



MASSACHUSETTS  
Alzheimer's Disease  
Research Center



# A World Without Alzheimer's Disease

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# Today's agenda:



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- Welcome and why we are here today?
- When is memory normal? When is it not?
- What is Alzheimer's disease?
- Why is it a problem?
- Can I do anything to prevent Alzheimer's disease?
- What is happening in research?
- What can you do to help?

# Massachusetts Alzheimer's Disease Research Center Center for Alzheimer's Research and Treatment

- Two centers united in **one vision**:

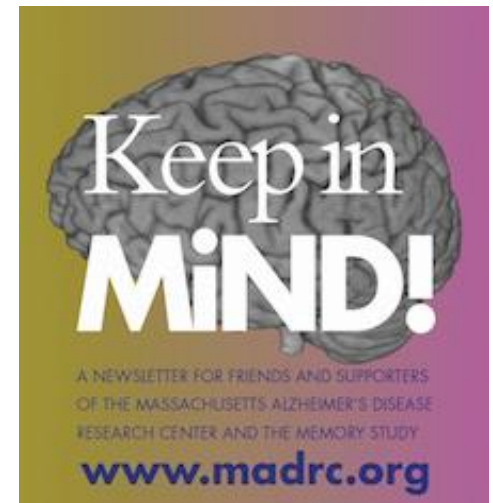


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**MGH Memory  
Disorders Unit**



- Frontotemporal Disorders Unit
- Spanish Speakers Services
- Research Studies



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[www.BWHCart.org](http://www.BWHCart.org)

**Center for Brain/Mind Medicine**



Why I do this  
work



# My Caregiver



ALZHEIMER'S DISEASE IS THE  
**6TH LEADING CAUSE**  
OF DEATH IN THE UNITED STATES

MORE THAN  
5 MILLION  
AMERICANS ARE  
LIVING WITH  
ALZHEIMER'S  
BY 2050, THIS  
NUMBER COULD  
RISE AS HIGH AS  
16 MILLION

EVERY  
  
66  
SECONDS  
someone in the  
United States  
develops the disease

MORE  
THAN

**15 MILLION AMERICANS**  
provide unpaid care for people with  
Alzheimer's or other dementias

IN  
2016

these caregivers provided  
an estimated  
**18.2 BILLION HOURS**  
of care valued at over  
**\$230 BILLION**

In 2017, Alzheimer's and other  
dementias will cost the nation  
\$259 billion  
By 2050, these costs could  
rise as high as

**\$1.1 TRILLION**



**35%** of caregivers for people with  
Alzheimer's or another dementia  
report that their health has gotten worse  
due to care responsibilities, compared to  
**19%** of caregivers for older people  
without dementia



**1 IN 3**  
seniors dies  
with Alzheimer's or  
another dementia



Since 2000, deaths  
from heart disease have  
decreased by 14%

while deaths from  
Alzheimer's disease have  
increased by 89%

**IT KILLS  
MORE THAN**  
breast cancer  
and prostate cancer  
**COMBINED**



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# ➤ Total cost: **\$259 Billion**

- ❖ Medicare \$131 B, 51%
- ❖ Medicaid \$44 B, 17%
- ❖ Out of pocket \$56 B, 22%
- ❖ Other \$28 B, 11%

*Other-* payment sources include private insurance, health maintenance organizations, other managed care organizations and uncompensated care.”

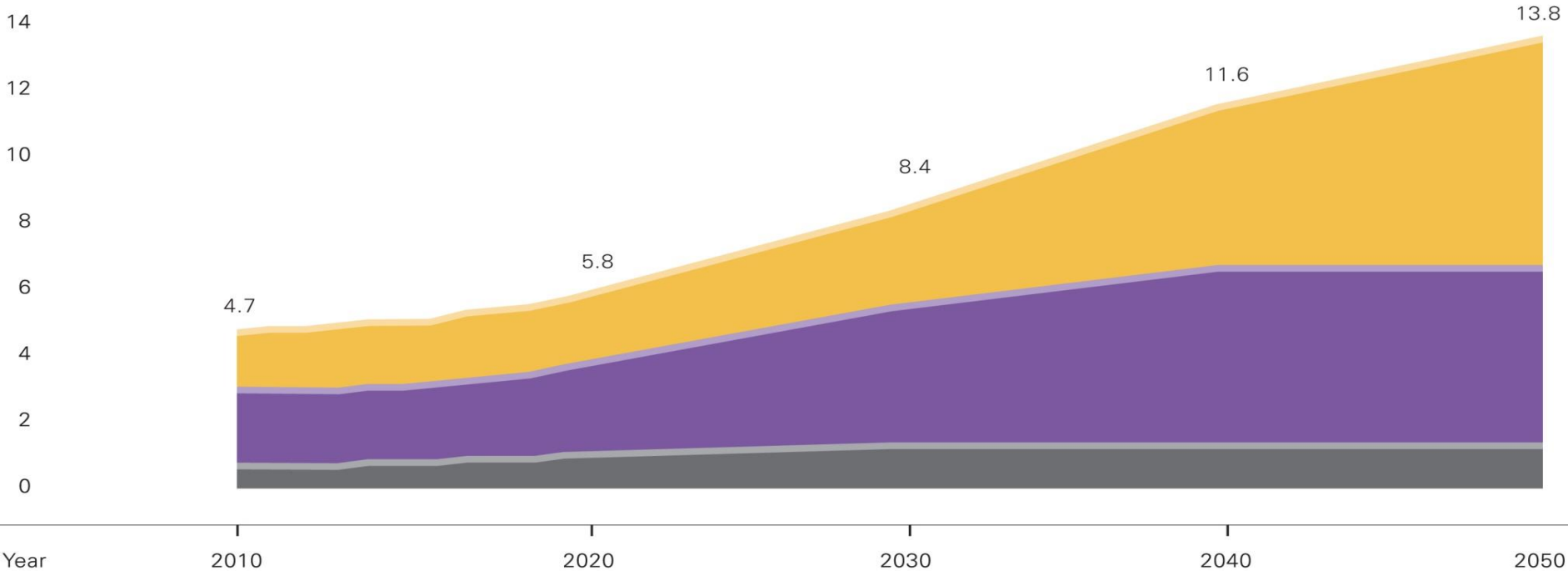
Aggregate Cost of Care by Payment Source for Americans Age 65 and Older with Alzheimer's and Other Dementias, 2017

\* *Alzheimer's Association facts and figures 2017 [www.alz.org/documents\\_custom/2017-facts-and-figures.pdf](http://www.alz.org/documents_custom/2017-facts-and-figures.pdf) p.49*

# Projected Number of People Age 65 and Older (Total and by Age Group) in the U.S. Population with Alzheimer's Disease, 2010 to 2050

Millions of people with Alzheimer's

Ages 65-74
  Ages 75-84
  Ages 85+



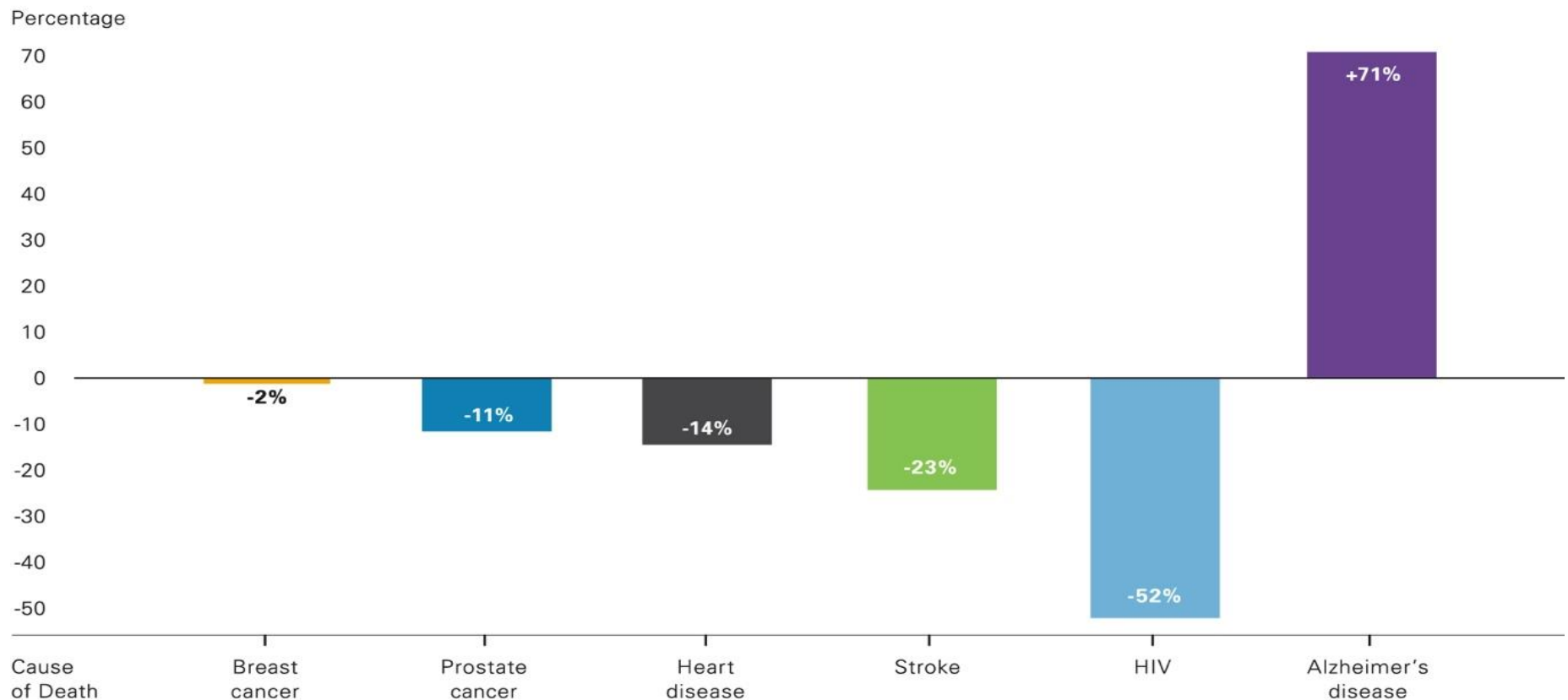
Created from data from Hebert et al.<sup>120, A11</sup>

Source: Alzheimer's Association 2015 Alzheimer's Disease Facts and Figures



# Alzheimer's Deaths Continue to Increase; Deaths from Other Major Diseases Decrease

Percentage Changes in Selected Causes of Death (All Ages) Between 2000 and 2013



Created from data from the National Center for Health Statistics.<sup>169</sup>

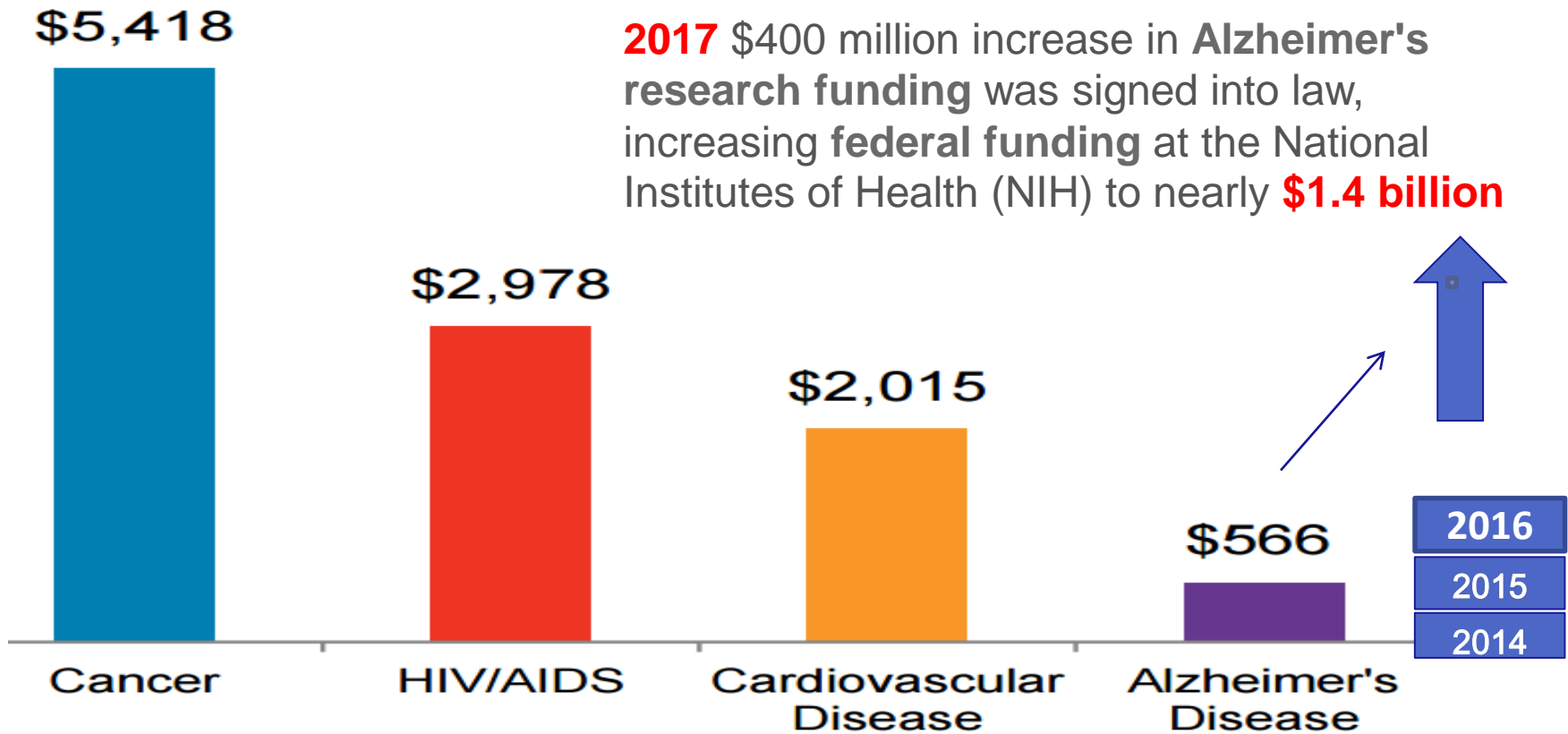
Source: Alzheimer's Association 2015 Alzheimer's Disease Facts and Figures

# Funding advances:



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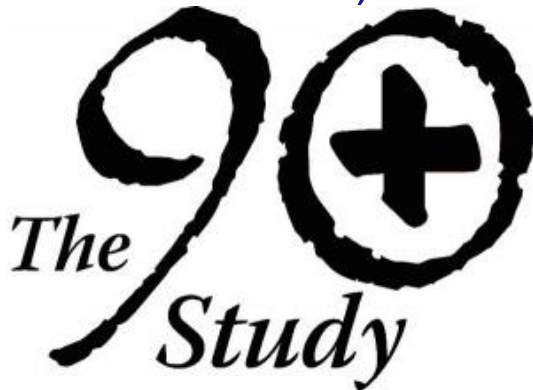
## National Institutes of Health (NIH) Research Funding, 2014 In millions of dollars



# Who lives to 100+ ?



Claudia Kawas, MD



People who...

- Drank moderate amounts of alcohol or coffee
- Were overweight in their 70s
- Stopped smoking
- Ate plant-based diets
- Kept up constant low-level exercise
- Had family & social support

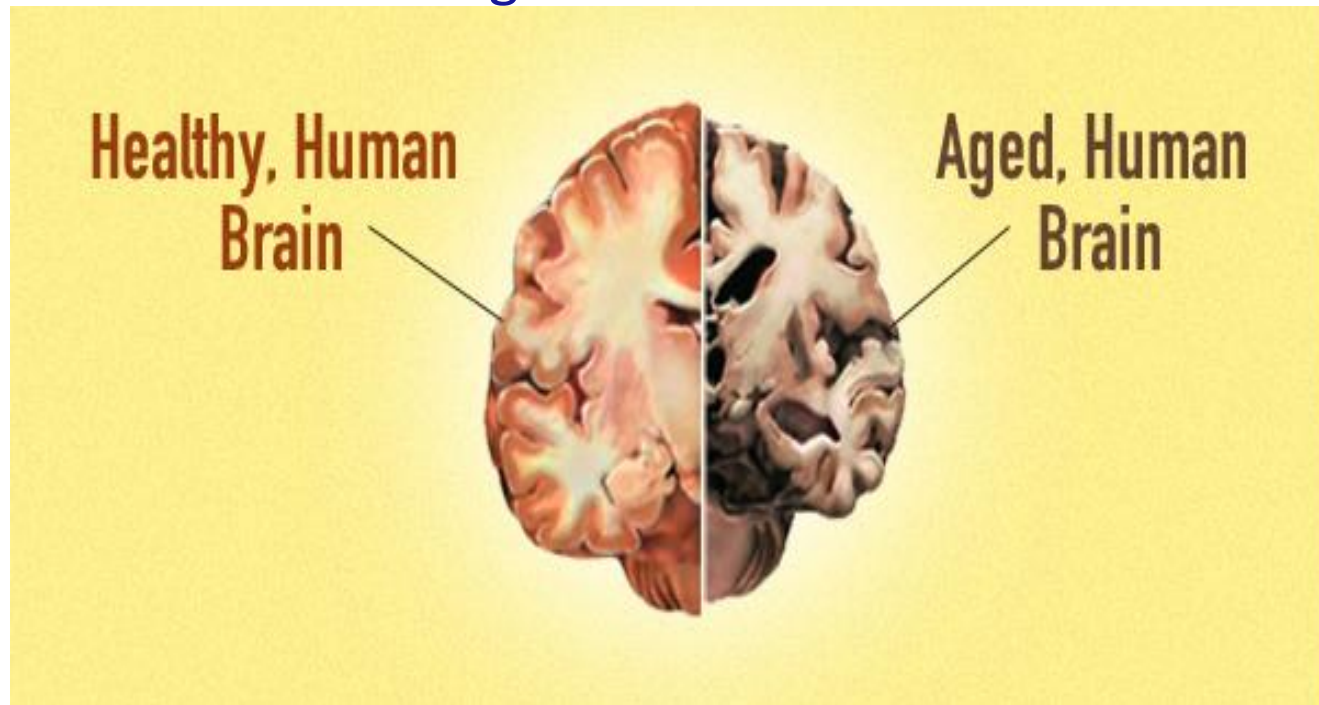
# Aging Brain:



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## Changes:

- Decreases in brain structure and size
- Diminished white matter integrity
- Neurochemical changes



# What's the difference?



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## Alzheimer's Disease:

- ❖ Poor judgment and decision making
- ❖ Inability to manage a budget
- ❖ Losing track of the date or the season
- ❖ Difficulty having a conversation
- ❖ Misplacing things and being unable to retrace steps to find them

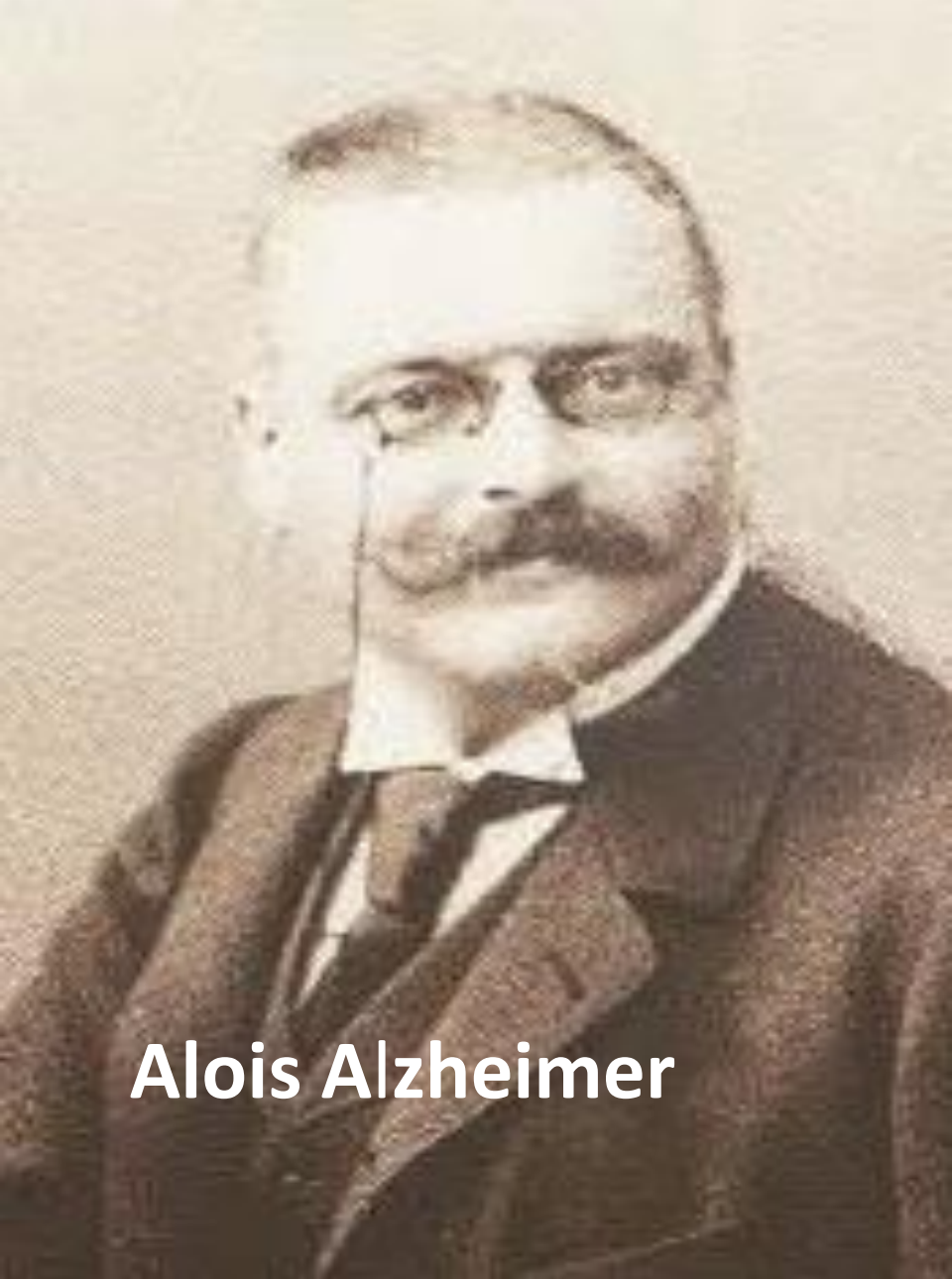
## Typical age-related changes:

- ❖ Making a bad decision once in a while
- ❖ Missing a monthly payment
- ❖ Forgetting which day it is and remembering later
- ❖ Sometimes forgetting which word to use
- ❖ Losing things from time to time



## What is a serious memory problem?

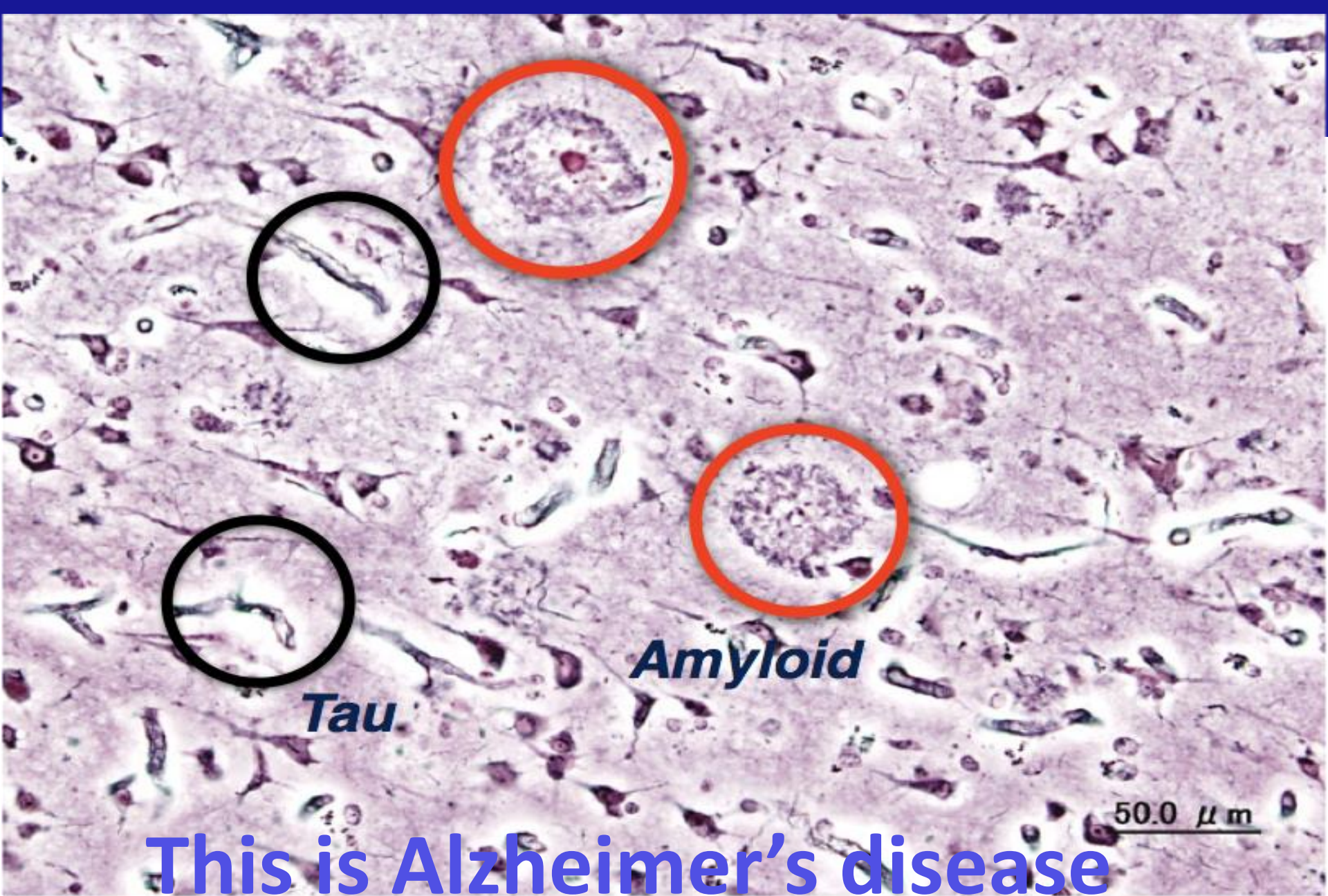
- Asking the same questions over and over again
- Getting lost in places the person knows well
- Not being able to follow directions
- Becoming more confused about time, people and places
- Poor self-care practices, i.e., eating poorly, not bathing, practicing unsafe behaviors.



Alois Alzheimer



Auguste Deter



*Tau*

*Amyloid*

50.0  $\mu$ m

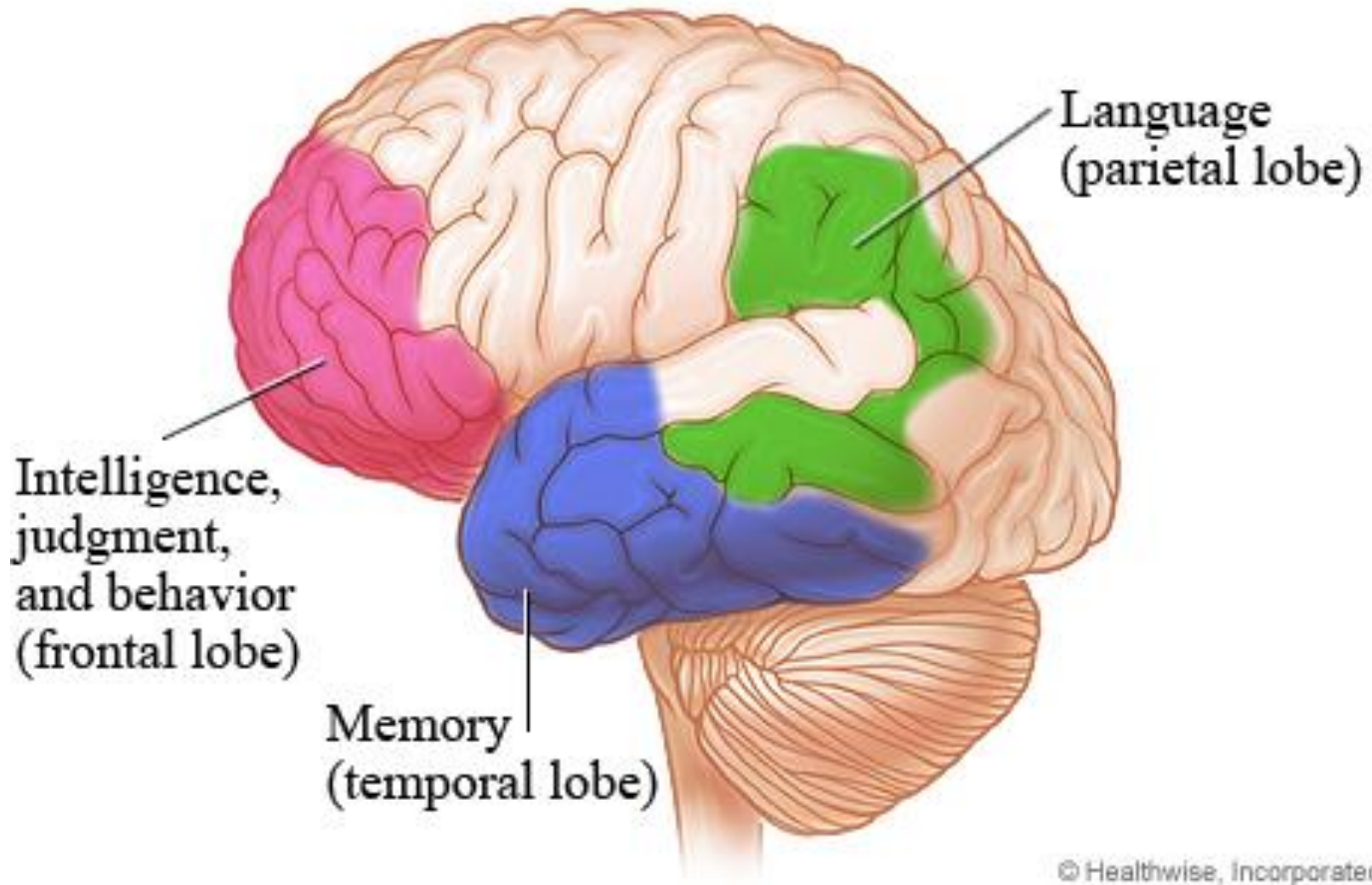
**This is Alzheimer's disease**



# Areas of the Brain Affected by Alzheimer's and Other Dementias:



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PET Scan

MRI Scan

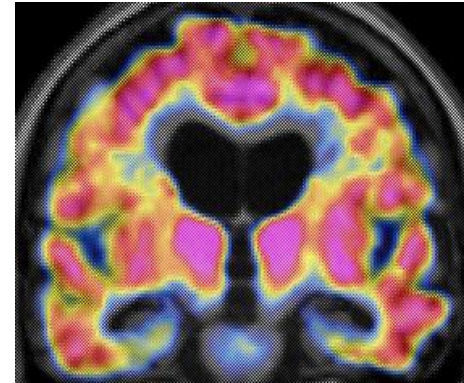
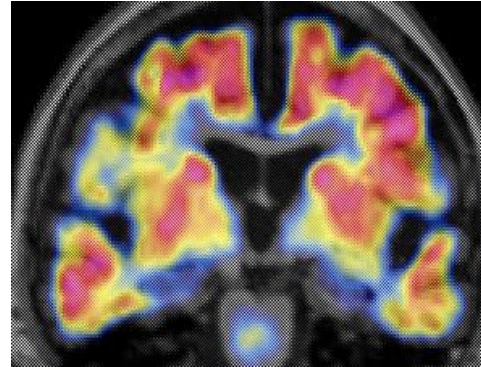
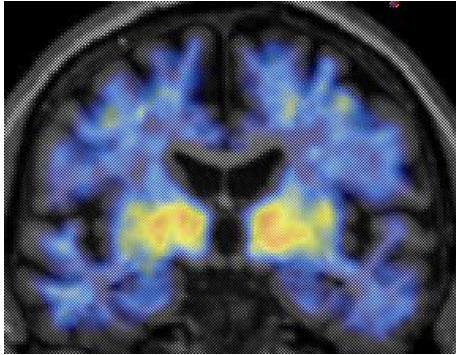


© 2006 Terese Winslow  
U.S. Govt. has certain rights

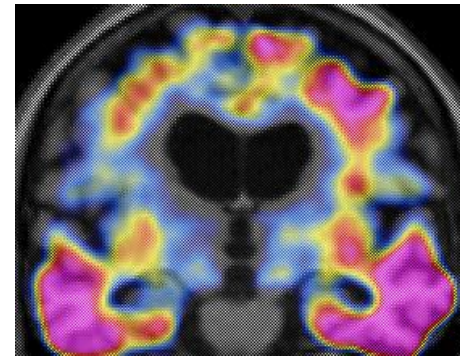
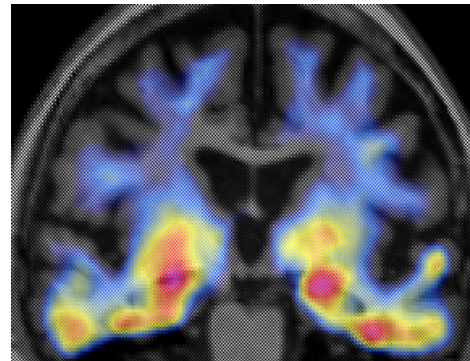
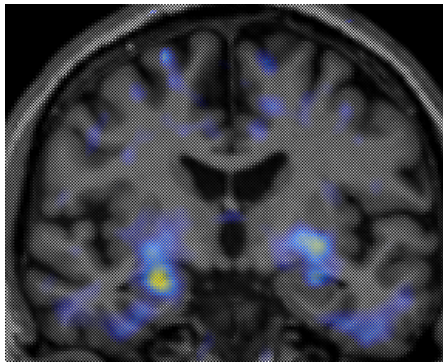
# PET/ MRI Neuroimaging

# What Amyloid and Tau PET scans

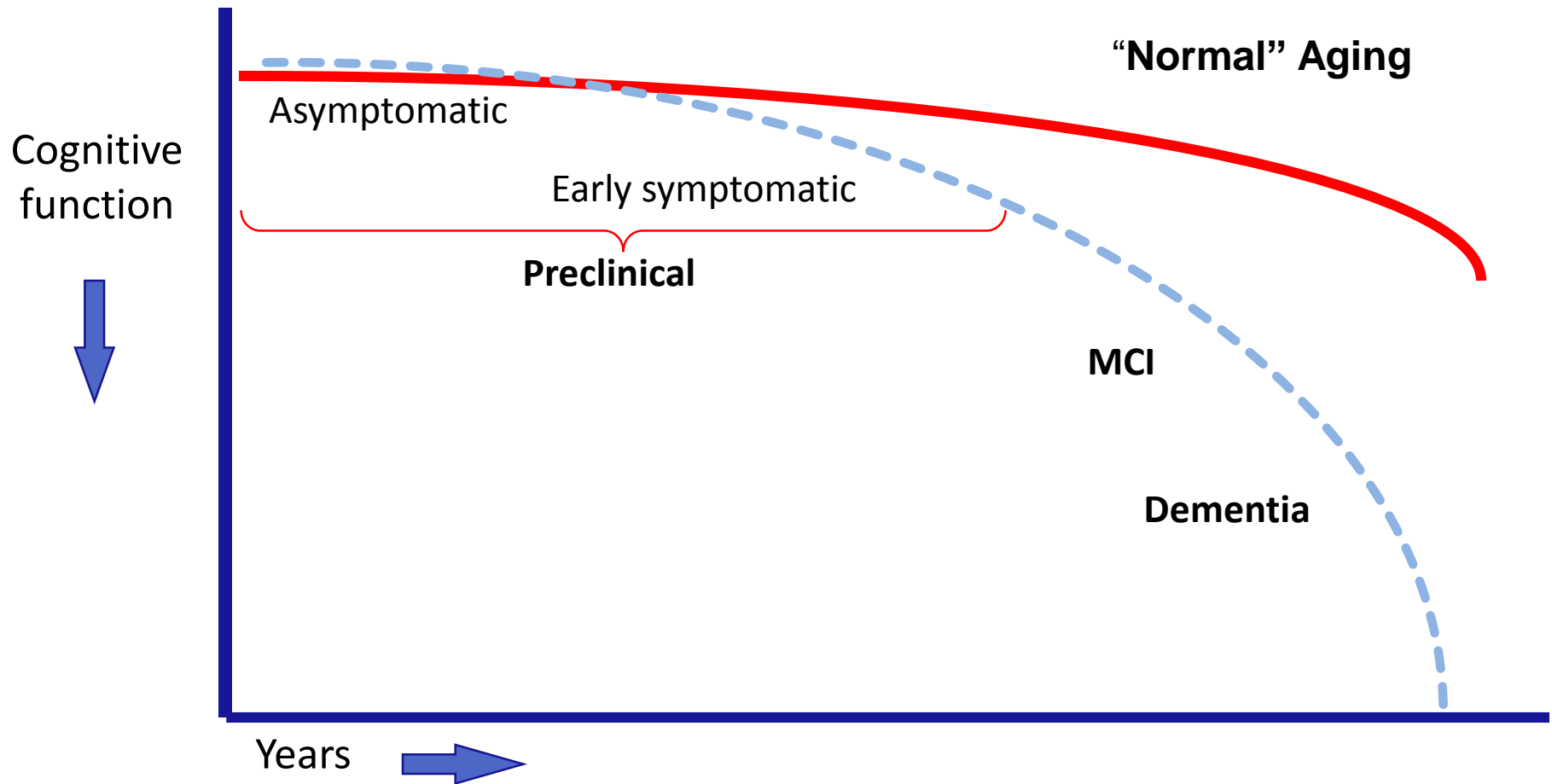
## PIB-PET



## Tau PET



# The continuum of Alzheimer's disease



Sperling R et al *Alzheimer & Dementia* 2011



# DEMENTIA

Defined: An 'umbrella' term used to describe the symptoms of a group of more than 100 conditions that impair memory, behaviours and thinking. The most common causes of dementia are outlined below.

## Vascular dementia (VaD)

is the second most common form of dementia accounting for 20% of cases. VaD occurs through a reduced blood supply to the brain usually due to stroke.

## Parkinsons disease (PD)

accounts for 5% of dementia cases. PD is a degenerative disorder of the central nervous system.

## Fronto-temporal dementia (FTD)

accounts for 5% of dementia cases. FTD is associated with rounded and tangled bundles of protein in brain nerve cells.

## Alzheimers disease (AD)

is the **most common form of dementia** accounting for 50-70%. AD is a degenerative disease that attacks the brain resulting in impaired functioning.

## Dementia with Lewy bodies (DLB)

accounts for 15% of dementia cases. DLB is associated with Lewy bodies which are abnormal brain cells.

- A serious loss of global cognitive ability in a previously unimpaired person beyond what might be expected from normal aging.
- Daily functioning is impacted by cognitive impairment.



## Cognitive Impairment & Dementia

### Progressive

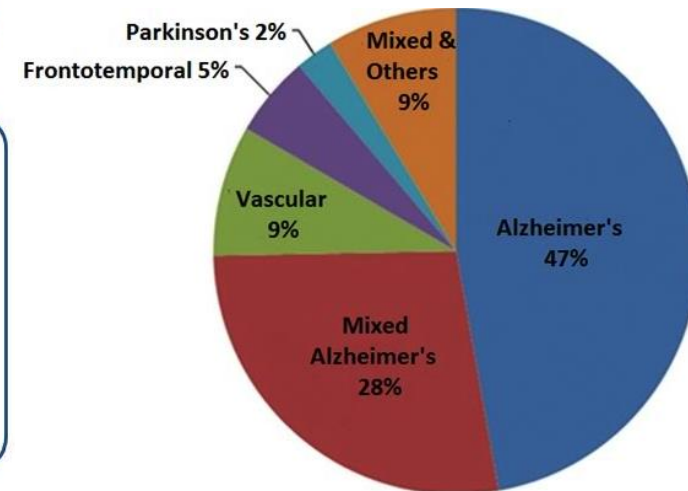
- Alzheimer's disease (AD)
- Dementia with Lewy Bodies (DLB)
- Fronto-temporal dementia (FTD)
- Vascular dementia (VaD)
- Parkinson's disease dementia (PDD)
- Other degenerative dementias

### Non-Progressive

- Traumatic Brain Injury (TBI)
- Anoxia (e.g., sleep apnea)
- Vascular (e.g., single stroke)

### Reversible

- Depression & anxiety
- Multiple medical conditions
- Metabolic problems
- Medication side effects
- Infections
- Normal Pressure Hydrocephalus



# Genetics of Alzheimer's disease:



Dr. Yakeel Quiroz

**Familial AD:** early-onset (ages 30-60);  
rare (5% of people with AD); caused by a number of single-gene  
mutations on chromosomes 21, 14 and 1

- Mutations on chromosome 21 causes formation of abnormal **amyloid precursor protein (APP)**
- Mutations on chromosome 14 leads to abnormal **presenilin 1**
- Mutation on chromosome 1 leads to abnormal **presenilin 2**



# DIAN Study:



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DIAN stands for the Dominantly Inherited Alzheimer's Network .

International Network established by the National Institute on Aging of the National Institutes of Health (US)

- People from families with a known mutation causing AD are eligible to participate in DIAN and its studies of physical and mental changes that may predict future AD.

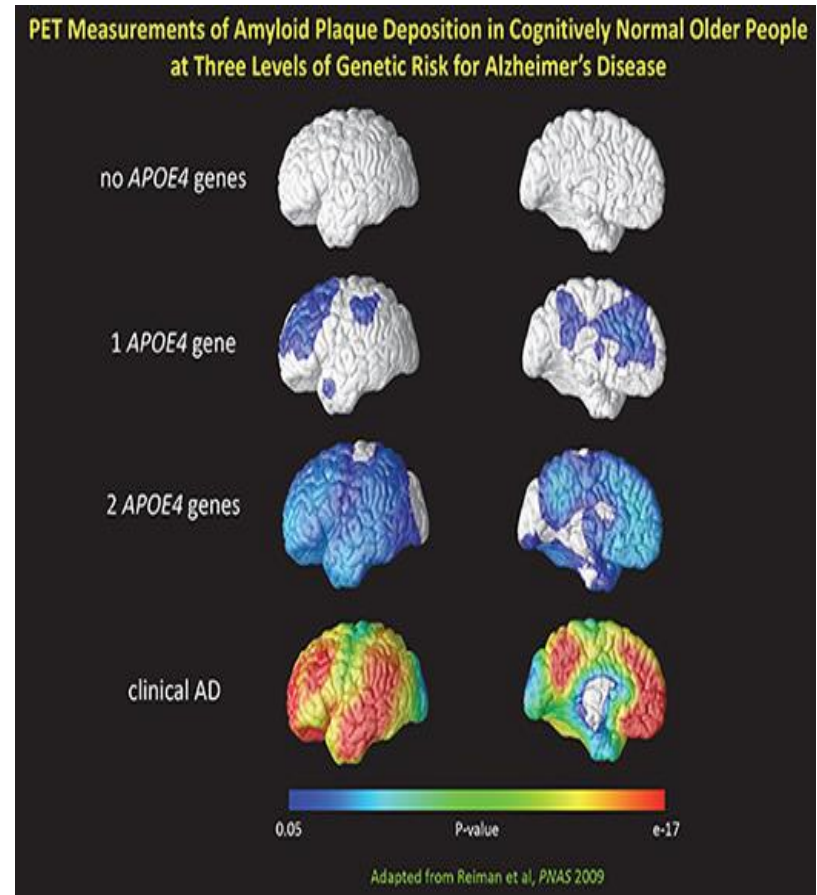


# Genetics of Alzheimer's disease:

## Sporadic AD:

late-onset (after age 60; causes are not known but believed to be a combination of genetic, environmental and life-style factors.

- No specific gene known but one genetic risk-factor increases risk of developing AD: The **apolipoprotein E (APOE) gene** found on chromosome 19.
- The **APOE 4 allele increases risk of developing AD.**





## The Longest Loss:



## Alzheimer's Disease and Dementia

### Why get a diagnosis ?

- ✓ Take charge of your life
- ✓ Get the support you and your family need
- ✓ Access to cutting edge research
- ✓ Help to decrease stigma

# Want to live life to the fullest?



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# Maintain you Brain



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≡ TIME |

HEART DISEASE

## Heart Health Is Linked to Brain Health: Study



Harvard Health Publications  
HARVARD MEDICAL SCHOOL

*Trusted advice for a healthier life*

Heart disease and brain health: Looking at the links



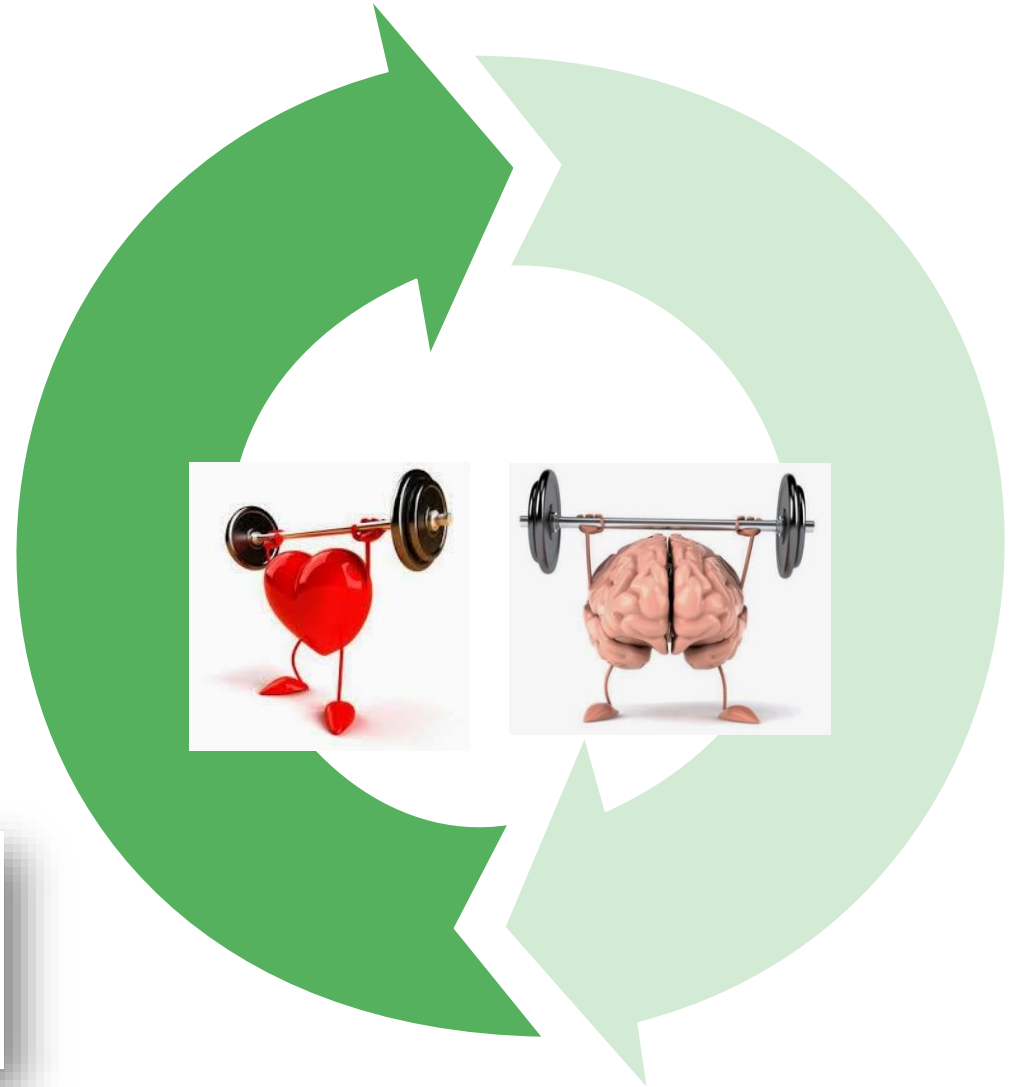
Protect Your Heart, Protect Your Brain

≡ npr WGBH RADIO

YOUR HEALTH

## What's Good For The Heart Is Good For The Brain

May 2, 2016 · 3:44 AM ET  
Heard on Morning Edition



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# Healthy Behaviors: Overview



Cleveland Clinic Healthy Brains Initiative <https://healthybrains.org/pillars/>

- Significant evidence that certain behaviors can decrease the chance developing new or worsening cognitive problems.
- A set of behaviors is more effective at slowing the rate of conversion from SCD and/or MCI to dementia than a single lifestyle change.

# Healthy Behaviors: Physical Activity

Numerous studies of physical activity show that **30-60 minutes** of cardiovascular exercise 3 or more times per week is associated with **lower risk of progressing from MCI to dementia.**

Improving fitness through regular exercise has been shown to **boost memory and daily functioning** in patients with dementia, and **improve global cognition, executive function and attention** for patients with MCI.

Grande G, et al. *J Alzheimers Dis.* 2014;39(4):833-9

Morris JK, et al. *PLoS One.* 2017;12(2)



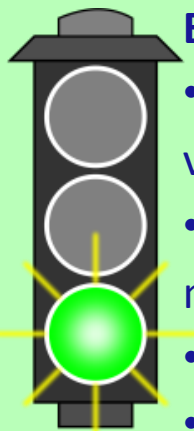
American Heart Association 2017

Age	Target HR, 50-85%	Maximum HR, 100%
50 years	85-145 BPM	170 BPM
60 years	80-136 BPM	160 BPM
70 years	75-128 BPM	150 BPM

# Healthy Behaviors: Diet

- In many studies, **anti-inflammatory diets** are shown to be both brain and heart healthy.
- Greater adherence to the diet is associated with a **lower risk of conversion from MCI to Alzheimer's dementia**, and **lower mortality** in Alzheimer's dementia patients.

## Mediterranean-Style Diet



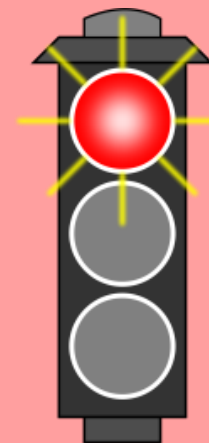
### Every Day:

- Fresh fruits and vegetables
- Beans, lentils and nuts
- Fish
- Whole grains
- Olive oil



### In Moderation:

- Poultry
- Eggs
- Dairy
- Alcohol (wine)



### Avoid:

- Sweets with refined sugars
- Red meat
- Saturated fats (butter)

# Healthy Behaviors: Social and Cognitive Activities

- Study of 2,249 women
- Social network size was correlated with reduced risk of dementia
- Women with larger social networks were 26 percent less likely to develop dementia than those with smaller social networks
- Women who had **daily contact with friends and family cut their risk of dementia by almost half**



- A 2015 study showed that **lonely older adults were more likely to become physically limited** and had a 20 percent faster cognitive decline
- In addition to loneliness, **depression accelerated the rate of decline**

Crooks VC, et al. *Am J Public Health*. 2008;98(7): 1221–27  
Holt-Lunstad J. *Perspect Psychol Sci*. 2015;10(2):227-37



# Brain Healthy Behaviors: Sleep Hygiene



Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™

Age Group		Recommended Hours of Sleep Per Day
Adult	18–60 years	7 or more hours per night <sup>3</sup>
	61–64 years	7–9 hours <sup>1</sup>
	65 years and older	7–8 hours <sup>1</sup>

## *Some habits that can improve your sleep health:*

- **Be consistent:** Go to bed at the same time each night and get up at the same time each morning, including on the weekends
- **Get some exercise:** Being physically active during the day can help you fall asleep more easily at night
- **Make your bedroom** is quiet, dark, relaxing, and at a comfortable temperature
- **Remove electronic devices**, such as TVs, computers, and smart phones, from the bedroom
- **Avoid** large meals, caffeine, and alcohol before bedtime
- **Talk to your doctor** if you have insomnia, snoring, fatigue, or excessive daytime sleepiness

# Medication Management



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Many over-the-counter (OTC), prescription and recreational drugs can affect memory and cognition:

Medications and SuPark HY, et al. *PLoS One*. 2017;12(1)  
Daffner K. Harvard Medical School Special Health Report 2015

## OTC

- **Antihistamines** can cause blurred vision, dry mouth and confused thinking
- **Diphenhydramine** is included in many OTC sleep aides, often recommended by doctors
- Other antihistamines include brompheniramine and chlorpheniramine, and are often included in **OTC allergy medications**



## Prescription

- Some prescription drugs are **anticholinergic**, blocking a neurotransmitter in the brain, and are associated with faster cognitive decline
- These include medications used to treat blood pressure (*captopril*), heartburn (*cimetidine*), overactive bladder (*oxybutynin and tolterodine*)
- **Polypharmacy**, an extensive daily drug regimen, is associated with a higher risk of dementia
- Meet with your doctor to ensure that your prescription drug regimen is appropriate and brain healthy

## Recreational

- **Smoking** • Current smokers have a higher risk of developing dementia and exhibit faster rates of cognitive decline
- Smoking may contribute to dementia by increasing vascular risk factors
- People who quit smoking in midlife have a lower risk of developing dementia than current smokers

## Marijuana

- Marijuana (THC) affects areas of the brain that are important for memory formation
- Studies have shown that chronic **regular** marijuana use may affect executive function

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# Types of Clinical Research

- Observational – no treatment
- Clinical trials – treatment
  - Prevention
  - Symptomatic

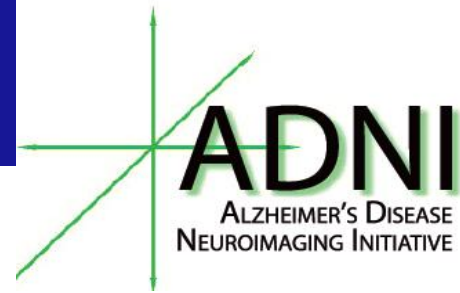


## MEMORY AND BRAIN CHANGES IN OLDER ADULTS

A research study to find the best ways to promote healthy aging.

- Age 50 to 90
- Speak English
- Have someone close to you who can answer questions about your daily activities

# Observational study:



- Have few or no memory concerns **or** a diagnosis of MCI or dementia due to AD.
- The **purpose** of the ADNI-3 Trial is to create a national database of brain aging from volunteers age 55-90 to improve clinical trials and provide researchers across the country with data to study how quickly brain cognition and function changes.
- Funded by the National Institutes for Health.

# Prevention study:

EARLY Trial



The **EARLY Trial** is assessing the effectiveness and safety of an investigational medication (a **BACE inhibitor** which stops the formation of the **building blocks of amyloid** in the brain) **to prevent** the development of symptoms of Alzheimer's disease in age 60-85 .

If you are age 60 to 64, you will need to have at least one of the following:

- A parent or a sibling with Alzheimer's disease
- An increased risk for developing Alzheimer's disease: the apolipoprotein E [APOE] e4 gene or previously observed elevation of amyloid in your brain

The sponsor of this study is Janssen pharmaceutical company.

# Symptomatic study:



The ENGAGE Trial assesses the effectiveness and safety of an investigational medication (aducanumab, a **monoclonal antibody** (passive vaccine) that removes **amyloid** from the brain) to determine whether it can slow the progression of symptoms in early AD.

- age 50-85
- Are experiencing problems with memory or thinking clearly that might be related to MCI or early AD

The sponsor of the ENGAGE trial is Biogen pharmaceutical company.

# Symptomatic study:



Experiencing problems with memory or thinking that might be related to MCI or dementia due to AD.

The Aware Study assesses the effectiveness and safety of an investigational medication (monoclonal antibody (*passive vaccine*) that removes abnormal **Tau** protein from the brain) to determine whether it can reduce symptoms in early AD in age's 55-85 .

The sponsor of the Aware Study is AbbVie pharmaceutical company.





The Mission AD study is assessing the effectiveness and safety of an investigational medication (a **BACE inhibitor** which stops the formation of the **building blocks of Amyloid** in the brain) to improve the symptoms of Alzheimer's disease.

- Mild Cognitive Impairment (MCI) or dementia due to the early stages of Alzheimer's Disease (AD)
- Ages 50 and 85

The sponsor of this study is Eisai pharmaceutical company.

# Why research matters?



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- Only thing that will change the course of Alzheimer's disease.
- Less than 5% of population participates in research.
- It may delay or prevent the course of Alzheimer's disease.
- We will learn more about Alzheimer's disease, the brain and aging.

# What do people say who have participated in Alzheimer's and related dementia Clinical Trials?

**“I feel like someone else is looking after me”**

**“I feel like the burden is not just on my shoulders”**

**“It makes me happy that I may help someone else”**



# What to look for in a reputable research site?

- Who is leading the study?
- Where will I be evaluated?
- Who is looking over my results?
- Who is treating me and providing me my treatment or medication's?
- Have I been given to time to read over and discuss the informed consent?

*Get your **questions answered and be informed.***

# Challenges for Alzheimer's Research Studies

- We need many more **participants**
- A **diverse group of people**
- We need PCP's, Specialists and the community to **support research**
- We need to **educate others** in the field



# Where Can I Volunteer For Clinical Trials?

## Center for Alzheimer Research and Treatment

Brigham and Women's Hospital

60 Fenwood Road-  
Boston, MA 02115

**(617) 732-8085**



# How can I Help?



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- Tell others about what you learned today
- Volunteer to participate in a study
- Tell your Doctor about the importance of a diagnosis of Alzheimer's disease and related dementia's
- Host an educational event
- Support a Caregiver
- Be a volunteer
- Become politically active
- Help with funding

# For More Information About Alzheimer's Brain Changes



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## **NIA Alzheimer's and related Dementias Education and Referral (ADEAR) Center**

1-800-438-4380 (toll-free)

The National Institute on Aging's ADEAR Center offers information and free print publications about Alzheimer's disease and related dementias for families, caregivers, and health professionals. ADEAR Center staff answer telephone, email, and written requests and make referrals to local and national resources.

## **Alzheimer's Association**

1-800-272-3900 (toll-free, 24/7)

1-866-403-3073 (TTY/toll-free)

## **Alzheimer's Foundation of America**

1-866-232-8484 (toll-free)

## **AARP**

1-866-654-5572 (toll-free)



We are inspired by our participants' courage and are determined to change the future of this disease.



**The only thing standing in our way is time and funding.**  
Consider joining the many families who are philanthropically partnering with us to speed the pace of discovery.

To learn more about ways to make a gift to support our efforts or to help us raise funds, please contact our colleague in the Development Office:

Ginny Fuller at 617-424-4329 (office) 617-510-9869 (cell)

# Thank you

