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From Prophecy to Plate: How to Actualize a Planetary Menu for Kidney Disease Nutrition

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Introduction

According to The EAT-Lancet Commission, "food is the single strongest lever to optimize human health and environmental sustainability on Earth."[1] Malnutrition, including both undernutrition and obesity, remains the leading cause of mortality and morbidity globally,[2] with implications for kidney health.[3-5] Co-occurring with lifestyle-related diseases is climate change, forming a global "syndemic."[2] Global food production and agriculture are the major contributors to environmental degradation, responsible for 26% of global greenhouse gas emissions and 78% of global ocean and freshwater pollution, while using 50% of the world's habitable land and 70% of the global freshwater withdrawals.[6] Climate change and chronic kidney disease (CKD) have a bidirectional relationship, where excessive heat, air pollution, and resource shortages all contribute to worse outcomes for people with CKD.[7,8]

As food production is a major component of our environmental stewardship, efforts in choosing foods that require fewer resource utilization in their production and that offer the highest nutrition yields for inputs, will support planetary health goals.[8] Recent attention has focused on plant-based diets, which can reduce air pollution, fertilizer use, agricultural space, clear-cutting of land, in addition to promoting crop rotation to protect the soil.[9] Reducing the reliance on ultra-processed foods and increasing intake of whole plant-based foods means fewer required inputs for food production[10] as well as offering a diet that helps prevent progression of CKD, which, in turn, reduces health care utilization.[3,10-14] As shown later in this article, the hospital system is one of the greatest sources of environmental waste and resource expenditures, therefore avoiding hospital admissions or reducing length of stay through nutrition therapy is a key feature to achieving planetary health.[10,15]

In this editorial, we describe a 3-pronged approach to applying planetary health concepts to food systems across the spectrum of CKD care, specifically: (1) promoting plant-based eating, (2) supporting patients with CKD in their home environment, and (3) addressing inpatient food services for patients with kidney disease.

Plant-Based Eating

Plant-based eating encompasses a wide range of dietary patterns that contain primarily lower amounts of animal products and higher amounts of plants such as vegetables, fruits, whole grains, legumes, nuts, and seeds.[9,14,16-18] Examples of such dietary patterns include Dietary Approaches to Stop Hypertension (DASH), Mediterranean, Flexitarian, Vegetarian, Whole-Food Plant Based, Vegan, and Plant-dominant low-protein diet (PLADO).[16-18] Higher adherence to healthy dietary patterns/plant-based diets, including the Mediterranean diet and DASH diet, is associated with reduced CKD incidence in several cohort studies.[19-33] Dietary Approaches to Stop Hypertension diet and a dietary pattern rich in whole grains, fruits, vegetables, and low-fat dairy foods have been associated with lower albuminuria.[28,34-36] Vegetarian and vegan diets have demonstrated reduced CKD prevalence in cross-sectional studies.[37,38] Plant-based diets are also associated with reduced risks of other noncommunicable diseases such as heart disease, type 2 diabetes, and cancer, as well as all-cause mortality.[18,39]

Both cohort studies and some small randomized controlled trials have demonstrated that dietary patterns favoring

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plant-based proteins, including Mediterranean diet and the DASH diet, are associated with slower progression of kidney disease,[40-45,46] higher quality of life scores for general health and mental health,[47] and dietary satisfaction.[48] However, the effects of dietary interventions on mortality, cardiovascular events, and end-stage kidney disease remains uncertain, as there is a paucity of studies assessing these outcomes,[46] with the majority of available evidence derived from observational studies.

There are several advantages to plant-based diets in the management of CKD, including high nutrient density, higher fiber, lower saturated fat, and lower intake of animal protein and processed foods.[3] Plant-based diets are higher in plant fibers, which have a favorable impact on the gut microbiota, and therefore may delay progression of kidney disease as it relates to the gut-kidney axis and uremic toxin production.[3] Plant-based diets may also reduce risk of metabolic complications of CKD, including uremia, acidosis, bone mineral disorders, and cardiovascular risk factors such as hypertension and dyslipidemia.[3,49] Another potential benefit is reducing constipation. The bioavailability of potassium and phosphate is reduced with plant-based, fiber-containing foods,[16,18] which may mitigate electrolyte abnormalities in patients with CKD. Furthermore, plant-based eating by design promotes higher intake of fruits and vegetables, which has been associated with reduced progression of CKD if consumed in quantities >6 servings per day.[50]

The Kidney Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guidelines for Nutrition in CKD: 2020 Update has placed specific emphasis on increasing fruit and vegetable intake to decrease body weight, and blood pressure, and manage net acid production; plant-based foods that have a lower bioavailability of phosphate; and a Mediterranean Dietary Pattern to improve lipid profiles.[16] However, the guideline cited insufficient evidence to recommend a particular protein type (plant vs animal) for nutritional status, calcium/phosphorus levels, or lipid profile outcomes.[16]

A key feature of the plant-based diet is its focus on dietary quality, favoring unprocessed, fresh and seasonal ingredients over processed and prepared foods.[48] Ultra-processed foods are associated with greater eGFR decline and all-cause mortality in patients with CKD.[51,52] However, not all plant-based diets are synonymous with beneficial health outcomes, as the food industry has most recently tapped into processed plant-based products as a means of promoting sales, and making nutrition claims that are not substantiated by scientific evidence.[14] Consumption of processed foods, including plant-based products, is associated with higher risk of metabolic consequences (inflammation, dyslipidemia, impaired glucose tolerance) than consumption of unprocessed plant-based products.[14,39] Furthermore, processed plant-based options on fast-food menus, where production on a mega-scale is paramount, does not improve environmental impact.[11]

The links between plant-based diets and environmental stewardship are manifold. Reducing animal-derived food production reduces the burden on farmlands and infrastructure to raise livestock, resulting in less greenhouse gas emissions and water consumption.[3] Dietary patterns that are healthier and more plant-based have 30% lower greenhouse gas emissions and use less nitrogenous fertilizer, cropland, and irrigation water compared with conventional diets.[9] It is suggested that promoting diets rich in plant-based foods within in the context of chronic disease prevention/management could yield dual benefits by improving health outcomes and positively impacting the environment through diminished demand for health services.[12,13,15] These principles align with the Canadian Society of Nephrology Action Planning Committee (SNAP), whose model includes addressing social determinants of health, health promotion, disease prevention, and chronic disease management.[12]

Planetary Health Diet

The EAT-Lancet Commission's healthy plant-based diet (Figure 1) is the flexitarian diet that aligns well with dietary management of patients with CKD.[1,3]

A sample menu for planetary health would be centered on foods that are locally sourced, and foods that produce the least amount of greenhouse emissions or inputs to grow and cultivate.[1,53] Examples of meals that incorporate planetary health concepts are available and can be adapted to suit cultural food ways and traditional diets.[49] As shown in Figure 1, the planetary health diet would contain a variety of fruits, vegetables, and legumes. Proteins would be primarily plant-based, with animal-derived proteins in smallest quantities, such as dairy, eggs, seafood, fish, and meat.[1]

A diet comprised mainly of plant-based foods can be included in all stages of CKD. For example, for patients on dialysis, post-transplant or with higher protein needs, this type of meal composition can be adapted accordingly using plant-based proteins in higher quantities.[54] Moreover, the diet may suit a variety of geographies, cultures and traditional food ways, as was intended by the EAT-Lancet Commission's recipe collection.[1,49]

Implementation Considerations: Supporting Patients With Chronic Kidney Disease in Their Home Environment

The majority of persons living with CKD in Canada are older,[55] face greater social isolation,[56] have lower socioeconomic status which may reduce food security, and have comorbidities[57,58] which may impact their ability to procure and prepare food, and manage meal planning. Moreover, there are barriers to nutrition literacy[59] and patients are exposed to conflicting nutrition information.[60]

Figure 1. Planetary Health Diet adapted for patients with CKD.[1]
Note. The EAT-Lancet planetary health diet is a flexitarian diet emphasizing fruits and vegetables (half a plate), with the other half consisting of primarily legumes, nuts, whole grains, and optionally modest amounts of animal sources of protein.[1] Whole Grains—quinoa, corn, wheat, rice, millet, amaranth, sorghum, bulgur, buckwheat, rice, rye, oats, spelt, teff, kamut, and triticale. Tubers/Starchy Vegetables—potato, cassava, sun choke, sweet potato, parsnip, yam, taro, chayote, celery, turnip, radish, rutabaga, and Jerusalem artichoke. Vegetables—all vegetables. Fruits—all fruits (unless otherwise indicated). Dairy Foods/Alternatives—milk, cheese, yogurt, soy milk, and almond milk. Protein sources—beef, lamb, pork, game meats, poultry, fish, legumes, nuts, and seeds. Added fats—unsaturated oils (canola, olive) and saturated fats (coconut, butter). Added sugars—all sources of sugar (honey, maple syrup, cane sugar, coconut sugar, and palm sugar). This graphic was prepared by EAT and is included in an adapted summary of the Commission Food in The Anthropocene: the EAT-Lancet Commission on Healthy Diets from Sustainable Food Systems. The entire commission can be found online at eatforum.org/eat-lancet commission.

Although plant-based dietary patterns are associated with improved CKD health outcomes, many outdated resources and online education platforms still endorse the so-called "renal diet," which contradicts plant-based eating and discourages the use of whole foods in favor of maintaining normal potassium and phosphate balance despite lack of scientific evidence.[18,49]

However, with the support of an interdisciplinary care team, including a dietitian, patients can better plan their grocery list, shop accordingly, and prepare and store foods that are nutritious and in line with their preferences, thereby increasing self-efficacy and reducing food waste. More importantly, patients can better economize their budget to allocate funds more effectively to the purchase of wholesome, fresh foods, rather than gravitating toward processed or prepared ingredients. Whether plant-based or not, purchasing foods that require less packaging, storage and transportation costs, reduces the burden on the environment by increasing reliance on local rather than remote food sources.[61] Promoting traditional food ways and "food as medicine," rather than prescribing an outdated "renal diet," means that patients can use ingredients more effectively across many dishes and enjoy food that they can relate to more closely, thereby reducing food waste, increasing quality of life, and building a healthier relationship to food.[62,63] The KDOQI guidelines recommend individualized support for patients to assist with implementing and adhering to dietary changes.[16]

It is perceived that plant-based diets are more expensive than the omnivorous diet, due to the costs of fruits, vegetables, and meat substitutes.[64] In the United States and other industrialized countries, processed, energy-dense foods are abundant, cheap and convenient whereas unprocessed healthier foods are often more expensive and less accessible in many areas, so-called "food deserts."[39] However, a Portuguese study noted that plant-based consumers spend approximately 40% less on foods as compared with consumers following an omnivorous diet.[64] In addition, more than half of those on a vegan diet reported spending less than 5 euros per week (equivalent to $7.30 CAD) on meals eaten outside of the home, whereas only 22% of those on animal-based diets reported the same.[64] Globally, however, the EAT-Lancet diet exceeds the per capita income of 1.58 billion people, primarily populations of sub-Saharan Africa and South Asia, who would be impacted should they switch to this way of eating, rather than to stay with their traditional food ways.[65] Therefore, it is important to consider that such a diet may require economic systems that support a lower cost of whole foods such as fruits, vegetables, and protein sources as well as offer substitutions that can either be grown locally or procured more cost-effectively in lower-income regions.[65]

Many patients receive misinformation online about supplements and over-the-counter remedies like vitamins, powders, and other concoctions touting benefits to the kidney. Educating patients on the value of whole food will reduce costs spent on ineffective (and potentially harmful) supplements, reduce environmental burden on discarding these supplements, and promote purchasing power of the consumer to the complementary and alternative medicine health industry.

Much work has already been undertaken by BC Renal, Nourish, Kidney Foundation of Canada, and the Teaching Kitchen Collaborative to promote a "food first" and "food as medicine" approach.[54,61,66-68] The initiatives set out by these groups empower individuals and groups to learn more about the healing power of food and to use food in ways to promote quality of life, optimal nutrition status, and environmental stewardship by delivering evidence-based strategies in a user-friendly manner to the public. When health promotion strategies are to be considered, it is imperative to include all stakeholders, including patient partners from diverse cultural

backgrounds and with lived experience, including voices of Indigenous communities where possible.[9,69-72] Drawing from the examples of organizations like the Kidney Foundation of Canada, intercultural collaborations for health promotion strategies, and inclusion of those who come from diverse sociocultural backgrounds and are living with CKD can embed this holistic approach into health care practice for both individuals and the communities in which they live.

Hospital Food Services: Challenges and Recommendations to Improve Environmental Sustainability

Individuals living with kidney disease have higher hospitalization rates as compared with the general population, with main causes including cardiovascular disease, digestive, genitourinary, endocrine, nutritional, and metabolic illness.[73]

Amidst the substantial toll of human-induced damage on the planet, the health care system is poised to reassess its practices for environmental protection and harm reduction.[74-78] The food service sector, a notable contributor to environmental impact, faces challenges such as constrained physical structures, resource overconsumption, and inadequate waste control measures.[78] According to the Food and Agriculture Organization, one third of the edible parts of food are lost or wasted worldwide, amounting to roughly 1.3 billion tons per year and resulting in $750 billion (US) in food waste costs.[78] Large-scale food operations, often prioritizing cost-effective bulk purchases, may compromise dietary variety and nutritional quality, leaning heavily on processed foods.[74] With considerable purchasing influence, these operations contribute to the decline of heirloom crops, because these are phased out to make room for higher quantities of fewer crops. This is particularly significant and detrimental for the case of cattle rearing, which requires both space for animals and their feed which is often a monocrop.[53] The most significant environmental damage stems from the cultivation and consumption of a limited variety of foods.[53]

In Canada, hospital food services are a $2 billion industry. Much of the food hospitals produce is inappropriate for the needs of the diverse cultures we serve, which contributes to malnutrition, and in turn, longer lengths of stay, significant amounts of food waste from both food and packaging, workflow inefficiencies such as food importation, preparation, and distribution losses, and lowered quality of life for patients.[61,76] Because hospital food systems are governed by several constraints that relate to distribution of high volumes of meals in a short time, requirements for dietary restrictions based on disease management criteria, and patient food preferences, this has led to adaptations that veer away from environmental stewardship.[76,77] In particular, 50% of all hospital waste is from direct food waste, portion-packaged food, and disposable tray systems.[76,77]

Therefore, at the level of the hospital, we need to place traditional and cultural food ways at the forefront.[77] This means foods that are locally grown, fresh, and varied.[78] Plant-based menus have been successfully implemented in large acute care settings with success, such as in the United States.[78,79] Specifically, a plant-based menu including fruit, vegetables, beans, lentils, and whole grains resulted in increased patient satisfaction, lowered costs, and higher nutritional quality of the meals.[78,79] Food waste was reduced by freezing the meals and using menu items that are simple to assemble, and aligned with patient preferences, with a sample menu provided by the authors.[78,79]

Studies show that hospitals can modify their waste management strategies by composting or donating surplus food items in line with the food recovery hierarchy.[77] Avoiding waste using evidence-based strategies is advisable as a priority, followed by the reuse of surplus edible food in different dishes.[77] The plant-based diet for CKD lends itself well to this, as whole ingredients such as beans, pulses, vegetables, and fruit can be incorporated into a variety of dishes, from soups to desserts without increased labor or cost to food services. Recently, Nourish Leadership, a collaborative initiative focused on promoting climate leadership, equity, and community wellbeing through food, developed "A Guide to Sustainable Menus."[80] This guide highlights strategies for a hospital planetary menu to promote the increased use of legumes, nuts, seeds, game meats, sustainable seafood, and plant-based meat substitutes over eggs, poultry, dairy, and red meats and pork.[78,80] Cooking methods to reduce processed ingredients and additives are featured, along with "swaps" that can currently be made on the hospital menu to adapt it to a more sustainable one.[69,71]

Conclusions

According to the framework of environmentally sustainable quality kidney care, sustainable kidney care actions include health promotion and adoption of lifestyle therapies as the initial steps to protecting both patients with kidney disease and the environment.[8] Plant-based diets offer both health benefits in preventing and managing CKD and have several environmental benefits, by affecting upstream food production and reducing downstream demand for health care services. To assist with implementing the planetary health diet in patients with kidney disease, dietitians and institutions are well-positioned to offer patient-centered nutrition education that fosters self-management skills and positively impacts quality of life.[76]

Achieving environmental sustainability and resilience necessitates more than individual acts of stewardship; it also demands the authentic commitment from hospital institutions to transcend profit margins. This commitment involves incorporating traditional foodways, minimizing packaging, and reducing food waste.

Coordinated efforts by consumers, the food industry, as well as the health care system are essential for a collective shift toward reducing our environmental burden and creating sustainable food systems to optimize both human and environmental health.

Ethics Approval and Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Availability of Data and Materials

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References

1. Summary report of the EAT-Lancet Commission. https://eatforum.org/content/uploads/2019/07/EAT-Lancet_Commission_Summary_Report.pdf. Published 2019. Accessed January 12, 2024.
2. Swinburn BA, Kraak VI, Allender S, et al. The global syndemic of obesity, undernutrition, and climate change: the Lancet Commission report. *Lancet*. 2019;393(10173):791-846. doi:10.1016/S0140-6736(18)32822-8. Erratum in: *Lancet*. 2019;393(10173):746.
3. Avesani CM, Cardozo LFMF, Yee-Moon Wang A, et al. Planetary health, nutrition, and chronic kidney disease: connecting the dots for a sustainable future. *J Ren Nutr*. 2023;33(6):S40-S48. doi:10.1053/j.jrn.2022.09.003.
4. Luyckx VA, Tonelli M, Stanifer JW. The global burden of kidney disease and the sustainable development goals. *Bull World Health Organ*. 2018;96(6):414-422D. doi:10.2471/BLT.17.206441.
5. Luyckx VA, Al-Aly Z, Bello AK, et al. Sustainable Development Goals relevant to kidney health: an update on progress. *Nat Rev Nephrol*. 2021;17(1):15-32. doi:10.1038/s41581-020-00363-6. Erratum in: *Nat Rev Nephrol*. 2021;17(10):704.
6. Ritchie H, Rosado P, Roser M. Environmental impacts of food production. https://ourworldindata.org/environmental-impacts-of-food. Published 2022. Accessed January 12, 2024.
7. Stenvinkel P, Shiels PG, Painer J, Miranda JJ, Natterson-Horowitz B, Johnson RJ. A planetary health perspective for kidney disease. *Kidney Int*. 2020;98(2):261-265. doi:10.1016/j.kint.2020.03.024.
8. Stigant CE, Barraclough KA, Harber M, et al. Our shared responsibility: the urgent necessity of global environmentally sustainable kidney care. *Kidney Int*. 2023;104(1):12-15.
9. Musicus AA, Wang DD, Janiszewski M, et al. Health and environmental impacts of plant-rich dietary patterns: a US prospective cohort study. *Lancet Planet Health*. 2022;6(11):e892-e900. doi:10.1016/S2542-5196(22)00243-1.
10. Dietz WH. Climate change and malnutrition: we need to act now. *J Clin Invest*. 2020;130(2):556-558.
11. Ricciardi V, Mehrabi Z, Wittman H, et al. Higher yields and more biodiversity on smaller farms. *Nat Sustain*. 2021;4:651-657. doi:10.1038/s41893-021-00699-2.
12. Rajan T, Amin SO, Davis K, et al. Redesigning kidney care for the anthropocene: a new framework for planetary health in nephrology. *Can J Kidney Health Dis*. 2022;9:20543581221116215. doi:10.1177/20543581221116215.
13. Barraclough KA, Agar JWM. Green nephrology. *Nat Rev Nephrol*. 2020;16(5):257-268. doi:10.1038/s41581-019-0245-1.
14. Torreggiani M, Fois A, Lippi F, et al. Plant-based diets for CKD patients: fascinating, trendy, but feasible? a green nephrology perspective. *Clin Kidney J*. 2022;16(4):647-661. doi:10.1093/ckj/sfac267.
15. MacNeill AJ, McGain F, Sherman JD. Planetary health care: a framework for sustainable health systems. *Lancet Planet Health*. 2021;5(2):e66-e68. doi:10.1016/S2542-5196(21)00005-X.
16. Ikizler TA, Burrowes JD, Byham-Gray LD, et al. KDOQI clinical practice guideline for nutrition in CKD: 2020 update. *Am J Kidney Dis*. 2020;76(3):S1-S107.
17. Kalantar-Zadeh K, Joshi S, Schlueter R, et al. Plant-dominant low-protein diet for conservative management of chronic kidney disease. *Nutrients*. 2020;12(7):1931. doi:10.3390/nu12071931.
18. Joshi S, McMacken M, Kalantar-Zadeh K. Plant-based diets for kidney disease: a guide for clinicians. *Am J Kidney Dis*. 2021;77(2):287-296.
19. Bach KE, Kelly JT, Palmer SC, Khalesi S, Strippoli GFM, Campbell KL. Healthy dietary patterns and incidence of CKD: a meta-analysis of cohort studies. *Clin J Am Soc Nephrol*. 2019;14(10):1441-1449. doi:10.2215/CJN.00530119.
20. Kim H, Caulfield LE, Garcia-Larsen V, et al. Plant-based diets and incident CKD and kidney function. *Clin J Am Soc Nephrol*. 2019;14(5):682-691. doi:10.2215/CJN.12391018.
21. Rebholz CM, Crews DC, Grams ME, et al. DASH (Dietary Approaches to Stop Hypertension) diet and risk of subsequent kidney disease. *Am J Kidney Dis*. 2016;68(6):853-861.
22. Khatri M, Moon YP, Scarmeas N, et al. The association between a Mediterranean-style diet and kidney function in the northern Manhattan study cohort. *Clin J Am Soc Nephrol*. 2014;9:1868-1875.
23. Hu EA, Steffen LM, Grams ME, et al. Dietary patterns and risk of incident chronic kidney disease: the Atherosclerosis Risk in Communities study. *Am J Clin Nutr*. 2019;110:713-721.

24. Asghari G, Yuzbashian E, Mirmiran P, Azizi F. The association between Dietary Approaches to Stop Hypertension and incidence of chronic kidney disease in adults: the Tehran Lipid and Glucose Study. *Nephrol Dial Transplant*. 2017;32(suppl 2):ii224-ii230.
25. Liu Y, Kuczmarski MF, Miller ER III, et al. Dietary habits and risk of kidney function decline in an urban population. *J Ren Nutr*. 2017;27(1):16-25.
26. Yuzbashian E, Asghari G, Mirmiran P, Amouzegar-Bahambari P, Azizi F. Adherence to low-sodium Dietary Approaches to Stop Hypertension-style diet may decrease the risk of incident chronic kidney disease among high-risk patients: a secondary prevention in prospective cohort study. *Nephrol Dial Transplant*. 2018;33:1159-1168.
27. Foster MC, Hwang SJ, Massaro JM, Jacques PF, Fox CS, Chu AY. Lifestyle factors and indices of kidney function in the Framingham Heart Study. *Am J Nephrol*. 2015;41(4-5):267-274.
28. Ma J, Jacques PF, Hwang SJ, et al. Dietary guideline adherence index and kidney measures in the Framingham heart study. *Am J Kidney Dis*. 2016;68(5):703-715.
29. Dunkler D, Kohl M, Teo KK, et al. Population-attributable fractions of modifiable lifestyle factors for CKD and mortality in individuals with type 2 diabetes: a cohort study. *Am J Kidney Dis*. 2016;68(1):29-40.
30. Haring B, Selvin E, Liang M, et al. Dietary protein sources and risk for incident chronic kidney disease: results from the Atherosclerosis Risk in Communities (ARIC) study. *J Ren Nutr*. 2017;27(4):233-242.
31. Chung HF, Hsu CC, Mamun AA, et al. Dietary patterns, dietary biomarkers, and kidney disease in patients with type 2 diabetes: a repeated-measure study in Taiwan. *Asia Pac J Clin Nutr*. 2018;27(2):366-374.
32. Naderinejad N, Ejtahed HS, Asghari G, Mirmiran P, Azizi F. Association between dietary patterns and incidence of chronic kidney disease in adults with high blood pressure: Tehran Lipid and Glucose study. *Majallah-i Ghudad-i Darun/Riz va Mitabulism-i Iran*. *Int J Endocrinol Metab*. 2016;18:231-242.
33. Asghari G, Momenan M, Yuzbashian E, Mirmiran P, Azizi F. Dietary pattern and incidence of chronic kidney disease among adults: a population-based study. *Nutr Metab (Lond)*. 2018;15:88.
34. Nettleton JA, Steffen LM, Palmas W, Burke GL, Jacobs DR Jr. Associations between microalbuminuria and animal foods, plant foods, and dietary patterns in the Multiethnic Study of Atherosclerosis. *Am J Clin Nutr*. 2008;87(6):1825-1836. doi:10.1093/ajcn/87.6.1825.
35. Lin J, Fung TT, Hu FB, Curhan GC. Association of dietary patterns with albuminuria and kidney function decline in older white women: a subgroup analysis from the Nurses' Health Study. *Am J Kidney Dis*. 2011;57(2):245-254.
36. Chang A, Van Horn L, Jacobs DR Jr, et al. Lifestyle-related factors, obesity, and incident microalbuminuria: the CARDIA (Coronary Artery Risk Development in Young Adults) study. *Am J Kidney Dis*. 2013;62(2):267-275.
37. Liu HW, Tsai WH, Liu JS, Kuo KL. Association of vegetarian diet with chronic kidney disease. *Nutrients*. 2019;11:279. doi:10.3390/nu11020279.
38. Wu CL, Tsai WH, Liu JS, Liu HW, Huang SY, Kuo KL. Vegan diet is associated with a lower risk of chronic kidney disease in patients with hyperuricemia. *Nutrients*. 2023;15:1444. doi:10.3390/nu15061444.
39. Hemler E, Hu FB. Plant-based diets for personal, population, and planetary health. *Adv Nutr*. 2019;10(suppl 4):S275-S283. doi:10.1093/advances/nmy117.
40. Azadbakht L, Atabak S, Esmaillzadeh A. Soy protein intake, cardiorenal indices, and C-reactive protein in type 2 diabetes with nephropathy: a longitudinal randomized clinical trial. *Diabetes Care*. 2008;31(4):648-654. doi:10.2337/dc07-2065.
41. Chen X, Wei G, Jalili T, et al. The associations of plant protein intake with all-cause mortality in CKD. *Am J Kidney Dis*. 2016;67(3):423-430. doi:10.1053/j.ajkd.2015.10.018.
42. Milovanova LY, Volkov AV, Milovanova SY, et al. Soy protein as a part of a low-protein diet is a new direction in cardio- and nephroprotection in patients with 3b-4 stages of chronic kidney disease. *J Ren Nutr*. 2023;33(3):435-442. doi:10.1053/j.jrn.2022.10.008.
43. Bernier-Jean A, Prince RL, Lewis JR, et al. Dietary plant and animal protein intake and decline in estimated glomerular filtration rate among elderly women: a 10-year longitudinal cohort study. *Nephrol Dial Transplant*. 2021;36(9):1640-1647. doi:10.1093/ndt/gfaa081.
44. Podadera-Herreros A, Alcala-Diaz JF, Gutierrez-Mariscal FM, et al. Long-term consumption of a Mediterranean diet or a low-fat diet on kidney function in coronary heart disease patients: the CORDIOPREV randomized controlled trial. *Clin Nutr*. 2022;41(2):552-559. doi:10.1016/j.clnu.2021.12.041.
45. Hu EA, Coresh J, Anderson CAM, et al. Adherence to healthy dietary patterns and risk of CKD progression and all-cause mortality: findings from the CRIC (Chronic Renal Insufficiency Cohort) Study. *Am J Kidney Dis*. 2021;77(2):235-244. doi:10.1053/j.ajkd.2020.04.019.
46. Palmer SC, Maggo JK, Campbell KL, et al. Dietary interventions for adults with chronic kidney disease. *Cochrane Database Syst Rev*. 2017;4:CD011998. doi:10.1002/14651858.CD011998.pub2.
47. Picard K, Senior PA, Perez SA, et al. Low Mediterranean Diet scores are associated with reduced kidney function and health related quality of life but not other markers of cardiovascular risk in adults with diabetes and chronic kidney disease. *Nutr Metab Cardiovasc Dis*. 2021;31(5):1445-1453. doi:10.1016/j.numecd.2021.02.002.
48. Piccoli GB, Di Iorio BR, Chatrenet A, et al. Dietary satisfaction and quality of life in chronic kidney disease patients on low-protein diets: a multicentre study with long-term outcome data (TOrino-Pisa study). *Nephrol Dial Transplant*. 2020;35(5):790-802. doi:10.1093/ndt/gfz147.
49. Carrero JJ, González-Ortiz A, Avesani CM, et al. Plant-based diets to manage the risks and complications of chronic kidney disease. *Nat Rev Nephrol*. 2020;16(9):525-542.
50. Banerjee T, Carrero JJ, McCulloch C, et al. Dietary factors and prevention: risk of end-stage kidney disease by fruit and vegetable consumption. *Am J Nephrol*. 2021;52(5):356-367.
51. Cai Q, Duan MJ, Dekker LH, et al. Ultraprocessed food consumption and kidney function decline in a population-based cohort in the Netherlands. *Am J Clin Nutr*. 2022;116(1):263-273. doi:10.1093/ajcn/nqac073.
52. Osté MCJ, Duan MJ, Gomes-Neto AW, et al. Ultra-processed foods and risk of all-cause mortality in renal

transplant recipients. *Am J Clin Nutr*. 2022;115(6):1646-1657. doi:10.1093/ajcn/nqac053.
53. Ouatahar L, Bannink A, Lanigan G, Amon B. Modelling the effect of feeding management on greenhouse gas and nitrogen emissions in cattle farming systems. *Sci Total Environ*. 2021;776:145932. doi:10.1016/j.scitotenv.2021.145932.
54. Kidney Foundation of Canada. Kidney wellness hub. https://kidney.ca/Kidney-Wellness-Hub.aspx. Published 2023. Accessed January 12, 2024.
55. Arora P, Vasa P, Brenner D, et al. Prevalence estimates of chronic kidney disease in Canada: results of a nationally representative survey. *CMAJ*. 2013;185(9):E417-E423. doi:10.1503/cmaj.120833.
56. Moorthi RN, Latham-Mintus K. Social isolation in chronic kidney disease and the role of mobility limitation. *Clin Kidney J*. 2019;12(4):602-610. doi:10.1093/ckj/sfy134.
57. Fraser SDS, Roderick PJ, May CR, et al. The burden of comorbidity in people with chronic kidney disease stage 3: a cohort study. *BMC Nephrol*. 2015;16:193. doi:10.1186/s12882-015-0189-z.
58. Tonelli M, Wiebe N, Guthrie B, et al. Comorbidity as a driver of adverse outcomes in people with chronic kidney disease. *Kidney Int*. 2015;88(4):859-866. doi:10.1038/ki.2015.228.
59. Lambert K, Mullan J, Mansfield K, Lonergan M. A cross-sectional comparison of health literacy deficits among patients with chronic kidney disease. *J Health Commun*. 2015;20(suppl 2):16-23. doi:10.1080/10810730.2015.1080329.
60. Garg N, Venkatraman A, Pandey A, Kumar N. YouTube as a source of information on dialysis: a content analysis. *Nephrology*. 2015;20(5):315-320. doi:10.1111/nep.12397.
61. Nourish Leadership. 16 opportunities for food in health care. https://www.nourishleadership.ca/infographic. Accessed January 12, 2024.
62. Food as medicine: translating the evidence. *Nat Med*. 2023;29(4):753-754. doi:10.1038/s41591-023-02330-7.
63. D'Alessandro C, Piccoli GB, Calella P, et al. "Dietaly": practical issues for the nutritional management of CKD patients in Italy. *BMC Nephrol*. 2016;17(1):102. doi:10.1186/s12882-016-0296-5.
64. Pais DF, Marques AC, Fuinhas JA. The cost of healthier and more sustainable food choices: do plant-based consumers spend more on food? *Agric Food Econ*. 2022;10(1):18.
65. Hirvonen K, Bai Y, Headey D, Masters WA. Affordability of the EAT-Lancet reference diet: a global analysis. *Lancet Glob Health*. 2020;8(1):e59-e66.
66. BC Renal. Diet. http://www.bcrenal.ca/health-info/managing-my-care/diet. Published 2024. Accessed January 12, 2024.
67. Teaching Kitchen Collaborative. https://teachingkitchens.org/. Published 2024. Accessed January 12, 2024.
68. Kidney Research Scientist Core Education and National Training. Vision and mission. https://kidney.ca/Krescent/About-Us/Mission-Vision. Accessed January 12, 2024.
69. CANSOLVE CKD Network. Indigenous initiatives. https://cansolveckd.ca/our-work/indigenous-initiatives/. Published 2023. Accessed January 12, 2024.
70. Ratima M, Martin D, Castleden H, Delormier T. Indigenous voices and knowledge systems—promoting planetary health, health equity, and sustainable development now and for future generations. *Glob Health Promot*. 2019;26(suppl 3):3-5. doi:10.1177/1757975919838487.
71. Redvers N, Celidwen Y, Schultz C, et al. The determinants of planetary health: an Indigenous consensus perspective. *Lancet Planet Health*. 2022;6(2):e156-e163.
72. National Indigenous Diabetes Association. Gifts from our relations: Indigenous original foods guide. https://www.nourishleadership.ca/resources-1/category/guide. Published 2020. Accessed January 12, 2024.
73. Schrauben SJ, Chen HY, Lin E, et al. Hospitalizations among adults with chronic kidney disease in the United States: a cohort study. *PLoS Med*. 2020;17(12):e1003470.
74. Carino S, Porter J, Malekpour S, Collins J. Environmental sustainability of hospital food services across the food supply chain: a systematic review. *J Acad Nutr Diet*. 2020;120(5):825-873. doi:10.1016/j.jand.2020.01.001.
75. Razalli NH, Cheah CF, Mohammad NMA, Abdul Manaf Z. Plate waste study among hospitalized patients receiving texture-modified diet. *Nutr Res Pract*. 2021;15(5):655-671. doi:10.4162/nrp.2021.15.5.655.
76. do Rosario VA, Walton K. Hospital food service. In: Meiselman H, ed. *Handbook of Eating and Drinking*. Cham: Springer; 2019:1007-1033. doi:10.1007/978-3-319-75388-1_74-1.
77. Cook N, Goodwin D, Porter J, Collins J. Food and food-related waste management strategies in hospital food services: a systematic review. *Nutr Diet*. 2023;80(2):116-142.
78. Carletto FC, Ferriani LO, Silva DA. Sustainability in food service: a systematic review. *Waste Manag Res*. 2023;41(2):285-302. doi:10.1177/0734242X221122604.
79. Saldivar B, Al-Turk B, Brown M, Aggarwal M. Successful incorporation of a plant-based menu into a large academic hospital. *Am J Lifestyle Med*. 2021;16(3):311-317.
80. Nourish Leadership. A guide to sustainable menus. https://menudurable.ca/en/. Published November 2019. Accessed January 12, 2024.