**Supplementary Table 1** covariates selection according to CERAD-learning test.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |
|  | β（95% CI） | P | Change percentage from crude model1 | Change percentage from full model2 | VIF | colinearity | select | select.VIF |
| Age, yr | -0.17(-0.206,-0.135) | <0.001 | 31.2 | -74 | 1.578 | 0 | Yes | Yes |
| Sex |  |  | 6.5 | 32.7 | 1.425 | 0 | Yes | Yes |
| Male | REF. |  |  |  |  |  |  |  |
| Female | 1.742(1.393,2.091) | <0.001 |  |  |  |  |  |  |
| Race |  |  | -38 | 86.3 | 2.385 | 0 | Yes | Yes |
| Mexican American | REF. |  |  |  |  |  |  |  |
| Other Hispanic | -0.502(-1.332,0.328) | 0.226 |  |  |  |  |  |  |
| Non-Hispanic White | 1.067(0.18,1.954) | 0.02 |  |  |  |  |  |  |
| Non-Hispanic Black | 0.672(-0.267,1.611) | 0.154 |  |  |  |  |  |  |
| Non-Hispanic Asian | 1.06(0.079,2.041) | 0.035 |  |  |  |  |  |  |
| Other races including multi-racial | NA |  |  |  |  |  |  |  |
| Education | |  | -63 | 15.6 | 1.581 | 0 | Yes | Yes |
| Less than 9th grade | REF. |  |  |  |  |  |  |  |
| 9-11th grade (includes 12th grade with no diploma) | 1.821(1.161,2.482) | <0.001 |  |  |  |  |  |  |
| High school graduate/GED or equivalent | 2.911(2.212,3.609) | <0.001 |  |  |  |  |  |  |
| Some college or AA degree | 3.949(3.261,4.638) | <0.001 |  |  |  |  |  |  |
| College graduate or above | 4.352(3.584,5.121) | <0.001 |  |  |  |  |  |  |
| Home status | |  | -6.6 | -1.2 | 1.263 | 0 | No | No |
| Owned or being bought | REF. |  |  |  |  |  |  |  |
| Rented | -0.806(-1.423,-0.189) | 0.012 |  |  |  |  |  |  |
| Other arrangement | -0.829(-2.286,0.629) | 0.255 |  |  |  |  |  |  |
| Employ status | |  | -15 | 31.7 | 1.344 | 0 | Yes | Yes |
| No | REF. |  |  |  |  |  |  |  |
| Yes | 1.367(-0.277,3.011) | <0.001 |  |  |  |  |  |  |
| Smoking | |  | 2.6 | -7 | 1.358 | 0 | No | No |
| Never | REF. |  |  |  |  |  |  |  |
| Previous | -0.39(-0.848,0.069) | 0.093 |  |  |  |  |  |  |
| Currently | -0.419(-0.953,0.114) | 0.119 |  |  |  |  |  |  |
| BMI |  |  | 12.6 | -16 | 1.065 | 0 | Yes | No |
| Healthy weight | REF. |  |  |  |  |  |  |  |
| Underweight | 0.76 (-0.6,2.11) | 0.273 |  |  |  |  |  |  |
| Overweight | 0.68 (-0.66,2.02) | 0.323 |  |  |  |  |  |  |
| Obesity | 1.14 (-0.2,2.48) | 0.094 |  |  |  |  |  |  |
| Stroke | -1.729(-2.586,-0.873) | <0.001 | 7.4 | -1.7 | 1.087 | 0 | No | No |
| Diabetes | |  | -17 | 4.6 | 1.211 | 0 | Yes | Yes |
| No | REF. |  |  |  |  |  |  |  |
| Yes | -0.841(-1.308,-0.374) | 0.001 |  |  |  |  |  |  |
| Boederline | -0.321(-2.308, 2.005) | 0.564 |  |  |  |  |  |  |
| Hypertension | -0.401(-0.806,0.003) | 0.052 | 0.7 | -11 | 1.149 | 0 | Yes | Yes |
| Heart disease | -0.996(-1.457,-0.535) | <0.001 | 5.4 | -27 | 1.162 | 0 | Yes | Yes |
| Depression | -0.718(-1.087,-0.348) | <0.001 | 8.6 | -29 | 1.167 | 0 | Yes | Yes |
| Alcohol intake, g/d | 0.001(-0.008,0.011) | 0.758 | -30 | 3.8 | 2715.8 | 1 | No | Pending |
| Energy, kcal/d | 0(0,1.836) | 0.076 | -11 | 7.4 | 116.68 | 1 | No | Pending |
| Protein, g/d | 0.004(-0.001,0.009) | 0.13 | -4.5 | 4.5 | 694.27 | 1 | No | Pending |
| Carbohydrate, g/d | 0.001(-0.002,0.003) | 0.533 | -16 | -12 | 5.37 | 1 | No | Pending |
| Fiber, g/d | 0.026(0.006,0.045) | 0.014 | -57 | 6.8 | 527.52 | 1 | No | Pending |
| Total fat, g/d | 0.009(0.004,0.014) | 0.001 | -30 | 2.9 | 5.245 | 1 | No | Pending |
| Vitamin E as alpha tocopherol, mg/d | 0.057(0.015,3.841) | 0.001 | -0.5 | 4.1 | 3.288 | 0 | No | No |
| Added alpha tocopherol/Vitamin E, mg/d | 0.022(-0.027,0.071) | 0.36 | -1.8 | 2.3 | 146223 | 1 | No | Pending |
| Retinol, mcg/d | 0(0,0) | 0.624 | -6.9 | 2.3 | 254058 | 1 | No | Pending |
| Vitamin A, mcg/d | 0(0,0) | 0.014 | -0.6 | 2.5 | 1541 | 1 | No | Pending |
| Alpha carotene, mcg/d | 0(0,0) | 0.012 | 1.2 | 2.2 | 83193 | 1 | No | Pending |
| Beta carotene, mcg/d | 0(0,0) | 0.001 | -0.3 | 1.6 | 168.92 | 1 | No | Pending |
| Beta cryptoxanthin, mcg/d | 0(0,0) | 0.882 | 1.7 | -10 | 1.467 | 0 | Yes | Yes |
| Lycopene, mcg/d | 0(0,0) | 0.023 | 5.4 | 5.5 | 5.162 | 1 | No | Pending |
| Lutein + zeaxanthin, mcg/d | 0(0,0) | 0.001 | -6.9 | -13 | 4.849 | 1 | Yes | Pending |
| Vitamin B1, mg/d | 0.153(-0.075,0.381) | 0.182 | -13 | -1.3 | 6.429 | 1 | Yes | Pending |
| Vitamin B2, mg/d | 0.14(-0.063,0.342) | 0.169 | -6.4 | 2.5 | 7.754 | 1 | No | Pending |
| Niacin, mg/d | 0.008(-0.007,0.022) | 0.275 | -2 | -1.2 | 6.581 | 1 | No | Pending |
| Vitamin B6, mg/d | 0.035(-0.109,0.18) | 0.623 | -7.8 | -0.6 | 9.597 | 1 | No | Pending |
| Total folate, mcg/d | 0.001(0,0.002) | 0.064 | 0.3 | -0.2 | 7.946 | 1 | No | Pending |
| Folic acid, mcg/d | 0(-0.001,0.001) | 0.962 | -5.5 | -1.2 | 5.042 | 1 | No | Pending |
| Choline, mg/d | 0(-0.001,0.002) | 0.445 | -3.8 | 3.5 | 10.445 | 1 | No | Pending |
| Added Vitamin B12, mcg/d | 0.012(-0.006,0.03) | 0.189 | -0.6 | -1.3 | 5.559 | 1 | No | Pending |
| Vitamin B13, mcg/d | 0.035(-0.059,0.13) | 0.453 | -1 | 5 | 2.216 | 0 | No | No |
| Vitamin C, mg/d | 0.001(-0.001,0.003) | 0.278 | 1.8 | 1.4 | 2.219 | 0 | No | No |
| Vitamin D(D2+D3), mcg/d | -0.013(-0.054,0.029) | 0.535 | 1 | 2.9 | 6.678 | 1 | No | Pending |
| Vitamin K, mcg/d | 0.001(0,0.001) | 0.006 | -7.5 | -11 | 4.742 | 1 | No | Pending |
| Calcium, mg/d | 0(0,0.001) | 0.29 | -15 | -5.4 | 16.148 | 1 | No | Pending |
| Phosphorus, mg/d | 0(0,0.001) | 0.218 | -28 | -2 | 8.147 | 1 | No | Pending |
| Magnesium, mg/d | 0.002(0.001,0.003) | 0.001 | -4.6 | -1.2 | 4.973 | 1 | No | Pending |
| Iron, mg/d | 0.007(-0.019,0.033) | 0.603 | -7.9 | 0 | 3.936 | 0 | No | No |
| Zinc, mg/d | 0.015(-0.019,0.048) | 0.379 | -20 | 23.3 | 8.514 | 1 | No | Pending |
| Copper, mg/d | 0.193(0.053,0.333) | 0.008 | -8.7 | 0.8 | 3.763 | 0 | No | No |
| Sodium, mg/d | 0(0,0) | 0.146 | -17 | -5.6 | 9.425 | 1 | No | Pending |
| Potassium, mg/d | 0(0,0) | 0.096 | -5.7 | 0.5 | 3.65 | 0 | No | No |
| Selenium, mcg/d | 0.002(-0.001,0.005) | 0.161 | -17 | 5.7 | 1.831 | 0 | Yes | Yes |
| Caffeine, mg/d | 0.001(0,0.003) | 0.052 | 1 | 2.9 | 86.086 | 1 | No | Pending |

**Supplementary Table 2** covariates selection according to CERAD-recall test.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | β（95% CI） | P | Change.percentage1 | Change.percentage2 | VIF | colinearity | select |
| Age, yr | -0.095(-0.109,-0.08) | <0.001 | 26.7 | -24 | 1.578 | 0 | Yes |
| Sex |  |  | 4.9 | 7.9 | 1.425 | 0 | No |
| Male | REF. |  |  |  |  |  |  |
| Female | 0.821(0.625,1.016) | 0.184 |  |  |  |  |  |
| Race |  |  | -17 | 22 | 2.385 | 0 | Yes |
| Mexican American | REF. |  |  |  |  |  |  |
| Other Hispanic | -0.234(-0.684,0.216) | 0.013 |  |  |  |  |  |
| Non-Hispanic White | 0.317(-0.083,0.717) | 0.042 |  |  |  |  |  |
| Non-Hispanic Black | -0.009(-0.415,0.397) | 0.001 |  |  |  |  |  |
| Non-Hispanic Asian | 0.877(0.444,1.309) | 0.008 |  |  |  |  |  |
| Other races including multi-racial | NA |  |  |  |  |  |  |
| Education | |  | -42 | 4.3 | 1.581 | 0 | Yes |
| Less than 9th grade | REF. |  |  |  |  |  |  |
| 9-11th grade (includes 12th grade with no diploma) | 0.672(0.292,1.052) | 0.267 |  |  |  |  |  |
| High school graduate/GED or equivalent | 1.113(0.743,1.482) | <0.001 |  |  |  |  |  |
| Some college or AA degree | 1.664(1.302,2.027) | <0.001 |  |  |  |  |  |
| College graduate or above | 1.771(1.334,2.209) | <0.001 |  |  |  |  |  |
| Home status | |  | -4.8 | -0.9 | 1.263 | 0 | No |
| Owned or being bought | REF. |  |  |  |  |  |  |
| Rented | -0.354(-0.609,-0.1) | <0.001 |  |  |  |  |  |
| Other arrangement | -0.609(-1.347,0.129) | 0.348 |  |  |  |  |  |
| Employ status | |  | -8.1 | 2.3 | 1.344 | 0 | No |
| No | REF. |  |  |  |  |  |  |
| Yes | -0.172(-1.115,0.771) | 0.491 |  |  |  |  |  |
| Smoking | |  | 1.6 | -3 | 1.358 | 0 | No |
| Never | REF. |  |  |  |  |  |  |
| Previous | -0.197(-0.412,0.018) | 0.337 |  |  |  |  |  |
| Currently | -0.177(-0.47,0.116) | 0.26 |  |  |  |  |  |
| BMI |  | 0.007 | 1.6 | -3 | 1.358 | 0 | No |
| Healthy weight | REF. |  |  |  |  |  |  |
| Underweight | 0.41 (-0.26,1.07) | 0.233 |  |  |  |  |  |
| Overweight | 0.2 (-0.46,0.86) | 0.556 |  |  |  |  |  |
| Obesity | 0.54 (-0.12,1.2) | 0.108 |  |  |  |  |  |
| Stroke | -0.738(-1.058,-0.418) | <0.001 | 5.1 | 0.3 | 1.087 | 0 | No |
| Diabetes | |  | -15 | 3.4 | 1.211 | 0 | Yes |
| No | REF. |  |  |  |  |  |  |
| Yes | -0.454(-0.704,-0.203) | <0.001 |  |  |  |  |  |
| Boederline | NA |  |  |  |  |  |  |
| Hypertension | -0.216(-0.404,-0.029) | <0.001 | 6.3 | -5.8 | 1.149 | 0 | No |
| Heart disease | -0.573(-0.781,-0.365) | <0.001 | 2.5 | -2.8 | 1.162 | 0 | No |
| Depression | -0.268(-0.447,-0.09) | <0.001 | 5.2 | -6.7 | 1.167 | 0 | No |
| Alcohol intake, g/d | 0.002(-0.003,0.006) | <0.001 | -17 | 1.3 | 2715.8 | 1 | No |
| Energy, kcal/d | 0(0,0) | <0.001 | -4.7 | 1.3 | 116.68 | 1 | No |
| Protein, g/d | 0.001(-0.001,0.003) | <0.001 | -2.8 | 1.4 | 694.27 | 1 | No |
| Carbohydrate, g/d | 0(-0.001,0.001) | <0.001 | -12 | -1.9 | 5.37 | 1 | No |
| Fiber, g/d | 0.012(0.003,0.02) | <0.001 | -30 | 1.8 | 527.52 | 1 | No |
| Total fat, g/d | 0.003(0.001,0.006) | <0.001 | -24 | -1.3 | 5.245 | 1 | No |
| Vitamin E as alpha tocopherol, mg/d | 0.03(0.016,0.044) | <0.001 | -0.5 | -0.1 | 3.288 | 0 | No |
| Added alpha tocopherol/Vitamin E, mg/d | 0.014(-0.004,0.032) | 0.108 | -0.3 | 0.7 | 146223 | 1 | No |
| Retinol, mcg/d | 0(0,0) | <0.001 | -3.4 | 0.6 | 254058 | 1 | No |
| Vitamin A, mcg/d | 0(0,0) | 0.002 | 0 | 0.7 | 1541 | 1 | No |
| Alpha carotene, mcg/d | 0(0,0) | 0.043 | 0.7 | 0.6 | 83193 | 1 | No |
| Beta carotene, mcg/d | 0(0,0) | 0.376 | -1.4 | 0.5 | 168.92 | 1 | No |
| Beta cryptoxanthin, mcg/d | 0(0,0) | 0.655 | 1.4 | -2.1 | 1.467 | 0 | No |
| Lycopene, mcg/d | 0(0,0) | <0.001 | 4.3 | -2.5 | 5.162 | 1 | No |
| Lutein + zeaxanthin, mcg/d | 0(0,0) | 0.36 | -7.2 | -3.3 | 4.849 | 1 | No |
| Vitamin B1, mg/d | 0.101(-0.021,0.223) | <0.001 | -8.4 | 0.3 | 6.429 | 1 | No |
| Vitamin B2, mg/d | 0.06(-0.016,0.136) | <0.001 | -5.6 | 0 | 7.754 | 1 | No |
| Niacin, mg/d | 0.005(-0.001,0.012) | <0.001 | -1.4 | 0.1 | 6.581 | 1 | No |
| Vitamin B6, mg/d | 0.017(-0.044,0.079) | 0.001 | -7.9 | 0 | 9.597 | 1 | No |
| Total folate, mcg/d | 0(0,0.001) | <0.001 | -2.9 | 0 | 7.946 | 1 | No |
| Folic acid, mcg/d | 0(0,0.001) | <0.001 | -2.1 | 0.1 | 5.042 | 1 | No |
| Choline, mg/d | 0(0,0.001) | <0.001 | -2.6 | 0.7 | 10.445 | 1 | No |
| Added Vitamin B12, mcg/d | 0.005(-0.003,0.014) | <0.001 | -0.6 | -0.1 | 5.559 | 1 | No |
| Vitamin B13, mcg/d | 0.023(-0.014,0.06) | 0.003 | -0.1 | 1.9 | 2.216 | 0 | No |
| Vitamin C, mg/d | 0(-0.001,0.001) | 0.011 | 1.3 | 0.4 | 2.219 | 0 | No |
| Vitamin D(D2+D3), mcg/d | -0.006(-0.023,0.012) | 0.031 | 0.4 | -0.5 | 6.678 | 1 | No |
| Vitamin K, mcg/d | 0(0,0.001) | 0.088 | 0.9 | 1.3 | 4.742 | 1 | No |
| Calcium, mg/d | 0(0,0) | <0.001 | -7.6 | -0.4 | 16.148 | 1 | No |
| Phosphorus, mg/d | 0(0,0) | <0.001 | -19 | -0.9 | 8.147 | 1 | No |
| Magnesium, mg/d | 0.001(0,0.002) | <0.001 | -5.2 | 0.9 | 4.973 | 1 | No |
| Iron, mg/d | 0.005(-0.006,0.017) | <0.001 | 0.1 | 1.1 | 3.936 | 0 | No |
| Zinc, mg/d | 0(-0.015,0.015) | <0.001 | -15 | 4.9 | 8.514 | 1 | No |
| Copper, mg/d | 0.093(0.014,0.171) | 0.001 | -9.2 | -6.7 | 3.763 | 0 | No |
| Sodium, mg/d | 0(0,0) | <0.001 | -8.1 | -1.3 | 9.425 | 1 | No |
| Potassium, mg/d | 0(0,0) | <0.001 | -4.1 | 0.2 | 3.65 | 0 | No |
| Selenium, mcg/d | 0.001(0,0.002) | <0.001 | -16 | 1.9 | 1.831 | 0 | No |
| Caffeine, mg/d | 0.001(0,0.001) | <0.001 | 1.6 | 1.1 | 86.086 | 1 | No |

**Supplementary Table 3** covariates selection according to animal fluency test.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | β（95% CI） | P | Change.percentage1 | coeff2 | Change.percentage2 | VIF | colinearity | select |
| Age, yr | -0.177(-0.202,-0.152) | <0.001 | 10.7 | 0.26 | -22.7 | 1.578 | 0 | Yes |
| Sex |  |  | -0.3 | 0.34 | 0 | 1.425 | 0 | No |
| Male | REF. |  |  |  |  |  |  |  |
| Female | -0.27(-0.676,0.135) | 0.184 |  |  |  |  |  |  |
| Race |  |  | -42.5 | 0.56 | 63.1 | 2.385 | 0 | Yes |
| Mexican American | REF. |  |  |  |  |  |  |  |
| Other Hispanic | -1.462(-2.591,-0.332) | 0.013 |  |  |  |  |  |  |
| Non-Hispanic White | 1.118(0.041,2.195) | 0.042 |  |  |  |  |  |  |
| Non-Hispanic Black | -1.808(-2.774,-0.841) | 0.001 |  |  |  |  |  |  |
| Non-Hispanic Asian | -1.63(-2.796,-0.463) | 0.008 |  |  |  |  |  |  |
| Other races including multi-racial | | | | |  |  |  |  |
| Education | |  | -19.7 | 0.32 | -7 | 1.581 | 0 | Yes |
| Less than 9th grade | REF. |  |  |  |  |  |  |  |
| 9-11th grade (includes 12th grade with no diploma) | 0.494(-0.399,1.387) | 0.267 |  |  |  |  |  |  |
| High school graduate/GED or equivalent | 1.792(1.073,2.51) | <0.001 |  |  |  |  |  |  |
| Some college or AA degree | 3.561(2.921,4.201) | <0.001 |  |  |  |  |  |  |
| College graduate or above | 5.075(4.086,6.064) | <0.001 |  |  |  |  |  |  |
| Home status | |  | -5.1 | 0.34 | -1.3 | 1.263 | 0 | No |
| Owned or being bought | REF. |  |  |  |  |  |  |  |
| Rented | -1.576(-2.176,-0.977) | <0.001 |  |  |  |  |  |  |
| Other arrangement | -0.827(-2.596,0.943) | 0.348 |  |  |  |  |  |  |
| Employ status | -0.747(-2.939,1.445) | 0.491 | -6.3 | 0.36 | 6.3 | 1.344 | 0 | No |
| Smoking | |  | 0.1 | 0.33 | -2.1 | 1.358 | 0 | No |
| Never | REF. |  |  |  |  |  |  |  |
| Previous | 0.242(-0.264,0.747) | 0.337 |  |  |  |  |  |  |
| Currently | -0.307(-0.854,0.239) | 0.26 |  |  |  |  |  |  |
| BMI |  | 0.437 | -1.1 | 0.34 | -1.9 | 2.216 | 0 |  |
| Healthy weight | REF. |  |  |  |  |  |  |  |
| Underweight | 0.46 (-1.1,2.01) | 0.566 |  |  |  |  |  |  |
| Overweight | 0.66 (-0.88,2.2) | 0.403 |  |  |  |  |  |  |
| Obesity | 0.83 (-0.71,2.37) | 0.289 |  |  |  |  |  |  |
| Stroke | -2.087(-3.001,-1.173) | <0.001 | 5.1 | 0.34 | -0.8 | 1.087 | 0 | No |
| Diabetes | |  | -9.6 | 0.35 | 3.4 | 1.211 | 0 | No |
| No | REF. |  |  |  |  |  |  |  |
| Yes | -1.357(-1.936,-0.778) | <0.001 |  |  |  |  |  |  |
| Borderline | -0.986(-3.44,1.469) | 0.418 |  |  |  |  |  |  |
| Hypertension | -1.376(-1.91,-0.842) | <0.001 | -3.4 | 0.34 | -1.2 | 1.149 | 0 | No |
| Heart disease | -1.06(-1.7,-0.421) | <0.001 | 0.3 | 0.34 | 0.3 | 1.162 | 0 | No |
| Depression | -1.222(-1.73,-0.713) | <0.001 | 5.2 | 0.31 | -9.2 | 1.167 | 0 | No |
| Alcohol intake, g/d | 0.021(0.011,0.032) | <0.001 | -39.2 | 0.35 | 1.3 | 2716 | 1 | No |
| Energy, kcal/d | 0.001(0.001,0.001) | <0.001 | -13.5 | 0.35 | 1.2 | 116.7 | 1 | No |
| Protein, g/d | 0.017(0.013,0.021) | <0.001 | -25.6 | 0.35 | 1.7 | 694.3 | 1 | No |
| Carbohydrate, g/d | 0.006(0.004,0.008) | <0.001 | -14.2 | 0.32 | -5.7 | 5.37 | 1 | No |
| Fiber, g/d | 0.069(0.052,0.086) | <0.001 | -43 | 0.35 | 1.7 | 527.5 | 1 | No |
| Total fat, g/d | 0.022(0.017,0.027) | <0.001 | -22.6 | 0.33 | -3.3 | 5.245 | 1 | No |
| Vitamin E as alpha tocopherol, mg/d | 0.127(0.088,0.166) | <0.001 | -0.3 | 0.33 | -2.2 | 3.288 | 0 | No |
| Added alpha tocopherol/Vitamin E, mg/d | 0.04(-0.009,0.09) | 0.108 | -5.2 | 0.34 | -1.6 | 1E+05 | 1 | No |
| Retinol, mcg/d | 0(0,0.001) | <0.001 | -3.8 | 0.34 | -1.6 | 3E+05 | 1 | No |
| Vitamin A, mcg/d | 0(0,0.001) | 0.002 | -0.2 | 0.34 | -1.7 | 1541 | 1 | No |
| Alpha carotene, mcg/d | 0(0,0) | 0.043 | 0.2 | 0.34 | -1.6 | 83193 | 1 | No |
| Beta carotene, mcg/d | 0(0,0) | 0.376 | 0.4 | 0.34 | -1.2 | 168.9 | 1 | No |
| Beta cryptoxanthin, mcg/d | 0(0,0) | 0.655 | 1 | 0.34 | 0.7 | 1.467 | 0 | No |
| Lycopene, mcg/d | 0(0,0) | <0.001 | 0.9 | 0.34 | -0.3 | 5.162 | 1 | No |
| Lutein + zeaxanthin, mcg/d | 0(0,0) | 0.36 | -11.4 | 0.36 | 6 | 4.849 | 1 | Yes |
| Vitamin B1, mg/d | 0.783(0.509,1.057) | <0.001 | -24.1 | 0.34 | -0.5 | 6.429 | 1 | Yes |
| Vitamin B2, mg/d | 0.735(0.564,0.905) | <0.001 | -9.7 | 0.34 | 0.5 | 7.754 | 1 | No |
| Niacin, mg/d | 0.044(0.03,0.058) | <0.001 | -4.2 | 0.34 | 0.5 | 6.581 | 1 | No |
| Vitamin B6, mg/d | 0.31(0.141,0.479) | 0.001 | -11.1 | 0.33 | -2.8 | 9.597 | 1 | No |
| Total folate, mcg/d | 0.003(0.003,0.004) | <0.001 | -4.7 | 0.34 | 0.1 | 7.946 | 1 | No |
| Folic acid, mcg/d | 0.003(0.001,0.004) | <0.001 | -10.4 | 0.35 | 1.3 | 5.042 | 1 | No |
| Choline, mg/d | 0.003(0.002,0.004) | <0.001 | -5.2 | 0.34 | 0.3 | 10.45 | 1 | No |
| Added Vitamin B12, mcg/d | 0.051(0.026,0.075) | <0.001 | -0.8 | 0.34 | -0.1 | 5.559 | 1 | No |
| Vitamin B13, mcg/d | 0.137(0.049,0.224) | 0.003 | -1.1 | 0.34 | -1.9 | 2.216 | 0 | No |
| Vitamin C, mg/d | 0.003(0.001,0.006) | 0.011 | -1.8 | 0.34 | 0.5 | 2.219 | 0 | No |
| Vitamin D(D2+D3), mcg/d | 0.044(0.004,0.083) | 0.031 | 0.3 | 0.34 | 0 | 6.678 | 1 | No |
| Vitamin K, mcg/d | 0(0,0.001) | 0.088 | -13.9 | 0.35 | 2.7 | 4.742 | 1 | No |
| Calcium, mg/d | 0.001(0.001,0.002) | <0.001 | -26.9 | 0.34 | 0.6 | 16.15 | 1 | No |
| Phosphorus, mg/d | 0.001(0.001,0.002) | <0.001 | -28.9 | 0.33 | -2.1 | 8.147 | 1 | No |
| Magnesium, mg/d | 0.006(0.005,0.007) | <0.001 | -15.8 | 0.3 | -11.6 | 4.973 | 1 | No |
| Iron, mg/d | 0.068(0.044,0.092) | <0.001 | -19.3 | 0.33 | -2.4 | 3.936 | 0 | No |
| Zinc, mg/d | 0.125(0.1,0.15) | <0.001 | -13.9 | 0.35 | 2.2 | 8.514 | 1 | No |
| Copper, mg/d | 0.42(0.181,0.658) | 0.001 | -9 | 0.33 | -3 | 3.763 | 0 | No |
| Sodium, mg/d | 0(0,0.001) | <0.001 | -23.8 | 0.34 | -1.9 | 9.425 | 1 | No |
| Potassium, mg/d | 0.001(0,0.001) | <0.001 | -6.6 | 0.34 | -0.5 | 3.65 | 0 | No |
| Selenium, mcg/d | 0.009(0.006,0.012) | <0.001 | -18.8 | 0.36 | 4.8 | 1.831 | 0 | Yes |
| Caffeine, mg/d | 0.005(0.003,0.006) | <0.001 | 4 | 0.35 | 1.3 | 86.09 | 1 | No |

**Supplementary Table 4** covariates selection according to DSST.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | β（95% CI） | P | Change.percentage1 | Change.percentage2 | VIF | colinearity | select |
| Age, yr | -0.721(-0.826,-0.616) | <0.001 | 14.7 | -47.3 | 1.578 | 0 | Yes |
| Sex |  |  | 2.3 | 11.7 | 1.425 | 0 | Yes |
| Male | REF. |  |  |  |  |  |  |
| Female | 5.188(4.049,6.328) | <0.001 |  |  |  |  |  |
| Race |  |  | -53 | 112.9 | 2.385 | 0 | Yes |
| Mexican American | REF. |  |  |  |  |  |  |
| Other Hispanic | -2.985(-7.18,1.209) | 0.156 |  |  |  |  |  |
| Non-Hispanic White | 10.64(7.79,13.489) | <0.001 |  |  |  |  |  |
| Non-Hispanic Black | -0.178(-3.244,2.888) | 0.906 |  |  |  |  |  |
| Non-Hispanic Asian | 11.622(8.719,14.525) | <0.001 |  |  |  |  |  |
| Other races including multi-racial | | | | |  |  |  |
| Education | |  | -45.7 | 14.7 | 1.581 | 0 | Yes |
| Less than 9th grade | REF. |  |  |  |  |  |  |
| 9-11th grade (includes 12th grade with no diploma) | 10.855(8.821,12.888) | <0.001 |  |  |  |  |  |
| High school graduate/GED or equivalent | 18.561(16.407,20.715) | <0.001 |  |  |  |  |  |
| Some college or AA degree | 25.218(23.2,27.236) | <0.001 |  |  |  |  |  |
| College graduate or above | 29.984(27.597,32.371) | <0.001 |  |  |  |  |  |
| Home status | |  | -7.8 | -2.3 | 1.263 | 0 | No |
| Owned or being bought | REF. |  |  |  |  |  |  |
| Rented | -8.162(-10.173,-6.151) | <0.001 |  |  |  |  |  |
| Other arrangement | -7.958(-12.157,-3.759) | 0.001 |  |  |  |  |  |
| Employ status | -3.315(-9.203,2.573) | 0.259 | -8.4 | 10.8 | 1.344 | 0 | Yes |
| Smoking | |  | 1 | -2.8 | 1.358 | 0 | No |
| Never | REF. |  |  |  |  |  |  |
| Previous | -1.101(-2.796,0.594) | 0.195 |  |  |  |  |  |
| Currently | -4.828(-7.085,-2.571) | <0.001 |  |  |  |  |  |
| BMI |  | 0.134 | 4.5 | 5.6 | 1.162 | 0 | No |
| Healthy weight | REF. |  |  |  |  |  |  |
| Underweight | 5.89 (0.96,10.81) | 0.019 |  |  |  |  |  |
| Overweight | 5.5 (0.62,10.38) | 0.027 |  |  |  |  |  |
| Obesity | 5.7 (0.83,10.57) | 0.022 |  |  |  |  |  |
| Stroke | -10.057(-12.828,-7.285) | <0.001 | 6.9 | -4.3 | 1.087 | 0 | No |
| Diabetes | |  | -16.8 | 9.4 | 1.211 | 0 | Yes |
| No | REF. |  |  |  |  |  |  |
| Yes | -6.876(-8.458,-5.294) | <0.001 |  |  |  |  |  |
| Borderline | -4.474(-11.808,2.861) | 0.222 |  |  |  |  |  |
| Hypertension | -4.025(-5.326,-2.724) | <0.001 | -3.8 | 0.8 | 1.149 | 0 | No |
| Heart disease | -6.326(-7.911,-4.742) | <0.001 | -0.1 | -1 | 1.162 | 0 | No |
| Depression | -5.428(-6.772,-4.085) | <0.001 | 7.7 | -16.2 | 1.167 | 0 | Yes |
| Alcohol intake, g/d | 0.053(0.015,0.09) | 0.007 | -27 | 2.5 | 2716 | 1 | No |
| Energy, kcal/d | 0.002(0.002,0.003) | <0.001 | -9.4 | 2.3 | 116.7 | 1 | No |
| Protein, g/d | 0.037(0.017,0.057) | 0.001 | -11.2 | 2.8 | 694.3 | 1 | No |
| Carbohydrate, g/d | 0.01(0.004,0.016) | 0.002 | -11.6 | -1.4 | 5.37 | 1 | No |
| Fiber, g/d | 0.178(0.119,0.236) | <0.001 | -37.7 | 3.6 | 527.5 | 1 | No |
| Total fat, g/d | 0.058(0.043,0.074) | <0.001 | -21.5 | -2.4 | 5.245 | 1 | No |
| Vitamin E as alpha tocopherol, mg/d | 0.361(0.212,0.51) | <0.001 | -0.3 | -2.7 | 3.288 | 0 | No |
| Added alpha tocopherol/Vitamin E, mg/d | 0.097(-0.055,0.249) | 0.203 | -2.5 | -2.5 | 1E+05 | 1 | No |
| Retinol, mcg/d | 0.001(0,0.001) | 0.031 | -3 | -2.5 | 3E+05 | 1 | No |
| Vitamin A, mcg/d | 0.001(0,0.002) | 0.034 | -0.2 | -2.5 | 1541 | 1 | No |
| Alpha carotene, mcg/d | 0(0,0.001) | 0.07 | 0.3 | -2.5 | 83193 | 1 | No |
| Beta carotene, mcg/d | 0(0,0) | 0.14 | 1.6 | -1.8 | 168.9 | 1 | No |
| Beta cryptoxanthin, mcg/d | -0.001(-0.001,0) | 0.031 | 0.9 | 1.7 | 1.467 | 0 | No |
| Lycopene, mcg/d | 0(0,0) | 0.01 | 2.1 | -1.8 | 5.162 | 1 | No |
| Lutein + zeaxanthin, mcg/d | 0(0,0) | 0.04 | -8.9 | -1.1 | 4.849 | 1 | No |
| Vitamin B1, mg/d | 1.891(1.136,2.647) | <0.001 | -18.6 | 0.2 | 6.429 | 1 | No |
| Vitamin B2, mg/d | 1.74(1.166,2.314) | <0.001 | -7 | -0.2 | 7.754 | 1 | No |
| Niacin, mg/d | 0.098(0.044,0.153) | 0.001 | -3.1 | 1 | 6.581 | 1 | No |
| Vitamin B6, mg/d | 0.738(0.177,1.299) | 0.012 | -8.7 | 0.9 | 9.597 | 1 | No |
| Total folate, mcg/d | 0.008(0.006,0.011) | <0.001 | -3.3 | 0.2 | 7.946 | 1 | No |
| Folic acid, mcg/d | 0.006(0.003,0.01) | 0.001 | -5.5 | 2.3 | 5.042 | 1 | No |
| Choline, mg/d | 0.005(0.001,0.009) | 0.009 | -3.4 | -0.4 | 10.45 | 1 | No |
| Added Vitamin B12, mcg/d | 0.1(0.016,0.184) | 0.022 | -0.7 | 0.2 | 5.559 | 1 | No |
| Vitamin B13, mcg/d | 0.359(0.12,0.598) | 0.004 | -0.9 | 0.8 | 2.216 | 0 | No |
| Vitamin C, mg/d | 0.008(0,0.015) | 0.04 | -1.4 | 0.7 | 2.219 | 0 | No |
| Vitamin D(D2+D3), mcg/d | 0.101(-0.032,0.233) | 0.131 | 0.4 | -0.2 | 6.678 | 1 | No |
| Vitamin K, mcg/d | 0.002(-0.001,0.006) | 0.191 | -9.1 | 5.5 | 4.742 | 1 | No |
| Calcium, mg/d | 0.003(0.001,0.004) | <0.001 | -20 | 0 | 16.15 | 1 | No |
| Phosphorus, mg/d | 0.003(0.002,0.005) | <0.001 | -26.8 | 1.2 | 8.147 | 1 | No |
| Magnesium, mg/d | 0.018(0.013,0.022) | <0.001 | -9.3 | -10.5 | 4.973 | 1 | No |
| Iron, mg/d | 0.13(0.063,0.197) | <0.001 | -11.7 | -0.5 | 3.936 | 0 | Yes |
| Zinc, mg/d | 0.241(0.13,0.353) | <0.001 | -11.3 | 0.9 | 8.514 | 1 | No |
| Copper, mg/d | 1.061(0.087,2.034) | 0.034 | -8.5 | -9.8 | 3.763 | 0 | No |
| Sodium, mg/d | 0.001(0.001,0.001) | <0.001 | -21.4 | 1.1 | 9.425 | 1 | No |
| Potassium, mg/d | 0.002(0.001,0.002) | <0.001 | -4.3 | 0.3 | 3.65 | 0 | No |
| Selenium, mcg/d | 0.017(0.004,0.03) | 0.013 | -16 | 0.9 | 1.831 | 0 | Yes |
| Caffeine, mg/d | 0.012(0.008,0.016) | <0.001 | 3.1 | 2.3 | 86.09 | 1 | No |

**Supplementary Table 5**. Characteristics ofincluded and excluded participants.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Excluded  N=777 | Included  N=2,854 | P value |
| Age, yr, mean ± SE | 73 | 70 | 0.00 |
| Male, | 39.1 | 45.6 | 0.34 |
| Race |  |  | 0.30 |
| Mexican American | 4.2 | 6.3 |  |
| Other Hispanic | 8.4 | 6.6 |  |
| Non-Hispanic White | 53.4 | 64.4 |  |
| Non-Hispanic Black | 24.2 | 15.1 |  |
| Other races including multi-racial | 9.8 | 7.6 |  |
| Education |  |  | 0.00 |
| Less than 9th grade | 22.3 | 9.1 |  |
| 9-11th grade (includes 12th grade with no diploma) | 23.4 | 12.4 |  |
| High school graduate/GED or equivalent | 19.2 | 22.8 |  |
| Some college or AA degree | 15.7 | 29.8 |  |
| College graduate or above | 19.5 | 25.9 |  |
| Marriage status | |  | 0.04 |
| Married/living with partner | 11.3 | 5.1 |  |
| Widowed/divorced/separated | 46.1 | 59.9 |  |
| Never married | 42.6 | 35 |  |
| Home status |  |  | 0.40 |
| Owned or being bought | 73.1 | 79 |  |
| Rented | 22.3 | 18.8 |  |
| Other arrangement | 4.6 | 2.2 |  |
| Employment | 14.1 | 26.1 | 0.05 |
| Employed | 85.9 | 73.9 |  |
| Unemployed |  |  |  |
| Smoking Status | |  | 0.15 |
| Never | 61.9 | 49.6 |  |
| Previous | 32.6 | 39.2 |  |
| Current | 5.5 | 11.2 |  |
| BMI |  |  | 0.26 |
| Underweight | 20.2 | 1.4 |  |
| Normal or healthy weight | 71 | 25.6 |  |
| Overweight | 8.8 | 58 |  |
| Obese |  | 14.9 |  |
| History of disease | 69.3 | 68.8 | 0.93 |
| Heart disease | 19.5 | 18.7 | 0.88 |
| History of stroke | 17.4 | 7.3 | 0.01 |
| Hypertension | 70.4 | 62 | 0.20 |
| Diabetes |  |  | 0.27 |
| No | 70.8 | 73.6 |  |
| Borderline | 9.2 | 4.5 |  |
| Yes | 20 | 21.9 |  |
| Sleep disorder | 14.5 | 12.3 | 0.63 |
| Depression | 25 | 23 | 0.75 |
| Dietary intake | |  |  |
| Energy, kcal | 1717.4 | 1838.7 | 0.26 |
| Protein, g | 67.1 | 71.6 | 0.35 |
| Lutein + Zeaxanthin, mg | 1484.7 | 1708.8 | 0.71 |
| Folic acid, mcg | 358.3 | 378.7 | 0.53 |
| Vitamin B12, mcg | 4.5 | 4.7 | 0.80 |
| Added vitamin B12, mcg | 0.9 | 0.9 | 0.96 |
| Vitamin D (D2 + D3), mcg | 5.6 | 4.7 | 0.27 |
| Magnesium, mg | 250.9 | 282.5 | 0.10 |
| Iron, mg | 14 | 14 | 1.00 |
| Zinc, mg | 10.1 | 10 | 0.95 |
| Copper, mg | 1.1 | 1.2 | 0.61 |
| Selenium, mg | 95.4 | 100.7 | 0.49 |
| Caffeine, mg | 107.8 | 159.5 | 0.04 |