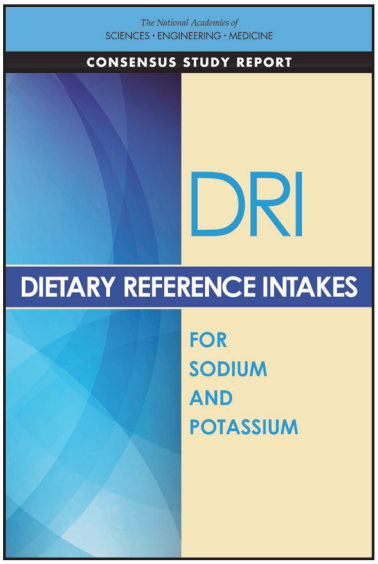
Consensus Study Report
HIGHLIGHTS
March 2019

Dietary Reference Intakes for Sodium and Potassium



Potassium and sodium are interrelated, essential nutrients that play vital roles in the body to maintain physiological homeostasis. Both nutrients have been linked to risk of chronic disease, particularly cardiovascular disease. Additionally, a possible association of sodium intake with other adverse health outcomes has been suggested. The coexistence of essentiality with a relationship to adverse health effects, including chronic disease, called for a new approach to establishing intake recommendations for potassium and sodium within the context of the Dietary Reference Intakes (DRIs).

The DRIs are a set of reference values developed jointly for the United States and Canada by the National Academies of Sciences, Engineering, and Medicine. The DRI model, which was developed in recognition of the need for a safe and adequate range of intakes, had intended that evidence on chronic disease risk be incorporated in the process. However, relationships between nutrient intakes and chronic disease risk, in particular, are often more complex than the relationships observed for adequacy and toxicity effects. Using evidence on chronic disease risk in the DRI model proved to be challenging.

To overcome methodological limitations, guidance for expanding the DRI model to include a new category of values specific to chronic disease risk reduction was provided in the 2017 National Academies report, *Guiding Principles for Developing Dietary Reference Intakes Based on Chronic Disease (the Guiding Principles Report)*.

In this new report, *Dietary Reference Intakes for Sodium and Potassium,* a National Academies committee reviews the current evidence and updates the DRIs for potassium and sodium that were established in 2005. The committee also applies recommendations from *the Guiding Principles Report* for establishing a new category of DRIs based on chronic disease, called the Chronic Disease Risk Reduction Intakes (CDRRs).

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DIETARY REFERENCE INTAKES FOR POTASSIUM

There remains insufficient evidence to establish potassium DRIs for adequacy as Estimated Average Requirements (EARs) and Recommended Dietary Allowances (RDAs). There also remains insufficient evidence to establish potassium DRIs for toxicity as Upper Tolerable Intake Levels (ULs).

In the absence of a specific indicator of potassium adequacy, the potassium Adequate Intakes (AIs) are established using the highest median potassium intake across two nationally representative surveys for each DRI group in children and for adult males and females. The median intakes that informed the potassium AIs for adults are from males and females with normal blood pressure and without a self-reported history of cardiovascular disease. For infants, the AIs are derived from estimates of potassium intakes in breastfed infants.

Despite moderately strong evidence that potassium supplementation reduces blood pressure, particularly among adults with hypertension, a potassium CDRR cannot be established because of unexplained inconsistency in the body of evidence, a lack of intake–response relationship, and limited evidence for relationships between potassium intake and chronic disease endpoints.

As with all AIs, the potassium AIs are the best estimates for an intake level in apparently healthy individuals, rather than estimates of potassium requirements. The lack of a potassium CDRR does not imply a lack of an effect of potassium intake on chronic disease, but rather a lack of evidence to characterize the effect. Similarly, the absence of a UL for potassium does not mean that there is no risk from excessive intake, either overall or for segments of the population. Caution against high intake through supplemental potassium is warranted for certain population groups, particularly those with or at high risk for compromised kidney function.

The potassium DRIs are presented in Table 1 below.

TABLE 1: POTASSIUM DIETARY REFERENCE INTAKES, BY AGE, SEX, AND LIFE-STAGE GROUP

Life-Stage Group	AI (mg/d)	UL	CDRR
Infants			
0–6 months	400	ND[b]	ND[c]
7–12 months	860[a]	ND[b]	ND[c]
Children			
1–3 years	2,000[a]	ND[b]	ND[c]
4–8 years	2,300[a]	ND[b]	ND[c]
Males			
9–13 years	2,500[a]	ND[b]	ND[c]
14–18 years	3,000[a]	ND[b]	ND[c]
19–30 years	3,400[a]	ND[b]	ND[c]
31–50 years	3,400[a]	ND[b]	ND[c]
51-70 years	3,400[a]	ND[b]	ND[c]
>70 years	3,400[a]	ND[b]	ND[c]
Females			
9–13 years	2,300[a]	ND[b]	ND[c]
14–18 years	2,300[a]	ND[b]	ND[c]
19–30 years	2,600[a]	ND[b]	ND[c]
31–50 years	2,600[a]	ND[b]	ND[c]
51–70 years	2,600[a]	ND[b]	ND[c]
>70 years	2,600[a]	ND[b]	ND[c]
Pregnancy			
14–18 years	2,600[a]	ND[b]	ND[c]
19–30 years	2,900[a]	ND[b]	ND[c]
31–50 years	2,900[a]	ND[b]	ND[c]
Lactation			
14–18 years	2,500[a]	ND[b]	ND[c]
19–30 years	2,800[a]	ND[b]	ND[c]
31–50 years	2,800[a]	ND[b]	ND[c]

NOTES: AI = Adequate Intake; CDRR = Chronic Disease Risk Reduction Intake; ND = not determined; UL =Tolerable Upper Intake Level.

[a]Updated DRI value, as compared to the *2005 DRI Report.*
[b]Not determined owing to lack of a toxicological indicator specific to excessive potassium intake.
[c]Not determined owing to insufficient strength of evidence for causality and intake–response.

DIETARY REFERENCE INTAKES FOR SODIUM

There remains insufficient evidence to establish sodium DRIs for adequacy as EARs and RDAs. Furthermore, there is insufficient evidence to establish a toxicological risk level from high sodium intake, separate from chronic disease risk. As such, no sodium UL is established.

In the absence of a specific indicator of sodium adequacy, the sodium AI for adults is based on the lowest levels of sodium intakes evaluated in randomized controlled trials for which there was no evidence of deficiency and also drew on evidence from the best-designed balance study. There is insufficient evidence from observational studies that there are harmful effects from low sodium intake. The sodium AIs for children are extrapolated from the adult values based on Estimated Energy Requirements. For infants, the AIs are derived from estimates of sodium intakes in breastfed infants.

There is sufficient evidence to characterize the relationship between sodium intake and risk of chronic disease. The CDRR is established using evidence of the beneficial effect of reducing sodium intake on cardiovascular disease risk, hypertension risk, systolic blood pressure, and diastolic blood pressure. Reduction of sodium intakes above the sodium CDRR is expected to reduce chronic disease risk within the apparently healthy population.

Most U.S. and Canadian population groups consume sodium above both the AI and CDRR levels. There is no concern of sodium inadequacy in the population. Intakes above the CDRR increase the risk of chronic disease in the population. Reducing sodium intake has a greater effect on adults with hypertension than on adults with normal blood pressure, but the benefits of reducing sodium intake toward the sodium CDRR apply to both groups. There is evidence that reducing sodium intake below the CDRR can lower systolic and diastolic blood pressure, but the effect on chronic disease risk cannot be characterized at this time.

The sodium DRIs are presented in Table 2 below.

TABLE 2: SODIUM DIETARY REFERENCE INTAKES, BY AGE, SEX, AND LIFE-STAGE GROUP

Life-Stage Group	AI (mg/d)	UL	CDRR
Infants			
0–6 months	110[a]	ND[b]	ND[c]
7–12 months	370	ND[b]	ND[c]
Children			
1–3 years	800[a]	ND[b]	Reduce intakes if above 1,200 mg/day[d]
4–8 years	1,000[a]	ND[b]	Reduce intakes if above 1,500 mg/day[d]
Males			
9–13 years	1,200[a]	ND[b]	Reduce intakes if above 1,800 mg/day[d]
14–18 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day[d]
19–30 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
31–50 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
51–70 years	1,500[a]	ND[b]	Reduce intakes if above 2,300 mg/day
>70 years	1,500[a]	ND[b]	Reduce intakes if above 2,300 mg/day
Females			
9–13 years	1,200[a]	ND[b]	Reduce intakes if above 1,800 mg/day[d]
14–18 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day[d]
19–30 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
31–50 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
51–70 years	1,500[a]	ND[b]	Reduce intakes if above 2,300 mg/day
>70 years	1,500[a]	ND[b]	Reduce intakes if above 2,300 mg/day
Pregnancy			
14–18 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day[d]
19–30 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
31–50 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
Lactation			
14–18 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day[d]
19–30 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day
31–50 years	1,500	ND[b]	Reduce intakes if above 2,300 mg/day

NOTES: AI = Adequate Intake; CDRR = Chronic Disease Risk Reduction Intake; ND = not determined; UL =Tolerable Upper Intake Level.

[a]Updated DRI value, as compared to the *2005 DRI Report*.
[b]Not determined owing to lack of a toxicological indicator specific to excessive sodium intake.
[c]Not determined owing to insufficient strength of evidence for causality and intake–response.
[d]Extrapolated from the adult CDRR based on sedentary Estimated Energy Requirements.

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FUTURE DIRECTIONS

The committee identifies a number of research needs that will help inform future potassium and sodium DRIs. For example, methods for assessing potassium and sodium intake need to be strengthened to improve accuracy. Additional research is needed to identify requirements for both nutrients and to better characterize negative health effects from high intake levels. Future trials that assess the long-term effects of different doses and forms of potassium are needed to characterize the intake–response relationship with blood pressure and chronic disease outcomes. Research providing additional insight into population groups with differing responses to sodium intake would benefit future updates to the sodium CDRR. Furthermore, additional research is needed on the interrelationship between potassium and sodium intakes. With the vast majority of U.S. and Canadian populations consuming sodium at levels above the CDRR, opportunities exist to find novel solutions to reduce population sodium intakes. Finally, as experience is gained with using the expanded DRI model, there will likely be continued enhancement of the process and a need for additional guidance on the proper applications of the reference values.

To read the full report, please visit
nationalacademies.org/DRISodiumPotassium

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