Current Neurology and Neuroscience Reports (2024) 24:507–515
https://doi.org/10.1007/s11910-024-01370-x

REVIEW

Lifestyle Factors and Stroke Prevention: From the Individual to the Community

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Accepted: 1 August 2024 / Published online: 24 August 2024

Abstract

Purpose of review The overwhelming majority of stroke burden can be prevented through the pillars of lifestyle medicine: diet, exercise, sleep, substance abuse, stress management, and healthy relationships. Among these, diet confers the greatest attributable risk.

Recent findings Despite abundant data and integration of lifestyle medicine within major stroke prevention guidelines, several barriers to effective implementation remain. These include lack of emphasis in medical education, integration in hospital certification metrics, reimbursement from medical insurance, and health policy that inadequately addresses social determinants of health. However, both top-down and bottom-up solutions introduced within the last few years are helping to break down these barriers. This review highlights recent literature and interventions that are closing the gap between the theory and practice of stroke prevention through lifestyle risk factors from a US perspective.

Summary By strategically targeting the various institutional barriers, it is possible and essential to substantially reduce stroke burden.

Keywords Stroke · Lifestyle · Nutrition · Exercise · Stroke prevention

Introduction

The overwhelming majority of strokes can be prevented through lifestyle risk factors, according to the American Heart Association's (AHA) 2021 stroke secondary prevention guidelines [1]. Key interventions cited include healthy diet, regular physical activity, and smoking cessation. Similarly, per the World Stroke Organization (WSO), approximately 90% of the global attributable risk is due to 10 modifiable risk factors: elevated blood pressure (56%), poor diet (31%), high body mass index (24%), high fasting glucose (20%), air pollution (20%), smoking (18%), high LDL cholesterol (10%), kidney dysfunction (8%), alcohol use (6%), and low physical activity (2%) [2]. These percentages reflect stroke-related DALYs (disability-adjusted life years), the sum of which exceeds 100% due to some overlap of risk factors. All these factors are heavily influenced, if not exclusively determined, by lifestyle and can be mitigated through lifestyle medicine.

Lifestyle medicine uses therapeutic lifestyle interventions in the prevention, treatment, and reversal of chronic disease. Its pillars are nutrition, physical activity, restorative sleep, stress management, avoidance of risky substances, and positive social connections. Among these, nutrition confers the greatest potential for stroke risk reduction. Per the INTERSTROKE study, patients within the highest tertile of high-quality dietary adherence (measured by the Alternate Health Eating Index) had 40% lower odds of stroke compared to those in the lowest tertile independent of other risk factors [3].

The recommendations for addressing these pillars per AHA guidelines are not accompanied by mechanisms of implementation, a key gap in stroke prevention and care. In contrast, national guidelines for Canada the UK, Australia and New Zealand are more explicit in their national guidelines for lifestyle interventions for stroke prevention [4–6].

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These recommendations range from quantifying servings of fruits and vegetables to individualized counseling by registered dieticians. The WSO performed a systematic review of 200 global stroke guidelines in 2023 to determine what existing stroke guidelines recommend for stroke management [7]. They identified diet modification, physical activity, weight loss, and limiting recreational drug use as ubiquitous recommendations across most guidelines. Despite these recommendations, there remains a mismatch between guidelines and clinical practice in many countries. The United States is a prime example, with lack of integration of lifestyle education in medical education; performance metrics in clinical guidelines; hospital certification metrics; reimbursement through CMS (Centers for Medicare and Medicaid) and private insurers.

Adequate support from hospital systems is also lacking. The American Medical Association "encourages healthful food options be available, at reasonable prices and easily accessible, on the premises of health care facilities" [8]. However, this is a recommendation and not an enforceable metric. The components of stroke center certification metrics (jointly issued by Joint Commission and AHA) typically require level A evidence to support them. This strength of evidence requires multiple, randomized controlled trials showing a clear benefit from an intervention. Due to the short duration, difficulty in blinding, and presence of multiple potential confounders inherent to exercise, nutrition, and other lifestyle research, data of this caliber is lacking.

Additionally, government subsidized lifestyle support does not reach many patients at high risk for stroke. Medicare Part B only covers medical nutrition therapy services provided by a registered dietician if a patient has had diabetes, kidney disease, or a kidney transplant in the last 36 months [9]. Most stroke patients do not have these conditions and therefore would not be eligible. Medicare does not cover exercise programs either [10]. Some Medicare-subsidized exercise programs, such as Silver Sneakers, are only available through Medicare Advantage and a few Medicap providers, which is add-on coverage potentially available through a patient's employer and varies widely in availability [11].

To address the disparity between guidelines and clinical practice, there have been key clinical trials, review articles, and scientific statements published in the last few years. They highlight the power of lifestyle medicine in reducing stroke-related disease and economic burden. Additionally, several open sources of nutrition information and tools for clinicians have emerged. This review will appraise relevant literature on stroke and lifestyle medicine from 2021—2024, emphasizing nutrition, given it has the largest attributable risk among lifestyle risk factors, with a focus on interventional programs in North America.

Diet's Role in Stroke Incidence and Secondary Prevention

A meta-epidemiological study of 78 clinical practice guidelines spanning a wide range of diseases (35 of which were cardiovascular-related) found that 49% of endorsed diets centered on plant foods, specifically promoting the consumption of fruits (69%), vegetables (74%), legumes/pulses (60%), and whole grains (58%) as well as discouraging alcohol (62%) and salt (56%) [12]. The AHA also released a scientific statement showing DASH, Mediterranean, Pescetarian and Vegetarian best aligned with AHA dietary guidance while Paleo and Ketogenic were least aligned [13].

A 2021 meta-analysis of diet's role in secondary stroke prevention is summarized in Table 1 [14]. The authors recommended the best evidence for probable efficacy, feasibility, and low risk of harm was adherence to a Mediterranean-style diet (increasing fruit, vegetable, and fiber), avoiding excessive salt and using folate supplementation in areas with known, low folate fortification. The findings from this study will be used as baseline knowledge upon which data from 2021–2024 will build upon.

One systematic review of 28 studies on diet and stroke risk identified 3 studies showing an association between increased vegetable and fruit consumption and lower stroke risk [15]. Among these, one study used a validated, country-specific questionnaire of dietary recall for around 418,000 people in 9 European countries followed for an average of 12.7 years [16]. The lowest ischemic stroke risks were seen with 200 g/day of fruit and vegetables (OR 0.87, P-trend < 0.001) and 10 g/day dietary fiber (0.77, P-trend < 0.001). Dairy was associated with a statistically significant lower OR of 0.88–0.95 depending on the form of dairy, however low vs high fat sources of dairy could not be differentiated. Interestingly, 50 g/day red meat was associated with an OR of 1.14 ($p = 0.02$) but this risk was attenuated when adjusted for the other statistically significant foods (OR 1.07, $p = 0.20$). No significant association was seen with legumes, nuts, poultry, white fish, or fatty fish, although the authors suggest that legume and nut consumption may have been too low to measure. However, this lack of association with either legume or fish intake and stroke has also been demonstrated in other meta-analyses [17, 18]. For hemorrhagic stroke (1430 cases), higher risk was associated with higher egg consumption (per 20 g/day, 1.25; 1.09–1.43, P-trend = 0.002). The interaction in red meat underscores two key dietary concepts. First, that foods interact when it comes to stroke risk, making it challenging to study the health effects of a single food in isolation. Second, the protective effects of some foods, such as fruits and vegetables, attenuate the risk of less healthy

Table 1 Summary of evidence for diet's role in secondary stroke prevention as of 2021, adapted with permission from English et al

	Number of studies (number of participants, where applicable)	Certainty of evidence	Suggested guidance for clinical practice in secondary stroke prevention
People at risk of stroke to prevent first stroke			
Folic acid supplements	Three meta-analyses of RCTs	Moderate	People at risk of stroke living in areas of low folate fortification should be advised to take low-dose folic acid supplements (0.5–5-0 mg/day) with or without low-dose vitamin B12 (≤0.05 mg/day)
Vitamin D supplements	One meta-analysis of RCTs	Moderate	People at risk of stroke should not be advised to take vitamin D supplements
Vitamin B3 (niacin) supplements	One meta-analysis of RCTs	Moderate	People at risk of stroke should not be advised to take vitamin B3 (niacin) supplements
Omega-3 fatty acids	Two meta-analyses of RCTs; one additional cohort Moderate study (2709)	Moderate	People at risk of stroke should not be advised to take omega-3 supplements
High intakes of fruit and vegetables	One meta-analysis of cohort studies	Low	People at risk of stroke should be advised to increase fruit and vegetable consumption
Low-fat diet	One RCT (48,835); one meta-analysis of RCTs	Moderate	People at risk of stroke should not be advised to follow a low-fat diet
Mediterranean-style diet	One RCT (7447); one meta-analysis of cohort studies; one additional cohort study (5200)	Moderate	People at risk of stroke should be supported to follow a Mediterranean-style diet
People with previous stroke or TIA or at risk of stroke to reduce blood pressure			
Salt reduction	One RCT (20 996); one meta-analysis of RCTs	Moderate	People with previous stroke should be supported to limit salt intake
DASH-style diet	One meta-analysis of RCT	Low	People at risk of stroke should be supported to follow a DASH-style diet

foods such as red meat. Meaning, having a salad with a steak may be healthier than having steak alone.

Vegetarian, Vegan, and Plant-Based Diets

A systematic review pooling 13 cohorts examined the risk of heart disease and stroke in vegetarian and vegan diets compared to nonvegetarian diets [19]. Although statistically significant associations were seen with cardiovascular disease and ischemic heart disease, these were not seen for total, ischemic, or hemorrhagic stroke. Stroke cases only made up around 9% of index events in this study. Another meta-analysis looking at 10 studies on plant-based dietary patterns and risk of cardiovascular disease found a significant protective effect for cardiovascular disease, but not stroke. Again stroke only made up 14% of incident events [20]. But in a meta-analysis of 7 cohort studies comparing vegetarian to nonvegetarian diets specifically looking at risk of incident total, ischemic, and hemorrhagic stroke, there was still no stroke risk reduction with vegetarian diets [21].

Japanese-Style Diet

A systematic review and meta-analysis examined the effect of a Japanese-style diet on stroke risk [22]. Pooled relative risk for highest compared to lowest adherence conferred a 0.80 ($p=0.003$) relative risk reduction. On subgroup analysis, the components of the diet that were associated with a statistically significant reduction in stroke risk were high consumption of fruit, fish, green tea, plant-derived protein, fiber, and dairy. The only component associated with a statistically significant increased risk of stroke was salt. Components that did not reach statistical significance were saturated fat, rice, soy, and meat. The authors did not specify whether "meat" referred to red meat or all meats. Vegetable intake was not significantly associated ($p=0.053$) with reduced stroke risk.

Mediterranean *vs* Low-Fat Diet

A randomized controlled trial in Spain, the CORDIOPREV study, randomized 1,002 patients with established coronary disease to a Mediterranean vs a low-fat diet for 7 years

[23]. It employed dieticians to institute the interventions. There was no significant difference in primary outcome of composite major cardiovascular events. However multivariable-adjusted analysis showed Mediterranean was slightly superior to low-fat for primary outcome, HR 0.72 (95% CI 0.54–0.96). There was no significant difference in the rate of strokes events, 0.016% (Mediterranean) vs 0.03% (low-fat) ($p = 0.123$). This contrasts with the historical PREDIMED, Mediterranean vs low fat study of 7,447 patients, which showed a significantly reduced risk of stroke favoring Mediterranean, OR 0.58 (95% CI 0.42–0.82) relative to the control group [24].

Dairy

In a meta-analysis of 55 studies, total dairy intake was associated with modestly lower stroke incidence when comparing high to low dairy consumption, RR 0.90 (95% CI 0.85–0.96) [25]. Each additional dose of total dairy was associated with a 4% lower stroke risk. Among individual dairy products, a significantly lower risk of stroke persisted for high fat dairy, low fat dairy, and cheese but no associations were seen with milk or yogurt.

Green Leafy Vegetables

A meta-analysis of 27 studies found green leafy vegetable intake was associated with lower stroke risk (RR 0.88; 95% CI 0.81–0.95) with a dose dependent relationship (RR 0.73, 95% CI 0.57–0.94) per 100 g increment of intake [26].

High Glycemic Loads

A meta-analysis found an association between high glycemic load foods and stroke incidence [27]. Among 7 studies, this ranged from a statistically significant RR of 1.12–1.71. This association was demonstrated across both men and women, body mass indices, and geographic locations spanning multiple continents. High glycemic index foods were not associated with higher stroke incidence but were associated with higher stroke mortality in one study.

Flavonoids

A meta-analysis of 10 studies found an association between flavonoids and reduced stroke risk [28]. Flavonoids are plant metabolites that serve several biological functions in plants including pigmentation, ultraviolet radiation protection, and antioxidant activity for metabolic pathways. They are found in a variety of fruits, vegetables, and in tea. The specific subtypes of flavonoids found to reduce stroke risk were flavanones (RR 0.85, 95% CI 0.78–0.93) and flavan-3-ols (RR 0.92, 95% CI 0.82–1.02). High dietary sources of flavanones include citrus fruits while cacao and tea are rich in flavan-3-ols. Moreover, there was a dose dependent relationship of 50 mg/day increments reducing stroke risk by 11% (RR 0.89, 95%CI 0.84–0.94) in flavanones and 200 mg/day increments associated with a 14% (RR 0.86, 95%CI 0.75–0.98) stroke reduction in flavan-3-ols.

Community-Based Nutrition Education Programs

One systematic review found 74 community-based, culturally tailored education programs for black communities [29]. Studies lasted less than 6 month (57%), over 1 year (28%), or 6 months-1 year (11%). Encouragingly, 45% of programs had age inclusion criteria of 18–30 years. Sample sizes ranged from 9 to 638. The majority targeted risk factors for stroke such as diabetes (65%) and hypertension (30%), but only 1% were stroke-specific making it hard to draw specific conclusions about stroke risk reduction.

A systematic review of culinary intervention studies in people with neurological conditions identified 10 programs, mostly in English-speaking countries, of which only 3 were tailored to stroke/TIA [30]. Strengths of these interventions included: delivery by appropriate personnel such as dieticians and occupational therapists. Limitations included: lack of standardized interventions, lack of guided peer support and collaborative activities, unclear optimal duration and frequency of interventions, lack of tailoring to a patient's ability, delivery in scheduled sessions limiting flexibility of participation, availability of long-term fidelity to the intervention, socioeconomic and language barriers.

Multi-Domain Lifestyle Intervention and Dietary Inventory Studies

A few lifestyle interventional trials combining therapeutic diet, exercise, and other lifestyle changes have been published in recent years. An observational study followed 41,043 Chinese patients over 5.65 years and categorized them into quartiles of adherence to the AHA's Life's Essential 8 (body mass index, cigarette smoking, diet quality, physical activity, sleep health, lipid, blood glucose, and blood pressure) [31]. They found a HR (hazard ratio) of 0.33 ($p < 0.0001$) for incident stroke risk in patients with ideal vs poor adherence.

A Finnish randomized control trial looked at the effects of a 2-year multidomain lifestyle intervention (diet, exercise, cognitive activity, and vascular monitoring) on stroke and other vascular outcomes measures [32]. Key interventions included individualized dietary counseling promoting increased consumption of fruits, berries, vegetables, whole grains, margarine and oil, and fish, progressive muscle

training 1–3 times/week, and aerobic exercises 2–5 times/week. 11.5% of study participants had a history of cardiovascular disease. Among 1,259 patients aged 60–77 years followed for an average of 7.8 years, there were a total of 68 TIAs and 105 strokes. The adjusted HR for stroke/TIA was 0.4 (95% CI 0.2–0.81) in the intervention group. Interestingly, the rate of outcome events was sustained at 5 years.

Another study looked at cardiovascular outcomes in 3,234 patients with impaired glucose tolerance who were randomized to metformin alone, intensive lifestyle alone, or placebo for 3 years and then followed for an average of 18 years [33]. No significant difference was found between the 3 groups for total major cardiovascular events or non-fatal stroke alone ($n = 28$ placebo, 16 metformin, and 39 lifestyle). This was despite a statistically significant relative incidence reduction of diabetes by 7% in the intensive lifestyle group and 5% in the metformin group compared to placebo. Key limitations of this study include concurrent use of antihypertensive and statin treatments; diabetes not being the only risk factor for stroke; inability to control the intensity of lifestyle interventions.

Another systematic review examined patients specifically at mid-life [34]. Based on 19 studies, the authors attributed a 60–67% estimated stroke risk reduction from a combination of prudent health behaviors. The attributable risks from each component of health behaviors were: diet (12–33%), physical activity (15–44%), smoking (9–23%), overweight (8%). This underscores that robust health benefits can be gained despite being overweight.

Practical Resources for Physicians

Although general information on healthy eating and lifestyle for stroke prevention is available on the websites of many mainstream medical societies, the practical steps of implementation are typically lacking. Several open access resources have emerged in the last few years, responding to increasing interest from both the healthcare community and the public. We have summarized a few here. It is important to note that most of them emphasize a vegan diet rather than plant-based. A plant-based diet allows for some animal products provided they make up a minority of the diet unlike a vegan diet where no animal products are permitted.

The Physicians Committee For Responsible Medicine (PCRM) provides a free evidence-based, peer-reviewed summary of nutritional data for the prevention and treatment of disease [35]. Users can search for nutrition information pertaining to a specific disease (stroke being one among them) that is presented alongside the allopathic prevention and treatment of that disease. The platform also has pages with more general topics such as the role of macronutrients in health or how to teach patients good health practices. It is available in both app and web-based format. This platform addresses the gap in nutrition information apparent in more mainstream sources of evidence-based literature, such as UpToDate.com.

The American College of Lifestyle Medicine (ACLM) provides 5.5 h of free continuing medical education (CME) on the role of food as medicine to clinicians [36]. It is presented as a web-based, self-paced module. The course serves as a foundation to understand food's role in the prevention and treatment of the most common chronic diseases such as hypertension, diabetes, and hyperlipidemia that contribute to the risk of stroke and other chronic diseases. ACLM also provides a range of other lifestyle medicine services including shared medical appointments financial calculators, free curricular integration tools for medical students and residency training programs, and dedicated certification tracks for health systems interested in having lifestyle medicine treatment and/or education programs [37, 38].

Greener By Default is a non-profit organization that provides free consults to healthcare systems on offering plant-based foods in hospital menus as the default, while giving diners the opportunity to opt in to meat and dairy [39]. They also provide free data on cost, patient engagement, and patient satisfaction scores after program implementation. They piloted their project at 11 New York City public hospitals in partnership with NYC Health and Hospitals. Success was measured with 60% of eligible patients opting into plant-based meals, a patient satisfaction score of 95%, and the program leading to a $500,000 annual cost savings. Other health systems are beginning to pilot similar programs in partnership with this organization.

Concierge Service Lifestyle Or Brain Health Programs

Filling the gap of CMS-subsidized stroke prevention or brain health programs, a few concierge stroke prevention services and brain health educational services have become available for patients that have the means to pay out-of-pocket. Neuro Academy is a multimodal lifestyle coaching program to optimize brain health started by a neurologist couple, Drs. Dean and Ayesha Sherzai, who have conducted extensive research on lifestyle and brain health in Loma Linda, California [40]. It includes self-paced learning modules, live weekly cooking sessions, live weekly group coaching with a neurologist, and online community support. However it does not offer direct clinical care or medical advice. Some health systems are beginning to incorporate multi-modal, lifestyle medicine using standardized questionnaires, such as the Brain Care Score, in conjunction with allopathic stroke care, truly embodying the meaning of a "comprehensive stroke center" [41].

Several similar online brain health coaching programs exist, but importantly, are usually not administered or overseen by a neurologist or other type of physician. Both neurological and psychiatric conditions are often lumped under the umbrella of "brain health". It is often unclear what conditions these programs address and what evidence-base supports the interventions. These programs are not accountable to clinical guidelines or standards, may not be stroke-specific, and both patients and physicians have little guidance on choosing one that is safe, effective, and reasonably priced.

Exercise's Role in Stroke Prevention

We found very few recent, relevant studies on exercise and stroke prevention. A systematic review compared sex differences in physical activity and incidence across 37 studies [42]. For total stroke risk, 41% of studies found an association of decrease total stroke risk and physical activity in both men and women (35% of studies in women only, 18% in men only). For ischemic stroke risk, 50% of studies found an association of decrease total stroke risk and exercise in both men and women (40% of studies in women only, 10% in men only). The relative risk reduction across studies ranged from 11–52% and there was no clear preferential benefit in one sex. For women, stroke relative risk reduction ranged 20–40% across most studies, averages for men were not reported. It's worth noting that most of these studies examined physical activity that was recreational while a minority were occupation-specific or related to commuting. Given the broad range of doses in physical activity, dose-specific conclusions could not be draw.

A systematic review on sedentary behavior identified 7 studies with a median follow up of 12.2 years for 15,135 stroke events [43]. It found a pooled HR of 1.16 (95% CI 1.09–1.24) for sedentary behavior and stroke risk. A slight and nonsignificant HR of 1.01 (95% CI 0.97–1.05) occurred at 3.7 h/d (hours/day), but jumped to HR 1.21 (95% CI 1.12–1.31) at 11 h/d. The risk increased by 6% for every additional hour beyond 6.5 h/d. This study was limited by data being self-reported rather than derived from an accelerometer.

Limitations of our Data

A key limitation is that strokes are often included in composite cardiovascular outcomes. On subgroup analysis, the number of index events that are strokes are usually the least common among them. Another limitation is the confounding effects of lifestyle interventions alongside diet such as regular exercise, stress reduction, and smoking cessation included in multidomain lifestyle intervention trials or independent patient behaviors that are not reported. This makes it hard to tease out the relative contribution of each intervention to outcome measures. A limitation of exercise in the literature is most studies use exercise to regain functional capacity as part of a stroke rehab program rather than aimed at secondary prevention. Those that do use exercise for stroke prevention range widely in dose and frequency. Lastly, we were unable to find studies referencing data between 2021–2024 on stroke risk and tobacco or alcohol use.

Conclusions

Although evidence examining diets labeled as plant-based, vegetarian, or vegan diet in stroke prevention is lacking, the data presented in this paper strengthen existing evidence for dietary patterns in stroke prevention including Mediterranean and DASH diets [1, 14, 44]. The unifying principles of all these diets is that they emphasize plants and minimally processed foods. This allows people to adopt a variety of diets appropriate for their culture, budget, and accessibility. The AHA now recommends modifying diets to be culturally appropriate as highlighted in their scientific statement on diabetes and atherosclerotic cardiovascular disease among Asian Americans [45]. Stroke prevention dietary guidelines are gradually shifting to recommending dietary patterns or "Mediterranean-style" diets rather than limiting recommendations to any particular dietary label.

But how can such dietary recommendations be implemented and scaled? The good news is that there is precedent for large-scale, government subsidization of nutritional and multi-domain lifestyle interventions for the secondary prevention of chronic disease. In 2011, the Ornish Reversal Program began to reimburse Medicare beneficiaries with common forms of heart disease including myocardial infarction and heart failure. It employs multimodal interventions focusing on diet, exercise, and the other pillars of lifestyle medicine both in-person and remotely [46]. The program also reimburses major private insurers such as Anthem and Aetna. It has demonstrated cost effectiveness, high adherence, and reductions in angina and improvement in exercise capacity among other clinical outcome measures. However only 34% of qualifying patients are typically enrolled in these cardiac rehab programs, underscoring the need to increase awareness and accessibility [47]. Given the large overlap of most cardiovascular and cerebrovascular risk factors, a similar program can and should be created for stroke.

A causal relationship between diet and stroke risk reduction would be best demonstrated by large, randomized controlled trials. This level of evidence is likely necessary to justify the cost of subsidized stroke prevention programs

like the Ornish Reversal Program. However, there are several considerations:

- **Confounders**: patients can eat a seemingly infinite combination of different foods that are sourced, prepared, and dosed differently. These foods, along with health behaviors such as sleep, exercise, stress, and social connection, may have interactions.
- **Cost**: health benefits from dietary interventions are best demonstrated with years of follow up making the cost of such studies high.
- **Post-stroke disability**: the unique disabilities suffered by stroke survivors such as dysphagia, hemiparesis, aphasia, and cognitive impairment can make participation in and adherence to such programs challenging.

In the absence of randomized controlled trials, English et al., in their seminal meta-analysis on diet's role in secondary stroke prevention, recommend "(…) there is value in carefully evaluating evidence. The GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach is an alternative method for assessing probable causation and providing guidance for clinical practice when evidence is uncertain." [14]. This is a reasonable approach to incorporate diet into stroke clinical practice guidelines and stroke center certification metrics given the low risk of harm, established evidence base of co-benefits to other organ systems (namely the cardiovascular system), and general healthcare cost-savings associated with preventative care. The time is ripe for preventative medicine to take center stage in stroke prevention. Reducing global stroke burden is not only necessary to maintain a population's brain capital and reduce healthcare spending, but also aligns with new initiatives from major medical organizations. These include the AHA's Food Is Medicine Initiative as well as those from the federal government such as the White House's Hunger, Nutrition, and Health Strategy [48, 49].

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Acknowledgements None

Author Contribution AS wrote the main manuscript and Table 1. All authors provided edits and reviewed the manuscript.

Data Availability No datasets were generated or analysed during the current study.

Declarations

Conflict of Interest Ali Saad is a board member of Greener By Default; co-chair of the neurology member interest group and member of the global sustainability committee at the American College of Lifestyle Medicine. No financial compensation received through any of these affiliations.
Laurel Cherian receives salary support from the NIH funded Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) Diet in Stroke Patients NCT04337255.
Karima Benameur declares that she has no conflict of interest.

Human and Animal Rights Informed Consent This article does not contain any studies. with human or animal subjects performed by any of the authors.

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