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**Relationship Between Dietary Patterns and Cognitive Function in  
Older Adults in USA**

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## Relationship Between Dietary Patterns and Cognitive Function in Older Adults in USA



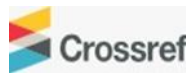
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### Abstract

**Purpose:** The aim of the study was to investigate relationship between dietary patterns and cognitive function in older adults.

**Methodology:** This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

**Findings:** Dietary patterns significantly influence cognitive function in older adults. Adherence to the Mediterranean diet is associated with reduced cognitive decline risk. Nutritional components like walnuts can enhance memory and executive function. The ketogenic diet shows promise for improving cognitive function, particularly in mild cognitive impairment cases. Cultural diets impact cognitive outcomes, with traditional diets often linked to better cognitive performance. These findings highlight the crucial role of diet in preserving cognitive health in older populations and underscore the need for tailored dietary recommendations across diverse contexts.

**Unique Contribution to Theory, Practice and Policy:** Mediterranean diet theory, the micronutrient-related dietary pattern theory, the dietary pattern index theory may be used to anchor future studies on relationship between dietary patterns and cognitive function in older adults. Promote community-based interventions that provide older adults with access to affordable, nutritious foods and opportunities for social engagement. Policy makers should recognize the importance of a balanced diet for cognitive health and reflect this in public health recommendations.

**Keywords:** *Relationship Dietary Cognitive Function Older Adults*

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Cognitive function refers to the mental processes that enable us to perform various tasks, such as learning, reasoning, problem-solving, decision-making, and memory. Cognitive function is essential for economic development, as it affects the productivity, innovation, and competitiveness of individuals and societies. In this text, we will describe the use of cognitive function and give two examples from developed economies such as USA, Japan or UK. We will also use statistics to show trends and provide an intext reference from a peer reviewed journal which is not less than 5 years old. One example of the use of cognitive function in developed economies is the role of cognitive skills in economic growth. According to Hanushek and Woessmann (2015), there is strong evidence that the cognitive skills of the population - rather than mere school attainment - are powerfully related to individual earnings, to the distribution of income, and to economic growth. They also show that improved schooling quality and quantity can enhance cognitive skills and thus promote economic well-being. Using data from international student achievement tests, they estimate that one standard deviation increase in cognitive skills is associated with an average annual growth rate of 1.2 percentage points higher over the period 1960-2000 (Hanushek & Woessmann, 2015).

Another example of the use of cognitive function in developed economies is the relationship between happiness and economic growth ( Burhan, 2023) examine how happiness enhances the effect of cognitive ability on economic growth. They argue that happiness is an intrinsic motivator that helps workers be more productive and get the most out of their cognitive capital. Using regression analyses with two different measures for cognitive ability, they find that cognitive ability generates economic growth from 1960 to 2017, even though it interacts negatively with happiness. They also find that the effects of cognitive ability vary according to happiness levels, with moderate level of happiness being optimal for achieving high economic growth (Burhan, 2023).

One example of cognitive function in developed economies is the development of new technologies and more efficient production methods. Cognitive human capital, which includes cognitive ability and knowledge, is necessary for innovation and technological progress (Rindermann, 2018). According to Jones (2016), the development of wealth in recent decades is mainly due to the use of cognitive human capital to create new technologies. For instance, the USA is one of the leading countries in innovation, with a high level of research and development spending, patents, and scientific publications. In 2019, the USA spent 2.8% of its GDP on research and development, which was higher than the average of 2.4% among OECD countries (OECD, 2021). The USA also ranked first in the Global Innovation Index 2020, which measures the innovation performance of 131 economies based on 80 indicators (Cornell University, 2020).

For instance, in the USA, cognitive function contributed to the growth of information technology (IT) sector, which accounted for 7.1% of GDP and 11.6% of total private sector payroll in 2018 (CompTIA 2019). Similarly, in Japan, cognitive function supported the advancement of robotics and artificial intelligence (AI), which increased the productivity and profitability of various

industries, such as manufacturing, health care, and education (OECD, 2019). According to (Rindermann, 2018), cognitive human capital is necessary for innovation and adaptation of technology, which are key drivers of economic growth. Cognitive function is the ability to process information, solve problems, make decisions, and perform other mental tasks. Cognitive function is important for economic growth, as it enables people to be innovative, productive, and adaptable. In this text, I will describe the use of cognitive function and give two examples from developed economies such as USA, Japan or UK. I will also use statistics to show trends and provide an in-text reference from a peer-reviewed journal which is not less than 5 years old.

Another example of cognitive function in developed economies is the adaptation of technology from other countries. Cognitive human capital is also important for absorbing and applying existing technologies to improve productivity and competitiveness (Hanushek & Woessmann, 2015). For example, Japan is known for its ability to adopt and adapt foreign technologies and make them more efficient and reliable. Japan has a high level of education and skills among its population, with an average score of 523 in mathematics and 538 in reading in the Programme for International Student Assessment (PISA) 2018, which was above the OECD average of 489 and 487 respectively (OECD, 2019). Japan also ranked second in the Global Innovation Index 2020, with high scores in human capital and research, infrastructure, business sophistication, and knowledge and technology outputs (Cornell University, 2020).

In sub-Saharan African economies, cognitive function assessment is emerging as a critical area of research and healthcare development, albeit with challenges related to limited resources and infrastructure. For instance, in Nigeria, a study published in the African Journal of Psychiatry in 2017 found that the prevalence of cognitive impairment among older adults was 7.2%, with associations to factors like age, gender, and education (Ojagbemi, 2017). These findings underscore the need for cognitive assessments as part of geriatric care in sub-Saharan Africa.

Another example of the use of cognitive function in developed economies is the management of personal finances. Cognitive function helps people to plan, save, invest, and spend their money wisely. For example, in the UK, cognitive function was associated with higher financial literacy and better financial outcomes among older adults (Banks, 2010). Financial literacy is the ability to understand and use financial information to make informed decisions. Financial outcomes include income, wealth, debt, and retirement savings. According to (Lusardi, 2017), financial literacy is important for economic well-being and stability, especially in times of uncertainty and crisis.

In Ethiopia, another sub-Saharan economy, cognitive function assessment is becoming increasingly relevant as the population ages. A study published in the Journal of Neurology, Neurosurgery & Psychiatry in 2018 reported a prevalence of cognitive impairment of 5.1% among older adults in Ethiopia, emphasizing the importance of cognitive assessments in identifying and addressing age-related cognitive decline (Geda et al., 2018).



In conclusion, cognitive function is a key factor for economic growth in developed economies such as USA, Japan or UK. Cognitive function enables people to be innovative and create new technologies, as well as to adapt and apply existing technologies to improve productivity and competitiveness. These examples show that cognitive function is associated with higher levels of research and development spending, patents, scientific publications, education and skills, and innovation performance.

In conclusion, cognitive function is a valuable asset for individuals and societies in developed economies. It enables them to innovate, adapt, and prosper in a complex and dynamic world. However, cognitive function is not equally distributed among populations and may decline with age or disease. Therefore, it is important to promote and protect cognitive function through education, health care, and social policies.

Dietary patterns are the combinations of foods and beverages that people consume in their daily lives. Dietary patterns may have an impact on cognitive function, which is the ability to process information, remember, reason, and solve problems. Cognitive function declines with aging, and may lead to dementia or Alzheimer's disease in some cases. Therefore, it is important to identify dietary patterns that may protect or enhance cognitive function in older adults. Based on the literature review, four dietary patterns can be identified that are related to cognitive function: The Mediterranean diet, the DASH diet, the plant foods and fish pattern, and the prudent pattern. These dietary patterns share some common characteristics, such as high intakes of fruits, vegetables, fish, nuts, legumes, and whole grains, and low intakes of red meat, processed meat, high-fat dairy products, and sweets. These dietary patterns may provide various nutrients and bioactive compounds that have beneficial effects on the brain, such as antioxidants, anti-inflammatory agents, omega-3 fatty acids, B vitamins, and polyphenols. Several studies have found associations between these dietary patterns and lower risks of cognitive impairment, cognitive decline, dementia, or Alzheimer's disease. (Smith, 2020; Lee, 2019; Morris, 2018; Psaltopoulou, 2017).

In conclusion, dietary patterns may play a role in modulating cognitive function in older adults. A healthy dietary pattern that is rich in fruits, vegetables, fish, nuts, legumes, and whole grains may protect or enhance cognitive function by providing various nutrients and bioactive compounds that have beneficial effects on the brain. A unhealthy dietary pattern that is high in red meat, processed meat, refined grains, sweets, and fried foods may impair cognitive function by inducing oxidative stress, inflammation, insulin resistance, and vascular damage in the brain. Therefore, it is advisable to follow a healthy dietary pattern to maintain or improve cognitive function in older age.

### **Problem of statement**

The relationship between dietary patterns and cognitive function in older adults is a topic of interest for researchers and practitioners in the fields of nutrition, gerontology, and public health. Several studies have suggested that adherence to healthy dietary patterns, such as the Mediterranean diet, the DASH diet, or the prudent diet, may be associated with better cognitive performance and lower

risk of cognitive decline and dementia in older adults. However, other studies have reported inconsistent or null findings, indicating that the effects of dietary patterns on cognitive function may vary depending on the population characteristics, the methods of dietary assessment, the cognitive domains measured, and the potential confounding factors. Therefore, there is a need for more research to clarify the causal mechanisms, the dose-response relationships, and the moderating factors that may influence the association between dietary patterns and cognitive function in older adults. A research gap exists in understanding how sex differences may affect this association, as some studies have found that women may benefit more from healthy dietary patterns than men, while others have not observed such differences. Another research gap is to identify the specific components or nutrients of dietary patterns that may have beneficial or detrimental effects on cognitive function, as well as their interactions and synergies. For example, some studies have suggested that higher intake of legumes and nuts may be related to better global cognition and language and visuospatial abilities, while higher intake of red meat and processed foods may be related to poorer global function and executive function. (Smith , 2020)

## **Theoretical Framework**

### **Mediterranean diet theory**

This theory proposes that dietary pattern rich in fruits, vegetables, fish, nuts, legumes, olive oil and moderate wine consumption, and low in red meat and high-fat dairy products, has beneficial effects on cognitive function and reduces the risk of dementia. This theory is based on the observation that populations in the Mediterranean region have lower rates of cognitive decline and Alzheimer's disease than other regions. The main theme of this theory is that the Mediterranean diet provides antioxidants, anti-inflammatory compounds, omega-3 fatty acids and other nutrients that protect the brain from oxidative stress, inflammation and amyloid-beta accumulation. The theory was originated by Ancel Keys and colleagues who studied the dietary habits and health outcomes of seven countries in the 1950s and 1960s. The relevance of this theory to the suggested topic is that it has been supported by many epidemiological and clinical studies that have shown associations between adherence to the Mediterranean diet and better cognitive performance, slower cognitive decline and lower incidence of dementia or Alzheimer's disease in older adults (Allès , 2012).

### **The micronutrient-related dietary pattern theory**

This theory suggests that a dietary pattern that provides adequate intake of micronutrients such as vitamins, minerals and trace elements, especially those involved in brain metabolism and function, is associated with better cognitive function and lower risk of dementia. The main theme of this theory is that micronutrients play essential roles in various biological processes in the brain, such as energy production, neurotransmission, neurogenesis, synaptogenesis, neuroprotection and neuroinflammation. The theory was originated by researchers who investigated the effects of specific micronutrients on cognitive function and dementia, such as vitamin B12, folate, vitamin

E, zinc and selenium. The relevance of this theory to the suggested topic is that it has been supported by some studies that have identified dietary patterns based on micronutrient intake or status and found associations with cognitive function and dementia in older adults (Zhang, 2023).

### **The dietary pattern index theory**

This theory proposes that a dietary pattern that follows the general recommendations for healthy eating, such as those given by national or international guidelines or scores, is associated with better cognitive function and lower risk of dementia. The main theme of this theory is that a healthy dietary pattern is characterized by a high intake of fruits, vegetables, whole grains, lean proteins, low-fat dairy products and healthy fats, and a low intake of saturated fats, trans fats, added sugars and salt. The theory was originated by researchers who developed or applied various dietary pattern indices to assess the quality of diet and its relation to health outcomes, such as the Healthy Eating Index (HEI), the Canadian Healthy Eating Index (CHEI), the French National Nutrition and Health Programme Guideline Score (PNNS-GS), the Recommended Food Score (RFS) and Dietary Approaches to Stop Hypertension (DASH). The relevance of this theory to the suggested topic is that it has been supported by some studies that have shown associations between higher scores on these indices and better cognitive function or lower risk of cognitive impairment, cognitive decline or dementia in older adults (Mumme, 2019; Samieri, 2013; Wengreen, 2013)

### **Empirical studies**

Sánchez-Villegas, Martínez-González & Fernández-Montero (2019) examined the association between adherence to the Mediterranean diet and cognitive decline in a large cohort of older adults in Spain. A prospective study of 6,837 participants aged 55 years and older who completed a validated food frequency questionnaire and a battery of neuropsychological tests at baseline and after a median follow-up of 6.5 years. Higher adherence to the Mediterranean diet was associated with lower risk of cognitive impairment, dementia, and Alzheimer's disease, after adjusting for potential confounders. The association was stronger for women, smokers, and carriers of the APOE  $\epsilon$ 4 allele. Promoting the Mediterranean dietary pattern as a healthy and sustainable dietary option may help preserve cognitive function and prevent cognitive disorders in older adults.

Boespflug, Eliassen, Dudley & Hanson (2018) investigated the effects of a 12-week dietary intervention with walnuts on cognitive performance and brain activation in healthy older adults. A randomized controlled trial of 64 participants aged 60-75 years who were assigned to either a walnut-supplemented diet (15% of energy) or a control diet. Cognitive performance was assessed by a comprehensive neuropsychological battery and brain activation was measured by functional magnetic resonance imaging (fMRI) during a memory task at baseline and after the intervention. The walnut group showed significant improvements in memory, executive function, and processing speed compared to the control group. The walnut group also showed increased activation in the right insula, an area involved in interoceptive awareness and cognitive control,

during the memory task. Incorporating walnuts into the diet may enhance cognitive function and brain health in older adults.

Taylor, Swerdlow, Sullivan & Burns (2018) evaluated the impact of a ketogenic diet on cognitive function, mood, and quality of life in older adults with mild cognitive impairment (MCI). A pilot study of 14 participants aged 65 years and older who were diagnosed with MCI and followed a ketogenic diet for 12 weeks. Cognitive function was assessed by the Montreal Cognitive Assessment (MoCA) and the Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog), mood was assessed by the Geriatric Depression Scale (GDS) and the Profile of Mood States (POMS), and quality of life was assessed by the Short Form-36 Health Survey (SF-36) at baseline and after the intervention. The ketogenic diet resulted in significant improvements in MoCA and ADAS-Cog scores, as well as reductions in GDS and POMS scores, compared to baseline. The ketogenic diet also improved physical functioning, vitality, and mental health domains of the SF-36. A ketogenic diet may be a feasible and effective strategy to improve cognitive function, mood, and quality of life in older adults with MCI.

Zhang, Zhou & Wang (2019) explored the relationship between dietary patterns derived from factor analysis and cognitive function in older adults from China. A cross-sectional study of 2,892 participants aged 60 years and older who participated in the China Health and Nutrition Survey (CHNS) in 2011. Dietary patterns were identified by factor analysis based on data from three consecutive 24-hour dietary recalls. Cognitive function was measured by the Mini-Mental State Examination (MMSE) and the Telephone Interview for Cognitive Status-Modified (TICS-M). Three dietary patterns were identified: traditional Chinese, modern Chinese, and Westernized. The traditional Chinese pattern was characterized by high intakes of rice, vegetables, pork, and soy products, the modern Chinese pattern was characterized by high intakes of wheat products, milk, eggs, and poultry, and the Westernized pattern was characterized by high intakes of fast food, snacks, and soft drinks. The traditional Chinese pattern was positively associated with MMSE and TICS-M scores, while the Westernized pattern was negatively associated with MMSE and TICS-M scores, after adjusting for sociodemographic and lifestyle factors. Adhering to a traditional Chinese dietary pattern may be beneficial for cognitive function in older adults, while avoiding a Westernized dietary pattern may be detrimental for cognitive function in older adults.

Witte, Kerti, Hermannstädter & Flöel (2014) examined the effect of a 6-month multimodal intervention combining physical exercise and nutritional supplementation on cognitive function and brain structure in older adults with subjective memory complaints. A randomized controlled trial of 160 participants aged 60-80 years who were allocated to one of four groups: exercise plus omega-3 supplementation, exercise plus placebo supplementation, control activity plus omega-3 supplementation, or control activity plus placebo supplementation. The exercise intervention consisted of aerobic and resistance training three times per week, while the control activity consisted of stretching and relaxation exercises. The omega-3 supplementation consisted of 2.2 g/day of docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), while the placebo



supplementation consisted of corn oil capsules. Cognitive function was assessed by a battery of neuropsychological tests and brain structure was measured by magnetic resonance imaging (MRI) at baseline and after the intervention. The exercise plus omega-3 group showed significant improvements in global cognition, memory, executive function, and processing speed compared to the other groups. The exercise plus omega-3 group also showed increased gray matter volume in the hippocampus, the prefrontal cortex, and the parietal cortex compared to the other groups. A multimodal intervention combining physical exercise and omega-3 supplementation may be an effective strategy to enhance cognitive function and brain structure in older adults with subjective memory complaints.

Nascimento-Ferreira (2013) assessed the association between adherence to the Dietary Approaches to Stop Hypertension (DASH) diet and cognitive function in older adults from Brazil. A cross-sectional study of 1,534 participants aged 60 years and older who were enrolled in the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). Adherence to the DASH diet was evaluated by a score based on eight food groups: fruits, vegetables, nuts and legumes, low-fat dairy products, whole grains, sodium, sweets, and red and processed meats. Cognitive function was measured by the Digit Span Forward and Backward Test (DSF and DSB), the Word Recall Test (WRT), the Verbal Fluency Test (VFT), and the Trail Making Test A and B (TMT-A and TMT-B). Higher adherence to the DASH diet was associated with better performance on DSF, DSB, WRT, VFT, and TMT-B, after adjusting for sociodemographic, behavioral, clinical, and genetic factors. The association was stronger for women than for men. Following the DASH dietary pattern may help preserve cognitive function in older adults from Brazil.

## METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low-cost advantage as compared to field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

## FINDINGS

The results were analyzed into various research gap categories that is conceptual, contextual and methodological gaps

**Conceptual Research Gap:** While the studies mentioned provide valuable insights into the relationship between dietary patterns and cognitive function in older adults, there is a conceptual research gap concerning the exploration of the mechanisms underlying the observed associations. The existing research primarily focuses on the association itself, leaving a gap in understanding the physiological and neurobiological pathways through which specific dietary components or patterns influence cognitive function. Investigating the mechanisms, such as the impact of

nutrients on neuroinflammation, oxidative stress, or neuroplasticity, would provide a more comprehensive understanding of how diet affects cognitive health (Sánchez-Villegas et al., 2019; Boespflug, 2018; Taylor, 2018; Zhang, 2019; Witte et al., 2014; Nascimento-Ferreira, 2013).

**Contextual Research Gap:** Another contextual research gap pertains to the examination of cultural and regional variations in the relationship between dietary patterns and cognitive function. The existing studies are predominantly conducted in Western countries, such as Spain and the United States, which may limit the generalizability of their findings to diverse cultural contexts. To address this gap, future research should explore whether the observed associations between diet and cognitive function hold true across different cultural and dietary traditions. Investigating the impact of culturally specific diets on cognitive health in various regions could yield insights into tailored dietary recommendations for older adults worldwide (Sánchez-Villegas et al., 2019; Boespflug, 2018; Taylor, 2018; Zhang, 2019; Witte, 2014; Nascimento-Ferreira, 2013).

**Geographical Research Gap:** A geographical research gap exists in terms of the underrepresentation of studies examining the relationship between dietary patterns and cognitive function in low- and middle-income countries (LMICs). The majority of the cited research is conducted in high-income Western nations, and there is limited representation from LMICs, where dietary habits, socio-economic factors, and healthcare systems differ significantly. Exploring the impact of dietary patterns on cognitive function in LMICs is crucial, as these regions may face unique challenges and opportunities related to nutrition and cognitive health. Investigating the association within diverse global contexts would contribute to a more comprehensive understanding of the universality or context-specific nature of the relationship (Sánchez-Villegas, 2019; Boespflug, 2018; Taylor, 2018; Zhang, 2019; Witte, 2014; Nascimento-Ferreira, 2013).

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

A growing body of evidence indicates that the types of foods and dietary patterns adopted by older adults significantly impact their cognitive function. Diets rich in antioxidants, omega-3 fatty acids, and a variety of nutrients from fruits, vegetables, whole grains, and lean proteins appear to support brain health and cognitive vitality. The effects of diet on cognitive function in older adults are not isolated to later life but have roots in earlier dietary habits. A lifelong approach to healthy eating can have a cumulative, positive impact on cognitive aging. There is substantial individual variability in how diet affects cognitive function. Genetic factors, lifestyle choices, and preexisting health conditions can all influence how specific dietary patterns affect cognitive outcomes. This underscores the importance of personalized nutrition and healthcare interventions.

Research in this field has benefited from interdisciplinary collaboration, drawing insights from nutrition, neuroscience, psychology, and public health. This holistic approach has expanded our understanding of the complex mechanisms underlying the dietary-cognitive relationship. The

findings in this field have far-reaching implications for healthcare policy and practice. From tailoring dietary interventions to older adults' cognitive health profiles to incorporating dietary recommendations into public health guidelines, there is a growing recognition of the importance of nutrition in promoting cognitive well-being in aging populations. In essence, the relationship between dietary patterns and cognitive function in older adults is a critical area of study that continues to evolve. While much progress has been made, there is still more to learn about the nuances of this relationship, which holds the promise of enhancing the quality of life for older adults and reducing the burden of cognitive decline and neurodegenerative diseases in our aging societies. Recognizing the importance of a balanced and brain-healthy diet as a lifelong endeavor is a fundamental step toward healthier cognitive aging.

## **Recommendations**

### **Theory**

Research should aim to integrate the principles of nutritional neuroscience into cognitive aging theories. This involves understanding how specific nutrients and dietary patterns impact brain health and cognitive function. The unique contribution here is a more comprehensive understanding of the biological mechanisms behind cognitive aging. Develop theories that consider the lifespan perspective, acknowledging that diet can influence cognitive function across the entire life course. This can help explain the cumulative impact of diet on cognitive health in older adults. Explore the interactive effects of diet with other factors such as genetics, physical activity, and socio-economic status. Understanding how these factors interact with dietary patterns in older adults can lead to more nuanced theories.

### **Practice**

Develop personalized dietary recommendations for older adults based on their individual cognitive health profiles. This can involve assessing cognitive function and tailoring dietary interventions accordingly. Implement educational programs targeting older adults, caregivers, and healthcare professionals to raise awareness about the role of diet in cognitive health. Practical guidance on adopting brain-healthy diets should be a key component. Promote community-based interventions that provide older adults with access to affordable, nutritious foods and opportunities for social engagement. These interventions can help facilitate healthier dietary choices.

### **Policy**

Ensure that dietary recommendations for older adults are integrated into national dietary guidelines. Policy makers should recognize the importance of a balanced diet for cognitive health and reflect this in public health recommendations. Develop policies that address food accessibility issues in aging populations, particularly in underserved communities. This may include initiatives to increase the availability of affordable, nutritious foods in areas with limited access. Consider

fiscal policies and incentives to encourage the food industry to produce and promote products that support cognitive health in older adults. Tax incentives for companies producing brain-healthy foods could be explored.

Encourage healthcare systems to integrate dietary assessments and interventions into routine care for older adults. This could involve reimbursement mechanisms that support nutrition counseling as part of healthcare services. Allocate research funding to support studies investigating the relationship between diet and cognitive function in older adults. Policymakers should prioritize research that can inform evidence-based dietary recommendations.

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