

Progress on Implementing Key Recommendations of the National Public Health Road Map for Maintaining Cognitive Health

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Introduction and Approach

In 2006, the Alzheimer's Association and the Centers for Disease Control and Prevention (CDC) Healthy Aging Program jointly published the *National Public Health Road Map for Maintaining Cognitive Health*, the first national consensus document outlining specific recommendations for promoting a healthy brain. The document was developed through expert review of existing research prior to 2006 and formal discussions in an expert scientific meeting held in May 2006. The development process also incorporated a wide-reaching consensus-building approach for selecting priority actions in four key areas: policy, communications, prevention research, and surveillance, which were further categorized into eight clusters. The results from the scientific consensus meeting were detailed in a special issue of *Alzheimer's and Dementia*, published in April 2007. Since that time, a variety of programs, research projects and initiatives have moved the recommendations forward into implementation.

The purpose of this document is to summarize and report the various activities relevant to each recommendation that have occurred since the release of the report in 2006. Special emphasis is placed on the ten priority actions, offering a detailed review for each priority action, while activities related to other recommendations in each cluster are also listed.

Eight clusters:

1. Disseminating information
2. Translating knowledge
3. Implementing policy
4. Conducting surveillance
5. Moving research into practice
6. Conducting intervention research
7. Measuring cognitive impairment and burden
8. Developing capacity

Ten priority actions:

1. Determine how diverse audiences think about cognitive health and its associations with lifestyle factors.
2. Disseminate the latest science to increase public understanding of cognitive health and to dispel common misconceptions.
3. Help people understand the connection between risk and protective factors and cognitive health.
4. Conduct systematic literature reviews on proposed risk factors (vascular risk and physical inactivity) and related interventions for relationships with cognitive health, harms, gaps and effectiveness.
5. Conduct controlled clinical trials to determine the effect of reducing vascular risk factors on lowering the risk of cognitive decline and improving cognitive function.
6. Conduct controlled clinical trials to determine the effect of physical activity on reducing the risk of cognitive decline and improving cognitive function.
7. Conduct research on other areas potentially affecting cognitive health such as nutrition, mental activity, and social engagement.
8. Develop a population-based surveillance system with longitudinal follow-up that is dedicated to measuring the public health burden of cognitive impairment in the United States.
9. Initiate policy changes at the federal, state, and local levels to promote cognitive health by engaging public officials.
10. Include cognitive health in *Healthy People 2020*, a set of health objectives for the nation that will serve as the foundation for state and community public health plans.

ROAD MAP CLUSTER: DISSEMINATING INFORMATION

ROAD MAP PRIORITY ACTION: *Disseminate the latest science to increase public understanding of cognitive health and to dispel common misconceptions.* Evidence exists that the current boomer generation is concerned about cognitive health and fears Alzheimer's disease. One critical area of focus should be on helping the public to understand the varying levels of evidence behind proposed interventions regarding cognitive health. Unless credible and broad reaching information about valid interventions in cognitive health is disseminated, consumers will fill the gap with untested programs and products. Not only can these programs and products present an economic burden, but some may also distract the aging population from meaningful lifestyle changes. Communications strategies (including the appropriate communication channels) should build upon current efforts by various organizations and agencies to share existing information and materials on cognitive health research and possible interventions that are consistent with current science.

Communications strategies to increase public understanding of cognitive health vary in approach and level of substantive content. To date, the Healthy Brain Initiative and its various national partners have delivered the most consistent and cogent messages regarding cognitive health, including the following highlights:

- The CDC Healthy Aging Program and the Alzheimer's Association collaborated to produce briefs such as *Cognitive Impairment: A Call for Action, Now!*, a document educating consumers on the basics of brain health, while also promoting message dissemination through community awareness.¹
- The CDC Healthy Aging Program and the Alzheimer's Association responded to public inquiries, conducted formal presentations on the Healthy Brain Initiative, and disseminated information to the public on their websites.²
- Because prevention efforts have the potential to increase public awareness, the CDC provided health information to consumers on a variety of risk factors for cognitive decline including depression, diabetes, smoking, heart disease and high blood pressure.
- In 2012, the CDC Healthy Aging Program focused on an initiative to increase the use of clinical prevention services by older adults.³ If successful, this program may also impact the use of preventive measures for cognitive health.

¹ Centers for Disease Control and Prevention. *Promoting Brain Health: Be a Champion Today*, February, 2011. Available at http://www.cdc.gov/aging/pdf/cognitive_impairment/cogImp_genAud_final.pdf

² Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

³Centers for Disease Control and Prevention. *Clinical Prevention Services for Older Adults*. Available at <http://www.cdc.gov/features/PreventiveServices/>

National partner organizations are another conduit of cognitive health information to the public. As the co-lead for the Healthy Brain Initiative, the Alzheimer's Association maintained a "Brain Health" section on its website devoted to lifestyle changes, risk factors and activities.⁴ The Association also engaged in a range of activities to help raise awareness of brain health messages, including a demonstration project to encourage understanding and advocacy for brain health among African-American baby boomers in Atlanta and Los Angeles. This demonstration included community-oriented materials, such as *Brain health for African Americans: Tips for keeping your brain and body healthy*.⁵

AARP provided similar information on brain health on its website including a recent feature article entitled *Age-Proof Your Brain* in the February/March 2012 issue of AARP Magazine. The article interpreted the latest in prevention research from a variety of credible sources including the University of Illinois, the Group Health Institute in Seattle, University of British Columbia at Vancouver, Cedars-Sinai Medical Center in Los Angeles, UCLA, Vanderbilt University, and Rush University Medical Center.⁶ Both the Alzheimer's Association and AARP provided information consistent with the Healthy Brain Initiative by encouraging consumers to consider the following prevention strategies:

- Engaging in activity and exercise;
- Challenging the mind and staying mentally active;
- Reducing stress;
- Maintaining heart health through diet and omega-3 fatty acids;
- Socializing and connecting with friends and peers;
- Reducing risks for chronic health conditions such as diabetes, obesity and hypertension; and
- Avoiding vitamin deficiencies.

External Communications Strategies

In 2011 and 2012, several researchers in the field of cognitive health (identified in the document, *Key Researchers and Brain Health Centers*⁷) contributed expert opinions to major media outlets including CNN, ABC News, CBS News, U.S. News & World Report, Fox News, PBS, The New York Times, New York Daily News, and the Huffington Post. With high profile stories such as *Baby Boomer Brain Power*, *Avoiding Dementia Similar to Heart Disease* and *Diabetes Boosts Dementia Risk*, communications regarding brain health and prevention became notable in popular media. In addition, a scan of social

⁴ Alzheimer's Association. *Brain Health*. Available at http://www.alz.org/we_can_help_brain_health_maintain_your_brain.asp

⁵ Alzheimer's Association. (2008). *Brain health for African Americans: Tips for keeping your brain and body healthy* (brochure).

⁶ AARP. *Brain Health*. Available at <http://www.aarp.org/health/brain-health/>

⁷ Center for Health Improvement. (2010). *Key Researchers and Brain Health Centers*.

media revealed that Twitter is the most common social media tool to communicate research findings regarding a healthy brain.⁸

Materials and products on brain health were also available to consumers through products and programs such as HAPPYneuron, Luminosity, mindRAMP, SeniorSMART, and many others. These and other products were detailed for the Healthy Brain Initiative in a 2010 environmental scan, *Summary of Existing Brain Health Promotion Programs and Products*.⁹ This report identified over 100 health products, programs, kits, books, DVDs, foods and beverages designed to support brain health.

Although external sources provided targeted communications regarding cognitive health, messaging from these sources were not consistent or reliable. Research funded by the CDC Healthy Aging Program found that media messages concerning cognitive health were rare and often conflicting. This finding was supported by a recent study of cable news websites that noted a communication gap resulting from poor journalistic interpretation of cognitive research to the general public. The study also found contextual information regarding cognitive function to be varied and often lacking.¹⁰ In support of this finding, the *Summary of Existing Brain Health Promotion Programs and Products* noted that the evidence base for the products was not well demonstrated and the majority of materials provided no citations for scientific claims relating to benefits. Hence, the overall evidence suggests that communication outside the CDC, Alzheimer's Association and their key partners lacks the necessary credibility.

Other Recommendations for the DISSEMINATING INFORMATION Cluster

Develop communications strategies and tools to increase awareness among health care providers, public health professionals, and aging service providers at the national, state, and local levels about the current state of science of cognitive health.

- In the study, *Examining the Impact of Cognitive Impairment on Co-Occurring Chronic Conditions and Geriatric Syndromes*, the University of Washington, in collaboration with the CDC Healthy Aging Research Network (CDC-HAN), is compiling resources to assist public health practitioners at the local, state and national levels to understand the effects of cognitive impairment on chronic conditions.
- The CDC Healthy Aging Program provides technical assistance and consultation to state and national agencies interested in modifying policies on cognitive health.

⁸ Based on search of terms related to brain health on socialmention.com

⁹ Center for Health Improvement. (2010). *Summary of Existing Brain Health Promotion Programs and Products*.

¹⁰ Anderson, L.A., Day, K.L., Beard, R.L., Reed, P.S., Wu, B. (2009). The public's perceptions about cognitive health and dementia among the United States population: A national review. *The Gerontologist*, 49(Suppl 1):S3-11.

- The CDC Healthy Aging Program, the CDC-HAN and the Alzheimer's Association actively engage practitioners and professionals at national conferences, summits and symposia.
- The Alzheimer's Association's International Society to Advance Alzheimer's Research and Treatment (ISTAART) is a professional society for individuals interested in Alzheimer's and dementia science. In addition to other areas of focus, this professional society promotes strategies to disseminate best practices in cognitive health.¹¹
- The American Society on Aging (ASA) presents content to health care professionals through its *MindAlert* series of lectures and web seminars, and communicates related material through its annual national conference.¹²

Develop and implement a training curricula related to cognitive health for continuing professional education of health and human services professionals.

It is worth noting that there are many programs for training health professionals on dementia care, and that some, though not most, include elements (or at least understanding) of cognitive health promotion. While some of these are included here, this list is not exhaustive by design because it is not the focus of this report.

- The ASA's Mental Health and Aging Network (MHAN) is a network of professionals dedicated to improving supportive interventions for older adults with mental health problems and their caregivers. MHAN contributes to ASA's programs, education events and activities to improve training for health care professionals, including offering period content on brain health promotion.¹³
- The 2012 ASA seminar, *Training to Teach Brain Health: A Facilitator Certification Program for Promoting Brain Wellness*, was presented by noted experts in the field.¹⁴
- The National Association of Chronic Disease Directors (NACDD) is preparing to launch its own online learning curriculum. These courses will consist of exclusive NACDD courses, as well as those developed by third-party educational institutions and public health associations.
- With its *Geropsychiatric Nursing Competency Enhancements* web portal launched in 2011, the Hartford Institute for Geriatric Nursing offers curriculum for nurses around cognitive issues of older adults.¹⁵

¹¹ Alzheimer's Association. *ISTAART*. Available at <http://www.alz.org/istaart/>

¹² American Society on Aging. *MindAlert*. Available at <http://www.asaging.org/mindalert/>

¹³ American Society on Aging. *Mental Health and Aging Network (MHAN)*. Available at <http://www.asaging.org/mhan/>

¹⁴ American Society on Aging (ASA) training. Available at <http://www.asaging.org/march-8-2012>

¹⁵ Hartford Institute for Geriatric Nursing. (2011). Available at http://hartfordign.org/education/geropsychiatric_nursing_competency_enhancements/

Develop creative and replicable means for raising the public’s awareness of cognitive health and engaging the public in promoting the importance of cognitive health through policy.

- As an element of the Healthy Brain Initiative, the Alzheimer’s Association developed and evaluated the nation’s first community-level, culturally-relevant demonstration project designed to increase awareness of cognitive health, increase intentions to engage in physical activity, and promote prevention and management of vascular risks among African-American baby boomers. Results indicated a capacity to raise awareness of the importance of brain health and to encourage participants to volunteer as “Healthy Brain Champions,” serving as advocates of brain health in their communities.¹⁶

Establish and maintain a Web-based cognitive health clearinghouse, in partnership with stakeholder organizations, that would be recognized as a centralized site for scientifically validated and recognized information.

- The National Institute on Aging (NIA), the National Institute of Mental Health (NIMH) and the National Institute of Neurological Disorders and Stroke (NINDS) have joined efforts to launch a new trans-National Institutes of Health (NIH) initiative, *Cognitive and Emotional Health Project: The Healthy Brain*. Through this project investigators conducting large-scale longitudinal and epidemiological studies of cognitive and emotional health were polled and a searchable database was created from their responses.¹⁷
- A future product of the *Examining the Impact of Cognitive Impairment on Co-Occurring Chronic Conditions and Geriatric Syndromes* study is a database of resources to assist public health practitioners at the local, state and national levels in understanding the effects of cognitive impairment on chronic conditions.
- In 2008, the CDC-HAN launched the Environmental and Policy Change (EPC) for Healthy Aging Clearinghouse, a searchable database of resources that support local efforts in environmental and policy change for healthy aging. Clearinghouse resources include toolkits, best practices, case studies, and process steps for engaging other stakeholders.¹⁸ While the resources are not specific to the promotion of cognitive health, this tool could serve as a resource for compiling, housing and disseminating any number of related structural interventions.

¹⁶ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

¹⁷ The database is available at <http://trans.nih.gov/CEHP/hbq/search.asp>.

¹⁸ EPC Clearinghouse. Available at <http://www.prc-han.org/clearinghouse-info>

ROAD MAP CLUSTER: TRANSLATING KNOWLEDGE

ROAD MAP PRIORITY ACTION: *Determine how diverse audiences think about cognitive health and its associations with lifestyle factors.* It is not clear how the general public or practitioners perceive and understand cognitive health. To develop useful programs, it will be imperative to better understand the diverse target audiences. Some issues that would be important to understand for translation to both the general public and practitioners include: how cognition is defined and translated; what aspects of cognitive health are important (including the level of knowledge about vascular factors); and how concerned the general public is about cognitive health.

In 2009, a special issue of *The Gerontologist* documented the state of science regarding older adults' perceptions of cognitive health. In that issue, authors of *The Forum* wrote about the dearth of evidence to support knowledge regarding public perceptions.¹⁹ To address this concern, the PRC-HAN conducted 55 focus groups that included over 450 participants from nine states from 2005 to 2007. This research addressed community-based perceptions across diverse cultural groups including non-Hispanic whites, Hispanics, African-Americans, American Indians, Chinese, and Vietnamese. Participants included caregivers, older adults with varying levels of cognitive health and health care providers. This work, representing the largest available effort to understand cross-cultural implications of cognitive health, highlighted various commonalities and differences as described by the following findings.

Older adults share perceptions regarding several common themes:

- A healthy brain is perceived as being alert, having good physical health and a positive mental outlook.
- Physical activity is important to cognitive health.
- A healthy diet is good for the brain.
- Involvement of “community champions” as advocates is beneficial.
- Media messages are rare and often conflicting, which lead participants to be distrustful of those types of communications.
- Social networks and educational programs can effectively address cognitive health.

¹⁹ Anderson, L.A., Day, K.L., Beard, R.L., Reed, P.S., Wu, B. (2009). The public's perceptions about cognitive health and dementia among the United States population: A national review. *The Gerontologist*, 49(Suppl 1):S3-11.

Findings also suggest variation in knowledge and perception on several issues:

- Race and ethnicity of older adults contribute to variations in their interpretation of, and engagement in, related practices such as independent living or choice of intellectual activities.²⁰
- Levels of knowledge in translating theories of cognitive health into practice varied by participants.
- Participants' understanding of a "healthy diet" and the benefits of dietary supplements was inconsistent.²¹

Overall, findings suggest that messages regarding cognitive health might be most effective with consideration to racial and ethnic diversity. In the conclusion of the journal, representatives of the PRC-HAN Promoting Cognitive Health Workgroup expressed a hope that recommendations from these studies could be translated into effective interventions at the community level.²² A fact sheet detailing the research is available at www.cdc.gov/aging/pdf/Perceptions_of_Cog_Hlth_factsheet.pdf.

Additional Recent Research

Several recent studies supplement findings from the Promoting Cognitive Health Workgroup research:

- Cognitive health-related questions were added to the 2010 HealthStyles survey, and the data support that Americans believe health behaviors can influence cognitive health. Participants perceived mental stimulation (81%), physical activity (80%), healthy diets (75%), social involvement (62%), vitamins (60%), healthy weight (53%), and avoiding smoking (43%) as the most beneficial activities to cognitive health.²³
- Another recent study demonstrated ethnic groups may differ on perceptions of cognitive health.²⁴
- An examination of cable news websites noted a communication gap resulting from poor journalistic interpretation of cognitive research to the general public.²⁵ However, consumers still access those sites for information. The 2010

²⁰ Laditka, S.B., Corwin, S.J., Laditka, J.N., Liu, R., Tseng, W., Wu, B., et al. (2009). Attitudes about aging well among a diverse group of older Americans: Implications for promoting cognitive health. *The Gerontologist*, 49(Suppl 1):S30-S39.

²¹ Wilcox, S., Sharkey, J.R., Mathews, A.E., Laditka, J.N., Laditka, S.B., Logsdon, R.G., et al. (2009). Perceptions and beliefs about the role of physical activity and nutrition on brain health in older adults. *The Gerontologist*, 49(Suppl 1):S61-71.

²² Logsdon, R.G., Hochhalter, A.K., Sharkey, J.R. on behalf of the Healthy Aging Research Network Promoting Cognitive Health Workgroup. (2009). From message to motivation: Where the rubber meets the road. *The Gerontologist*, 49(Suppl 1):S108-11.

²³ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

²⁴ Laditka, J.N., Laditka, S.B., Liu, R., Price, A.E., Friedman, D.B., Corwin, S.J., Sharkey, J.R., Tseng, W., Hunter, R., Fetterman, D., Logsdon, R.G., Beard, R.L. (October 2011). Older adults' concerns about cognitive health: Commonalities and differences among six United States ethnic groups. *Ageing and Society*, 31, 1202-1228.

²⁵ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

HealthStyles survey found that participants reported their main sources of information for learning about maintaining cognitive health were television (46%), magazines (42%), family and friends (36%), newspapers (33%), the Internet (30%), health care providers (28%), and radio (19%).²⁶

- Physicians' perceptions were studied through an additional question added to the 2009 DocStyles survey. where 71% of physician respondents agreed that early diagnosis of cognitive impairment gives patients and families opportunities for treatment and planning. According to research published in the March 2011 issue of the *Journal of Applied Gerontology*, 40% of respondent physicians reported discussions with their patients about reducing the risk of cognitive impairment. Physicians reported that they most frequently sought out information about new evidence and practice guidelines about cognitive impairment through professional journals, online or in-person continuing medical education, and professional websites or listservs.²⁷

ROAD MAP PRIORITY ACTION: *Help people understand the connection between risk and protective factors and cognitive health.* Risk and protective factors are keys to figuring out how to address individual and community health and require clarifying for the public what is demonstrated as effective in clinical trials versus associations observed in other studies. Of primary interest are aspects of personal and environmental experiences that make it more likely (risk factors) or less likely (protective factors) that people will experience cognitive decline. Consideration should be given to these connections and to promoting a better understanding of it, including an understanding of areas in which clinical trials have (or have not yet) established a cause and effect between risk and protective factors and cognitive health.

Porter Novelli's 2008 DocStyles surveyed physicians' practices related to cognitive health of patients. Demonstrating that messages are being delivered to the public, the majority of physicians in the DocStyles survey reported frequently discussing cognitive impairment with patients and stated that they advised patients to reduce risk through physical activity, mental stimulation, and a healthy diet.²⁸ The question remains, though, of the extent to which the messages are grounded in a solid research base. The following projects have examined the extent to which these and other risk and protective factors may be protective of cognitive health.

²⁶ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

²⁷ Day et al., 2011

²⁸ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

- In 2010, the Alzheimer's Association commissioned a comprehensive review to identify and assess the current evidence for protective factors on cognitive health. Of the 229 related studies identified through the literature search (all published after 2006), 197 were included in a full bibliography with 71 described in the review. The review found strong evidence for: 1) the protective effects of cognitive engagement, physical activity and healthy eating related to lower fat intake, and 2) the adverse contribution of the vascular risk of diabetes. Protective factors viewed as having relatively strong evidence include the influence of general healthy eating (particularly for the Mediterranean Diet), and the specific vascular risk of high blood pressure. Inconsistent evidence was found regarding the effects of general vascular risk and weight. Findings are detailed in the document, *Review of Recent Literature on Protective Factors for Cognitive Health*.²⁹
- The CDC Healthy Aging Program funded a systematic literature review on community-based physical activity interventions designed to promote cognitive health. Investigators conducted a systematic review of physical activity and exercise interventions related to cognitive health. Of the 30 studies reviewed, some had positive outcomes for certain exercise types and cognitive domains, but the panel concluded that there was not sufficient evidence to determine whether physical activity or exercise interventions improve cognition in older adults. Recommendations included that future research should use longer study durations and determine the clinical relevance of measures used.³⁰
- NIH funded the project, *Systematic Review: Factors Associated with Risk for and Possible Prevention of Cognitive Decline in Later Life*. Authors concluded that evidence was weak to support preventive factors.

In addition to these reviews, the CDC Healthy Aging Program maintains several related projects, including the following examples (not all are directly related to cognitive health, but target common factors):

- *Disseminating Healthy Aging Interventions* (University of Washington Health Promotion Research Center): Researchers are evaluating dissemination strategies for an Internet-based workplace health intervention and a fall prevention program. They will also study how well community partners can disseminate established programs that provide physical activity and depression-management for seniors. One component of the program will address the question of how community partners can effectively disseminate a depression

²⁹ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

³⁰ Snowden, M., Steinman, L., Mochan, K., Grodstein, F., Prohaska, T.R., Thurman, D.J., et al. (April 2011). Effect of exercise on cognitive performance in community-dwelling older adults: Review of intervention trials and recommendations for public health practice and research. *J Am Geriatr Soc.*, 59(4):704-16.

management program (PEARLS) or a physical activity program (EnhanceFitness).

- *Enhancing Mobility and Healthy Aging* (University of Pittsburgh Center for Healthy Aging): Researchers at this Prevention Research Center (PRC) developed an effective program, *10 Keys to Healthy Aging*, which can help reduce the risk of serious diseases like heart disease and cancer by focusing on smoking cessation, as well as controlling blood pressure, cholesterol, and blood sugar; getting cancer screenings, adequate physical activity, timely immunizations, and meaningful social involvement; and avoiding depression and the weakening of bones and muscles.
- *Examining the Impact of Cognitive Impairment on Co-occurring Chronic Conditions and Geriatric Syndromes* (University of Washington Health Promotion Research Center): This project is compiling resources to assist public health practitioners at the local, state and national levels in understanding the effects of cognitive impairment on chronic conditions.
- *Defining the Public Health Role in Depression and Depressive Disorders for Older Adults* (University of Washington Health Promotion Research Center): This study uses existing evidence to identify effective interventions for older adults (60 years of age or older) with depression. Researchers are focusing on identification of interventions particularly suitable for dissemination to older adults through the public health and aging services networks and on making recommendations about how such dissemination could be accomplished, including the structural, process, and policy components.

Other Recommendations for the TRANSLATING KNOWLEDGE Cluster

Develop a mechanism to review cognitive health messages and programs to determine their scientific accuracy and public credibility.

- In 2010, the Alzheimer's Association commissioned the review, *Summary of Existing Brain Health Promotion Programs and Products*. This report identified over 100 health products, programs, kits, books, DVDs, foods and beverages designed to support brain health. The authors noted that the evidence base for the products was not well demonstrated and that the majority of materials provided no citations for scientific claims relating to benefits.³¹
- In 2010, the Alzheimer's Association commissioned the document, *Key Researchers and Brain Centers*, to provide a formative assessment of key brain health researchers and brain health centers. This list detailed activities that could be utilized in a screening process of credible research.³²

³¹ Center for Health Improvement. (2010). *Summary of Existing Brain Health Promotion Programs and Products*.

³² Center for Health Improvement. (2010). *Key Researchers and Brain Centers*.

- *Prevention Research to Promote and Protect Brain Health:* As described previously, researchers at the nine universities that make up the CDC-HAN are assessing the diverse ways that groups of older adults and health care providers understand brain health. The project has conducted diverse multicultural focus groups to help researchers develop questions to measure trends in perceptions about cognitive health.
- The EPC Clearinghouse is a searchable database of environmental and policy change resources that support local efforts in environmental and policy change for healthy aging. The Clearinghouse was created by the CDC Healthy Aging Research Network. Clearinghouse resources include toolkits, best practices, case studies, and process steps for engaging other stakeholders.

ROAD MAP CLUSTER: IMPLEMENTING POLICY

ROAD MAP PRIORITY ACTION: *Initiate policy changes at the federal, state, and local levels to promote cognitive health by engaging public officials.* Far-reaching public health issues demand informed action by public officials, because action by the private sector alone will be insufficient to reach desired results. Because program and funding decisions are made by policymakers at the national, state and local levels, it is important to engage and educate this audience. Public officials have significant competing interests; it is essential that they become educated and engaged in this arena to contribute to positive policy change in cognitive health interventions and to support the need for further research.

The Alzheimer's Association, in particular, has aggressively promoted progress for this priority action through advocacy efforts, educational offerings and technical assistance. Highlights are detailed in the following examples.

- The Behavioral Risk Factors Surveillance System (BRFSS) Cognitive Impairment Module, developed by the CDC Healthy Aging Program and the Alzheimer's Association, is providing state-level data that should contribute to the development of public policy to support older adults with cognitive impairment.
- The Alzheimer's Association has engaged in active state-level advocacy to promote the adoption of the BRFSS Cognitive Impairment Module with increasingly strong results in adoption over the past few years, including a total of 38 unique states between 2011 and 2012. Specifically:
 - In 2009, five pilot states adopted the module.
 - In 2011, 22 states adopted the module.
 - In 2012, 24 states adopted the module.
- According to the *CDC Healthy Brain Initiative Progress 2006-2011* report, the CDC Healthy Aging Program provided assistance to the Council of State Governments on aging-related matters, with particular emphasis on information to inform state legislators and policymakers as they craft and enact policy improvements related to older adult health, specifically brain health.
- The publication, *Cognitive Impairment & Alzheimer's Disease*, was developed by the Council of State Governments (with support from the Alzheimer's Association and CDC Healthy Aging Program) to educate states on policy changes to support cognitive health including data on prevalence and cost of Alzheimer's disease, suggested legislative actions and additional resources.
- In FY 2009, the CDC Healthy Aging Program and NACDD funded 12 states (Alaska, Colorado, Hawaii, Kansas, Kentucky, Michigan, New Hampshire, New Jersey, North

Carolina, Oregon, South Carolina, and Virginia) to focus on strategies for policy change, oral health capacity-building and emergency preparedness.

- The Alzheimer's Association and CDC Healthy Aging Program participated in the Alzheimer's Study Group, promoting the creation of a national strategic plan, available at www.alz.org/documents/national/report_ASG_alzplan.pdf. Ultimately, this initiative set the stage for a significant advocacy effort by the Alzheimer's Association to achieve the successful passage of the *National Alzheimer's Project Act* (NAPA), landmark legislation to create a coordinated, national plan to overcome the Alzheimer's crisis and ensure the coordination and evaluation of all national efforts in Alzheimer's research, clinical care, institutional, and home- and community-based programs and their outcomes.³³

ROAD MAP PRIORITY ACTION: *Include cognitive health in Healthy People 2020, a set of health objectives for the nation that will serve as the foundation for state and community public health plans.* The development and use of documents such as *Healthy People 2020* will represent a systematic and widely recognized approach to improving health. As research demonstrates ways in which cognitive health can be maintained, the area of cognitive health can be elevated to a major health priority by being incorporated into the outcome-oriented approach used by *Healthy People 2020*.

With input from a Federal Interagency Workgroup co-chaired by the CDC, a new topic area and a set of objectives related to Alzheimer's disease and other dementias is now included in *Healthy People 2020*. The goal of the new topic area, "Dementias, including Alzheimer's disease," is to "reduce the morbidity and costs associated with, and maintain or enhance the quality of life for, persons with dementia, including Alzheimer's disease." While this new section does address Alzheimer's disease, it does not directly address the issue of the burden of cognitive impairment or potential for brain health promotion. Specifically, the topic area currently consists of two objectives:

- DIA – 1: (Developmental) Increase the proportion of persons with diagnosed Alzheimer's disease and other dementias, or their caregivers, who are aware of the diagnosis.
- DIA – 2: (Developmental) Reduce the proportion of preventable hospitalizations in adults with diagnosed Alzheimer's disease and other dementias.

The CDC Healthy Aging Program is currently leading a workgroup on "Dementias, including Alzheimer's disease" to identify and obtain relevant data from the necessary sources to establish baseline measures and track changes at regular intervals

³³ Alzheimer's Association. *National Alzheimer's Project Act (NAPA)*. Available at http://www.alz.org/join_the_cause_21243.asp

throughout the 10-year time frame.³⁴ The Medicare Current Beneficiary Survey (MCBS) and Medicare Part A and Part B claims are potential data sources.

Other Recommendations for the IMPLEMENTING POLICY Cluster

Include the public health burden of cognitive impairment in the State of Aging and Health in America Report when population level data are available.

- The *State of Aging and Health in America* reports data on preventive and risk factors of cognitive health. Although the CDC website does not list any specific plans to utilize data from the Cognitive Impairment Module, efforts are underway to encourage their inclusion and it is anticipated that progress is likely. Examples of potentially risk-related or protective cognitive health variables are:
 - Eating at least five fruits and vegetables daily;
 - Obesity;
 - Current smoking;
 - Physically unhealthy days;
 - Frequent mental distress; and
 - No leisure-time physical activity.

Promote appropriate strategic partnerships among associations, government agencies, insurers and payers, private industry, public organizations, and elected officials to support and advance research and policy related to cognitive health.

- There is a fairly wide-ranging coalition of partners that have been successfully convened to support various aspects of this initiative. Multiple organizations were listed as partners in the *CDC Healthy Brain Initiative Progress 2006-2011* report. In addition to the Alzheimer's Association, which is co-lead on the Healthy Brain Initiative, other examples of organizations and partnerships (with projects in parentheses) include:
 - Michigan's Dementia Coalition (BRFSS Cognitive Impairment Module)
 - The states of California, Florida, Iowa, Louisiana, and Michigan (BRFSS pilot states)
 - The National Center for Health Statistics (inclusion in NHANES)
 - The National Institute on Aging (inclusion in *Healthy People 2020*)
 - The Council of State Governments (technical assistance and the 2011 Summit)
 - The Alzheimer's Study Group (national plan for Alzheimer's disease)
 - Host institutions of the Healthy Aging Research Network (research efforts)

³⁴ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

- The U.S. Department of Health and Human Services (the Strategic Framework on Multiple Chronic Conditions)
- The University of Washington (*Examining the Impact of Cognitive Impairment on Co-Occurring Chronic Conditions and Geriatric Syndromes*)
- The University of Florida (BRFSS Caregiver Module)
- The University of Michigan and the National Association of Chronic Disease Directors (*The REACH OUT Action Guide: Implementing a Community-Based Program for Dementia Caregivers*)
- Rosalynn Carter Georgia Mental Health Forum (a 2-day symposium to educate public health, aging and mental health professionals)
- National Association of Chronic Disease Directors (Community-based interventions literature review)

Engage national organizations and agencies that focus on the older population, and educate these agencies about cognitive health and its connection to their missions.

- The Healthy Brain Initiative created materials to support the engagement and education of organizations regarding cognitive health. Some examples include:
 - *Cognitive Impairment: A Call for Action, Now!* provided information on the impact of cognitive impairment, along with “Calls to Action,” state and community examples of successful efforts, and other resources.
 - The publication, *Cognitive Impairment & Alzheimer’s Disease*, developed by the Council of State Governments (with support from the Alzheimer’s Association and CDC) educated states on policy changes to support cognitive health.
 - *Cognitive Health: An Emerging Public Health Issue*, an article developed by the Alzheimer’s Association and CDC Healthy Aging Program, appeared in a special issue of *Alzheimer’s & Dementia: The Journal of the Alzheimer’s Association*.
 - The brochure, *Combating Alzheimer’s disease: A Public Health Agenda*, was published by the Alzheimer’s Association.³⁵

³⁵ Alzheimer’s Association. *Combating Alzheimer’s disease: A public health agenda*. Available at <http://www.kintera.org/atf/cf/%7Bb96e2e84-af7d-4656-9c86-285306f00e19%7D/BROCHURE%20-%20PUBLIC%20HEALTH%202011.PDF>

Convene policy experts to identify and examine current policies (e.g., national policy, state policy, private sector policy) that could be modified, modernized, or broadened to include cognitive health.

- Healthy Brain Initiative representatives from the CDC Healthy Aging Program and the Alzheimer's Association participated in the 'megasummit' event, *Alzheimer's Disease: A Megacommunity Approach to Prevention, Detection, Treatment and Care*, which brought together hundreds of practitioners, researchers, and decision-makers concerned with Alzheimer's disease to consider appropriate national directions in tackling Alzheimer's disease in the 21st century.
- The Council of State Governments sponsored the 2011 National Conference & North American Summit, *Aging and Alzheimer's Disease: Emerging Issues and Policy Solutions*, attended by legislators from across the country and other key stakeholders. Speakers outlined the growing burden of Alzheimer's disease, the state of the science around prevention, diagnosis and treatment of the disease, and states' policy responses to the issues of aging and Alzheimer's disease. Dr. Lynda Anderson, Director of the Healthy Aging Program for CDC, was one of the invited presenters.³⁶
- The NIA sponsored the *Cognitive Aging Summit* in 2010. This meeting brought together approximately 325 researchers to discuss age-related brain and cognitive change, and to consider the current state of the science and needed future avenues of research.³⁷
- The NIH sponsored a 2010 State-of-the-Science summit on *Preventing Alzheimer's Disease and Cognitive Decline*. The conference generated a NIH consensus and state-of-the-science statement on the topic available at: <http://consensus.nih.gov/2010/alzstatement.htm>.³⁸

Promote the modification of existing national and state public health plans to include cognitive health in their strategies or recommendations where appropriate.

- According to the Alzheimer's Association, there are currently 23 published state plans on Alzheimer's disease and an additional 14 task forces have been established to develop a state Alzheimer's plan.³⁹

³⁶ More information is available at <http://knowledgecenter.csg.org/drupal/content/aging-and-alzheimer%E2%80%99s-disease-emerging-issues-and-policy-solutions>

³⁷ More information is available at <http://www.nia.nih.gov/about/events/2011/cognitive-aging-summit-ii>

³⁸ More information is available at <http://consensus.nih.gov/2010/alzstatement.htm>

³⁹ Chapman, R. (2011). Alzheimer's disease state public policy: What is it and why do we need it? [PowerPoint Presentation]. Available at <http://knowledgecenter.csg.org/drupal/system/files/ChapmanPDF.pdf>

- The additions of the Cognitive Impairment and Caregiver Modules to the BRFSS should provide data to guide national, state and local public health efforts. To help facilitate this, presently 11 of the 23 published state plans specifically refer to the BRFSS, three call for more surveillance without referencing the BRFSS, and five include at least some provision related to data collection efforts to better understand the impact of Alzheimer's disease.
- The development of a set of objectives to support dementias, including Alzheimer's disease, in *Healthy People 2020* should provide additional needed data to guide national and state policymakers to support strategic development.

ROAD MAP CLUSTER: CONDUCTING SURVEILLANCE

ROAD MAP PRIORITY ACTION: *Develop a population-based surveillance system with longitudinal follow-up that is dedicated to measuring the public health burden of cognitive impairment in the United States.* A population-based surveillance system would assist in the collection of consistent data to monitor, assess, and inform public health programs and policy about the public health burden of cognitive impairment.

Behavioral Risk Factor Surveillance System (BRFSS)

One extensive area of progress for this priority action is the development of an optional module on cognitive impairment and health in the CDC's Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is the world's largest, ongoing health survey system, collecting data monthly from all states, the District of Columbia, and some U.S. territories. Through this system, all states ask core questions, but also have the option to include additional survey items around select topics (optional modules). To provide states the opportunity to include questions on cognitive impairment, an expert panel was convened to guide the development of the *Impact of Cognitive Impairment Module*. The module was finalized in 2009 and presently gathers information about:

- Individuals affected by cognitive impairment;
- The impact of cognitive impairment on activities in and outside of the home;
- The need for assistance and caregiving;
- Health care-seeking behaviors and treatment; and
- In households with more than one person, the total number of persons affected by cognitive impairment.

As previously noted, the Alzheimer's Association has engaged in active state-level advocacy to promote the adoption of the BRFSS Cognitive Impairment Module, with increasingly strong results in adoption over the past few years, including a total of 38 unique states between 2011 and 2012. Specifically:

- In 2009, five pilot states adopted the module.
- In 2011, 22 states adopted the module.
- In 2012, 24 states adopted the module.

Four of the five states that piloted the module in 2009 – California, Florida, Iowa and Louisiana – created reports that document the importance of this data for the development of policy and prevention strategies at the state level.⁴⁰

⁴⁰ State reports are available at <http://www.cdc.gov/aging/healthybrain/surveillance.htm>

National Health and Nutrition Examination Survey (NHANES)

The National Health and Nutrition Examination Survey (NHANES) is a collection of studies designed to assess the health and nutritional status of adults and children in the United States. The CDC Healthy Aging Program has been working with the National Center for Health Statistics (NCHS) to include within the survey a component assessing cognitive function among adults aged 60 and older. According to the *CDC Healthy Brain Initiative Progress 2006-2011* report, this process resulted in two questions on cognitive impairment and decline in the 2011-2012 household survey, and three brief neuropsychological assessments on cognitive function in the mobile examination component. One benefit of the integration of cognitive components into NHANES is the ability to examine the prevalence of cognitive health within the context of multiple physical, psychological, and social variables from other data sources including BRFSS, Patient-Reported Outcomes Measurement Information System (PROMIS), and REasons for Geographic and Racial Differences in Stroke (REGARDS).

Other Recommendations for the CONDUCTING SURVEILLANCE Cluster

Define the goals of a surveillance system to promote the development of an appropriate system and the collection of data on cognitive health.

- To develop the 10 items included in the BRFSS *Impact of Cognitive Impairment Module*, a two year development process was guided by a panel of national experts comprised of specialists in public health, population-based surveillance, cognitive impairment, and aging. The panel was instrumental in assessing the goals of the module, defining the constructs to be assessed, and developing the questions for use in this population-based surveillance system.⁴¹
- As noted above, the CDC Healthy Aging Program worked collaboratively with NCHS to identify the two household survey questions and three neuropsychological assessment measures incorporated into the NHANES.

Determine which existing general population-based surveillance systems include information useful for the surveillance of cognitive health at national, state and local levels.

- The efforts of the CDC Healthy Aging Program to include questions in the BRFSS and NHANES are representative of progress in this recommendation.
- The University of Michigan Health and Retirement Study (HRS) is a longitudinal panel study that surveys a representative sample of more than 26,000 Americans over the age of 50 every two years. Supported by the NIA and the Social Security

⁴¹ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

Administration, the HRS explores the changes in labor force participation and the health transitions that individuals undergo toward the end of their work lives and in the years that follow.⁴² Currently, the Survey Research Center of the University of Michigan, in cooperation with the U.S. Census Bureau and Cornell University, has proposed to link the HRS to economic, business, and employment data from the Census Bureau. This crosswalk between HRS and census data will allow researchers with projects approved by the Census Bureau to conduct research and construct new variables using the full scope of Census economic and business data.

Identify existing studies that measure longitudinal trends in cognitive function.

- The Michigan Center on Demography and Aging, with funding from the NIA, is conducting an extension of *Assessing and Improving Measurement in HRS*. The purpose of this study is to continue longitudinal data collection activities to assess a variety of cognitive abilities using different modes of administration. Data from the study will be used to create a large, longitudinal public-use dataset that will be analyzed and used to understand age trends in cognitive abilities, the measurement of different cognitive abilities in multiple modes of administration, the relationship of cognitive abilities and trajectories to genetic characteristics, and relations to economic behavior indicators.
- The Michigan Center on Demography and Aging, with funding from the NIA, is also conducting *National Trends in Brain Health: A Follow-Up Study of CIND and Dementia in the U.S.* This project examines U.S. trends in the prevalence of cognitive impairment and dementia by performing a new Aging, Demographics, and Memory Study (ADAMS 2010) that uses a similar methodology to that employed for the original NIA-funded study performed in 2001-2003. The study proposes to provide the first nationally representative data to assess the prevalence and trends of CIND and dementia in the U.S.

⁴² University of Michigan. *Health and Retirement Study (HRS)*. Available at: <http://hrsonline.isr.umich.edu>

ROAD MAP CLUSTER: MOVING RESEARCH INTO PRACTICE

ROAD MAP PRIORITY ACTION: *Conduct systematic literature reviews on proposed risk factors (vascular risk and physical inactivity) and related interventions for relationships with cognitive health, harms, gaps and effectiveness.* It is critical to examine all studies to date to document which interventions have been proven effective. Such reviews should focus on determining the relationships between risk factors, protective factors, and cognitive function across observational and clinical trials. Where interventions exist, their effectiveness should be documented and remaining gaps in the field should be identified in order to move strategies into public health practice.

Since the release of the *Road Map*, several different initiatives and research teams have developed literature reviews, of varying scope. Across these reviews there are some consistent findings as well as some variable findings, depending upon the specific focus of the reviews. To initially consider the breadth of reviews conducted since 2006, it is worth starting with a comprehensive multiple protective factor review commissioned by the Alzheimer's Association specifically for the Healthy Brain Initiative. This review includes both details of other multi-factor and single factor reviews, as well as direct summative analysis of various studies with a range of methodology and rigor, categorizing each according to the strength of evidence and potential application.

Specifically, *Review of Recent Literature on Protective Factors for Cognitive Health*⁴³, was commissioned to identify and assess the current evidence for protective factors on cognitive health. Of the 229 related studies identified through the literature search (all published after 2006), 197 were included in a full bibliography with 71 described in the review. The review found strong evidence for: 1) the protective effects of cognitive engagement, physical activity and healthy eating related to lower fat intake, and 2) the adverse contribution of the vascular risk of diabetes. Protective factors viewed as having relatively strong evidence include the influence of general healthy eating (particularly for the Mediterranean Diet) and the specific vascular risk of high blood pressure. Inconsistent evidence was found regarding the effects of general vascular risk and weight.

Another important multi-factor review, perhaps drawing the most attention since 2006, is a review of the evidence for protective factors related to cognitive health conducted by researchers at the Duke Evidence-based Practice Center, with support from the Agency for Healthcare Research and Quality (AHRQ). This review was commissioned to help inform the NIH State-of-the-Science Conference in April 2010. The results of this review

⁴³ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

were published as a report for AHRQ⁴⁴ and as a complementary peer-review publication in the *Annals of Internal Medicine*⁴⁵. This general review included synthesis of the findings from observational studies, randomized control trials (RCT), and other systematic reviews across a range of potential risk and protective factors. Specifically, the review included consideration of nutritional factors; medical factors and medications; social, economic, and behavioral factors; toxic environmental exposures; and genetics, exploring the link between each of these to the development of Alzheimer's disease or cognitive decline.

In regard to all of the primary protective factors of interest in this review, including physical activity, vascular risk factors, healthy diet, and cognitive stimulation, the review demonstrated little support for a link to preventing Alzheimer's disease or cognitive decline. The final conclusion of the authors is that more research is needed to better explore these areas because "[t]he current research on the list of putative and protective factors is largely inadequate to confidently assess their association with [Alzheimer's disease] or cognitive decline." However, their review did show the strongest association between diabetes and increased risk of Alzheimer's disease and cognitive decline. Further, this study showed a "fairly consistent association" for both increased cognitive engagement and physical activity reducing risk of Alzheimer's disease and cognitive decline. Authors note separate single RCTs individually supporting benefits of cognitive training and physical activity. Overall though, with an explicit evidence standard of RCT-derived evidence and despite numerous positive findings in observational studies, the findings do not support a definitive conclusion for the effects of any potentially modifiable protective factors, thus indicating the need for further research. Important complementary documents to this review are the *NIH Consensus and State-of-the-Science Statements*,⁴⁶ reporting the proceedings and conclusions of the expert panel convened to interpret the review using their understanding of existing research and practice.

A second recent multi-factor systematic review was published in *International Psychogeriatrics*, with authors concluding that there is "accumulating evidence" to support the connection between modifiable behavioral factors and cognitive decline and dementia.⁴⁷ In this review, Lee and Colleagues (2010) identified 12,105 related abstracts and reviewed 690 full articles, yielding 115 articles meeting their criteria, with

⁴⁴ Williams, J.W., Plassman, B.L., Burke, J., Holsinger, T., Benjamin, S. (2010). Preventing Alzheimer's disease and cognitive decline. *Agency for Healthcare Research and Quality*: Rockville, MD.

⁴⁵ Plassman, B.L., Williams, J.W., Burke, J.R., Holsinger, T., Benjamin, S. (2010). Systematic review: Factors associated with risk for and possible prevention of cognitive decline in later life. *Annals of Internal Medicine*, 153(3): 182 – 193.

⁴⁶ More information is available at <http://consensus.nih.gov/2010/alzstatement.htm>

⁴⁷ Lee, Y., Back, J.H., Kim, J., Kim, S.H., Na, D.L., Cheong, H.K., Hong, C.H., Kim, Y.G. (2010). Systematic review of health behavioral risks and cognitive health in older adults. *International Psychogeriatrics*, 22(2): 174 – 187.

37 studies meeting their highest standard of quality. This review focused on multiple health behaviors, including physical activity, smoking, alcohol consumption, and body mass index (BMI), as well as diet and nutrition. Regarding protective factors of interest, results found that leisure-time physical activity, even in moderate levels, as well as vegetable and fish consumption, offered protective effects against dementia. Further, midlife obesity and a high-fat diet were found to increase risk of dementia.

Other Recommendations for the MOVING RESEARCH INTO PRACTICE Cluster

Conduct systematic literature reviews on proposed risk factors (social engagement, nutrition, and mental activity) and related interventions relationships with cognitive health, harms, gaps and effectiveness.

- While social engagement and nutrition were included in the larger multi-factor reviews detailed above, no reviews specific to these two factors were identified.
- Three reviews were identified that explore the benefits of cognitive training as a protective factor against risk of dementia. Of these, two show that there is promise, but little evidence, and one indicates there is little benefit of cognitive training.⁴⁸

Conduct a systematic literature review on the relationship between treatment of diabetes and cognitive health.

- One systematic review assessing the effect of vascular risk factors on cognitive function was identified, which offered variable results depending on the specific risk factor. This review of cross-sectional and longitudinal observational studies found that both diabetes and hypertension were related to cognitive decline. However, the results did not demonstrate a connection between obesity and cognitive decline.⁴⁹

Conduct a systematic literature review on the relationship between treatment of hypertension and cognitive health.

- One systematic review assessing the effect of vascular risk factors on cognitive function was identified, which offered variable results depending on the specific risk factor. This review of cross-sectional and longitudinal observational studies found that both diabetes and hypertension were related to cognitive decline. However, the results did not demonstrate a connection between obesity and cognitive decline.⁵⁰

⁴⁸ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁴⁹ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁵⁰ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

Identify gaps in knowledge about cognitive health and related lifestyle changes, and determine whether these vary by specific groups.

- As previously noted, the special issue of *The Gerontologist* (2009) documented the current state of science regarding older adults' perceptions of cognitive health. This research addressed community-based perceptions across diverse cultural groups including non-Hispanic whites, Hispanics, African-Americans, American Indians, Chinese, and Vietnamese. Overall, the findings suggested that messages regarding cognitive health might be most effective with consideration to racial and ethnic diversity. Researchers expressed the hope that recommendations from these studies could be translated into effective interventions at the community level.⁵¹

Conduct a systematic review of lifestyle interventions and contextual factors to examine the benefits and barriers to their adoption and maintenance.

- While general social lifestyle interventions and contextual factors were partially included in the larger multi-factor reviews detailed above, no reviews specific to these factors were identified.

Conduct reviews of the literature to determine the prescriptions for physical activity (e.g., type, frequency, duration, and intensity of activity) that are effective in enhancing cognitive function.

- The CDC Healthy Aging Program funded a systematic literature review on community-based physical activity interventions designed to promote cognitive health. Investigators conducted a systematic review of physical activity and exercise interventions related to cognitive health. Of the 30 studies reviewed, some had positive outcomes for certain exercise types and cognitive domains, but the panel concluded that there was not sufficient evidence to determine whether physical activity or exercise interventions improve cognition in older adults. Recommendations included that future research should use longer study durations and determine the clinical relevance of measures used.⁵²
- In addition, as described in the previously noted *Review of Recent Literature on Protective Factors for Cognitive Health*⁵³, with full citations included in the *Protective Factors for Cognitive Health* bibliography⁵⁴, seven recent reviews explicitly considered the link between physical activity and cognitive health. The

⁵¹ Logsdon, R.G., Hochhalter, A.K., Sharkey, J.R. on behalf of the Healthy Aging Research Network Promoting Cognitive Health Workgroup. (2009). From message to motivation: Where the rubber meets the road. *The Gerontologist*, 49(Suppl 1):S108-11.

⁵² Snowden, M., Steinman, L., Mochan, K., Grodstein, F., Prohaska, T.R., Thurman, D.J., et al. (April 2011). Effect of exercise on cognitive performance in community-dwelling older adults: Review of intervention trials and recommendations for public health practice and research. *J Am Geriatr Soc.*, 59(4):704-16

⁵³ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁵⁴ Center for Health Improvement. (2010). *Protective Factors for Cognitive Health*

results from these reviews provide inconsistent evidence regarding the benefits of physical activity as a protective factor against dementia. Of the seven studies, three concluded physical activity is, or may be, a protective factor; two provided subtly conflicting results; and two concluded there is no demonstrated link. Given these reviews, it is difficult to conclude anything but that more research is needed to better understand the link between physical activity and cognitive function.

Develop cognitive health interventions that reflect the most current scientific research and that are consistent with effective community-based interventions.

- As an element of the Healthy Brain Initiative, the Alzheimer’s Association developed and evaluated the nation’s first community-level, culturally-relevant demonstration project designed to increase awareness of cognitive health, increase intentions to engage in physical activity, and promote prevention and management of vascular risks among African-American baby boomers. Results indicated a capacity to raise awareness of the importance of brain health and to encourage participants to volunteer as “Healthy Brain Champions,” serving as advocates of brain health in their communities.⁵⁵
- In 2010, the Alzheimer’s Association commissioned the review, *Summary of Existing Brain Health Promotion Programs and Products*. This report identified over 100 health products, programs, kits, books, DVDs, foods and beverages designed to support brain health. The authors noted the evidence base for the products was not well demonstrated, and the majority of materials provided no citations for scientific claims relating to benefits.⁵⁶

⁵⁵ Centers for Disease Control and Prevention. *The CDC Healthy Brain Initiative 2006 – 2011*. Available at <http://www.cdc.gov/aging/healthybrain/roadmap.htm>

⁵⁶ Center for Health Improvement. (2010). *Summary of Existing Brain Health Promotion Programs and Products*

ROAD MAP CLUSTER: CONDUCTING INTERVENTION RESEARCH

ROAD MAP PRIORITY ACTION: *Conduct controlled trials to determine the effect of reducing vascular risk factors on lowering the risk of cognitive decline and improving cognitive function.* To date, few vascular studies (including large-scale controlled clinical trials of older adult cohorts) have combined cognitive health outcomes and vascular outcomes in a single study.

In the *Review of Recent Literature on Protective Factors for Cognitive Health*⁵⁷, with full citations included in the *Protective Factors for Cognitive Health* bibliography⁵⁸, multiple studies have been identified that consider potential interventions to modify vascular risk factors (diabetes, hypertension, and weight) to assess potentially protective effects against cognitive decline.

- Among the identified studies considering diabetes as a potential risk factor for dementia, six provided supporting evidence and two found no association. However, none of the studies were RCTs; rather, each study was either a large longitudinal study or a small retrospective study.
- The five studies relating hypertension and blood pressure to cognitive function provided inconsistent results, both supporting and not supporting an association. Again though, none of the studies identified were RCTs.
- As with the other areas of vascular risk, studies assessing the link between weight and obesity and cognitive function provided inconsistent results. Further, none of the studies identified were RCTs.

The need for high quality controlled trials assessing the link between vascular risk and cognitive impairment still clearly exists.

⁵⁷ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁵⁸ Center for Health Improvement. (2010). *Protective Factors for Cognitive Health*

ROAD MAP PRIORITY ACTION: *Conduct controlled clinical trials to determine the effect of physical activity on reducing the risk of cognitive decline and improving cognitive function.* To date, few, if any, physical activity studies (including large-scale controlled clinical trials for older adult cohorts) have combined outcomes for cognitive health and physical activity outcomes in a single study.

As detailed in the *Review of Recent Literature on Protective Factors for Cognitive Health*⁵⁹, with full citations included in the *Protective Factors for Cognitive Health* bibliography⁶⁰, 12 individual studies were identified that assessed the relationship of physical activity to dementia and cognitive function. Nine provided evidence supporting a link and three did not find an association.

Among the supportive studies, five were randomized control trials and four were prospective studies. There were specific commonalities across the five randomized control trials. First, while each was an RCT, they all had relatively small sample sizes, ranging from 102 to 259. Also, the outcome of interest in each of the RCTs was cognitive function rather than any form of neurocognitive disorder or disease.

- Lautenschlager and colleagues (2008) conducted an RCT of a 24-week physical activity intervention with a total of 138 participants without a diagnosis of dementia, but with memory complaints. After participation in the 6-month intervention, participants showed significant improvements in cognitive function relative to controls at an 18-month follow up.⁶¹
- Similarly, in a 12-month study of 155 women randomly assigned to a once-weekly resistance training group, a twice-weekly resistance training group, or a tone and balance group, both resistance groups showed significant improvements in cognitive function relative to the declining function seen in the tone and balance group.⁶²
- In a randomized placebo-control (n=152) study of the combined and differential effects of walking and vitamin B supplementation, van Uffelen and colleagues (2008) demonstrated improvements in memory for those participating in the walking group.⁶³

⁵⁹ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁶⁰ Center for Health Improvement. (2010). *Protective Factors for Cognitive Health*

⁶¹ Lautenschlager, N.T., Cox, K.L., Flicker, L., Foster, J.K., van Bockxmeer, F.M., Xiao, J., Greenop, K.R., Almeida, O.P. (2008). Effect of physical activity on cognitive function in older adults at risk for Alzheimer's disease: A randomized trial. *JAMA*, 300(9): 1027 – 1037.

⁶² Liu-Ambrose, T., Nagamatsu, L.S., Graf, P., Beattie, B.L., Ashe, M.C., Handy, T.C. (2010). Resistance training and executive functions: A 12-month randomized controlled trial. *Archives of Internal Medicine*, 170(2): 170 – 178.

⁶³ van Uffelen, J.G., Chinapaw, M.J., van Mechelen, W., & Hopman-Rock, M. (2008). Walking or vitamin B for cognition in older adults with mild cognitive impairment? A randomised controlled trial. *British Journal of Sports Medicine*, 42(5): 344 – 51.

- Further supporting the link while not demonstrating significant group effects, Williamson and colleagues (2009) found significant improvements in cognitive function to be associated with improvements in physical function in their pilot RCT, including 102 randomly assigned participants in physical activity versus health education groups.⁶⁴
- An additional RCT assessing effects of physical activity was conducted by Klusmann, and colleagues (2010), including a sample of 259 healthy older women, randomly assigned to a 6-month computer course, physical activity group, or control. Those in the physical activity group demonstrated significantly improved delayed story recall.⁶⁵

As previously noted, three studies were identified that reported no association between physical activity and cognitive health. These included one RCT and two cohort studies.

- In a small RCT, conducted by Smiley-Oyen and colleagues (2008), 57 older adults were randomized to either an aerobic exercise training group or a strength and flexibility exercise training group to test the effects of exercise training on neurocognitive tasks. Results indicated that aerobic exercise did not have a beneficial effect on tasks requiring little executive control, although some higher level tasks were improved. Authors concluded that while aerobic exercise may be beneficial on certain tasks, it is “not a prerequisite” for these effects.⁶⁶

In considering all of the above studies, while there is some conflicting evidence, there does appear to be emerging evidence for a protective effect of physical activity on cognitive health. Still, there is a clear need for additional trials to confirm the detailed elements required for success.

⁶⁴ Williamson, J.D., Espeland, M., Kritchevsky, S.B., Newman, A.B., King, A.C., Pahor, M., Guralink, J.M., Pruitt, J.M., Miller, M.E. (2009). Changes in cognitive function in a randomized trial of physical activity: Results of the lifestyle interventions and independence for elders pilot study. *Journals of Gerontology: Series A*, 64A(6): 688-694.

⁶⁵ Klusmann, V., Evers, A., Schwarzer, R., Schlattmann, P., Reischies, F.M., Heuser, I., Dimeo, F.C. (2010). Complex mental and physical activity in older women and cognitive performance: A 6-month randomized controlled trial. *Journals of Gerontology: Series A*, 65(6): 680 – 688.

⁶⁶ Smiley-Oyen, A.L., Lowry, K.A., Francois, S.J., Kohut, M.L., Ekkekakis, P. (2008). Exercise, fitness, and neurocognitive function in older adults: The “selective improvement” and “cardiovascular fitness” hypotheses. *Annals of Behavioral Medicine*, 36(3): 280 – 291.

ROAD MAP PRIORITY ACTION: *Conduct research on other areas potentially affecting cognitive health such as nutrition, mental activity, and social engagement.* Science is evolving regarding risk and protective factors in the areas of cognitive training, nutrition, and social engagement. It is critical to monitor and include these areas as the science emerges.

As detailed in the *Review of Recent Literature on Protective Factors for Cognitive Health*⁶⁷, with full citations included in the *Protective Factors for Cognitive Health* bibliography⁶⁸, seven individual studies were identified that assessed the impact of various eating habits on cognitive health. Three studies focused on the “Mediterranean Diet”, while two focused on intake of fruits and vegetables, and two focused on fat intake.

- The review identified three studies that focused on a Mediterranean Diet (MeDi) as a potential protective factor against cognitive decline. All three studies were large prospective cohort studies, with two supporting the benefits of a MeDi, and one that was non-supportive.
- The review identified two studies that assessed the benefits of a diet high in fruits and vegetables as potentially protective against cognitive decline. While both large cohort studies found high intake of vegetables to be beneficial, only one found the same benefit for intake of fruits.
- Two studies were identified in the review that focused on the impact of dietary fat intake and risk of cognitive decline. Both of these large, longitudinal studies demonstrated a significantly higher risk of cognitive decline among those with high levels of fat intake at midlife.

Nine studies were found and detailed in the *Review of Recent Literature on Protective Factors for Cognitive Health*⁶⁹, with full citations included in the *Protective Factors for Cognitive Health* bibliography⁷⁰, that assessed the impact of cognitive training and enhancement programs on cognitive function and risk of dementia identified in this review. Of these, two were large RCTs, one was a small RCT, four were large longitudinal cohort studies, and three were small, short-term intervention control studies. Of these, only one (a small intervention control study) reported finding no association between cognitive engagement and improved cognition. The majority of studies did find beneficial effects of cognitive training on cognitive performance.

⁶⁷ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁶⁸ Center for Health Improvement. (2010). *Protective Factors for Cognitive Health*

⁶⁹ Center for Health Improvement. (2010). *Review of Recent Literature on Protective Factors for Cognitive Health*

⁷⁰ Center for Health Improvement. (2010). *Protective Factors for Cognitive Health*

Other Recommendations for the CONDUCTING INTERVENTION RESEARCH Cluster

Conduct physical activity studies to determine the long-term benefit of physical activity as it relates to cognitive function.

- No physical activity studies were identified in addition to those previously described.

Conduct studies to determine the physical activity prescription (e.g., type of activity, frequency, duration, and intensity) needed to maintain or promote cognitive functioning.

- While no definitive prescriptions have been identified, the previously described literature reviews do provide insights into potential directions for specific elements.

Conduct studies to determine the effect of physical activity and physical activity relapse on persons of different backgrounds in relation to cognition.

- No studies specific to this issue were identified.

Identify how physical activity relates to those aspects of cognitive functioning that are important to the successful performance of activities of daily living and instrumental activities of daily living.

- No studies specific to this issue were identified.

Determine the feasibility of conducting secondary analyses of existing studies to examine the relationship between physical activity and the maintenance of cognition.

- The need for this determination still exists.

Identify the mechanisms that may mediate the relationship between physical activity and cognitive functioning.

- Detailed study is required to determine potentially mediating factors.

Encourage cardiovascular disease and diabetes researchers to use appropriate measures addressing cognitive domains as outcomes in their studies.

- Other than the call for more research outlined in the NIH Consensus Statements, current NIH/NIA priorities are unclear regarding this recommendation.

Encourage research to determine the impact of multiple vascular risks on cognition.

- Other than the call for more research outlined in the NIH Consensus Statements, current NIH/NIA priorities are unclear regarding this recommendation.

ROAD MAP CLUSTER: MEASURING COGNITIVE IMPAIRMENT AND BURDEN

Identify thresholds for cognitive decline that have functional importance for population-based surveillance systems.

Recent studies that support this objective include:

- A 2012 BMJ article concluded that cognitive decline is already evident in middle age (45-49 years). Data sourced in this study were from Whitehall II data sharing. Participants in the Whitehall II study have now been followed for a quarter of a century. During this time they have taken part in 10 data collection phases, five of which included a medical screening. Participation continues to be high at 70% of those alive. According to the group, *“The results from our next medical screening (2012-13), which is the 11th wave of Whitehall II data collection, will be optimal for studying outcomes in the elderly. Ninety percent of participants will be [over] 65, more than 30% 75-85, and our data will span an age range of 50 years. By combining our existing 25 years of data on social inequalities and chronic disease with new clinical measures of cognitive function, mental disorders and physical functioning we will transform Whitehall II into a world-class, interdisciplinary study of aging. In addition to providing insights into individual and social differences in the development of frailty, disability, dependence, and dementia, our work will enable the determination of optimal time windows and targets for interventions that maximize the potential for healthy aging and independent living.”*⁷¹
- A recent study found that incidence of all-cause dementia is very high in people aged 90 years and older and continues to increase exponentially with age in both men and women.⁷²

Included above and additionally, there are several well established longitudinal prospective cohort studies assessing various relevant factors (particularly vascular risk) for consideration in this context. Among others, these epidemiological studies include:

- The Whitehall II Study, <http://www.ucl.ac.uk/whitehallII/>;
- The Framingham Heart Study, <http://www.framinghamheartstudy.org/>;
- The Rotterdam Study, <http://www.epib.nl/research/ergo.htm>;
- The MRC Cognitive Function and Aging study (CFAS), <http://www.phpc.cam.ac.uk/longitudinalstudies/>; and
- The CDC Longitudinal Studies of Aging, <http://www.cdc.gov/nchs/lsoa.htm>.

⁷¹ Abstract available at <http://www.bmj.com/content/344/bmj.d7622>

⁷² Corrada, M.M., Brookmeyer, R., Paganini-Hill, A., Berlau, D., Kawas, C.H. Department of Neurology, University of California, Irvine, CA 92697-1400, USA. mcorrada@uci.edu

Identify critical dimensions of cognition and the most appropriate corresponding measures that may be useful in surveillance systems.

- As discussed in the *Conducting Surveillance* cluster, CDC has worked extensively to identify dimensions and measures of cognitive health to be included in the BRFSS and NHANES surveillance systems. Measures were developed with guidance from expert panels and through a high involvement process.
- The NIA *2010 Alzheimer's Disease Progress Report: A Deeper Understanding* provides insight into social and behavioral factors that might be useful for identification in a surveillance system including the role of diet, vitamin D, exercise and obesity on cognitive health.⁷³
- The NIA reports over 20 ongoing clinical trials on age-related cognitive decline including:
 - Active interventions for the aging mind;
 - Omega-3 and blueberry supplementation in age-related cognitive decline;
 - Aging and the renin-angiotensin system in elderly hypertensive individual;
 - Cognitive benefits of aerobic exercise across the lifespan; and
 - Combining exercise and cognitive training to improve everyday function.

Identify measures of the public health burden of cognitive impairment on individual people, families, and communities.

- The CDC Healthy Aging Program released *Assuring Healthy Caregivers, A Public Health Approach to Translating Research into Practice: The RE-AIM Framework* to assist with interventions to ameliorate the public health burden of cognitive decline. This report also helps to identify the burden on caregivers of people with dementia.
- The Healthy Aging Program at the CDC and the NACDD released two issue briefs focused on the mental health of older adults in the United States: *Issue Brief #1: What Do the Data Tell Us?*⁷⁴ and *Issue Brief #2: Addressing Depression in Older Adults: Selected Evidence-based Programs.*⁷⁵
- The Alzheimer's Association has authored several documents that identify levels of public burden. Examples include *A National Alzheimer's Strategic Plan: The Report of the Alzheimer's Study Group* and *Changing the Trajectory of Alzheimer's Disease: A National Imperative.*

⁷³ Available at http://www.nia.nih.gov/sites/default/files/2010_alzheimers_disease_progress_report_.pdf

⁷⁴ Available at http://www.cdc.gov/aging/pdf/mental_health.pdf

⁷⁵ Available at http://www.cdc.gov/aging/pdf/mental_health_brief_2.pdf

Identify a set of questions appropriate for use in people of diverse educational attainment, culture, and ethnicity that will measure cognitive function with sufficient sensitivity, specificity, and predictive values.

- The Prevention Research Centers Healthy Aging Research Network (PRC-HAN) conducted 55 focus groups that included over 450 participants from nine states from 2005 to 2007. This research addressed community-based perceptions across diverse cultural groups including non-Hispanic whites, Hispanics, African-Americans, American Indians, Chinese, and Vietnamese. Participants included caregivers, older adults with varying levels of cognitive health and health care providers. This work highlighted commonalities and differences across cultures that could help to inform this Road Map recommendation.
- Two NIA-funded Alzheimer’s disease centers focused on minority recruitment efforts. The University of California, Davis Alzheimer’s Disease Center developed an outreach program that included educational presentations at community churches, senior centers, and support groups.⁷⁶ The Bryan Alzheimer’s Disease Research Center at Duke University emphasized partnerships between community members and researchers to identify problem issues, recruit participants, and share research findings with the community.⁷⁷ According to the NIA, “Researchers hope that efforts such as these will lead to greater representation in research by these groups so that interventions can be more effectively developed and tested to benefit everyone with cognitive decline and dementia.”
- CDC’s Healthy Aging Program supported the Alzheimer’s Association in developing and evaluating the nation’s first community-level, culturally-relevant demonstration project designed to increase awareness of cognitive health, increase intentions to engage in physical activity, and promote prevention and management of vascular risks among African-American baby boomers. Members volunteered as “Healthy Brain Champions” and served as advocates of brain health in their communities.

⁷⁶ Hinton, L., Carter, K., Reed, B.R., Beckett, L., Lara, E., DeCarli, C., Mungas, D. (2010). Recruitment of a community-based cohort for research on diversity and risk of dementia. *Alzheimer Disease and Associated Disorders*, 24(3):234-241. Available at www.ncbi.nlm.nih.gov/pubmed/20625273

⁷⁷ Ballard, E.L., Gwyther, L.P., Edmonds, H.L. (2010). Challenges and opportunities: Recruitment and retention of African Americans for Alzheimer disease research: Lessons learned. *Alzheimer Disease and Associated Disorders*, 24:Suppl S19-S23. Available at www.ncbi.nlm.nih.gov/pubmed/20711060

ROAD MAP CLUSTER: DEVELOPING CAPACITY

Engage the private sector and other entities in planning and funding research to address ways to maintain and improve cognitive health, including clinical trials.

The Healthy Brain Initiative maintains a range of partnerships to promote connection to the larger field of organizations with a potential interest in this area. However, while there is strong representation from the non-profit, academic and government sectors, true 'private sector' representation is limited. The following are partnerships in support of this recommendation:

- The Alzheimer's Association is a key collaborator with the CDC Healthy Aging Program in the implementation of the Healthy Brain Initiative as well as the Road Map recommendations. The *Community-Based Demonstration Project to Increase Awareness of African-Americans* is an example of the reach and influence of the Alzheimer's Association in supporting prevention and awareness at the community level.
- As previously noted, the CDC Healthy Aging Program has been working with the NCHS on the incorporation of cognitive health elements into the NHANES.
- The CDC works with federal agencies such as the NIA, NIH and the U.S. Census Bureau in an attempt to move forward with research agendas well-aligned with the Road Map and cognitive health. However, other than the Alzheimer's (NIA) and cognitive health summits (NIH), little direct action has been taken to promote many of the specific recommendations embedded in the Road Map in terms of a new research agenda.
- According to the *CDC Healthy Brain Initiative Progress 2006-2011* report, CDC's Healthy Aging Program collaborated with the University of Michigan and the NACDD to develop an action guide focused on caregiving interventions. The *REACH OUT Action Guide: Implementing a Community-Based Program for Dementia Caregivers* is designed to assist community and state agencies in implementing evidence-based programs for improving health and quality-of-life for persons caring for older adults with dementia.

Convene researchers and community interventionists conducting interventions on risk and protective factors to identify potential mechanisms to advance the work in the field of cognitive health.

- CDC funds the Healthy Aging Research Network that brings together researchers and diverse communities to improve the lives of older adults. The network's goal is to deliver healthy aging practices, programs, and policies into community settings. Network members engage in individual and collaborative

projects that test measures, interventions, and dissemination strategies for healthy aging. Host institutions include:

- The University of Washington, Health Promotion Research Center;
 - The University of California-Berkeley, Center for Family and Community Health;
 - The University of Colorado-Denver, Rocky Mountain Prevention Research Center;
 - The University of North Carolina-Chapel Hill, Center for Health Promotion and Disease Prevention;
 - The University of South Carolina, Prevention Research Center;
 - Texas A&M Health Science Center, Center for Community Health Development; and
 - West Virginia University, West Virginia Prevention Research Center.
- Efforts to inform and guide the Healthy Aging Research Network also support this recommendation. A symposium conducted in collaboration with the Rosalynn Carter Georgia Mental Health Forum is one example of this type of activity. The symposium gathered diverse professionals from community agencies across the country to discuss the latest scientific evidence to support cognitive health.⁷⁸

⁷⁸ According to the *CDC Healthy Brain Initiative Progress 2006-2011* report.