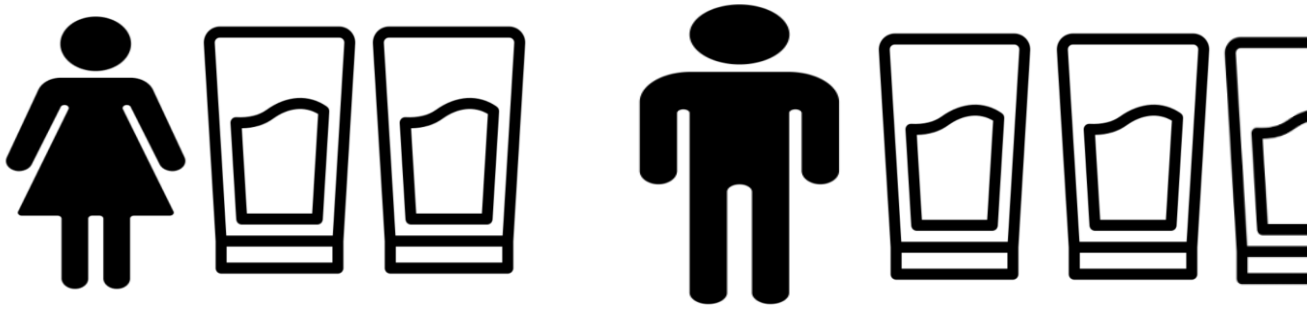
長庚醫療財團法人
Chang Gung Medical Foundation

Effect of Increased Fluid Intake and Kidney Function: A Systematic Review and Dose- Response Meta-analysis

Jia-Jin Chen

Chang Gung Memorial Hospital

European Food Safety Authority: 2 L(F), 2.5L (M)



World Health Organization: 2.2 L (F), 2.9 L (M)

U.S. National Academies of Sciences: 2.7 L (F), 3.7 L (M)

Only about half of the general population meets these target

Ferreira-Pêgo C. Eur J Nutr. 2015 Jun;54 Suppl 2(Suppl 2):35

Increased fluid intake benefit: stone or UTI prevention

Hakam N, JAMA Netw Open. 2024 Nov 4;7(11):e2447621

Conflict Evidence about kidney function preservation

No benefit	Benefit
CKD-WIT pilot (Clark, 2013)	ECIWIC trial (D. Ivanova, 2020)
CKD-WIT trial (Clark, 2018)	RCT, Japan (Nakamura, 2020)
DRINK trial (Damanawi, 2020)	RCT, Austria (Magpantay, 2011)

Different high vs. low fluid intake volume definition

Low intake volume are relative high in RCTs

- CKD-WIT pilot: urine volume 3 L vs. 1.7 L
- DRINK trial: urine volume 3.2 L vs. 1.9 L
- PREDIMED-Plus (prospective): total fluid 3.7 L vs. 2.2 L
- Korea cohort (Lo, 2021): total fluid 3.5 L vs. 1.0 L

CKD-REIN: U-shape relationship observed (Wagner, 2022)

Question 1: Is increased fluid intake associated with kidney function benefit ?

Question 2 : A linear or non-linear relationship with kidney function?

Data-Source

Systematic review of PubMed, Embase, and the Cochrane Library

RCT or observational studies

PROSPERO (CRD42024627796)

Selection & curation

Daily fluid intake or urine volume, and reported association with eGFR change or advanced stage CKD (≥CKD 3)

Primary analysis: combined UOP (+ 0.5 L) and total fluid intake

Analysis Plan

Random effect meta-regression: eGFR decline vs. total fluid intake

Dose-response meta-analysis: prevalence of advanced CKD vs. total fluid intake

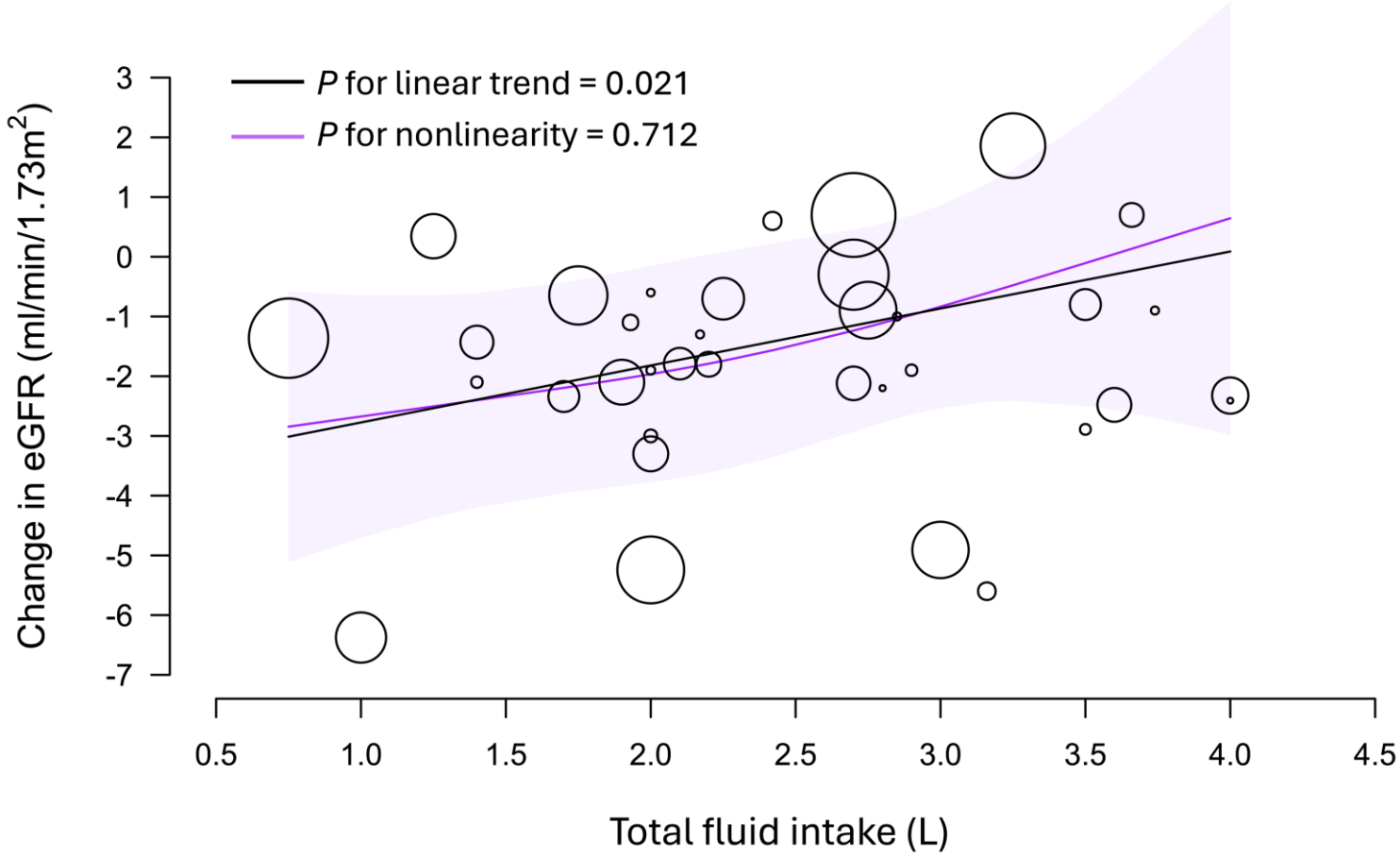
Subgroup & Sensitivity

16 Studies, 70k participants

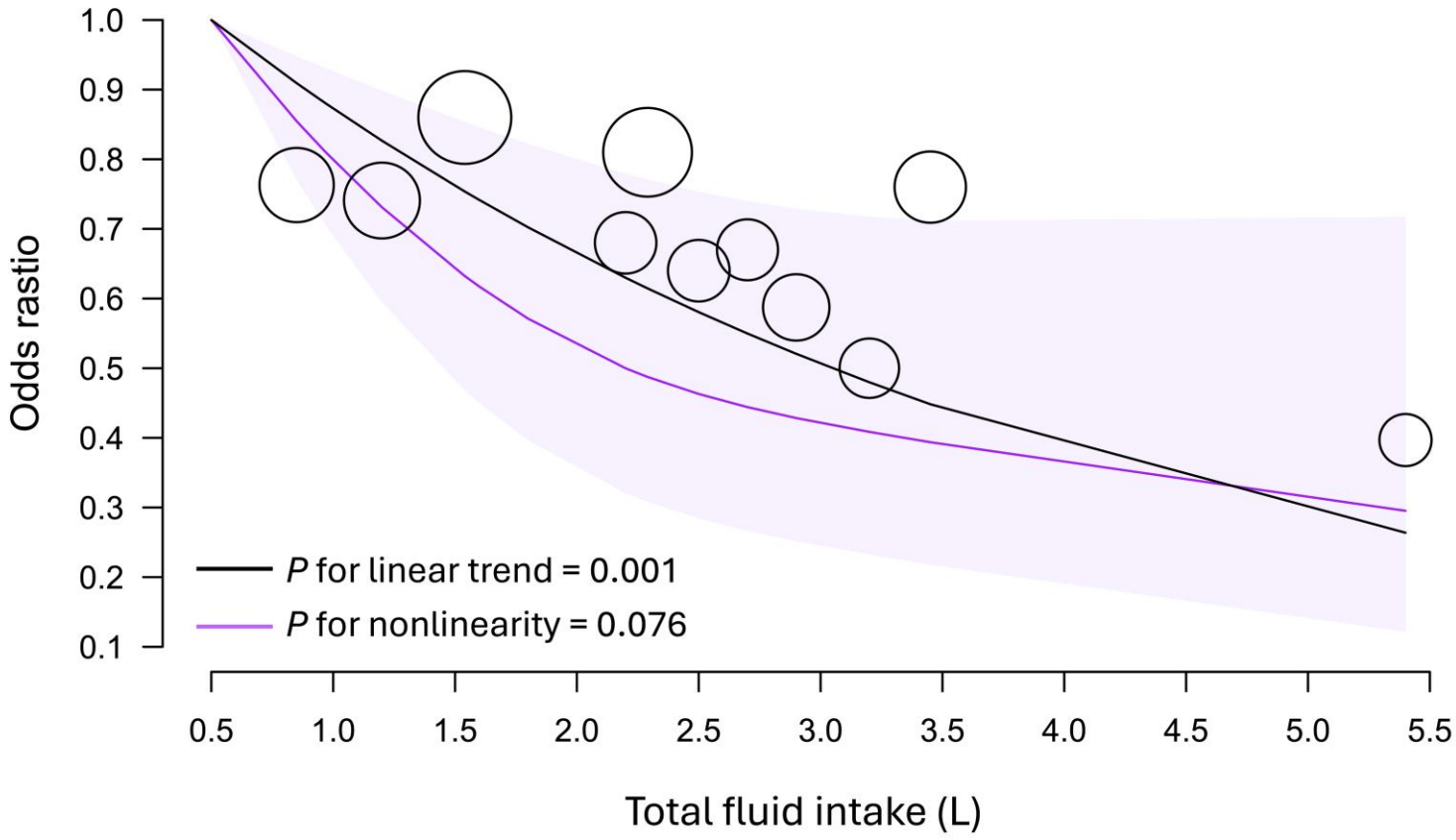
- 7 RCTs, 4 prospective cohorts, 4 cross-sectional studies, and 1 retrospective cohort

- 3 studies focused on patients with ADPKD
- 4 studies included CKD stage 3 to 4

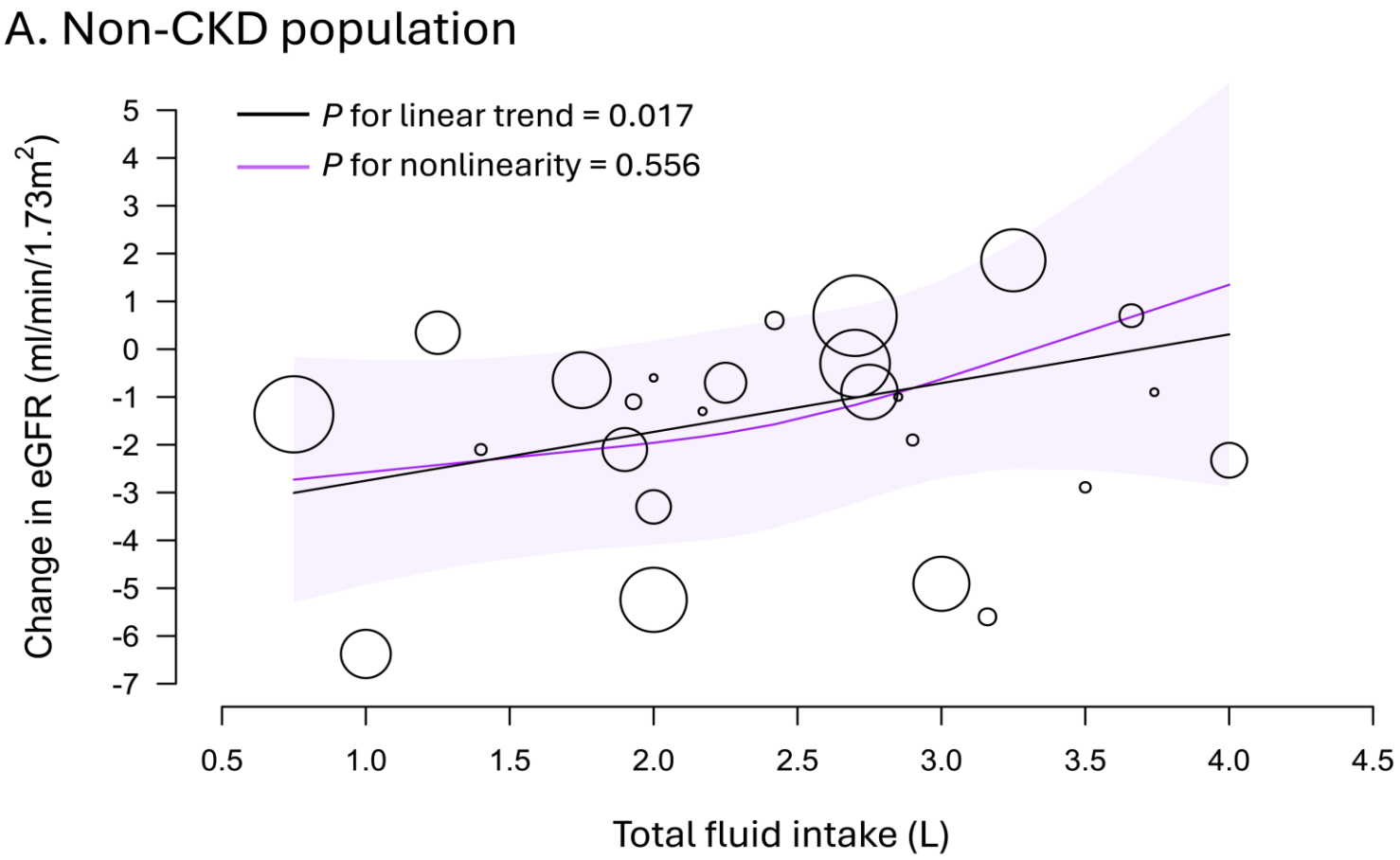
Total daily fluid intake vs. eGFR decline rate



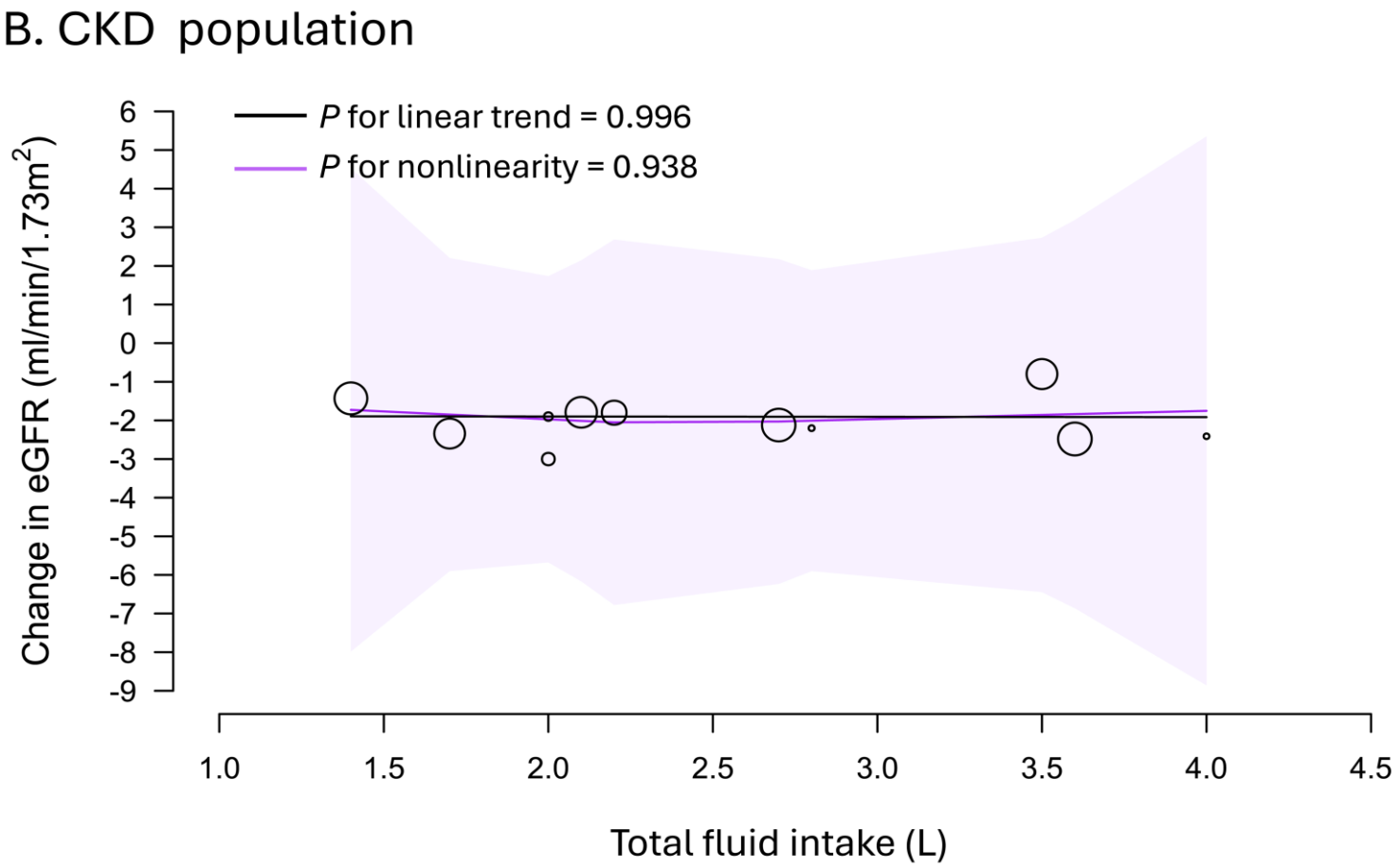
Total daily fluid intake vs. advanced stage CKD



Total daily fluid intake vs. eGFR decline rate (Subgroup: Early CKD)



Total daily fluid intake vs. eGFR decline rate (Subgroup: Late CKD)



Three major result:

1. Total fluid intake vs. eGFR decline: inverse linear
   ~2.5–3 L/day vs. 1 L/day an annual eGFR decline preservation of ~1
2. Total fluid intake vs. advanced CKD risk: inverse linear
   cross-sectional
3. Subgroup analysis for total fluid intake vs. eGFR decline
   early CKD subgroup

Limitation:

1. Most evidence focused on total fluid between 1 L to 3L
2. Source of fluid
3. Special population (heart failure, hyponatremia)
4. Observational studies/cross sectional in nature