**Suppl 1.** Results of logistic regression analysis after standardization of covariates and FI by machine learning in three studies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **StB** | **Absolute stB** | **WCS value** | **FI** |
| **Study 1** Middle-aged individuals with normal weight  (Outcome; 10 % increase in weight over 10 years) |  |  |  |  |
| Age | -0.4613 | 0.4613 | 5902.8527 | 0.067 |
| Smoking | 0.2729 | 0.2729 | 3170.2816 | 0.0442 |
| sex | -0.2749 | 0.2749 | 2414.2322 | 0.0336 |
| Serum triglyceride | -0.1939 | 0.1939 | 800.362 | 0.0307 |
| HbA1c | -0.1523 | 0.1523 | 700.5605 | 0.0252 |
| Body mass index | -0.0875 | 0.0875 | 293.3137 | 0.0186 |
| Medication-hypertension | 0.0836 | 0.0836 | 220.5422 | 0.0107 |
| Systolic blood pressure | -0.0476 | 0.0476 | 82.8364 | 0.0116 |
| Alcohol consumption (ethanol g/session) | -0.0447 | 0.0447 | 71.2575 | 0.013 |
| Medication-dyslipidemia | 0.0325 | 0.0325 | 49.8142 | 0.0156 |
| Habitual exercise | -0.0408 | 0.0408 | 21.7144 | 0.0108 |
| History of cardiovascular disease | 0.0292 | 0.0292 | 8.1561 | 0.0121 |
| Medication-diabetes | -0.080 | 0.0802 | 2.3554 | 0.0119 |
| Serum high-density lipoprotein cholesterol | -0.0082 | 0.0082 | 1.5706 | 0.0090 |
| AUC (%) |  |  | 68.5 | 68.6 |
|  |  |  |  |  |
| **Study 2** Middle-aged women  (Outcome; Decrease of HDL-C 10 mg/dL or over during 10 years) |  |  |  |  |
| Serum high-density lipoprotein cholesterol (baseline) | 0.8062 | 0.8062 | 2282.1342 | 0.1461 |
| Serum low-density lipoprotein cholesterol | 0.1817 | 0.1817 | 193.3024 | 0.0394 |
| Body mass index | 0.1561 | 0.1561 | 133.7432 | 0.0344 |
| Medication-dyslipidemia | 0.0632 | 0.0632 | 38.074 | 0.0311 |
| Serum triglyceride | 0.0987 | 0.0987 | 19.3033 | 0.0254 |
| Age | 0.0509 | 0.0509 | 12.6092 | 0.0210 |
| Smoking | 0.1001 | 0.1001 | 28.2958 | 0.0175 |
| Alcohol consumption (ethanol g/session) | 0.0719 | 0.0719 | 13.2112 | 0.0158 |
| Serum gamma-glutamyl transferase | 0.0775 | 0.0775 | 10.2583 | 0.0127 |
| Alcohol consumption (frequency/week) | 0.0102 | 0.0102 | 1.0909 | 0.0121 |
| AUC (%) |  |  | 68.4 | 68.8 |
|  |  |  |  |  |
| **Study 3** Middle-aged individuals with normal weight  (Outcome; Percentage increase in weight (%) over 10 years) |  |  |  |  |
| Age | -1.1084 | 1.1084 | 12978.9 | 2.343 |
| Smoking | 0.4996 | 0.4996 | 2995.97 | 1.102 |
| HbA1c | -0.4881 | 0.4881 | 2834.93 | 0.891 |
| Body mass index | -0.3617 | 0.3617 | 1675.83 | 0.915 |
| Serum triglyceride | -0.3445 | 0.3445 | 1309.85 | 0.858 |
| Systolic blood pressure | -0.2196 | 0.2196 | 577.57 | 0.551 |
| sex | -0.2241 | 0.2241 | 505.14 | 0.659 |
| Medication-hypertension | 0.1835 | 0.1835 | 360.32 | 0.274 |
| Alcohol consumption (ethanol g/session) | -0.1224 | 0.1224 | 176.59 | 0.514 |
| Medication-diabetes | -0.1277 | 0.1277 | 160.91 | 0.209 |
| Medication-dyslipidemia | 0.1104 | 0.1104 | 126.1 | 0.281 |
| Serum high-density lipoprotein cholesterol | -0.0502 | 0.0502 | 26.07 | 0.454 |
| Habitual exercise | -0.0198 | 0.0198 | 3.34 | 0.458 |
| History of cardiovascular disease | 0.0104 | 0.0104 | 0.9 | 0.236 |

The factors are listed in descending order based on the value of WCS. stB; Standardized β, WCS; Wald-chi square, FI; Feature importance.