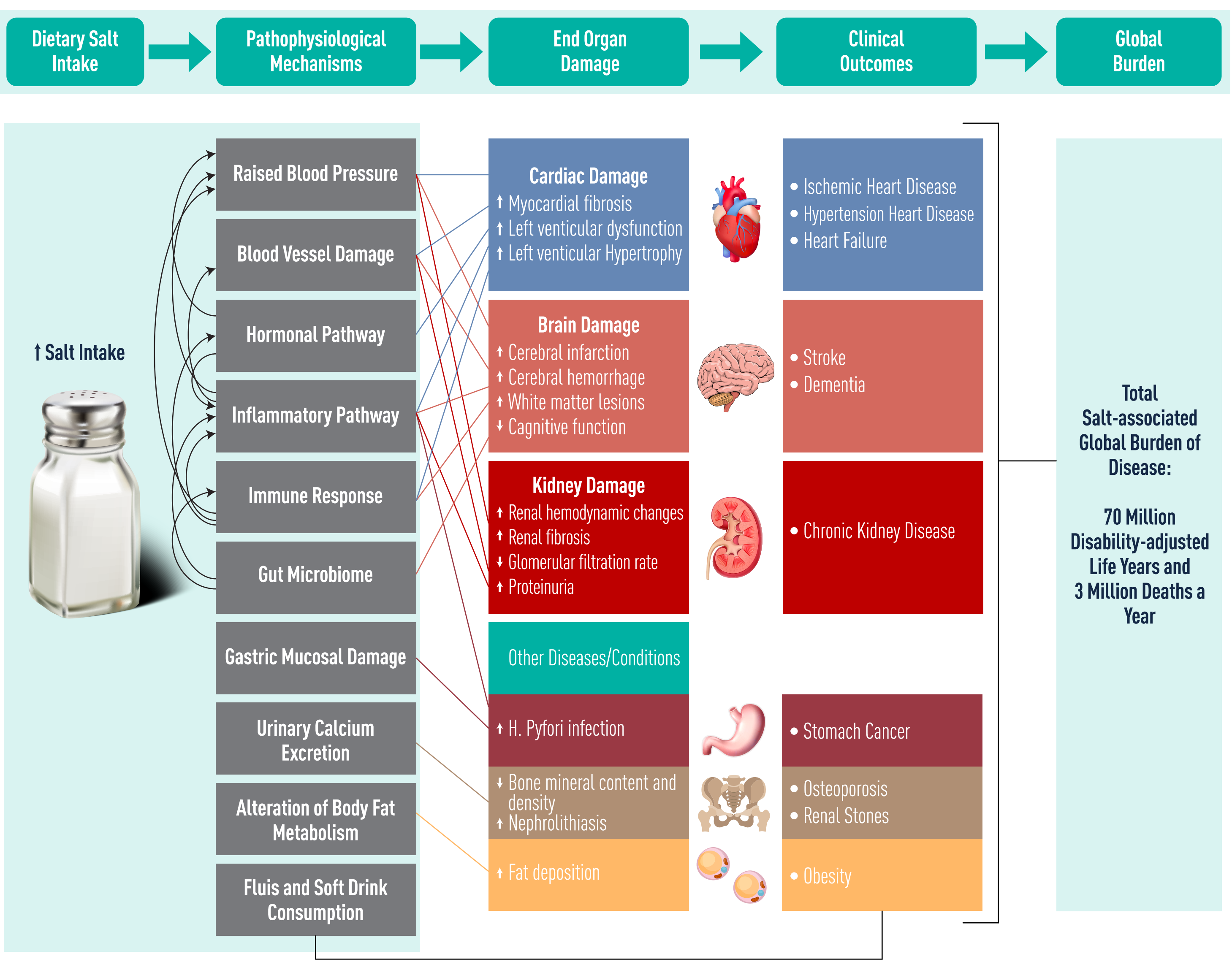
CMHC Cardiometabolic Health Congress

LINK BETWEEN SODIUM AND CARDIOVASCULAR EVENTS

SODIUM INTAKE RECOMMENDATIONS

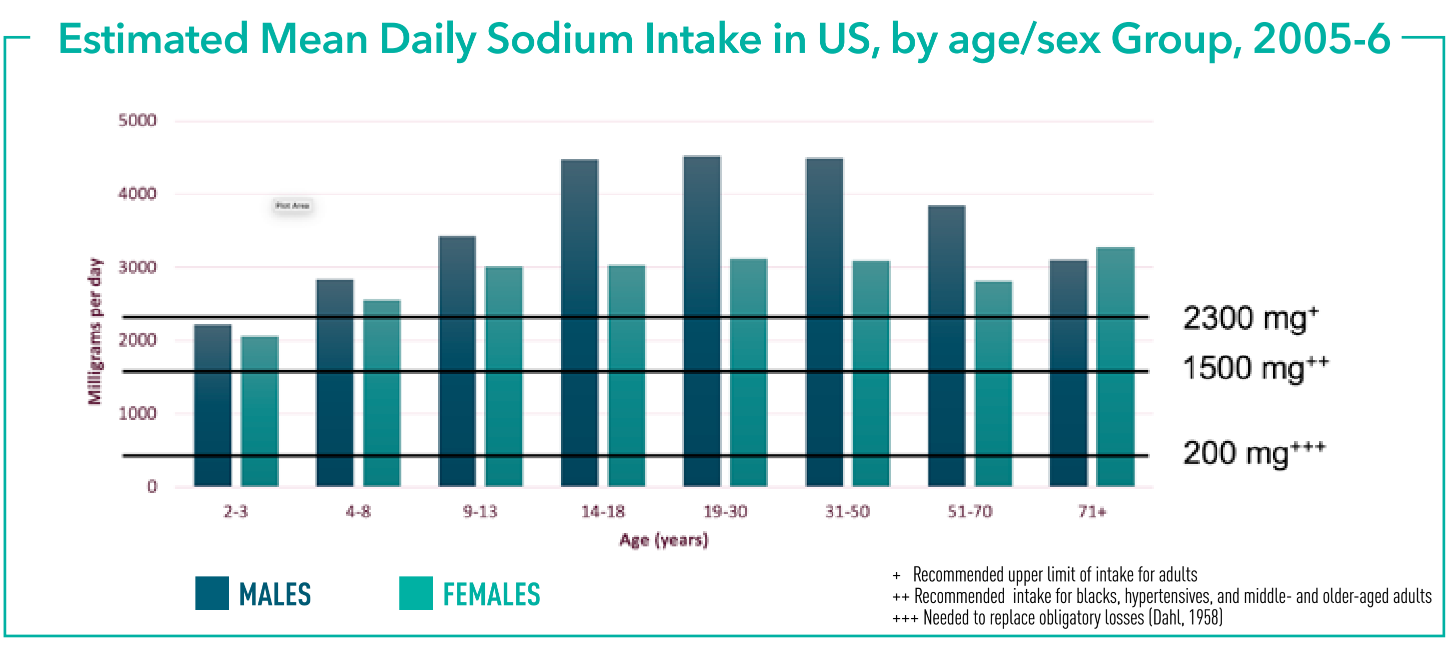
Central Illustration: Salt and Health



He, F.J. et al. J Am Coll Cardiol. 2020;75(6):632-47.

SLEEP, SODIUM, AND CVD

Estimated Mean Daily Sodium Intake in US, by age/sex Group, 2005-6



\+ Recommended upper limit of intake for adults
++ Recommended intake for blacks, hypertensives, and middle- and older-aged adults
+++ Needed to replace obligatory losses (Dahl, 1958)

SLEEP, SODIUM, AND CVD

ADVERSE EFFECTS OF EXCESS SODIUM INTAKE

ESTABLISHED RELATIONSHIP
Increased blood pressure
↓
CVD and Stroke

PROBABLE RELATIONSHIP
Gastric cancer
Increased protein excretion, CKD progression
Headaches

SUGGESTIVE RELATIONSHIP
Increased risk of osteoporosis
Increased left ventricular mass

HYPOTHESIZED RELATIONSHIP
Overweight obesity

HOW DOES SALT CAUSE HYPERTENSION

Increased salt intake is associated with sustained increases in plasma and blood volume

Increased salt intake may be accompanied by reduced ability of the kidney to excrete sodium

When the capacity of the kidneys to maintain Na+ balance and extracellular fluid volume within the appropriate range is compromised, increases in arterial pressure become necessary to re-establish normal balance **– Pressure Natriuresis**

SALT SENSITIVITY

Some people can effectively excrete high dietary salt intake without an increase in arterial BP, and other people (salt sensitive) cannot excrete sodium effectively without an increase in arterial BP.

This is a heterogeneous characteristic with a familial component

Factors associated with heightened salt sensitivity (increased BP with sodium intake) include women, African Americans, post menopause and increased age

73% of black hypertensives are salt sensitive versus 56% of white hypertensives

SLEEP, SODIUM, AND CVD

SALT SENSITIVE HYPERTENSION

In response to a high salt diet, cardiac output increases. Salt resistant subjects respond with reciprocal decreases in systemic vascular resistance, while salt sensitive subjects have a paradoxical increase in vascular resistance associated with increased BP.

Salt sensitive hypertension is defined as an increase in blood pressure associated with increased salt intake.

End organ structure and function damaged by salt may be the basis for the increased mortality among normotensive individuals with salt.

Approximately 50% of humans with hypertension have salt sensitivity with this number varying between sexes and influenced by age and race.

Among normotensives, approximately 26% are salt sensitive which has led to increased mortality - increased salt intake has effects apart from blood pressure and volume expansion that may contribute to tissue injury.

SLEEP, SODIUM, AND CVD

DIETARY SOURCES OF SODIUM - US

In US, Most Sodium(>70%) Comes from Processed and Restaurant Food

- 71% Processed and Restaurant Foods
- 14% Naturally Ocurring
- 5% At the Table
- 6% Home Cooking
- 4% Others

Harnack LJ, et al. Sources of Sodium in US Adults from 3 Geographic Regions. Circulation. 2017;135:1775-1783.

Sources of Sodium Among the US Population, 2005-6

- Yeast breads, 7.3%
- Chicken and chicken mixed dishes, 6.8%
- Pizza, 6.3%
- Pasta and pasta dishes, 5.1%
- Cold cuts, 4.5%
- Condiments, 4.4%
- Mexican mixed dishes, 4.1%
- Sausage, franks, bacon, and ribs, 4.1%
- Regular cheese, 3.5%
- Grain-based desserts, 3.4%
- Soups, 3.3%
- Beef and beef mixed dishes, 3.3%,
- Rice and rice mixed dishes, 2.6%
- Eggs and egg mixed dishes, 2.6%
- Burgers, 2.4%
- Salad dressing, 2.4%
- Ready-to-eat cereals, 2.0%
- Potato/corn/other chips, 1.8%
- Pork and pork mixed dishes, 1.8%
- Quickbreads, 1.7%
- Other white potatoes, 1.6%
- Other fish and fish mixed dishes, 1.5%
- Reduced fat milk, 1.3%
- Crackers, 1.3%
- Pancakes/waffles/ French toast, 1.1%
- Whole milk, 0.7%

National Cancer Institute website http://riskfactor.cancer.gov/diet/foodsources/sodium/.

SODIUM LOADING VIA DRUGS

Sodium-containing medications were associated with significantly increased odds of adverse cardiovascular events (George et al, 2013)

4 weeks after d/c effervescent paracetamol (1700 mg sodium), SBP was lower by 13 mmHg and DBP by 2.5 mmHg (Ubeda et al, 2009)

Sodium intake reduction of 1200mg/day is projected to reduce MI by 12%, stroke by 8%, and all-cause mortality by 4% (Bibbins-Domingo et al, 2010)

George J et al. BMJ. 2013;317:f6954. Ubeda A et al. Pharmacoepidemiol Drug Saf. 2009;18:417-9. Bibbins-Domingo K et al. N Engl J Med. 2010;362:590-99.

SODIUM LOADING

2300 mg/day increase in sodium excretion was associated with a 3.1–to 6.0–mmHg increase in SBP (INTERSALT Study, Elliott et al, 1996)

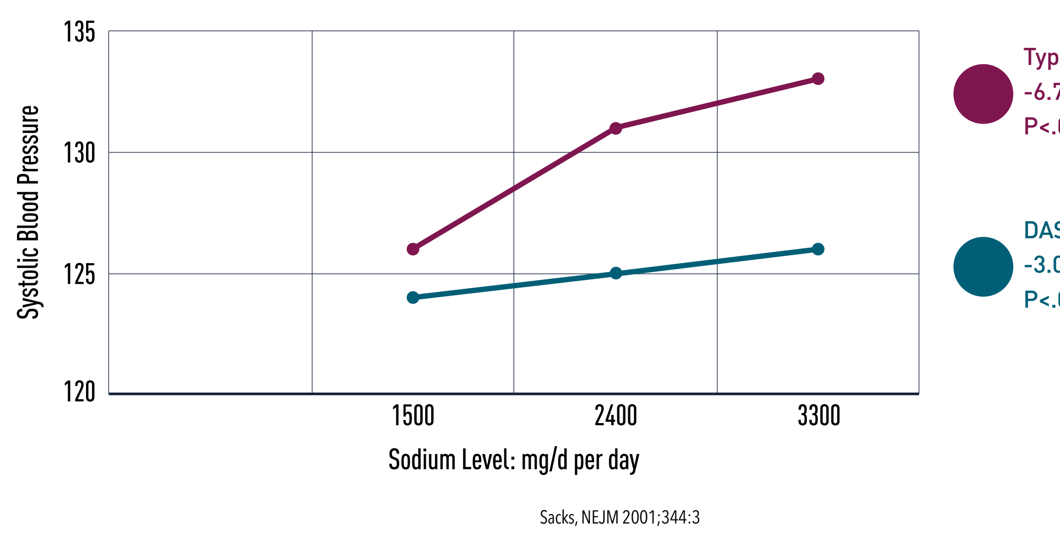
24-h SBP increased by 3.6 mm Hg with 3 weeks of effervescent paracetamol (1600 mg sodium/day) (Benitez-Camps et al, 2018)

Salt loading may blunt nocturnal BP decline (Higashi et al, 1997)

Elliott P et al. BMJ. 1996;312:1249-53.;
Benitez-Camps M et al. J Hypertens. 2018;36:1656-62.
Higashi Y et al. Hypertension.1997;30:163-67.

SLEEP, SODIUM, AND CVD

AS SODIUM INTAKE IS REDUCED, SO IS BLOOD PRESSURE

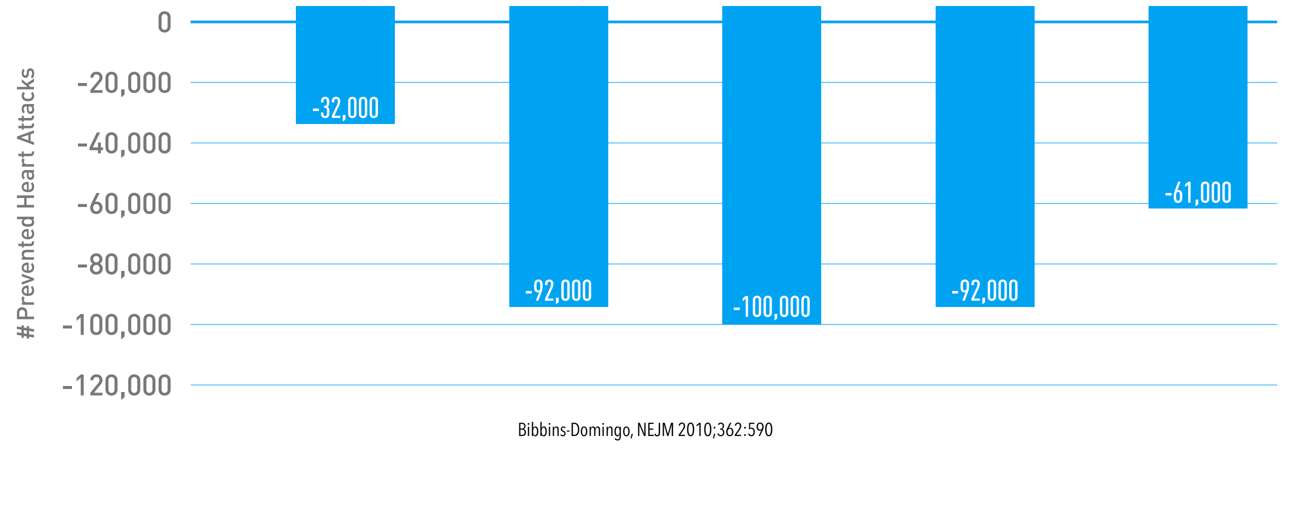


DASH-SODIUM

Sacks, NEJM 2001;344:3

SLEEP, SODIUM, AND CVD

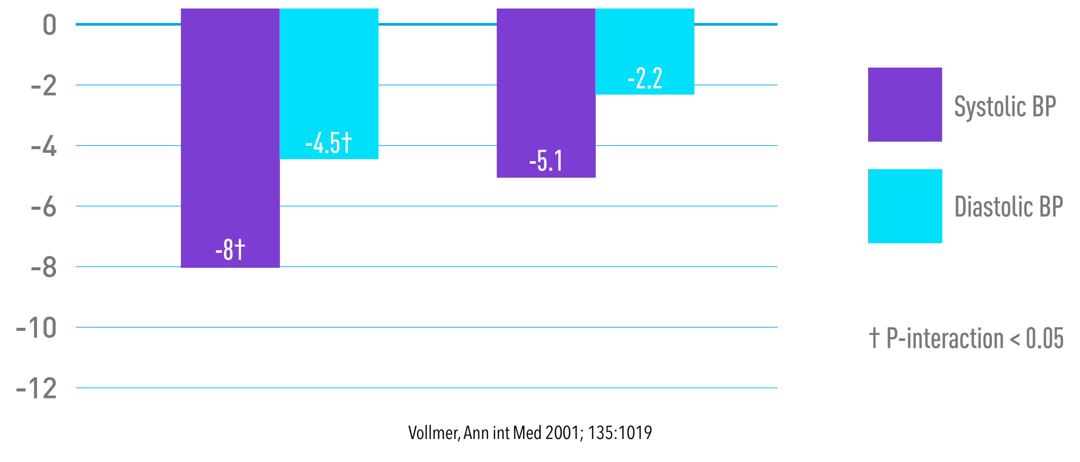
ESTIMATED ANNUAL NUMBER OF PREVENTED HEART ATTACKS FROM POPULATION-WIDE SODIUM REDUCTION



Bibbins-Domingo, NEJM 2010;362:590

REDUCED SODIUM INTAKE HAS GREATER BP EFFECTS IN AFRICAN-AMERICANS

DASH-SODIUM



† P-interaction < 0.05

Vollmer, Ann int Med 2001; 135:1019

LINK BETWEEN SODIUM AND CARDIOVASCULAR EVENTS

www.cardiometabolichealth.org