The Road Map is a “living” document expected to evolve over time. Some actions are achievable within 1 to 3 years, while others will require more time to come to fruition. Some are linked and need to occur in a certain sequence, with the outcomes of the first setting the stage for initiating the next. And, while no particular age group is singled out for special attention, the Road Map concentrates primarily on interventions for middle-aged and older adults. This focus recognizes that interventions to reduce risks are best begun early in life; yet, adults, particularly older adults, are more likely to be concerned and motivated to take action.

The full set of Road Map actions fall into eight clusters. Within each cluster, the actions are listed in no special order of priority. The letter in parentheses after each action refers
to the group (either workgroup or Steering Committee) that originally proposed it (P=Prevention Research, C=Communication, P=Policy, S=Surveillance, SC=Steering Committee). All of the actions generated by the groups are included.

In offering these actions, we cannot underestimate the complexities of translating them into action. Most essential is a commitment to base this Road Map on scientific evidence, moving forward collaboratively to leverage existing resources and activities as promotion activities become defined. Key partnerships must be formed among a diverse array of organizations and agencies to build on collective strengths, deliver compatible messages and interventions, and assure efficient use of resources. Existing health promotion communities associated with heart disease, stroke, diabetes, and physical activity are invaluable resources for promoting cognitive health.

### Disseminating information

1. **Disseminate the latest science to increase public understanding of cognitive health and to dispel common misconceptions.** (SC)

   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.
2. **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.** *(C)*

   In disseminating information to the public, information must be filtered through trusted health and community resources. Providing professionals with accurate, evidence-based information and tools will respond to the growing interest among consumers regarding questions on preserving cognitive health.

3. **Develop and implement a training curricula related to cognitive health for continuing professional education of health and human services professionals.** *(P)*

   To increase the awareness and knowledge of professionals in health and human services, strategies should be developed in both preservice and in-service modalities. Bringing new professionals into the field with appropriate knowledge is not enough; the level of understanding of practicing professionals must also be raised so that they can help the public sort out evidence-based approaches to cognitive health from less proven or undemonstrated outcomes.

4. **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.** *(P)*

   The public plays an important role in stimulating both public sector and marketplace action on issues it finds important. It is essential that the public be educated based on current science and knowledge of best practices. This will contribute to the development of a new conventional wisdom regarding cognitive health.

5. **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.** *(C)*

   A one-stop-shop, go-to place for valid and tested information will provide consumers and professionals who serve older adults and their families with the tools to make informed decisions about their health and effect positive behavior change. The site would provide guiding principles to help consumers and health information providers and professionals to evaluate local services that address these concerns and to maintain current
understanding about cognitive health and these interventions as the science becomes more sophisticated.

**Translating knowledge**

1. **Determine how diverse audiences think about cognitive health and its associations with lifestyle factors.** (R)
   
   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.

2. **Help people understand the connection between risk and protective factors and cognitive health.** (C, SC)
   
   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.

3. **Develop a mechanism to review cognitive health messages and programs to determine their scientific accuracy and public credibility.** (C)
   
   Currently, the public has no single source of informed and valid recommendations for programs, services, and lifestyle related interventions to address positive measures in cognitive health. Creating a system for reviewing the growing number of programs and providing public access to the reviews generated will move consumers closer to informed decisions and more positive investments in health.
Implementing policy

1. **Initiate policy changes at the federal, state, and local levels to promote cognitive health by engaging public officials.** (P)
   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.

2. **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.** (P)
   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.

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

Including cognitive health in such documents as the *State of Aging and Health in America Report* would elevate its status as a recognized public health issue and make data readily available for action. Armed with important data from this and other monitoring systems, public health professionals will be prepared to move policy forward to test interventions.

4. **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.**

Partnerships can help to maximize limited resources (fiscal and personnel) and competing priorities. They should be based upon such criteria as the ability to: examine evidence-based research; establish on-going forms of dialogue; build leadership and capacity related to policy and public and professional education; address diverse cultural and ethnic populations; provide funding; and explore the links between the vascular factors, physical activity, and cognitive health.

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

To achieve broad, effective collaborations for cognitive health and emotional well-being, national organizations and agencies must identify and agree to common ground. National organizations and agencies are essential to both reaching large numbers of individual men and women and to using their influence to educate policy makers and opinion leaders. Education of the public and leaders of key organizations is a precursor to policy change related to cognitive health.
6. 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. (P)
   Policies should be amended to reflect current science and knowledge and be inclusive of cognitive health. Adjusting and amplifying current policies are efficient and economical routes to systems change.

7. Promote the modification of existing national and state public health plans to include cognitive health in their strategies or recommendations where appropriate. (P)
   National and state public health plans significantly influence efforts in public health and serve as a barometer of improvement. As interventions are demonstrated that can have an effect on cognitive health, including it in these plans would elevate its status as a recognized public health issue and provide a venue for the evaluation of progress.

Conducting surveillance

1. Define the goals of a surveillance system to promote the development of an appropriate system and the collection of data on cognitive health. (S)
   Clearly defined goals of public health surveillance will promote the development of appropriate surveillance systems and the collection of consistent data that provide useful information to inform public health policy. Goals of the surveillance system may include: defining the burden of cognitive decline in the population; monitoring the trends in burden (e.g., prevalence, incidence); monitoring trends in risk factors; defining the population at increased risk; and determining whether additional analyses should be performed for the purpose of public health surveillance.

2. Determine which existing general population-based surveillance systems include information useful for the surveillance of cognitive health at national, state and local levels. (S)
   Adding to or changing existing surveillance systems (e.g., Behavioral Risk Factor Surveillance System, Health and Retirement Study, National Health Interview Survey) to
address issues related to cognitive decline is less costly and may be more efficient than developing new surveillance systems. However, there are important limitations of existing systems and the data they collect; in particular, most are cross sectional rather than longitudinal. Many are already quite lengthy, with major constraints on adding new items. Close examination of these systems will ensure that they are amended appropriately and cost-effectively.

3. Identify existing studies that measure longitudinal trends in cognitive function. (S)
Existing large cohort or other longitudinal studies of cognitive decline may provide items that could be incorporated into surveillance systems for measuring such decline. Some of these studies may have validated items used previously in both majority and minority populations that estimate variability and true change over time.

4. 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. (S)
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.

Moving research into practice

1. 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. (R)
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.

2. 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. (R, SC)
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.

3. **Conduct a systematic literature review on the relationship between treatment of diabetes and cognitive health.** (R)

Some evidence suggests that diabetes is a risk factor for cognitive decline. Recommendations for types of diabetes management (e.g., medications, lifestyle modification) that might also be beneficial for cognitive health cannot be made without a review of the literature relating diabetes interventions to cognitive change (and most likely undertaking additional clinical trials), and identification of areas that need to be clarified before specific interventions can be proposed.

4. **Conduct a systematic literature review on the relationship between treatment of hypertension and cognitive health.** (R)

Hypertension is a known risk factor for stroke, and therefore for vascular dementia and cognitive decline. Recommendations for types of antihypertensive therapy and the ranges of blood pressure for different age groups recommended for maintaining cognitive health cannot be made without a review of the literature relating hypertensive interventions to cognitive change, and probably not without pursuing additional clinical trials. The systematic literature review would identify areas that need to be clarified before specific interventions can be recommended.

5. **Identify gaps in knowledge about cognitive health and related lifestyle changes, and determine**
whether these vary by specific groups. (C)
To develop appropriate materials and tools, the gaps in knowledge need to be understood, especially among high-risk populations, vulnerable populations, and health care providers. Specific racial or ethnic groups may need to have targeted and culturally appropriate materials and tools developed because they are at greater risk for experiencing cognitive decline. Health care providers may have needs and gaps in knowledge that differ from the general public because they are also providing information to others about cognitive health.

6. Conduct a systematic review of lifestyle interventions and contextual factors to examine the benefits and barriers to their adoption and maintenance. (R)
Understanding the benefits of and barriers to adopting and maintaining an intervention is one of the critical steps for translating interventions effectively and efficaciously in a community-based setting.

7. 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. (R)
It is important to know what kinds of physical activity stimuli are necessary to promote cognitive health. An examination of the scientific literature will identify gaps in knowledge and focus research. Without such information and research development, accurate advice cannot be conveyed to the public on how active they should be to maintain their cognitive health.

8. Develop cognitive health interventions that reflect the most current scientific research and that are consistent with effective community-based interventions. (C,SC)
Clinical trials assessing the efficacy of interventions to effect cognitive function and public health studies examining the effectiveness and feasibility of community-based interventions are often reported separately. More comprehensive approaches involving collaborations between clinical researchers and community participatory researchers are critical to ensure that the effectiveness and feasibility of cognitive health interventions are developed and tested with various communities.
Conducting intervention research

1. **Conduct controlled clinical trials to determine the effect of reducing vascular risk factors on lowering the risk of cognitive decline and improving cognitive function.** *(R)*
   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.

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

3. **Conduct physical activity studies to determine the long-term benefit of physical activity as it relates to cognitive function.** *(R)*
   To date, studies of physical activity interventions that have assessed cognitive outcomes typically have no follow-up at all or only a short follow-up. Studies of physical activity are needed to determine to what extent any cognitive benefits associated with physical activity persist across long-term follow-up: at 6 month, 1 year, or longer time periods. Long-term follow-up studies of physical activity are also needed to determine the duration of cognitive effects in those who stop the program.

4. **Conduct studies to determine the physical activity prescription (e.g., type of activity, frequency, duration, and intensity) needed to maintain or promote cognitive functioning.** *(R)*
   Small clinical trials have shown that aerobic activity (e.g., walking several times a week for 6 months duration) was capable of producing cognitive improvement in older adults, at least in the short term. These few studies, however, have yet to yield a “prescription” that could be given to older adults; thus, many questions remain to be answered about the types of activity (e.g., aerobic or anaerobic, individual or group) and their duration, intensity, and frequency that are needed to maintain, or even gain, good cognitive function.

5. **Conduct studies to determine the effect of physical activity and physical activity relapse on persons of**
different backgrounds in relation to cognition. (R)
Similar to the pharmacogenetics approach that has been used to determine the efficacy of specific drugs for persons with certain genotypes, it seems possible that recommendations for behavioral interventions such as physical activity might be crafted to an individual person’s background (e.g., genetic endowment, cultural context, life histories, fitness levels, and age).

6. 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. (R)
It is important to understand how any cognitive benefit measured in the laboratory translates to better functioning in real world tasks. Although well-controlled laboratory studies are essential to advancing knowledge in this area, it is currently not clear how much the cognitive tasks assessed in these studies will generalize to the cognitive functioning required in routine daily activities important to older adults, such as balancing a check book, safely driving a car, and compliance with prescriptions for medications (i.e., knowing how many or what pills to take when).

7. Determine the feasibility of conducting secondary analyses of existing studies to examine the relationship between physical activity and the maintenance of cognition. (R)
It is recognized that secondary analyses of existing data sets often possess methodological problems (including cross-sectional data). Nevertheless, data sets (perhaps even some representative of the U.S. population) may exist that contain variables related to cognitive functioning, health, and physical activity. Efforts to locate such data and to evaluate research questions and associations among the variables may provide additional insights into this area.

8. Identify the mechanisms that may mediate the relationship between physical activity and cognitive functioning. (R)
Physical activity may not affect cognitive function directly but it may still affect it through intermediate mechanisms. It is important to know whether the association between physical activity and cognitive functioning is mediated by changes in diabetes outcomes, in vascular fitness outcomes, or in risk factors such as hypertension or hyperlipidemia.
9. **Encourage cardiovascular disease and diabetes researchers to use appropriate measures addressing cognitive domains as outcomes in their studies. (R)**

The best way to understand which interventions in cardiovascular disease and diabetes will affect cognitive health is for appropriate aspects of cognitive measures to be routinely included in appropriate studies in these two areas.

10. **Encourage research to determine the impact of multiple vascular risks on cognition. (R)**

Specific focus is needed to both understand the biology of how vascular risk factors affect cognition and to determine whether the effects of having multiple factors are additive or multiplicative. Some observational studies have suggested that the greater the number of vascular risk factors, the greater the cognitive deficit. We know, however, that clinical trials with pharmacological agents that control individual risk factors have effectively reduced vascular risk but have not consistently produced cognitive benefit. A better understanding of the mechanisms by which multiple vascular risk factors may contribute to cognitive deficits could identify targets for interventions to reverse or reduce the deficit. The biological mechanisms of the interaction among risk factors, as well as models of the size of the interaction effect on cognition, would assist in designing trials of potentially effective interventions.

11. **Conduct research on other areas potentially affecting cognitive health such as nutrition, mental activity, and social engagement. (R)**

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.
Measuring cognitive impairment and burden

1. **Identify thresholds for cognitive decline that have functional importance for population-based surveillance systems.** (S)
   It is important to recognize points on the continuum of cognitive decline that are functionally meaningful. It should also be recognized that measurements beyond some points on this continuum may require information from proxy respondents. Useful comparisons of findings from different surveillance systems and research studies are improved if there is consistency among the thresholds being used. Functionally important thresholds should be of practical significance to help inform public health policy regarding needs for caregiver support and other special health care or social services.

2. **Identify critical dimensions of cognition and the most appropriate corresponding measures that may be useful in surveillance systems.** (S)
   It is important to know the key components of cognition (e.g. memory, intelligence, problem solving, and reasoning) that are most sensitive and specific to cognitive decline and practically measurable in surveillance systems.

3. **Identify measures of the public health burden of cognitive impairment on individual people, families, and communities.** (SC)
   The public health burden of cognitive impairment encompasses its effects on individual men and women, caregivers, families, employers, and others in the community. These effects may have physical, mental, social, and economic dimensions. It is important to identify key measurable components of these effects to enable the public health burden to be fully assessed, monitored, and described.

4. **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.** (S)
These questions might exist within an ongoing population-based surveillance system, or they could be added to such a system. To the extent possible, education- and culture-independent measures should be sought. Because the effects of education and culture are potential confounders, measures and analytic techniques are needed that would enable reduced cognitive function to be distinguished from low performance due to variations in educational or cultural exposures. It is critical to recognize and correct these confounding effects so as to avoid misinterpreting or misusing surveillance data.

2. 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. (R)

The fields of cardiovascular disease, depression, diabetes, and cognition are beginning to intersect. After conducting literature reviews on what is currently known about the effects of interventions targeting vascular factors, depression, and diabetes on cognitive health, researchers and community interventionists in each of these fields should be convened to determine strategies for moving the field of cognitive health forward.

Developing capacity

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

Support of research on cognitive health is expensive in scope, effort, and cost. Partnerships with federal agencies, foundations, and other entities will likely be necessary to secure such support and conduct this research.