2016 Dietary Salt Fact Sheet and Call to Action: The World Hypertension League, International Society of Hypertension, and the International Council of Cardiovascular Prevention and Rehabilitation

Norm R. C. Campbell, MD, FRCPC;[1] Daniel T. Lackland, DrPH;[2] Mark L. Niebylski, PhD, MBA, MS;[2] Marcelo Orias, MD;[2] Kimbree A. Redburn, MA;[2] Peter M. Nilsson, MD, PhD;[2] Xin-Hua Zhang, MD, PhD;[2] Louise Burrell, MD, MBChB, MRCP, FRACP;[3] Masatsugu Horiuchi, MD, PhD, FAHA;[3] Neil R. Poulter, MBBS, MSc, FRCP, FMed Sci;[3] Dorairaj Prabhakaran, MD, DM, MSc, FRCP, FNASc;[3] Agustin J. Ramirez, MD, PhD;[3] Ernesto L. Schiffrin, CM, MD, PhD, FRSC, FRCPC, FACP;[3] Alta E. Schutte, PhD, MSc;[3] Rhian M. Touyz, MBBCh, PhD, FRCP, FRSE;[3] Ji-Guang Wang, MD, PhD;[3] Michael A. Weber, MD;[3] International Council of Cardiovascular Prevention and Rehabilitation[4]

From the Libin Cardiovascular Institute of Alberta, University of Calgary, Calgary, AB, Canada;[1] World Hypertension League, Corvallis, MT;[2] ISH Secretariat, c/o The Conference Collective Ltd., Teddington, Middlesex, UK;[3] and International Council of Cardiovascular Prevention and Rehabilitation, York University, Toronto, ON, Canada[4]

DIETS HIGH IN SALT (SODIUM) ARE ASSOCIATED WITH A HIGH BURDEN OF HYPERTENSION, PREMATURE DEATH, AND DISABILITY

- The Global Burden of Disease Study estimated that there were 3.7 million deaths, 68 million years of life lost, and 74 million years of disability as a result of excess dietary salt in 2013. (Institute for Health Metrics and Evaluation, http://vizhub.healthdata.org/gbd-compare/. Accessed December 22, 2015.)
- One half of blood pressure (BP)–related disease occurs in people with raised BP within the normal range. However, high dietary salt increases BP in this normal range and in patients with hypertension.
- High dietary salt causes an estimated 30% of hypertension or over 300 million people to have hypertension.[1,2]
- Increased BP is a leading preventable risk factor for heart disease (heart attack and heart failure), stroke, and kidney failure and a major contributor to premature death, dementia, disability, and healthcare costs.[2]
- Other diseases that have been associated with high salt intake include gastric cancer (probable procarcinogen), total cancer, recurrent kidney stones (causal association), osteoporosis, obesity, fatty liver, headache, multiple sclerosis, rheumatoid arthritis, cataracts, infertility, and direct renal, and vascular and cardiac damage.[3–11]

GLOBALLY, PEOPLE CONSUME TOO MUCH SALT

- The recommended daily intake level of salt for healthy adults is <5 g/d (sodium <2000 mg/d), with lower levels in children based on their lower caloric needs.[12]
- The average intake of salt per adult globally is about 10 g/d (sodium 4000 mg/d), with higher intakes in Asia.[13]
- Salt intake in fully developed economies largely comes from prepackaged, processed, and restaurant foods; in undeveloped economies, the largest source is "discretionary" and added in cooking and at the table. Only a small portion is naturally found in food (salt <2.0 g/d or sodium <800 mg/d in a meat/vegetarian diet, and salt <1.25 g/d or sodium <500 mg/d in a vegetarian diet). In developing economies, globalization of the food industry (nutritional transition) is increasing the exposure of populations to salt in processed foods.[14,15]

THERE IS A STRONG CONSENSUS THAT REDUCTION IN DIETARY SALT SAVES LIVES, HEALTHCARE RESOURCES, AND DOLLARS

- Reducing dietary salt is one of the most impactful and cost-effective mechanisms to improve population health, and is considered one of the World Health Organization's (WHO's) "best buys" to prevent chronic disease.[14,15]
- Noncommunicable diseases threaten the global economy and economic development and led the World Health Assembly to support nine targets for prevention and control, including a key recommendation to reduce dietary salt by 30%.[16]
- Repeated comprehensive critical appraisals of the literature under the auspices of national governments and high-profile scientific organizations uniformly conclude that dietary salt needs to be reduced and that high dietary salt causes disease.[12, 17–23]
- Controversy surrounding dietary salt reduction is largely related to competing commercial financial interests and the use of weak research methods (especially the use of single spot urine samples to estimate usual salt intake).[40–43] The use of a spot urine test to assess an individual's usual salt intake is not recommended.[44]

Address for correspondence: Mark L. Niebylski, PhD, MBA, MS, World Hypertension League, 415 Bass Lane, Corvallis, MT 59828
E-mail: mniebylski@yahoo.com

DOI: 10.1111/jch.12894

KEEPING UP TO DATE ON THE EVOLVING EVIDENCE ON DIETARY SALT AND HOW TO REDUCE DIETARY SALT

- The World Hypertension League (WHL) with other national and international partners and the *Journal of Clinical Hypertension* have developed multiple mechanisms to maintain up-to-date evidence on dietary salt.
- A weekly MEDLINE search with independent abstracting of relevant studies is available at http://www.hypertensiontalk.com/science-of-salt-weekly/. (Canadian Institute for Health Research and Heart and Stroke Foundation [CIHR HSF] Chair in Hypertension Prevention and Control. Accessed December 22, 2015.)
- An annual update of the evidence on dietary salt and outcomes 2013–2014 was published in the *Journal of Clinical Hypertension* with a 2014–2015 update pending.[45]
- A more regularly updated critical appraisal and update of the evidence on dietary salt, outcomes, and programs to reduce dietary salt has also been published in the *Journal of Clinical Hypertension*.[46,47]

APPROACHES TO REDUCE DIETARY SALT NEED TO BE STRENGTHENED GLOBALLY

- Governments in most countries need to take action to develop and implement multisectoral national strategies to reduce salt
- Industry-based voluntary approaches to reduce salt additives to food that do not have strong government oversight and close monitoring have a long history of being ineffective.[21]
- Regulatory approaches are most effective while voluntary approaches with strong government oversight have had some success.[21,33]
- Public education is important especially where discretionary salt is the major dietary source.[48]
- Close monitoring of salt intake, sources of salt in the diet, salt levels in foods, as well as knowledge, attitudes and behaviors of the public are essential components of salt reduction programs.[49]
- Integrating efforts to reduce dietary salt with those to increase dietary potassium and prevent iodine deficiency through salt fortification are important to optimize population health.[50,51]
- Global networks of concerned healthcare professionals and scientists have formed to help support reductions in dietary salt. The World Action on Salt and Health (WASH) sponsors World Salt Week annually during the second week of March (www.worldactiononsalt.com/. Accessed December 22, 2015.) Other organizations include the Australian Division of World Action on Salt and Health (www.awash.org.au), Consensus Action on Salt and Health (http://www.actiononsalt.org.uk/), and ALASS Coalition (Latin America Action on Health or Salt) (http://www.alass.net/).

NATIONAL HYPERTENSION AND CARDIOVASCULAR ORGANIZATIONS

- Highlight the important roles of hypertension and cardiovascular organizations in research, education, and advocacy.
- Promote research, presentations, and publications on high-quality research related to dietary salt emphasizing the importance of high-quality research methodology and interpretation that is free of commercial bias.
- Educate members on the health risks of high dietary salt and how to reduce salt intake.
- Broadly disseminate relevant literature on dietary salt to the public.
- Educate policy and decision makers on the health benefits of lowering BP among normotensive and hypertensive persons, regardless of age.
- Advocate for policies and regulations that will contribute to population-wide reductions in dietary salt.
- Provide opportunities for members to be involved in advocacy. Promote and advocate through media releases on dietary salt reduction to reach the public.
- Promote coalition building, increase organizational capacity for advocacy, and develop advocacy tools to promote civil society actions.
- Be cautious about the role of low-quality research and commercial conflicts of interest in generating controversy related to dietary salt reduction.

THE WHL ACTIONS

- The WHL and the International Society of Hypertension have developed a policy statement to support the WHO-recommended salt intake levels.[37]
- The WHL has developed annual certificates of excellence and of notable achievement to recognize organizations and individuals who have contributed to efforts to reduce dietary salt at the population level.[52] (http://www.whleague.org/index.php/news-awards-recognition. Accessed December 22, 2015.)
- Assisting the global and national efforts to reduce dietary salt is a top priority of the WHL.

Acknowledgments: This work is an updated version of the WHL 2014 Dietary Salt Fact Sheet.[53]

Disclosures: Dr Mark Niebylski and Kimbree Redburn are paid WHL consultants but report no other conflicts. Dr Ji-Guang Wang reports receiving research grants and consulting fees from several BP-measuring device companies including A&D, AViTA, Honsun, Omron, and Rossmax but reports no other conflicts. Dr Michael Weber is a consultant for and received travel support from Omron but reports no other conflicts. All other authors including those from WHL and the International Society of Hypertension report no conflicts of interest.

References

1. Committee on Public Health Priorities to Reduce and Control Hypertension in the U.S. Population, Institute of Medicine of the National Academies. A Population-Based Policy and Systems Change Approach to Prevent and Control Hypertension. Report, v-173. 2010. Washington, DC; National Academies Press.

2. World Health Organization. A global brief on hypertension: silent killer, global public health crisis. World Health Day 2013. Report. Geneva, Switzerland: World Health Organization; 2013:1–39
3. de Wardener HE, MacGregor GA. Harmful effects of dietary salt in addition to hypertension. *J Hum Hypertens*. 2002;16:213–223.
4. Djamgoz MB. Blood pressure and risk of cancer progression—A possible connection with salt and voltage-gated sodium channel. *Med Hypotheses*. 2015;85:591–593.
5. Ma Y, He FJ, MacGregor GA. High salt intake: independent risk factor for obesity? *Hypertension*. 2015;66:843–849.
6. D'Elia L, Galletti F, Strazzullo P. Dietary salt intake and risk of gastric cancer. *Cancer Treat Res*. 2014;159:83–95.
7. Salgado E, Bes-Rastrollo M, de IJ, et al. High sodium intake is associated with self-reported rheumatoid arthritis: a cross sectional and case control analysis within the SUN cohort. *Medicine (Baltimore)* 2015;94:e0924.
8. Haring B, Wang W, Lee ET, et al. Effect of dietary sodium and potassium intake on left ventricular diastolic function and mass in adults</=40 years (from the Strong Heart Study). *Am J Cardiol*. 2015;115:1244–1248.
9. Farez MF, Fiol MP, Gaitan MI, et al. Sodium intake is associated with increased disease activity in multiple sclerosis. *J Neurol Neurosurg Psychiatry*. 2015;86:26–31.
10. Amer M, Woodward M, Appel LJ. Effects of dietary sodium and the DASH diet on the occurrence of headaches: results from randomised multicentre DASH-Sodium clinical trial. *BMJ Open*. 2014;4:e006671.
11. Singer P, Cohen H, Alderman M. Assessing the associations of sodium intake with long-term all-cause and cardiovascular mortality in a hypertensive cohort. *Am J Hypertens*. 2015;28:335–342.
12. World Health Organization. WHO guideline: sodium intake for adults and children. Report, i-46. Geneva, Switzerland: WHO Press; 2012.
13. Powles J, Fahimi S, Micha R, et al. Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide. *BMJ Open*. 2013;3:e003733.
14. Wang G, Labarthe D. The cost-effectiveness of interventions designed to reduce sodium intake. *J Hypertens*. 2011;29:1693–1699.
15. World Economic Forum, World Health Organization. From burden to "best buys": reducing the economic impact of non-communicable diseases in low- and middle-income countries. Report. Geneva, Switzerland: World Economic Forum; 2011:1–11.
16. United Nations General Assembly. Note by the Secretary-General transmitting the report of the Director-General of the World Health Organization on the prevention and control of non-communicable diseases. Report, 1–19. 2013. New York, NY; Department for General Assembly and Conference Management.
17. Scientific Advisory Committee on Nutrition. Salt and Health. Scientific Advisory Committee on Nutrition 2003, 1–134. 2003. Norwich, UK, The Stationery Office.
18. Appel LJ, Brands MW, Daniels SR, et al. Dietary approaches to prevent and treat hypertension: a scientific statement from the American Heart Association. *Hypertension*. 2006;47:296–308.
19. Dickinson BD, Havas S. Reducing the population burden of cardiovascular disease by reducing sodium intake: a report of the Council on Science and Public Health. *Arch Intern Med*. 2007;167:1460–1468.
20. American Public Health Association. Reducing Sodium Content in the American Diet. American Public Health Association—Association News 2002 Policy Statements, 5–6. 2002. Fort Worth, TX, American Public Health Association.
21. Henny JE, Taylor CL, Boon CS. *Strategies to Reduce Sodium Intake in the United States*. Washington, DC: The National Academies Press; 2010.
22. Strom BL, Anderson CA, Ix JH. Sodium reduction in populations: insights from the Institute of Medicine committee. *JAMA*. 2013;310:31–32.
23. Institute of Medicine of the National Academies. Sodium Intake in Populations: Assessment of Evidence. Strom BL, Yaktine AL, Oria M, eds. Report, V-F-44. 2013. Washington, DC: The Academies Press.
24. Appel LJ, Frohlich ED, Hall JE, et al. The importance of population-wide sodium reduction as a means to prevent cardiovascular disease and stroke: a call to action from the American Heart Association. *Circulation*. 2011;123:1138–1143.
25. 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. Scientific Evaluation of Dietary Reference 2004;1–640.
26. World Health Organization. Report of the Formal Meeting of Member States to conclude the work on the comprehensive global monitoring framework, including indicators, and a set of voluntary global targets for the prevention and control of noncommunicable diseases. Report. Geneva, Switzerland: World Health Organization; 2012:1–6.
27. World Health Organization. World Health Organization nutrition and food security programme. food based dietary guidelines in the who european region. World Health Organization 2003; 1–38.
28. Provincial and Territorial Ministers of Health and Healthy Living. Reducing the Sodium Intake of Canadians: A Provincial and Territorial Report on Progress and Recommendations for Future Action. Report, i,-42. 2012. Canada, Provincial and Territorial Ministers of Health and Healthy Living.
29. Sodium Working Group. Sodium Reduction Strategy for Canada—Recommendations of the Sodium Working Group. Report, 1–61. 2010. Ottawa, Canada, Health Canada.
30. Whelton PK, Appel LJ, Sacco RL, et al. Sodium, blood pressure, and cardiovascular disease: further evidence supporting the American Heart Association sodium reduction recommendations. *Circulation*. 2012;126:2880–2889.
31. Campbell NR, Legowski B, Legetic B. Mobilizing the Americas for dietary salt reduction. *Lancet*. 2011;377:793–795.
32. Legetic B, Campbell N. Reducing salt intake in the Americas: Pan American Health Organization actions. *J Health Commun*. 2011;16 (suppl 2):37–48.
33. Cappuccio FP, Capewell S, Lincoln P, McPherson K. Policy options to reduce population salt intake. *BMJ*. 2011;343:d4995.
34. Webster JL, Dunford EK, Hawkes C, Neal BC. Salt reduction initiatives around the world. *J Hypertens*. 2011;29:1043–1050.
35. Webster J, Dunford E, Huxley R, et al. The development of a national salt reduction strategy for Australia. *Asia Pac J Clin Nutr*. 2009;18:303–309.
36. Chalmers J, Arima H, Harrap S, et al. Global survey of current practice in management of hypertension as reported by societies affiliated with the international society of hypertension. *J Hypertens*. 2013;31:1043–1048.
37. Campbell N, Lackland D, Chockalingam A, et al. The World Hypertension League and International Society of Hypertension call on governments, nongovernmental organizations, and the food industry to work to reduce dietary sodium. *J Clin Hypertens (Greenwich)*. 2014;16:99–100.
38. Lim SS, Vos T, Flaxman AD, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2013;380:2224–2260.
39. Dietary Guidelines Advisory Committee. Scientific Report of the 2015 Dietary Guidelines Advisory Committee. Part D. Chapter 6: Cross-Cutting Topics of Public Health Importance. Report, 1–40. 2-2-0015. USA, The Dietary Guidelines Advisory Committee.
40. Campbell NR, Lackland DT, Niebylski ML, Nilsson PM. Is reducing dietary sodium controversial? Is it the conduct of studies with flawed research methods that is controversial? A perspective from the World Hypertension League Executive. *J Clin Hypertens (Greenwich)*. 2015;17:85–86.
41. Campbell NRC, Lackland DT, Lisheng L, et al. The World Hypertension League: where now and where to in salt reduction. *Cardiovasc Drugs Ther*. 2015;5:238–242.
42. Campbell NR, Appel LJ, Cappuccio FP, et al. A call for quality research on salt intake and health: from the World Hypertension League and supporting organizations. *J Clin Hypertens (Greenwich)*. 2014;16:469–471.
43. Campbell NR, Lackland DT, MacGregor GA. Dietary sodium: a perspective on recent sodium evidence–its interpretation and controversies. *J Clin Hypertens (Greenwich)*. 2013;15:765–768.
44. Pan American Health Organization. Salt Smart Americas. Report, 1–140. 2013. Pan American Health Organization.
45. Johnson C, Raj TS, Trudeau L, et al. The science of salt: a systematic review of clinical salt studies 2013 to 2014. *J Clin Hypertens (Greenwich)*. 2015;17:401–411.
46. Arcand J, Webster J, Johnson C, et al. Announcing "Up to Date in the Science of Sodium." *J Clin Hypertens (Greenwich)*. 2016;18: 85–88.
47. Arcand J, Wong MM, Trieu K, et al. The science of salt: a regularly updated systematic review of salt and health outcomes (June and July 2015). *J Clin Hypertens (Greenwich)*. 2016;18:371–377.
48. World Health Organization. Creating an enabling environment for population-based salt reduction strategies. Report of a joint technical meeting held by WHO and the Food Standards Agency, United Kingdom, July 2010. 2011; 1:3–42.
49. World Health Organization. Strategies to monitor and evaluate population sodium consumption and sources of sodium in the diet:

report of a joint technical meeting convened by WHO and the Government of Canada. Canada October 2010. Report. Geneva, Switzerland; WHO Press: World Health Organization; 2011: 3–40.
50. World Health Organization. Salt reduction and iodine fortification strategies in public health. Report. Geneva, Switzerland: World Health Organization; 2013:1–34.
51. Pan American Health Organization. Salt-Smart Americas: A Guide for Country-Level Action. Report, ix-159. 2013. Washington, DC; Pan American Health Organization.
52. Redburn KA, Niebylski ML. Excellence and notable achievement awards from the World Hypertension League: a call for 2015 nominations. *J Clin Hypertens (Greenwich)*. 2014;16:928–929.
53. Campbell N, Niebylski M, Lackland D. 2014 dietary salt fact sheet of the World Hypertension League, International Society of Hypertension, Pan American Health Organization Technical Advisory Group on cardiovascular disease prevention through dietary salt reduction, WHO coordinating centre on population centre salt reduction, and world action on salt and health. *J Clin Hypertens (Greenwich)*. 2015;17:7–9.