UCDAVIS
ALZHEIMER'S DISEASE CENTER

Life's Essential 8
What You Can Do To Improve Your Brain Health

Charles DeCarli, MD
Victor and Genevieve Orsi Chair in Alzheimer'sResearch
Co-Director University of California at Davis, Alzheimer's Disease Center

IDeA Lab
Imaging of Dementia and Aging

THE UNIVERSITY OF CALIFORNIA
LET THERE BE LIGHT
DAVIS

Dementia prevention, intervention, and care: 2020 report of the *Lancet* Commission

Gill Livingston, Jonathan Huntley, Andrew Sommerlad, David Ames, Clive Ballard, Sube Banerjee, Carol Brayne, Alistair Burns, Jiska Cohen-Mansfield, Claudia Cooper, Sergi G Costafreda, Amit Dias, Nick Fox, Laura N Gitlin, Robert Howard, Helen C Kales, Mika Kivimäki, Eric B Larson, Adesola Ogunniyi, Vasiliki Orgeta, Karen Ritchie, Kenneth Rockwood, Elizabeth L Sampson, Quincy Samus, Lon S Schneider, Geir Selbæk, Linda Teri, Naaheed Mukadam

***Panel:* Recommended strategies for dementia risk reduction**

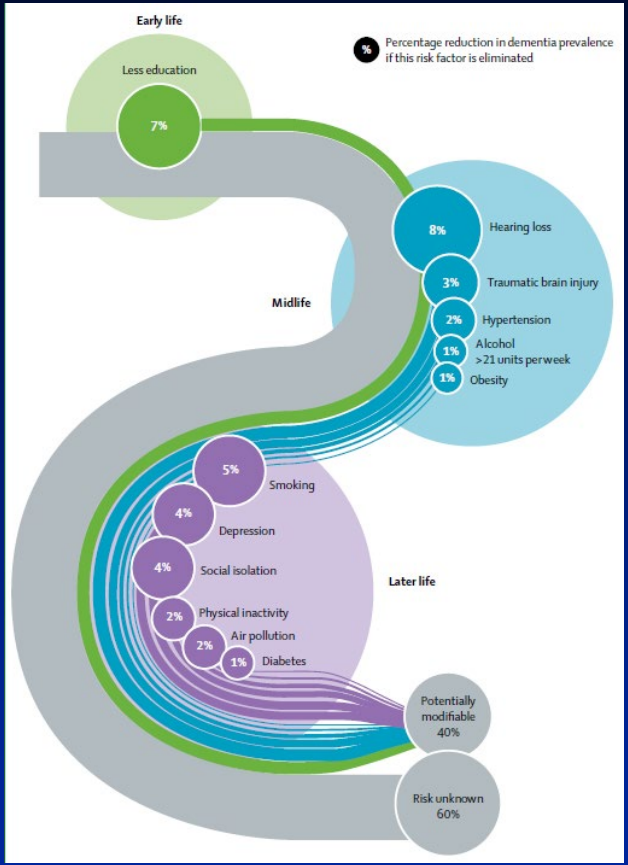
Risks are particularly high in more socially disadvantaged populations including in Black, Asian, and minority ethnic groups.

Population-wide

- Prioritise childhood education for all, worldwide
- Implement social public health policies that reduce hypertension risk in the entire population
- Develop policies that encourage social, cognitive, and physical activity across the life course for all (with no evidence for any specific activities being more protective)
- Scrutinise the risks for hearing loss throughout the life course, to reduce the risk of exposure to this risk factor
- Reduce the risk of serious brain trauma in relevant settings, including occupational and transport
- National and international policies to reduce population exposure to air pollution
- Continue to strengthen national and international efforts to reduce exposure to smoking, both for children and adults, and to reduce uptake and encourage cessation

Targeted on individuals

- Treat hypertension and aim for systolic blood pressure <130 mm Hg in midlife
- Use hearing aids for hearing loss; we need to help people wear hearing aids as many find them unacceptable, too difficult to use, or ineffective
- Avoid or discourage drinking 21 or more units of alcohol per week
- Prevent head trauma where an individual is at high risk
- Stopping smoking is beneficial regardless of age
- Reduce obesity and the linked condition of diabetes by healthy food availability and an environment to increase movement
- Sustain midlife, and possibly late-life physical activity



Risk score for the prediction of dementia risk in 20 years among middle aged people: a longitudinal, population-based study

Miia Kivipelto, Tiia Ngandu, Tiina Laatikainen, Bengt Winblad, Hilkka Soininen, Jaakko Tuomilehto

Lancet Neurol 2006; 5: 735–41

Midlife risk score for the prediction of dementia four decades later

Lieza G. Exalto[a,b], Charles P. Quesenberry[a], Deborah Barnes[c], Miia Kivipelto[d], Geert Jan Biessels[a], Rachel A. Whitmer[b,*]

Alzheimer's & Dementia 10 (2014) 562–570

Step 1

Age, y	Points
40–46	0
47–53	3
54–55	4

Step 2

Education, y	Points
0–6	3
7–9	2
>9	0

Step 3

Sex	Points
Men	1
Female	0

Step 4

Cholesterol, mg/dL	Points
<251	0
≥251	2

Step 5

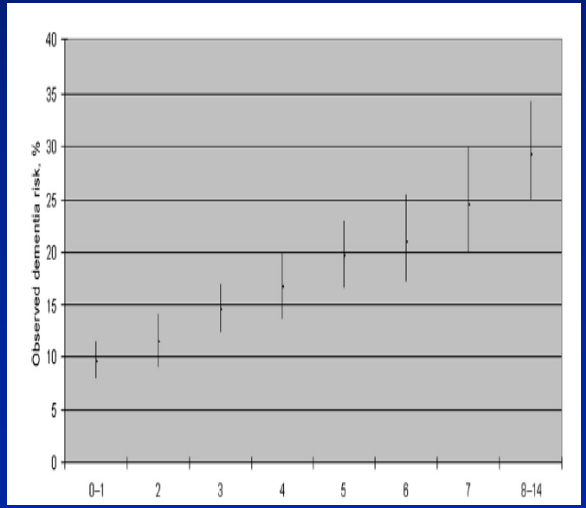
BMI, kg/m²	Points
<30	0
≥ 30	2

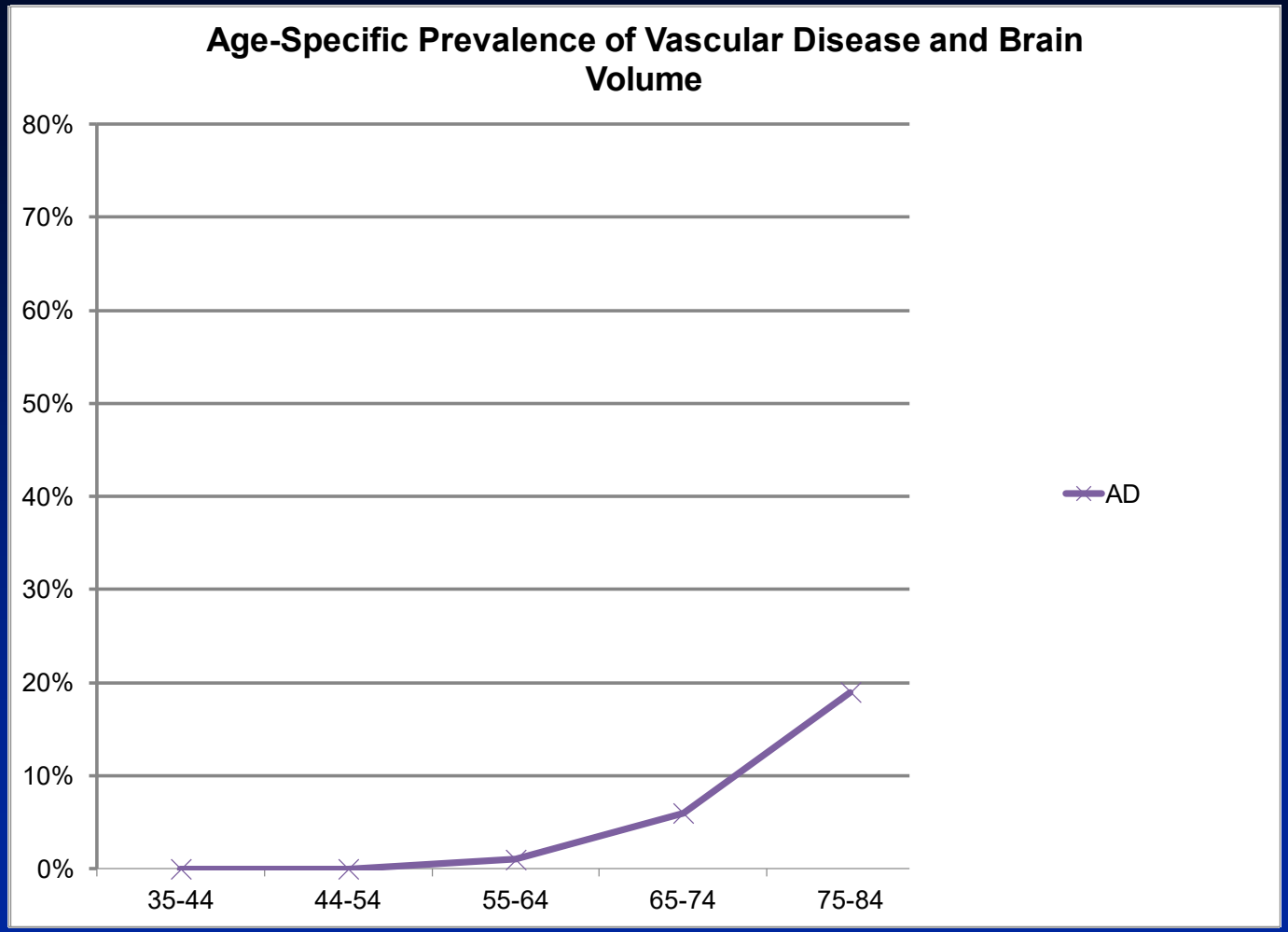
Step 6

Systolic blood Pressure, mm/Hg	Points
<140	0
>140	2

Predicted 40-year risk of dementia

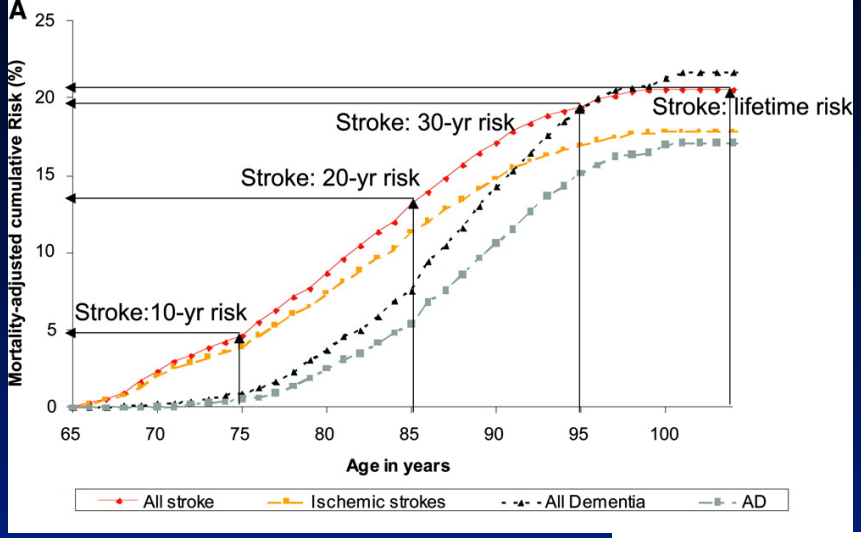
Total points	40–Year risk, %
0–1	10
2	11
3	15
4	17
5	20
6	21
7	25
8 –14	29

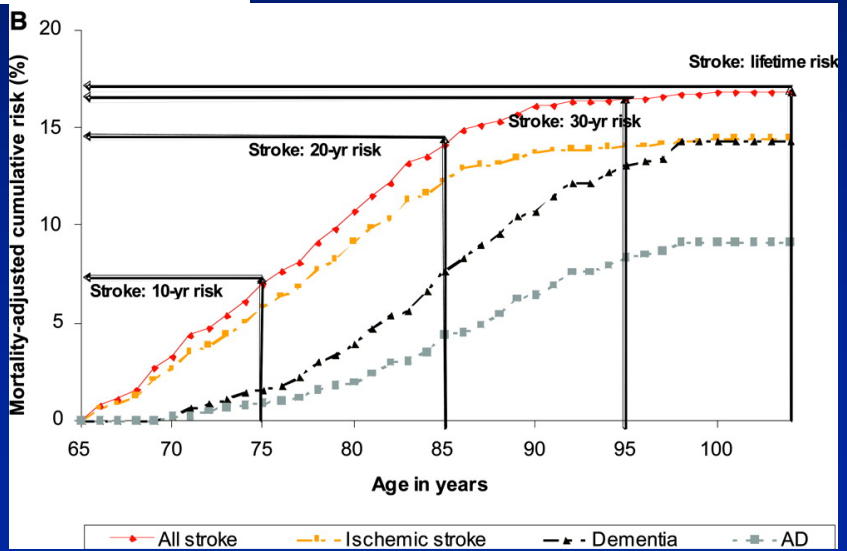




Framingham Heart Study, unpublished data

Future Risk of Stroke or Dementia at Age 65

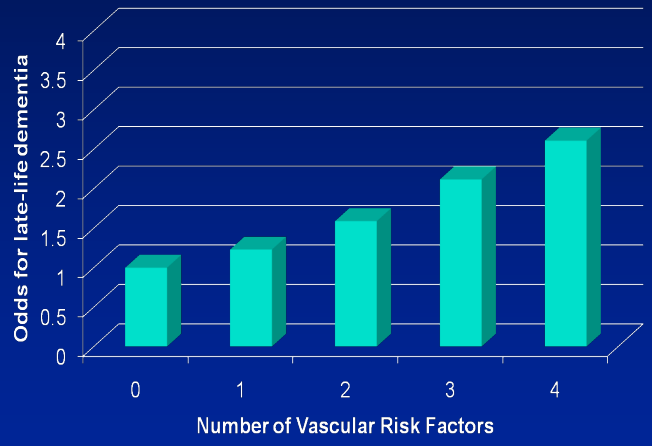




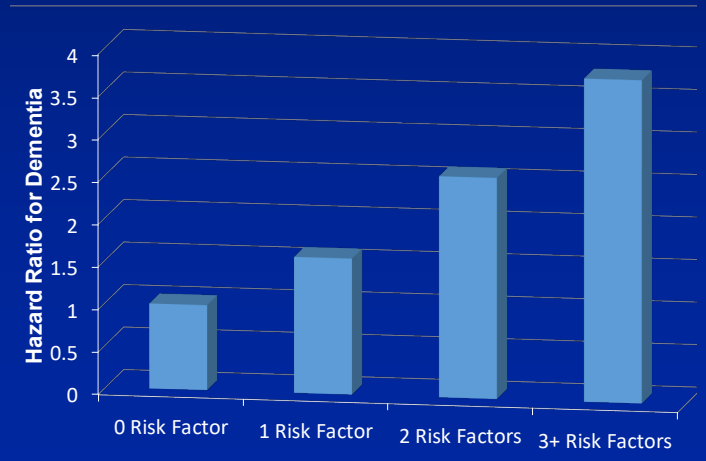
Seshadri, S. et al.
Stroke 2006;37:345-350

Increasing odds of Dementia with Number of Vascular Risk Factors

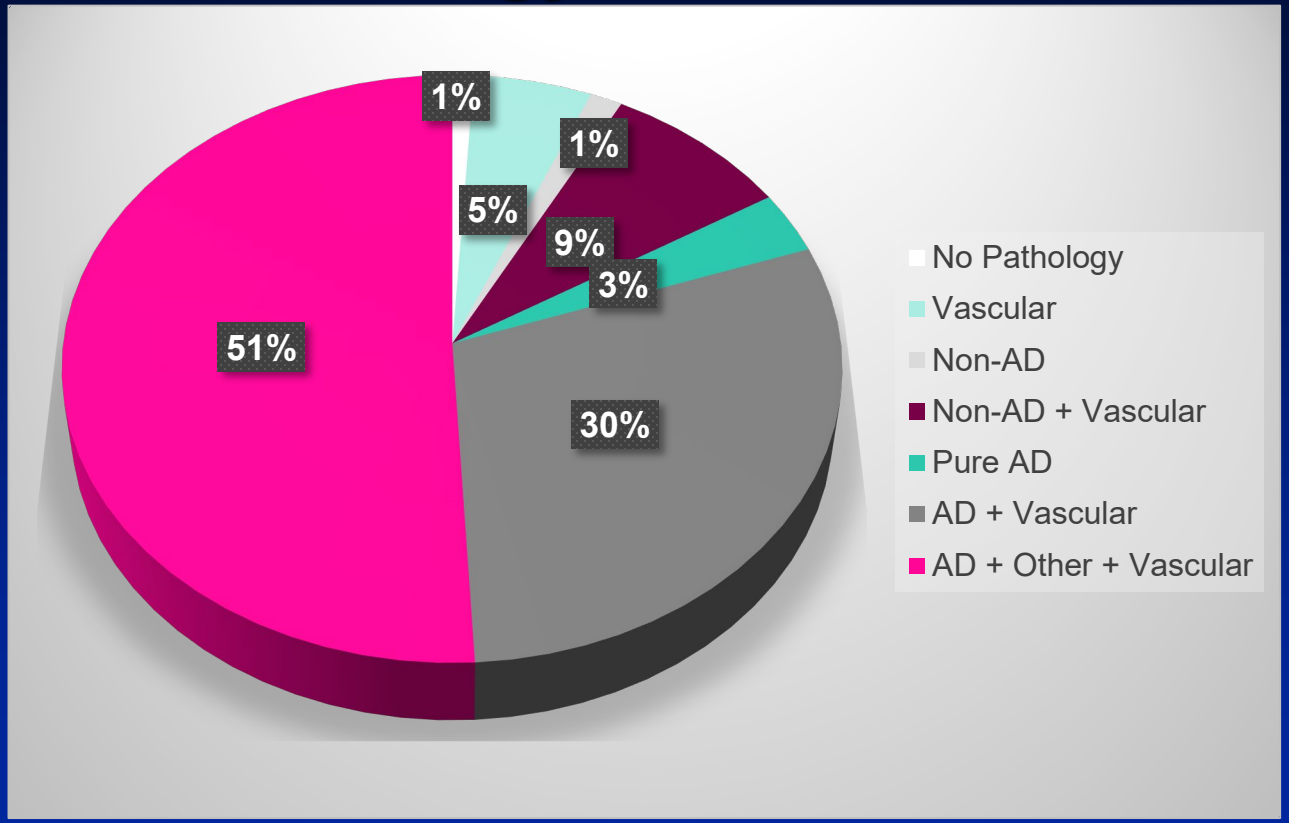
Whitmer, et al, Neurology, 2005
~74% Caucasian



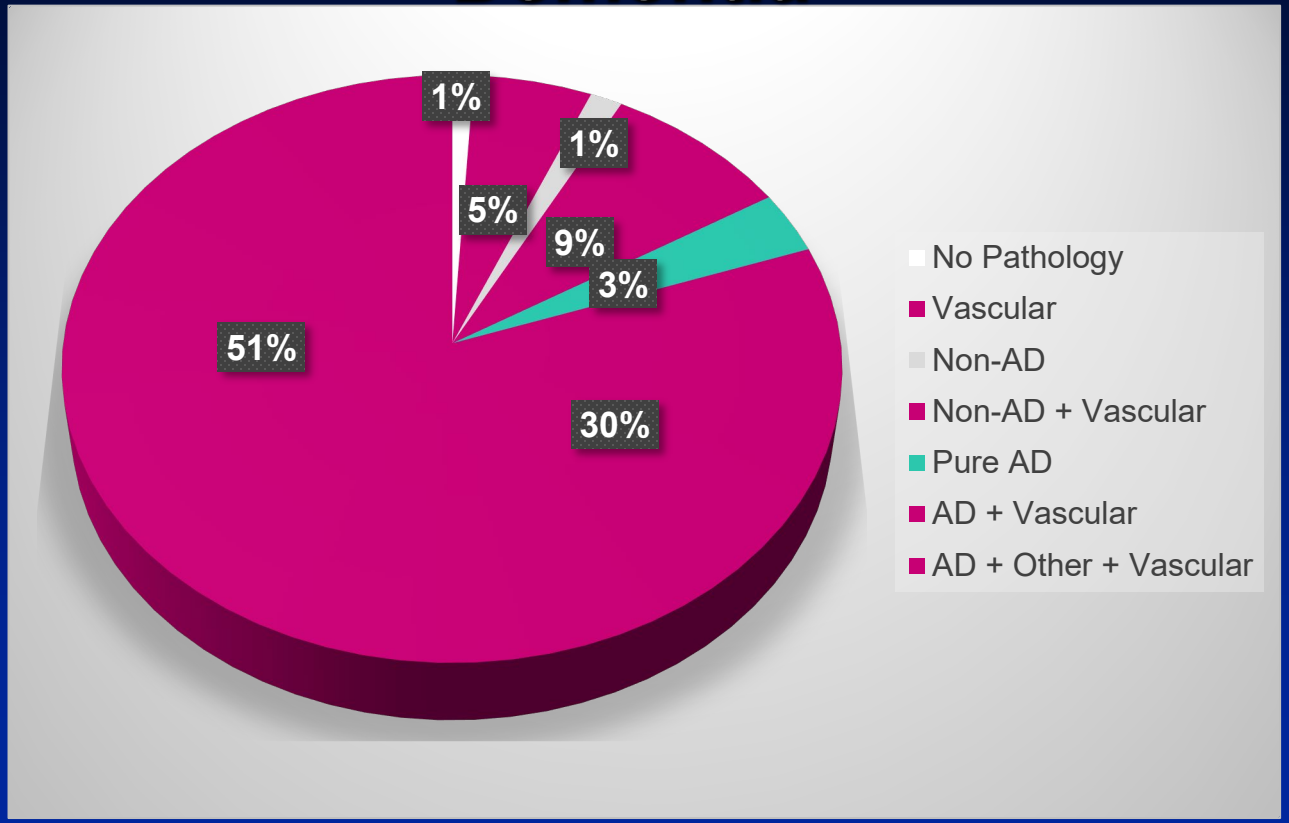
Luchsinger, et al, Neurology 2005
~23% Caucasian



Pathology of Dementia



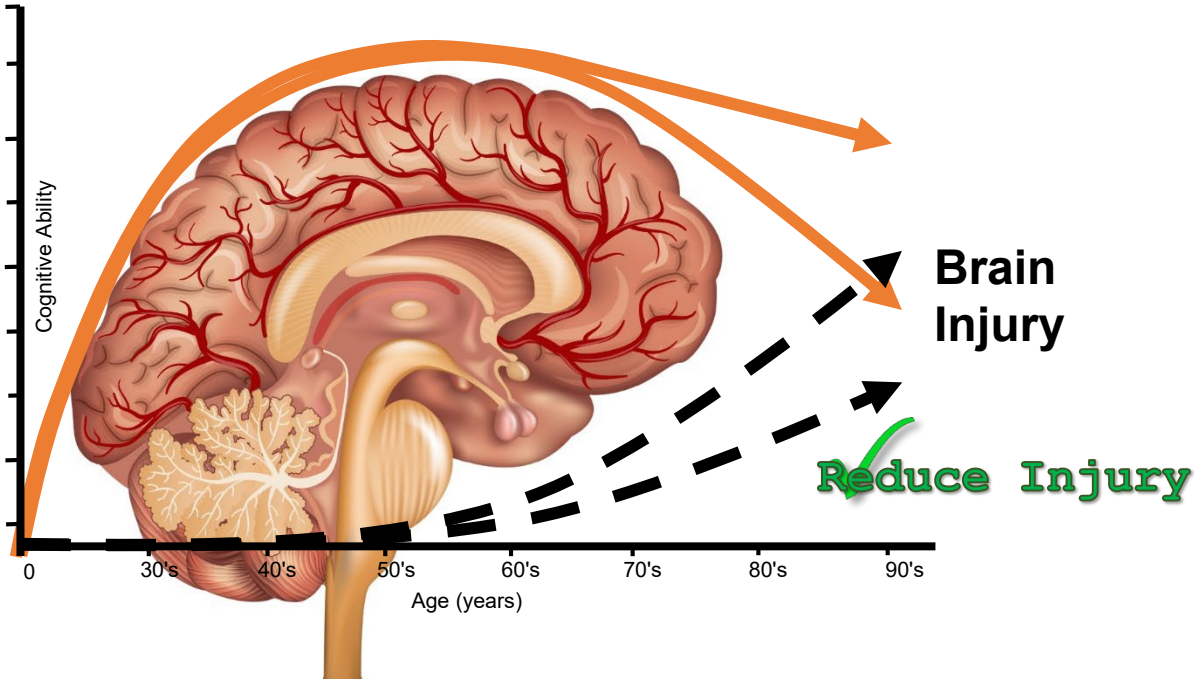
Vascular Pathology of Dementia



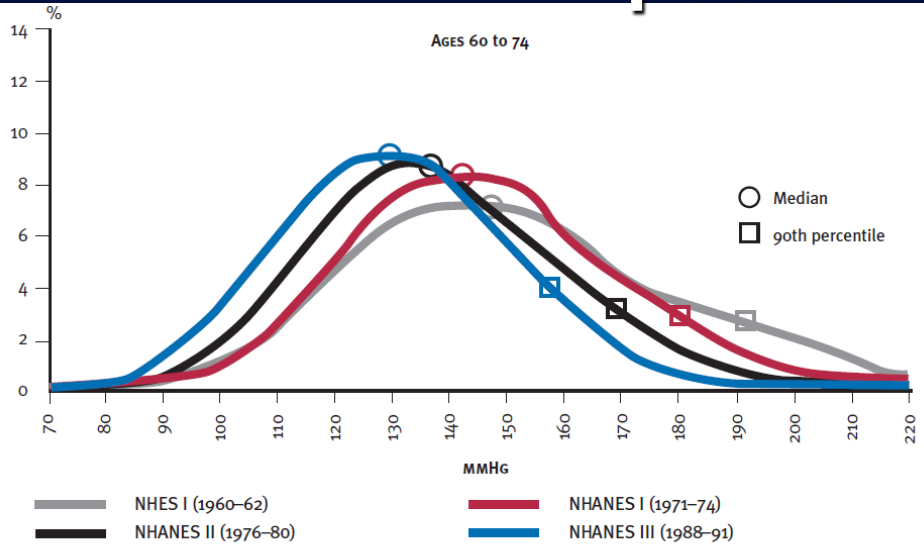
Summary

- Vascular risk factors and consequential vascular disease is common to the aging process
- Vascular risk factors also increase risk for dementia
- Vascular pathology commonly accompanies Alzheimer's disease in dementia

IMPROVING COGNITIVE AGING

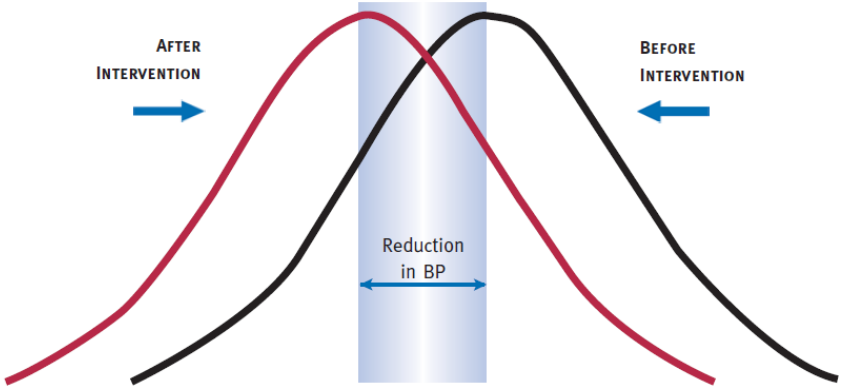


Impact of Intervention



NHANES, National Health and Nutrition Examination Survey; NHES, National Health Examination Survey

Source: Burt VL, et al. Trends in the prevalance, awareness, treatment, and control of hypertension in the adult US population. Data from the health examination surveys, 1960 to 1991. Erratum in: Hypertension *1996;7(5):1192.*

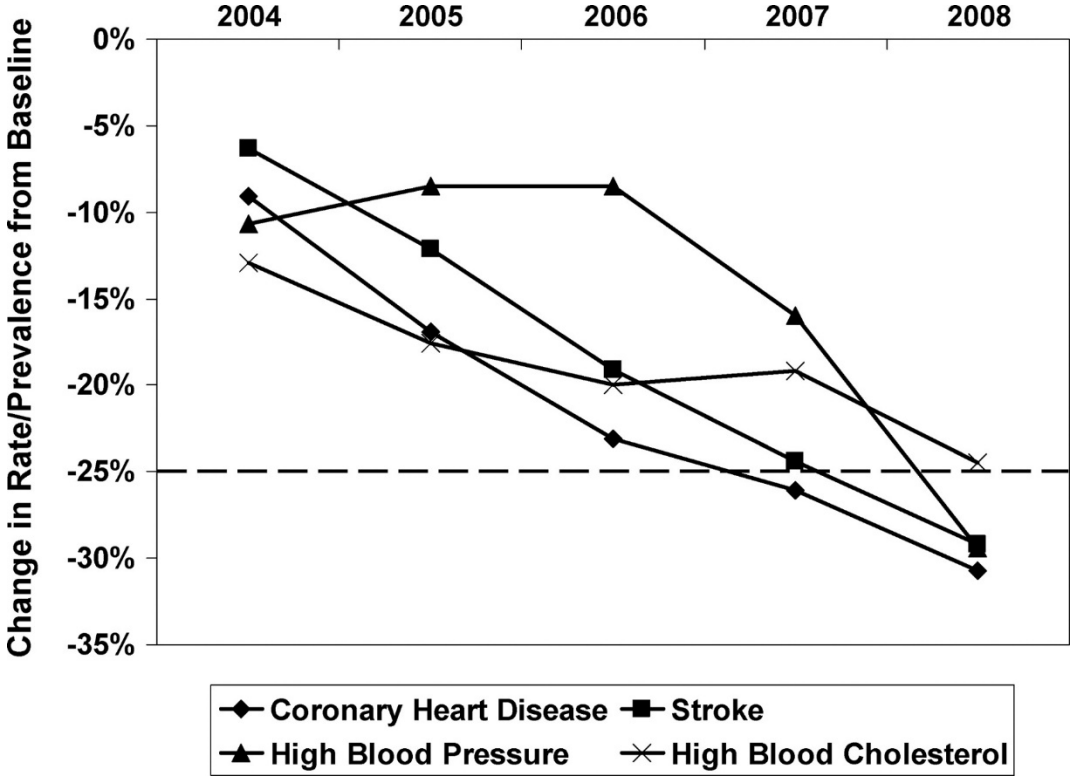


Reduction in SBP mmHg	% Reduction in Mortality Stroke	CHD	Total
2	-6	-4	-3
3	-8	-5	-4
5	-14	-9	-7

BP, blood pressure; CHD, coronary heart disease; SBP, systolic blood pressure

Source: Whelton PK, et al. Primary prevention of hypertension: Clinical and public health advisory from The National High Blood Pressure Education Program. JAMA *2002;288:1882–8.*

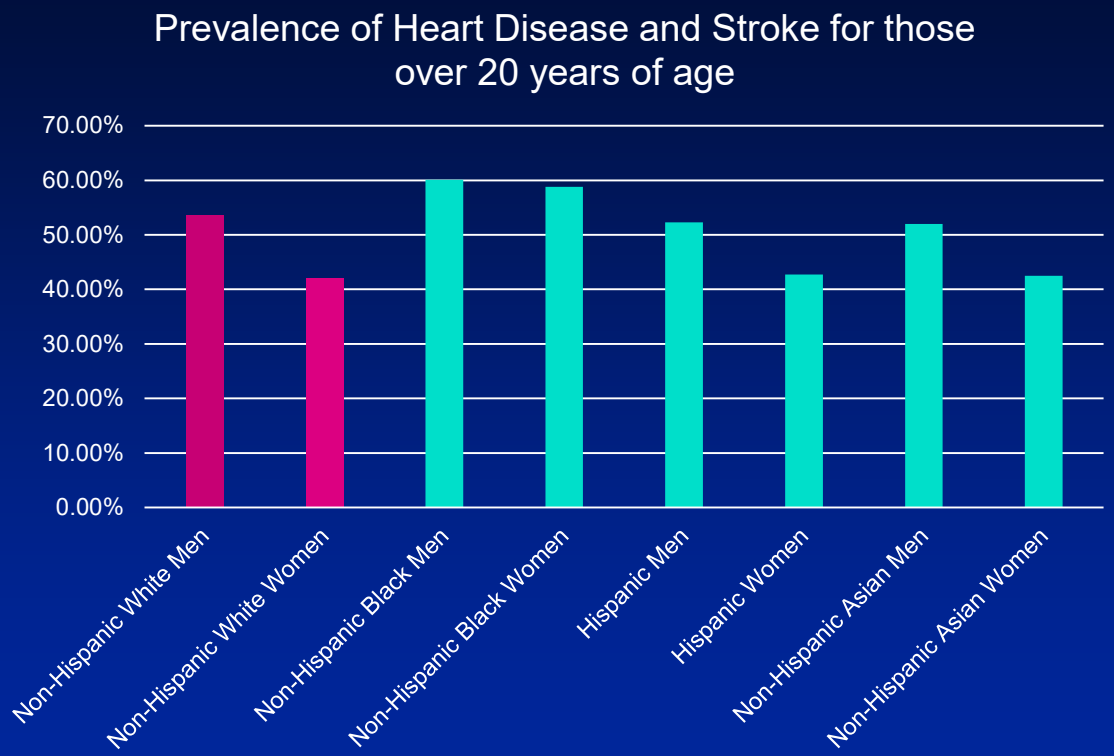
Trajectory of mortality rates from CHD and stroke, rate of uncontrolled high blood pressure, and prevalence of high blood cholesterol from 2004 to 2008.



Donald M. Lloyd-Jones et al. Circulation. 2010;121:586-613

American Heart Association

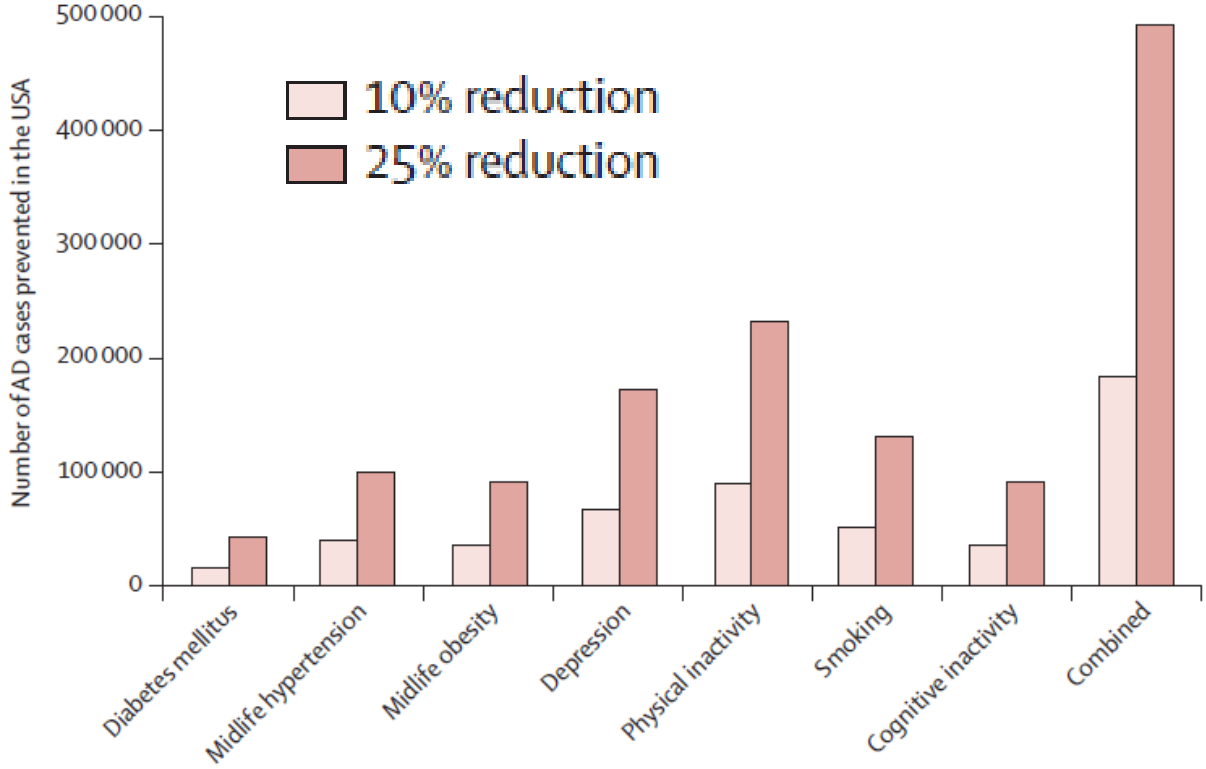
Copyright © American Heart Association, Inc. All rights reserved.


Prevalence of Heart Disease and Stroke for those over 20 years of age
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Non-Hispanic White Men
Non-Hispanic White Women
Non-Hispanic Black Men
Non-Hispanic Black Women
Hispanic Men
Hispanic Women
Non-Hispanic Asian Men
Non-Hispanic Asian Women

The projected effect of risk factor reduction on Alzheimer's disease prevalence

Deborah E Barnes, Kristine Yaffe

www.thelancet.com/neurology Vol 10 September 2011



Defining and Setting National Goals for Cardiovascular Health Promotion and Disease Reduction

The American Heart Association's Strategic Impact Goal Through 2020 and Beyond

Donald M. Lloyd-Jones, Yuling Hong, Darwin Labarthe, Dariush Mozaffarian, Lawrence J. Appel, Linda Van Horn, Kurt Greenlund, Stephen Daniels, Graham Nichol, Gordon F. Tomaselli, Donna K. Arnett, Gregg C. Fonarow, P. Michael Ho, Michael S. Lauer, Frederick A. Masoudi, Rose Marie Robertson, Véronique Roger, Lee H. Schwamm, Paul Sorlie, Clyde W. Yancy, Wayne D. Rosamond

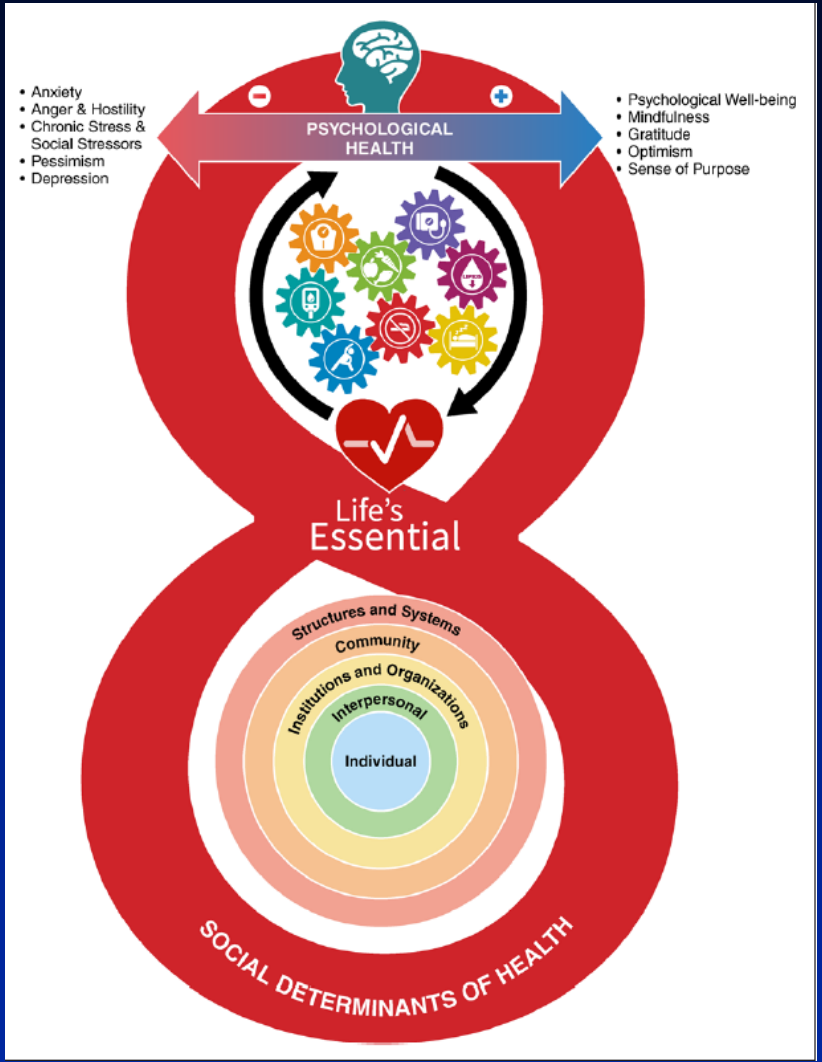
and on behalf of the American Heart Association Strategic Planning Task Force and Statistics Committee

Circulation. 2010;121:586-613

Component	Ideal (2 Points)	Intermediate (1 Point)	Poor (0 Points)
Smoking	Never or former >1 year	Former ≤1 year	Current
Healthy diet score*	4 to 5 points	2 to 3 points	0 to 1 points
Physical activity†	≥4 bouts per week of intense physical activity sufficient to work up a sweat	1 to 3 bouts per week of intense physical activity sufficient to work up a sweat	No intense physical activity sufficient to work up a sweat
Body mass index	<25 kg/m^2	25 to 29.9 kg/m^2	≥30 kg/m^2
Blood pressure	<120/<80 mm Hg untreated	SBP 120 to 139 or DBP 80 to 89 mm Hg or treated to ideal level	SBP ≥140 or DBP ≥90 mm Hg
Total cholesterol	<5.18 mmol/L (<200 mg/dL) untreated	5.18 to 6.19 mmol/L (200 to 239 mg/dL) or treated to ideal level	≥6.22 mmol/L (≥240 mg/dL)
Fasting glucose	<5.55 mmol/L (<100 mg/dL) untreated	5.55 to 6.94 mmol/L (100 to 125 mg/dL) or treated to ideal level	≥6.99 mmol/L (≥126 mg/dL)

Life's Essential 8: Updating and Enhancing the American Heart Association's Construct of Cardiovascular Health: A Presidential Advisory From the American Heart Association

Donald M. Lloyd-Jones, MD, ScM, FAHA, Chair; Norrina B. Allen, PhD, MPH, FAHA; Cheryl A.M. Anderson, PhD, MPH, MS, FAHA; Terrie Black, DNP, MBA, CRRN, FAHA; LaPrincess C. Brewer, MD, MPH; Randi E. Foraker, PhD, MA, FAHA; Michael A. Grandner, PhD, MTR, FAHA; Helen Lavretsky, MD, MS; Amanda Marma Perak, MD, MS, FAHA; Garima Sharma, MD; Wayne Rosamond, PhD, MS, FAHA; on behalf of the American Heart Association


• Anxiety
• Anger & Hostility
• Chronic Stress & Social Stressors
• Pessimism
• Depression
PSYCHOLOGICAL HEALTH
• Psychological Well-being
• Mindfulness
• Gratitude
• Optimism
• Sense of Purpose
Life's Essential
Structures and Systems
Community
Institutions and Organizations
Interpersonal
Individual
SOCIAL DETERMINANTS OF HEALTH

A Few Words About Diet

- Dietary habits show strongest evidence for causal effects on cardiovascular events, diabetes, and/or obesity
- Recommend dietary pattern based on foods rather than nutrients
- Inclusion of as few as possible elements with minimal overlap with each other while at the same time having some overlap with other relevant dietary guidelines

Dietary Approaches to Stop Hypertension (DASH)

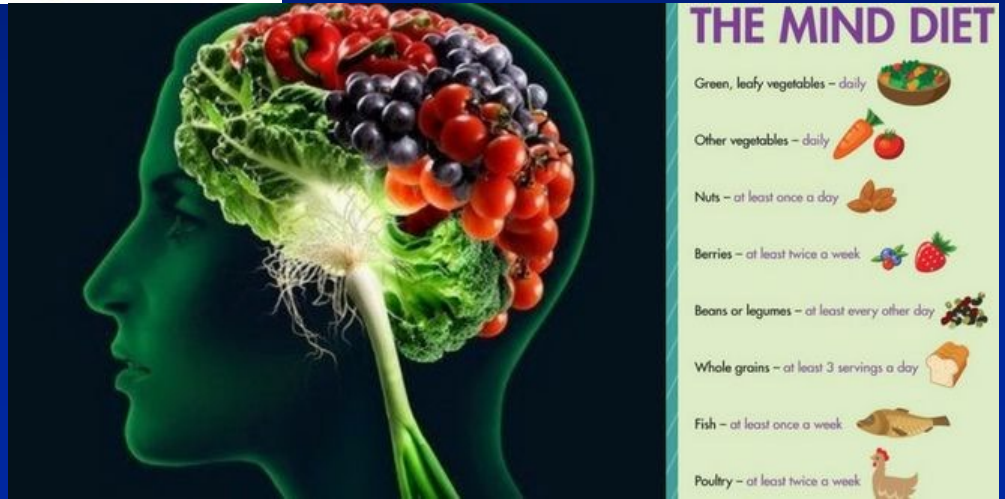
- Fruits and vegetables: ≥4.5 cups per day
- Fish: ≥two 3.5-oz servings per week (preferably oily fish)
- Fiber-rich whole grains: ≥three 1-oz-equivalent servings per day
- Sodium: <1500 mg per day
- Sugar-sweetened beverages: ≤450 kcal (36 oz) per week

Secondary Dietary Metrics

- Nuts, legumes, and seeds: ≥4 servings per week
- Processed meats: none or ≤2 servings per week
- Saturated fat: <7% of total energy intake

Other Diets

The Mediterranean Diet Pyramid
2 - 3 times a month
2 - 3 times a week
10 - 12 8oz glasses daily
1 - 2 glasses daily
2 - 3 times a day
7500 steps daily
3 - 4 times a day
6 - 8 times a day
1 - 2 times a day

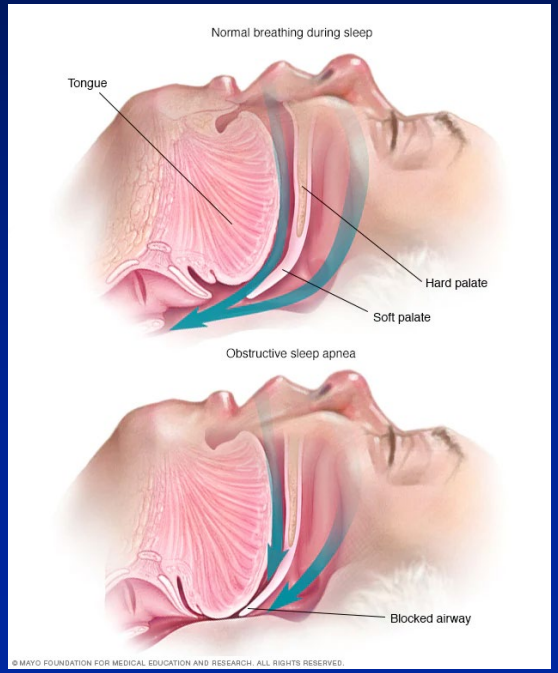

THE MIND DIET
Green, leafy vegetables – daily
Other vegetables – daily
Nuts – at least once a day
Berries – at least twice a week
Beans or legumes – at least every other day
Whole grains – at least 3 servings a day
Fish – at least once a week
Poultry – at least twice a week

A Few Words About Sleep

- It is not all about the length!
  - Too short is bad
  - Too long is bad
- Its about the quality!
  - Restful, deep sleep is best
  - Awaking spontaneously is best
- Its about the oxygen!
  - Sleep apnea reduces oxygen to the brain
    - Repeated awakening
    - Day time sleepiness

Symptoms of Sleep Apnea

- Loud snoring
- Episodes in which you stop breathing during sleep — which would be reported by another person
- Gasping for air during sleep
- Awakening with a dry mouth
- Morning headache
- Difficulty staying asleep (insomnia)
- Excessive daytime sleepiness (hypersomnia)
- Difficulty paying attention while awake
- Irritability



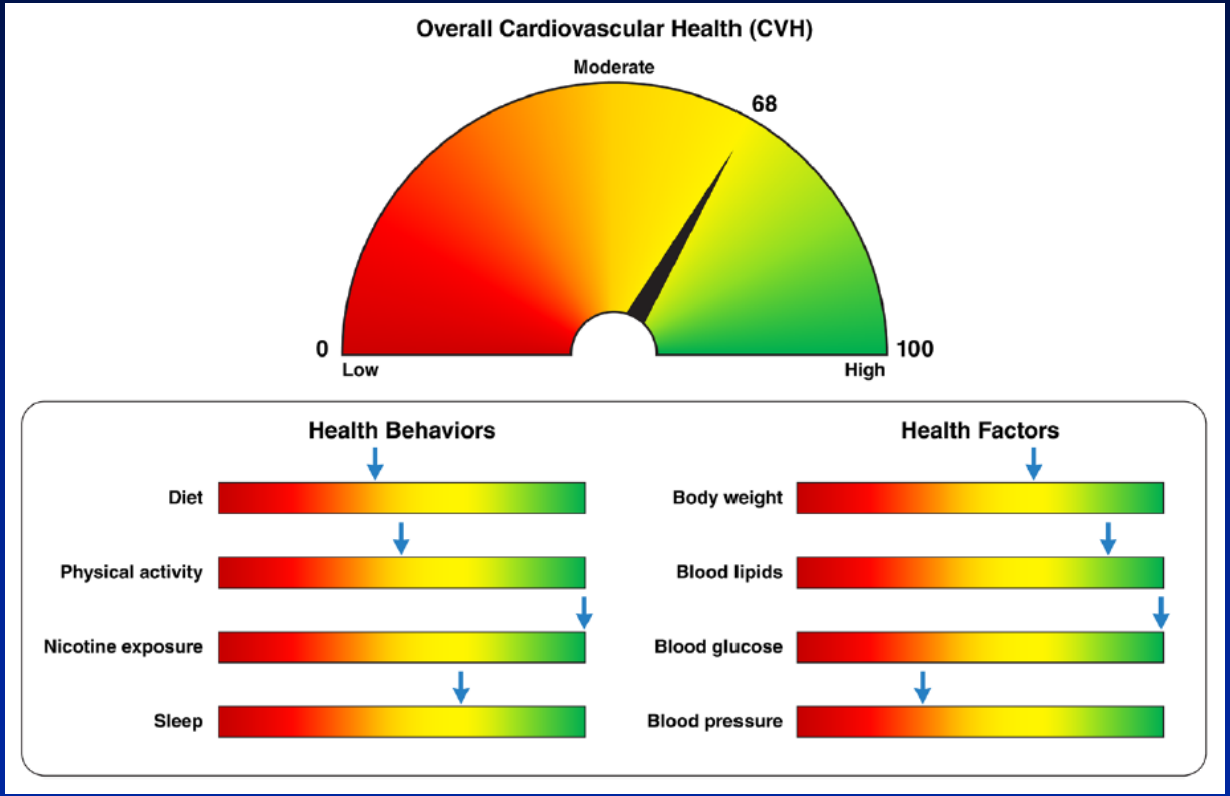
Risk Factors for Sleep Apnea

- Excess weight: Fat deposits around your upper airway can obstruct your breathing
- Neck circumference: People with thicker necks might have narrower airways
- A narrowed airway: Tonsils or adenoids also can enlarge and block the airway, particularly in children.
- Being male
- Being older
- Positive Family history

Risk Factors for Sleep Apnea (cont'd)

- Use of alcohol, sedatives or tranquilizers. These substances relax the muscles in your throat, which can worsen obstructive sleep apnea
- Smoking
- Nasal congestion
- Medical conditions: Congestive heart failure, high blood pressure, type 2 diabetes and lung diseases

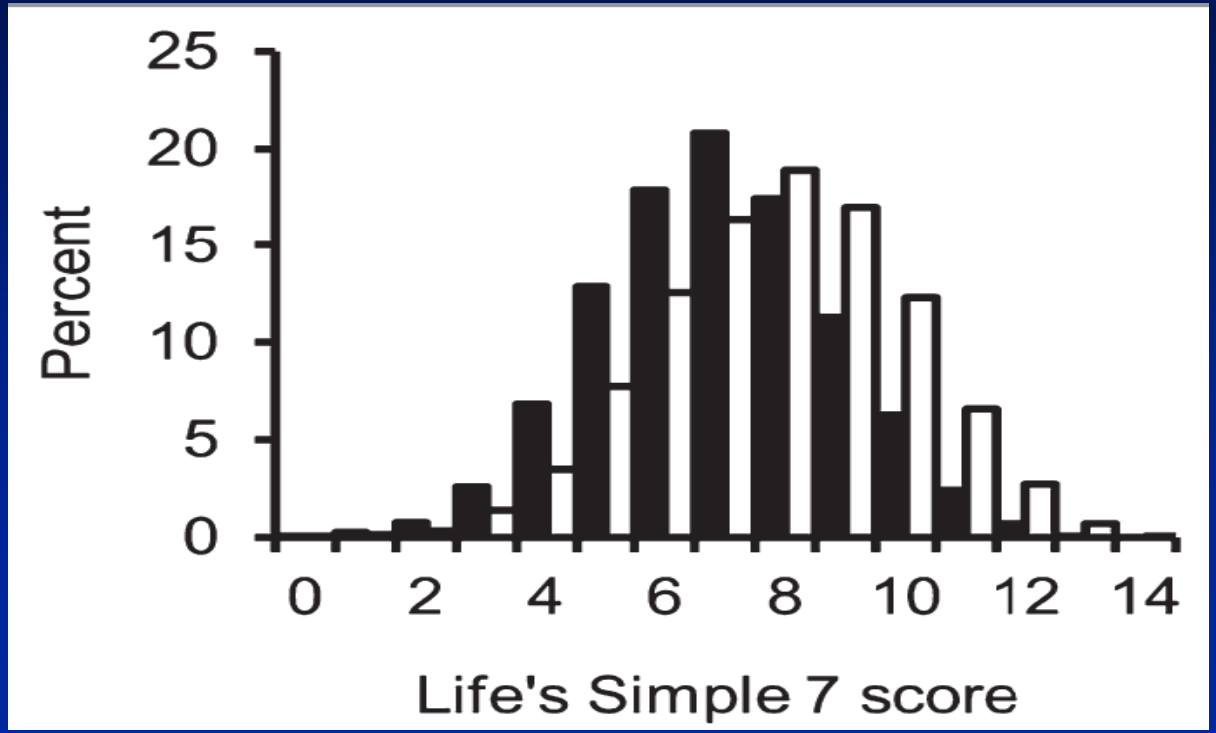
Monitoring your Cardiovascular Health



The American Heart Association Life's Simple 7 and Incident Cognitive Impairment: The REasons for Geographic And Racial Differences in Stroke (REGARDS) Study

Evan L. Thacker, PhD; Sarah R. Gillett, PhD; Virginia G. Wadley, PhD; Frederick W. Unverzagt, PhD; Suzanne E. Judd, PhD; Leslie A. McClure, PhD; Virginia J. Howard, PhD; Mary Cushman, MD, MSc

J Am Heart Assoc. 2014



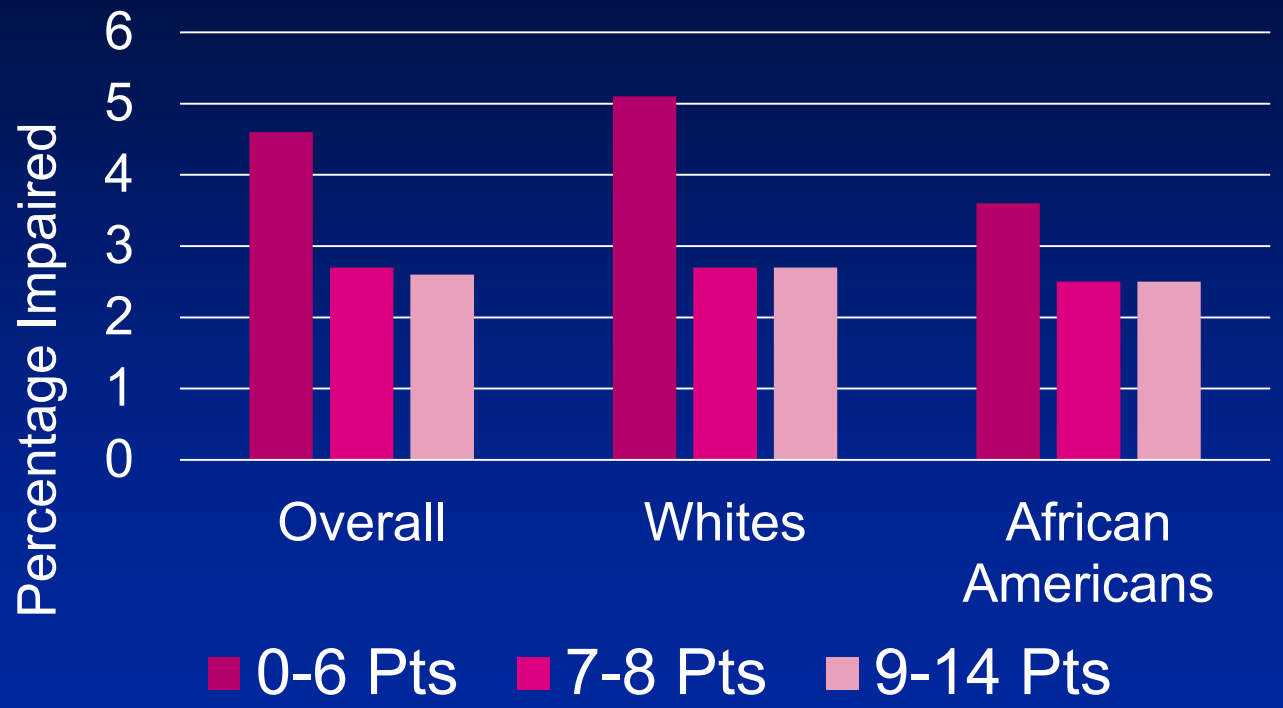
Whites

African Americans

Study Design

- 17,761 Individuals > 45 years of age
  - Free of Stroke and Dementia
- Study Duration: 2003-2012
- Biennial Assessment of Cognition
  - Word list immediate and delayed recall
  - Animal fluency

Impact on Cognition



Impact of Individual Components

Life's Simple 7 Component	Adjusted Odds Ratio* (95% CI)
Smoking	
Poor	1.00 (reference)
Intermediate or ideal†	0.77 (0.60, 0.98)
Healthy diet score	
Poor	1.00 (reference)
Intermediate or ideal†	0.90 (0.68, 1.18)
Physical activity	
Poor	1.00 (reference)
Intermediate	0.88 (0.72, 1.08)
Ideal	0.94 (0.76, 1.17)
Body mass index	
Poor	1.00 (reference)
Intermediate	0.77 (0.63, 0.95)
Ideal	0.71 (0.56, 0.91)
Blood pressure	
Poor	1.00 (reference)
Intermediate	0.79 (0.64, 0.97)
Ideal	0.86 (0.65, 1.14)
Total cholesterol	
Poor	1.00 (reference)
Intermediate	1.08 (0.80, 1.45)
Ideal	1.04 (0.77, 1.40)
Fasting glucose	
Poor	1.00 (reference)
Intermediate	0.79 (0.59, 1.07)
Ideal	0.72 (0.53, 0.97)

Association of Ideal Cardiovascular Health With Vascular Brain Injury and Incident Dementia

Matthew P. Pase, PhD; Alexa Beiser, PhD; Danielle Enserro, MA; Vanessa Xanthakis, PhD; Hugo Aparicio, MD; Claudia L. Satizabal, PhD; Jayandra J. Himali, PhD; Carlos S. Kase, MD; Ramachandran S. Vasan, MD; Charles DeCarli, MD; Sudha Seshadri, MD

	Remote Ideal CVH	
Event	HR (95% CI)	*P* Value
Stroke	0.79 (0.66–0.94)	0.01
All-cause dementia	0.80 (0.67–0.97)	0.02
Alzheimer disease	0.79 (0.64–0.98)	0.006
Vascular dementia	0.61 (0.39–0.95)	0.03

Ideal CVH frequencies, n (%)	
0	22 (0.8)
1	245 (9.3)
2	638 (24.3)
3	734 (27.9)
4	569 (21.6)
5	275 (10.5)
6	124 (4.7)
7	24 (0.9)

Impact on Cognition and Brain

Measures	Recent Ideal CVH		Remote Ideal CVH	
	β±SE	*P* Value	β±SE	*P* Value
Cognitive decline				
Global decline	0.003±0.002	0.07	0.006±0.002	0.002
Visual reproductions delayed	0.02±0.01	0.01	0.02±0.01	0.01
Similarities	0.02±0.01	0.04	0.04±0.01	<0.001
Trail A	0.001±0.002	0.46	−0.002±0.002	0.43
Trail B	−0.01±0.004	0.13	−0.01±0.004	0.08
Logical Memory Delayed	−0.01±0.01	0.51	0.01±0.01	0.44
Brain atrophy and white-matter injury				
Total brain volume	0.09±0.08	0.26	0·19±0.08	0.02
Frontal brain volume	0.31±0.10	0.003	0.15±0.11	0.16
Lateral ventricular volume	0.02±0.01	0.10	0.002±0.02	0.88
WMHV	−0.0002±0.01	0.98	0.0003±0.01	0.97

DOI: 10.1002/alz.13421

Alzheimer's & Dementia®
THE JOURNAL OF THE ALZHEIMER'S ASSOCIATION

RESEARCH ARTICLE

Cardiovascular health and cognitive outcomes: Findings from a biracial population-based study in the United States

Anisa Dhana[1,2] | Charles S. DeCarli[3] | Klodian Dhana[1,2] | Pankaja Desai[1,2] | Thomas M. Holland[1,2] | Denis A. Evans[1,2] | Kumar B. Rajan[1,2,3]

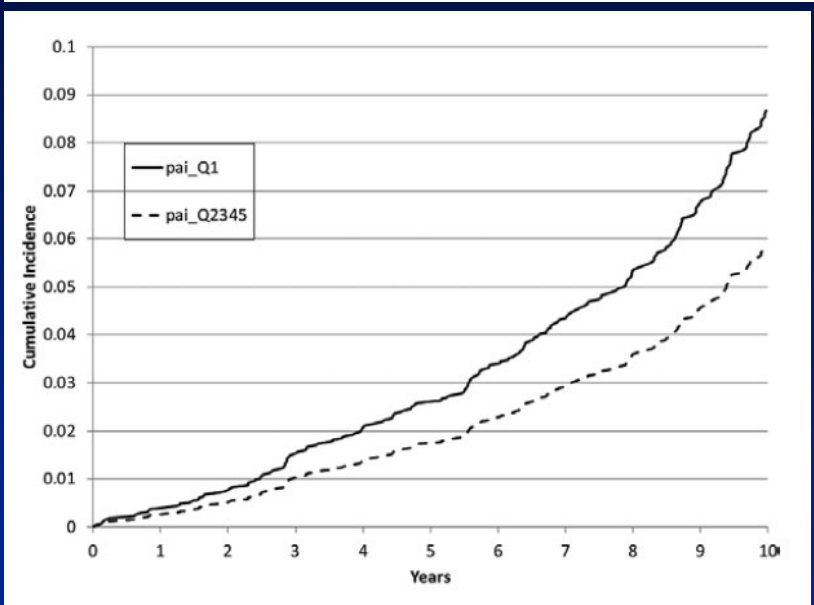
Journal of Alzheimer's Disease 53 (2016) 955–965
DOI 10.3233/JAD-151125
IOS Press

Life's Simple 7's Cardiovascular Health Metrics are Associated with Hispanic/Latino Neurocognitive Function: HCHS/SOL Results

Hector M. González[a,*], Wassim Tarraf[b], Natalia Gouskova[c], Carlos J. Rodríguez[d], Tatjana Rundek[e], Ellen Grober[f], Amber Pirzada[g], Patricia González[h], Pamela L. Lutsey[i], Alvaro Camacho[j], Martha L. Daviglus[g], Clinton Wright[e] and Thomas H. Mosley[k]

Physical Activity, Brain Volume, and Dementia Risk: The Framingham Study

Zaldy S. Tan,[1,2,*] Nicole L. Spartano,[2,3,*] Alexa S. Beiser,[2,4,5] Charles DeCarli,[6] Sanford H. Auerbach,[2,4] Ramachandran S. Vasan,[2,3] and Sudha Seshadri[2]



	β ± *SE*	
	Age and Sex Adjusted	*p* Value
TCBV		
Per *SD*	0.24 ± 0.06	<.001
Q1	1.00 (Referent)	
Q2	0.02 ± 0.20	.914
Q3	0.26 ± 0.20	.191
Q4	0.56 ± 0.20	.005
Q5	0.54 ± 0.20	.007
HPV		
Per *SD*	0.004 ± 0.001	.003
Q1	1.00 (Referent)	
Q2	0.001 ± 0.004	.713
Q3	0.001 ± 0.004	.746
Q4	0.006 ± 0.004	.107
Q5	0.010 ± 0.004	.007

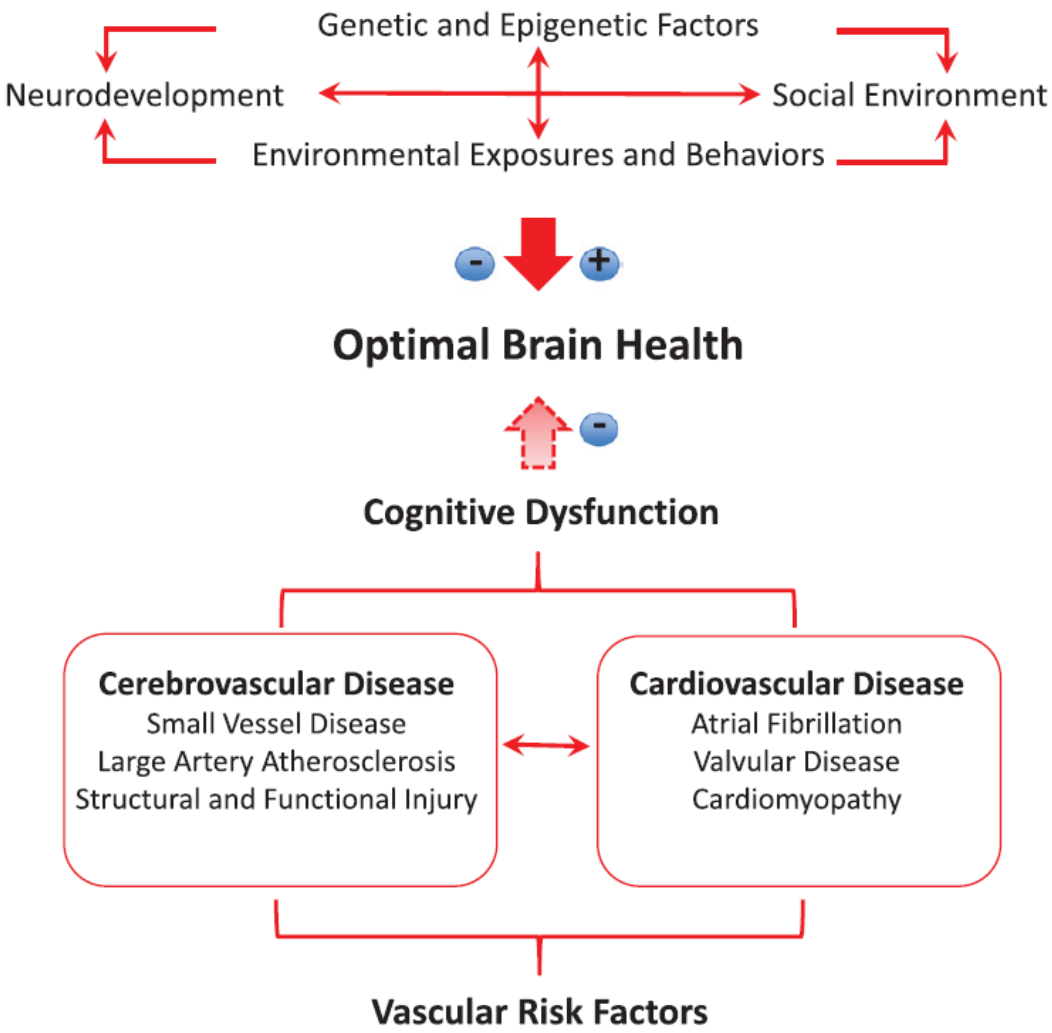
AHA/ASA Presidential Advisory

Defining Optimal Brain Health in Adults

A Presidential Advisory From the American Heart Association/ American Stroke Association

Philip B. Gorelick, MD, MPH, FAHA, Chair*; Karen L. Furie, MD, MPH, FAHA, Co-Chair†; Costantino Iadecola, MD, FAHA, Co-Chair†; Eric E. Smith, MD, MPH, FAHA‡; Salina P. Waddy, MD§; Donald M. Lloyd-Jones, MD, ScM, FAHA‖; Hee-Joon Bae, MD, PhD, FAHA; Mary Ann Bauman, MD; Martin Dichgans, MD; Pamela W. Duncan, PhD, PT, FAHA; Meighan Girgus; Virginia J. Howard, PhD, FAHA; Ronald M. Lazar, PhD, FAHA; Sudha Seshadri, MD, FAHA; Fernando D. Testai, MD, PhD, MS, FAHA; Stephen van Gaal, MD; Kristine Yaffe, MD, FAHA; Hank Wasiak, MBA; Charlotte Zerna, MD, MSc; on behalf of the American Heart Association/ American Stroke Association

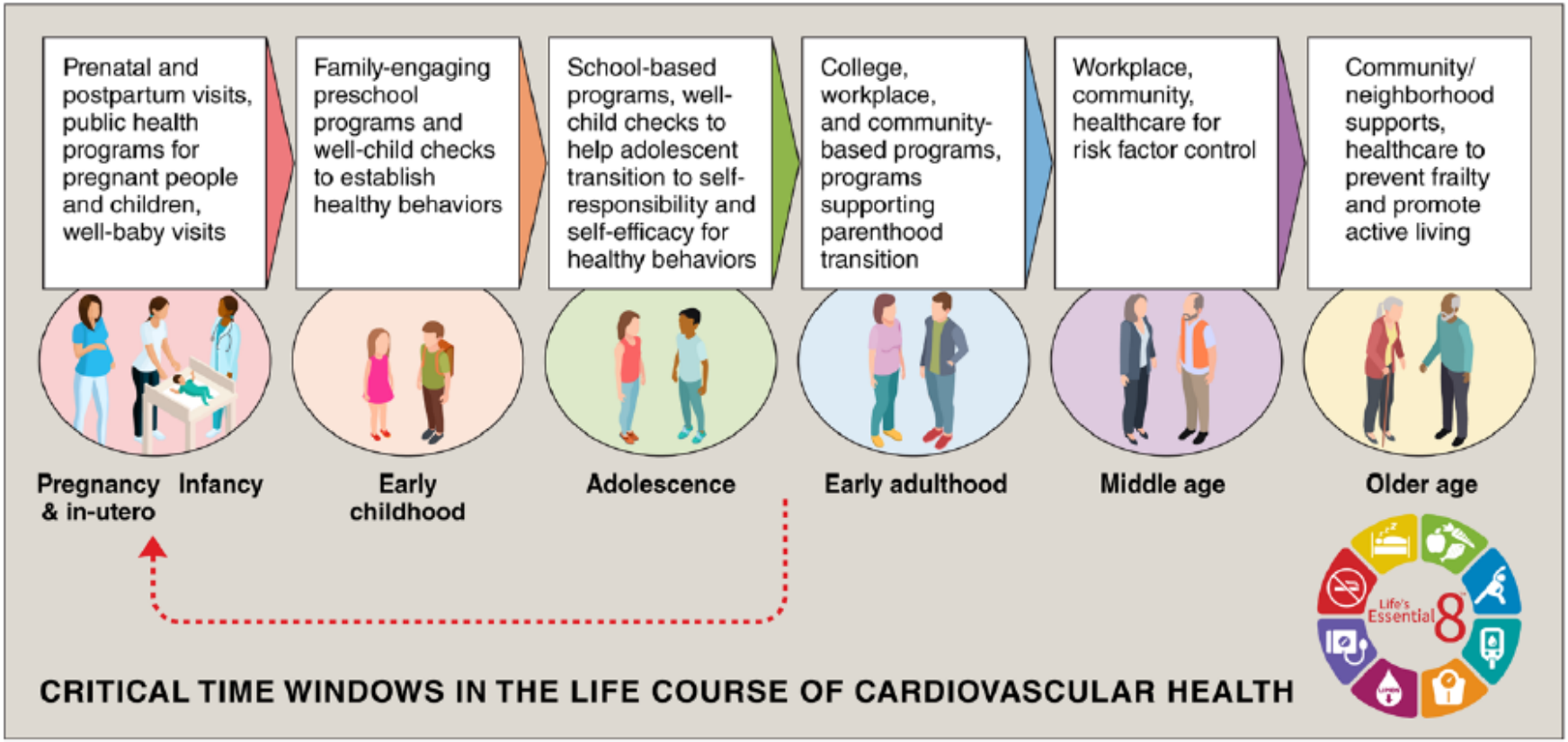
Stroke. 2017;48:e284-e303


Genetic and Epigenetic Factors
Neurodevelopment
Social Environment
Environmental Exposures and Behaviors
Optimal Brain Health
Cognitive Dysfunction
Cerebrovascular Disease
Small Vessel Disease
Large Artery Atherosclerosis
Structural and Functional Injury
Cardiovascular Disease
Atrial Fibrillation
Valvular Disease
Cardiomyopathy
Vascular Risk Factors

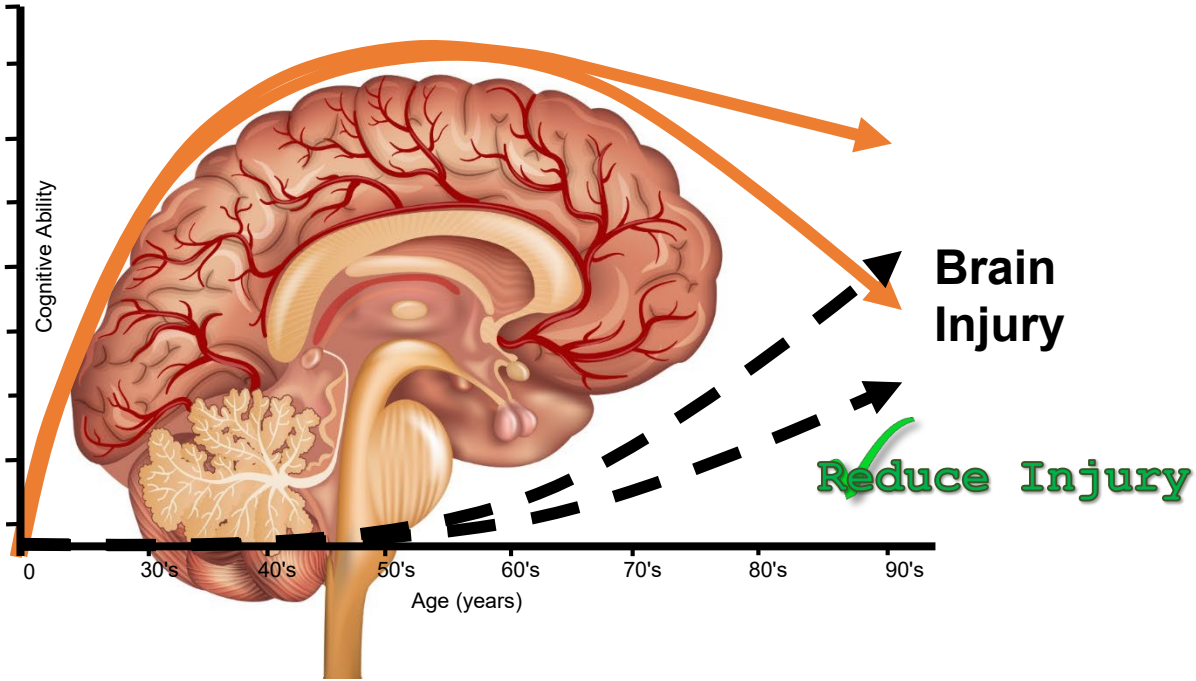
Recommendations for Promotion and Maintenance of Optimal Brain Health

Individual[168]
Check health status with AHA's Life's Simple 7 (http://www.heart.org)
Remain physically active
Eat a healthy diet; evidence suggests that a Mediterranean-style diet preserves cognitive function better than a low-fat diet
Address vascular risk factors, if present, with a primary care practitioner
Pursue cognitively stimulating and rewarding activities
Address mental health concerns with a primary care practitioner or specialist as needed
Healthcare practitioners
Apply primordial and primary preventive care for cardiovascular disease and stroke according to AHA/ASA guidelines[9,124,142,163,164]
Diagnose and treat symptomatic stroke according to AHA/ASA guidelines[165–167]
Administer brief screens to monitor cognitive status

Health systems
Support patients by providing access to preventive care and lifestyle modification
Support good-quality care for stroke[169] and for primary prevention of cardiovascular disease[170]
Public health, health policy, private sector[9,168]
Disseminate knowledge of potentially modifiable risk factors for cognitive decline and dementia
Provide tools and resources to maintain healthy lifestyles such as the AHA Healthy for Good program[171]
Provide opportunities for stimulating cognitive, physical, and social activities
Maintain a healthy environment, including neighborhoods that promote cognitive and physical activity
Fund research on risk factors for cognitive decline and dementia and how to intervene to reduce risk


Prenatal and postpartum visits, public health programs for pregnant people and children, well-baby visits
Family-engaging preschool programs and well-child checks to establish healthy behaviors
School-based programs, well-child checks to help adolescent transition to self-responsibility and self-efficacy for healthy behaviors
College, workplace, and community-based programs, programs supporting parenthood transition
Workplace, community, healthcare for risk factor control
Community/ neighborhood supports, healthcare to prevent frailty and promote active living
Pregnancy & in-utero
Infancy
Early childhood
Adolescence
Early adulthood
Middle age
Older age
Life's Essential 8
CRITICAL TIME WINDOWS IN THE LIFE COURSE OF CARDIOVASCULAR HEALTH

IMPROVING COGNITIVE AGING



Conclusions

- Treatment of vascular risk factors and promotion of "vascular health" is likely to have a strong public health benefit to reduce late-life dementia
- Current efforts to improve vascular health with "Life's Essential 8" provide a public health opportunity to assess the efficacy of this approach

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

Life’s Essential 8

- Don’t Smoke
- Watch Your Weight
- Eat A Healthy Diet
- Exercise
- Control Your Blood Pressure
- Control Your Blood Sugar
- Control Your Blood Cholesterol
- Sleep Well

THANK YOU

Charles DeCarli, MD
UC Davis Alzheimer's Disease Center
Imaging of Dementia and Aging (IDeA) Laborat