



MASSACHUSETTS  
GENERAL HOSPITAL



NEUROSCIENCE

# Brain Health: New Understanding, New Targets, New Metrics

**Jonathan Rosand, M.D., M.Sc.**

Henry and Allison McCance Center for Brain Health

Massachusetts General Hospital

Harvard Medical School

Broad Institute

# Disclosures

---

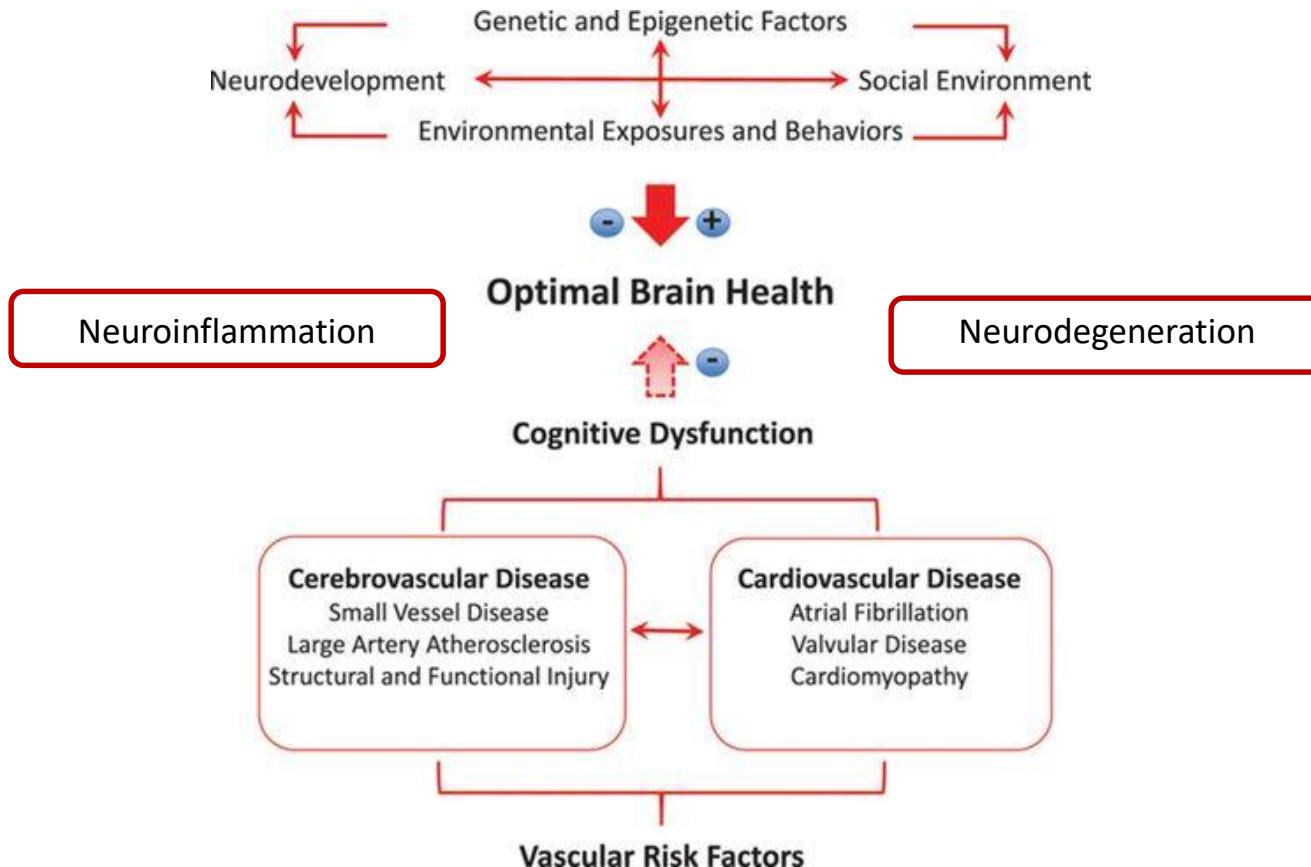
I have the following relevant financial relationship with a commercial interest to disclose:

**Boehringer Ingelheim**

# The unmet need of our lifetimes

- The impact on healthcare:
  - Brain diseases are the leading cause of disability
  - They claim an **estimated 9 million deaths** a year globally
- The impact on the economy:
  - We are facing a high demand for treatment, rehabilitation, and support services for brain disease that **cost billions of dollars a year**
  - Treatments are ineffective and as populations age, the burden and prevalence of disease increase further



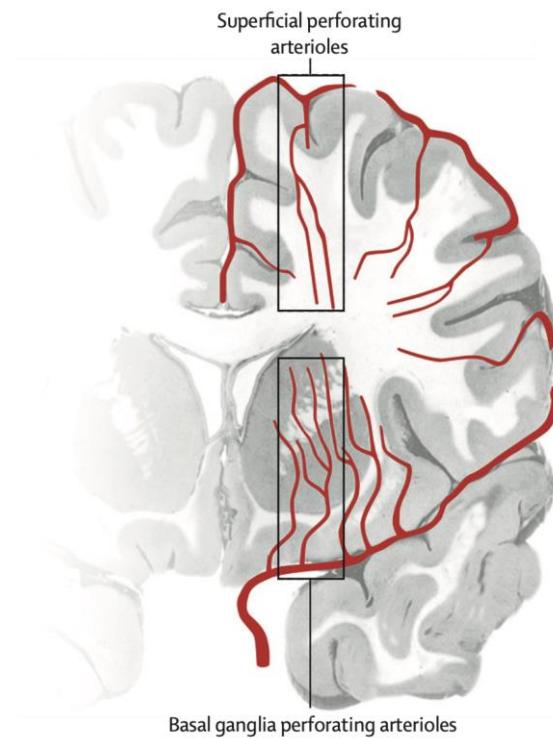
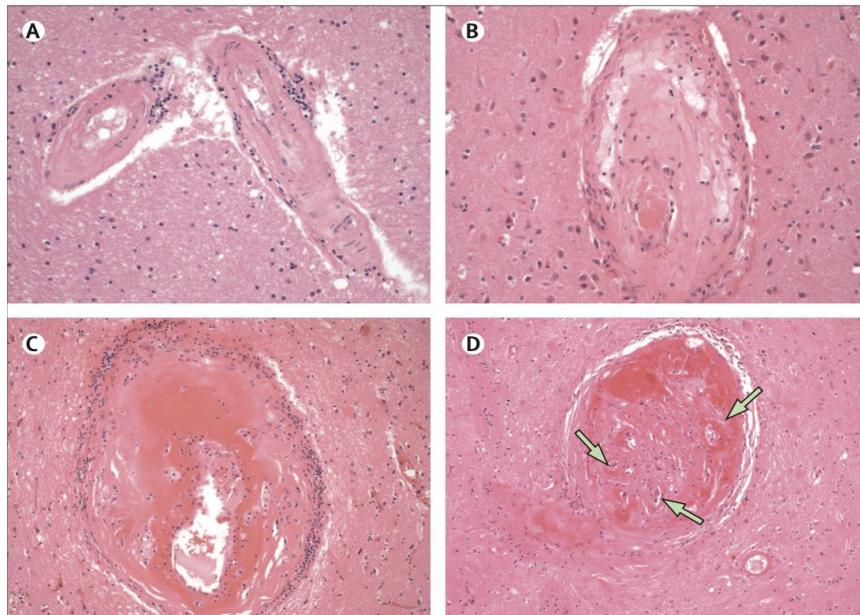


Modified from Philip B. Gorelick. Stroke. Defining Optimal Brain Health in Adults: A Presidential Advisory From the American Heart Association/American Stroke Association, Volume: 48, Issue: 10, Pages: e284-e303, DOI: (10.1161/STR.0000000000000148)



# Cerebral Small Vessel Disease

Progressive neurovascular disorder of aging  
affecting the small-caliber arterial vessels of  
the CNS



*Wardlaw et al. Lancet Neurol. 2013 Jun;12(6):532*

# Control your BP, Protect your Brain!

## Blood Pressure Categories



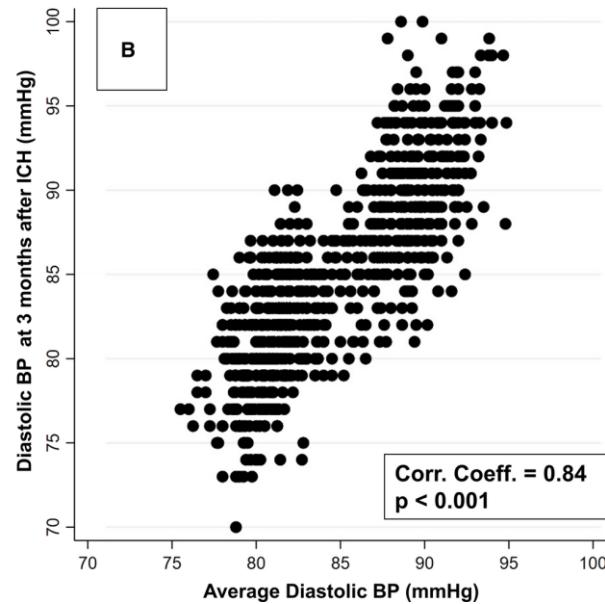
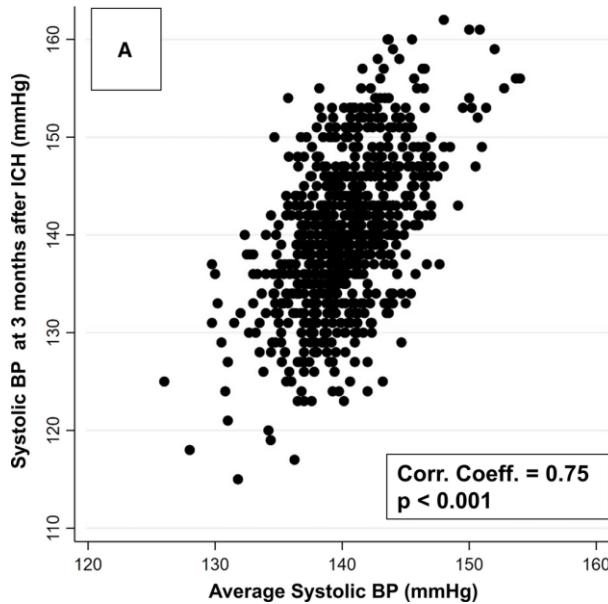
BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

©American Heart Association

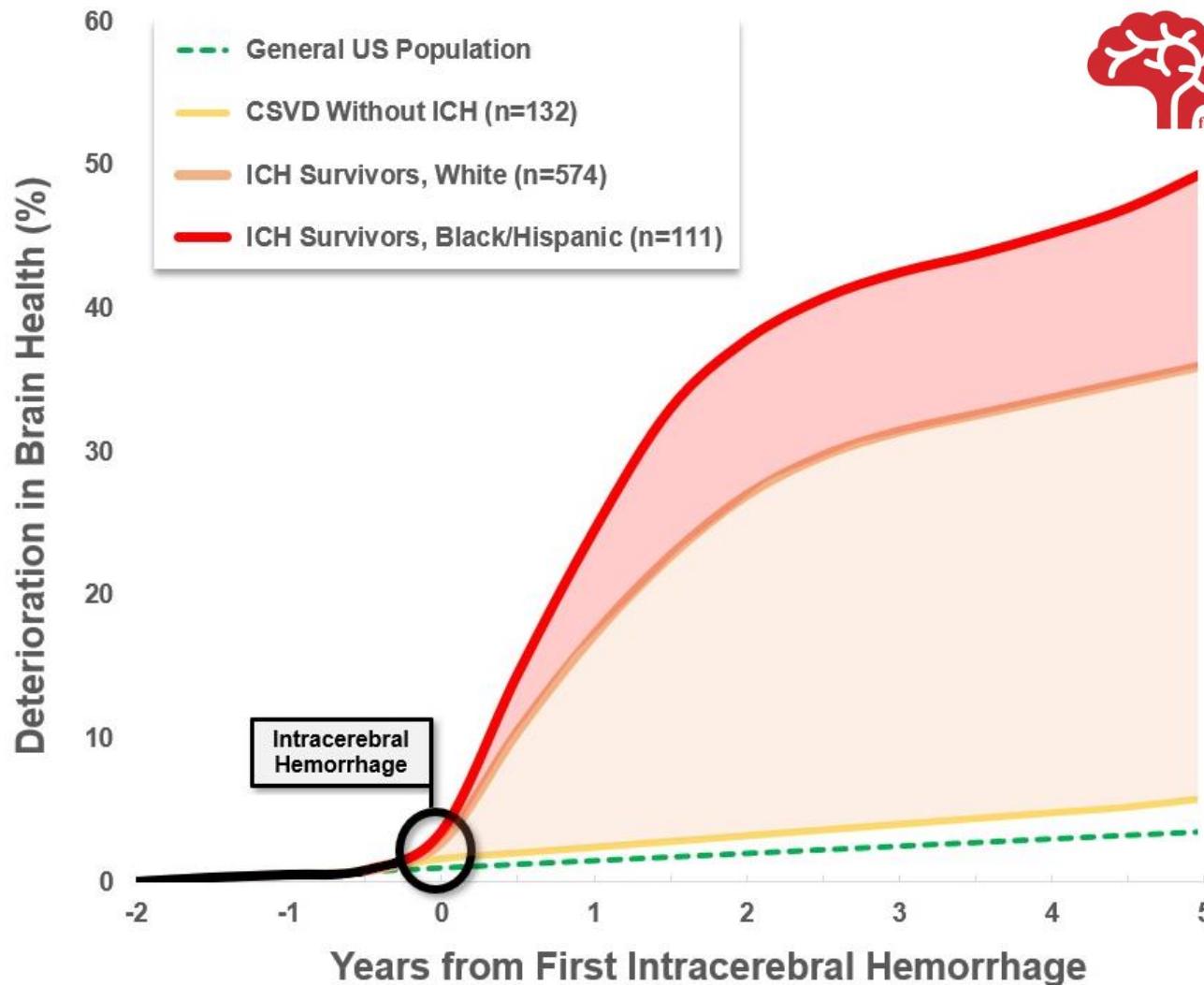
**heart.org/bplevels**

**HENRY AND ALLISON McCANCE**  
**CENTER FOR BRAIN HEALTH**

# BP measured 3 months after ICH predicts average BP over the long-term

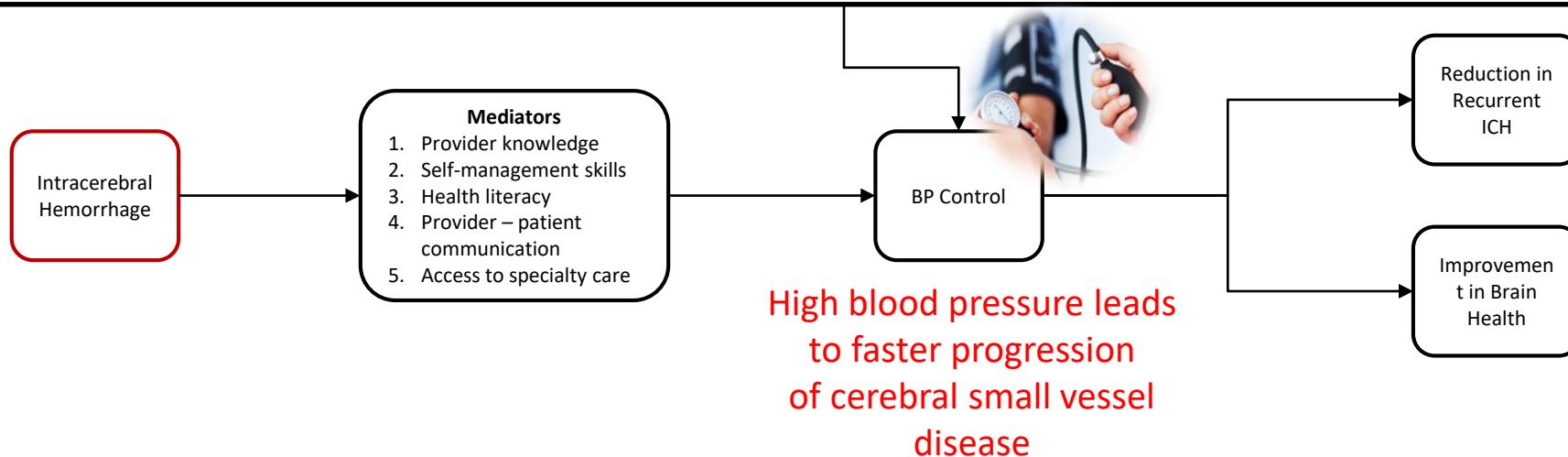


# Progressive Cerebral Small Vessel Disease: the Major Threat to Brain Health

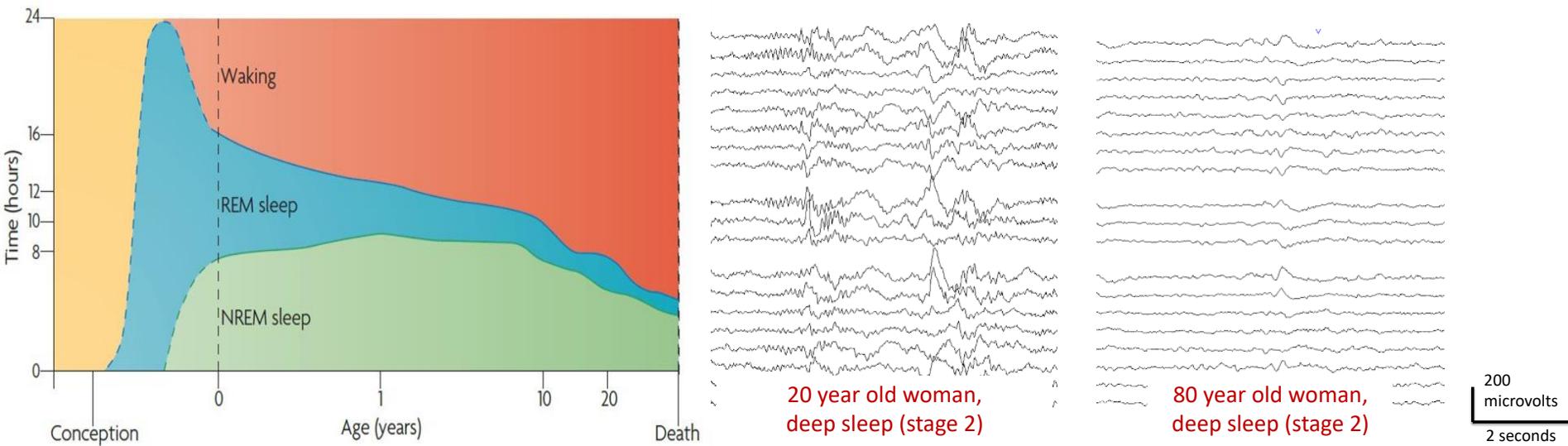


# Addressing Biological and Social Determinants of Health

- Health Care**
  - Insurance
  - Medication affordability
  - Implicit bias
  - Access to primary care
- Economic Stability**
  - **Competing needs**
  - Poverty
  - Unemployment
  - Food insecurity
  - Housing instability
- Education/Language**
  - Higher education
  - English proficiency
  - Literacy
  - Childhood development
- Neighborhood**
  - Access to healthy foods
  - Housing infrastructure
  - Crime/violence
  - **Transportation**
- Social Context**
  - Structural racism
  - Acculturation
  - **Social connections/network**
  - Social stressors
  - immigration

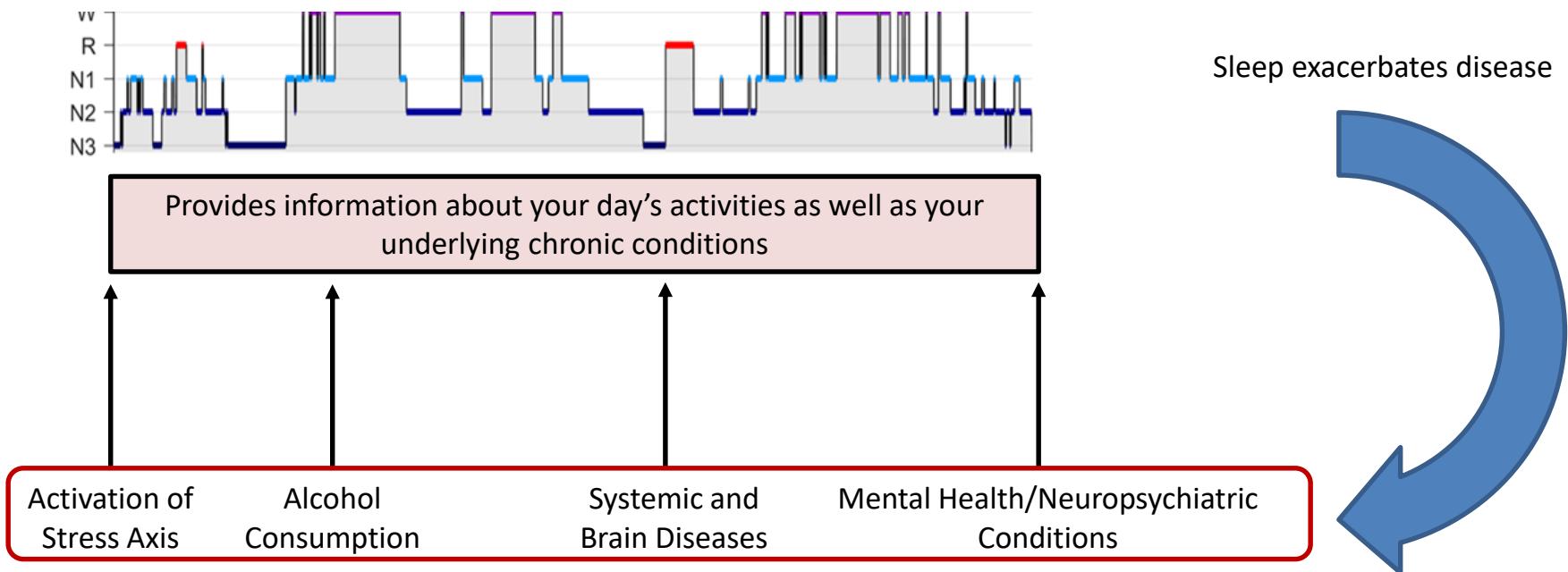


# Sleep: measurable in multiple domains



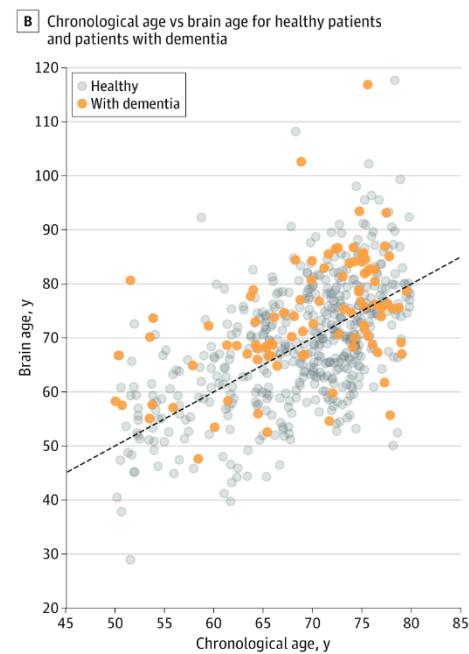
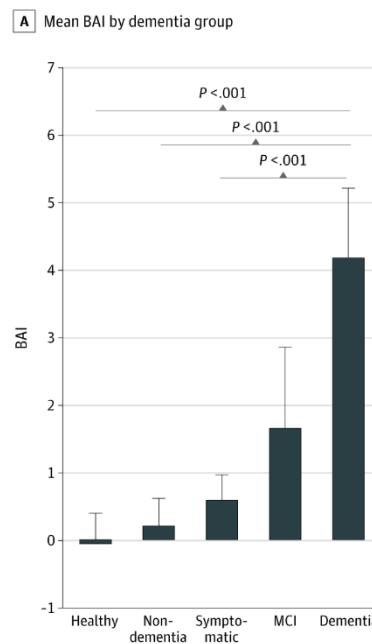
*Nat Rev Neurosci* 10, 803–813 (2009)

# Your sleep has a “signature”



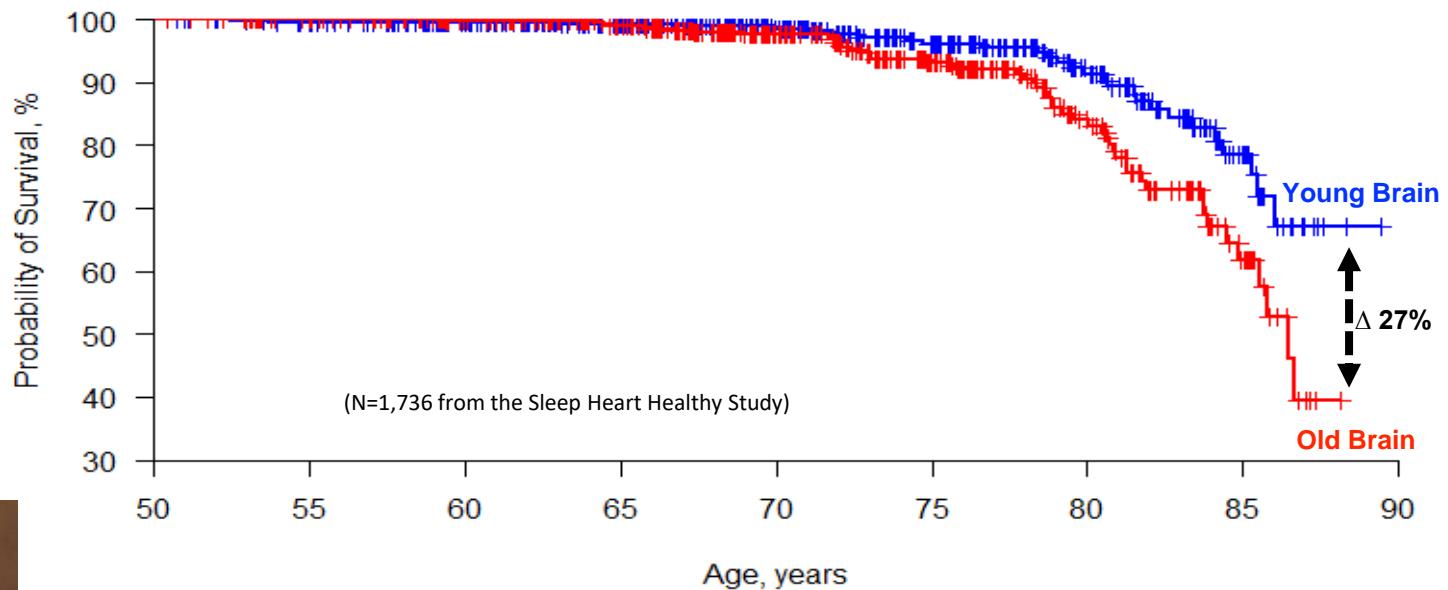
From: **Association of Sleep Electroencephalography-Based Brain Age Index With Dementia**

JAMA Netw Open. 2020;3(9):e2017357. doi:10.1001/jamanetworkopen.2020.17357



Brain Age Index (BAI) Across Dementia Groups The dashed line indicates BAI = 0; MCI, mild cognitive impairment.

# BAI is an independent predictor of mortality



Brain age index (BAI) is an independent predictor of mortality, with higher BAI (i.e., an older brain) being associated with increased mortality. Each extra year of BAI yields a 3.3% relative increase in the risk of death.

## AHA SCIENTIFIC STATEMENT

---

# A Primary Care Agenda for Brain Health

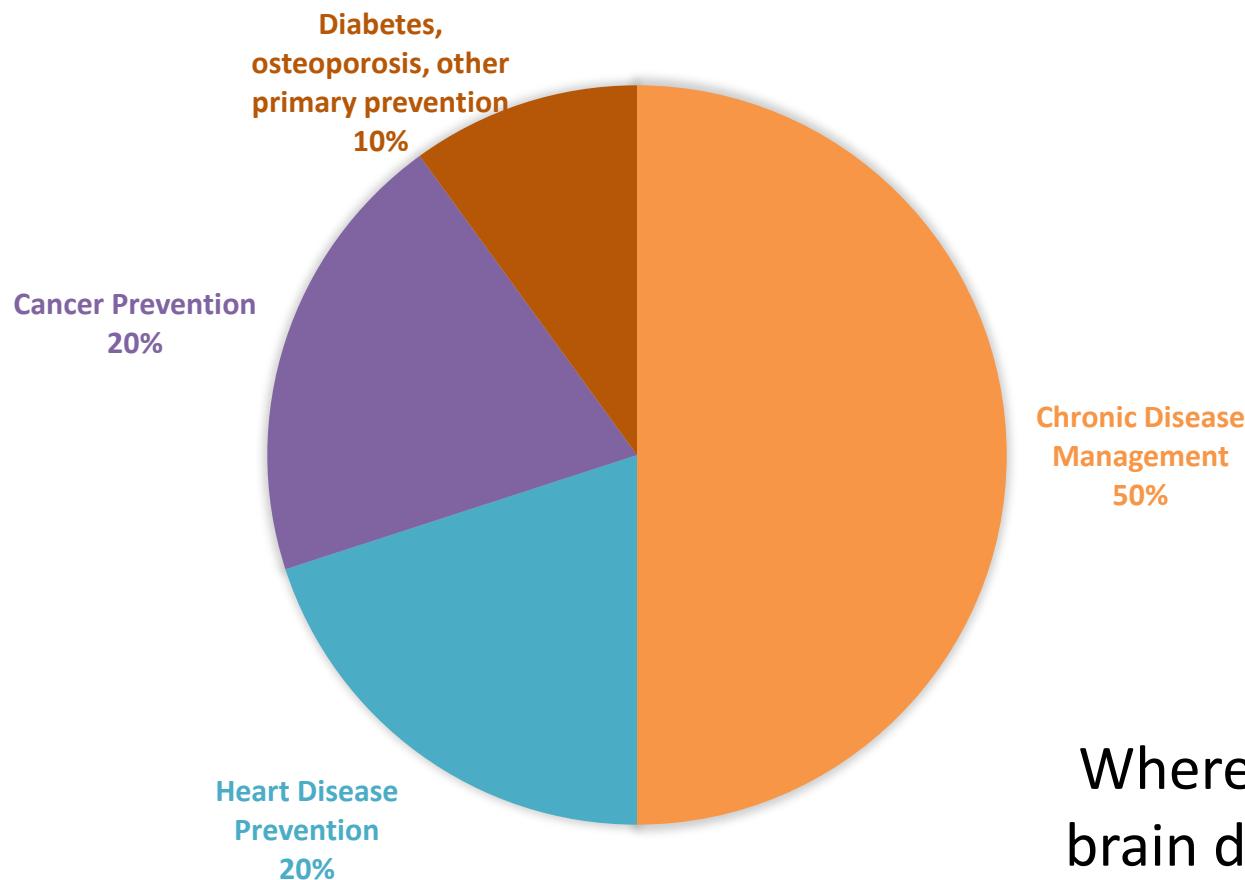
A Scientific Statement From the American Heart Association

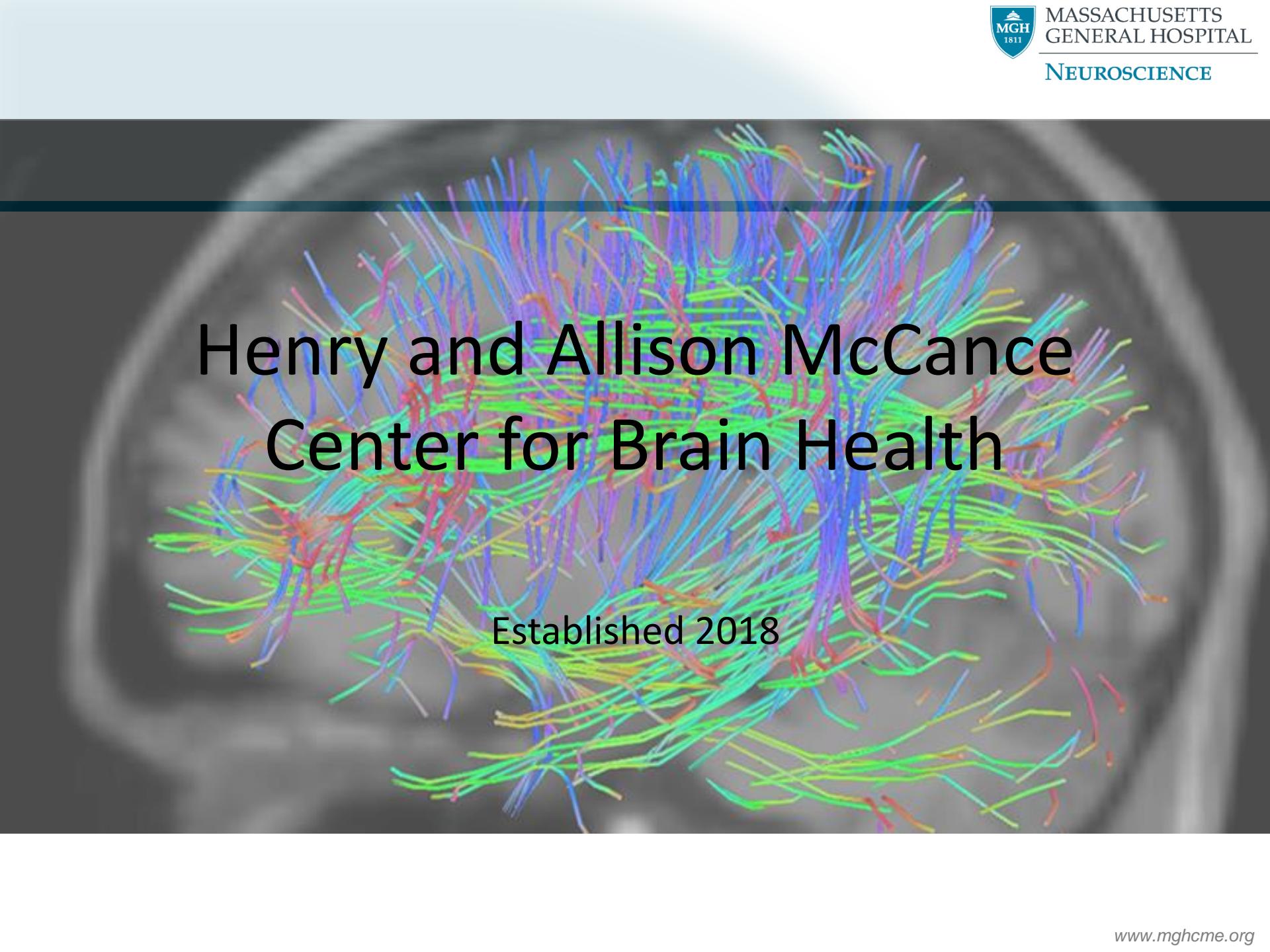
*The American Academy of Neurology affirms the value of this statement as an educational tool for neurologists.*

Ronald M. Lazar, PhD, FAHA, Chair; Virginia J. Howard, PhD, FAHA, Vice Chair; Walter N. Kernan, MD;  
Hugo J. Aparicio, MD, MPH; Deborah A. Levine, MD, MPH; Anthony J. Viera, MD, MPH; Lori C. Jordan, MD, PhD;  
David L. Nyenhuis, PhD; Katherine L. Possin, PhD; Farzaneh A. Sorond, MD, PhD; Carole L. White, PhD, RN; on behalf of the  
American Heart Association Stroke Council

**Approach brain disease the way we  
approach heart disease and cancer!**

# The Current State of Primary Care



A grayscale 3D rendering of a human brain with a complex network of colored lines representing neural tracts or pathways. The lines are primarily in shades of blue, green, and red, forming a dense web across the cerebral cortex.

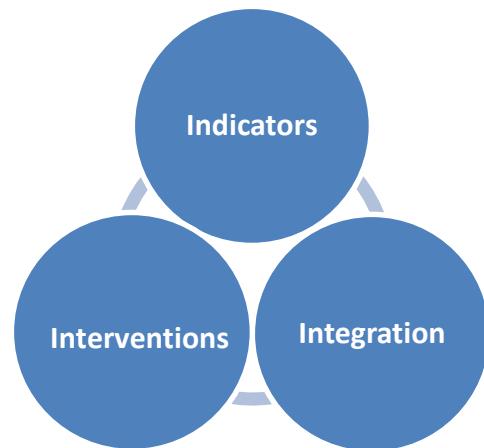
# Henry and Allison McCance Center for Brain Health

Established 2018

# The McCance Center Mission

To maximize human potential through better brain health

1. Identify and characterize the **indicators** of brain health to facilitate brain health assessments across the lifespan
2. Discover and develop the **interventions** that prevent brain disease and improve brain function
3. Catalyze a borderless community of knowledge and tools for **integrating** these indicators and interventions into primary care



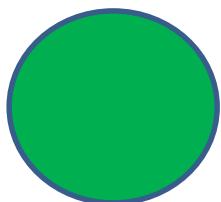
Move from  
recreational medicine  
to evidence-based  
medicine

For example: Supplements



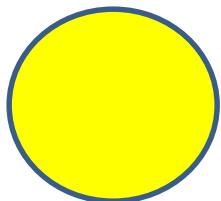
We aim to test these  
supplements on brain health  
indicators, so that we can  
recommend those based on  
evidence.

# Primary prevention of brain disease



## Motivated to preserve brain function

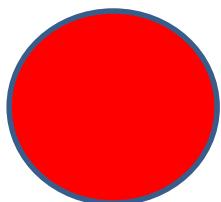
Goals: *preserve* and *promote* brain health and *prevent* disease



## High risk for disease

Goals: *preserve* / *promote* / *prevent*

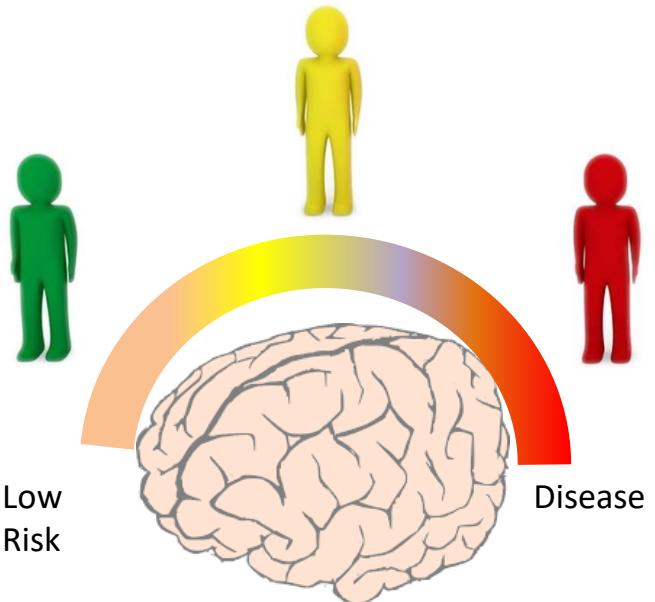
- First-degree relatives
- Potent risk factors present (primary prevention)
- Recovering from brain disease/injury (secondary prevention)



## Individuals with active disease or brain injury

Goals: *preserve* and *restore* brain function

# McCance Brain Care Score



McCANCE BRAIN CARE SCORE © 2020. The General Hospital Corporation. All rights reserved

Scoring: (0, 1 or 2 points per category)

BMI (0,1,2)	<18.5 kg/m <sup>2</sup> 18.5 - 25 kg/m <sup>2</sup> 25-29.9 kg/m <sup>2</sup> >30 kg/m <sup>2</sup> or <18.5 kg/m <sup>2</sup>
Diet (0, 1)	Adheres at least moderately to the MIND diet. Two or more of the following components: At least 4.5 cups per day of fruits and vegetables, At least two 3.5 oz servings per week of protein low in saturated fat (e.g., fish, walnuts, etc.) Three or more 1 oz servings per day of fiber-rich whole grains, Less than 1500 mg/d of sodium, Less than 36 oz per week of sugar sweet beverages
Alcohol (0,1,2)	No more than 2 alcoholic drinks/seating NTE 2 days/week No more than 1 alcoholic drink/seating NTE 2 days/week None
Aerobic Activity (0,1)	At least 150 minutes per week of moderate intensity physical activity or At least 75 minutes per week moderate-to-high intensity physical activity
Muscle Strengthening (0,1)	At least 3 times per week
Sleep (0,1)	1 or 0 Treated sleep disturbances and 7-8 hours of routine sleep per night
Smoking (0,1)	1 or 0 Never smoked or quit more than a year ago
Serum LDL (0,1)	No treatment required or <190 mg/dL in absence of cardiovascular disease If cardiovascular disease is present, then target LDL according to the latest American Heart Association guidelines.
Glycemia (0,1,2)	Hemoglobin A1c <5.7 Hemoglobin A1c >5.7 and <6.4 Hemoglobin A1c >6.4
Resting Blood Pressure (0,1,2)	- < 120/80 with or without treatment - SBP 120-139/80-89, with or without treatment - >140/90, with or without treatment
Social Relationships (0,1)	At least one person available most or all of the time to provide social support (e.g., available to listen or provide companionship, emotional support, and/or affection), and At least two relatives (besides spouse and children) or close friends they see at least once per month to whom they feel close and with whom they felt at ease, could talk to about private matters, and could call upon for help
Meaning in Life (0,1)	Feels their life has meaning/purpose or Strives to find meaning/purpose in their life.
Total SCORE (of 16)	

# Striving towards Precision Brain-Health

