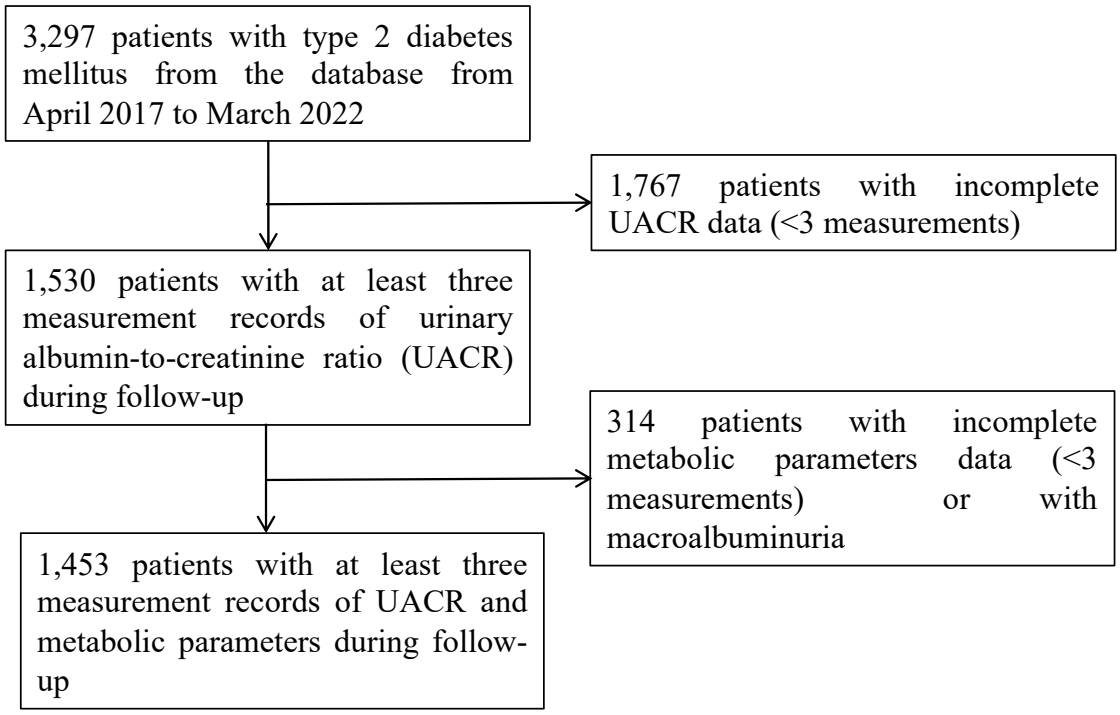
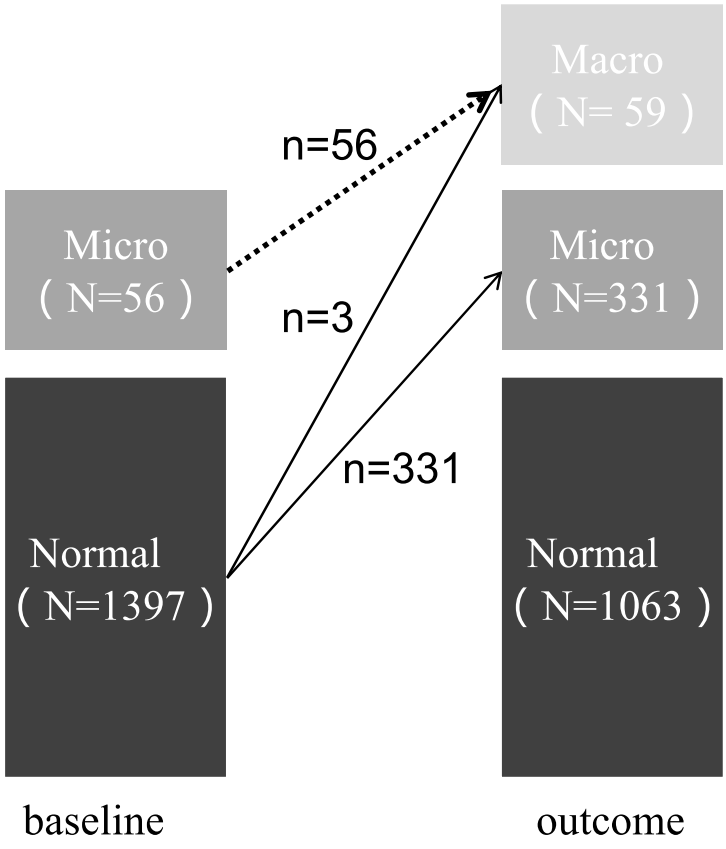
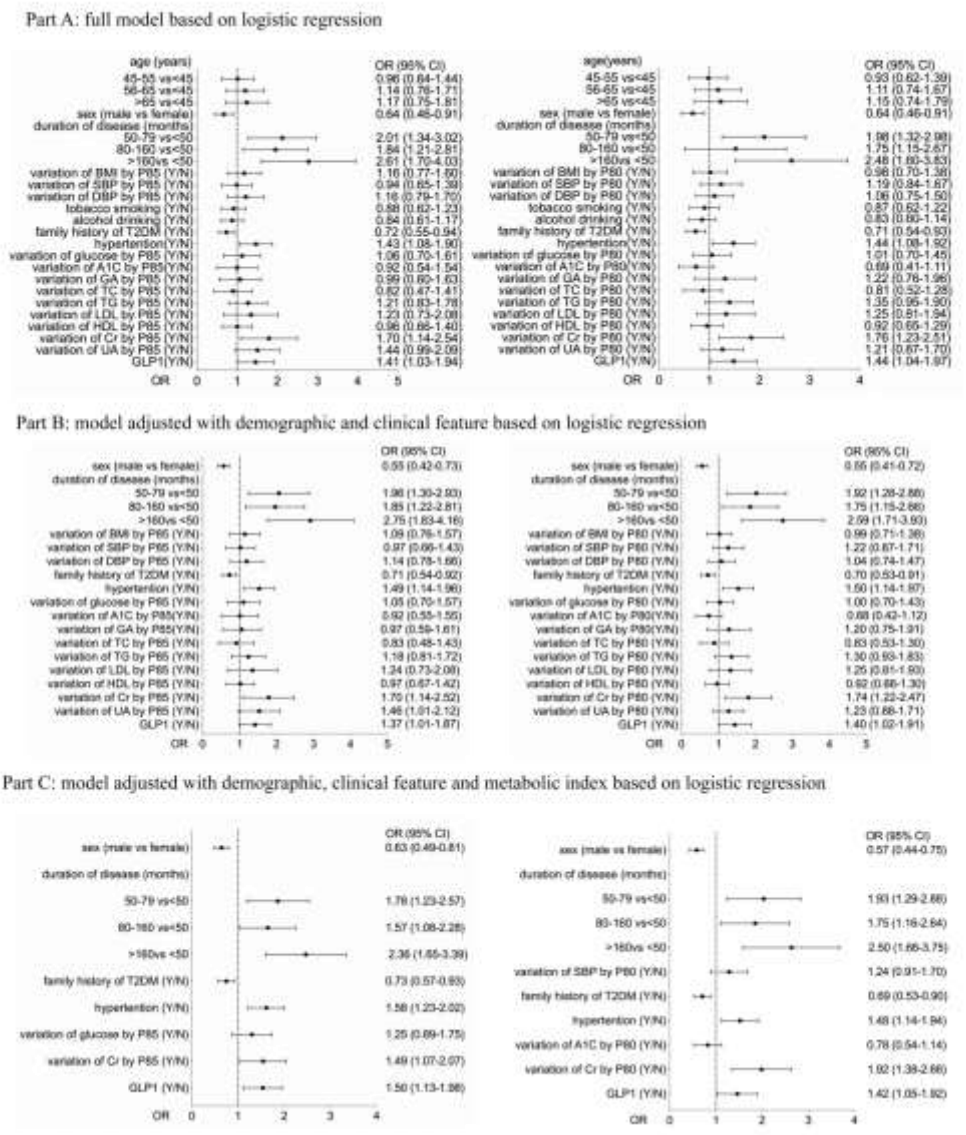


Supplementary Figure 1 Study flowchart.



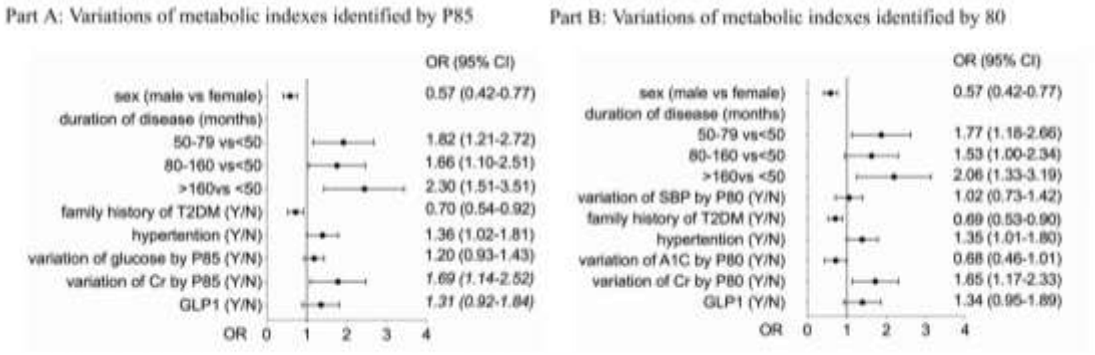
Supplementary Figure 2 Baseline and progression of proteinuria in type 2

diabetes mellitus patients. Normal (< 30 mg/g), Microalbuminuria (30–299 mg/g, Macroalbuminuria (≥ 300mg/g).



Supplementary Figure 3 Factors associated with progression of proteinuria based on multivariable logistic regression by different variation of the 12 metabolic indexes identified by percentiles (P85 and P80) of their standard deviation among type 2 diabetes mellitus patients. OR: odds ratios; CI: confidence intervals; T2DM: type 2 diabetes mellitus; GLP-1RA: glucagon-like peptide 1 receptor agonist; BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; LDL-C: low-density lipoprotein cholesterol; HDL-C: high-density lipoprotein cholesterol； TC: total cholesterol; TG:

triglyceride; Cr: Creatinine; UA: uric acid; FBP: fasting blood glucose; HbA1c: glycated hemoglobin; GA: glycated albumin.



Supplementary Figure 4 Factors associated with progression of proteinuria among type 2 diabetes mellitus patients based on variations of metabolic indexes identified by different percentiles (P85 and P80), and with the adjustment of potential confounding factors including mean body mass index, systolic blood pressure, diastolic blood pressure, triglyceride, uric acid, and glycated hemoglobin. OR: odds ratios; CI: confidence intervals; SBP: systolic blood pressure; T2DM: type 2 diabetes mellitus; Cr: Creatinine; HbA1c: glycated hemoglobin; GLP-1RA: glucagon-like peptide 1 receptor agonist.

Supplementary Table 1 Comparison of percentage of with and without progress of proteinuria in type 2 diabetes mellitus stratified by their mean and standard deviation of 12 metabolic indexes identified by percentiles

Patients with obvious variation of the 12 metabolic indexes	Cutoff based on P85		Cutoff based on P80		Cutoff based on P75		Cutoff based on P67	
	Proteinuria (-)	Proteinuria (+)	Proteinuria (-)	Proteinuria (+)	Proteinuria (-)	Proteinuria (+)	Proteinuria (-)	Proteinuria (+)
BMI Mean (kg/m^2), n (%) ①②③④	125 (13.4)	67 (19.5)	168 (18.0)	87 (25.3)	213 (22.9)	106 (30.8)	287 (30.8)	133 (38.7)
BMI SD (kg/m^2), n (%) ④	133 (14.3)	59 (17.2)	181 (19.4)	74 (21.5)	223 (23.9)	96 (27.9)	291 (31.2)	130 (37.8)
SBP Mean (mmHg), n (%) ①②③④	116 (12.5)	74 (21.5)	159 (17.1)	95 (27.6)	206 (22.2)	113 (32.8)	281 (30.2)	139 (40.4)
SBP SD (mmHg), n (%) ②③④	131 (14.1)	60 (17.4)	166 (17.9)	89 (25.8)	212 (22.8)	107 (31.1)	287 (30.9)	134 (38.9)
DBP Mean (mmHg), n (%)	136 (14.6)	55 (16.0)	179 (19.2)	74 (21.5)	226 (24.3)	93 (27.0)	299 (32.2)	344 (34.6)
DBP SD (mmHg), n (%)	130 (14.0)	60 (17.4)	177 (19.1)	78 (22.7)	224 (24.1)	95 (27.6)	302 (32.5)	119 (34.6)
LDL-c Mean (mmol/L), n (%)	159 (15.3)	54 (14.0)	215 (20.7)	70 (18.1)	268 (25.8)	88 (22.8)	352 (33.9)	118 (30.6)
LDL-c SD (mmol/L), n (%) ③	154 (14.8)	60 (15.5)	201 (19.4)	84 (21.8)	244 (23.5)	112 (29.1)	332 (32.0)	138 (35.8)
HDL-c Mean (mmol/L), n (%)	152 (14.6)	62 (16.1)	207 (19.9)	77 (19.9)	267 (25.7)	89 (23.1)	350 (33.7)	118 (30.6)
HDL-c SD (mmol/L), n (%)	150 (14.5)	64 (16.6)	201 (19.4)	84 (21.8)	259 (24.9)	97 (25.1)	344 (33.1)	126 (32.6)

TC Mean (mmol/L), n (%)	155 (14.9)	60 (15.5)	209 (20.0)	77 (19.9)	263 (25.2)	95 (24.5)	349 (33.5)	123 (31.8)
TC SD (mmol/L), n (%)	155 (14.9)	60 (15.5)	205 (19.7)	81 (20.9)	256 (24.5)	102 (26.4)	338 (32.4)	134 (34.6)
TG Mean (mmol/L), n (%) ①②③	144 (13.8)	71 (18.3)	194 (18.6)	92 (23.8)	246 (23.6)	112 (28.9)	329 (31.5)	143 (37.0)
TG SD (mmol/L), n (%)	156 (14.9)	59 (15.3)	202 (19.4)	84 (21.7)	252 (24.2)	106 (27.4)	331 (31.7)	141 (36.4)
UA Mean (μmol/L), n (%)	153 (14.7)	62 (16.0)	206 (19.8)	80 (20.6)	259 (24.8)	99 (25.5)	342 (32.8)	130 (33.5)
UA SD (μmol/L), n (%)	145 (13.9)	70 (18.0)	201 (19.3)	85 (21.9)	252 (24.2)	106 (27.3)	335 (32.1)	137 (35.3)
Cr Mean (μmol/L), n (%)	146 (14.1)	67 (17.3)	203 (19.6)	81 (20.9)	261 (25.1)	94 (24.3)	353 (34.0)	116 (30.0)
Cr SD(μmol/L), n (%) ①②③④	135 (13.0)	79 (20.4)	183 (17.6)	102 (26.4)	234 (22.5)	122 (31.5)	317 (30.5)	153 (39.5)
FBG Mean (mmol/L), n (%)①②③④	128 (12.1)	89 (22.9)	176 (16.7)	113 (29.0)	222 (21.1)	139 (35.7)	303 (28.7)	173 (44.5)
FBG SD (mmol/L), n (%) ④	149 (14.1)	68 (17.5)	201 (19.1)	88 (22.6)	252 (23.9)	109 (28.0)	325 (30.8)	151 (38.8)
HbA1c Mean, n (%) ①②③④	139 (13.2)	78 (20.1)	187 (17.7)	100 (25.7)	239 (22.7)	122 (31.4)	322 (30.5)	153 (39.3)
HbA1c SD (%), n (%) ②	170 (16.1)	47 (12.1)	227 (21.5)	62 (15.9)	277 (26.3)	84 (21.6)	363 (34.4)	114 (29.3)
GA Mean (%), n (%) ①②③	132 (12.8)	80 (20.8)	183 (17.8)	100 (26.0)	234 (22.7)	120 (31.2)	323 (31.4)	142 (36.9)
GA SD (%), n (%)	163 (15.8)	49 (12.7)	212 (20.6)	71 (18.4)	266 (25.9)	88 (22.9)	340 (33.0)	127 (33.0)

① the difference of percentage of obvious variation identified by 85 Percentile between T2DM with or without the progress of proteinuria was statistically significant (P<0.05)

② the difference of percentage of obvious variation identified by 80 Percentile between T2DM with or without the progress of proteinuria was statistically significant (P<0.05)

③ the difference of percentage of obvious variation identified by 75 Percentile between T2DM with or without the progress of proteinuria was statistically significant (P<0.05)

④ the difference of percentage of obvious variation identified by 67 Percentile between T2DM with or without the progress of proteinuria was statistically significant (P<0.05)

Proteinuria (+): patients with the progress of proteinuria; Proteinuria (-): patients without the progress of proteinuria; BMI: body mass index; SBP: systolic blood pressure; DBP: diastolic blood pressure; LDL-C: low-density lipoprotein cholesterol; HDL-C: high-density lipoprotein cholesterol； TC: total cholesterol; TG: triglyceride; Cr: Creatinine; UA: uric acid; FBP: fasting blood glucose; HbA1c: glycated hemoglobin; GA: glycated albumin.