

Supplementary Table 1. Variables-stratified, multivariable-adjusted analyses for the associations of SUA level with all-cause mortality in patients with diabetes from NHANES 1999-2018.

Subgroups	Serum uric acid levels					<i>P interaction</i>
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Age, years						0.023
≤60	1(ref)	1.10 (0.63, 1.92)	0.92 (0.50, 1.70)	1.15 (0.66, 2.03)	1.77 (1.05, 2.97)	
>60	1(ref)	1.02 (0.80, 1.31)	1.05 (0.81, 1.35)	0.83 (0.64, 1.07)	1.14 (0.90, 1.44)	
Sex groups						0.240
Men	1(ref)	0.97 (0.67, 1.40)	1.03 (0.77, 1.39)	0.83 (0.60, 1.14)	1.44 (1.05, 1.98)	
Women	1(ref)	1.12 (0.83, 1.51)	1.03 (0.78, 1.37)	1.04 (0.78, 1.40)	1.11 (0.83, 1.50)	
Race/ethnicity						0.872
Non-Hispanic white	1(ref)	1.04 (0.79, 1.36)	0.97 (0.73, 1.30)	0.92 (0.69, 1.22)	1.35 (1.01, 1.82)	
Non white	1(ref)	1.04 (0.75, 1.44)	1.13 (0.83, 1.54)	1.03 (0.75, 1.41)	1.20 (0.91, 1.59)	

Income groups						0.188
<1.31	1(ref)	0.95 (0.65, 1.40)	1.03 (0.73, 1.46)	0.87 (0.58, 1.29)	1.16 (0.81, 1.67)	
1.31-3.50	1(ref)	1.16 (0.81, 1.65)	1.32 (0.95, 1.83)	0.93 (0.65, 1.35)	1.33 (0.92, 1.94)	
>3.50	1(ref)	0.95 (0.50, 1.79)	0.82 (0.43, 1.55)	1.16 (0.62, 2.16)	2.09 (1.04, 4.19)	
Educational level						0.947
High school or less	1(ref)	1.08 (0.84, 1.39)	1.10 (0.88, 1.37)	0.99 (0.78, 1.26)	1.23 (0.95, 1.59)	
College or above	1(ref)	0.93 (0.58, 1.52)	0.92 (0.57, 1.49)	0.85 (0.54, 1.33)	1.36 (0.88, 2.09)	
Smoking groups						0.821
Non-smoker	1(ref)	1.03 (0.76, 1.40)	1.01 (0.72, 1.43)	0.84 (0.60, 1.18)	1.38 (0.98, 1.96)	
Current smoker	1(ref)	1.10 (0.83, 1.45)	1.04 (0.75, 1.43)	0.99 (0.73, 1.33)	1.21 (0.90, 1.63)	
Alcohol intake						0.601
None	1(ref)	1.07 (0.82, 1.38)	1.07 (0.83, 1.37)	0.98 (0.76, 1.28)	1.26 (0.96, 1.65)	
Drinking	1(ref)	0.97 (0.49, 1.93)	0.79 (0.42, 1.49)	0.84 (0.43, 1.63)	1.42 (0.77, 2.62)	

Physical activity groups						0.011
Inactive	1(ref)	1.02 (0.81, 1.29)	0.95 (0.75, 1.22)	0.79 (0.60, 1.04)	1.01 (0.78, 1.30)	
Insufficient	1(ref)	0.98 (0.43, 2.20)	1.08 (0.48, 2.42)	0.84 (0.39, 1.84)	1.31 (0.56, 3.07)	
Active	1(ref)	1.04 (0.68, 1.59)	1.15 (0.72, 1.86)	1.48 (0.99, 2.23)	2.24 (1.33, 3.75)	
eGFR, ml/min per 1.73 m²						0.242
<60	1(ref)	1.63 (0.96, 2.78)	1.93 (1.19, 3.13)	1.53 (0.99, 2.36)	1.91 (1.22, 2.97)	
60-89	1(ref)	1.02 (0.71, 1.46)	0.90 (0.67, 1.22)	0.79 (0.56, 1.10)	1.41 (1.03, 1.92)	
≥90	1(ref)	0.84 (0.56, 1.26)	1.00 (0.63, 1.59)	1.02 (0.65, 1.61)	1.41 (0.88, 2.25)	
BMI, kg/m²						0.228
<30	1(ref)	1.06 (0.73, 1.54)	1.12 (0.77, 1.61)	0.95 (0.64, 1.41)	1.43 (1.01, 2.02)	
≥30	1(ref)	1.02 (0.75, 1.39)	0.94 (0.71, 1.25)	0.93 (0.70, 1.25)	1.06 (0.76, 1.47)	

Values are weighted hazard ratio (95% confidence interval).

Model: adjusted for age, sex, race/ethnicity, education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015, BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD, with excluding the stratifying factors.

Supplementary Table 2. Variables-stratified, multivariable-adjusted analyses for the associations of SUA level with CVD mortality in patients with diabetes from NHANES 1999-2018.

Subgroups	Serum uric acid levels					<i>P interaction</i>
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Age, years						0.717
≤60	1(ref)	1.22 (0.51, 2.93)	0.73 (0.27, 1.97)	0.59 (0.22, 1.58)	1.73 (0.80, 3.72)	
>60	1(ref)	0.88 (0.57, 1.36)	1.22 (0.81, 1.82)	0.95 (0.63, 1.43)	1.44 (0.97, 2.12)	
Sex groups						0.616
Men	1(ref)	0.98 (0.52, 1.85)	1.17 (0.70, 1.94)	0.82 (0.49, 1.38)	1.51 (0.92, 2.47)	
Women	1(ref)	1.10 (0.66, 1.82)	0.97 (0.62, 1.53)	0.96 (0.61, 1.50)	1.38 (0.88, 2.17)	
Race/ethnicity						0.604
Non-Hispanic white	1(ref)	1.09 (0.67, 1.75)	1.07 (0.65, 1.74)	0.99 (0.66, 1.50)	1.65 (1.11, 2.44)	
Non white	1(ref)	0.91 (0.55, 1.52)	1.16 (0.73, 1.84)	0.78 (0.48, 1.26)	1.30 (0.83, 2.03)	

Income groups						0.174
<1.31	1(ref)	0.82 (0.44, 1.52)	0.90 (0.55, 1.49)	0.72 (0.40, 1.31)	1.14 (0.70, 1.86)	
1.31-3.50	1(ref)	1.11 (0.59, 2.09)	1.33 (0.75, 2.34)	1.10 (0.64, 1.91)	1.68 (0.97, 2.90)	
>3.50	1(ref)	1.35 (0.56, 3.29)	1.26 (0.45, 3.52)	1.44 (0.68, 3.08)	3.20 (1.21, 8.45)	
Educational level						0.466
High school or less	1(ref)	1.08 (0.71, 1.65)	1.26 (0.84, 1.9)	1.10 (0.74, 1.65)	1.57 (1.04, 2.36)	
College or above	1(ref)	0.86 (0.41, 1.82)	0.92 (0.37, 2.30)	0.55 (0.25, 1.21)	1.18 (0.52, 2.65)	
Smoking groups						0.946
Non-smoker	1(ref)	0.76 (0.48, 1.22)	0.96 (0.62, 1.50)	0.80 (0.46, 1.41)	1.64 (1.00, 2.69)	
Current smoker	1(ref)	1.48 (0.85, 2.60)	1.32 (0.80, 2.17)	1.06 (0.70, 1.60)	1.43 (0.89, 2.28)	
Alcohol intake groups						0.375
None	1(ref)	1.24 (0.80, 1.94)	1.24 (0.81, 1.91)	0.96 (0.64, 1.45)	1.48 (1.01, 2.17)	
Drinking	1(ref)	0.36 (0.13, 1.00)	0.70 (0.31, 1.62)	0.75 (0.30, 1.84)	1.62 (0.70, 3.76)	

Physical activity groups						0.506
Inactive	1(ref)	1.13 (0.73, 1.72)	1.00 (0.65, 1.54)	0.74 (0.48, 1.12)	1.25 (0.83, 1.87)	
Insufficient	1(ref)	0.44 (0.16, 1.20)	0.60 (0.17, 2.17)	0.79 (0.26, 2.40)	0.38 (0.07, 2.07)	
Active	1(ref)	0.84 (0.42, 1.65)	1.34 (0.70, 2.59)	1.25 (0.68, 2.30)	2.60 (1.35, 5.01)	
eGFR, ml/min per 1.73 m²						0.889
<60	1(ref)	0.88 (0.35, 2.23)	1.54 (0.70, 3.40)	0.99 (0.47, 2.09)	1.52 (0.72, 3.20)	
60-89	1(ref)	1.14 (0.61, 2.16)	1.02 (0.61, 1.69)	0.96 (0.55, 1.69)	1.75 (0.94, 3.23)	
≥90	1(ref)	1.03 (0.48, 2.19)	1.12 (0.49, 2.54)	0.94 (0.39, 2.29)	1.47 (0.69, 3.12)	
BMI, kg/m²						0.041
<30	1(ref)	1.17 (0.62, 2.20)	1.49 (0.80, 2.76)	1.22 (0.64, 2.33)	1.85 (1.01, 3.39)	
≥30	1(ref)	1.01 (0.61, 1.66)	0.88 (0.56, 1.39)	0.78 (0.47, 1.29)	1.11 (0.66, 1.86)	

Values are weighted hazard ratio (95% confidence interval).

Model: adjusted for age, sex, race/ethnicity, education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015, BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD, with excluding the stratifying factors.

Supplementary Table 3. Multivariable-adjusted analyses for the associations of SUA level with all-cause and CVD mortality among diabetes from NHANES 1999-2018 after excluding the patients died within two years.

	Serum uric acid levels					Per 1 mg/ml increment	<i>P trend</i>
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5		
All-cause mortality							
Model 1	1(ref)	0.96 (0.76, 1.21)	0.99 (0.79, 1.23)	0.95 (0.76, 1.19)	1.42 (1.14, 1.77)	1.12 (1.07, 1.17)	<0.001
Model 2	1(ref)	0.96 (0.76, 1.20)	1.04 (0.84, 1.28)	0.93 (0.75, 1.17)	1.37 (1.09, 1.71)	1.10 (1.04, 1.16)	<0.001
Model 3	1(ref)	1.06 (0.84, 1.34)	1.07 (0.86, 1.33)	0.98 (0.79, 1.23)	1.30 (1.03, 1.63)	1.07 (1.02, 1.13)	0.010
CVD mortality							
Model 1	1(ref)	0.88 (0.59, 1.33)	0.97 (0.68, 1.39)	0.88 (0.60, 1.28)	1.55 (1.10, 2.19)	1.15 (1.06, 1.25)	0.001
Model 2	1(ref)	0.90 (0.61, 1.34)	1.05 (0.74, 1.49)	0.88 (0.61, 1.28)	1.51 (1.10, 2.08)	1.13 (1.05, 1.22)	0.002
Model 3	1(ref)	1.02 (0.70, 1.50)	1.08 (0.74, 1.57)	0.94 (0.66, 1.33)	1.45 (1.04, 2.03)	1.11 (1.02, 1.20)	0.015

Values are n or weighted hazard ratio (95% confidence interval).

Model 1: adjusted for age, sex, and race/ethnicity.

Model 2: model 1 + education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015.

Model 3: model 2 + BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD.

Supplementary Table 4. Multivariable-adjusted analyses for the associations of SUA level with all-cause and CVD mortality among diabetes from NHANES 1999-2018 after excluding the patients with allopurinol therapy, insulin therapy, or oral hypoglycemic drugs.

Patients without	1(ref)	1.02 (0.69, 1.51)	1.04 (0.72, 1.51)	0.90 (0.65, 1.26)	1.48 (1.07, 2.06)	1.12 (1.04, 1.20)	0.005
allopurinol therapy							
Patients without insulin	1(ref)	0.97 (0.63, 1.48)	1.05 (0.67, 1.66)	0.93 (0.62, 1.40)	1.34 (0.89, 2.03)	1.10 (1.01, 1.20)	0.023
therapy							
Patients without oral	1(ref)	1.06 (0.57, 1.96)	0.91 (0.56, 1.47)	0.69 (0.41, 1.17)	1.10 (0.67, 1.79)	1.03 (0.93, 1.13)	0.601
hypoglycemic drugs							

Values are weighted hazard ratio (95% confidence interval).

Model: adjusted for age, sex, and race/ethnicity, education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015, BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD, with excluding the therapy factors.

Supplementary Table 5. Multivariable-adjusted analyses for the associations of hyperuricemia using the different definitions with all-cause and CVD mortality among diabetes from NHANES 1999-2018

	Serum uric acid levels		Serum uric acid levels	
	Normal (n=5,801)	Hyperuricemia (n=1,300)	Normal (n=5,001)	Hyperuricemia (n=2,100)
Cut-off points	≤ 7.0 mg/dL	>7.0 mg/dL	≤ 7.0 mg/dL in men, ≤ 5.7 mg/dL in women	>7.0 mg/dL in men, >5.7 mg/dL in women
All-cause mortality				
Deaths/person years	1,412/48,151	488/9,786	1,204/41,696	696/16,260
Model 1	1(ref)	1.56 (1.35, 1.80)	1(ref)	1.45 (1.27, 1.66)
Model 2	1(ref)	1.47 (1.25, 1.74)	1(ref)	1.38 (1.19, 1.61)
Model 3	1(ref)	1.29 (1.08, 1.53)	1(ref)	1.26 (1.08, 1.47)
CVD mortality				
Deaths/person years	481/48,151	193/9,786	412/41,696	262/16,260
Model 1	1(ref)	1.85 (1.50, 2.28)	1(ref)	1.54 (1.25, 1.90)
Model 2	1(ref)	1.75 (1.41, 2.17)	1(ref)	1.48 (1.19, 1.84)

Model 3	1(ref)	1.49 (1.17, 1.91)	1(ref)	1.30 (1.01, 1.66)
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Values are n or weighted hazard ratio (95% confidence interval). Hyperuricemia was defined based on supersaturation point (SUA>7.0 mg/dL) or different sexes (SUA>7.0 mg/dL in men, and >5.7 mg/dL in women).

Model 1: adjusted for age, sex, and race/ethnicity.

Model 2: model 1 + education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015.

Model 3: model 2 + BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD.

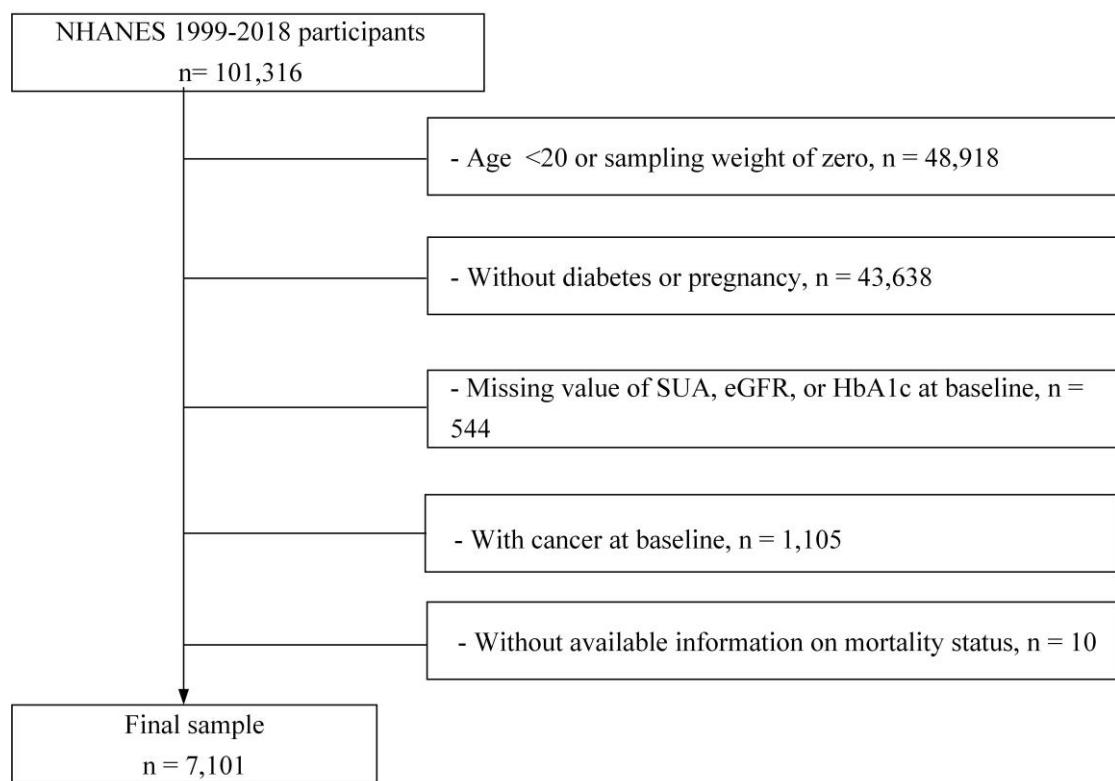
Supplementary Table 6. Baseline characteristics of the included studies.

Author, year	Country, region	Population	Men (%)	Mean age	Follow-up year	Sample size	Event	Confounders	Quality score
Jee 2004(1)	Korea	Diabetes (sub)	100	44.6±8.7(all)	6.5±1.9(all)	3200	549 deaths	age, diabetes, hypertension, hypercholesterolaemia and smoking status	5
Ioachimescu 2007(2)	America	Type 2 diabetes	69.16	59.3±11.5	4.5	535	58 deaths	age, gender, waist circumference, weight, logGFR, tobacco use, history of hypertension, CHD and stroke, BMI, LDL cholesterol, HDL cholesterol, triglycerides, fibrinogen and fasting plasma glucose	7
Zoppini 2009(3)	Italy	Type 2 diabetes	55.28	67.3±9.7	4.7	2726	329 deaths (145 CVD deaths)	age, sex, BMI, A1C, diabetes duration, smoking, hypertension, dyslipidemia, LDL, medication use, eGFR and albuminuria	8
Kramer 2010(4)	America	Type 2 diabetes	51.4	72.1 ± 9.4	13.2±6.2(all)	446	294 deaths (142 CVD deaths)	age, current smoking, BMI, alcohol intake, regular exercise, diuretic use and eGFR	8
Ong 2010(5)	Australia	Type 2 diabetes	48.6	64.1±11.3	10.3±3.9	1268	525 deaths (271 CVD deaths)	age, sex, Asian ethnicity, aboriginal, BMI, exercise, lipid-lowering medication use, TG, ACE inhibitor use, ACR, retinopathy, peripheral neuropathy, CHD, PAD	9
Panero 2012(6)	Italy	Type 2 diabetes	43.5	68.8 ± 10.6	13.7	1509	1000 deaths (541 CVD deaths)	age, sex, diabetes duration, hypertension, HDL-C, LDL-C, TC, BMI, smoking and HbA1c	7
Kuo, 2013(7)	Korea	Diabetes(sub)	54.7(all)	49.8±16.4(all)	4.6±2.6(all)	29787	NA	age, sex, eGFR, fasting glucose, cholesterol and history of CHD, stroke, heart failure or CKD	6
Lamacchia 2017(8)	Italy	Type 2 diabetes	GMS: 50.4 FMS: 45.5 PMS: 59.7	GMS: 62.0 FMS: 64.2 PMS: 59.6	GMS:10.3 FMS:7.0 PMS: 10.8	2271	581 deaths	sex, age at diabetes diagnosis, smoking habits, BMI, disease duration, HbA1c, HDL-C, TC, TG, ACR, eGFR, glucose-lowering drugs, anti-hypertensive drugs, anti-dyslipidemic treatments	8

Xia 2016(9)	China	Diabetes	57.6	59.43±10.88	NA	328	127 deaths (66 CVD deaths)	age, gender, BMI, hypertension, CVD, hemoglobin, serum albumin, serum phosphorus, serum creatinine, HDL-C, residual renal function, CRP, HbA1c, use of allopurinol, use of ACE inhibitor or angiotensin receptor blocker	6
Sakata 2020(10)	Japan	Diabetes (sub)	40.04	59.23±12.08(all)	over 19(all)	312	42 deaths	age, sex, systolic blood pressure, antihypertensive medication, diabetes, TC, HDL-C, BMI, serum albumin, eGFR, electrocardiogram abnormalities, smoking habit, alcohol intake, and regular exercise	7
Verma 2020(11)	Multiple countries	Type 2 diabetes	72.01	63.21±8.8	3.1	2333	194 deaths (137 CVD deaths)	age, sex, baseline BMI, HbA1c, eGFR, region, use of diuretics, anti-gout medication and HF	8
Zhu 2021(12)	China	Diabetes	45.89	59.96±8.66	5.83	475	28 deaths	age, gender, BMI, WHR, hypertension, dyslipidemia, smoking status and total protein intake	8
Li 2022(13)	America	Diabetes	51.95	59.22±0.27	17	6178	1515 deaths (380 CVD deaths)	age, sex, and race/ethnicity, education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2010, BMI, hypertension, dyslipidemia, diabetes duration, A1c, allopurinol, antihypertensive drugs, lipid-lowering drugs, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, baseline CVD and cancer	9

Quality score were assessed by Newcastle-Ottawa Scale.

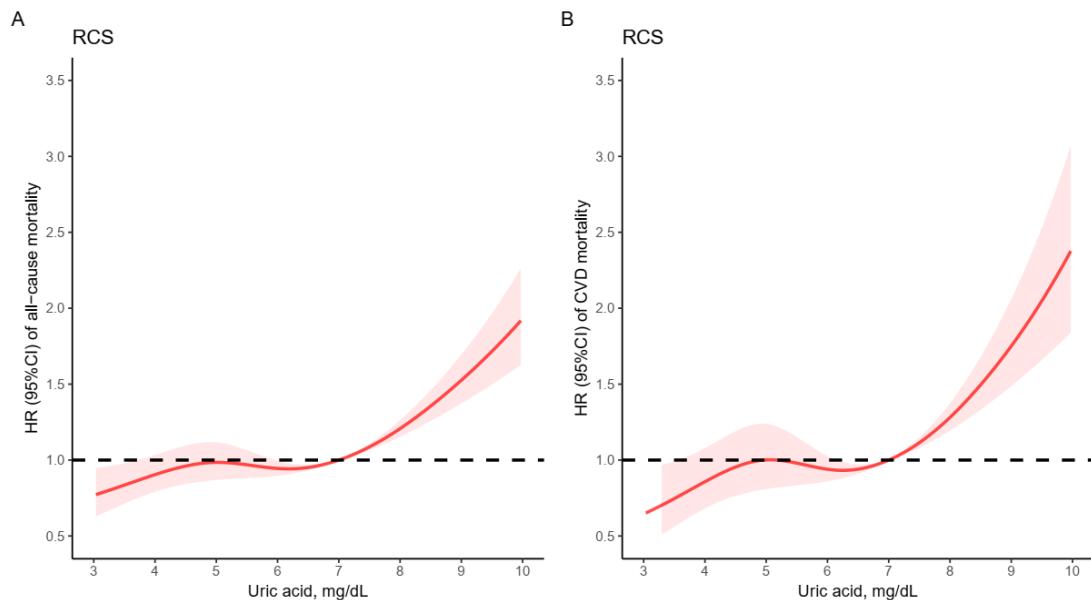
Supplementary Figure 1. Flow chart of participants in this study



NHANES 1999-2018, National Health and Nutrition Examination Survey 1999-2018;

SUA, serum uric acid; eGFR, estimated glomerular filtration rate.

Supplementary Figure 2. The multivariable adjusted restricted cubic splines for associations of serum uric acid levels with all-cause and CVD mortality from NHANES 1999-2018.

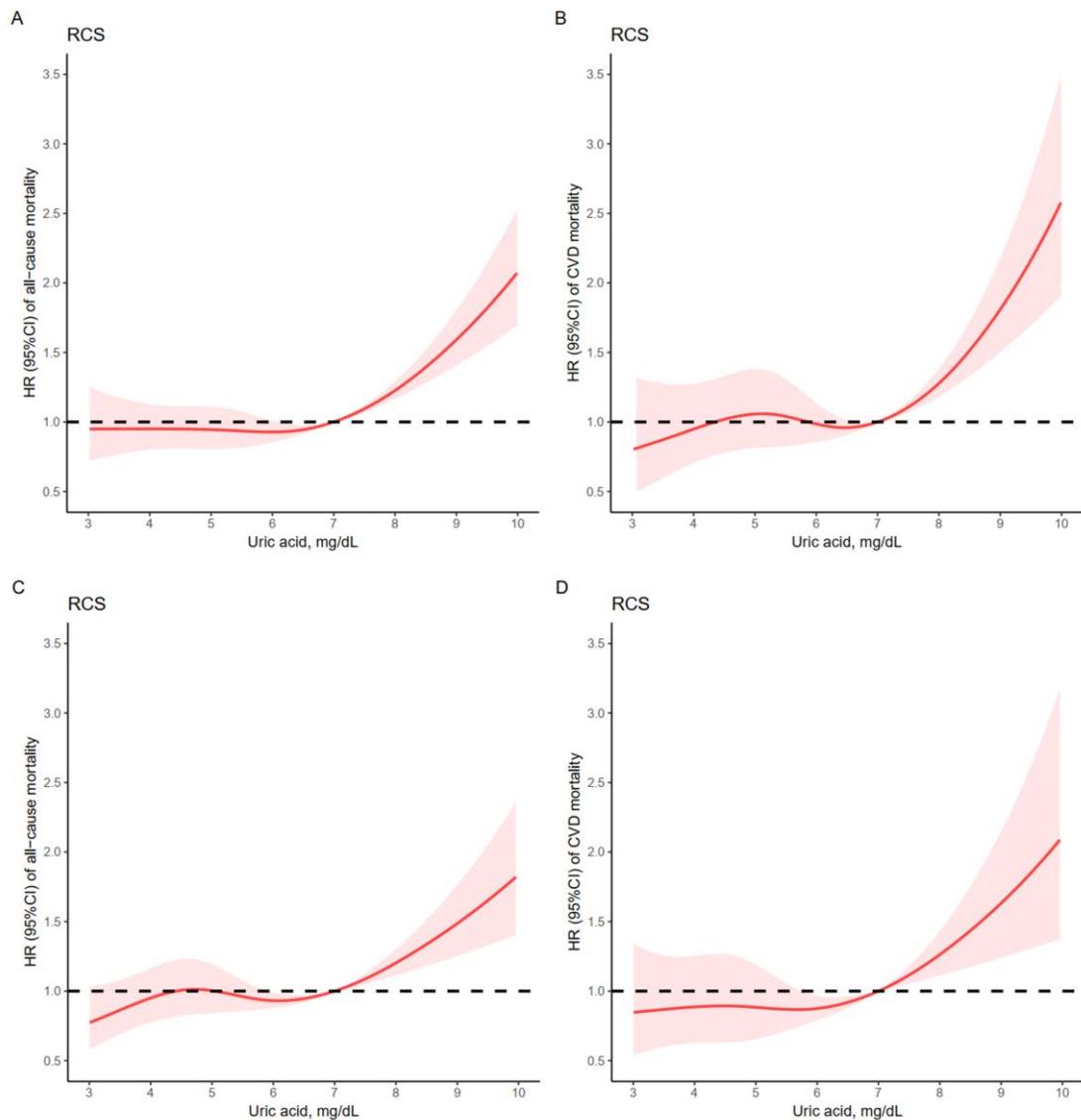


The four knots of restricted cubic splines were set at 5th, 35th, 65th, and 95th percentiles, adjusted for age, sex, and race/ethnicity, education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015, BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD.

A. Association of serum uric acid with all-cause mortality in diabetes from NHANES 1999-2018, P for non-linearity < 0.001.

B. Associations of serum uric acid with CVD mortality in diabetes from NHANES 1999-2018, P for non-linearity = 0.002.

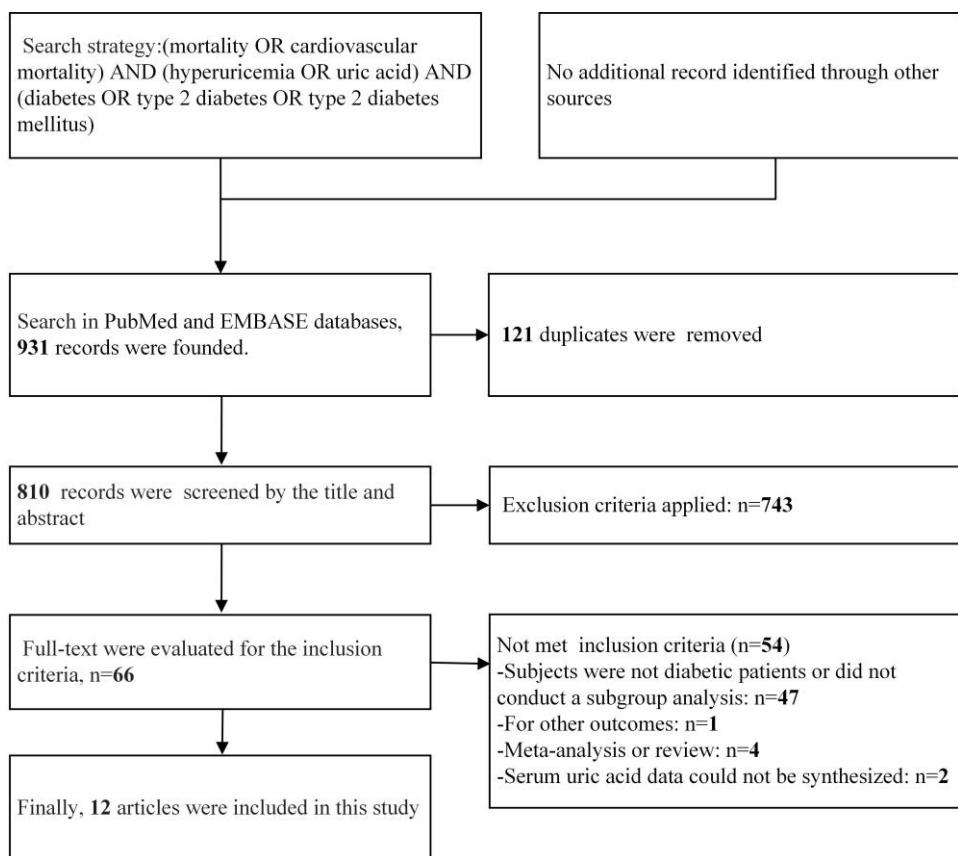
Supplementary Figure 3. The multivariable adjusted restricted cubic splines for associations of serum uric acid levels with all-cause and CVD mortality among men and women from NHANES 1999-2018.



The four knots of restricted cubic splines were set at 5th, 35th, 65th, and 95th percentiles, adjusted for age, sex, and race/ethnicity, education level, family income level, smoking status, alcohol intake, physical activity, TEI, and HEI-2015, BMI, hypertension, dyslipidemia, diabetes duration, HbA1c, allopurinol, oral hypoglycemic drugs, insulin therapy, albuminuria, eGFR, and baseline CVD.

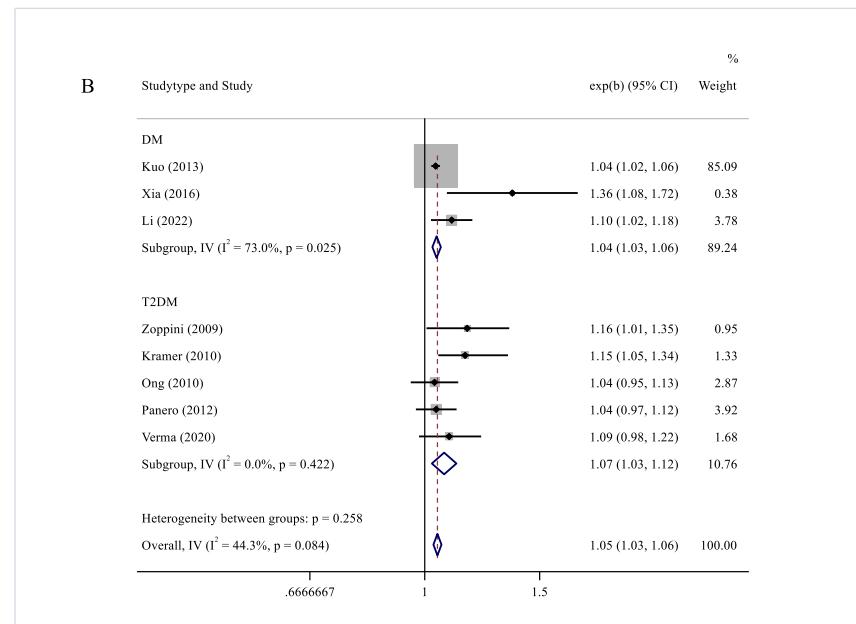
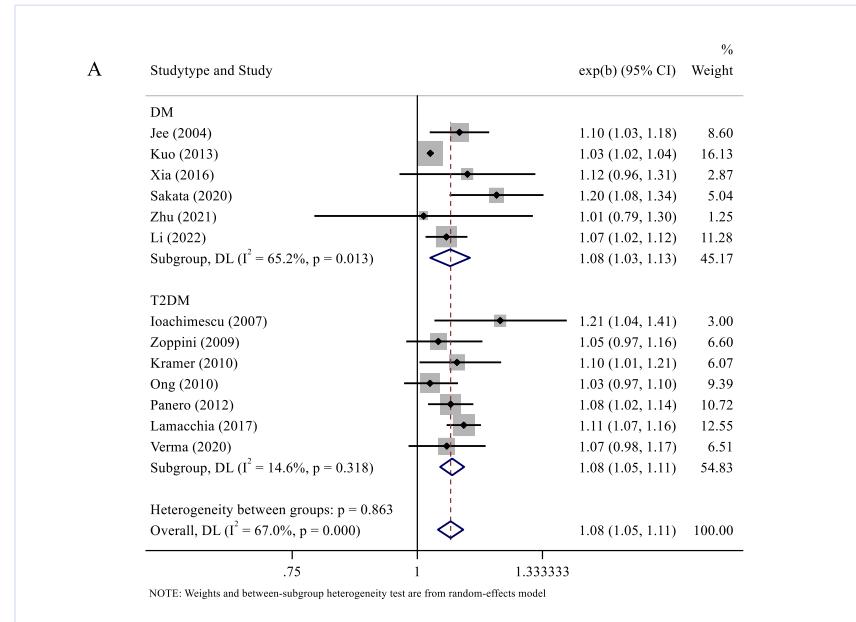
- A. Association of serum uric acid with all-cause mortality in diabetes among men from NHANES 1999-2018, P for non-linearity < 0.001.
- B. Associations of serum uric acid with CVD mortality in diabetes among men from NHANES 1999-2018, P for non-linearity = 0.001.
- C. Association of serum uric acid with all-cause mortality in diabetes among women from NHANES 1999-2018, P for non-linearity = 0.014.
- D. Associations of serum uric acid with CVD mortality in diabetes among women from NHANES 1999-2018, P for non-linearity = 0.102.

Supplementary Figure 4. Literature screening flow chart for the meta-analysis.



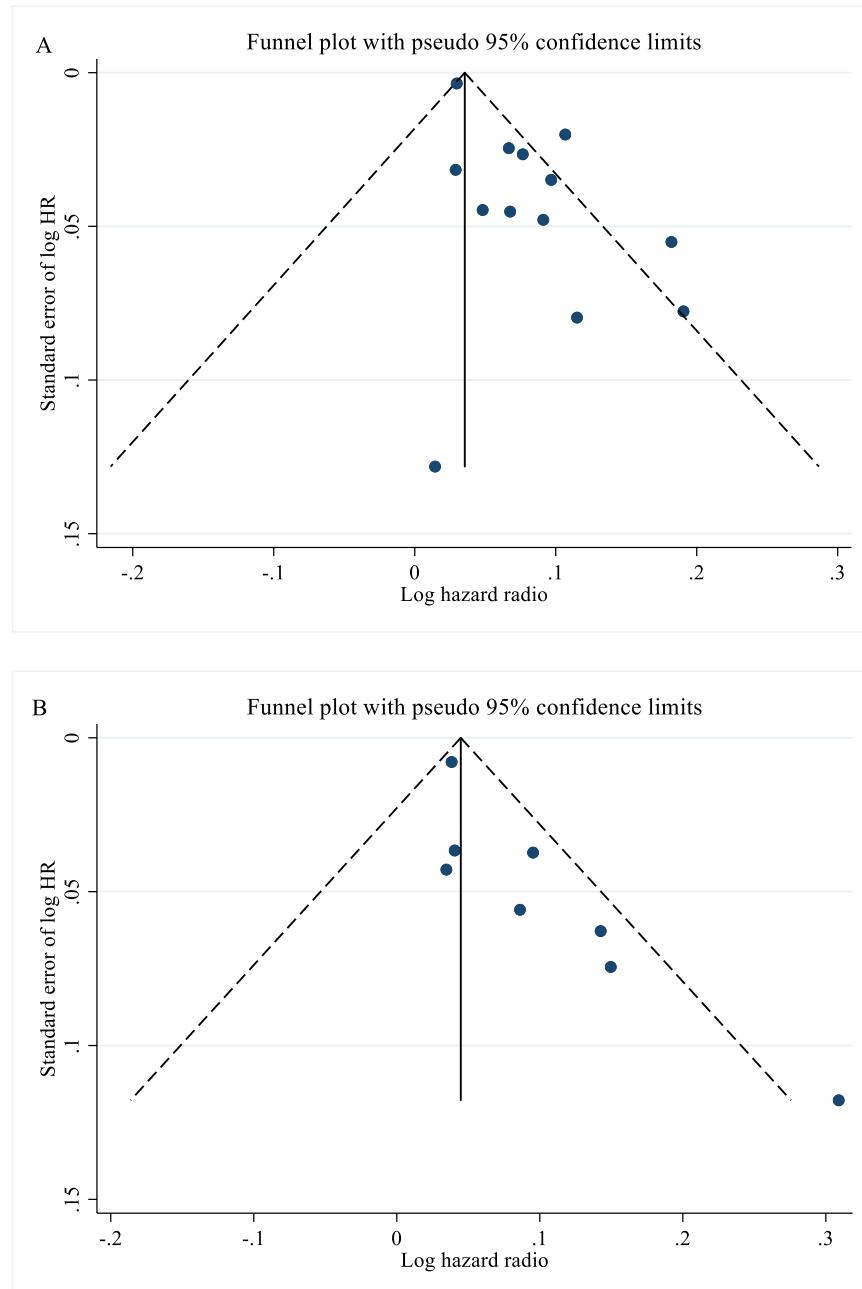
Flow chart demonstrated processes of study search, screening, and selection.

Supplementary figure 5. Forest plot of subgroup meta-analysis of serum uric acid levels and all-cause and CVD mortality in patients with diabetes and type 2 diabetes.



Subgroup meta-analysis among diabetes and type 2 diabetes for the associations of per 1 mg/dL increase in SUA levels with all-cause mortality (A) and CVD mortality (B).

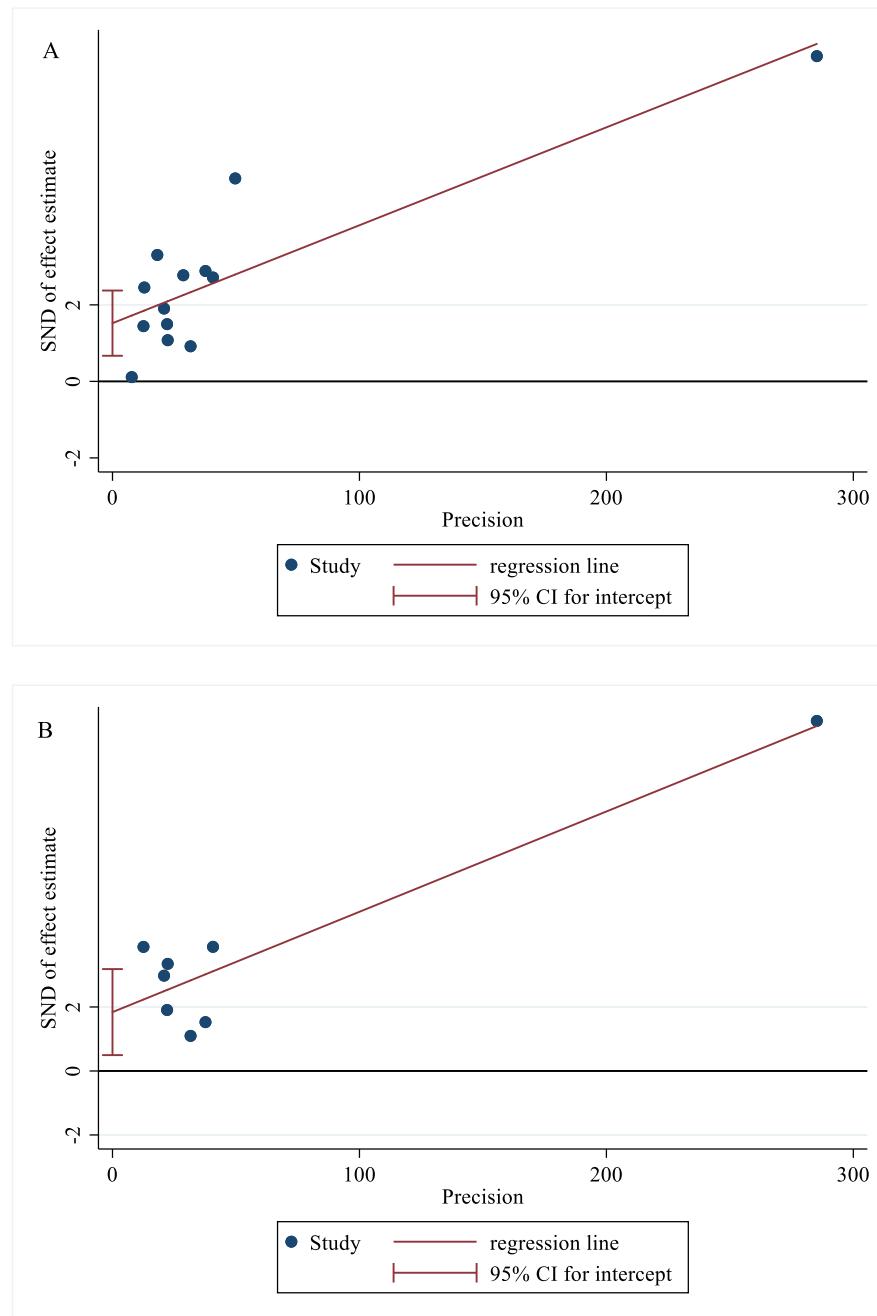
Supplementary Figure 6. The funnel plot, egger's plot of meta-analysis of serum uric acid levels and all-cause and CVD mortality in patients with diabetes.



A. The funnel plot of meta-analysis of serum uric acid levels and all-cause mortality in patients with diabetes.

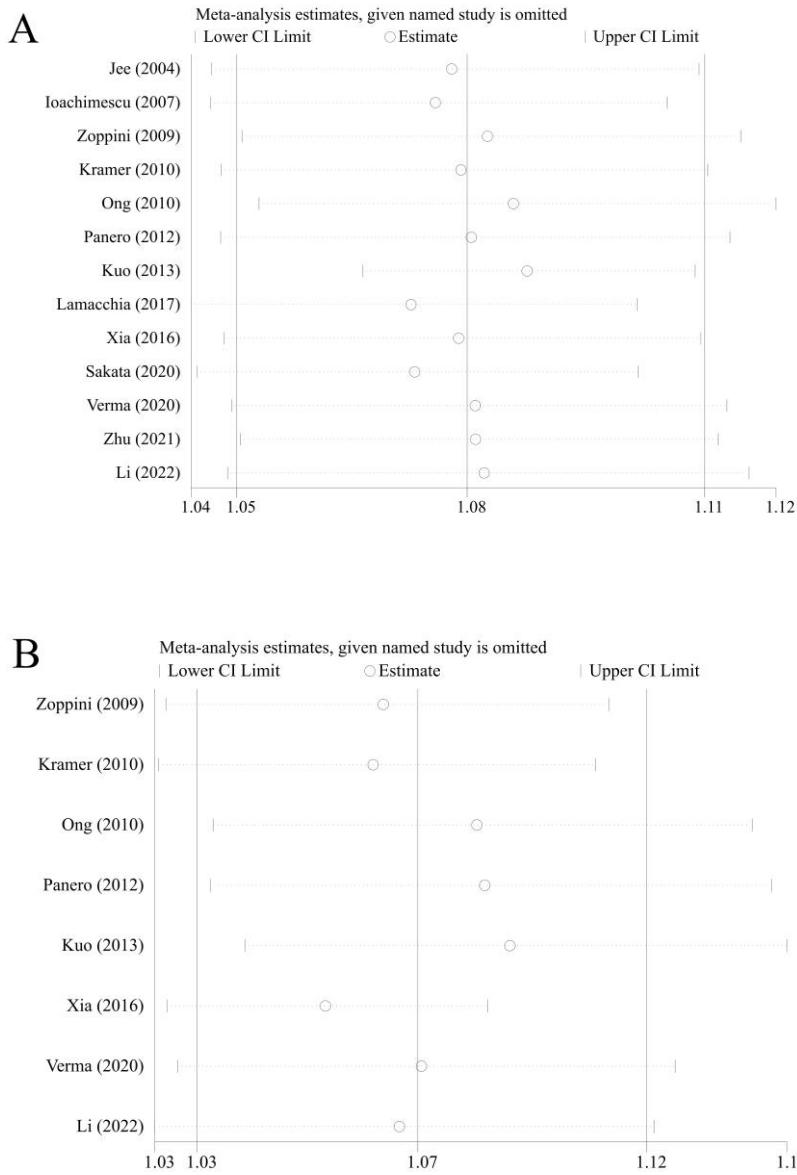
B. The funnel plot of meta-analysis of serum uric acid levels and CVD mortality in patients with diabetes.

Supplementary Figure 7. The egger's plot of meta-analysis of serum uric acid levels and all-cause and CVD mortality in patients with diabetes.



- A. The egger's plot of meta-analysis of serum uric acid levels and all-cause mortality in patients with diabetes, $P=0.002$.
- B. The egger's plot of meta-analysis of serum uric acid levels and CVD mortality in patients with diabetes, $P=0.015$.

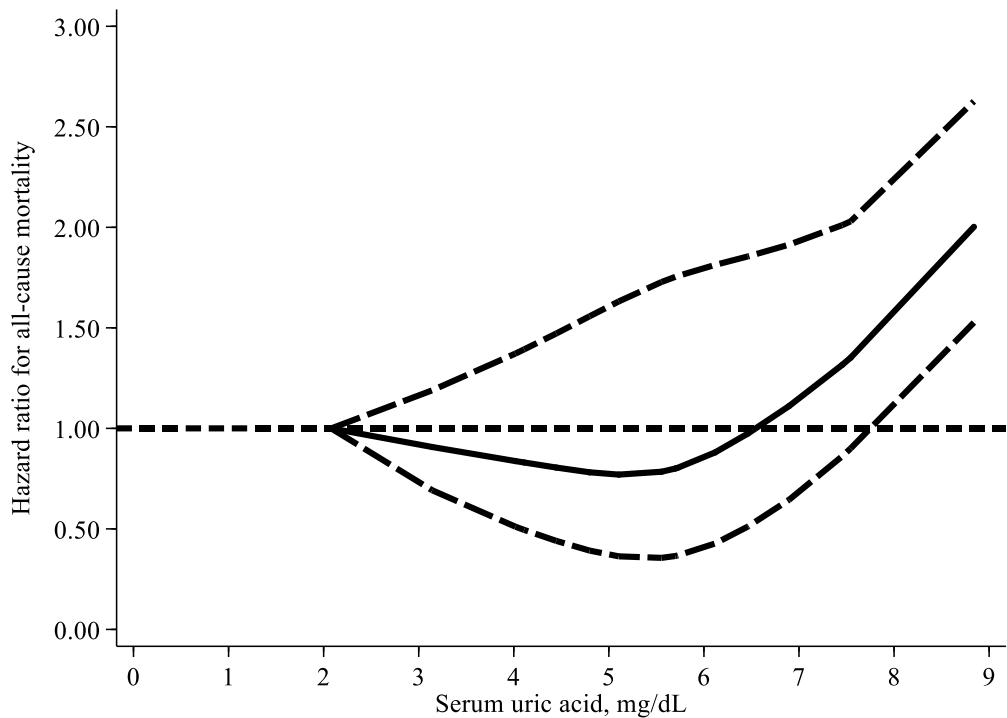
Supplementary Figure 8. Sensitive analysis of meta-analysis of serum uric acid levels and all-cause and CVD mortality in patients with diabetes



A. The dots represent the pooled results of HRs for all-cause mortality using random-effects meta-analysis when only the excluding the left listed study.

B. The dots represent the pooled results of HRs for CVD mortality using random-effects meta-analysis when only the excluding the left listed study.

Supplementary Figure 9. Non-linear dose-response meta-analysis of serum uric acid levels with all-cause mortality in patients with diabetes



The pooled non-linear dose-response analysis of association of serum uric acid levels with all-cause mortality in patients with diabetes based on four cohort studies, P for non-linearity < 0.001 .

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