

Comment on: Less sodium and more potassium to reduce cardiovascular risk and the PURE study

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We read with interest the commentary by Muiresan *et al.* but are concerned the PURE study was cited to describe the association between dietary sodium and blood pressure (BP).¹ The PURE study used 24-h urine sodium estimated from a fasting morning spot urine sample and the Kawasaki equation, a method which has been shown to have a large systematic and random error in estimating 24-h urine sodium.² Twenty-four-hour sodium estimated from the Kawasaki equation (and other estimating equations) markedly alter the association of sodium to BP relative to measured 24-h. urine sodium and have an association with BP independent of sodium values.² The PURE study has been variably reported as showing that there is no significant association of dietary sodium with BP below 3000 mg/day, and that the association is curvilinear with less impact at lower levels of dietary sodium. Meta-analyses of randomized controlled trials (RCTs) utilizing 24-h. urine sodium samples show a linear graded association with BP at greater than 800 mg sodium/day.³ The association between sodium and BP occurs in infants, children, and the elderly and in those with normal BP and hypertension.³ Those of older age, with hypertension and Black ancestry have greater changes in BP with changes in dietary sodium.³

Spot urine samples with estimating equations have been recommended by major international and national health organizations not to be used to estimate 24-h. urine sodium in individuals especially in association with health outcomes.² The most recent recommendation clearly states 'It is strongly recommended to not conduct, fund, or publish research studies that use spot urine samples with estimating equations to assess individuals' sodium (salt) intake in association with health outcomes'.² The recommendations further state 'Manuscripts reviewing the literature on the health impacts of reducing dietary sodium that include studies that have used spot and short duration timed urine samples with estimating equations to assess individual sodium intake in association with health outcomes need to fully

acknowledge the limitations of this method (i.e. that the method is recommended not to be used and that it is associated with spurious associations).'²

The PURE study provides a good example (case study) that using an inappropriate methodology even with a large sample size can produce spurious results. Randomized controlled trial evidence should be cited to support the association of dietary sodium with BP and cardiovascular disease.³

Author contributions

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References

1. Muiesan ML, Buso G, Agabiti Rosei C. Less sodium and more potassium to reduce cardiovascular risk. *Eur Heart J Suppl* 2023;**25**:B108–Bb110. doi:10.1093/eurheartjsupp/suad084
2. Campbell NRC, Whelton PP, Orias M, Cobb LL, Jones ESW, Garg R, Williams B, Khan N, Chia YC, Jafar TH. It is strongly recommended to not conduct, fund, or publish research studies that use spot urine samples with estimating equations to assess individuals' sodium (salt) intake in association with health outcomes: a policy statement of the world hypertension league, international society of hypertension and resolve to save lives. *J Hypertens* 2023;**41**:683–6865.
3. Campbell NRC, Whelton PK, Orias M, Wainford RD, Cappuccio FP, Ide N, Neal B, Cohn J, Cobb LK, Webster J. 2022 World hypertension league, resolve to save lives and international society of hypertension dietary sodium (salt) global call to action. *J Hum Hypertens* 2023;**37**:428–437. doi:10.1038/s41371-022-00690-0