



**Pan American  
Health  
Organization**



Regional Office of the  
World Health Organization

*Mobilizing for Dietary Salt Reduction Policies and Strategies in the Americas:  
Expert & Country Consultation*

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# Dietary Sodium and the Health of Canadians

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# Dietary Sodium and Health

- Hypertension
- Direct (non- BP-related\*) vascular and cardiac damage
- Obesity and related diseases (e.g. diabetes)
- Asthma
- Kidney stones
- Osteoporosis
- Gastric Cancer

BP = blood-pressure

# Sodium and Obesity

- High dietary sodium increases thirst and fluid consumption.
- Many of the fluids consumed contain simple sugars or alcohol and contribute to caloric intake.
- He & MacGregor have estimated that high sodium diets contribute to about 20–30% of the excess calories consumed by children and adolescents through increased beverage consumption.
- Therefore, high-sodium diets are likely to be a significant factor in the obesity epidemic.

# Sodium and Asthma

- The biological mechanisms for regulating smooth muscle tone in the airways is similar to that of the blood vessels.
- Concerns have been raised that high sodium diets contribute to airways reactivity in asthma.
- Several small randomized controlled trials of different levels of dietary sodium on asthma severity have been conducted.
- A meta-analysis examining the severity of asthma with high sodium in the diet found a tendency for more airways obstruction that was not statistically significant and did not have adequate statistical power to exclude significant harm.
- The safety of high dietary sodium in persons with asthma has not been established.

# Sodium, Kidney Stones, and Osteoporosis

- Dietary sodium affects renal calcium excretion.
- High dietary sodium increases urinary calcium excretion; hence, intravenous saline is the primary therapy for rapid reduction of high blood calcium levels.
- Reducing urinary calcium excretion through reduced dietary sodium is one of the primary mechanisms of preventing urinary calcium stones.
- High urinary calcium excretion associated with high dietary sodium has been suggested to be a cause of osteoporosis.
- There is inadequate data to exclude high dietary sodium as a significant cause of osteoporosis.

*N Engl J Med* 2002 Jan 10;346:77-84

*Current Opinions in Rheumatol* 1998;10:368-372

# Sodium and Gastric Cancer

- High dietary sodium is associated with an increased rate of gastric cancer in a dose-related fashion.
- High dietary sodium is associated with diets that have increased carcinogens (nitrates).
- High dietary sodium enhances the initiation and promotion of cancer in animals exposed to carcinogens.
- There is inadequate evidence to exclude high dietary sodium contributing to gastric cancer in humans.

Panel on Dietary Reference Intakes for Electrolytes and Water, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes. *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride and Sulfate*. Washington, D.C.: National Academies Press, 2004:1-640.

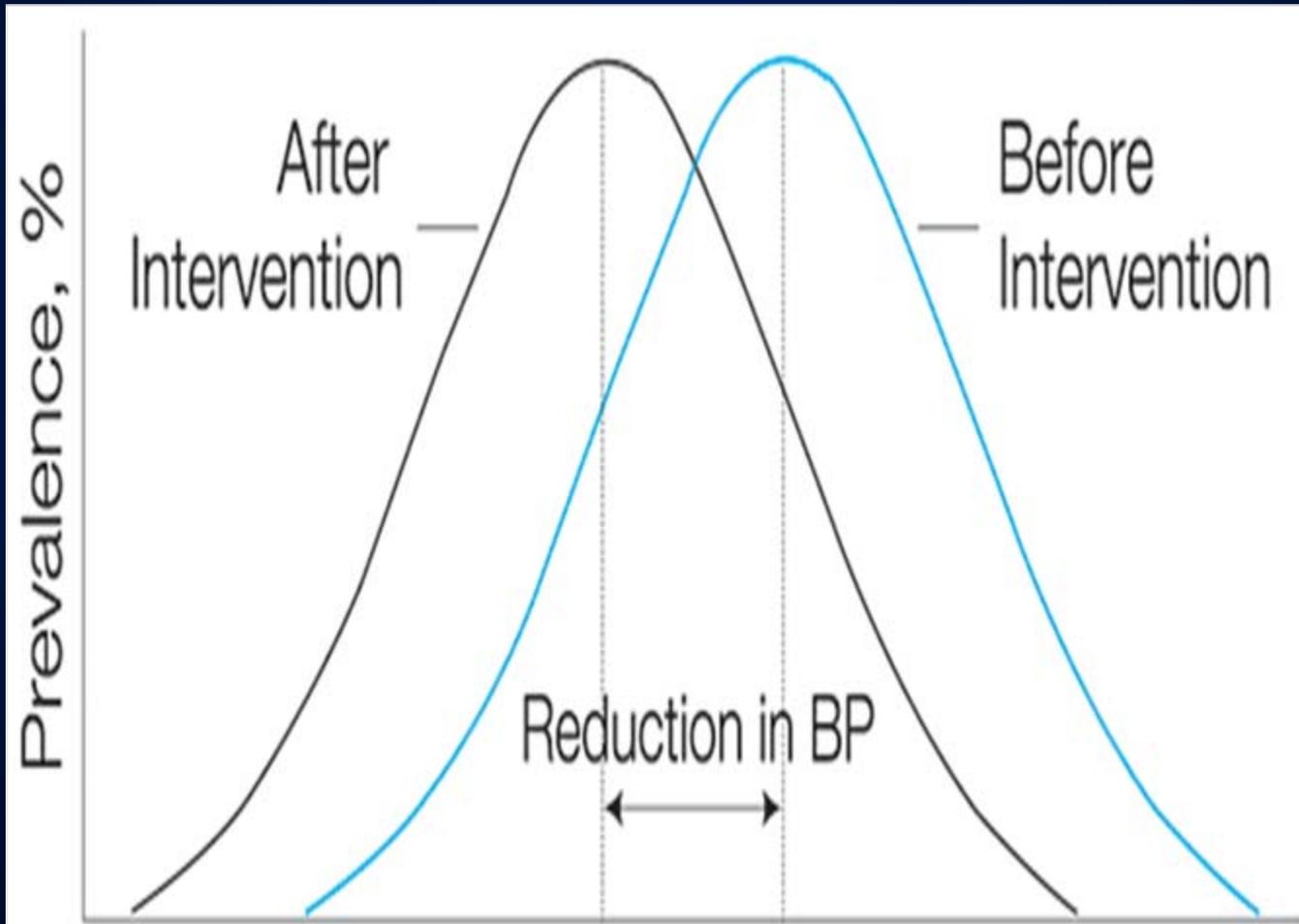


# Sodium and Hypertension

# Dietary Sodium in Canada

- We conducted a study to estimate the effects of the current levels of dietary sodium on the blood pressures of Canadians and the associated healthcare costs of hypertension in Canada.
- Current Canadian intake was estimated to be 3500 mg sodium per day (3,100 mg from processed food + 400 mg from sodium added at the table and in cooking).
- The estimated impact on hypertension of reducing sodium in the diet by 1,860 mg per day—from 3,500 mg per day to 1,640 mg per day—was calculated.

# Before and After the Sodium Reduction



# Dietary Sodium in Canada

- Blood pressure reduction was used from the Cochrane meta-analysis.
- Blood pressure distribution and hypertension prevalence and control rates were from the Canadian Community Health Survey (1985–1992); and medication use, from the Canadian Community Health Survey (2003). Physicians' visits and drug costs were obtained from IMS Canada; and costs of laboratory tests and physicians' visits, from Ontario databases.
- The impact of antihypertensive therapy on blood pressure was obtained from a meta analysis of antihypertensive therapy (BMJ 2003;326:1427-34).

# Sodium 2006: Meta-Analyses

## The Cochrane Library 2006;3:1-41

### Key Features

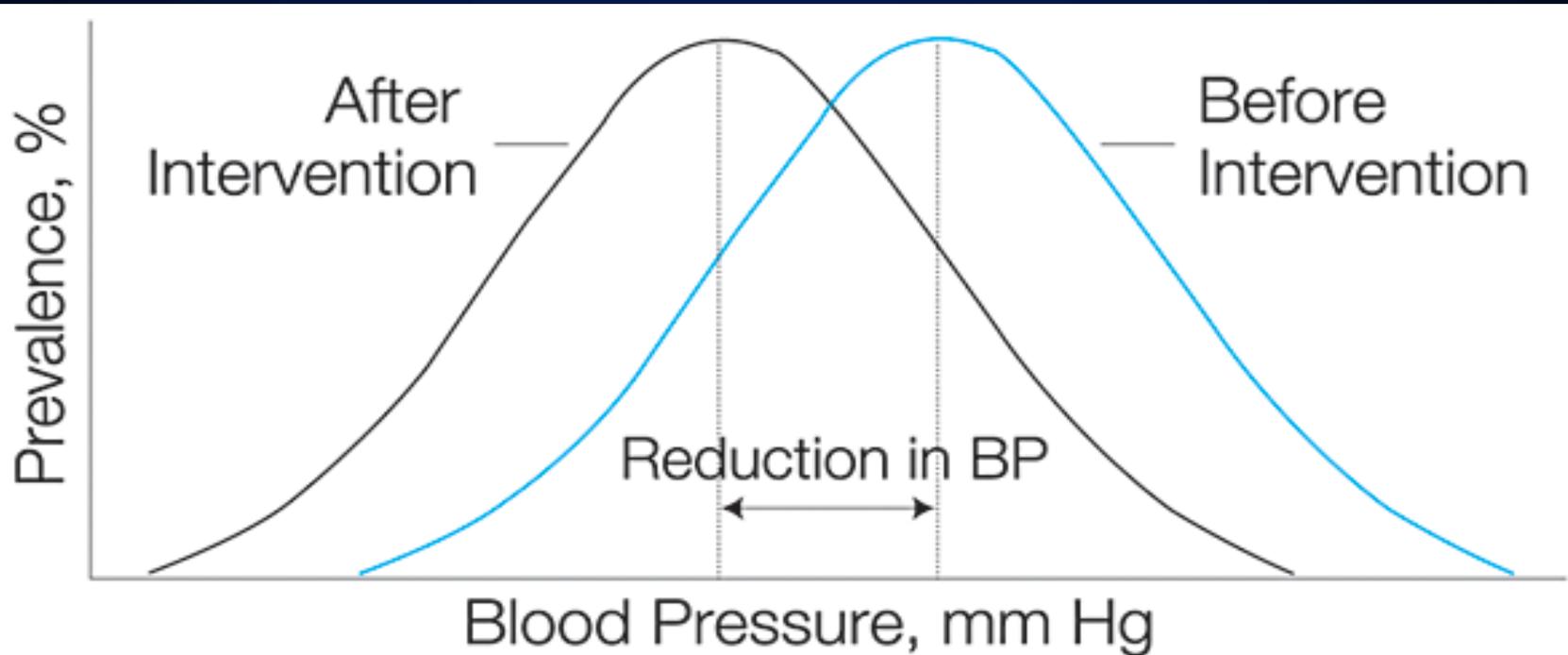
- Random allocation; >920 mg/day reduction in sodium; >4 weeks duration; isolated intervention.
- Hypertensive Median age 50 (range 24-73)  
Reduction of BP 5.1 (5.8 – 4.3) / 2.7 (3.2-2.2) mmHg;  
Reduction of 1800 mg sodium/day.
- Normotensive median age 47 (range 22-67)  
Reduction of BP 2.0 (2.6 – 1.5) / 1.0 (1.4-0.6) mmHg;  
Reduction of sodium 1700 mg/day.
- Reduction in BP from a single medication 9.1/5.5 mmHg;  
Reduction in BP from 2 antihypertensive medications  
11.3/6.7 mmHg (BMJ 2003;326:1427-34).

# Estimated Effects on Prevalence of Hypertension and Its Related Costs If Dietary Sodium Were Reduced in Canada

- Reduction in average dietary sodium from about 3,500 mg to 1,700 mg.
- 30% reduction in the number of Canadians with hypertension (a million fewer hypertensive Canadians).
- Almost double the treatment and control rate
- Hypertension care cost savings of \$430 to \$538 million per year.

**Estimate the Effects of Reduced Blood Pressure from Reduced Dietary Sodium on Cardiovascular Events in Canada**

# Effect of 'Small' Reductions in Systolic Blood Pressure on Cardiovascular and Total Deaths

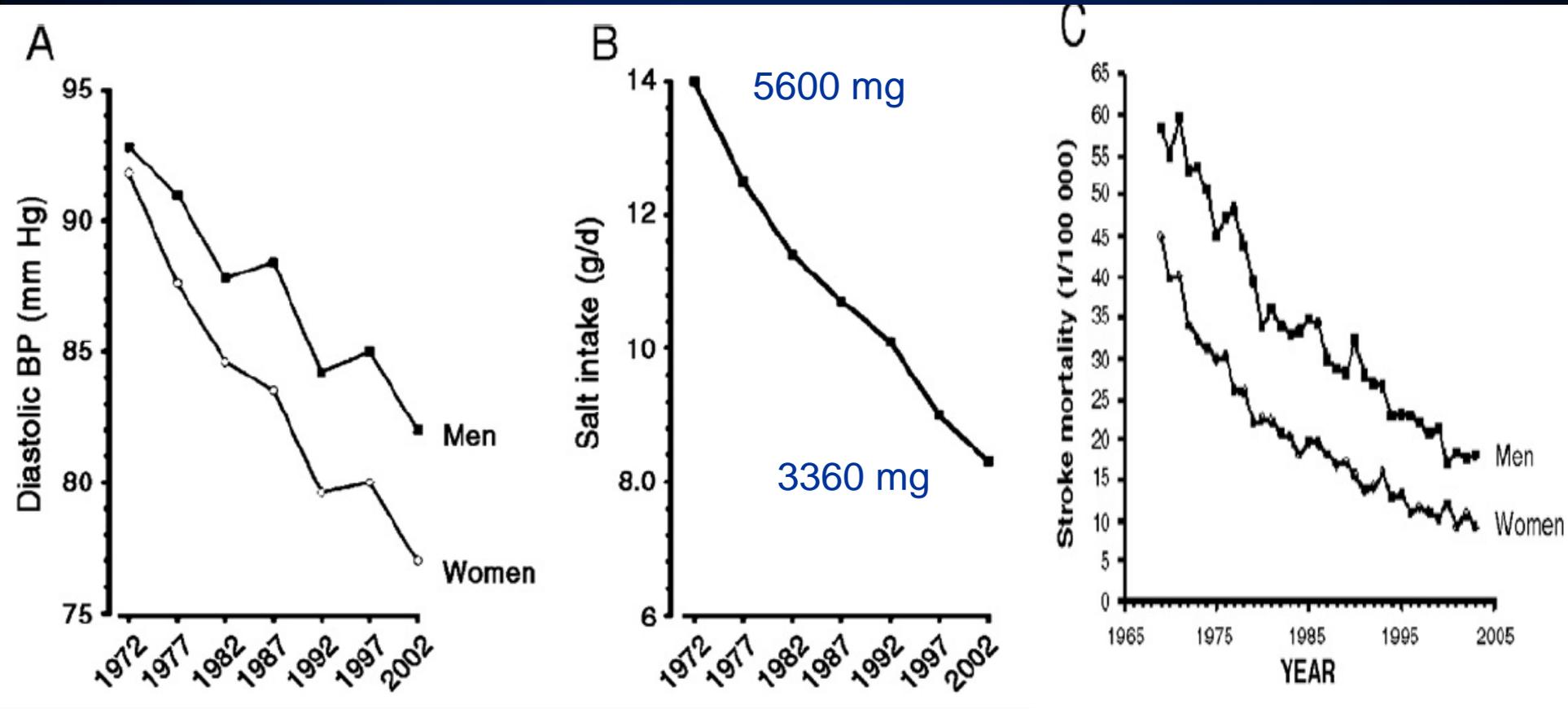


Reduction in BP, mm Hg	% Reduction in Mortality		
	Stroke	CHD	Total
2	-6	-4	-3
3	-8	-5	-4
5	-14	-9	-7

# Sodium and Outcomes

- Long-term follow-up of patients in TOPH I and II trials who had been randomized to low-sodium diets.
- 25–30% lower risk of cardiovascular events in those who had been in the low- sodium groups.
- 759–1,012 mg per day reduction in dietary sodium during intervention.

# Changes in BP, Sodium, and Stroke in Finland



From Karppanen H et al., *Progress in Cardiovascular Disease* 2006;49:59-75

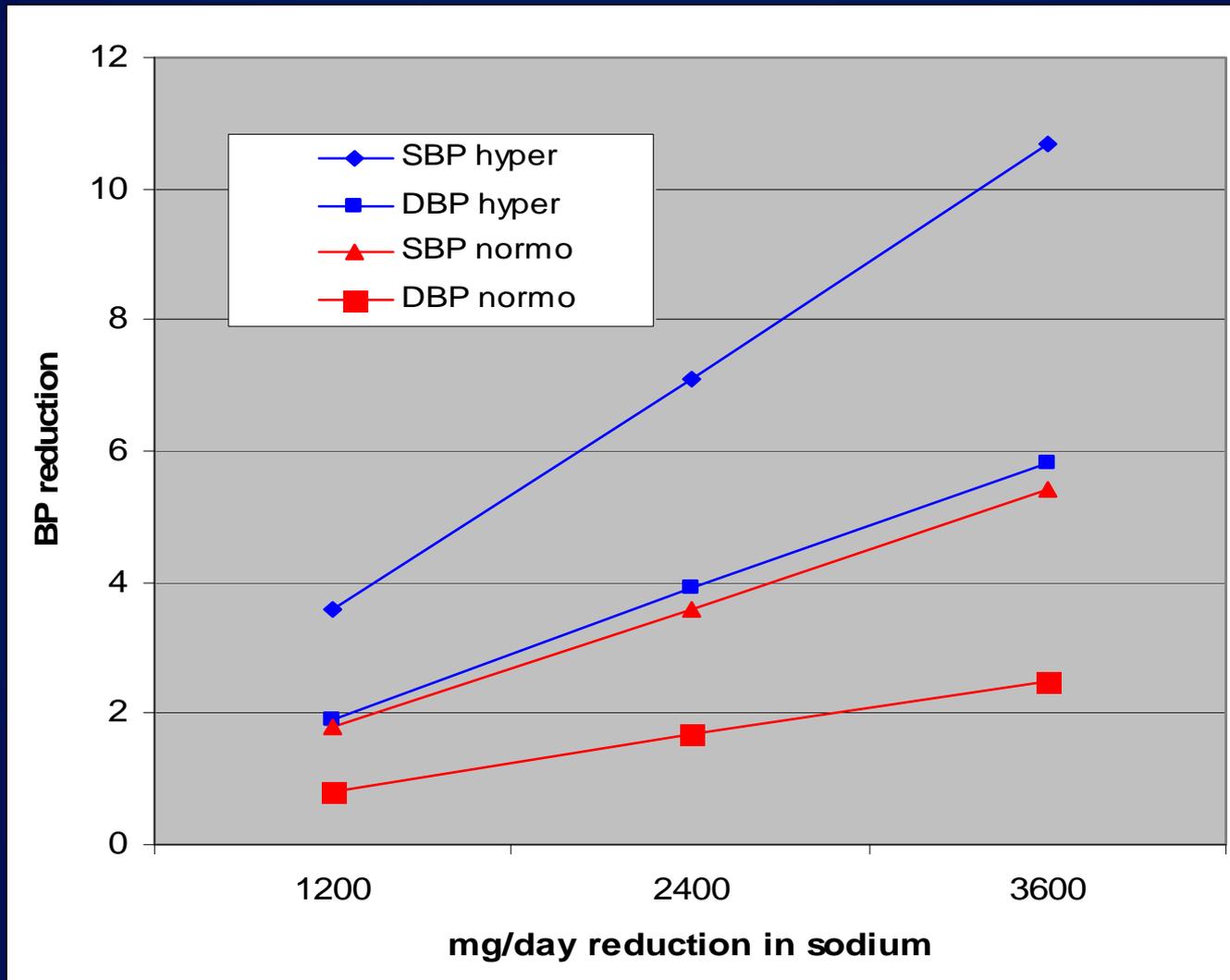
# Reduced Dietary Sodium and Cardiovascular Events in Canada

- The same assumptions regarding current Canadian levels of sodium intake as in our last analysis.
- Estimated the reduction in cardiovascular events would be similar to reduced events with diuretic therapy for proportional reductions in blood pressure.

# Estimated Effects on Cardiovascular Disease by Lowering of Blood Pressure with a Reduction of Dietary Sodium in Canada

- 1860 mg reduction in dietary sodium
- Annual reduction in
  - Cardiovascular events: 13%
  - Myocardial infarction: 8%
  - Strokes: 12%
  - Heart Failure: 21%
- Reduction in healthcare costs associated with the overall predicted 13% reduction CVD in 1998
  - \$1.38 billion per year
  - \$2.99 billion in indirect and direct costs

# Salt 2008: Meta-Analysis on Different Reduction in Sodium on Blood Pressure



# Estimated Effects on Cardiovascular Disease by Lowering of Blood Pressure with a Reduction of Dietary Sodium in Canada

- 1,200 mg per day reduction in dietary sodium
  - 9% reduction in cardiovascular (CVD) events
- 2,400 mg per day reduction in dietary sodium
  - 19% reduction in CVD events
- United States had levels of dietary sodium and blood pressure similar to Canada and the estimates are likely to pertain to the United States as well.

# Limitations of Estimates of the Health Effects of Dietary Sodium

- Only estimates; some of the data sources are old, or have substantive limitations; randomized controlled trial results may not reflect populations.
- Excludes other health issues—only deals with blood pressure.
- Current RCT not powered to detect overall health effects; they raise very serious health concerns, and there is almost no data to support the safety of high dietary sodium.

# Summary

- Canadians consume a unhealthy amount of sodium.
- This causes hypertension a leading risk for death and disability.
- Dietary sodium at current levels likely contributes to at least 13% of cardiovascular disease in Canada and over 2 billion dollars in healthcare costs.
- These analysis are likely to be relevant to the United States, which has similar sodium intakes and similar levels of sodium intake.

