

# Association between serum uric acid concentrations and grip strength: is there effect modification by age?

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## Background and objectives

Muscle strength is an important predictor of cause-specific and total mortality in middle-aged and older adults.

Decreased muscle strength is associated with an increased risk of obesity, hypertension, insulin resistance and the metabolic syndrome among middle-aged and older adults, and with an increased risk of future cardiovascular disease among adolescents.

Evidence for an association between uric acid (UA) and muscle strength is limited to older adults.

**Objective:** To test the hypothesis that the association between UA and muscle strength differs by age.

## Methods

**Study population:** 3595 participants 20 to 90 years in the US National Health and Nutrition Examination Survey (NHANES) 2011-2012

**Study variables:** **Serum uric acid:** determined by the uricase-peroxidase technique

**Grip strength:** average of the best measure obtained in each hand with a Takei digital grip strength dynamometer

**Statistical analyses:** Linear regression models adjusted for the main confounders.

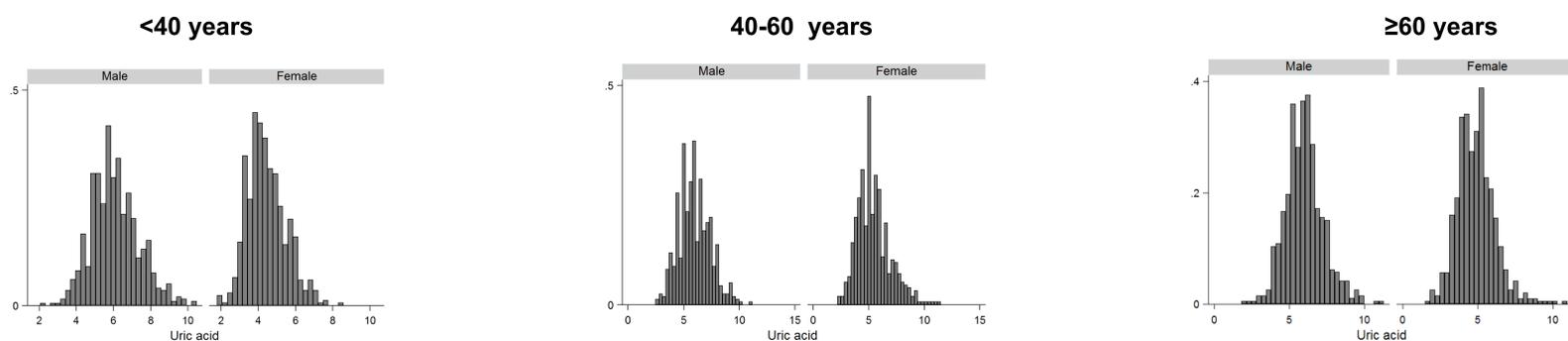
Restricted cubic splines with knots at the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles of UA distribution in each specific age-group

Mediation analysis to evaluate if the studied association could be mediated by testosterone concentrations

Interaction analyses to evaluate if the studied association varied by sex or body mass index (BMI)

## Results

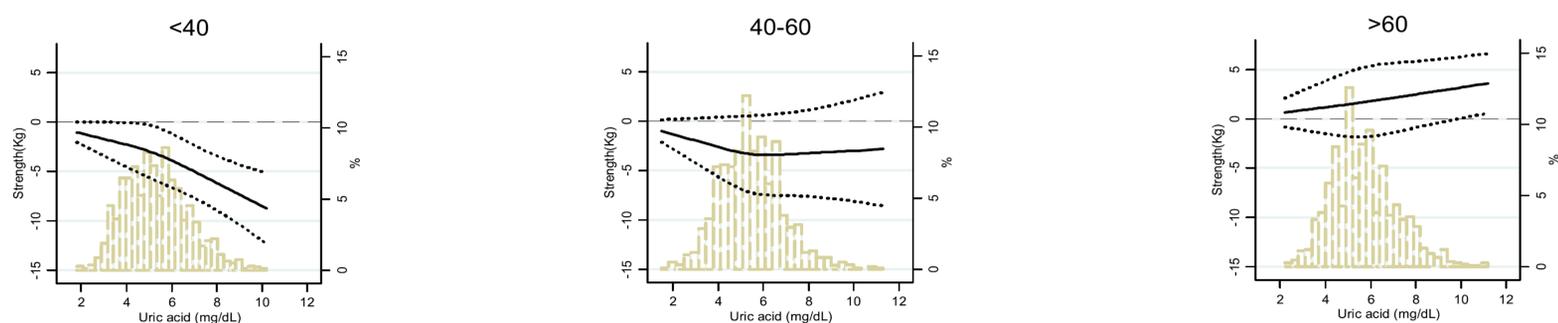
### DISTRIBUTION OF URIC ACID CONCENTRATIONS BY AGE GROUP AND SEX



### BETA COEFFICIENTS (95%CI) FOR GRIP STRENGTH ACCORDING TO INCREASING TERTILES OF UA CONCENTRATIONS

	Age 20-24 (n=1361)				Age 40-60 (n=1180)				Age >60 (n=1054)				p-interaction
	T1*	T2*	T3*	p-trend	T1*	T2*	T3*	p-trend	T1*	T2*	T3*	p-trend	
<b>Model 1</b>	Ref	0.04 (-1.02; 1.09)	-1.45 (-2.49; -0.41)	0.01	Ref	0.62 (-0.69; 1.93)	0.76 (-0.88; 2.41)	0.34	Ref	1.18 (0.06; 2.30)	2.19 (1.21; 3.16)	<0.02	0.02
<b>Model 2</b>	Ref	0.07 (-0.92; 1.07)	-1.50 (-2.50; -0.50)	<0.01	Ref	0.74 (-0.52; 1.99)	0.74 (-0.71; 2.18)	0.29	Ref	1.14 (0.00; 2.28)	2.26 (1.24; 3.28)	<0.01	<0.01
<b>Model 3</b>	Ref	-0.45 (-1.46; 0.57)	-2.36 (-3.27; -1.44)	<0.01	Ref	0.21 (-1.00; 1.42)	-0.45 (-2.10; 1.20)	0.60	Ref	0.58 (-0.50; 1.65)	1.57 (0.63; 2.50)	<0.01	<0.01

**T1:** <5.5 mg/dL men; <4.2 mg/dL women; **T2:** 5.6-6.5 mg/dL men; 4.3-5.2 mg/dL women; **T3:** ≥6.6 mg/dL men; ≥5.3 mg/dL women. **Model 1:** Adjusted for sex and age (continuous). **Model 2:** Further adjusted for educational level, ethnicity and body mass index. **Model 3:** Further adjusted for tobacco smoke exposure, (none, passive, active), alcohol consumption (never, former, current), physical activity (MET-h/wk), time spent watching TV (h/day), total protein intake, diet quality, arm circumference, cardiovascular disease, hypertension, diabetes, cancer, osteo-articular disease, serum albumin, eGFR and albumin-creatinin ratio (continuous)



## Conclusions

Our findings suggest that age modifies the effect of serum UA concentrations on muscle strength. Although we are unaware of the exact mechanisms that can explain these findings, we believe that they should be confirmed in future studies in order to evaluate if uric acid targets for individuals with hyperuricemia should consider patients' age and muscle strength.