Supplementary Table 1. A summary of the introduction and characteristics of these machine learning-based techniques.	
Extreme Gradient Boosting Machine (eXGBM)	eXGBM is a powerful and efficient machine learning algorithm that is based on the concept of boosting. It is known for its speed and accuracy in handling large datasets and complex problems. eXGBM is also capable of handling missing data and has built-in regularization to prevent overfitting.
Decision Tree (DT)	DT is a simple yet effective algorithm that is easy to interpret and understand. It is capable of handling both numerical and categorical data, and can be used for classification and regression tasks. DT is also robust to outliers and can handle non-linear relationships in the data.
K-Nearest Neighbor (KNN)	KNN is a non-parametric algorithm that makes predictions based on the majority vote of its k-nearest neighbors. It is simple to implement and can be used for both classification and regression tasks. KNN is also robust to noisy data and can handle multi-class classification problems.
Random Forest (RF)	RF is an ensemble learning algorithm that consists of multiple decision trees. It is known for its high accuracy and ability to handle high-dimensional data. RF is also robust to overfitting and can handle missing data and outliers effectively.
Neural Network (NN)	NN is a powerful and flexible algorithm that is capable of learning complex patterns in the data. It is often used for tasks such as image and speech recognition, and can handle non-linear relationships in the data. NN is also capable of automatic feature extraction and can handle large amounts of data.
Support Vector Machine (SVM)	SVM is a powerful algorithm that is capable of finding the optimal hyperplane to separate data into different classes. It is effective for both linear and non-linear classification tasks, and is robust to overfitting. SVM is also capable of handling high-dimensional data and can work well with small to medium-sized datasets.

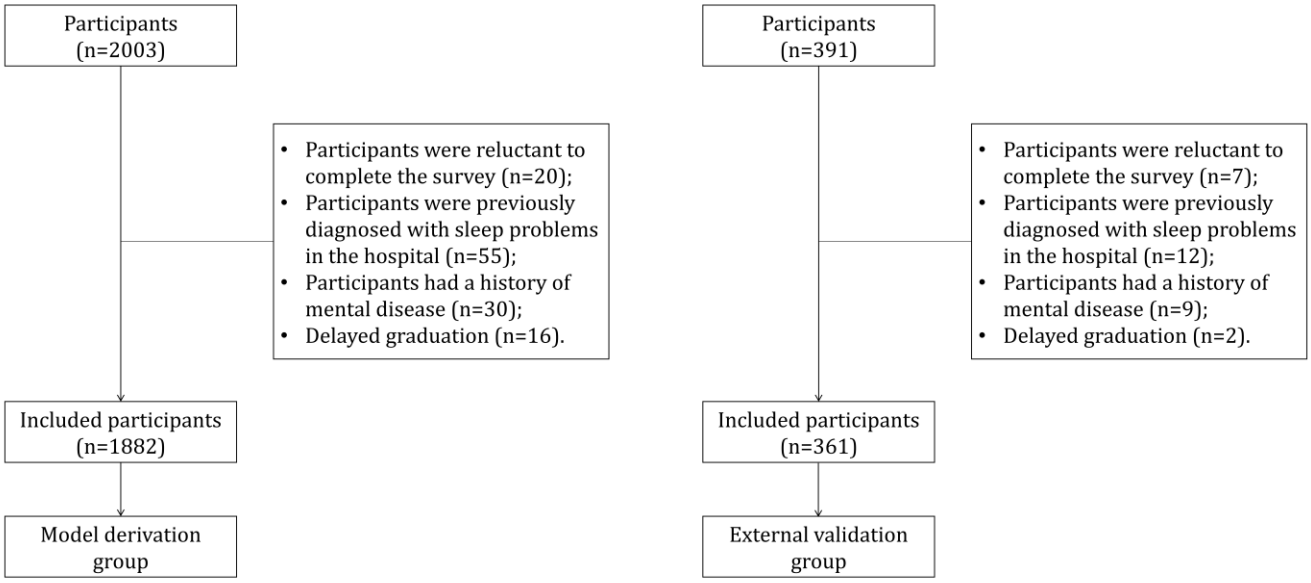
Supplementary Table 2. Prediction performance of model only including one variable as model feature.	
Features	AUC
Age	0.580 (95%CI: 0.518-0.641)
Gender	0.535 (95%CI: 0.481-0.589)
Grade	0.555 (95%CI: 0.497-0.614)
Drinking	0.524 (95%CI: 0.477-0.572)
Fatty meal	0.571 (95%CI: 0.518-0.624)
Vegetable	0.510 (95%CI: 0.454-0.565)
Sedentary time	0.596 (95%CI: 0.535-0.656)
Chronic disease	0.506 (95%CI: 0.482-0.531)
AUC, area under the curve.	

Supplementary Table 3. A comparison of clinical characteristics between the model derivation group and external validation group.

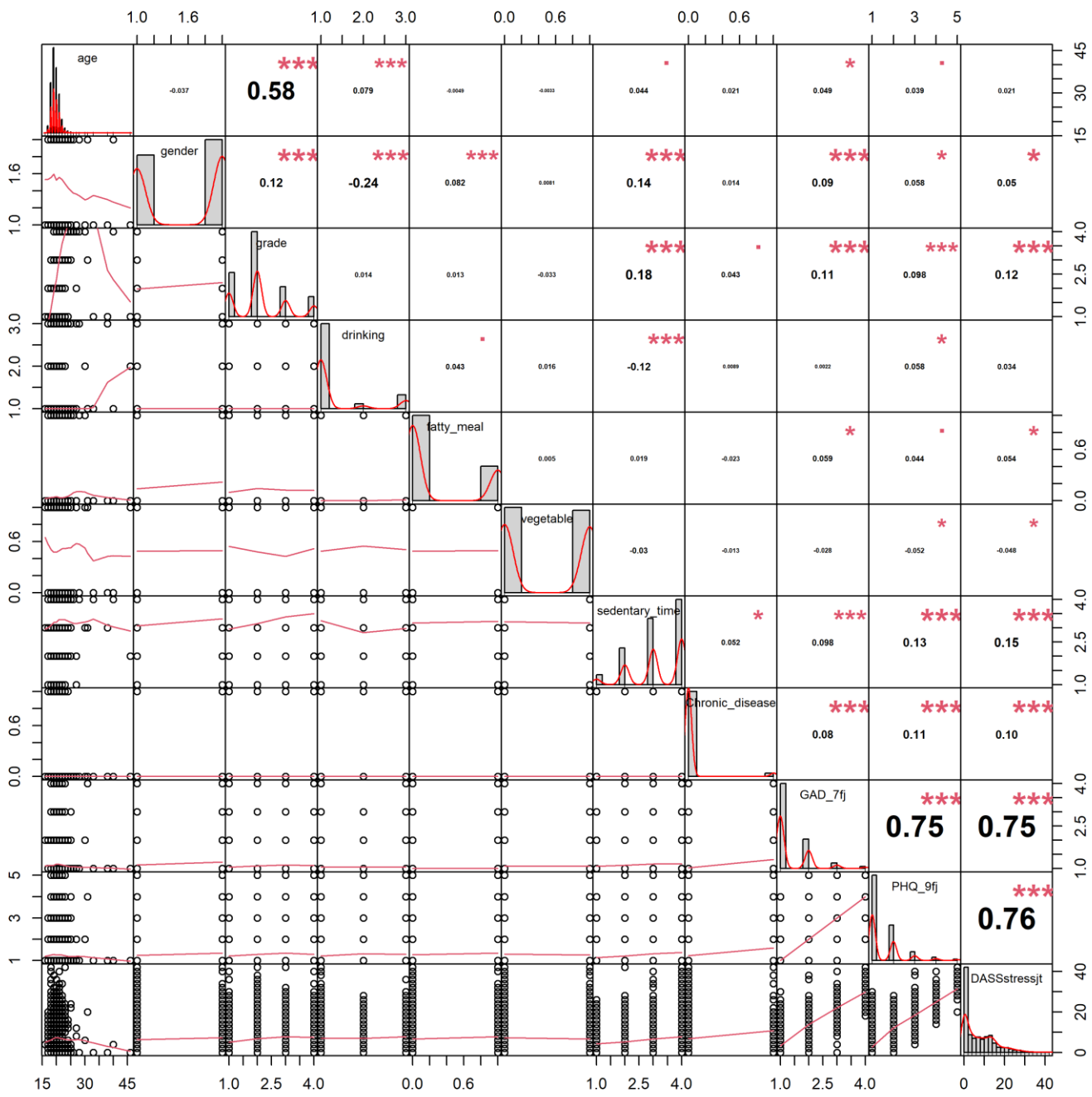
Characteristics	Overall	Groups		P
		Model derivation group	External validation group	
n	2243	1882	361	
Age (years, mean (SD))	19.70 (1.76)	19.64 (1.71)	19.99 (1.97)	<0.001
Gender (male/female, %)	978/1265 (43.6/56.4)	848/1034 (45.1/54.9)	130/231 (36.0/64.0)	0.002
Grade (%)				<0.001
First	640 (28.5)	462 (24.5)	178 (49.3)	
Second	1020 (45.5)	892 (47.4)	128 (35.5)	
Third	352 (15.7)	316 (16.8)	36 (10.0)	
Fourth	228 (10.2)	212 (11.3)	19 (5.2)	
Marital status (%)				0.977
Single	1727 (77.0)	1450 (77.0)	277 (76.7)	
Dating	505 (22.5)	423 (22.5)	82 (22.7)	
Married	11 (0.5)	9 (0.5)	2 (0.6)	
Smoking (%)				0.221
No	2064 (92.0)	1740 (92.5)	324 (89.8)	
Abstained from smoking	67 (3.0)	53 (2.8)	14 (3.9)	
Yes	112 (5.0)	89 (4.7)	23 (6.4)	
Drinking (%)				0.072
No	1818 (81.1)	1541 (81.9)	277 (76.7)	
Abstained from drinking	109 (4.9)	87 (4.6)	22 (6.1)	
Yes	316 (14.1)	254 (13.5)	62 (17.2)	
Loving eating fatty meal (no/yes, %)	1563/680 (69.7/30.3)	1339/543 (71.1/28.9)	224/137 (62.0/38.0)	0.001
Loving eating vegetable (no/yes, %)	1130/1113 (50.4/49.6)	957/925 (50.9/49.1)	173/188 (47.9/52.1)	0.336
Loving eating fruit (no/yes, %)	923/1320 (41.2/58.8)	793/1089 (42.1/57.9)	130/231 (36.0/64.0)	0.035
Sedentary time (hours, %)				0.005
<1	128 (5.7)	95 (5.0)	33 (9.1)	
≧1 and <3	426 (19.0)	349 (18.5)	77 (21.3)	
≧3 and <6	746 (33.3)	628 (33.4)	118 (32.7)	
≧6	943 (42.0)	810 (43.0)	133 (36.8)	
Frequency of sports per week (%)				0.004
0	452 (20.2)	399 (21.2)	53 (14.7)	
1-2	848 (37.8)	688 (36.6)	160 (44.3)	
3-4	482 (21.5)	398 (21.1)	84 (23.3)	
≧5	461 (20.6)	397 (21.1)	64 (17.7)	
Monthly expense (￥, %)				0.104

<2000	1761 (78.5)	1491 (79.2)	270 (74.8)	
≧2000 and <5000	464 (20.7)	378 (20.1)	86 (23.8)	
≧5000 and <10000	11 (0.5)	7 (0.4)	4 (1.1)	
≧10000	7 (0.3)	6 (0.3)	1 (0.3)	
Chronic disease (no/yes, %)	2149/94 (95.8/4.2)	1810/72 (96.2/3.8)	339/22 (93.9/6.1)	0.068
Severity of anxiety (%)				0.597
None	1567 (69.9)	1315 (69.9)	252 (69.8)	
Mild	534 (23.8)	452 (24.0)	82 (22.7)	
Moderate	107 (4.8)	85 (4.5)	22 (6.1)	
Severe	35 (1.6)	30 (1.6)	5 (1.4)	
Severity of depression (%)				0.763
None	1419 (63.3)	1196 (63.5)	223 (61.8)	
Mild	602 (26.8)	497 (26.4)	105 (29.1)	
Moderate	142 (6.3)	123 (6.5)	19 (5.3)	
Moderate-to-severe	57 (2.5)	47 (2.5)	10 (2.8)	
Severe	23 (1.0)	19 (1.0)	4 (1.1)	
Stress score (mean (SD))	7.68 (8.04)	7.65 (7.96)	7.85 (8.44)	0.665
Sleep disturbance (no/yes, %)	1223/1020 (54.5/45.5)	1041/841 (55.3/44.7)	182/179 (50.4/49.6)	0.098
SD, standard deviation. The Chi-square test was used to compare the distribution of categorical variables, and the student t-test was employed to compare continuous variables.				

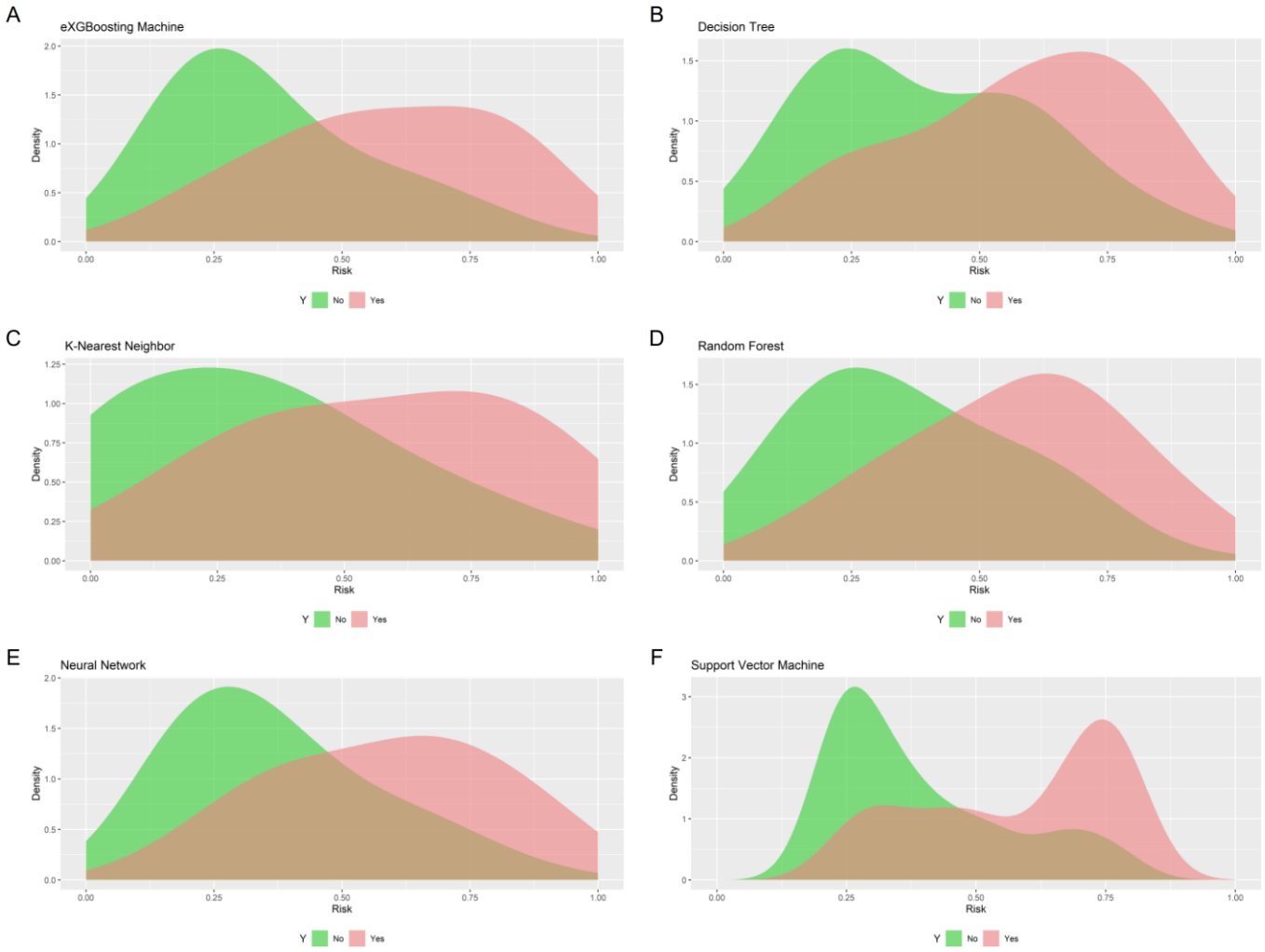
Supplementary Figures



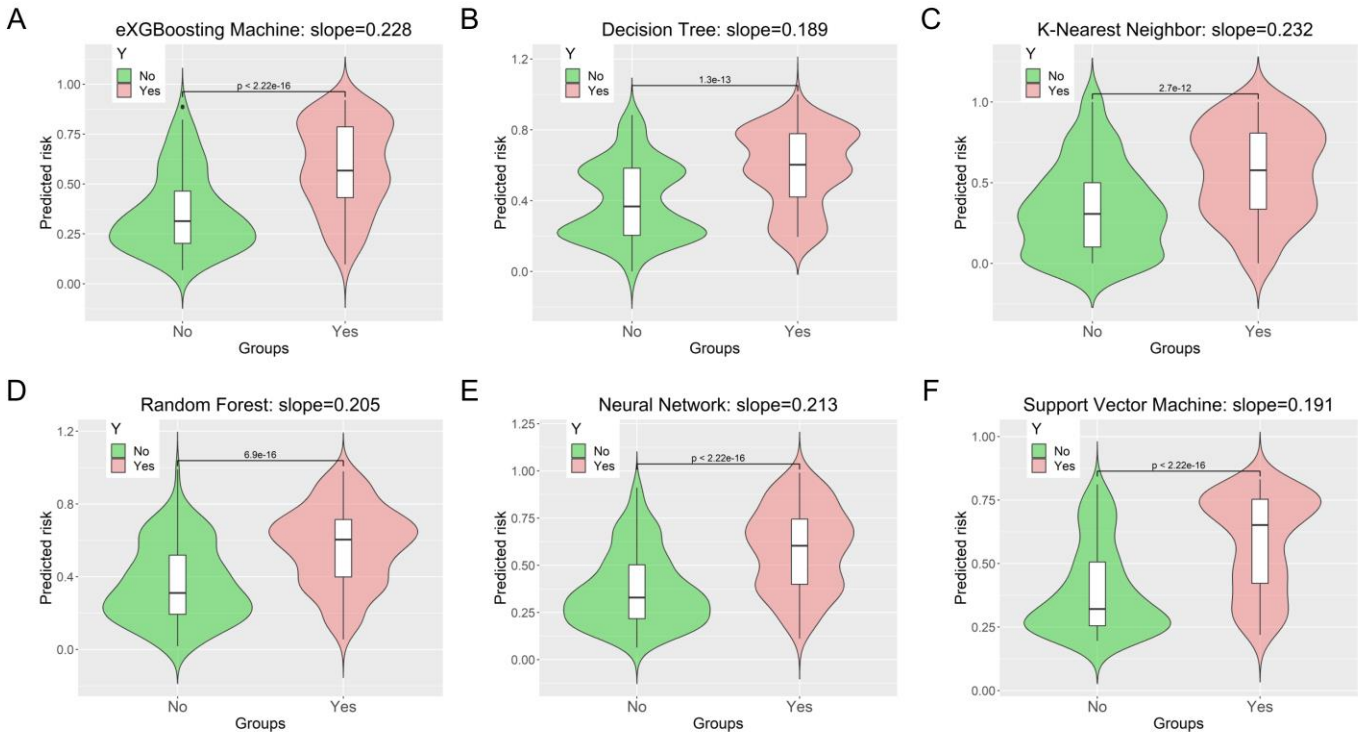
Supplementary Figure 1: Participant's flowchart in the model derivation and external validation groups.



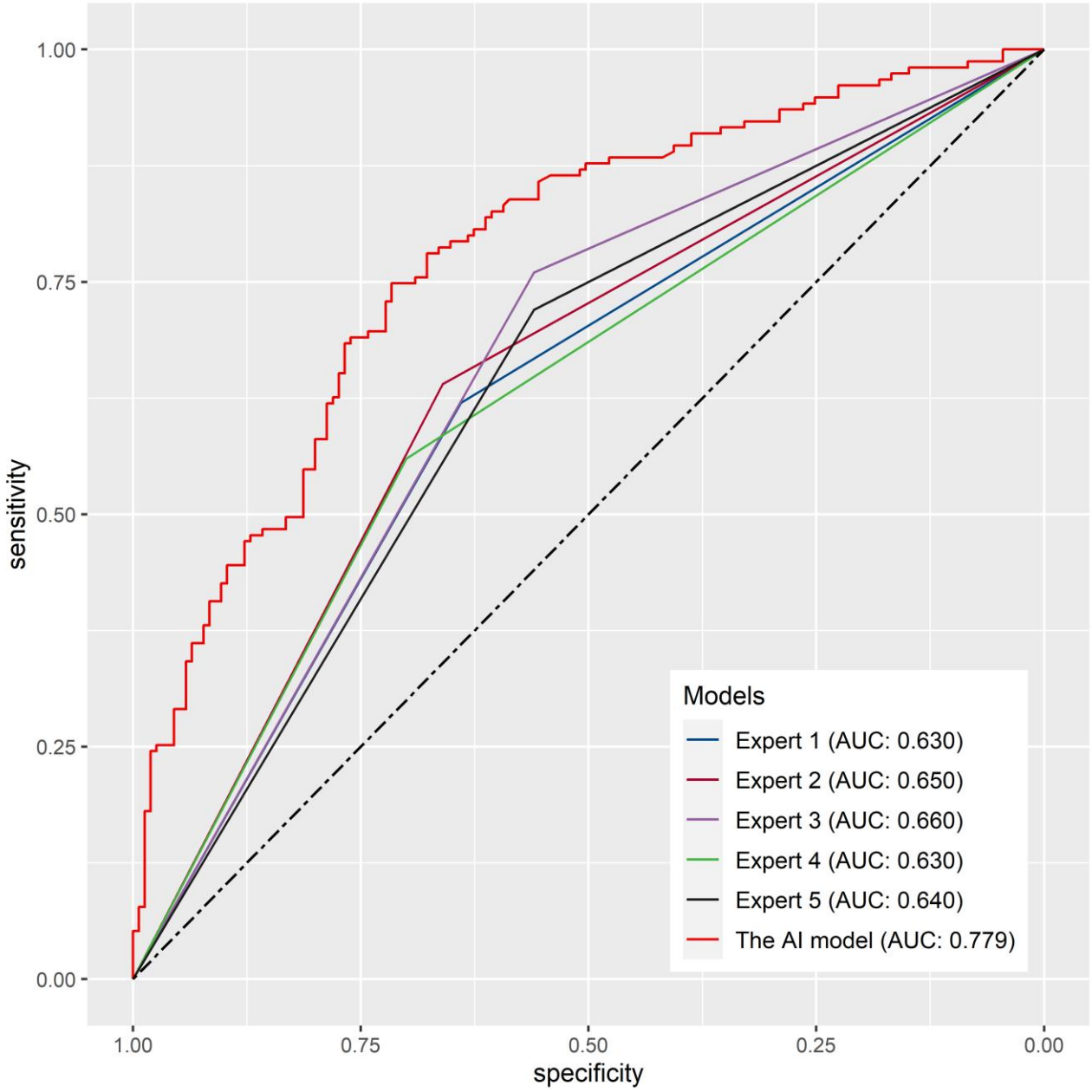
Supplementary Figure 2: Correlation matrix of model features.



Supplementary Figure 3: Probability density curve for each model. A. eXGBoosting Machine; B. Decision Tree; C. K-Nearest Neighbor; D. Random Forest; E. Neural Network; F. Support Vector Machine. The green curve indicates patients without sleep disturbance, and the red curve indicates patients with sleep disturbance.



Supplementary Figure 4: Volin plot for presenting discrimination slope for each model. A. eXGBoosting Machine; B. Decision Tree; C. K-Nearest Neighbor; D. Random Forest; E. Neural Network; F. Support Vector Machine. The green curve indicates patients without sleep disturbance, and the red curve indicates patients with sleep disturbance.



Supplementary Figure 5: Comparison of prediction performance between experts and the AI model using area under the curve.