**Supplemental Material**

**Table S1** Beta values, standard error of the means (SE) and p values from minimally adjusted time-based linear mixed effect models adjusting for age, education, and race/ethnicity.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | **Processing Speed** | | | | | | **Executive Function** | | | | | **Episodic Memory** | | | | |
|  |  | | |  |  | |  | | |  |  | |  | |  |  | |  | |
|  | Drinking  Group | | | Beta | | S.E. | | P-value | Beta | | | S.E. | | P-value | Beta | | S.E. | | P-value |
| **Intercept** |  | | | 0.044 | | 0.063 | | 0.49 | -0.031 | | | 0.060 | | 0.60 | -0.027 | | 0.062 | | 0.66 |
| **Time** |  | | | -0.098 | | 0.004 | | **<0.001** | -0.070 | | | 0.004 | | **<0.0001** | -0.045 | | 0.004 | | **<0.001** |
| **Alcohol** |  | | |  | |  | | **0.02** |  | | |  | | 0.48 |  | |  | | 0.34 |
|  | Abstainer | | | -0.254 | | 0.127 | | 0.05 | -0.114 | | | 0.122 | | 0.35 | -0.093 | | 0.124 | | 0.45 |
|  | Former | | | -0.233 | | 0.072 | | **0.001** | -0.132 | | | 0.070 | | 0.06 | -0.142 | | 0.071 | | **0.04** |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | -0.021 | | 0.078 | | 0.79 | -0.022 | | | 0.076 | | 0.78 | -0.072 | | 0.076 | | 0.34 |
|  | Moderate | | | -0.083 | | 0.093 | | 0.37 | -0.013 | | | 0.090 | | 0.88 | -0.125 | | 0.091 | | 0.17 |
|  | At-risk | | | -0.075 | | 0.087 | | 0.39 | -0.049 | | | 0.084 | | 0.56 | -0.161 | | 0.085 | | 0.06 |
| **Alcohol x Time** | | |  |  | |  | | 0.11 |  | | |  | | 0.48 |  | |  | | 0.28 |
|  | Abstainer | | | 0.015 | | 0.010 | | 0.12 | 0.012 | | | 0.009 | | 0.18 | 0.011 | | 0.010 | | 0.25 |
|  | Former | | | -0.004 | | 0.006 | | 0.55 | 0.0005 | | | 0.005 | | 0.93 | -0.001 | | 0.006 | | 0.88 |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | 0.004 | | 0.006 | | 0.51 | -0.003 | | | 0.006 | | 0.65 | 0.006 | | 0.006 | | 0.39 |
|  | Moderate | | | 0.013 | | 0.008 | | 0.10 | -0.001 | | | 0.007 | | 0.89 | 0.002 | | 0.008 | | 0.79 |
|  | At-risk | | | -0.005 | | 0.007 | | 0.47 | -0.008 | | | 0.006 | | 0.24 | -0.010 | | 0.007 | | 0.16 |
|  |  | | | **General Verbal Fluency** | | | | | | **Semantic Fluency** | | | | | **Working Memory** | | | | |
| **Intercept** |  | | | -0.071 | | 0.063 | | 0.26 | 0.018 | | | 0.063 | | 0.78 | 0.004 | | 0.058 | | 0.94 |
| **Time** |  | | | -0.027 | | 0.004 | | **<0.001** | -0.032 | | | 0.005 | | **<0.001** | -0.034 | | 0.004 | | **<.001** |
| **Alcohol** |  | | |  | |  | | **0.01** |  | | |  | | **0.02** |  | |  | | **0.04** |
|  | Abstainer | | | -0.171 | | 0.125 | | 0.17 | -0.105 | | | 0.129 | | 0.42 | -0.142 | | 0.112 | | 0.20 |
|  | Former | | | -0.239 | | 0.071 | | **0.001** | -0.219 | | | 0.074 | | **0.003** | -0.178 | | 0.064 | | **0.01** |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | -0.046 | | 0.077 | | 0.55 | -0.008 | | | 0.080 | | 0.93 | -0.105 | | 0.068 | | 0.12 |
|  | Moderate | | | 0.028 | | 0.092 | | 0.76 | 0.056 | | | 0.095 | | 0.56 | -0.172 | | 0.081 | | **0.03** |
|  | At-risk | | | -0.021 | | 0.086 | | 0.81 | -0.043 | | | 0.089 | | 0.63 | -0.004 | | 0.077 | | 0.96 |
| **Alcohol x Time** | |  | |  | |  | | 0.95 |  | | |  | | 0.91 |  | |  | | **0.04** |
|  | Abstainer | | | 0.004 | | 0.009 | | 0.66 | -0.002 | | | 0.011 | | 0.89 | 0.005 | | 0.008 | | 0.52 |
|  | Former | | | -0.0001 | | 0.005 | | 0.99 | 0.001 | | | 0.007 | | 0.84 | -0.003 | | 0.005 | | 0.58 |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | -0.003 | | 0.006 | | 0.62 | -0.005 | | | 0.007 | | 0.46 | -0.002 | | 0.005 | | 0.72 |
|  | Moderate | | | -0.005 | | 0.007 | | 0.46 | -0.007 | | | 0.009 | | 0.46 | 0.008 | | 0.006 | | 0.21 |
|  | At-risk | | | -0.001 | | 0.006 | | 0.83 | -0.003 | | | 0.008 | | 0.69 | -0.014 | | 0.006 | | **0.02** |

**Table S2.** Beta values, standard error of the means (SE) and p values from time-based linear mixed effect models adjusted for age, education, race/ethnicity, young adult cognitive ability, family income, childhood socioeconomic status, physical activity, smoking status, body mass index, diastolic blood pressure, number of comorbidities, depression, diabetes, and head injury.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **Processing Speed** | | | | | | **Executive Function** | | | | | **Episodic Memory** | | | | |
|  |  | |  |  | |  | | |  |  | |  | |  |  | |  | |
|  | Drinking  Group | | Beta | | S.E. | | P-value | Beta | | | S.E. | | P-value | Beta | | S.E. | | P-value |
| **Intercept** |  | | -0.532 | | 0.186 | | **0.004** | -0.328 | | | 0.169 | | **0.05** | -0.356 | | 0.183 | | **0.05** |
| **Time** |  | | -0.093 | | 0.005 | | **<.0001** | -0.068 | | | 0.004 | | **<.0001** | -0.046 | | 0.005 | | **<.0001** |
| **Alcohol** |  | |  | |  | | 0.17 |  | | |  | | 0.92 |  | |  | | 0.57 |
|  | Abstainer | | -0.228 | | 0.126 | | 0.07 | -0.066 | | | 0.117 | | 0.57 | -0.038 | | 0.121 | | 0.75 |
|  | Former | | -0.171 | | 0.071 | | 0.02 | -0.062 | | | 0.066 | | 0.35 | -0.088 | | 0.068 | | 0.20 |
|  | Very Light | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | -0.041 | | 0.076 | | 0.59 | -0.051 | | | 0.072 | | 0.48 | -0.093 | | 0.074 | | 0.21 |
|  | Moderate | | -0.089 | | 0.091 | | 0.33 | 0.004 | | | 0.086 | | 0.96 | -0.135 | | 0.088 | | 0.12 |
|  | At-risk | | -0.063 | | 0.086 | | 0.46 | -0.017 | | | 0.080 | | 0.83 | -0.128 | | 0.082 | | 0.12 |
| **Alcohol x Time** | |  |  | |  | | 0.18 |  | | |  | | 0.46 |  | |  | | 0.21 |
|  | Abstainer | | 0.008 | | 0.021 | | 0.71 | 0.010 | | | 0.009 | | 0.25 | 0.010 | | 0.010 | | 0.30 |
|  | Former | | -0.003 | | 0.013 | | 0.80 | -0.0001 | | | 0.005 | | 0.99 | -0.001 | | 0.006 | | 0.85 |
|  | Very Light | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | 0.014 | | 0.015 | | 0.35 | -0.002 | | | 0.006 | | 0.72 | 0.006 | | 0.006 | | 0.34 |
|  | Moderate | | 0.018 | | 0.018 | | 0.32 | -0.003 | | | 0.007 | | 0.68 | 0.002 | | 0.008 | | 0.80 |
|  | At-risk | | 0.002 | | 0.017 | | 0.90 | -0.009 | | | 0.006 | | 0.16 | -0.011 | | 0.007 | | 0.11 |
|  |  | | **General Verbal Fluency** | | | | | | **Semantic Fluency** | | | | | **Working Memory** | | | | |
| **Intercept** |  | | -0.231 | | 0.178 | | 0.20 | -0.110 | | | 0.199 | | 0.58 | -0.506 | | 0.160 | | **0.002** |
| **Time** |  | | -0.027 | | 0.004 | | **<.0001** | -0.033 | | | 0.005 | | **<.0001** | -0.033 | | **0.004** | | **<.0001** |
| **Alcohol** |  | |  | |  | | 0.06 |  | | |  | | 0.07 |  | |  | | 0.06 |
|  | Abstainer | | -0.132 | | 0.124 | | 0.29 | -0.069 | | | 0.129 | | 0.59 | -0.082 | | 0.109 | | 0.45 |
|  | Former | | -0.189 | | 0.070 | | 0.007 | -0.182 | | | 0.073 | | 0.01 | -0.110 | | 0.062 | | 0.07 |
|  | Very Light | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | -0.071 | | 0.075 | | 0.35 | -0.027 | | | 0.079 | | 0.73 | -0.125 | | 0.065 | | 0.06 |
|  | Moderate | | 0.023 | | 0.090 | | 0.80 | 0.060 | | | 0.095 | | 0.53 | -0.161 | | 0.078 | | 0.04 |
|  | At-risk | | 0.007 | | 0.084 | | 0.94 | 0.006 | | | 0.088 | | 0.95 | 0.039 | | 0.074 | | 0.60 |
| **Alcohol x Time** | |  |  | |  | | 0.92 |  | | |  | | 0.83 |  | |  | | **0.03** |
|  | Abstainer | | 0.010 | | 0.021 | | 0.62 | 0.001 | | | 0.021 | | 0.95 | 0.004 | | 0.008 | | 0.62 |
|  | Former | | 0.024 | | 0.013 | | 0.06 | 0.029 | | | 0.013 | | 0.03 | -0.003 | | 0.005 | | 0.53 |
|  | Very Light | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | 0.018 | | 0.015 | | 0.21 | 0.023 | | | 0.015 | | 0.13 | -0.001 | | 0.005 | | 0.83 |
|  | Moderate | | 0.021 | | 0.017 | | 0.23 | 0.025 | | | 0.018 | | 0.17 | 0.007 | | 0.006 | | 0.26 |
|  | At-risk | | 0.007 | | 0.017 | | 0.68 | 0.020 | | | 0.017 | | 0.25 | -0.015 | | 0.006 | | **0.01** |

**Table S3.** Beta values, standard error of the means (SE) and p values from age-based linear mixed effect models, which included alcohol group as a time-varying exposure and adjusted for education and race/ethnicity.

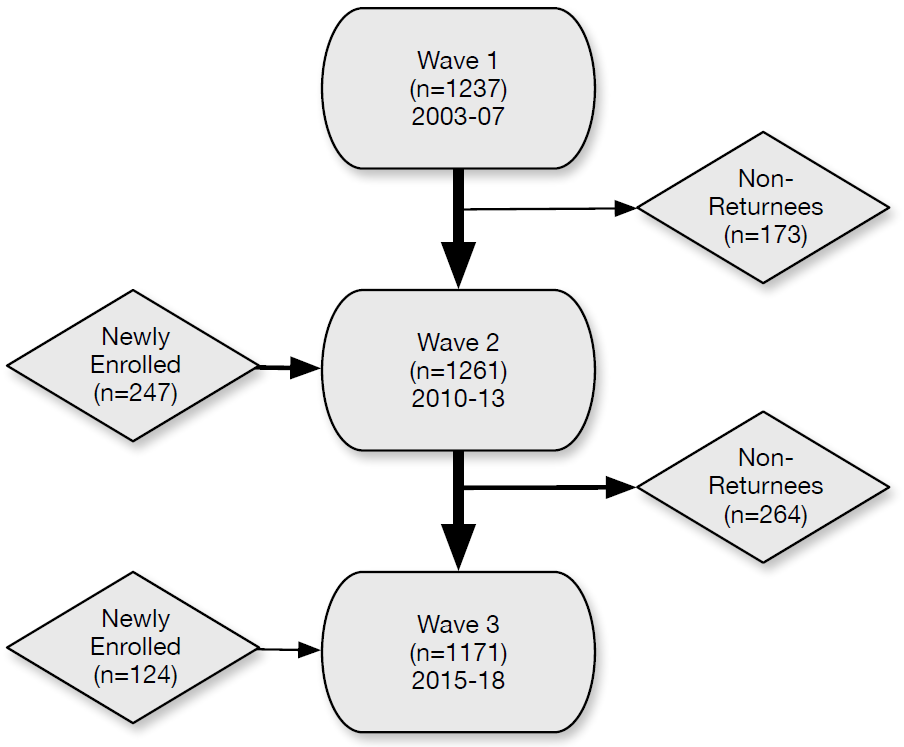
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | **Processing Speed** | | | | | | **Executive Function** | | | | | **Episodic Memory** | | | | |
|  |  | | |  |  | |  | | |  |  | |  | |  |  | |  | |
|  | Drinking  Group | | | Beta | | S.E. | | P-value | Beta | | | S.E. | | P-value | Beta | | S.E. | | P-value |
| **Intercept** |  | | | 0.006 | | 0.052 | | 0.91 | -0.063 | | | 0.050 | | 0.21 | -0.123 | | 0.051 | | **0.02** |
| **Age** |  | | | -0.101 | | 0.004 | | **<0.001** | -0.066 | | | 0.004 | | **<0.0001** | -0.048 | | 0.004 | | **<0.001** |
| **Alcohol** |  | | |  | |  | | **0.047** |  | | |  | | 0.66 |  | |  | | 0.56 |
|  | Abstainer | | | -0.224 | | 0.10 | | **0.027** | -0.167 | | | 0.104 | | 0.11 | -0.087 | | 0.10 | | 0.40 |
|  | Former | | | -0.097 | | 0.05 | | **0.039** | -0.006 | | | 0.048 | | 0.89 | -0.002 | | 0.05 | | 0.96 |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | -0.013 | | 0.05 | | 0.791 | 0.018 | | | 0.052 | | 0.73 | -0.069 | | 0.05 | | 0.19 |
|  | Moderate | | | -0.046 | | 0.06 | | 0.452 | 0.021 | | | 0.063 | | 0.74 | 0.005 | | 0.06 | | 0.93 |
|  | At-risk | | | 0.049 | | 0.06 | | 0.422 | 0.016 | | | 0.062 | | 0.79 | 0.033 | | 0.06 | | 0.60 |
| **Alcohol x Age** | |  | |  | |  | | 0.12 |  | | |  | | 0.40 |  | |  | | **0.05** |
|  | Abstainer | | | 0.016 | | 0.009 | | 0.093 | 0.001 | | | 0.009 | | 0.90 | 0.0004 | | 0.010 | | 0.97 |
|  | Former | | | 0.001 | | 0.005 | | 0.872 | -0.009 | | | 0.005 | | 0.07 | -0.003 | | 0.005 | | 0.60 |
|  | Very Light | | | 0.000 | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | 0.012 | | 0.006 | | 0.057 | -0.004 | | | 0.006 | | 0.52 | 0.014 | | 0.006 | | **0.03** |
|  | Moderate | | | 0.009 | | 0.007 | | 0.211 | -0.008 | | | 0.007 | | 0.28 | -0.009 | | 0.007 | | 0.23 |
|  | At-risk | | | -0.002 | | 0.007 | | 0.730 | -0.011 | | | 0.006 | | 0.10 | 0.002 | | 0.007 | | 0.77 |
|  |  | | | **General Verbal Fluency** | | | | | | **Semantic Fluency** | | | | | **Working Memory** | | | | |
| **Intercept** |  | | | -0.177 | | 0.051 | | **<0.001** | -0.109 | | | 0.055 | | 0.05 | -0.079 | | 0.048 | | 0.10 |
| **Age** |  | | | -0.027 | | 0.004 | | **<0.0001** | -0.035 | | | 0.005 | | **<0.0001** | -0.036 | | 0.003 | | **<.0001** |
| **Alcohol** |  | | |  | |  | | 0.35 |  | | |  | | 0.18 |  | |  | | 0.32 |
|  | Abstainer | | | -0.112 | | 0.103 | | 0.27 | -0.029 | | | 0.115 | | 0.80 | -0.102 | | 0.093 | | 0.27 |
|  | Former | | | -0.033 | | 0.046 | | 0.47 | -0.024 | | | 0.056 | | 0.67 | -0.009 | | 0.041 | | 0.84 |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | 0.037 | | 0.050 | | 0.46 | 0.065 | | | 0.062 | | 0.29 | -0.012 | | 0.044 | | 0.79 |
|  | Moderate | | | 0.084 | | 0.060 | | 0.16 | 0.160 | | | 0.075 | | 0.03 | -0.069 | | 0.054 | | 0.20 |
|  | At-risk | | | 0.038 | | 0.060 | | 0.53 | 0.089 | | | 0.072 | | 0.22 | 0.058 | | 0.054 | | 0.29 |
| **Alcohol x Age** | | |  |  | |  | | 0.92 |  | | |  | | 0.78 |  | |  | | 0.44 |
|  | Abstainer | | | 0.004 | | 0.009 | | 0.63 | -0.003 | | | 0.011 | | 0.77 | 0.002 | | 0.008 | | 0.83 |
|  | Former | | | -0.001 | | 0.005 | | 0.89 | 0.003 | | | 0.006 | | 0.69 | -0.004 | | 0.005 | | 0.33 |
|  | Very Light | | | Ref | |  | |  | Ref | | |  | |  | Ref | |  | |  |
|  | Light | | | 0.001 | | 0.006 | | 0.92 | 0.003 | | | 0.007 | | 0.67 | 0.0004 | | 0.005 | | 0.94 |
|  | Moderate | | | -0.005 | | 0.007 | | 0.43 | -0.009 | | | 0.009 | | 0.30 | 0.004 | | 0.006 | | 0.49 |
|  | At-risk | | | -0.003 | | 0.006 | | 0.60 | -0.002 | | | 0.008 | | 0.80 | -0.008 | | 0.006 | | 0.17 |

**Table S4**. Beta values, standard error of the means (SE) and p values from age-based linear mixed effect models, which included alcohol group as a time-varying exposure and adjusted for education, race/ethnicity, young adult cognitive ability, family income, childhood socioeconomic status, physical activity, smoking status, body mass index, diastolic blood pressure, number of comorbidities, depression, diabetes, and head injury.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | **Processing Speed** | | | | **Executive Function** | | | **Episodic Memory** | | |
|  | Drinking  Group | | | Beta | S.E. | P-value | Beta | | S.E. | P-value | Beta | S.E. | P-value |
| **Intercept** |  | | | -0.542 | 0.183 | **0.003** | -0.353 | | 0.167 | **0.034** | -0.447 | 0.180 | **0.01** |
| **Age** |  | | | -0.095 | 0.004 | **<.0001** | -0.062 | | 0.004 | **<.0001** | -0.048 | 0.004 | **<.0001** |
| **Alcohol** |  | | |  |  | 0.17 |  | |  | 0.85 |  |  | 0.33 |
|  | Abstainer | | | -0.200 | 0.102 | 0.049 | -0.109 | | 0.101 | 0.29 | -0.041 | 0.102 | 0.69 |
|  | Former | | | -0.074 | 0.047 | 0.11 | 0.018 | | 0.047 | 0.70 | 0.021 | 0.048 | 0.67 |
|  | Very Light | | | Ref |  |  | Ref | |  |  | Ref |  |  |
|  | Light | | | -0.034 | 0.051 | 0.51 | 0.002 | | 0.051 | 0.97 | -0.090 | 0.052 | 0.08 |
|  | Moderate | | | -0.048 | 0.062 | 0.44 | 0.034 | | 0.062 | 0.59 | -0.006 | 0.063 | 0.93 |
|  | At-risk | | | 0.043 | 0.061 | 0.48 | 0.018 | | 0.061 | 0.77 | 0.028 | 0.062 | 0.66 |
| **Alcohol x Age** | | |  |  |  | 0.13 |  | |  | 0.18 |  |  | **0.03** |
|  | Abstainer | | | 0.013 | 0.009 | 0.18 | 0.000 | | 0.009 | 0.96 | -0.002 | 0.010 | 0.85 |
|  | Former | | | -0.001 | 0.005 | 0.87 | -0.011 | | 0.005 | 0.03 | -0.005 | 0.005 | 0.36 |
|  | Very Light | | | 0.000 |  |  | Ref | |  |  | Ref |  |  |
|  | Light | | | 0.011 | 0.006 | 0.07 | -0.005 | | 0.006 | 0.40 | 0.014 | 0.006 | **0.03** |
|  | Moderate | | | 0.007 | 0.007 | 0.33 | -0.010 | | 0.007 | 0.14 | -0.010 | 0.008 | 0.18 |
|  | At-risk | | | -0.004 | 0.007 | 0.51 | -0.014 | | 0.006 | 0.03 | -0.001 | 0.007 | 0.90 |
|  |  | | | **General Verbal Fluency** | | | | **Semantic Fluency** | | | **Working Memory** | | |
| **Intercept** |  | | | -0.32 | 0.17 | 0.07 | -0.23 | | 0.20 | 0.25 | -0.570 | 0.157 | **0.0003** |
| **Age** |  | | | -0.03 | 0.00 | **<.0001** | -0.04 | | 0.01 | **<.0001** | -0.033 | 0.004 | **<.0001** |
| **Alcohol** |  | | |  |  | 0.58 |  | |  | 0.16 |  |  | 0.31 |
|  | Abstainer | | | -0.07 | 0.10 | 0.50 | 0.005 | | 0.12 | 0.97 | -0.046 | 0.091 | 0.62 |
|  | Former | | | -0.03 | 0.05 | 0.58 | -0.01 | | 0.06 | 0.83 | 0.014 | 0.041 | 0.74 |
|  | Very Light | | | Ref |  |  | Ref | |  |  | Ref |  |  |
|  | Light | | | 0.02 | 0.05 | 0.66 | 0.05 | | 0.06 | 0.41 | -0.027 | 0.044 | 0.53 |
|  | Moderate | | | 0.08 | 0.06 | 0.18 | 0.17 | | 0.07 | 0.02 | -0.064 | 0.054 | 0.24 |
|  | At-risk | | | 0.04 | 0.06 | 0.50 | 0.11 | | 0.07 | 0.12 | 0.066 | 0.054 | 0.22 |
| **Alcohol x Age** | |  | |  |  | 0.79 |  | |  | 0.65 |  |  | 0.27 |
|  | Abstainer | | | 0.004 | 0.009 | 0.64 | -0.004 | | 0.01 | 0.72 | 0.001 | 0.008 | 0.93 |
|  | Former | | | -0.001 | 0.005 | 0.87 | 0.002 | | 0.01 | 0.80 | -0.006 | 0.005 | 0.18 |
|  | Very Light | | | Ref |  |  | Ref | |  |  | Ref |  |  |
|  | Light | | | 0.0002 | 0.006 | 0.97 | 0.002 | | 0.01 | 0.77 | 0.0002 | 0.005 | 0.97 |
|  | Moderate | | | -0.007 | 0.007 | 0.34 | -0.011 | | 0.01 | 0.19 | 0.002 | 0.006 | 0.71 |
|  | At-risk | | | -0.006 | 0.006 | 0.35 | -0.005 | | 0.01 | 0.54 | -0.010 | 0.006 | 0.07 |

**Figure. S1. Vietnam Era Twin Study of Aging Analysis Flow Diagram.** Number of participants at each wave, the number of participants who did not return to subsequent waves (non-returnees), and number of attrition replacement participants enrolled at waves 2 and 3 (newly enrolled). A total of 804 participants completed 3 waves; 450 participated in 2 waves, and 354 participated in one wave.

Note that non-returnees are not necessarily lost to follow-up in the VETSA, and may have participated in follow-up interviews even though they did not attend subsequent waves.



2009-2013

2016-2019