

Figure S1 Restricted cubic spline analysis evaluating the dose-response association between body mass index (BMI) and all-cause mortality.

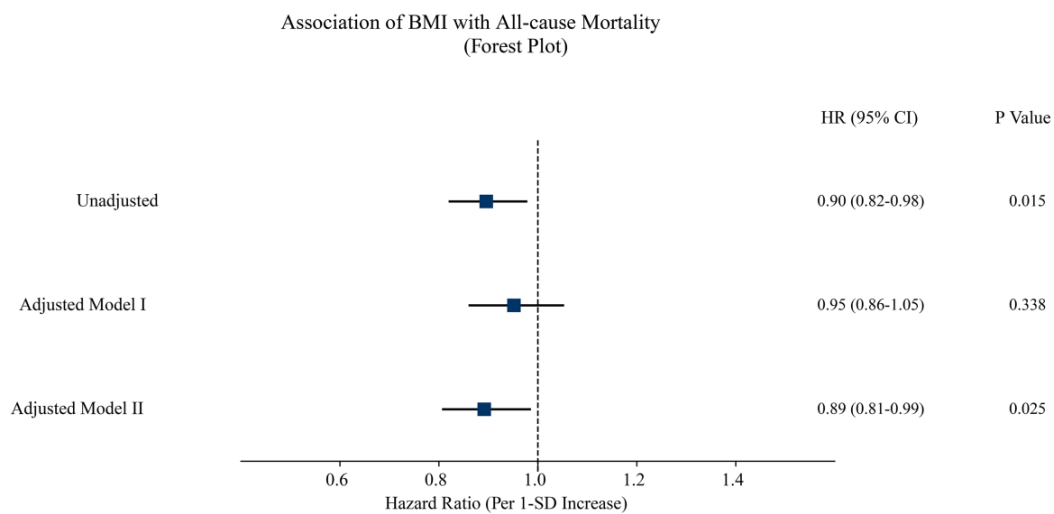
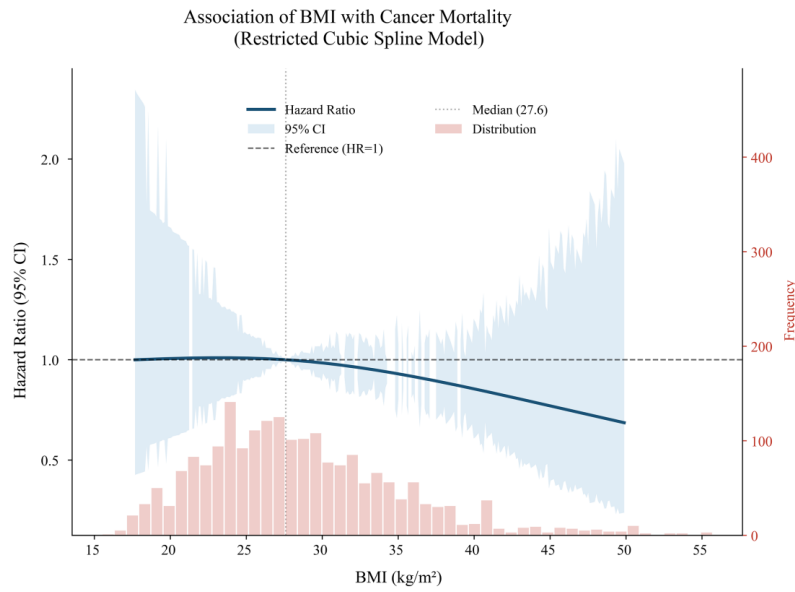
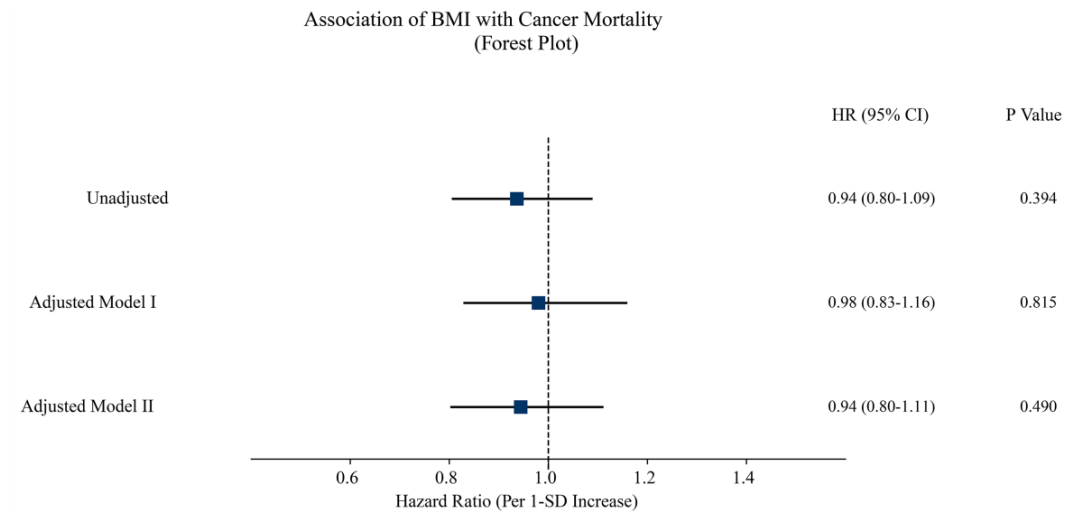


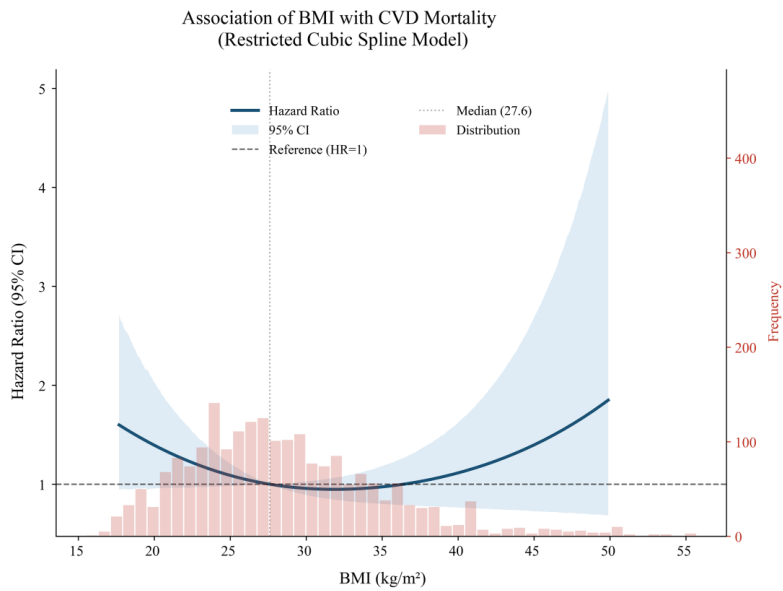
Figure S2 Forest plot illustrating the risk of all-cause mortality associated with a continuous increase in BMI.



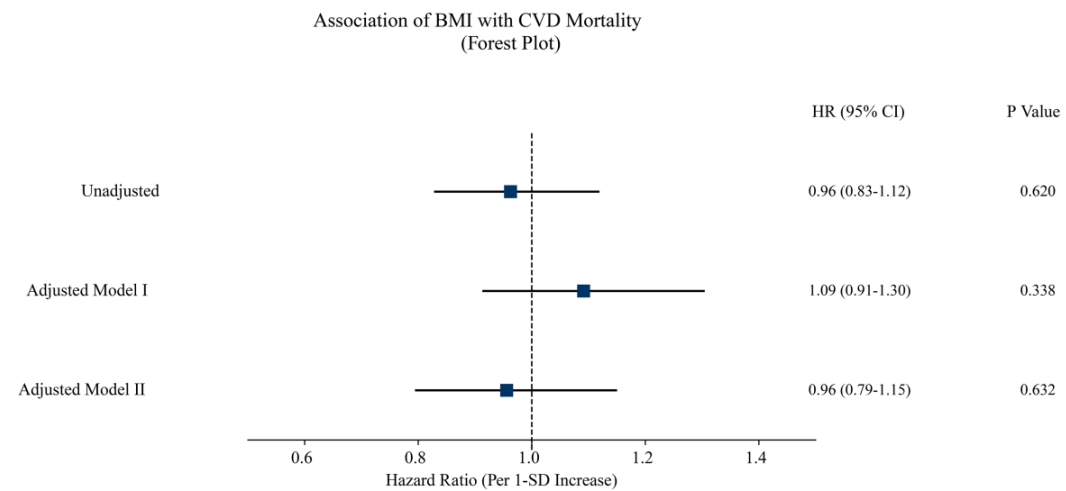
**Figure S3** Restricted cubic spline analysis evaluating the dose-response association between body mass index (BMI) and cancer-specific mortality.



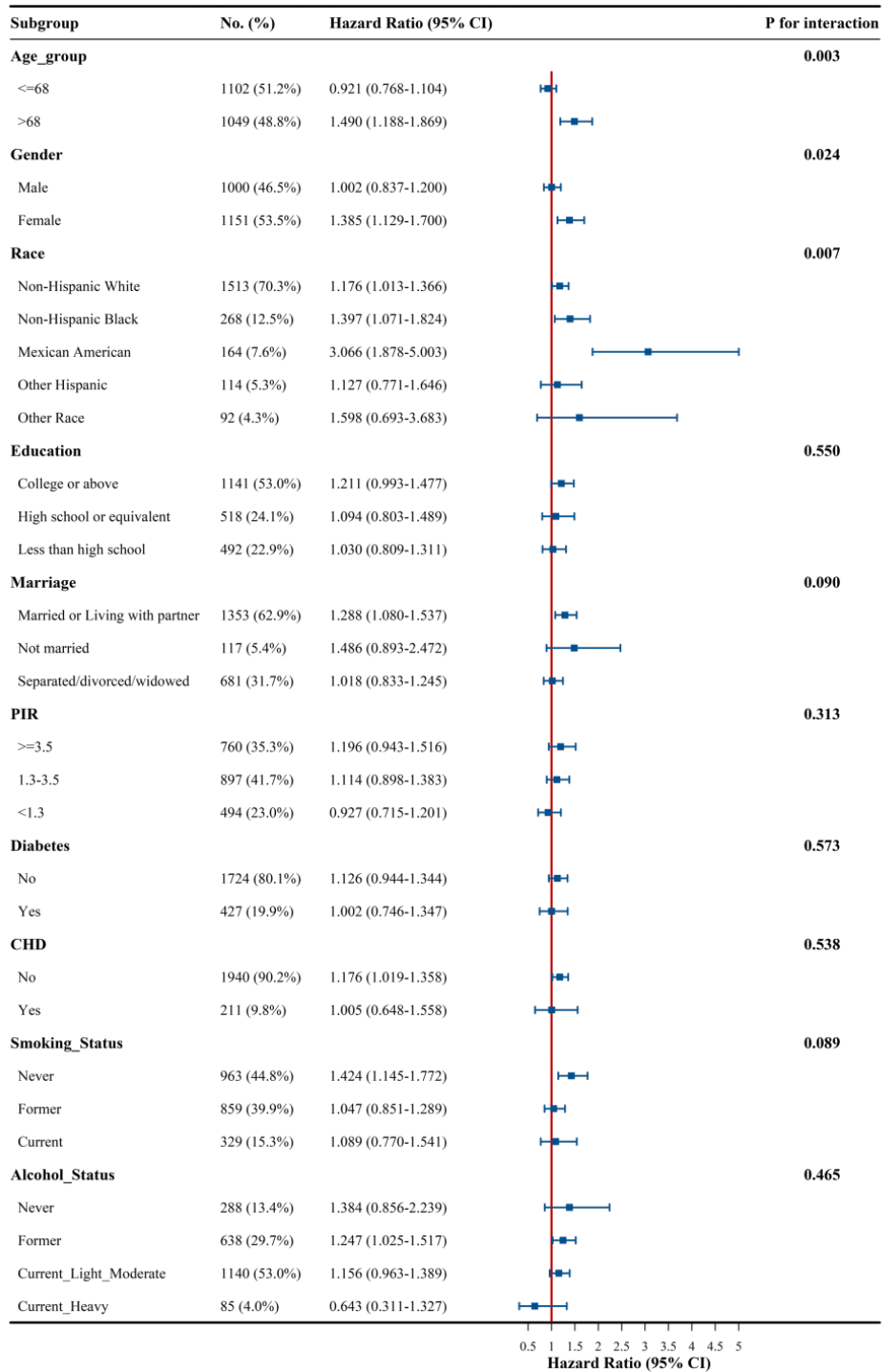
**Figure S4** Forest plot illustrating the risk of cancer-specific mortality associated with a continuous increase in BMI.



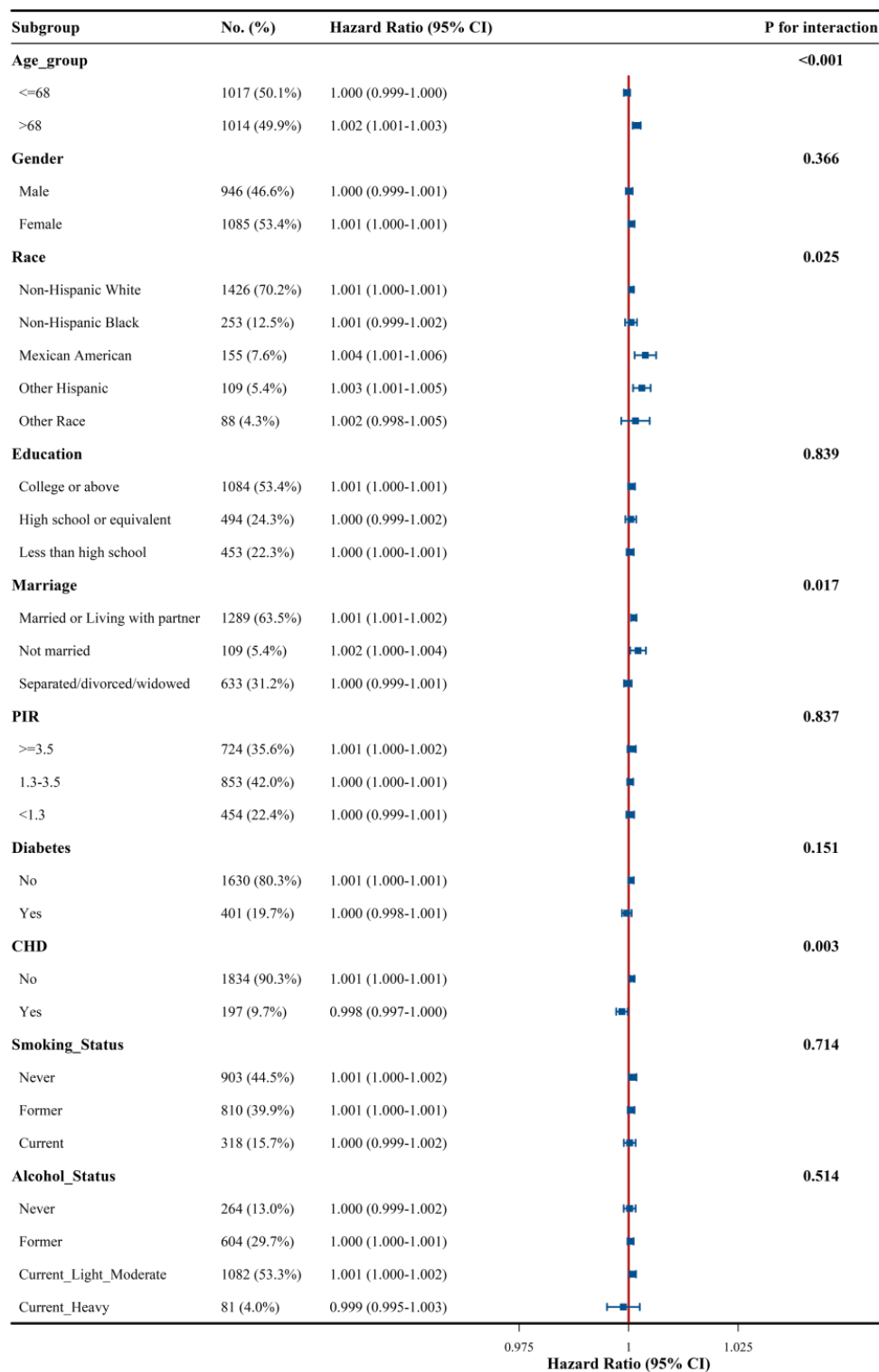
**Figure S5** Restricted cubic spline analysis evaluating the dose-response association between body mass index (BMI) and cardiovascular disease (CVD) mortality.



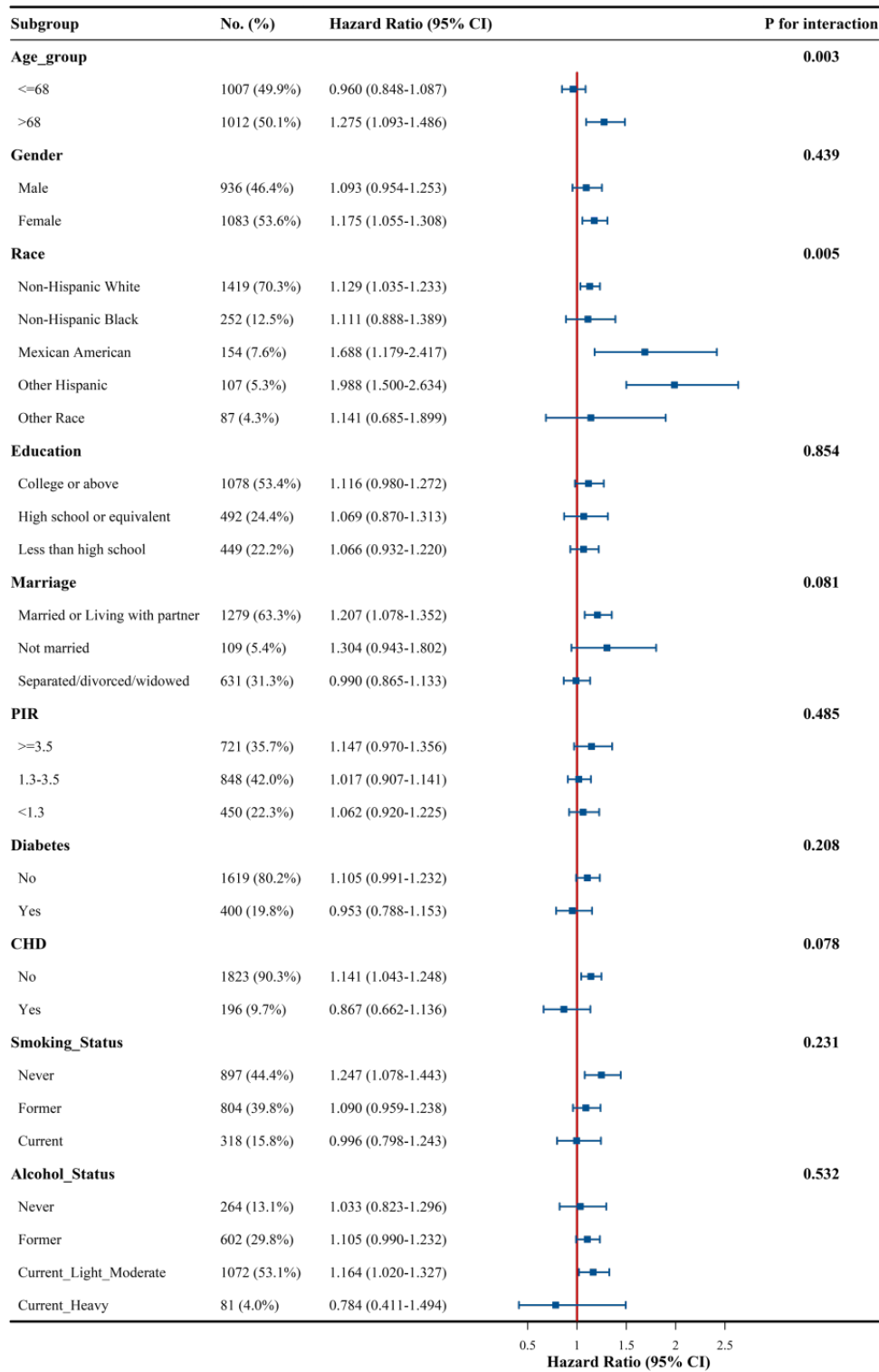
**Figure S6** Forest plot illustrating the risk of cardiovascular disease (CVD) mortality associated with a continuous increase in BMI.



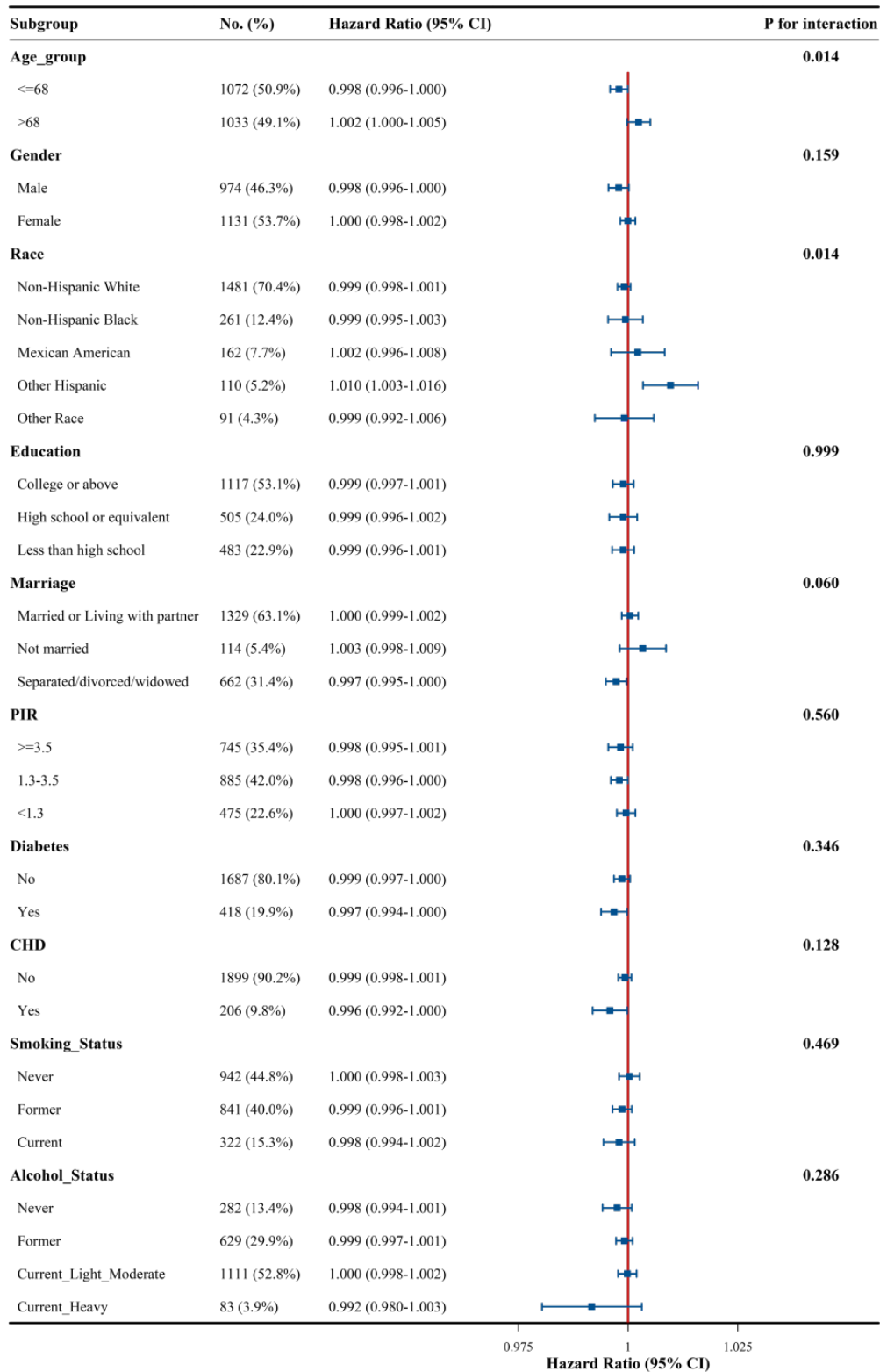
**Figure S7** Forest plot of the interaction between TyG and all-cause mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



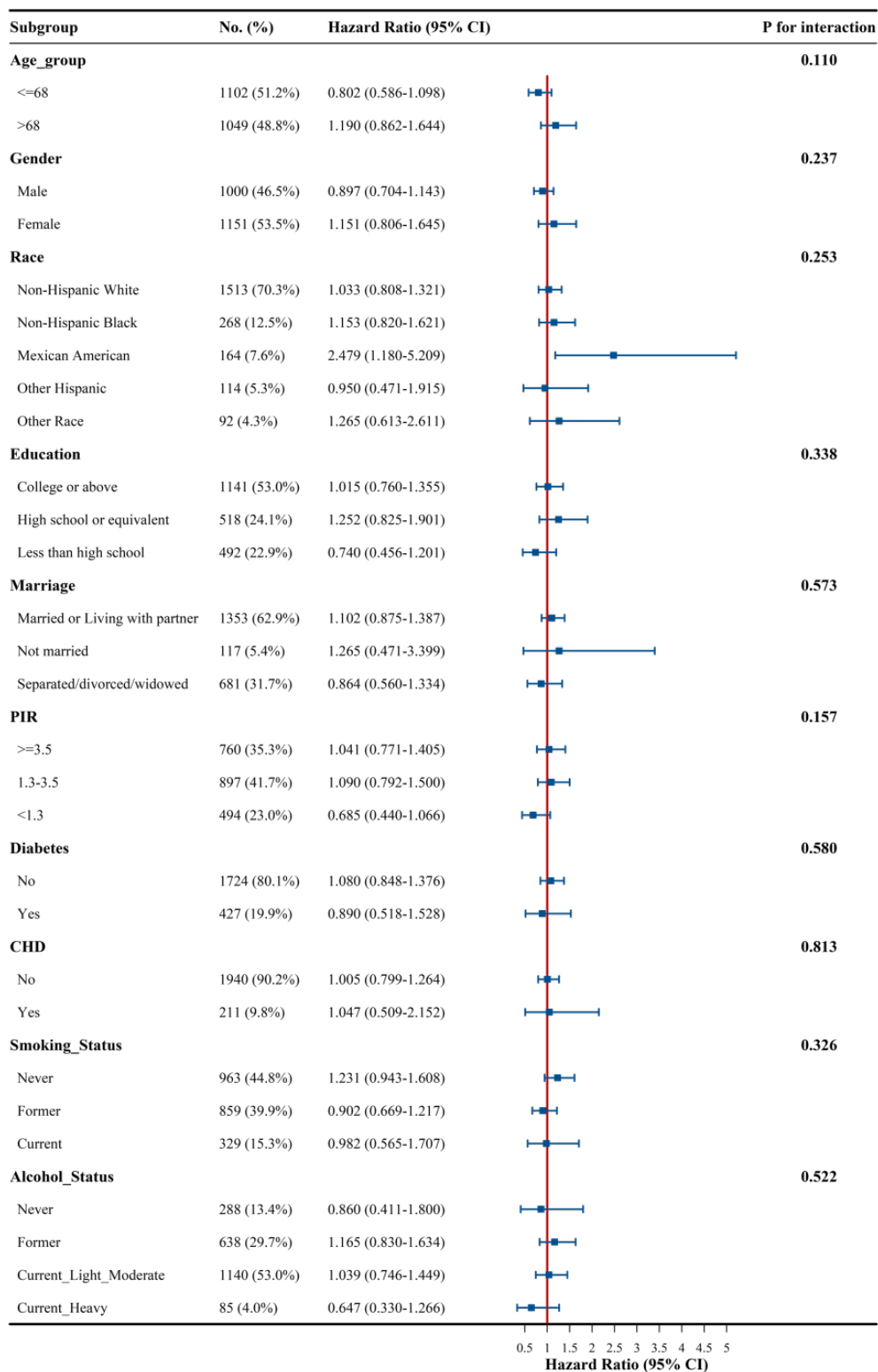
**Figure S8** Forest plot of the interaction between TyG-WC and all-cause mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; WC: Waist Circumference; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



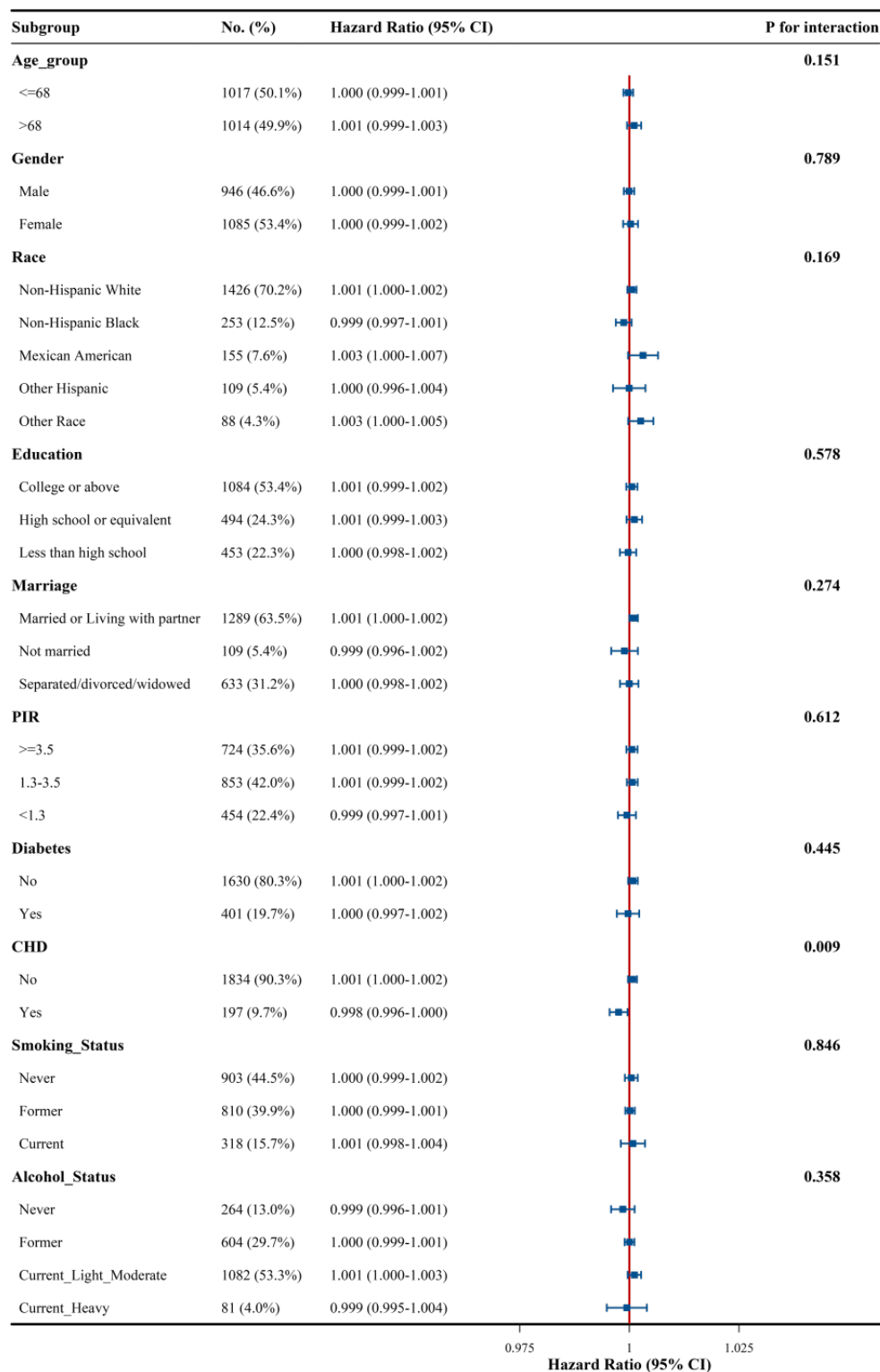
**Figure S9** Forest plot of the interaction between TyG-WHtR and all-cause mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; WHtR: Waist-To-Height Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



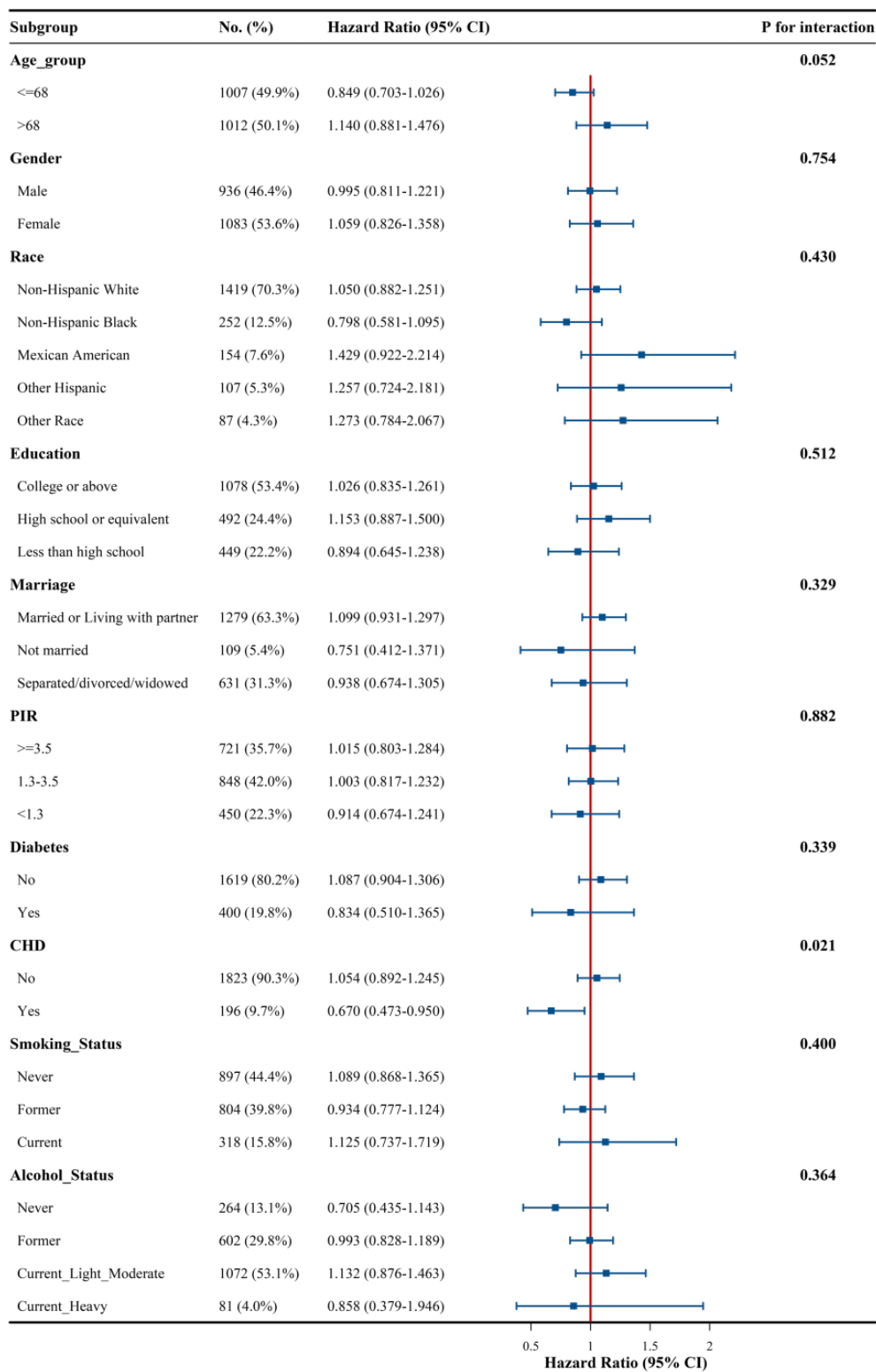
**Figure S10** Forest plot of the interaction between TyG-BMI and all-cause mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; BMI: Body Mass Index; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



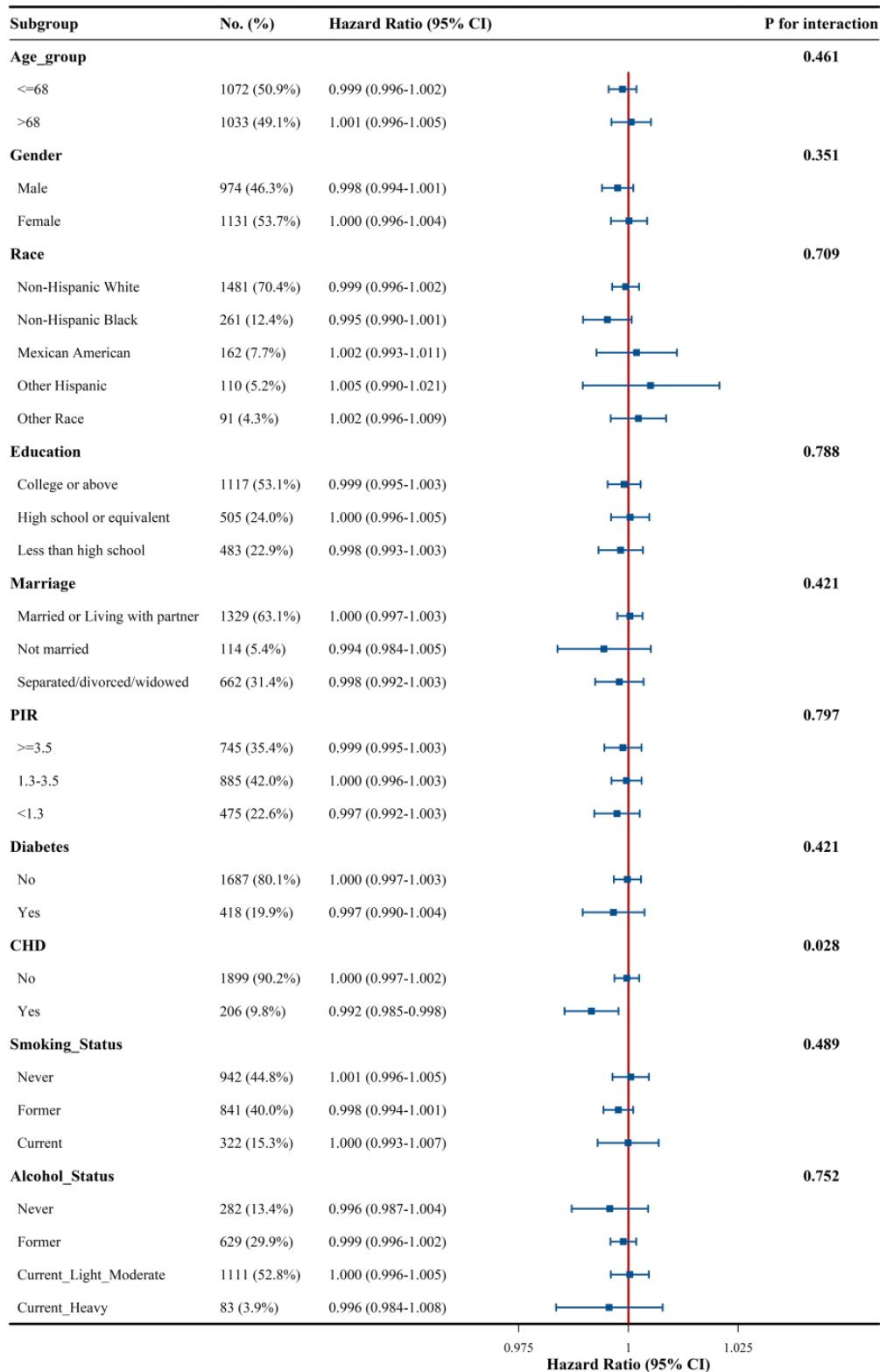
**Figure S11** Forest plot of the interaction between TyG and cancer-specific mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



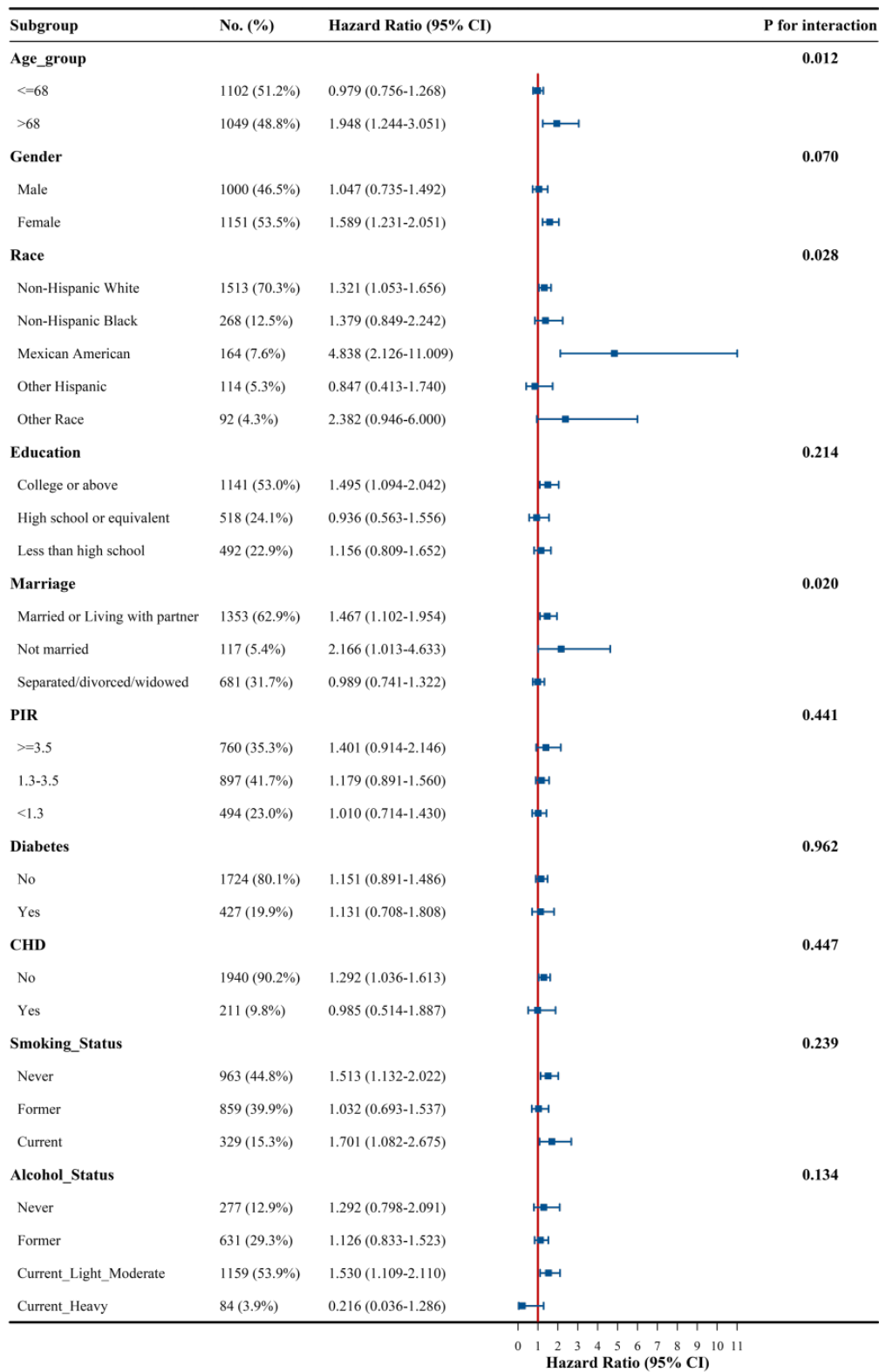
**Figure S12** Forest plot of the interaction between TyG-WC and cancer-specific mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; WC: Waist Circumference; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



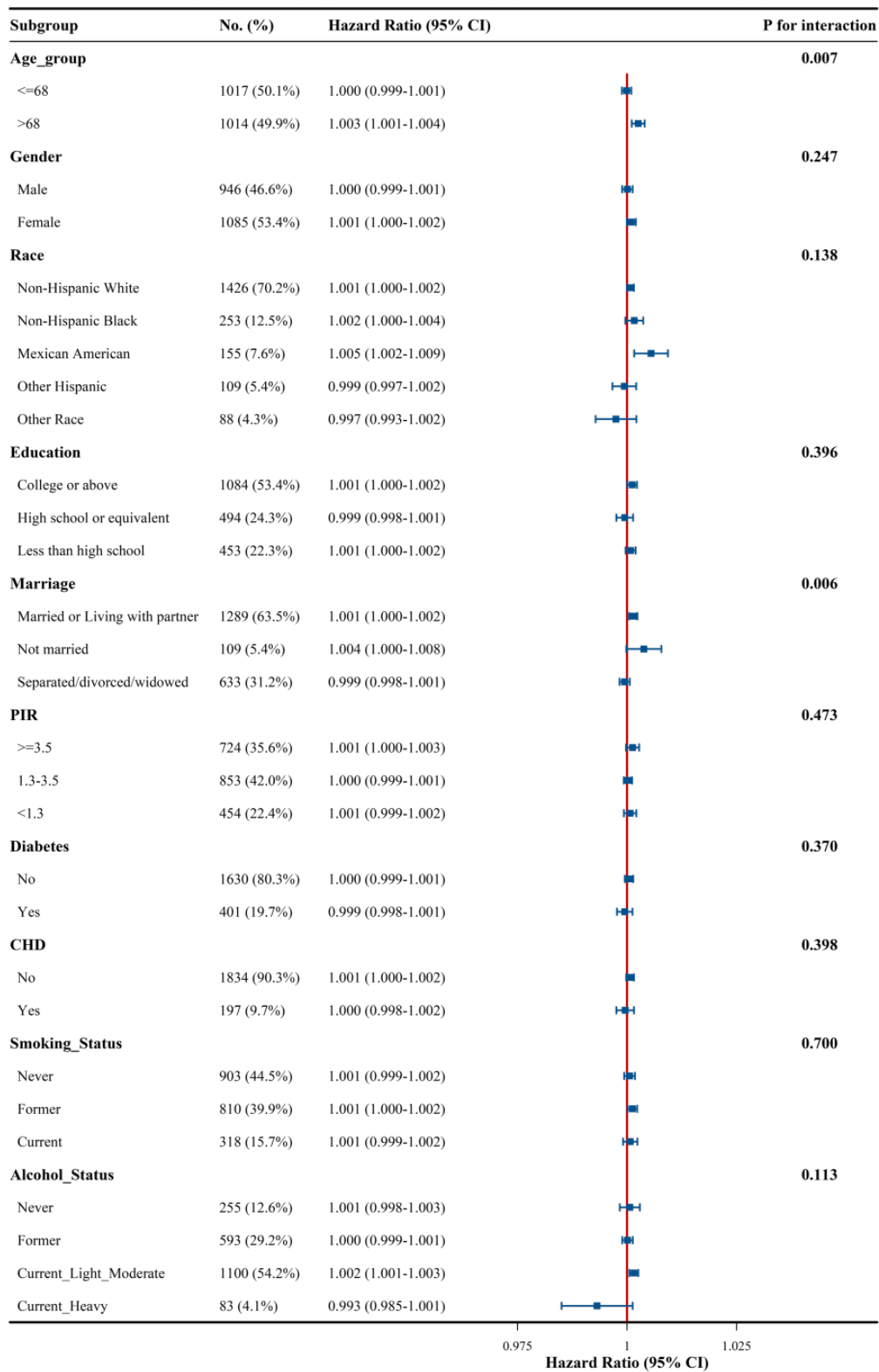
**Figure S13** Forest plot of the interaction between TyG-WHtR and cancer-specific mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; WHtR: Waist-To-Height Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



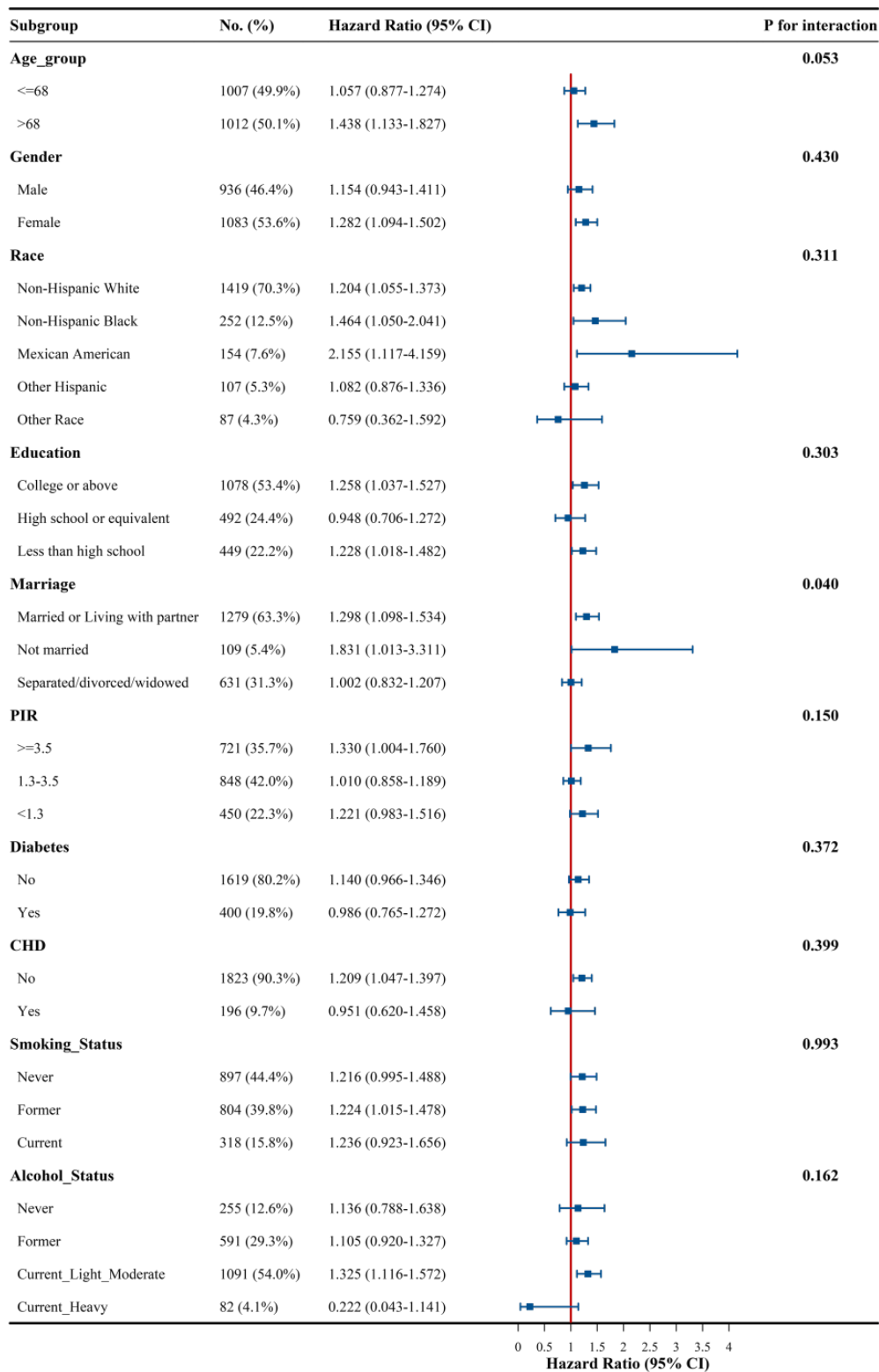
**Figure S14** Forest plot of the interaction between TyG-BMI and cancer-specific mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; BMI: Body Mass Index; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



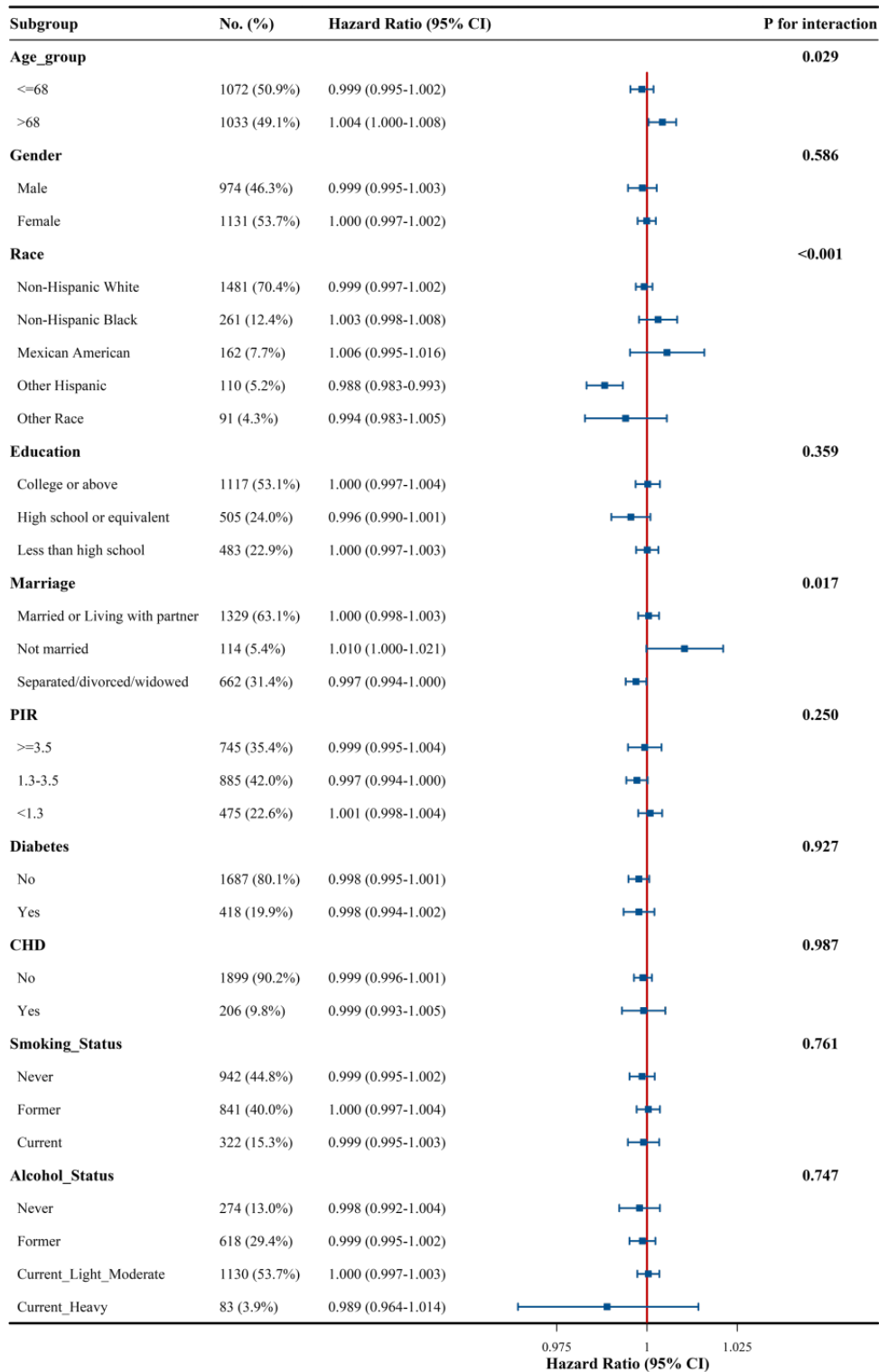
**Figure S15** Forest plot of the interaction between TyG and cardiovascular mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval.



**Figure S16** Forest plot of the interaction between TyG-WC and cardiovascular mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval; WC: Waist Circumference.

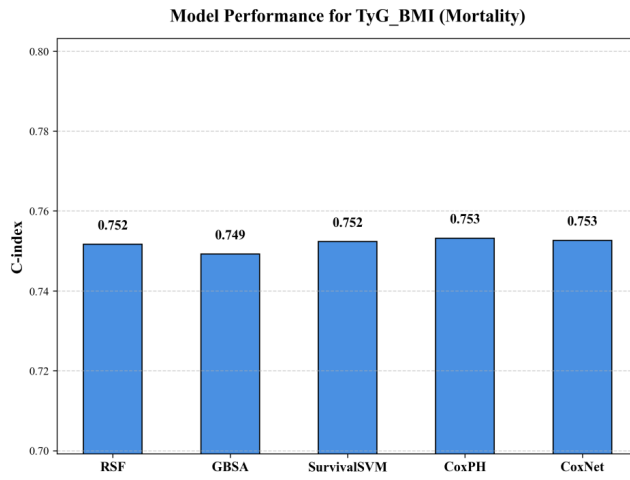


**Figure S17** Forest plot of the interaction between TyG-WHtR and cardiovascular mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval; WHtR: Waist-To-Height Ratio.



**Figure S18** Forest plot of the interaction between TyG-BMI and cardiovascular mortality. TyG: Triglyceride-Glucose; PIR: Poverty-to-Income Ratio; CHD: Coronary Heart Disease; HR, Hazard Ratio; CI, Confidence Interval; BMI: Body Mass Index.

A



B

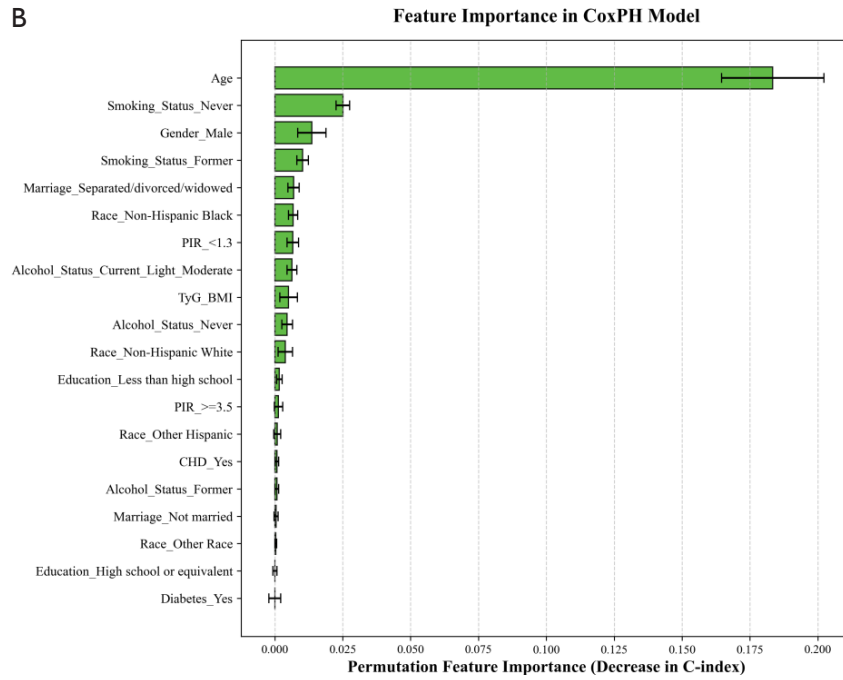
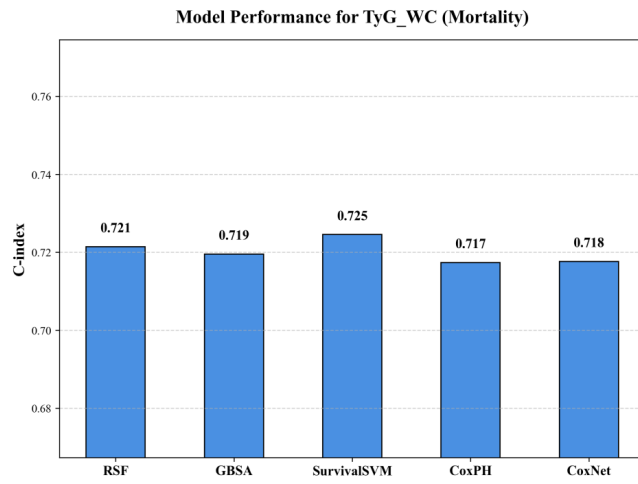


Figure S19 A Model Performance (C-index). B Permutation Feature Importance.

A



B

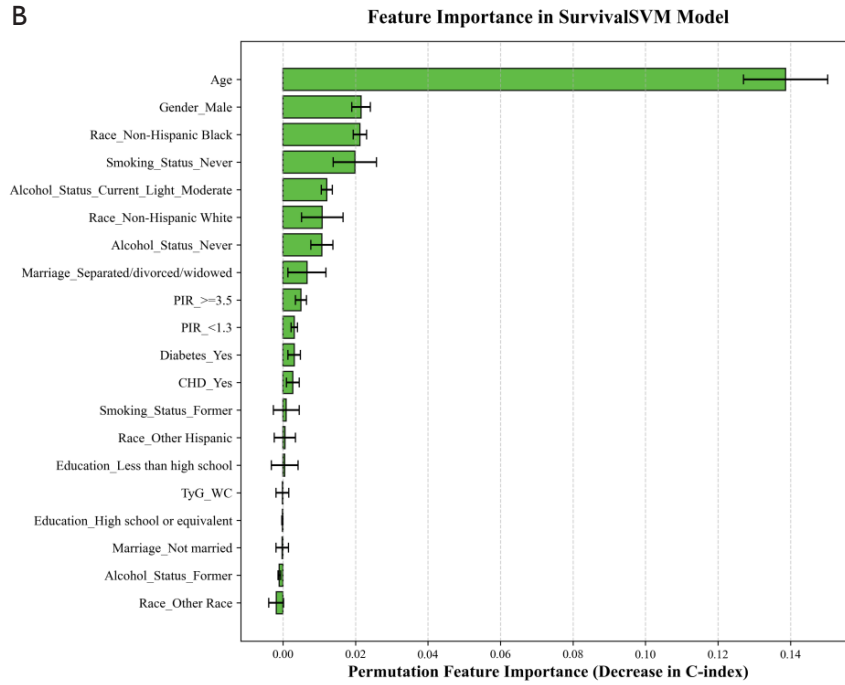
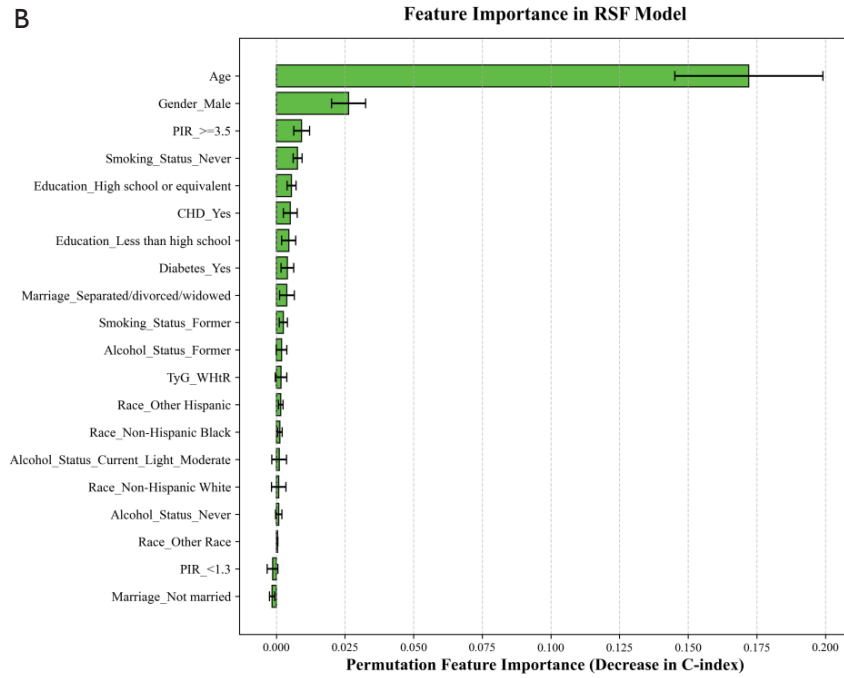
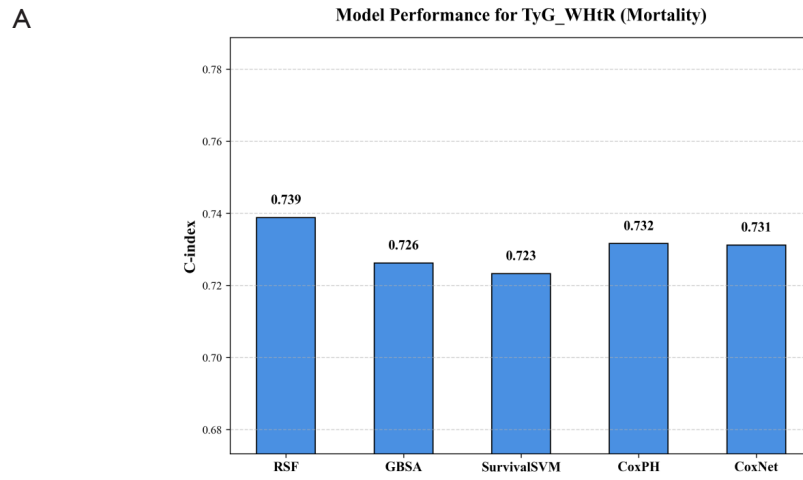
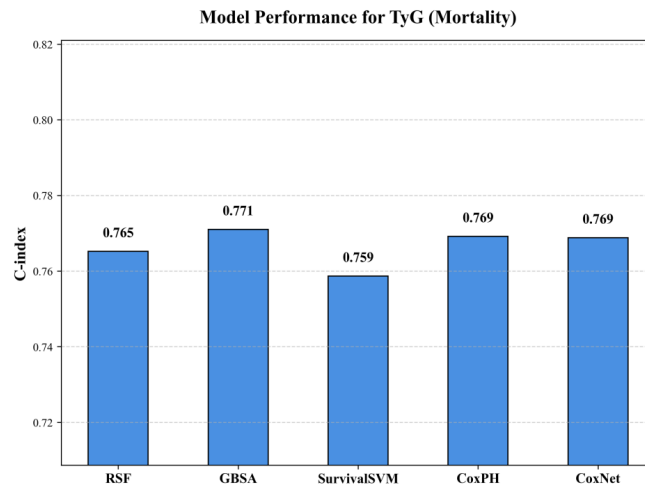


Figure S20 A Model Performance (C-index). B Permutation Feature Importance.



**Figure S21** A Model Performance (C-index). B Permutation Feature Importance.

A



B

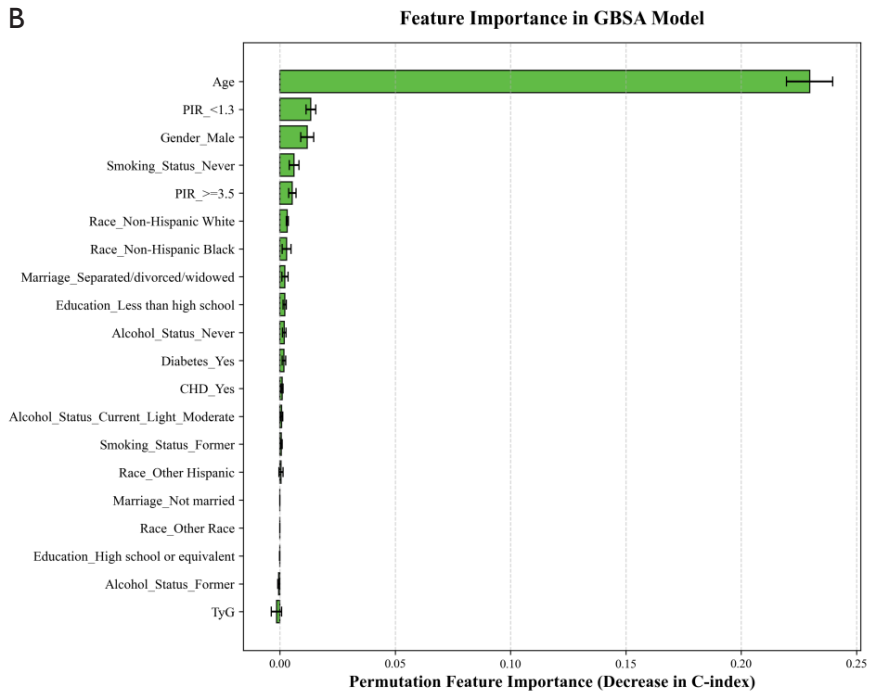


Figure S22 A Model Performance (C-index). B Permutation Feature Importance.

**Table S1** Performance of machine learning models for TyG BMI Mortality

Outcome	Index	Model	C-index (95% CI)
Mortality	TyG_BMI	CoxPH	0.753 (0.721-0.787)
Mortality	TyG_BMI	CoxNet	0.753 (0.720-0.786)
Mortality	TyG_BMI	RSF	0.752 (0.722-0.783)
Mortality	TyG_BMI	SurvivalSVM	0.752 (0.719-0.785)
Mortality	TyG_BMI	GBSA	0.749 (0.717-0.781)

**Table S2** Performance of machine learning models for TyG WC Mortality

Outcome	Index	Model	C-index (95% CI)
Mortality	TyG_WC	SurvivalSVM	0.725 (0.688-0.761)
Mortality	TyG_WC	RSF	0.721 (0.686-0.756)
Mortality	TyG_WC	GBSA	0.719 (0.685-0.754)
Mortality	TyG_WC	CoxNet	0.718 (0.678-0.756)
Mortality	TyG_WC	CoxPH	0.717 (0.678-0.755)

**Table S3** Performance of machine learning models for TyG WHtR Mortality

Outcome	Index	Model	C-index (95% CI)
Mortality	TyG_WHtR	RSF	0.739 (0.703-0.777)
Mortality	TyG_WHtR	CoxPH	0.732 (0.694-0.769)
Mortality	TyG_WHtR	CoxNet	0.731 (0.694-0.770)
Mortality	TyG_WHtR	GBSA	0.726 (0.692-0.763)
Mortality	TyG_WHtR	SurvivalSVM	0.723 (0.686-0.763)

**Table S4** Performance of machine learning models for TyG Mortality

Outcome	Index	Model	C-index (95% CI)
Mortality	TyG	GBSA	0.771 (0.741-0.801)
Mortality	TyG	CoxPH	0.769 (0.738-0.803)
Mortality	TyG	CoxNet	0.769 (0.738-0.802)
Mortality	TyG	RSF	0.765 (0.735-0.796)
Mortality	TyG	SurvivalSVM	0.759 (0.728-0.792)

**Table S5** Performance of machine learning models for TyG BMI CVD

Outcome	Index	Model	C-index (95% CI)
CVD Mortality	TyG_BMI	RSF	0.840 (0.802-0.875)
CVD Mortality	TyG_BMI	SurvivalSVM	0.828 (0.783-0.867)
CVD Mortality	TyG_BMI	CoxPH	0.828 (0.780-0.870)
CVD Mortality	TyG_BMI	CoxNet	0.827 (0.777-0.870)
CVD Mortality	TyG_BMI	GBSA	0.820 (0.772-0.864)

**Table S6** Performance of machine learning models for TyG WC CVD

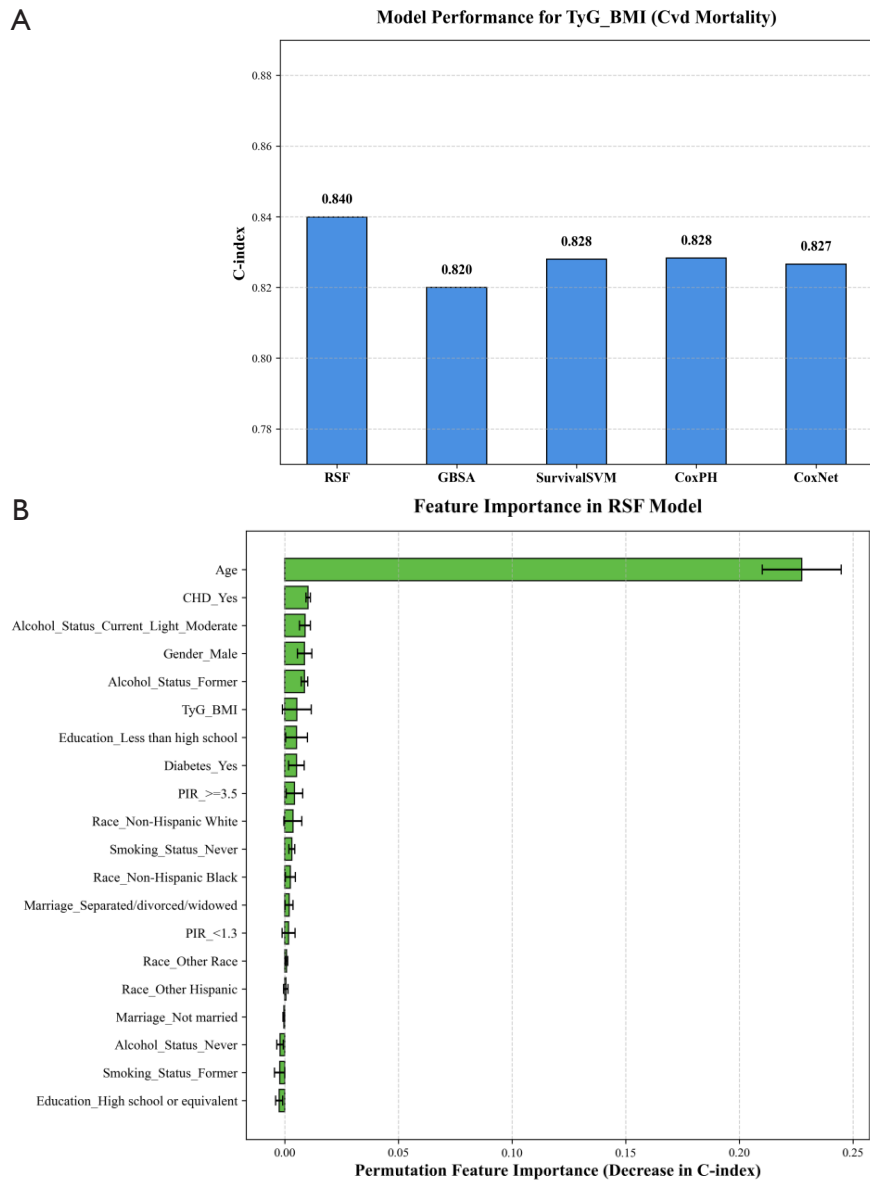
Outcome	Index	Model	C-index (95% CI)
CVD Mortality	TyG_WC	SurvivalSVM	0.794 (0.744-0.834)
CVD Mortality	TyG_WC	RSF	0.783 (0.727-0.831)
CVD Mortality	TyG_WC	CoxPH	0.782 (0.727-0.829)
CVD Mortality	TyG_WC	CoxNet	0.782 (0.728-0.829)
CVD Mortality	TyG_WC	GBSA	0.757 (0.702-0.807)

**Table S7** Performance of machine learning models for TyG WHtR CVD

Outcome	Index	Model	C-index (95% CI)
CVD Mortality	TyG_WHtR	CoxNet	0.817 (0.763-0.867)
CVD Mortality	TyG_WHtR	CoxPH	0.816 (0.763-0.866)
CVD Mortality	TyG_WHtR	RSF	0.813 (0.766-0.860)
CVD Mortality	TyG_WHtR	SurvivalSVM	0.807 (0.759-0.855)
CVD Mortality	TyG_WHtR	GBSA	0.791 (0.732-0.848)

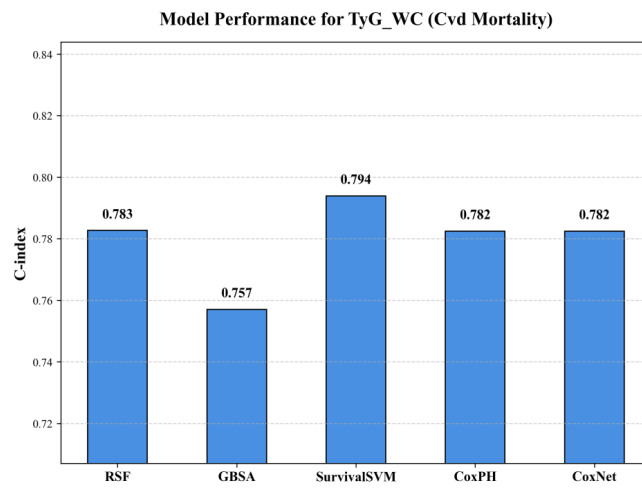
**Table S8** Performance of machine learning models for TyG CVD

Outcome	Index	Model	C-index (95% CI)
CVD Mortality	TyG	CoxPH	0.815 (0.770-0.857)
CVD Mortality	TyG	CoxNet	0.815 (0.769-0.857)
CVD Mortality	TyG	RSF	0.807 (0.760-0.848)
CVD Mortality	TyG	SurvivalSVM	0.804 (0.759-0.846)
CVD Mortality	TyG	GBSA	0.801 (0.754-0.844)

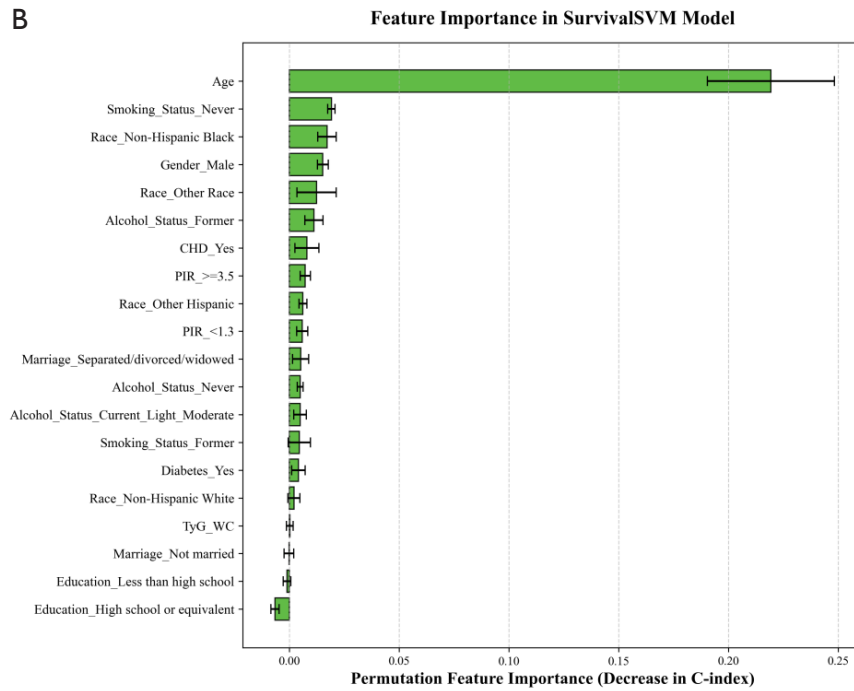


**Figure S23** A Model Performance (C-index). B Permutation Feature Importance.

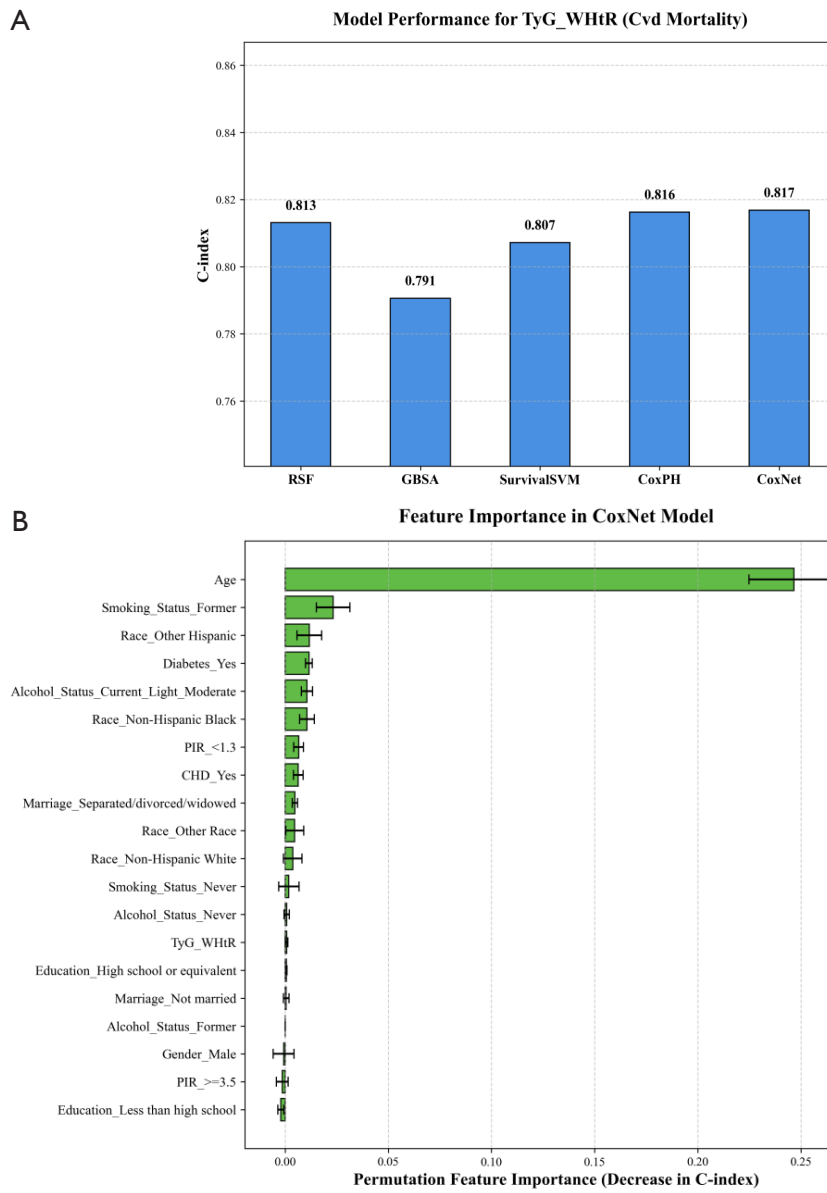
A



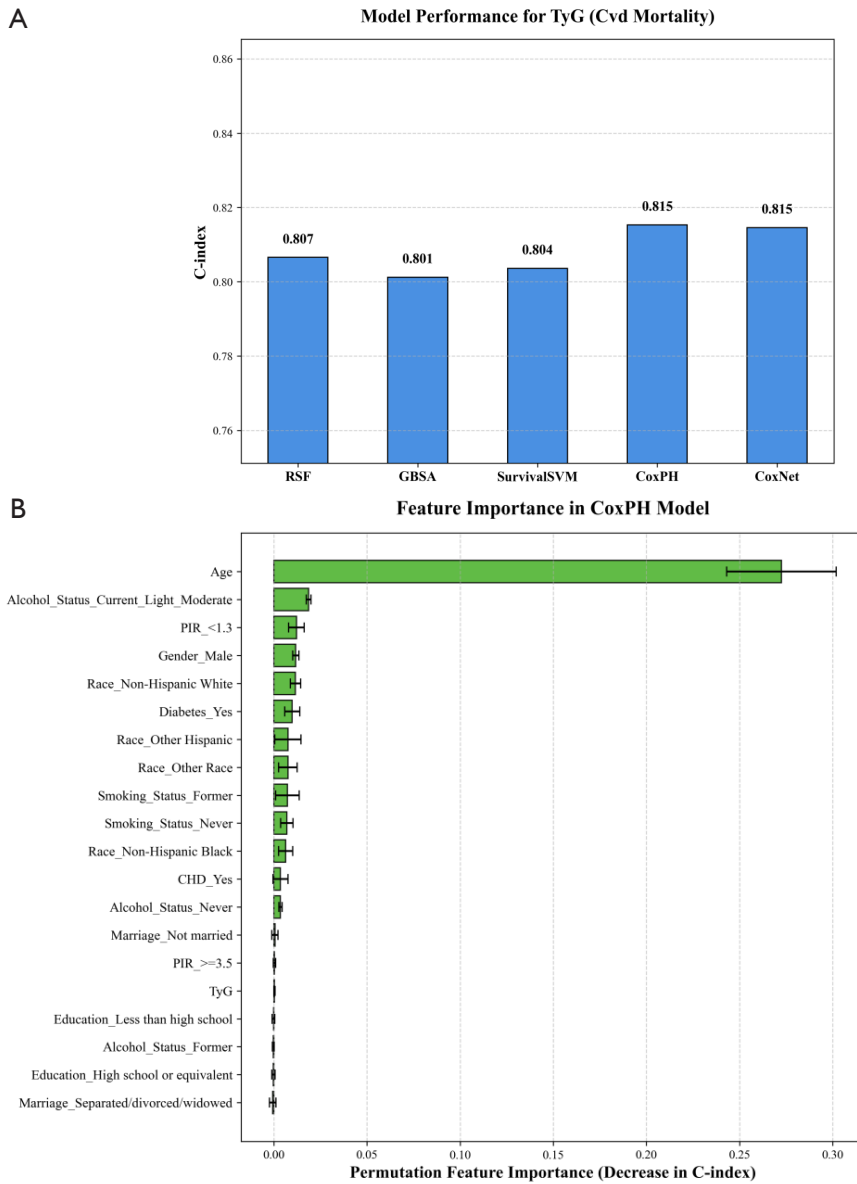
B



**Figure S24** A Model Performance (C-index). B Permutation Feature Importance.

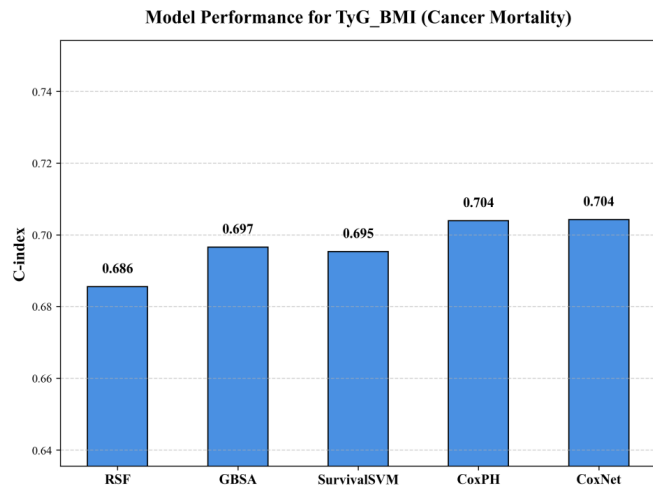


**Figure S25** A Model Performance (C-index). B Permutation Feature Importance.



**Figure S26** A Model Performance (C-index). B Permutation Feature Importance.

A



B

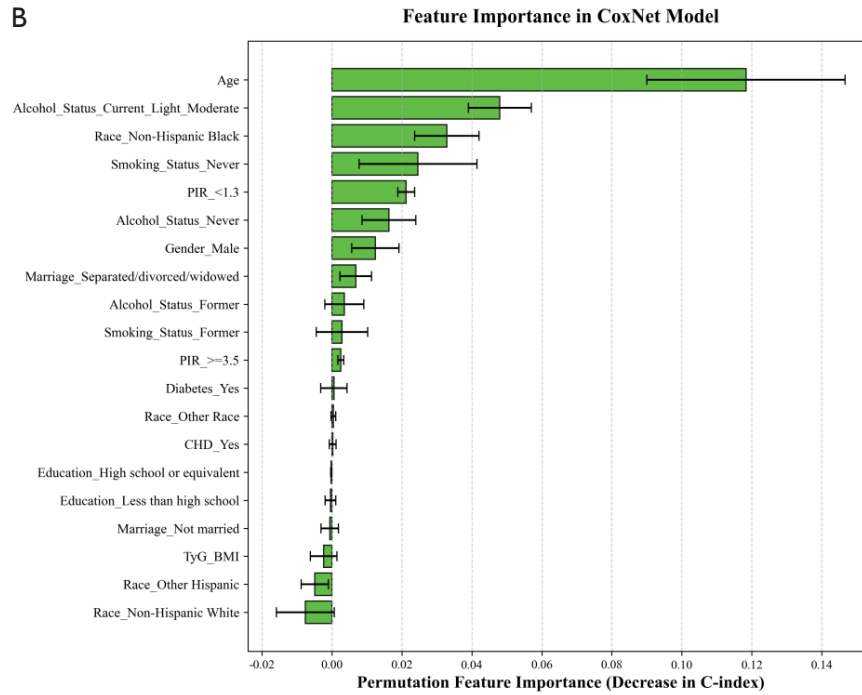
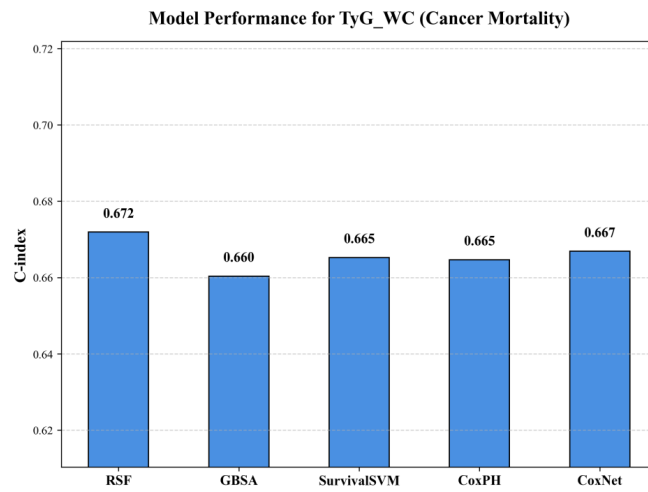
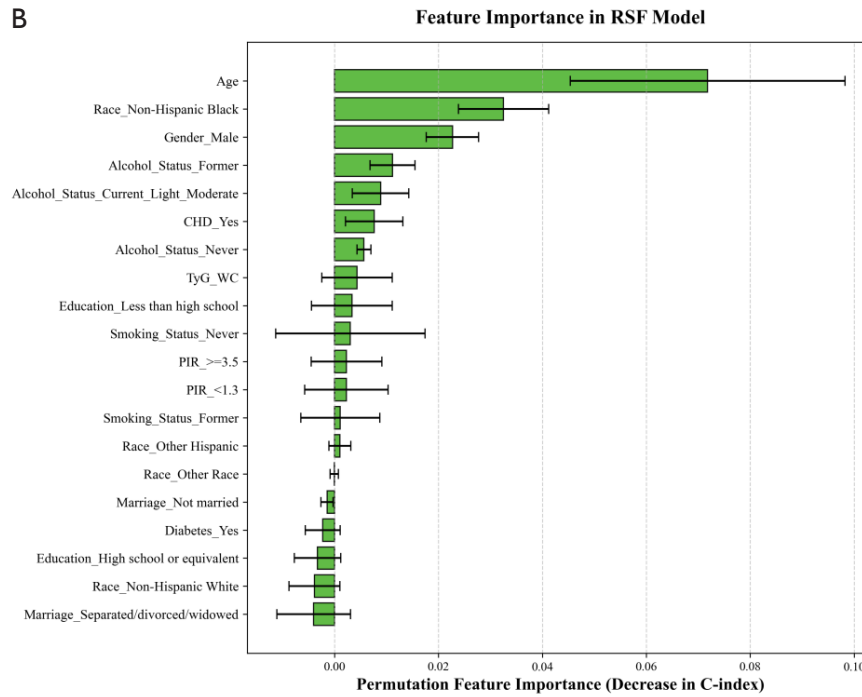


Figure S27 A Model Performance (C-index). B Permutation Feature Importance.

A

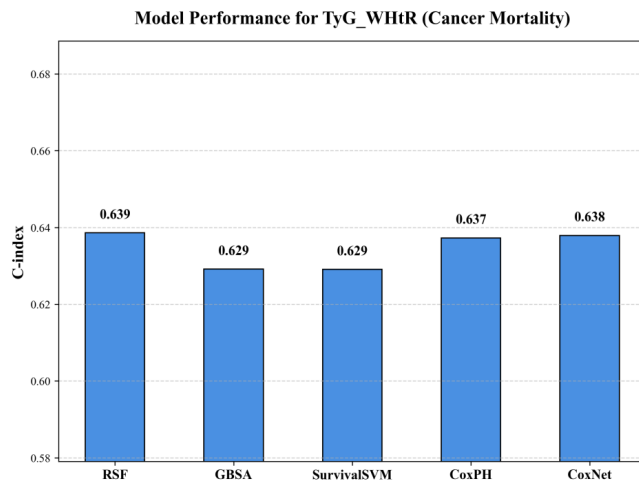


B



**Figure S28** A Model Performance (C-index). B Permutation Feature Importance.

A



B

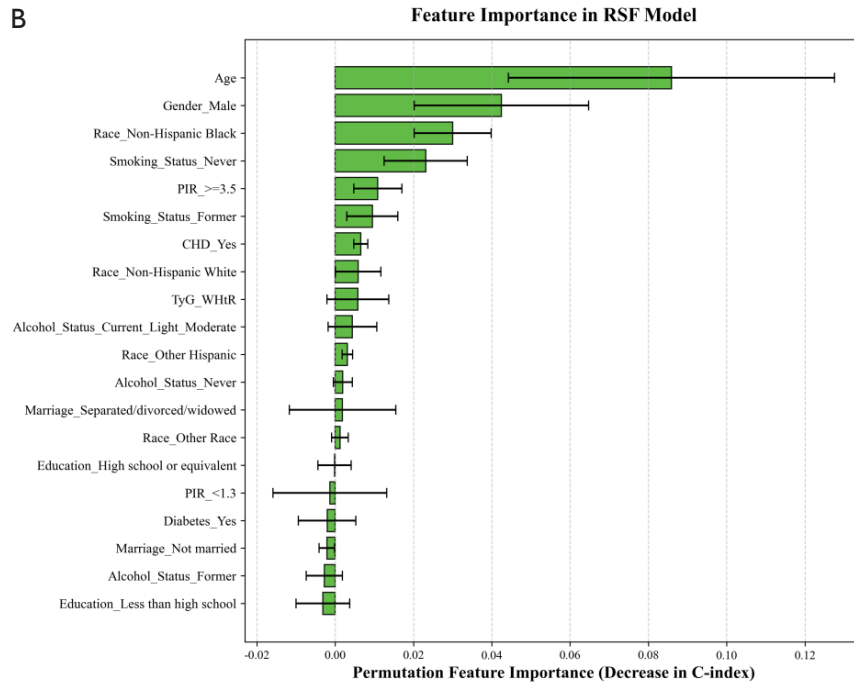
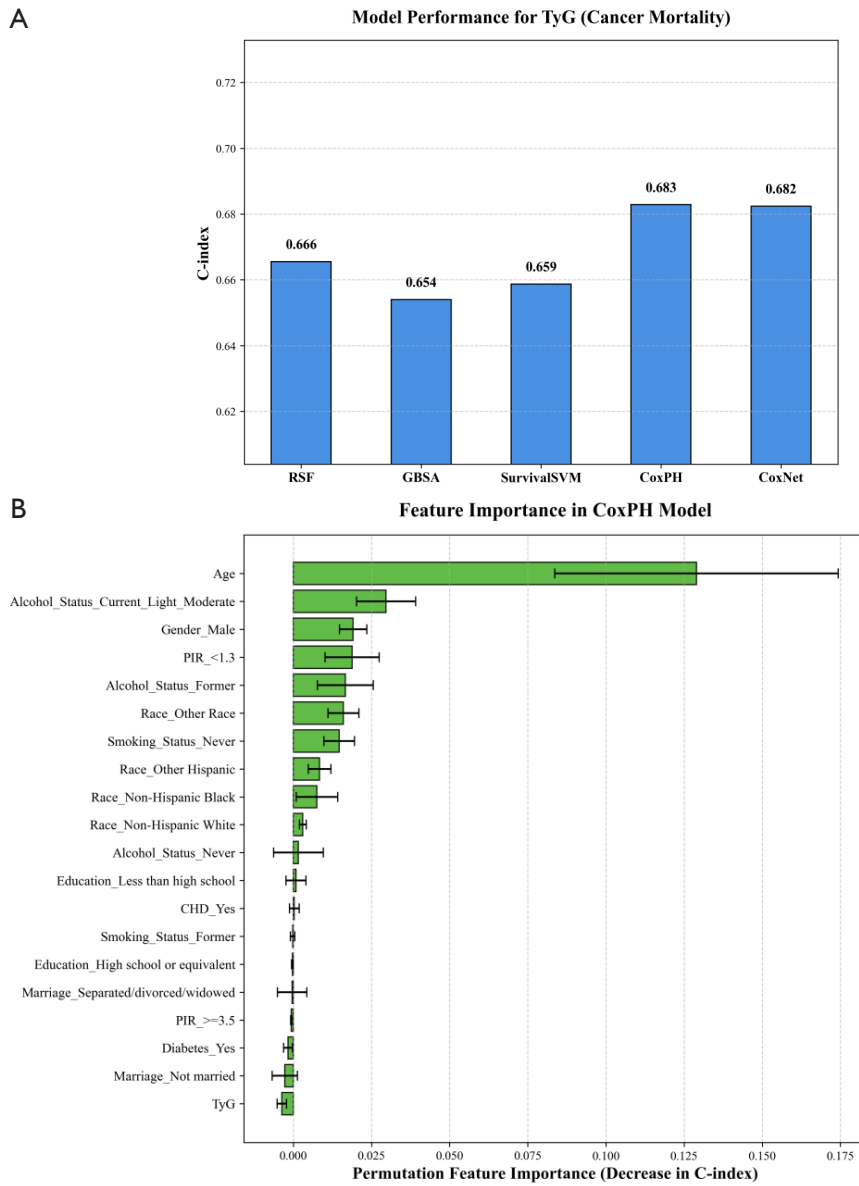


Figure S29 A Model Performance (C-index). B Permutation Feature Importance.



**Figure S30** A Model Performance (C-index). B Permutation Feature Importance.

**Table S9** Performance of machine learning models for TyG BMI Cancer

Outcome	Index	Model	C-index (95% CI)
Cancer Mortality	TyG_BMI	CoxPH	0.704 (0.637-0.763)
Cancer Mortality	TyG_BMI	CoxNet	0.704 (0.639-0.763)
Cancer Mortality	TyG_BMI	GBSA	0.697 (0.636-0.750)
Cancer Mortality	TyG_BMI	SurvivalSVM	0.695 (0.627-0.756)
Cancer Mortality	TyG_BMI	RSF	0.686 (0.618-0.743)

**Table S10** Performance of machine learning models for TyG WC Cancer

Outcome	Index	Model	C-index (95% CI)
Cancer Mortality	TyG_WC	RSF	0.672 (0.612-0.733)
Cancer Mortality	TyG_WC	CoxNet	0.667 (0.598-0.736)
Cancer Mortality	TyG_WC	SurvivalSVM	0.665 (0.597-0.732)
Cancer Mortality	TyG_WC	CoxPH	0.665 (0.596-0.736)
Cancer Mortality	TyG_WC	GBSA	0.660 (0.593-0.724)

**Table S11** Performance of machine learning models for TyG WHtR Cancer

Outcome	Index	Model	C-index (95% CI)
Cancer Mortality	TyG_WHtR	RSF	0.639 (0.578-0.698)
Cancer Mortality	TyG_WHtR	CoxNet	0.638 (0.568-0.710)
Cancer Mortality	TyG_WHtR	CoxPH	0.637 (0.567-0.710)
Cancer Mortality	TyG_WHtR	GBSA	0.629 (0.565-0.693)
Cancer Mortality	TyG_WHtR	SurvivalSVM	0.629 (0.563-0.702)

**Table S12** Performance of machine learning models for TyG Cancer

Outcome	Index	Model	C-index (95% CI)
Cancer Mortality	TyG	CoxPH	0.683 (0.613-0.751)
Cancer Mortality	TyG	CoxNet	0.682 (0.612-0.752)
Cancer Mortality	TyG	RSF	0.666 (0.606-0.730)
Cancer Mortality	TyG	SurvivalSVM	0.659 (0.591-0.726)
Cancer Mortality	TyG	GBSA	0.654 (0.588-0.717)