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# ALZHEIMER'S: NEW DIRECTIONS IN BIOMEDICAL RESEARCH AND CAREGIVING

## HEARING

BEFORE THE

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# C O N T E N T S

# ALZHEIMER'S: NEW DIRECTIONS IN BIOMEDICAL RESEARCH AND CAREGIVING

**TUESDAY, APRIL 2, 2019**

U.S. SENATE,
SPECIAL COMMITTEE ON AGING,
*Washington, DC.*

The Committee met, pursuant to notice, at 9:39 a.m., in Room 106, Dirksen Senate Office Building, Hon. Susan M. Collins, Chairman of the Committee, presiding.

Present: Senators Collins, Tim Scott, McSally, Hawley, Braun, Rick Scott, Casey, Blumenthal, Jones, Sinema, and Rosen.

## OPENING STATEMENT OF SENATOR SUSAN M. COLLINS, CHAIRMAN

The CHAIRMAN. The hearing will come to order.

Good morning, and welcome to all the individuals, families, and organizations from all across the country who have come to our Nation's Capital to advocate for better treatments and ultimately a means of prevention and a cure for Alzheimer's disease as well as for more support for caregivers.

In the fight against Alzheimer's, you are the champions. Your advocacy has ushered in an era of hope paired with action against this devastating disease. Since we gathered last June, through your diligent work, in a matter of months, we successfully pushed the landmark BOLD Infrastructure for Alzheimer's Act across the finish line.

Today this law marks a new public health approach for this disease. It will promote early diagnosis and improve treatment and care for millions for whom the disease is a reality day in and day out.

The statistics remain stark. A new CDC report shows that the rate of Americans dying from dementia has more than doubled in our country since the year 2000. An estimated 5.8 million Americans are living with Alzheimer's, costing our Nation $290 billion a year, including $195 billion in costs to Medicare and Medicaid.

If we continue along this trajectory, Alzheimer's is projected to claim the minds of nearly 14 million Americans and surpass $1 trillion in costs by the year 2050.

While scientists and medical professionals are working hard on an effective treatment and cure, recent clinical trials have unfortunately ended in a string of failures.

Just last month, two more major trials targeting amyloid deposits in the brain were halted. For decades, many researchers have been targeting amyloid, the hallmark sign of Alzheimer's disease.

Today, due to advancements in brain imaging, we know that some people exhibit rampant amyloid plaques and yet never develop the disease. While amyloid remains an important part of ongoing research and I remain hopeful that the new trials starting earlier in the disease process will produce better news, the record funding that we have provided will allow our medical researchers to pursue so many other promising approaches.

I am delighted that last year, a bipartisan coalition, of which every member on this Committee is a part, worked hard to achieve a $425 million increase in Federal funding for Alzheimer's research. That was the largest increase in our Nation's history, and I can see Dr. Hodes smiling broadly at that.

With our total investment at more than $2 billion for Alzheimer's this year, we are on a strong path forward, and we are not going to turn back.

This year, as we have before, I expect Congress to once again reject the President's unwise request to cut the funding for the National Institutes of Health.

The robust funding that Congress has provided is enabling scientists to explore a myriad of new pathways that could lead to earlier detection and potential therapies. From the ocular and the cardiovascular to the genome and the microbiome to the immune and the lymphatic system, researchers are leaving no system unexamined and no cell unturned.

While we continue to forge ahead to accelerate biomedical research, we face the reality that this disease is affecting millions of American families. BOLD, now signed into law, marks a milestone toward building the public health infrastructure we need to better support individuals, families, and communities.

Support can make all of the difference. Tom O'Connor, a caregiver from Portland, Maine, who is with us today, told us, "When we got the diagnosis, we were shocked and did not know where to start."

When he was referred to community partners, he received the information he needed and was able to put a plan in place to make the time ahead better for himself and for his wife, who is battling Alzheimer's.

Diagnosis is the first step that can empower individuals and families to understand changes in the brain, but developing a plan for care can make the journey so much better. Care plans can also help to reduce comorbidities, prevent hospitalizations, and improve life not only for those living with the disease, but also for their caregivers.

As the BOLD approach spreads to communities across America, we must continue to develop Federal policies to better support all Americans with Alzheimer's and their families.

Last year, I heard from constituents facing early onset Alzheimer's that it can be difficult to access necessary supports simply due to not meeting the age thresholds for various Federal programs.

This year, I am leading the reauthorization of the Older Americans Act along with my Ranking Member, Senator Casey.

Last week, I introduced a bill that would ensure that key services in the Older Americans Act, such as the National Family Care-

giver Support Program, will also serve those with Alzheimer's who are younger than age 60.

Whenever I ask family caregivers, which included my own mother, about their greatest needs, the number one, request that I hear is for more respite care. Today, I am also introducing the Lifespan Respite Care Act with Senator Tammy Baldwin to help communities and States provide respite care for families.

From accelerating research to advancing care, every year that we gather as one sea of purple, we make waves, and by the way, I want to thank Michael Hartt for giving me a sash today to wear. Thank you, Michael.

From accelerating research to advancing care, we are making progress. While Alzheimer's robs our loved ones of precious memories, I stand with you to do everything we can to make Alzheimer's itself a memory 1 day.

Thank you. I am not delighted to turn to another fierce advocate for research for this disease, the Ranking Member, Senator Casey.

**OPENING STATEMENT OF SENATOR ROBERT P. CASEY, JR., RANKING MEMBER**

Senator CASEY. Thank you, Chairman Collins, for, of course, holding this hearing today, one of the highlights of the year in terms of hearings. I do not know of a hearing throughout the year that has this much energy and enthusiasm and this kind of a crowd and that kind of applause.

I also want to thank Chairman Collins for her enduring leadership in the fight to find a cure for Alzheimer's disease.

I want to extend our gratitude as well to all the advocates in the room today, all of the caregivers, family members who have traveled across the Country to be in this hearing room with us today.

Few American families are unaffected by this vicious disease. Indeed, over 5.8 million people over the age of 65 currently live with Alzheimer's disease. Approximately 280,000 of those people are Pennsylvanians, and those number are rising.

We know that the impact it has on the person diagnosed, but also the impact on their family can be devastating, and that is, of course, an understatement.

We must support efforts to find a cure.

I am pleased every year to be able to lead the appropriations letter in the Senate with Senator Burr to advocate for more research funding at the National Institutes of Health and to join Chairman Collins in ensuring robust funding for Alzheimer's disease research and in this case, of course, specifically in her work on the Appropriations Committee, and we commend her for that.

Until there is a cure, we must do everything in our power to make sure that people receive the best possible care, so we focus on both finding a cure, but also on ensuring quality care.

We know that this disease impacts different people differently, so our efforts must take into account people who are diagnosed at younger ages, people with disabilities, people from diverse backgrounds, and people living in both urban and rural settings.

For example, people who are diagnosed at younger ages and are still working may have difficulty knowing where to turn for help because many essential supports are more commonly advertised to

seniors. That is why I joined with Senator Collins, Senator Jones, who is with us today, Senator Capito in introducing the Younger-Onset Alzheimer's Disease Act to ensure that people younger than age 65 have access to counselors and support groups to help them navigate the health care system and plan for their long-term care needs.

A subset of the people diagnosed at these younger ages are of course people with disabilities. For example, nearly half—half—of all people with Down Syndrome will develop Alzheimer's disease in their lifetime; 30 percent of these Americans will be diagnosed before the age of 50.

Research and clinical trials must include people with disabilities to ensure their needs are met in the quest for treatment and a cure.

I would like to thank Senator Collins again for agreeing to work with me on policies that would address this specific disparity among people with disabilities.

We also know that African Americans are two times—two times more likely than their white counterparts to develop Alzheimer's disease, and the Hispanic and Latino populations of America are one and a half times more likely to develop Alzheimer's disease. We must understand why and what can be done about those issues.

People living in rural areas may not live near a major medical center or a research facility, which makes it harder for them to participate in research studies or clinical trials.

We must tackle this disease from every angle, from continuing our research for a cure to ensuring medical professionals and community organizations can provide the best care possible to every American with Alzheimer's disease.

I look forward to our witnesses' testimony today and the important conversations we will have. Thank you very much.

The CHAIRMAN. Thank you, Senator Casey.

Before we turn to our great panel of witnesses, we are going to start with a video so that we can hear directly from people around the country who are living with Alzheimer's.

I want to thank the Alzheimer's Association for providing us with their voices.

[Video played.][Video may be viewed at aging.senate.gov/hearings]

Those thoughts about diagnosis and insights about the path forward will help to frame our discussion today.

Now I am pleased to turn to our witnesses. First, I am delighted to welcome from the great State of Maine, Mary Dysart Hartt and Michael Hartt, former business owners from Hampden, Maine.

Today Mary is the caregiver for her husband, Mike, who was diagnosed 4 years ago at the age of 62. Now, Mrs. Hartt is known across the State of Maine for her famous Pies for a Purpose, which are Purpleberry pies. Yes, they are baked and sold to raise awareness about Alzheimer's.

Mrs. Hartt has been honored as Restaurateur of the Year by the Maine Restaurant Association. She is also a photographer and a runner, and next month, she will run in the Boston Marathon and is fundraising for Alzheimer's research.

Next, I would like to turn to our Ranking Member to introduce our witness from the Commonwealth of Pennsylvania.

Senator CASEY. Thank you, Chairman Collins.

I am pleased to introduce Clay Jacobs. Clay is the Executive Director of the Greater Pennsylvania Chapter of the Alzheimer's Association. Clay is from North Abington Township, which happens to be Lackawanna County, where I live. It had nothing to do with is presence here today, but it certainly helped.

Clay's wife, Becky, is also with us today. We are grateful that Becky took the time to travel to Washington.

Clay is a graduate of a great Pennsylvania institution of higher education, Westchester University. He also told me earlier that he is a graduate of Abington Heights High School.

In his current position, Clay works to support people living with Alzheimer's disease and their families through direct services, support, and education programs.

I also want to welcome the large contingent of advocates who are in the audience today from Pennsylvania and across the country. Thank you for making the journey to be with us, and, Clay, thank you for being with us today. We look forward to your testimony.

The CHAIRMAN. Our next witness, Dr. Sharon Fekrat, is a professor of Ophthalmology and associate professor of Surgery at Duke University School of Medicine. She also serves at the Durham VA Medical Center. She has coauthored more than 130 publications in medical journals and 45 textbook chapters.

Finally, we will hear from Dr. Richard Hodes, the Director of the National Institute on Aging at the National Institutes of Health. Dr. Hodes will provide an overview of the advancements in Alzheimer's research across the NIH and discuss partnerships with industry to accelerate therapies. He will also share new NIH research on supporting caregivers.

I want to thank you all for joining us, and we will start with Mary Hartt.

**STATEMENT OF MARY DYSART HARTT, FAMILY CAREGIVER**

Mrs. HARTT. Thank you, Chairman Collins.

The CHAIRMAN. We are going to have your mic turned on for you.

Mrs. HARTT. I had a plan, and then I did not do it.

Chairman Collins, Ranking Member Casey, and members of the Committee, thank you for the opportunity to testify about my experiences as a caregiver for my late mother and now my husband, Mike, who is currently living with Alzheimer's disease.

Mike was diagnosed at age 62. My hope is that, in sharing our story, others who are impacted by this disease will feel less alone and understand that with proper supports, there is life after a diagnosis.

Mike was 58 when I started noticing that things did not seem quite right. After living on our family farm since 1977, daily tasks like running the tractor became a challenge. During that same time, I was part of a family care team caring for my mom who was living with dementia. She was a brave woman who started our family owned business, Dysart's, with my father 52 years ago, and for 52 years, our business has been open 24/7, so you can gather how brave she was to start that.

My two brothers and I are very proud to have carried on our parents dream into the third generation. I began to see similarities in the challenges both Mike was facing and decided to reach out to our family doctor who agreed to help me monitor Mike for changes. For 4 years, we continued on this path, with things coming to a head when Mike was 62 and agreed to be tested.

After incorrectly being diagnosed with frontotemporal dementia, or FTD, we received a diagnosis of younger-onset Alzheimer's from Mass General Memory Clinic in Boston. We are so thankful for the care we received at Mass General, and following the diagnosis, our lives changed significantly.

Mike had owned a business that manufactured log homes. He was our money manager. After the diagnosis, we sold our farm where we had lived for nearly 40 years and simplified our life. The farm had a half-mile-long driveway, and it snows occasionally Maine.

At 63, Mike volunteered to give up driving, a freedom that he really loved.

Before Mike was diagnosed, we were not familiar with younger-onset Alzheimer's disease but had had some knowledge of Alzheimer's and dementia through the experience of caring for my mother.

One common assumption about this disease is that life completely stops. While we have faced unique challenges as we have tackled this disease, we continue to move forward with our lives as best we can.

In just 2 weeks, as Senator Collins says, I am going to be running the Boston Marathon with a charity number for the Alzheimer's Association to help rid the stigma of this disease. Too often, Alzheimer's is talked about in terms of cognition and memory, but it is much more.

In Mike, I see it affect his emotions and temperament. If someone is diagnosed with cancer, people automatically rally around to offer support and guidance. An Alzheimer's diagnosis is sadly not the same, but there is nothing to be ashamed about. We cannot hide behind a diagnosis if we want to make progress.

The staff at Mass General made clear that this disease is something that is meant to be taken day by day, to be approached with humor and a grasp of reality. Our doctor told us, "Do not worry about tomorrow. Enjoy today." That is how we have chosen to live our life.

Thanks to our providers and the support we received at the Alzheimer's Association, Maine Chapter, we have begun fulfilling wishes on our bucket list. Lucky for Mike, most of them have been fishing adventures. After more than 40 years of marriage, I took Fly Fishing 101, but I cannot out-fish him yet.

However, I know these adventures are not typical for everyone, especially those without a care plan. For us, this plan came in pieces and with the help of our team of care providers at Mass General.

Mike's diagnosis at 62 was a shock, but working with the team of care providers gave us time to talk through the reality of the situation and plan for the challenges that lie ahead.

We continue to have regular visits, and at our last appointment, we had the conversation about giving up power of attorney, something I would never have thought to seek but was part of our plan.

Thank you, Chairman Collins, for introducing the Improving Hope for Alzheimer's Act. It will make a difference in the lives of people living with Alzheimer's disease and other dementias and their families.

I think a lot about how lucky we have been in our life to be able to care for ourselves in this next phase. For many people with younger onset, that is not the reality. The services and supports——

[Mr. Hartt points to timer.]

I think he is giving me a time.

The CHAIRMAN. He is doing my job.

Mrs. HARTT. There you go.

The services and supports that are there for those 60 years and older are vast compared to those that are available to the population in the Alzheimer's and dementia community who have not yet reached that age.

Thank you, Chairman Collins, Ranking Member Casey, Senator Jones, and Senator Capito for leading the Younger-Onset Alzheimer's Disease Act, which would help those with younger-onset with supports and services.

Throughout the last few days, Mike and I have joined our Alzheimer's Association, Maine Chapter, along with 12,000 advocates from across the Nation to make a difference in our Nation's Capital.

I am here today because I am the wife, caregiver, friend, and daughter of Alzheimer's. We all are, and we must remain a strong and a resilient voice for those who have lost theirs.

Thank you very much.

The CHAIRMAN. Mary, you and Mike are truly an inspiration, and I thank you both for being here.

Mr. Jacobs.

**STATEMENT OF CLAY JACOBS, EXECUTIVE DIRECTOR, GREATER PENNSYLVANIA AREA CHAPTER OF THE ALZHEIMER'S ASSOCIATION, WILKES-BARRE, PENNSYLVANIA**

Mr. JACOBS. Chairman Collins, Ranking Member Casey, and members of the Committee, I am Clay Jacobs, and I am the Executive Director of the Greater Pennsylvania Chapter of the Alzheimer's Association.

Thank you for the opportunity to testify before the Committee on how we are working to support persons living with Alzheimer's disease, related dementias, and their families.

Currently, 5.8 million Americans are living with Alzheimer's, and without significant action, nearly 14 million may have the disease by 2050. More than 16 million unpaid caregivers are supporting and caring for these individuals at a cost of $234 billion. In my home State of Pennsylvania, 280,000 older individuals have Alzheimer's today, and in just a few years, 320,000 will likely be affected.

Among the millions of individuals living with Alzheimer's, we know that there are communities who are disproportionately af-

fected but remain underserved. Older African Americans are approximately twice as likely to have Alzheimer's or other dementias as older whites, and older Hispanics are about one and one half times as likely to be affected.

Another population that is often under-recognized and underserved is the approximately 200,000 individuals under the age of 65 who have younger-onset Alzheimer's disease. The need to reach everyone affected will grow significantly in the coming years, and the Alzheimer's Association is working to reach as many of those people as possible.

Alzheimer's is also a local disease, and our nationwide network of chapters serve to respond to the specific needs in their communities.

To address the unique challenges of younger Pennsylvanians living with Alzheimer's, we offer early stage education and support groups throughout the Commonwealth to promote social engagement in local communities by partnering with museums, local tourism boards, libraries, and other organizations.

We also work with the Pennsylvania Department of Aging to train facilitators for memory cafes and a variety of other services.

In spite of these efforts to support this population, we know that they simply do not have access to many of the services they need.

The Alzheimer's Association is grateful to Chairman Collins, Ranking Member Casey, Senator Jones, and Senator Capito for introducing the Younger-Onset Alzheimer's Disease Act.

To reach other underserved populations in the Pennsylvania Chapter of the Alzheimer's Association, we conduct faith-based outreach and community education in partnership with a large African-American sorority, Alpha Kappa Alpha. We have recruited and deployed Spanish-speaking volunteers for health fairs, education programs, and support groups.

We have actually had the great pleasure of working with Ranking Member Casey's staff on a number of these efforts.

With our local area Agency on Aging, we work to reach Chinese, Korean, and Vietnamese organizations, attending their meetings and health fairs, working with interpreters when needed.

I would actually like to share an example of how important it is to reach the variety of communities impacted by Alzheimer's and why outreach matters.

Ruben Deoleo was born in the Dominican Republic. He moved to Pennsylvania in his 20's to serve as a minister, a drug and alcohol counselor, and a motivational speaker for the Dauphin County Prison. Memory problems, however, began to affect his life's calling. After losing several jobs, his wife, Rosayna, asked Ruben to see a doctor. For over 2 years, they grappled with what was happening and, just 4 months ago, he was diagnosed with Alzheimer's at the age of 58. They struggled with the diagnosis and, in particular, the fact that it was an untreatable illness.

However, when Ruben learned about an Early Stage Engagement group at Lancaster General Health-Penn Medicine and that other individuals living with the disease cope and can live well, he decided to fight back. Ruben has a sense of purpose as a member of the group. He is energized, and he wants to create the same opportunities for others. He is now a volunteer for the chapter, help-

ing the Spanish-speaking community to understand Alzheimer's and the resources that are available. Ruben is getting valuable support while also reaching others.

A constant theme throughout all of our outreach is the importance of care planning after diagnosis. It is essential to learning about medical and non-medical treatments, clinical trials, and support services. These services result in fewer hospitalizations and emergency room visits and a higher quality of life.

This is also true for caregivers, who too often find themselves as the plan, with little support after diagnosis.

The association was grateful for the support of Members of Congress who sponsored or cosponsored the HOPE for Alzheimer's Act in the 114th Congress and to the Centers for Medicare and Medicaid Services for now covering care planning services. However, access to services remains an issue. That is why the association supports the Improving HOPE for Alzheimer's Act, which would help educate clinicians on Alzheimer's and dementia care planning services through Medicare.

We are grateful to Senator Collins for her leadership on the legislation.

Thank you for your time and for the invitation to be here with you today. I am happy to answer any questions.

The CHAIRMAN. Thank you for your testimony.

Dr. Fekrat.

**STATEMENT OF SHARON FEKRAT, M.D., PROFESSOR OF OPHTHALMOLOGY AND ASSOCIATE PROFESSOR OF SURGERY, DUKE SCHOOL OF MEDICINE, DURHAM, NORTH CAROLINA**

Dr. FEKRAT. Thank you, Chairman Collins, Ranking Member Casey, and members of the Committee for the opportunity to testify and share some very exciting multidisciplinary and collaborative work on one of the most important health issues of our time, Alzheimer's disease, the societal and cost impact of which you are well aware.

My name is Dr. Sharon Fekrat, and I am a retina surgeon at the Duke University School of Medicine.

Alzheimer's disease is the leading cause of dementia worldwide, yet its early detection remains challenging. The high cost of MRI, the limited sensitivity and specificity of genetic and serum markers, and the invasiveness of PET imaging and spinal fluid sampling limit our ability to detect Alzheimer's early.

Alzheimer's has a 20-year relatively asymptomatic period of neuropathogenesis, there is growing interest in identifying Alzheimer's at asymptomatic stages for earlier clinical trial intervention to ultimately identify medications to delay the onset of, prevent, or even reverse Alzheimer's. We need rapid, easily accessible, inexpensive, noninvasive, yet accurate, diagnostic techniques to screen for Alzheimer's.

The task before us is not insurmountable. If a human being can walk on the moon or live in a Space Station, then we can find a means of diagnosing Alzheimer's earlier and subsequently identifying effective therapeutic interventions.

This requires collaborative teamwork across disciplines and institutions, innovative critical thinking, and going out on a limb where the fruits are.

Look at the eyes of the person next to you. You see the colored iris and dark circular pupil. Yet there is so much more there than meets the eye. Behind the pupil, there is the wallpaper lining the inside of the eyeball called the retina.

The retina wallpaper is the film of the camera. It is nerve tissue and a direct extension of our brain. The retina shares many structural and functional similarities with the brain. Spinal fluid biomarkers for Alzheimer's such as tau and amyloid have been found in the vitreous gel behind the pupil, and levels correlate with cognitive test scores. Amyloid has also been detected and imaged in the retina.

The neurodegenerative process in the brain also occurs in the retina with thinning of certain retinal layers. Changes in the retina and its small blood vessels may mirror, or even precede, detectable changes in the brain and its small blood vessels.

Imaging the retina in Alzheimer's, however, is not new. Color photographs of the retina in Alzheimer's show decreased retinal vein diameters, blood vessel branching complexity, and tortuosity. Recent imaging advances now allow us to evaluate the retinal microvasculature with unprecedented detail on the order of 5 microns, not even the width of a human hair, using new technology called OCTA which takes almost 70,000 scans per second to look at the very small retinal blood vessels.

With this FDA-approved imaging technology, we can now take pictures of the retina through an un-dilated pupil quickly, noninvasively, inexpensively, and reproducibly at high resolution.

Several research groups, including our group at Duke, are exploring how this technology along with other retinal imaging methods can be used to diagnose preclinical Alzheimer's.

We recently completed the largest prospective study using this technology, OCTA, of 70 eyes with Alzheimer's, 72 eyes with mild cognitive impairment, or MCI, and 254 eyes from cognitively healthy adults. We found decreased retinal blood vessel density and thickness in one of the retinal layers in Alzheimer's compared to MCI and compared to controls, even after adjusting for age, sex, and education.

A larger sample size may be needed to detect the difference between MCI and controls because of the varied spectrum of MCI.

Our study adds to the published literature and improves our understanding of the smallest blood vessels in Alzheimer's. Right now, these tests cannot be used to solely diagnose Alzheimer's, but this is the beginning of something big.

Before these tests are ready for prime time, the findings must be validated in larger and diverse populations. The goal is to obtain multimodal retinal images that would result in a suite of biomarkers that could predict the risk of Alzheimer's and stratify the stages of disease, similar to getting a cholesterol panel and being able to determine your risk of heart disease.

The potential impact on early detection and clinical trial results is motivating. We are building multidisciplinary and multi-institutional teams and forging relationships with industry to move for-

ward. We are collecting longitudinal data to assess changes over time, imaging genetically predisposed asymptomatic persons, using images for artificial intelligence, and collecting retinal images globally to store in a central registry for researchers to access.

Our eyes may indeed be windows to our brain health.

Thank you for your efforts to support those working to find the way forward, which in turn supports those with Alzheimer's disease and their families. Time is of the essence.

The CHAIRMAN. Thank you very much for sharing your research.

Dr. Hodes, welcome back. We are delighted to have you join us again this year.

**STATEMENT OF RICHARD J. HODES, M.D., DIRECTOR, NATIONAL INSTITUTE ON AGING, NATIONAL INSTITUTES OF HEALTH, BETHESDA, MARYLAND**

Dr. HODES. Thank you, Chairman Collins and Ranking Member Casey and members of the Committee for the opportunity to be here and share the basis for the hope which we now have as a result of research through support that comes from you and looking forward toward research accomplishments, recent and future, and I will try to do justice to the scholarly introduction that Senator Collins provided of the research that is now ongoing.

If we look at the next slide, just to illustrate the magnitude of increase and support that has come from congressional appropriations of around $600 million in 2016 through what you see is a total of $1.9 million in 2018 and 2019, the current year, if we add the appropriations and estimate the total, this would be approximately 2.3-to $2.4 billion, an extraordinary increase.

Importantly, it has energized and excited the research community. It has led to the recruitment of a large number of new investigators, people who are trying to tie the directions they would place their wisdom and their careers and now take it to the important cause of Alzheimer's research.

It has led to the current support by NIA of approximately 140 clinical studies and trials. Some of these are in the important area alluded to, trials to identify the most effective means of providing support, care, and services to those already affected. Others are a diverse set of trials looking at the strategies for prevention, cure, treatment of disease.

Some number of those are non-pharmacologic, looking at interventions such as exercise, diet, cognitive training, or combinations of them.

If we look at the next slide, an example of the number and diversity of pharmacologic studies undertaken, this illustrates here at various stages of drug discovery, drug development, then their implementation in early stage clinical trials, and finally, the more advanced stage III clinical trials, and the colors are intended here to show the number of trials attacking different categories of targets.

Alluded to, was amyloid, which remains an important area of research where failures have occurred in attempts to treat at later stage of disease by targeting amyloid, where hope remains, and additional trials are targeted at looking at early intervention.

Notably, as commented upon, the availability of biomarkers that now detect disease years to decades before symptoms means we can

make a difference by targeting interventions not only of people who need them or had the disease but those for whom prevention is important before the onset of substantial damage to neurons and their connections within the brain.

In the next slide, you see a summary of what we have just shown in color to make it simply evident that the numbers of trials targeting amyloid, in gray, is far exceeded by those, the diversity of targets that you see here, so if some 32 trials are currently ongoing, only 13 are now targeted toward amyloid.

The diversity comes from a variety of basic studies, new methods for identifying genetic, molecular underpinnings of the processes that occur in Alzheimer's, amyloid and other, are translated into new targets for intervention.

Most recently, in public-private partnerships with pharma, biotech, academic institutions, in a new spirit of big data and open data, these findings, the large data, then computational analyses have led to the discovery of new potential targets recently published, a wall of targets, some 100 candidate, best-consensus candidates for future studies, which will now go into the pipeline in development for ultimate clinical trials, giving us hope and expectation with these multiple approaches that will do far better in making advances toward treatment, cure, and prevention.

In the next slide, this is just an illustration of the pace of advance in one of the areas of basic science. This is in genomics. If you look at the discovery of genes, which are associated with either a higher risk of Alzheimer's or a lower risk, that is, protective factors, you can see year by year, the increase in number of genes there.

Just to note, in 2018, that large list of genes is more than has been discovered, had been discovered in all the preceding years. They are color-coded here, hard to see, I know, but meant to illustrate that the genes are not random but fall into patterns which give us ideas of the targets—vascular and areas of protein transport and inflammatory pathways—and each and every one of these discoveries, again, gives us a new clue in terms of directions to take for cure and prevention.

Finally, in the next slide, it just illustrates, once again, the importance of providing research, evidence-based, identification of the best strategies for care and caregiving for those who are affected with disease. Just as we hold summits bringing together the best science for cure and prevention, we do the same in the area of care and caregiving, and this will continue.

The first prize under the 21st Century Cures authorized is in fact a prize to identify an app to help in navigating the often complex and challenging situation for those who are looking to find a way through the resources available and those lacking as they pursue care and caregiving.

With all of this, with the inspiration we have from the appropriations from you, the inspirations of those here in the room, the hope provided by the cadre of investigators now studying disease, the courage shown by those who participate in clinical trials, with all of this we reinforce the hope we have for a future that will take us toward an end of Alzheimer's disease.

Thank you.

The CHAIRMAN. Thank you very much for that hopeful testimony.

Mrs. Hartt, I am going to start with you. You talked about the difficulty that you and Mike had in obtaining an accurate diagnosis. That is one of the reasons I am so interested in the research that Dr. Fekrat is doing, which might make that much easier for you.

Initially, you knew something was wrong, and Mike underwent a series of tests. You got a diagnosis that was not correct originally, and I am curious how knowing the accurate diagnosis helped you both cope with the disease.

Mrs. HARTT. Knowing the accurate diagnosis helped us cope by being able to make a plan. We were at that point able to digest that this is what was going to be, and as I said, we simplified our life. We began to say what can Mike do, and we just came together about what did he want to do, what could he do.

I got my job that I have always loved. I kind of started working less, and then I retired, which is a big move to do, and when I was sitting on the beach this winter, I began to wonder why am I missing my job, but, you know—but we have been absolutely taking the approach of saying today is a great day, and we are going to enjoy it.

The CHAIRMAN. That is a great attitude to have.

Mike, what was the most difficult decision that you had to make once you received your diagnosis?

Mr. HARTT. I never was one to look for help from anybody. I always found my own way, and it is hard to depend on somebody else.

The CHAIRMAN. I think that is very true, and I appreciate you sharing that with us.

Dr. Hodes, we know now that Alzheimer's disease has proven to be far more complex than we had hoped, and research teams around the country and the world are working to better understand this disease.

The Alzheimer's disease Precision Models Center is one such cross-country partnership, and through this center, I am proud to say that scientists at Jackson Laboratories in Bar Harbor, Maine, are developing mouse models for Alzheimer's, and data are shared with the Indiana University for clinical use and also with Sage Bionetworks in Seattle for public use.

This data sharing, I think is so important. Particularly if the Federal Government is funding these projects, it seems to me that the more data sharing the better, so what specifically is NIH doing to foster that kind of collaboration and data sharing that could help us advance the research?

Dr. HODES. Thank you very much for asking about this very important aspect, and I am proud, happy, excited to say that the culture around Alzheimer's research in particular has been a model in terms of the appreciation for the need for data sharing.

Large and larger datasets, rather than being hoarded, guarded, and reported by individual laboratories, are now being analyzed with increasing power due to the numbers of these data and an open analysis for all of those who want to lend their wisdom to it.

NIH in fact now has a policy that insists upon sharing as a condition of award. We monitor it carefully, but I am again most

pleased to say this has become a part of the spirit of science, and it is consistent with our regulations but requires very little push. I think science has come to realize that all researchers—public gain by an optimization of a sharing of data toward common goal.

The CHAIRMAN. Thank you.

Let me followup also by asking you—the last time you testified you said that we did not know how to present the disease, and I know if there were a pill that we could take to promote brain health that every one of us would want it. Has there been any progress since the last time you testified on the prevention side?

Dr. HODES. Yes. Thank you again for the question.

The study referred to, last reported, was an exhaustive review of the literature carried out by the National Academies of Science, Engineering and Medicine, which found that there was encouraging but no inclusive evidence for interventions that would significantly slow cognitive decline or decrease the risk of dementia.

Since that time, there was a great deal of excitement about the report, of a study, SPRINT and SPRINT MIND. Now, the SPRINT trial was going to see the effect of reducing blood pressure to 140, which had been a previous target, or 120, a more aggressive target for controlling blood pressure.

The trial itself was stopped prematurely for ethical reasons because of the more aggressive decrease in blood pressure had impact on survival, on cardiovascular disease, but we had initiated in concert with that study monitoring of brain imaging, of cognitive function, and we are pleased to see the interpretation released just a few months ago that the more aggressive control of blood pressure was associated with a significant decrease in mild cognitive impairment, an often precursor of dementia.

These studies will continue, but they now for the first time identify a specific intervention, evidence based in a randomized control trial, for something that can prevent cognitive decline often associated as a precursor of dementia.

The CHAIRMAN. That is good news. Thank you.

Senator CASEY. Thank you, Chairman Collins.

We all know that our aging population is growing a lot more diverse, and as I mentioned in my opening statement, the rate of dementia among both African Americans and Latino Americans is already high and actually on the rise.

Both groups are severely underrepresented in research and in clinical trials, and many in these communities lack access to high-quality diagnostic treatment and support services.

I will start with Clay Jacobs for this question. Clay, you mentioned in your testimony, you made reference to volunteers that the association recruits to reach out to these underserved populations. Could you provide details on two things? One is who these volunteers are, and I know you have provided some in your opening.

The second part of it is if you could provide information about the importance of educating people about their options for enrolling in clinical trials.

Mr. JACOBS. Thank you for the question, Senator.

To reach members of underrepresented and underserved communities, the Alzheimer's Association has launched several recent initiatives that resulted from input and feedback from people in those

very communities. We are recruiting volunteers to engage with faith and Spanish-speaking communities. The association has partnered with the Mexican Consulate to engage in the Hispanic and Latino communities with information on Alzheimer's detection, diagnosis, care, treatment, research, and access to culturally appropriate resources.

In collaboration with the National Hispanic Council on Aging, we are building a network of "promotores," or community health workers, who deliver Alzheimer's education in Latino communities and help connect people to resources and services in Spanish.

With regard to clinical trial recruitment, it is critical that we are aggressive in pursuing a therapy since Alzheimer's is one in the top ten causes of death without a proven way to prevent, treat, or slow progression. Therefore, we must have robust clinical trial participation.

In Pennsylvania, the Delaware Valley Chapter is a member of the University of Pennsylvania's African American Family Advisory Council to help guide their efforts and provide feedback on increasing diverse participation in clinical trial enrollment.

Another great example is in Pittsburgh with the Alzheimer's Disease Research Center. We offer support groups, community education events, community research presentations, and more things based in communities to try and increase clinical trial recruitment and overall engagement with the community, but with a specific focus on African Americans in southwestern Pennsylvania.

The CHAIRMAN. Thanks very much.

Dr. Hodes, I am going to turn to you as well, as Senator Collins did. She has referred to 200,000 people having younger onset Alzheimer's disease. That is where we have the bill, the Younger-Onset Alzheimer's Disease Act, that we are working on together to ensure that this population can receive the supportive services through a vast network of programs funded by the Older Americans Act.

As I mentioned in my opening, I am also concerned about the overlap here of people with disabilities, specifically those with down Syndrome, who are diagnosed with Alzheimer's disease at younger ages.

Can you share with the Committee how researchers are working to include people with disabilities in research related to both Alzheimer's disease and also related dementias?

Dr. HODES. Certainly, Senator.

First, to touch upon the emphasis you placed on early onset Alzheimer's, an important area—and there is in fact now a LOADs, a longitudinal study for analysis of early onset Alzheimer's disease, that is designed to do just as you described. I understand those people, the burdens they face, also the potential for underlying differences in the biology of early onset disease. That study began last year and is accruing patients now.

In terms of Down Syndrome, we have, together with the National Institute of Child Health, been working for some years to try to understand the high risk of Alzheimer's-like dementia alluded to in individuals with Down Syndrome.

There has been now ongoing a longitudinal study which takes people that range from childhood into adulthood to look over time

at the progression of cognitive function, of biomarkers, imaging and other to try to understand the nature of the progression of disease that occurs in these individuals, both to help people with Down Syndrome, but also in the spirit of informing all of us about Alzheimer's at large. It has been an exciting and inspiring community to work with, and we look forward to furthering and expanding that effort.

Senator CASEY. Thank you, Doctor. Chairman Collins, I am going to be jumping to a hearing, but I will come back, so, if we have a second round, I will have some more questions. Thank you.

The CHAIRMAN. Thank you.

I want to explain to our audience that we recognize members in the order that they come and then alternate sides, although on this disease, there is no side. It is a joint effort.

Senator Braun is next.

Senator BRAUN. Thank you, Madam Chair.

This question is for Dr. Hodes, and it is going to be related to the FDA.

This malady and many others, it seems like it takes so long to get through the approval process, and as illusive and vexing as progress has been, I would like your comments on things like midstage clinical trials and approval. In general, do you think that we need to look at some reforms to get things more quickly through the approval process, where you err a little bit on the side of giving the benefit of the doubt to getting these things to market more quickly as opposed to what seems to me to be kind of a laborious process that is overregulated and maybe counterproductive to getting to the finish line? A comment on that and any reforms in general as it would relate to the FDA involvement in Alzheimer's drugs.

Dr. HODES. Well, Senator, I would reflect that our own interactions with the FDA have found them to be very collegial, collaborative, and open in concept to the idea that endpoints for clinical trials and Alzheimer's in particular, the long-term disease with the slow rate of progression or symptoms, could be based on progression and change in rate of progression of surrogate or biomarkers if they could be clearly defined as reflections of the pace of disease, so these conversations are ongoing.

I should say in many of our initiatives, those looking at biomarkers and translation, it has been a constant to have presence of FDA involved, very much important, I think both for the academics but also for our pharma and biotech partners, who appreciate the fact that FDA is there listening and willing to be convinced by the evidence based to make decisions that will facilitate the most expeditious and yet responsible for qualifying of drugs.

Senator BRAUN. It sounds like the congeniality has been there. Are you okay with the process? Do you have any comments on reforming it, even though they are interactive and interested, and do you think that in the case of Alzheimer's, should they be more aggressive on trying to advance stuff to the marketplace? Are you comfortable with the speed at which it is going?

Dr. HODES. I can say at present, yes.

Senator BRAUN. Okay.

Then I am looking at the resources, and we have gone from $631 million in 2015 to $2.3 billion in 2019. That is aggressive, and in this case, should it be more aggressive? When it comes to the funding, is the research and what is happening out there keeping pace with the availability of funding, and do you think that is about right or needs to be more aggressive?

Dr. HODES. Well, I think we have been fortunate in having the opportunity, in fact, requirement, to generate each year a so-called bypass or professional judgment budget. That is a budget that goes straight to you in Congress without modification by the Department or elsewhere in the administration.

We take that very seriously, and from the beginning of the increase in funding and appropriations, we have each year examined—in the context of recommendations made by scientists at summits on a yearly basis, we find priorities, milestones for achieving those, and each year, in a very explicit way, we make the best professional judgment of what it would take to achieve each milestone, and so buildup, in a real sustainable methodology, our estimate for the needs in the following year.

Each year, last year most recently—now in July, the next to be released—is our real professional judgment to you of what we think is required to optimally advance the cause with no consideration about limitations in funding and pleased to say that those estimates have been reflected in very real and appropriate proportion by the appropriations that follow. I therefore think we have a good match between scientific opportunity and appropriations and resources.

Senator BRAUN. That is good to hear. Thank you.

I yield the rest of my time.

The CHAIRMAN. Thank you, Senator.

Senator JONES. Thank you, Madam Chairman, and thank you for holding this hearing. I only hope that during my time in the Senate, I can become as strong an advocate for this issue as you have been over the years.

Also, just for your benefit and the folks out there, Senator Collins also every year when we have these hearings does an incredible job of diverting the attention of the fire marshals so that we can get as many people in here as possible.

Dr. Hodes, I would like to kind of followup a little bit on what Senator Braun was talking about.

Seven years ago, the Country established a national plan to address Alzheimer's disease, which set a goal of preventing and effectively treating Alzheimer's by 2025. We are 6 years away from that date, and recognizing the many challenges that are associated with the developing therapies for Alzheimer's, I would like to just get your assessment of how we are doing, how far we are a progressing. Are we on track? Are there course corrections that we need to make, things that we can do to make sure that those goals are achieved?

Dr. HODES. Well, the goal for achieving significant, effective treatment by 2025 is a noble and important and aspirational goal, and it drives us constantly.

We do not know precisely what the year will be by which we will achieve those.

In terms of course correction, there is a constant modification and redirection. As I mentioned, each year we consult with experts. We reevaluate the progress made on goals. We identify whether there are new gaps, new science that needs to be sustained based on most recent discovery, so we are constantly renewing the strategies to optimize our chance of getting there.

Whether it is in 2025 or as soon thereafter as possible, our goal is simple and shared with all of you to absolutely, as soon as it is humanly possible, given the resources provided, to make a different.

Senator JONES. You are comfortable with where we are on track, though? Is there something else that we need to be looking at or focused on to make sure we stay on that track?

Dr. HODES. I think each year, we bring experts together to assure that we are up to date with the right input and making best judgments.

I am not satisfied—none of us are satisfied—given our failure as yet to achieve effective interventions, but I think we are on the right track with information to constantly update and optimize our strategy for getting there.

Senator JONES. Great. Thank you.

This could really go to any number of folks here, I guess. We have got several major medical research facilities across Alabama that I think are making tremendous contributions to the understanding and treatment of Alzheimer's, but the problem is sometimes Alabamans live hundreds of miles away from these facilities, and I think that there is some disparity with not just the underserved areas, Mr. Jacobs, that you talked about, but the rural area that populations seem to be affected even more.

What can we do to make sure in these clinical trials that folks in these rural areas also have the availability and the ability to participate in some of these clinical trials?

I will open that to Mr. Jacobs or any one of the panelists.

Mr. JACOBS. Thank you, Senator. Thank you for the question.

I think as I look at this, 70 percent of Pennsylvania's counties are considered rural, which can often pose challenges to receiving a diagnosis, accessing services, transportation and more, because of this, at least in our Commonwealth, what we have tried to do is approach where people go for services and where they ask.

A great example is actually Geisinger Health System that received part of a Federal grant, but as part of the trial, we are proud to work with them on the care and support side, how do we convene stakeholders, how do we make sure that we are contributing to project design and people living with the disease are represented, that we are providing materials to share after diagnosis, so that when people do connect, they know there when to turn.

Even in that instance, many of those participants are being directly referred to us, and so from these association in Pennsylvania, what I would say is one of the things we are trying to do is make sure we are connecting to communities, whatever people consider them, the systems where they go, and just trying to make sure whatever door folks enter that they are receiving the best possible care and support, and we go from there.

Senator JONES. Great. Thank you.

Yes, ma'am.

Dr. FEKRAT. I think also making some clinical trial sites at VA medical centers and their CBOCs and outlying clinics can also help recruit a wide variety of patients and a diverse population.

The VA offers transportation for the veteran patients and may make it easier to improve the diversity.

Senator JONES. Great.

Well, thank you. Thank you all for being here today, your testimony, and thank you all for coming and sharing your experiences. Thank you.

The CHAIRMAN. Thank you, Senator.

Senator MCSALLY. Thank you, Madam Chair.

Thank you to everybody for being here today and the wonderful group of advocates as well in the room on this really important issue.

I represent Arizona. It was reported last month that Arizona has the fastest growing rate of Alzheimer's in the country. Of the 5.8 million estimated Americans, 65 and over, impacted, 140,00 are in my home State.

Furthermore, the death rate in Arizona is almost 20 percent higher than the U.S. average, so this is something that is very real for the people that I represent.

Mary and Mike, thank you for being here and for your testimony. It was very moving, and for those who are behind you could not see. As Mary was testifying, Mike was choking up several times, and it was very tender to just see the connection that you have and the support that you have with one another.

Many aging Americans and many Arizonans that have Alzheimer's do not have that support. They are aging alone, and they are dealing with this disease alone. I cannot even imagine navigating what you are navigating without someone like you, Mary.

Mike, this may be a hard question to ask, what would you do if you did not have someone like Mary as you are navigating this disease?

Mr. HARTT. I would make the best of it, and that is a hard thing to say. I take every day as it comes. It is just an adventure.

Senator MCSALLY. God bless you, Mike, really for being here and for being willing to share your personal story for others.

Our local paper in Tucson shared stories like yours in a series last year. I think it was really helpful for people to hear the real challenges, the inspiration, just understanding from other stories, the opportunities there are for help from the community as people are struggling with Alzheimer's.

Mary, as a caregiver, this is really challenging. One story we had in this series was of a woman named Joan in Tucson, a local church pianist, a choir director for 35 years, and her husband, Clark, who was a caregiver for 13 years alone, and he then suffered with depression and other things.

Can you share a little more about what helps you as a caregiver to be fully present and able to support Mike while also caring for yourself?

Mrs. HARTT. One of the major benefits initially was that I got in a younger-onset support group. They were other people who had been down the road before me. Many of them were further along

with the disease than myself. I was able to look at where we were sort of in a lucky place because we were not there yet.

I run. I look at my running as something that takes an hour or so a day to do. Mike is fine to be alone. It is a stress breaker for me. I am outside. I am feeling the sunshine, that aspect of things, and then maybe I find a little joy being Mike's camp counselor. He might groan at this.

I come up with a plan pretty much every day to say, "Okay. Today we are going to"—and so we try not to be in the just sitting at home. We are always trying to find something because for nothing else—and when we are in Bangor to go to City Forest and have a picnic. It is not like it is expensive stuff. It is just doing something.

Senator MCSALLY. Great. Thank you.

I am a runner too. I totally get what you are talking about. I appreciate it.

Clay, can you share other resources that are available to caregivers like Mary, so that they are not alone, and they can access support from others?

Mr. JACOBS. Absolutely. Thank you, Senator, for that question.

I think as we look at it, early stage and younger-onset support groups are key. Social engagement programs throughout our chapter network nationwide are available. Even something as simple as our 24/7 help line, so folks can know when they are interested and able and willing to reach out that there is someone who will be there to answer, be able to talk with them, be able to support the next steps in that. That is a privilege.

The association and my colleagues are volunteers. We get to provide and be able to connect with such fantastic people like the Hartts.

Senator MCSALLY. Great. Thank you. I appreciate it.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator.

Senator ROSEN. Thank you so much, Madam Chair. I really appreciate you bringing this forward.

I appreciate all of you being here. It is an incredibly important topic. We had one of our constituents, Chuck, you saw in the video. We thank him for being such a great advocate.

What I want to say is this really hits particularly close to home for me because I stepped away from my career to take care of my aging parents and in-laws, and at the end of my mother-in-law's life, she suffered from Alzheimer's, lived in a memory care unit, so I went through this personal journey, myself along with some of my friends that I met along the way, and I know the toll that it takes on families.

For me, as I think back on what I went through, I think coordinated care is really a big part of the key. I was going to so many different doctors, and it seemed like I did not have that centralized care.

How do you think we should think perhaps about coordinated care for a patient, and who do you think the best person would be in the team of caregivers to coordinate this?

Doctor, do you have a——

Dr. HODES. It is a great and important question. As I alluded to, research, to try to provide evidence for the best strategies for providing care and services is a very active part now of the trials we carry out, and there is not going to be a simple answer and the same answer for all populations. It may be different for urban and rural populations, for different ethnic and racial groups.

Senator ROSEN. Even managing the amount of medications that an older person takes that can often interact, sometimes you are going to so many different physicians, you can have side effects based on those things too.

Dr. HODES. Absolutely. I think, as you are alluding to quite rightly, it does require a team of individuals with varied expertise, but just how to orchestrate those, organize those and make those accessible to all who need them, is itself a subject of active research, so we are looking at ways in which now, for example, with a collaboratory that will put together clinical trials designed to see what use of health care systems can best coordinate care, and we will soon be issuing a solicitation for applications from academics and consortia to try to search for the beset combinations.

I mentioned there is a prize, the first price under 21st Century Cures that has been issued by NIA, which asks for apps that may help to navigate through the multiple steps, some of which you have enumerated, people need to understand in order to coordinate care.

It will be different for people living alone, those who live in communities, and we are trying to target each of these situations with understanding and sensitivity.

Senator ROSEN. I look forward to us having that hearing here because I think for me as I went through that journey—of course, four different journeys with my parents and my in-laws, each person different—understanding how you coordinate care and collaborate for the caregiver is extremely important.

I want to move on and ask one more question about medical data collection. It is critical to all research, particularly Alzheimer's and so many diseases, so what I want to ask is this. How many years has the NIH been collecting data on Alzheimer's disease, and what picture does this aggregate data show us about the disease and where we are headed in the future?

Dr. HODES. NIH, NIA have been collecting longitudinal data, including Alzheimer's disease, for decades now.

Now, the data have emerged, have evolved from a time in which they were simply reported of diagnosis to a point in which cognitive testing, biomarkers have become a part of it, and over the last 10 and 20 years, there has been more and more of this. I think there is now a great effort going into how to best use electronic health care records together with administrative records like Medicare, Medicaid, to put all those together with clinical trials data to maximize what we learn from information about any one individual.

Senator ROSEN. Let me ask you. What do you think are the gaps in what you are collecting? So how can we help you fill those gaps? Because I know the data tells a story. Those predictive analytics helps your research, helps all of us, so what gaps do you think we need to fill in getting you the right aggregate data?

Dr. HODES. I think we need to continue our efforts to work very closely with those who have data of relevance. The medical care systems and electronic health records, Medicare and Medicaid data, experimental longitudinal studies supported by the Federal Government, in each of these there are considerations of privacy, of confidentiality that we have to accommodate to, nonetheless, being able to share data across.

I think we have made progress. We now have through enclaves in which confidentiality is assured. The access is limited to specific questions. We can bring together data from these several sources, analyze them, and then let the confidentiality remain for individual studies.

We are learning with the power of computational biology more and more. We certainly have not reached an optimal stage yet, but continued progress, I would say, in bringing together these various sorts of data.

Senator ROSEN. Thank you. Appreciate it.

The CHAIRMAN. Thank you very much.

Senator HAWLEY. Thank you, Madam Chair. Thank you for convening this very important hearing.

I want to start by saying I represent the great State of Missouri, and there are over 20 Missouri advocates who are here in the room with us today. Thank you so much for being here. That makes me very proud.

One of those advocates is Lonni Schicker, and I just want to share just a small piece of her story that I know will resonate with all of you.

Lonni came to the Alzheimer's Association at the age of 59 when she had a test that revealed she was suffering from mild cognitive impairment. That diagnosis placed her at higher risk for dementia, and since then, she has been diagnosed with Alzheimer's.

Let me just read to you what Lonni said. She said, "Because I am younger, I am the younger face of this disease. I had to stop working as a professor, and since Missouri does not have resources as robust as other States, it has made it very difficult for my family and I to access support and services. It took me almost 3 years to get a diagnosis because doctors were hesitant due to my age."

This is so true what Lonni faces, what so many folks around the country face, and I just want to say, Lonni, thank you for being here, and thank you for being so courageous to share your story.

This is something that is also personal to me as it is, I suspect, to almost every family in America. My family too has struggled with Alzheimer's. My grandparents, my uncle have struggled with this disease.

In my State, in 2017, over 2,500 people died from Alzheimer's. We currently have over 5,000 in hospice care who suffer from Alzheimer's or an associated form of dementia, so this is a serious, serious problem in my State.

I want to ask Mr. Jacobs, if I could. Your testimony, I was particularly struck by. Coming from a rural State like Missouri, your discussion about programming in rural areas, Senator Jones became to touch on some of this. I just want to come back to it.

Can you elaborate for us the challenges that you have found in serving rural communities, outreach to those communities, and any

strategies that you have found that are successful for expanding services into those areas?

Mr. JACOBS. Absolutely. Thank you, Senator.

As we look at it in Pennsylvania, one of the greatest challenges is being clear on what the concerns are. Every community is different, and so I think that highlights for me one of the strategies that we have taken that we have proven to be successful is not assuming we know what is best or what services will be the best fit for that community, and so what does it look like to be able to convene leaders in that community, whether it is the mayor's office and business, people impacted by the disease and others, to hear from them about what challenges they are facing, to be able to work together on how do we resolve that.

These type of community forums are incredibly valuable to make sure that we are spending time on things that are impactful, but that we are doing it with an ear to what really matters to folks who live there, who are invested in, and that we use that as a way to not only engage the community but really mobilize the community to support each other and to be able to work together, so that is one of the greatest examples that I think can be replicated throughout the U.S., and we know we have seen results in Pennsylvania.

Senator HAWLEY. Can I just ask you on that point in terms of mobilizing folks in the community? You also mentioned several times in your written testimony, your work with faith-based groups and outreach to faith-based groups. What role does working with that community play?

I am thinking of where—I come from a very small town in Missouri. I am from rural Missouri. My town, Lexington, Missouri, has fewer than 5,000 people, and of course, communities across Missouri, rural communities, have faced hospital closures, the loss of clinics, but often there is a robust faith community in these areas.

What have you found in working with faith-based communities and faith-based outreach? How has that worked? Has it been helpful? What has been successful? What not?

Mr. JACOBS. Absolutely. We have mentioned communities a few times, and I think for me and I think others, community is whatever you associate with it. It may be geography. It may be family, your workplace or others. It is where you turn, and for many, that is the faith community.

For us to effectively engage people, if you are concerned about memory or you have noticed symptoms or you have noticed it in others, often it may be a church group. It may be your pastor. It may be others we are turning to, so how do we effectively engage so that that is a way to continue the conversation? So it really is about identifying there and where people turn. What does it look like in the AME church to know that there is connections and to have those relationships?

One of the things we hope to do is to be able to be a convener and a connector, and if we can start that conversation and give that platform, how meaningful it will be for folks who maybe turned previously and did not find that support.

Senator HAWLEY. Richard, did you want to add something here?

Dr. HODES. I do not want to fail to emphasize that with NIH and the Federal Government, its role in trying to engage, in acquiring evidence for the best ways to diagnose, treat, and manage, the partnerships you have been hearing about are very much a part of what we do.

The Alzheimer's Association here and the National Institute on Aging have a hugely effective partnership that then involves the faith-based groups, community associations.

I could not agree more that for us to carry out research that engages a diverse population, we have to deal with the institutions where those individuals live. The Alzheimer's Association has been often a great means of connecting with those communities. It is a partnership between Federal Government and communities that is invaluable in this effort.

Senator HAWLEY. Thank you.

Thanks to all the witnesses for being here and for your outstanding work. Thank you for sharing your personal stories, and thank you for the advocates, for being here and for advocating for folks who are going through this and who are hoping for progress and a cure. Thank you for being willing to share your stories.

Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator.

Senator SINEMA. Thank you so much to our Chairman and to our Vice Chair for today's hearing on Alzheimer's.

This is an especially critical topic for my State, Arizona, which as you know has one of the highest rates of Alzheimer's in the Nation.

It is also quite personal for me, as my grandmother currently suffers from Alzheimer's, and my aunt is her full-time caregiver. I thank all of our advocates for being here today, and I give my special thanks and my special welcome to those who are living with Alzheimer's and those who are caring for family members with Alzheimer's.

Right now, over 140,000 Arizonans over the age of 65 life with Alzheimer's, and that number is expected to increase by 43 percent in Arizona by 2025, so that is why the city of Tempe is leading the way to help address the toll that Alzheimer's has on patients and caregivers.

Our mayor of Tempe, Mark Mitchell, knows this firsthand. His mother Mary Ann has been living with Alzheimer's for over a decade. Mark's father, former mayor of Tempe and former Congressman Harry Mitchell, has devoted himself to caregiving, but their family saw the impact that Alzheimer's was having on both Mary Ann, who required progressively increased levels of care, and on Harry as her primary caregiver, so it was Mayor—Mark decided to do more, so he partnered with the Banner Alzheimer's Institute, and it has made Tempe into the Nation's first Alzheimer's-and dementia-friendly city, so with the goal of creating a safe and livable community for people living with dementia, Tempe has trained thousands of volunteers and first responders to recognize and respond to dementia sufferers in the community, and the city also hosts every Monday a Memory Caf? to provide patients and caregivers a place to socialize and find comfort and support.

The message that Tempe is sending to Alzheimer's patients and their loved ones is that they are not alone, but of course, we all know and as we have heard here today, we can and must do more.

I wanted to start with asking you a question, Dr. Hodes. Your testimony mentioned a recent study from the National Institute on Aging that found in the last 5 years of life, total health care spending for people with dementia is more than a quarter million dollars per person, so does that figure include the cost that family caregivers bear by losing wages, the lost impact on Social Security benefits, and the cost that occurs to their own health?

As you probably know, in the State of Arizona, we have nearly 340,000 caregivers who provide more than $4.8 billion of unpaid care a year. If you could share a little bit more about your numbers and what they include, that would be helpful.

Dr. HODES. Yes. Thank you.

The costs by disease have been compared in a series of reports lately and as alluded to here. Alzheimer's disease is really the most expensive disease, in particular, in the last years of life.

In those calculations, it has been important in the studies that it be done—and I think has been well done—to include both direct costs, out-of-pocket, Federal, but the indirect costs, the loss of wages, the value of the care being provided, so the total numbers, as huge as they are that you report, are attempted in the studies we carry out to account for all of the varieties of cost, direct, indirect, that you mention.

Senator SINEMA. Thank you.

Research has shown that early biomarker evidence of Alzheimer's can be detected through PET scans and even when someone maybe shows little or no clinical symptoms, so given that we now know that early diagnosis helps patients benefit from treatment, clinical trials, and allows families to create a care plan, my question for other members of the panel is, what types of questions should family know to ask their doctor early on if they are concerned that their loved one may be subject or have a predisposition toward Alzheimer's?

It looks like it is you, Mr. Jacobs.

Mr. JACOBS. Thank you.

I think really what I could best touch on is, anecdotally, as we hear from families. It is the willingness to have that conversation with each other, the willingness to be able to engage physicians and others, because we know that often the disease, diagnosis is not disclosed.

We know through the Alzheimer's Association's recent Facts and Figures Report that while 82 percent of seniors think cognitive assessment is important, only 16 percent report regularly receiving them.

This conversation needs to shift, our comfort with it, and what I think had traditionally been a disease that we talk about quietly, today, as a great example with this hearing, with all of the folks who are behind me in this room and across the Capitol, it is that the urgency, the need, the passion, and the volume is raised, so we need to take that back to our communities and continue the conversation and be willing to talk with each other when we notice

symptoms, be able to walk with our providers, and I think that is just a key point to start as we look at moving forward.

Senator SINEMA. Thank you so much.

Chairman, I just want to take a moment to thank all of he advocates who are here, not just here in this room with us today, but all over the Capitol sharing their stories of personal experience with Alzheimer's, and I want to thank you for taking the time out of your life to do that and to share these highly personal stories and let you know they do make an impact.

Thank you.

The CHAIRMAN. Thank you, Senator.

Dr. Fekrat, your research points to a whole new direction in our understanding of Alzheimer's disease, and I find it very exciting that you are exploring the link between vision and cognitive health.

Could you tell us how you decided to study that potential ink?

Dr. FEKRAT. Well, our group specifically became interested in joining the other researchers around the world that are studying this link. After we were examining a set of identical twins in our clinic in the middle of a busy day, one set of 96-year-old identical twins with the same DNA and genetic risk, however, one had advanced Alzheimer's disease and the other one was cognitively healthy, living independently, using a smartphone, talking about current events.

We took this opportunity to take this new technology that I had mentioned, OCTA, and obtain images in both of the twins, and we saw a striking decreased retinal vessel density in the twin with advanced Alzheimer's, so this showed us that independent of aging that Alzheimer's had the decreased retinal vessel density, and that sort of spurred the rest of our work.

The CHAIRMAN. That is absolutely fascinating.

Dr. Hodes, one of the reasons that I am so excited by the charts that you have placed and explained is that we have concentrated the research on amyloid plaque, on tau, and yet, as you pointed out when you talked about blood pressure, it may be that cardiovascular factors are at play, which seems to be what our ophthalmologist has just discussed as well.

Has the expansion in funding allowed you to fund applications for grant money that are exploring whole new, different, out-of-the-box areas that we have not previously looked at?

Dr. HODES. The answer is absolutely yes in a most exciting way.

Just a couple of examples, in the studies of the genetics and gene expression patterns that I mentioned, over hundreds and thousands of brains looking for generic targets that were previously unanticipated, one, I would say, intriguing provocative report published last year found changes that were associated with viral infections of a type. This is another dimension to what has been raised over the years, the possibility that there might be infectious and inflammatory components.

Another example, as we look at the impact of what we would call normal aging, changes that occur with aging and how they interact with Alzheimer's, why does Alzheimer's disease occur in later years of life generally, among the changes that occur with aging at a molecular, cellular level, we are just discovering, is something called "cellular senescence." In each of us, in all our organs and tissues,

as we age, a number of cells become senescent. They do not divide the way they normally do. They have a different phenotype or type . They secrete inflammatory molecules, and what has been found in some very interesting studies, even in animal models, you find very clever genetic or pharmacological ways to get rid of those senescent cells called "senolytics." You are lysing the senescent cells. It actually has a positive impact in the brain of a mouse model of Alzheimer's disease in terms of decreasing damage, in fact, even allowing reversing of damage, examples of very disparate ways in which research is carried out by people in a totally different field are now being drawn into the area of Alzheimer's research.

As one strategy for doing it, we recently in this past year looked at all of the institutes across NIH and asked whether their investigators who were not studying Alzheimer's research had proposals to extend their expertise into Alzheimer's research, and we funded last year some 300 such new scientists to be brought into the field with imaginative ideas that you have heard about today and some of those I have tried to illustrate.

This has been one of the most exciting and productive aspects of scientific opportunity converging with the resources that you have been able to provide.

The CHAIRMAN. I like that multidisciplinary approach. I think that is really important too.

I was fascinated, what you just described about cells because it reminded me of a discussion that I had with a scientist at Harvard.

I have visited NIH, Jackson Labs, Mayo Clinic, University of Pennsylvania, and a lot of different places where research is going on, and this researcher told me about what he called a "REST." Is that what you are talking about here? I cannot remember whether it is a REST protein. I think it was a protein that could wake up the cell and cause it to regenerate.

It sounds very similar to what you just described.

Dr. HODES. It is a unique and additional example of a protein that normally changes with aging and its expression in the brain and where that normal progression and regulation is altered with Alzheimer's disease.

The CHAIRMAN. That is fascinating.

I actually could spend all day at those labs. I want to tell everyone here. You would be so encouraged when you see the dedication of these researchers and other health care providers who are exploring all different approaches. I know it is easy to get discouraged about the failed clinical trials, but, boy, when you talk to people in the labs, your optimism goes way up. It is just so exciting what is going on.

Dr. HODES. If I may take the liberty——

The CHAIRMAN. Please.

Dr. HODES [continuing]. of inviting you, Mr. Casey, and members, we have had most exciting opportunities at NIH on campus to have delegations, individual or multiple, come to visit. We would love to let you see more about what goes on in the way of researching, including in Alzheimer's disease, so please take that as an open invitation at any point. We would love to explore with you on campus.

The CHAIRMAN. Thank you. I will come back any day. Thank you.

Mr. Jacobs, let me end my questioning by asking you a little bit more about care planning. Care planning is now recognized as such a critical aspect of dealing with the Alzheimer's, particularly since this disease spans so many years, and yet there is no one roadmap. There is no one answer to care planning. Each plan needs to be flexible, tailored to the individual. What may work well for the Hartts might not work for my family.

Could you tell us more about the process of developing a care plan that is tailored to the individual needs of a family?

Mr. JACOBS. Yes. Thank you, Senator.

As we look at care consultation services, as an example, through the Alzheimer's Association, we know that people reach out to us at different aspects of the disease, to your point, at different points on either pre-diagnosis or after being diagnosed, really with changes that come along, knowing that disease spans years.

The hope is to be able to provide brief counseling, be able to identify immediate needs there, and then be able to help them move on with immediate concerns.

Often what we see throughout Pennsylvania is folks reach us after when we would love to see care planning already having occurred. We are dealing with acute situations and trying to help them through the next steps, and so that is why we are encouraging, incredibly excited as we look at the additional legislation being proposed, because if we can reach people earlier, talk about legal and financial issues, talk about medical management, develop a care team or a care team of choice, all of those things may change how people connect with us, may change how they experience this disease, and provide a little bit more hope and provide the opportunity for folks to live well with the disease, as we have heard from others today, early on and really be active and engaged in what that looks like in the coming years.

The CHAIRMAN. Thank you.

I know I said that would be my last question, but I hope the Ranking Member will forgive me if I ask one more, and that is of Mary Hartt.

Just following up on that, you talked about how the support group of the younger-onset Alzheimer's helped you, but what about medical and other health care providers or other sources? Did you find help in putting together a plan, or did you just develop it on your own?

Mrs. HARTT. We went to Mass General because at Dysart's, we had a wellness group that was able to get us the appointment, and when we were at Mass General, they had care plan. We met with a social worker. We have met with—Mike has met with a speech therapist. We have had, as I said in my speech, the doctor suggested that I get power of attorney, so it has not just been medical that we have been given at Mass General. It has been life needs, and the doctor very much has encouraged the living life today.

I do not know that I would have had the strength to be able to be as creative as I have had I not had his advice to be doing this.

The CHAIRMAN. Thank you. That is very helpful.

Senator CASEY. Thank you, Madam Chair.

I wanted to go back to the funding question for Dr. Hodes. I know that you and your colleagues at the National Institute on

Aging are making incredible progress and scientific discoveries every day. We know that those discoveries are not only focused on helping find a cure, but also on improving care.

The legislation we are working on together, Chairman Collins and I and others, will help to continue that progress.

I wanted to ask you. I guess my question—and I know it is a bit redundant, but I do not think we can emphasize it enough, the importance of the funding. I know maybe for even folks here in Washington that are used to these discussions, but especially for folks who do not live and work in the halls of Congress or do not work on these issues every day, they may think it is yet another appropriations request just like everything else, just adding funding for the purposes we outlined.

I do think, though, that it is important that we emphasize the impact of the dollars and that this is not just another funding request, that it is really an investment, an investment in a cure, an investment in better care.

I just want to have you walk through again. When we look at the chart that you showed us, $631 million in Fiscal Year 2015 all the way up now to potentially $1.9 billion——

Dr. HODES. Plus this year, an addition of $425 million.

Senator CASEY. Right.

Dr. HODES. Approximately $2.3 billion.

Senator CASEY. Tell us what that means because I think we sometimes talk about the numbers, and the numbers are important, but what does that mean to the measure of progress we got to make?

Dr. HODES. Again, if I could just briefly outline what I alluded to, the way in which we generate or bypass budgets is tied very much to our planning, so that as a result of summits held each year, either in Alzheimer's disease, Alzheimer's-related dementia, or care and services, we generate from hundreds of national and international leaders and advocates and community members, a list of the priorities for research and gaps.

We translate those into milestones, to achieve any of those priorities, what do we need to accomplish year by year, and then we estimate the cost of carrying out that research.

In addition, each year we go back to account for what was accomplished. In the beginning, the first metrics are we funded new grants, new investigators, and this is important and exciting by itself. I think some figures we mentioned repeatedly, of all the awards given, about a quarter were to new and early stage investigators who had no previous NIH support at all. These are the exciting newest generation of research that has come into the field. Part of what we have accomplished with this funding is to give them an opportunity to commit their ingenuity, creativity.

Approximately a third of all of the awards we have given were to investigators who had never been in the field before. Some of them are new, but some are established investigators moving into the field, so these themselves are metrics.

Now, year by year, we will ask about what the success has been after funding our new grants, how many new targets have there been identified as potential translational vehicles toward clinical trials. The next step will be to track the number of clinical trials

we have instituted, and so each of these, year by year, we factor to monitor whether we are doing the appropriate and optimal job of utilizing the resources that come and estimating for the subsequent years what we think additional resources might be.

Senator CASEY. Well, you are doing something that Washington does not do very well, which is planning. We have not been accused of that much lately, but we are grateful for that insight.

I do not have any more questions. I do want to mention that I guess while I was upstairs at another hearing, Clay Jacobs got the question about rural, access to folks in rural areas, and we are grateful to others on the panel who are addressing that question.

Madam Chair, thank you very much, and again, thanks for this hearing.

The CHAIRMAN. Thank you, Senator Casey.

I want to thank all of our witnesses for being here today and particularly my constituents, the Hartts, who came from Hamden, Maine, to be with us, but each and every one of you has added so much to our understanding.

I also want to thank our staff, which worked very hard, to put this hearing together.

Most of all, I want to thank all of the advocates who have come to participate, including those of you who are living with Alzheimer's, those of you who are family members, caregivers, and those of you who are researchers, organizers, and advocates.

In the puzzle to end Alzheimer's, each of you is a critical piece, and with your efforts, we are making progress.

This is very personal as well as a professional cause to me. As I told the advocates from Maine, I lost my father a year ago to Alzheimer's after my mother had cared for him as his principal caregiver for approximately 8 years before he went into the Veterans Home in our hometown of Caribou for the last few months of his life.

I know firsthand how difficult it is and also the stress placed on a caregiver, particularly one who is turning 92 next month, so paying attention to our caregivers as well as the research is equally important.

I also lost my grandfather and two of my three uncles to this devastating disease, so Dr. Fekrat, I may be down to see you for that scan.

I do so appreciate that sea of advocates that we see. Working together, I know that we can turn the tide on Alzheimer's, but without you, we never could have gotten to the funding levels that are making possible such exciting research that is going on today, so I am grateful for your work.

Senator Casey, do you have any final words for us?

Senator CASEY. Just briefly, Madam Chair. Thank you, and I want to thank all those who are in attendance today—the advocates, the researchers, and of course, our witnesses who have given us, certainly for me and I know other members of this Committee, an expanded knowledge base. We learn every year we are here about Alzheimer's disease and related dementias and also the effort that has been undertaken here led by individual Senators, like Senator Collins, to make this not only a critical priority, but also a bipartisan endeavor. Those happen around here once in a while,

and we are grateful for her leadership to improve both awareness and to increase resources.

Clay, I want to thank you for representing Lackawanna County well. I will tell everyone back home.

I did want to close with something that Mr. Hartt said in your comments earlier. You said—and I think I am quoting you accurately here—"I have always found my own way" and how that challenge that you have been presented with challenges the way you have lived your life, but I think your presence here and the testimony and brave witness of others will help all of us find a way to a cure and better care, so we appreciate those who are standing up, like you and others, Mr. Hartt, for this effort. Thanks very much.

The CHAIRMAN. Thank you.

Committee members will have until Friday, April 12th, to submit any additional questions for the record, which we will send your way.

Again, my thanks to every single person in this room. You truly are making a difference.

This concludes this hearing.

[Whereupon, at 11:26 a.m., the Committee was adjourned.]

# APPENDIX

## Prepared Witness Statements

**Testimony of Mary Dysart Hartt**
**Alzheimer's: New Directions in Biomedical Research and Caregiving**

**Special Committee on Aging**
**United States Senate**

**April 2, 2019**

Chairman Collins, Ranking Member Casey, and members of the committee. Thank you for the opportunity to testify before the committee about my experiences as a caregiver for my late mother, and now my husband Mike, who is currently living with Alzheimer's disease. He was diagnosed at 62. My hope is that, in sharing my story, others who are impacted by this disease will feel less alone and understand that with proper supports, there is life after diagnosis.

Mike was 58 when I started noticing that things did not seem quite right. After living on our family farm since 1977, daily tasks like running the tractor became a challenge and fender benders became more frequent. During that same time, I was part of a family care team caring for my mother who was living with dementia. She was a brave woman who was never afraid to forge her own path. She started our family-owned business, Dysart's, with my father 52 years ago and my two brothers and I are very proud to have carried on our parents dream into the third generation. You may have heard of our famous "Purpleberry Pie" which has raised over $25,000 for Alzheimer's Association, Maine Chapter. I began to see similarities in the challenges they were both facing and decided to reach out to our family doctor who agreed to help me monitor Mike for changes. For four years we continued on this path, with things coming to a head when Mike was 62.

When Mike was 62, he agreed to be tested. We turned to a hospital in Bangor for help and a diagnosis. After enduring test after test, Mike was diagnosed with frontotemporal dementia, or FTD, and given five years to live. In an effort to understand the diagnosis and what lay ahead, we contacted our insurance provider who referred us to Massachusetts General Memory Clinic in Boston. We are so thankful for the care we received at Mass General where after more tests, his diagnosis was changed to younger-onset Alzheimer's disease. Following the diagnosis, life changed significantly. We sold our farm where we had lived for nearly 40 years and condensed our life. At 63, Mike volunteered to give up driving, a freedom that was too dangerous to continue.

Before Mike was diagnosed, we were not familiar with younger-onset Alzheimer's disease, but had some knowledge of Alzheimer's and dementia through the experience of caring for my mother. One common assumption about this disease is that life stops completely. While we've faced unique challenges as we've tackled this disease, we continue to move forward with our life as best we can. It has been important to both of us for him to retain his dignity. Mike was president of his family's trucking business, Hartt Transportation, and also owned a business that manufactured log homes — he was our primary breadwinner. He always managed the money, so when we go out, he has money in his wallet. I help him keep an eye on it, but he has control

over it. In a disease that robs you of simple freedoms, it's important to feel grounded and in control of the aspects that are manageable.

In just two weeks I will be running my 41st marathon in Boston, Massachusetts. I am running to help rid the stigma of this disease. Too often, Alzheimer's is only talked about in terms of cognition and memory, but it is so much more. In my husband, I see it affect his emotions and temperament with agitation, apathy, anxiety. If someone is diagnosed with cancer, people automatically rally around to offer support and guidance. An Alzheimer's diagnosis is sadly not the same — but there's nothing to be ashamed about. We cannot hide behind a diagnosis if we want to make progress.

The staff at Mass General made clear that this disease is something that is meant to be taken day by day — to be approached with humor and a grasp of reality. Our doctor told us "don't worry about tomorrow, enjoy today." That's how we've chosen to live our new life. Thanks to our providers and the support we received at the Alzheimer's Association, Maine Chapter, we've begun fulfilling wishes on our "bucket list". Lucky for Mike, most of them are fishing adventures. Following more than 40 years of marriage, I took my first class at his fishing club, 'Fly Fishing 101.' We've made trips all over the world, including to Alaska, Iceland, British Columbia, the Yukon, and more. Mike can still out fish everyone on the river.

However, I know these adventures aren't typical for everyone — especially for those without a care plan. For us, this plan came in pieces and with the help of our team of care providers at Mass General. According to the Alzheimer's Association, today only about half of those living with Alzheimer's have been diagnosed, and of those only 33 percent are aware of their diagnosis. One of the reasons physicians do not diagnose — or do not disclose a diagnosis once it is made — is because of the lack of time and resources to provide information and support to patients and caregivers. But a diagnosis allows people to work with their family and physicians to engage in care planning, address financial decisions, and access support services. Mike's diagnosis at 62 was a shock, but working with the team of care providers at Mass General gave us time to talk through the reality of the situation and plan for the challenges that lie ahead.

Having a care plan has been critical to managing these new challenges and to living well with Alzheimer's. Care planning allows both the person living with the diagnosis and caregivers to learn about medical and non-medical treatments, clinical trials, and support services available in their community. It can mean fewer hospitalizations and ER visits and a better quality of life. Fortunately, Medicare now covers care planning for individuals with cognitive impairment and has made it easier for physicians to provide the care and support services that people affected by Alzheimer's need. I believe that our quality of life would be significantly different had we not been made aware that a care plan was vital to our future. However, patients and their providers are often unaware that these services are available.

Legislation like the Improving HOPE for Alzheimer's Act would help educate clinicians on Alzheimer's and dementia care planning services through Medicare and give them the

knowledge and tools to better help patients and families. For example, as part of our care plan, Mike and I met with a social worker who helped us to access speech pathology services--these have been enormously helpful. We continue to have regular visits to Mike's team of care providers and at our last appointment, we had the conversation about giving me power of attorney — something I would have never thought to seek but was part of our plan. Thank you Chairman Collins for introducing this important legislation that will make a difference in the lives of people living with Alzheimer's disease and other dementias and their families.

Mike is 66 now and quieter than he once was. An avid outdoorsman, he is no longer able to drive to his camp in the North Maine Woods — which he enjoyed for over 30 years. Once a larger than life character who used to joke and tell stories, he now listens respectfully and smiles to let you know he hears you. He can read but does not enjoy it as he once did. And while his memories seem to be mostly intact, we're re-learning how to do every day, routine tasks like turning on the T.V.

I think a lot about how lucky we've been in our life to be able to care for ourselves in this next phase. For many with the younger-onset diagnosis, that is not their reality. The services and supports that are there for those 60 years and older are vast compared to those available to the population in the Alzheimer's and dementia community who have not yet reached retirement age. Under the Older Americans Act, individuals and families are able to access programs related to support services, the long term care Ombudsman program and the National Family Caregiver Support program. These programs would make a huge difference in the lives of individuals living with younger-onset Alzheimer's disease who don't have support services available to them. The Younger-Onset Alzheimer's Disease Act, introduced by Chairman Collins, Ranking Member Casey, Senator Jones and Senator Capito, would make these Older Americans Act programs available to this population. Thank you for being leaders on this impactful legislation.

Throughout the past few days, Mike and I have joined our Alzheimer's Association, Maine Chapter, along with over 1,200 advocates from across the nation to make a difference in our nation's capital. We are here to advocate for the 5.8 million Americans living with Alzheimer's, 200,000 of whom are under the age of 65 and living with younger-onset Alzheimer's disease, and the more than 16 million people caring for them. Alzheimer's is the only leading cause of death in the U.S. that cannot be prevented, cured, or even slowed, but through the power of advocacy we have quadrupled the funding for Alzheimer's disease research at the National Institutes of Health since 2011, where the scientific community is tireless in their efforts to identify medical breakthroughs to change that dire sentence.

I am here today because I am the wife, caregiver, friend, and daughter of Alzheimer's. We all are. And we must remain a strong and resilient voice for those who may have lost theirs. I am honored to be the Alzheimer's Ambassador to Chairman Collins who has been a champion for individuals living with Alzheimer's disease and other dementias - especially for her leadership on the Building Our Largest Dementia (BOLD) Infrastructure for Alzheimer's Act which became law at the end of last year. I respectfully ask Congress to continue to make Alzheimer's

research a priority and to work together to pass critical legislation like the Improving HOPE for Alzheimer's Act (S.880) and the Younger-Onset Alzheimer's Disease Act (S.901) to help other families like Mike and me receive the support and services we all need and deserve. Thank you for inviting me to speak, listening to our story, and for all you have done. Please continue to join us in the fight to end Alzheimer's for generations to come.

**Testimony of Clay Jacobs**
**Alzheimer's: New Directions in Biomedical Research and Caregiving**

**Special Committee on Aging**
**United States Senate**

**April 2, 2019**

Chairman Collins, Ranking Member Casey, and members of the Committee, I am Clay Jacobs and I serve as the Executive Director of the Greater Pennsylvania Chapter of the Alzheimer's Association. Thank you for the opportunity to testify before the Committee on how we are working to support persons living with Alzheimer's disease and related dementias, caregivers, and their providers.

Currently, 5.8 million Americans are living with Alzheimer's and, without significant action, nearly 14 million may have the disease by 2050. More than 16 million unpaid caregivers are supporting and caring for these individuals today at a cost of $234 billion. In 2019, Alzheimer's and related dementias will cost the nation $290 billion with Medicare and Medicaid bearing $195 billion of that figure. In my home state of Pennsylvania, 280,000 older individuals have Alzheimer's today and in just a few years, 320,000 will likely be affected.

Among the millions of individuals living with Alzheimer's, we know that there are communities who are disproportionately affected but remain underserved. Older African Americans are approximately twice as likely to have Alzheimer's or other dementias as older whites, and older Hispanics are about one and one-half times as likely to be affected. Another population that is often under-recognized and underserved is the approximately 200,000 individuals under age 65 who have younger-onset Alzheimer's disease. The need to reach everyone affected will grow significantly in the coming years and the Alzheimer's Association is working to reach as many of those people as possible. But Alzheimer's is also a local disease. Therefore, our nationwide network of chapters serve to respond to the specific needs in their communities.

We are doing just that in Pennsylvania. For example, we are aware of the unique challenges of younger Pennsylvanians with Alzheimer's and have developed and implemented a variety of programs in response. We offer early-stage education and support groups throughout the Commonwealth to promote social engagement in local communities by partnering with museums, local tourism boards, and libraries. We also work with the Pennsylvania Department of Aging to train facilitators for memory cafés.

In spite of these efforts to support this population, however, we know that they simply do not have access to many of the services they need. We believe that the Younger-Onset Alzheimer's Disease Act (S. 901/H.R. 1903) can change that. The legislation would allow individuals under the age of 60 living with Alzheimer's disease to access supports and services from programs under the Older Americans Act (OAA). Those programs include supportive services and respite care through the National Family Caregiver Support Program. The Alzheimer's Association is grateful to Senator Collins, Senator Casey, and Senator Jones on the Committee as well as Senator Capito, for introducing this important bill and we look forward to working with you to garner support for it.

As the leading voluntary health organization in Alzheimer's care, support, and research, we engage in a number of strategies and offer a wide variety of programs nationally. The Alzheimer's Association 24/7 Helpline (800.272.3900) is available around the clock, 365 days a year. Through this free service, specialists and master's-level clinicians offer confidential support and information to people living with the disease, caregivers, families, and the public. And while the Helpline serves individuals, the Association is also implementing a health systems strategy to address the crisis at a population level, influencing practice and care on a broad scale.

To reach members of under-represented and underserved communities, the Alzheimer's Association has undertaken several recent initiatives. We are recruiting volunteers to engage with faith and Spanish-speaking communities. The Association is partnering with the Mexican Consulate to engage the Hispanic and Latino communities with information on Alzheimer's detection and diagnosis, care, treatment, research, and access to culturally-appropriate resources. In collaboration with the National Hispanic Council on Aging, the Alzheimer's Association will also build a network of "promotores," or community health workers, who deliver Alzheimer's education in Latino communities and help connect people to resources and services in Spanish.

Recognizing the unique challenges younger individuals with Alzheimer's and related dementias face, the Alzheimer's Association convened its National Early-Stage Advisory Group in 2006. This cohort of individuals from across the United States are living in the early stage of dementia. They are leaders and spokespeople for the Association and provide guidance on appropriate programs for people living with early-stage Alzheimer's, raise awareness about early-stage issues, advocate to increase funding for research and support programs, and provide input to external groups regarding early-stage issues.

Our chapters in Pennsylvania are also working to support underserved individuals. In our Greater Pennsylvania Chapter, we conduct faith-based outreach and community education in partnership with the Alpha Kappa Alpha Mu Nu Omega Chapter and we have recruited and deployed Spanish-speaking volunteers for health fairs, education programs, and support groups. We have had the great pleasure of working with Senator Casey's staff on a number of these efforts. The Delaware Valley Chapter is a member of the University of Pennsylvania's African American Family Advisory Council to guide their efforts to increase diverse participation in clinical trial enrollment. With the local Area Agency on Aging, we work to reach Chinese, Korean, and Vietnamese organizations, attending their meetings and health fairs, working with interpreters when needed. As a member of the Department of Aging's Cultural Diversity Advisory Council, we advise the agency on services and trainings used throughout the Commonwealth's aging network, allowing us to have a statewide influence.

With 70 percent of Pennsylvania's counties considered rural, we have been deliberate in replicating our programming in rural communities with the help of already-embedded organizations to serve those individuals and families and to ensure that the providers caring for them have the tools to do so. We are also proud to work with Geisinger Health System as part of a trial focused on post-diagnostic support services in rural communities. The chapter has helped to convene stakeholders, contributed to the project design, provided materials to be shared after diagnosis, and many people are referred directly to us.

A constant theme of all of our outreach is the importance of care planning after diagnosis. We often hear directly from constituents who are trying to live well with Alzheimer's, and while we are able to provide pieces, there are still gaps in the support they need. Care planning is essential to learning about medical and non-medical treatments, clinical trials, and support services. These services result in fewer hospitalizations and emergency room visits, and a higher quality of life. This is also true for caregivers, who too often find themselves serving as "the plan" with little support after a diagnosis. The Association was grateful for the support of the members of the Committee who sponsored or cosponsored the HOPE for Alzheimer's Act in the 114th Congress and to the Centers for Medicare & Medicaid Services for now covering care planning services. We are concerned, however, that access remains an issue. That is why the Association supports the Improving HOPE for Alzheimer's Act (S. 880/H.R. 1873), which would help educate clinicians on Alzheimer's and dementia care planning services through Medicare. With that knowledge, clinicians will be better equipped to support patients and caregivers. We are grateful to Senator Collins for her leadership on the legislation and we look forward to advocating for better access to care planning services for persons living with dementia and caregivers.

To illustrate how elusive care planning has been for many people, I'd like to tell you about Michele Castro, one of our Early-Stage Ambassadors. Her mother, a manager for Section 8 housing in New York City, started exhibiting signs before their family even knew what early- or younger-onset Alzheimer's was. As her mother's caregiver, Michele watched her mother move in and out of psychiatric hospitals to try to address the behaviors that we now know to be part of the disease but that were a mystery to the family because her mother wasn't diagnosed until later. She passed away at age 59. Not long after, Michele's brother Joe, a New York City firefighter and first responder on 9/11, started to exhibit heartbreakingly similar signs at age 43. He tested positive for the PS1 genetic mutation for early-onset Alzheimer's. His wife and two young children cared for Joe before he passed away at age 58. With her family history, Michele chose to be tested as well--for planning purposes. When she tested positive for the gene, she knew she needed a plan in order to cope. While she is living well now and is grateful for every day, the only reason she knew to pursue diagnosis and care planning was through her family's devastating experiences. The Improving HOPE for Alzheimer's Act could prevent others with no or little knowledge of the disease from having to stagger through it.

Another invaluable collaboration in Pennsylvania has been with the Alzheimer's Disease Research Center (ADRC) in Pittsburgh. With the ADRC, we offer support groups, community education events, clinical trial recruitment, and overall engagement with the community. Partnering with the Pittsburgh ADRC allows us to reach a much broader audience than we could on our own as well as target efforts in the local African American community. As millions more Americans develop Alzheimer's, a broader, population-level approach is critical, so the Alzheimer's Association is grateful to both chambers of Congress for passing the bipartisan Building Our Largest Dementia (BOLD) Infrastructure for Alzheimer's Act (P.L. 115-406), and particularly to the bill's champions on this Committee. The BOLD Infrastructure for Alzheimer's Act, now law, will create a public health infrastructure across the country to tackle Alzheimer's as the urgent and growing public health crisis it is. This infrastructure, through the establishment of Alzheimer's Disease and Related Dementias Public Health Centers of Excellence and funding to public health departments at the state, local, and tribal levels, will implement public health interventions focused on increasing early detection and diagnosis, reducing risk of the disease, and preventing avoidable hospitalizations, among other important priorities. The Centers of Excellence will

also take the great research findings from the ADRCs and help translate the evidence into public health interventions in communities across the country. Finally, the law also increases the data analysis and timely reporting that is critical to identifying opportunities, helping stakeholders track progress in the public health response, and enabling state and federal policymakers to make informed decisions when developing plans and policies. The overwhelming bipartisan support for the bill underscores the need for such an infrastructure and that is why the Alzheimer's Association supports an appropriation of $20 million in Fiscal Year 2020 for BOLD's implementation.

I would like to conclude with an example of how important it is to reach a variety of communities affected by Alzheimer's and why outreach matters.

Ruben Deoleo, an evacuee from Puerto Rico, was born in the Dominican Republic. He moved to Pennsylvania in his 20s to serve as a minister, a drug and alcohol counselor, and a motivational speaker for the Dauphin County Prison. He continued his life of service by helping youth, being a hospital interpreter, and serving a local church's Spanish ministry. Memory problems, however, began to affect his life's calling. After losing several jobs, his wife Rosayna asked Ruben to see a doctor. For two years they grappled with what was happening and, just four months ago, he was diagnosed with Alzheimer's at the age of 58. They struggled with the diagnosis and, in particular, the fact that it is an untreatable illness. However, when Ruben learned about an Early-Stage Engagement group at Lancaster General-Penn Medicine and that other individuals living with the disease cope and can live well, he decided to fight back. Ruben has a sense of purpose as a member of the group, he is energized, and he wants to create the same opportunities for others. He is now a volunteer for the Alzheimer's Association, helping the Spanish-speaking community to understand Alzheimer's and the resources that are available. Ruben is getting valuable support while reaching more people in need.

Thank you for your time and the invitation to be here with you today. I am happy to answer any questions.

Testimony prepared for the United States Senate Special Committee on Aging:

Tuesday, April 2, 2019

## "So much more than meets the eye"

Sharon Fekrat MD FACS
Vitreoretinal Surgeon, Duke Eye Center
Professor, Ophthalmology; Associate Professor, Surgery
Duke University School of Medicine
Associate Chief of Staff
Durham VA Medical Center
Durham, NC

Dilraj S. Grewal MD
Stephen P. Yoon BS
Bryce W. Polascik
Atalie C. Thompson MD MPH
James R. Burke MD PhD

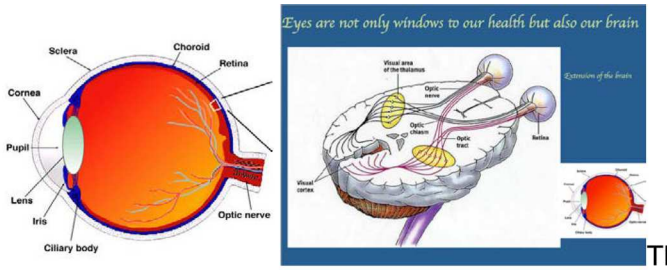
Thank you Chairman Collins, Ranking Member Casey and members of the Committee for the unmatched opportunity to testify today and

share some exciting multidisciplinary and collaborative work on one of the most important health issues of our time, Alzheimer's disease - the societal and cost impact of which you are well aware. My name is Dr. Sharon Fekrat and I am a retina surgeon and Professor of Ophthalmology and Associate Professor of Surgery at the Duke University School of Medicine and Associate Chief of Staff at the Durham VA Medical Center.

Alzheimer's disease is the leading cause of dementia worldwide, yet its early detection remains challenging. The high cost of MRI, the limited sensitivity and specificity of genetic and serum markers, and invasiveness of PET imaging and spinal fluid sampling limit our ability to detect Alzheimer's early. Because Alzheimer's has a 20-year relatively asymptomatic period of neuropathogenesis, there is growing interest in identifying Alzheimer's at asymptomatic stages for earlier clinical trial intervention to ultimately identify medications to delay the onset of, prevent, or even reverse Alzheimer's. We need rapid, easily accessible, inexpensive, noninvasive, yet accurate, diagnostic techniques to screen for Alzheimer's disease.

The task before us is not insurmountable. If a human being can walk on the moon or live in a space station, then we can find a means of diagnosing Alzheimer's earlier and subsequently identifying effective therapeutic interventions. This requires collaborative teamwork across disciplines and institutions, innovative critical thinking, and going out on a limb where the fruits are.

Look at the eyes of the person next to you. You see the colored iris, white sclera, and dark circular pupil. Yet there is so much more there than meets the eye. Behind the pupil, there is the wallpaper lining the inside of the eyeball called the retina.

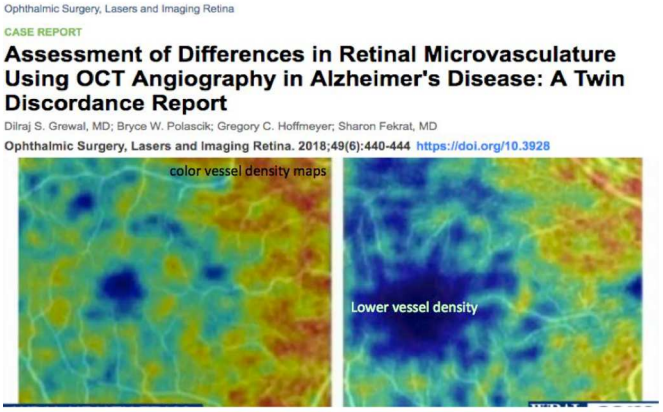



The retina wallpaper is the film of the camera, it is nerve tissue, and is a **direct extension** of our brain. In fact, the retina shares many structural and functional similarities with the brain and central nervous system. Spinal fluid biomarkers for Alzheimer's such as tau and amyloid beta have also been found in the vitreous gel behind the pupil and levels correlate with cognitive test scores. Amyloid has also been detected and imaged in the retina. Research has suggested that the neurodegenerative process in the brain may also occur in the retina with thinning of certain retinal layers. Changes in the retina and its small blood vessels may mirror, or even precede, detectable changes in the brain and its small blood vessels.

Imaging the retina in Alzheimer's disease however is not new. Color photographs of the retina in Alzheimer's show decreased retinal vein diameters, blood vessel branching complexity, and tortuosity. Recent imaging advances now allow us to evaluate the retinal microvasculature with unprecedented detail, on the order of **5 microns-** not even the width of a human hair, using new technology called optical coherence tomography angiography (OCTA) which takes ~70,000 scans per second to look at the very small retinal blood vessels. With this FDA approved retinal imaging technology, we are now able to take pictures of the retina through an undilated pupil quickly, noninvasively, inexpensively, and reproducibly at high resolution. Several research groups, including our group at Duke, are exploring how this new technology along with other retinal imaging methods can be used to diagnose preclinical Alzheimer's and stratify

the various stages. In fact, there is an Alzheimer's Association meeting on this topic next month.

We published imaging findings from 96-year-old identical twins, one had advanced Alzheimer's and one was cognitively normal. We found reduced retinal blood vessel density in the twin with Alzheimer's compared to her sister, indicating that marked loss of small retinal blood vessels does occur in Alzheimer's, independent of aging.



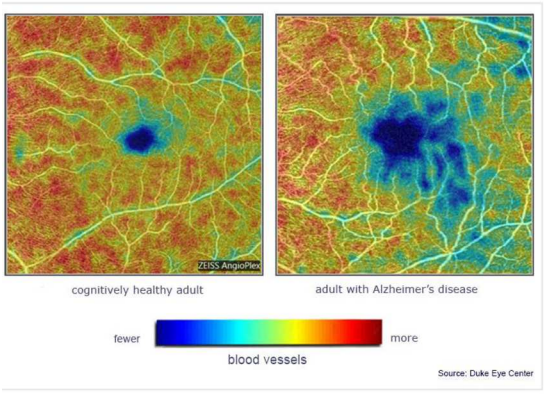
And it was these findings that spurred further research.

We recently completed the largest prospective study of 70 eyes with 39 individuals with Alzheimer's disease, 72 eyes of 37 persons with mild cognitive impairment (MCI), and 254 eyes from 133 cognitively healthy adult controls. We found decreased retinal blood vessel density and decreased perfusion density as well as decreased thickness in one of the retinal layers (ganglion cell – inner plexiform layer) in Alzheimer's disease compared to MCI and compared to

controls, even after adjusting for age, gender, and education. We did not find a difference in MCI compared to controls and it may be that we need a larger sample size to detect a difference between MCI and controls because of the varied spectrum of MCI individuals.

Our study adds to the published literature and improves our understanding of the smallest blood vessel changes in Alzheimer's. Right now, these eye tests cannot be solely used to diagnose Alzheimer's disease. However, this is the beginning of something big and more work needs to be done before these tests are ready for prime time because the findings must be validated in larger and diverse populations. The goal is to obtain multimodal retinal images that would result in a suite of biomarkers that could predict the risk of Alzheimer's and stratify the various stages of disease. Similar to getting a lipid panel and being able to determine your risk of heart disease.

The potential impact on early detection and clinical trial results is motivating. New treatments may be more effective earlier in the disease process. We are building multidisciplinary and multi-institutional teams and forging relationships with industry to purposefully move forward. Our ongoing and future efforts keep us up at night and include collecting longitudinal data to assess changes over time, imaging genetically predisposed asymptomatic persons, using images for deep learning artificial intelligence, and collecting retinal images globally to store in the Duke



Neurodegenerative Disease Retinal Imaging Repository for researchers to access.

Our eyes may indeed be windows to our brain health. Thank you for your efforts to support those working to find the way forward, which in turn supports those with Alzheimer's disease and their families. Time is of the essence.

DEPARTMENT OF HEALTH AND HUMANS SERVICES

NATIONAL INSTITUTES OF HEALTH

NATIONAL INSTITUTE ON AGING

Hearing titled "Alzheimer's: New Directions in Biomedical Research and Caregiving"

Testimony before the
Senate Special Committee on Aging

Richard Hodes, M.D.,
Director, National Institute on Aging
National Institutes of Health

April 2, 2019

Good morning, Chairman Collins, Ranking Member Casey, and distinguished members of the Committee. I am Richard Hodes, M.D., Director of the National Institute on Aging (NIA), which is one of the 27 Institutes and Centers of the National Institutes of Health (NIH). It is an honor to be here today to update you on our progress addressing a public health issue of considerable urgency: the need for compassionate care and effective treatment for men and women with Alzheimer's disease or a related form of dementia (AD/ADRD). I look forward to telling you about some of the many ongoing initiatives and exciting scientific advances in dementia treatment and care supported by the over one billion dollars in additional funding for AD/ADRD--including frontotemporal dementia, vascular cognitive impairment/dementia, Lewy body dementia, and mixed dementias--NIH has received since 2014.

**An Issue of Widespread Concern**

As you know, Alzheimer's disease is a progressive brain disease that slowly destroys memory and thinking skills and eventually even the ability to carry out the simplest tasks of daily living. Other forms of dementia are characterized by different brain pathologies and may initially present with different symptoms, but all forms of dementia share a common, devastating trait: Although treatment can help manage symptoms in some people, these diseases cannot, at present, be cured or even adequately controlled.

In the United States alone, as many as 5.6 million people age 65 and older are living with Alzheimer's disease.[1] Although several large epidemiological studies suggest that the percentage of older people with dementia, including Alzheimer's disease, has been declining, absolute numbers of persons with dementia continue to rise as[2] the number of "oldest old" – those over 85 and at highest risk of dementia – climbs. The growth of this age group is expected to accelerate in the coming decades, and will increase from approximately 5.8 million in 2010 to some 19 million in 2050.[3] Health conditions that often emerge at midlife and are known risk factors for

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[1] Hebert LE et al. Alzheimer disease in the United States (2010-2050) estimated using 2010 census. *American Academy of Neurology* 80: 1778-1783, 2013. See Table 1.

[2] Larson EB, Yaffe K, and Langa KM. New Insights into the Dementia Epidemic. *New England Journal of Medicine* 369: 22-25-2277, 2013.

[3] Vincent, Grayson K. and Victoria A. Velkoff. The Next Four Decades. The Older Population in the United States, 2010-2050. Current Population Reports, P25-1138. U.S. Census Bureau, Washington, D.C., 2010.

later development of dementia, such as hypertension and diabetes, also remain common.[4] For these reasons, unless we identify a way to prevent or effectively treat dementia, the number of affected Americans will rise dramatically within the lifetime of many of us here today.[5]

Family caregivers provide the majority of care for people with dementia in the community, and the support that is typically required for a person with dementia as the condition progresses can profoundly impact the caregiver's well-being. While many dementia caregivers report satisfaction with caregiving and find the experience deeply rewarding, they may also feel exhausted, overwhelmed, isolated, and distressed at the mental, emotional, and behavioral changes these diseases can cause in their loved ones, as well as the unceasing labor involved in physical care. NIA-supported investigators estimate that family caregivers spend an average of around 92 hours—the equivalent of over two full workweeks—per month on in-home caregiving of adults ages 65 and older with dementia. For spouses of persons with dementia, that figure rises to some 145 hours per month.[6]

In addition to the severe medical and psychological costs to patients and their families, AD and related forms of dementia impose significant economic costs in many forms. In a recent NIA-funded study, economists found in the last five years of life, total health care spending for people with dementia was more than a quarter-million dollars per person, some 57 percent greater than costs associated with death from other diseases, including cancer and heart disease. This analysis estimates that total health care spending was $287,000 for those with probable dementia and $183,000 for other Medicare beneficiaries in the study.[7]

Acknowledging the magnitude of this public health crisis, in 2010 Congress passed the National Alzheimer's Project Act (NAPA), and in 2012 then-Secretary Sebelius of the Department of Health and Human Services (DHHS) released the groundbreaking and ambitious National Plan to Address Alzheimer's Disease.[8] One goal articulated in the National Plan is to prevent and/or effectively treat AD/ADRD by 2025. Another goal, and one that we consider at

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[4] Barnes DE and Yaffe KY. The Projected Effect of Risk Factor Reduction on Alzheimer's Disease Prevalence. Lancet Neurology 10: 819-828, 2011.
[5] Hebert, op cit.
[6] Kasper JD et al. The Disproportionate Impact of Dementia on Family and Unpaid Caregiving to Older Adults. Health Aff (Millwood) 34: 1642-1649, 2015.
[7] Kelley AS et al. The Burden of Health Care Costs for Patients with Dementia in the Last Year of Life. Ann Intern Med 163: 729-736, 2015.
[8] The National Plan included other AD-related dementias, including frontotemporal, Lewy Body, vascular, and mixed dementias, from its establishment.

NIA to be of similarly critical importance, is to expand supports for people with AD/ADRD and their families and caregivers.

**Back to Basics**

Thanks to the efforts of an expanding community of scientists, we have important progress to report on our understanding of the disease and more promising paths to prevention and effective treatment. Our hope for a cure has never been stronger, as new resources and initiatives are allowing the scientific community to redouble their efforts to understand the basic biology of AD/ADRD, prevent the development of these diseases, and possibly even reverse the most intractable symptoms.

An area in which we have made remarkable progress is in the complex genetics of AD/ADRD. Initiatives such as the Alzheimer's Disease Sequencing Project, the Alzheimer's Disease Genetics Consortium, the Late-Onset Alzheimer's Disease Family Study, and many others continue to provide important insights into the etiology of these diseases. For example, we now know from our studies of genetics in combination with clinical and pathological studies that AD is not a single entity, but rather has several different complex phenotypes—underscoring the fact that a "one-size-fits-all" approach to treating the disease may not be appropriate, and highlighting the need for personalized diagnosis and treatment. Individuals' AD-related genes can also be used in the research setting to calculate a "polygenic risk score" that estimates the likelihood of developing the disease across time.

A number of genes implicated in the pathogenesis of these diseases have been identified, and new discoveries are constantly being made. Just last month, an NIA-supported analysis of genetic data from more than 94,000 individuals revealed five new risk genes for AD and confirmed 20 known others. The international research team also reported for the first time that mutations in genes specific to tau, a protein that is abnormal in AD, may play an earlier role in the development of the disease than originally thought.

These new findings also support developing evidence that groups of genes associated with specific biological processes, such as cell trafficking, lipid transport, inflammation and the immune response, are "genetic hubs" that play an important role in the disease process; this in turn suggests that interventions that target one process may have broad effects on other processes

and diseases. Some genes are observed in more than one pathway, leaving open the possibility that individuals with multiple affected pathways may be more vulnerable to the pathophysiology associated with AD/ADRD. This knowledge may provide an avenue to identify highly targeted therapeutic approaches for AD/ADRD.

Even beyond the realm of genetics, NIH remains at the forefront of discovery related to the basic biology of neurological disease, and right now we are revisiting and re-exploring the implications of the most fundamental fact about AD/ADRD: These are diseases that, for the most part, occur in people ages 65 and older. They are diseases of aging. What does this mean, at the cellular level, and how can we leverage this information to better understand and even intervene against these diseases?

Answers are beginning to emerge from the growing field of geroscience, which is built upon the hypothesis that slowing aging processes will delay the appearance or severity of many different chronic diseases. Supporting this hypothesis is data from the NIA-supported Interventions Testing Program and a number of other projects and initiatives, through which researchers have identified behavioral, genetic and pharmacological approaches to extend lifespan in a variety of model systems. Importantly, interventions that extend lifespan often result in significant delays in the appearance of pathology and frailty. Conversely, when lifespan is shortened, diseases and frailty occur earlier.

Geroscience approaches are already producing exciting and promising results and opening new avenues for translational research. For example, last year NIA-supported investigators found that senescent cells, which are alive but no longer divide or function normally, in the mouse brain play a role in the neurodegeneration associated with AD/ADRD, and that eliminating these cells before they cause damage to neurons appears to preserve cognition. Future research questions include whether these findings apply to other mouse models of AD/ADRD or to humans, and whether treatments to destroy or inhibit senescent cells can reverse cognitive damage that has already occurred.

Last month NIA released a pair of funding opportunity announcements (FOAs) to support independent research teams that will use established approaches that manipulate the rate of aging in model systems to advance our understanding of the role of aging in the development and etiology of AD/ADRD. We anticipate that these studies will provide key information about how

aging processes result in vulnerability to dementia, and may also uncover new targets for prevention and treatment.

**Translational Medicine in the Era of Big Data**

Translation of basic findings into effective treatment has traditionally been a slow process. However, we have been able to speed that process significantly in recent years, building on basic science and with the support of an expanded foundational "infrastructure for discovery". NIA is increasingly turning to massive data sets containing de-identified information on millions of people in order to speed discovery, and to facilitate diagnosis and treatment based on highly specific individual data. These "big data" approaches are facilitating discovery even as they help usher in the era of precision medicine.

An NIH flagship Big Data initiative related to AD/ADRD, the Accelerating Medicines Partnership-Alzheimer's Disease (AMP-AD), is a precompetitive public-private partnership including government, industry, and nonprofit organizations that focuses on discovering novel, disease relevant therapeutic targets and on developing biomarkers to help validate existing therapeutic targets. AMP-AD is transforming the way new therapeutic targets and biomarkers are discovered through the use of powerful molecular profiling and advanced information technologies and by providing an infrastructure for rapid and broad sharing of valuable and robust datasets.

The Target Discovery component of the AMP-AD Program applies a systems biology approach to the discovery and validation of new therapeutic targets in an open science research model. Since its inception in 2014, the research teams within the AMP-AD Target Discovery Consortium have established a centralized data resource/infrastructure, the AMP-AD Knowledge Portal, for rapid and broad data sharing; generated human data from over 2000 brains and over 1000 plasma samples (across all stages of AD) and made them widely available to researchers; developed network models of disease pathways/targets; and nominated over 100 novel candidate targets. In addition, the newly nominated targets and associated data and analyses have also been made broadly available through the AGORA web-based interactive platform. This ground-breaking program was renewed in 2018.

One intriguing finding using brain banks and cohort studies participating in the AMP-AD consortium provides new evidence that viral species, particularly herpesviruses, may have a role in AD biology. Although these findings do not prove that the viruses cause the onset or progression of Alzheimer's, they do demonstrate how viral DNA sequences and activation of biological networks—the interrelated systems of DNA, RNA, proteins and metabolites—may interact with molecular, genetic and clinical aspects of Alzheimer's. NIA is planning a new initiative, to which the National Advisory Council on Aging has given concept approval, to encourage studies to answer whether microbial pathogens in AD represent a causal component of the disease and to invite research across a broad range of topics on mechanisms underpinning neurodegeneration in AD associated with microbial pathogens in the central nervous system.

**New Biomarkers for Detection, Diagnosis, and Treatment Monitoring**

Another area in which NIA has made tremendous progress is the identification and use of clinical, imaging, genetic, and biochemical biomarkers for early detection and tracking of AD/ADRD and for use tracking treatment efficacy in clinical trials. 2019 will mark the fifteenth anniversary of the establishment of the Alzheimer's Disease Neuroimaging Initiative (ADNI), a landmark public-private partnership. ADNI investigators have made major contributions to AD research, particularly in the areas of early detection and progression monitoring. For example, ten years ago, Alzheimer's disease could only be definitively diagnosed after the patient had died, because the only fully reliable diagnostic tool we had was examination of post-mortem brain tissue for the disease's characteristic amyloid plaques and tau tangles. Today, however, due in large measure to the work of ADNI scientists, we can diagnose Alzheimer's in living subjects using sophisticated neuroimaging techniques or by detecting tau and amyloid in the cerebrospinal fluid. These breakthroughs have had and will continue to have important implications on researchers' ability to counsel patients with symptoms of dementia, help them manage their symptoms, and recommend appropriate clinical trials. A critical aspect of this initiative is its innovative data-access policy, which provides all data without embargo to all scientists in the world. More than 53 million data downloads from ADNI servers have been executed by investigators around the world, and ADNI also makes biosamples available to scientists globally.

Although groundbreaking and undeniably effective, brain imaging and cerebrospinal fluid analysis are both cumbersome and expensive. NIA-supported researchers are currently working to develop blood tests that detect amyloid-β, a pathological hallmark of Alzheimer's, and other AD-related entities in the blood and plasma. In one study, NIA-supported investigators found that measuring the ratio of Aβ42/Aβ40 (subtypes of amyloid β) in blood plasma may be one such inexpensive, minimally invasive test. Elsewhere, investigators with the NIA Intramural Research Program developed a novel framework to identify brain and blood metabolites associated with disease pathology and progression in prodromal and preclinical AD as potential disease biomarkers.

**From Target to Treatment**

NIA supports a number of initiatives to make the often fraught journey from target or biomarker identification to compound development to animal testing to evaluation in humans as seamless as possible. For example, one of the major reasons for the high failure rate of AD drugs in the clinic is the poor predictive power of studies in AD transgenic mouse models. To address this obstacle, NIA launched the MODEL-AD Consortium, which aims to develop some 50 new transgenic models based on genetic risk factors for late-onset AD and make them available to researches from academia and industry for use in basic research and therapy development. The Consortium has already created models incorporating some of the most common genetic mutations found in sporadic late-onset disease. Researchers supported by the NIA are also using human induced pluripotent stem cells—stem cells that are generated directly from adult cells and that can be induced to develop into different types of cells—to define the molecular function of identified risk genes for AD and to build 3-dimensional tissue models of brain cell interactions. These assays are also being used to screen large numbers of potential therapeutic compounds in a remarkably short period of time.

As potential treatments and treatment targets emerge from laboratory and model studies, it can be challenging for scientists to decide which compounds to test—and how to test them. NIA is investing in bringing to light data from preclinical efficacy testing studies (published and unpublished) by creating the Alzheimer's Disease Preclinical Efficacy Database (AlzPED). AlzPED is a publicly available and searchable data resource designed to improve transparency in

reporting and reproducibility and translatability of animal model efficacy testing studies. The database hosts curated summaries of published studies (over 600 published studies curated to date) and provides easy access to information on: study design methods and outcomes, animal models, therapeutic agents, therapeutic targets, patents and related clinical trials. It also provides a platform for creating citable reports/preprints of unpublished studies, including studies with negative findings. In addition to being a valuable resource for academic and industry researchers and data scientists, AlzPED also provides NIH and other funding organizations with a tool for enforcement of requirements for transparent reporting and rigorous study design.

New challenges arise when a compound is ready to move from animal into human testing. Basic researchers may lack the resources or know-how to move promising compounds into clinical trials; biopharmaceutical companies may be reluctant to invest in neurotherapeutics development because there are few clinically validated targets or strategies, there is a long track record of failure, and many nervous system disorders affect relatively small populations.

To help meet these challenges, NIA participates in the NIH Blueprint Neurotherapeutics Network (BPN), which provides support for small molecule drug discovery and development. Through this and other initiatives, NIA supports a robust preclinical-early clinical drug development program for AD/ADRD. Over 30 novel AD/ADRD drug candidates are currently in different stages of late preclinical and early clinical development for over a dozen different targets (non-Aβ; non-tau). From 2012- 2016 NIA and BPN supported the biotech firm Tetra Discovery Partners for a program aimed at developing BPN14770, which is designed to treat behavior and cognition in Fragile X Syndrome, and memory loss in early-to-moderate AD patients. The compound has successfully completed Phase 1 testing, is now in Phase 2 clinical testing for Fragile X Syndrome and is poised enter Phase 2 testing for early AD in 2019.

At present, over 40 compounds are currently under study for the prevention and treatment of AD, mild cognitive impairment, and age-related cognitive decline. NIH also supports approximately 140 clinical trials, including both pilot and large-scale trials, of a wide range of interventions to prevent/slow/treat AD and/or cognitive decline. Over 60 of these studies are testing non-pharmacological interventions, including but not limited to diet, exercise, and cognitive training.

Other investigators are exploring the application of treatments already in use for other conditions. For example, one researcher recently conducted a small clinical trial of deep brain

stimulation (DBS), an effective therapy in the treatment of Parkinson's disease, in patients with AD. Although this study failed to show benefit in individuals under 65, additional analyses in individuals over the age of 65 showed a potential slowing of cognitive decline. These results indicate that DBS may be beneficial in late-, but not early-onset AD. The National Advisory Council on Aging (NACA) recently granted concept approval for an FOA supporting research on other noninvasive brain stimulation approaches to treat AD/ADRD. Elsewhere, NIA-supported investigators found that a form of vitamin B3 prevented neurological damage and showed cognitive benefits in a mouse model of AD; other investigators found that people with mild cognitive impairment (MCI), often a precursor to AD, who took metformin, a safe and commonly-used diabetes drug, performed better on some cognitive tests (although not others) than MCI patients who did not take the drug—results that justify further study of this widely-used agent.

To ensure that the benefits of participation in AD/ADRD clinical trials are broadly available to diverse populations, last year NIA established its National Strategy for Recruitment and Participation in Alzheimer's and Related Dementias Clinical Research. The National Strategy was developed with facilitation by the Alzheimer's Association and the expertise and insights of government, private, academic, and industry stakeholders, as well as individuals, caregivers, and study participants. It represents the culmination of more than two years of dedication and work to outline practical, proactive approaches to help study sites engage a wider, more diverse number of volunteers. In another NIA-supported initiative, the Global Alzheimer's Platform Trial-Ready Cohort for Preclinical/Prodromal Alzheimer's Disease, NIA is working with the Global Alzheimer's Platform Foundation to recruit a large number of "trial-ready" potential participants at high risk of developing AD/ADRD. Investigators anticipate that this approach will markedly shorten recruitment timelines, potentially from years to months.

A new, NIA-funded Alzheimer's Clinical Trial Consortium (ACTC) will help investigators harness best practices and latest methods for Alzheimer's trials. The ACTC includes 35 sites in the United States and will address the complexity, time, and expense of participant recruitment and site activation to find new and effective ways to treat or prevent these devastating disorders. It will also provide needed infrastructure in areas such as imaging, biostatistics, and data management.

**"Until There Is a Cure, There Is Care"**

I would also like to report on progress toward the equally compelling goal of expanding research on care and caregiving interventions in the area of Alzheimer's and related dementias. This field of research has grown tremendously over the past several years, and some programs have already begun to be disseminated into more widespread use. For example, the REACH II (Resources for Enhancing Alzheimer's Caregiver Health) caregiver intervention, originally supported by the NIA, has been demonstrated to be effective in an ethnically diverse population and is currently being translated more broadly through the Department of Veterans Affairs. Centers in fifteen states are participating in this effort, and modifications are underway to extend the intervention to caregivers of veterans with traumatic brain and spinal cord injury. The Indian Health Service (IHS) is also pilot testing the program with several Tribal Nations sites through the IHS and Administration for Community Living.

Other care-related interventions exist for which additional data and evaluation are needed. To provide a comprehensive assessment of evidence for effectiveness of interventions studied to date, including REACH II, the NIA has entered into an interagency agreement with the Agency for Healthcare Research and Quality to support an Evidence-based Practice Center (EPC) in conducting a systematic review of the relevant science and issuing findings on these topics. The NIA has also contracted with the National Academies of Sciences, Engineering, and Medicine to establish a committee of experts that will assess the EPC's evidence review in the context of a range of other data, identify research gaps, and issue recommendations that will inform future research and practice.

Although some progress has been made in these areas, the critical need for further research around care and services for persons with dementia and their caregivers led NIA, along with the DHHS Office of Women's Health and Office of the Assistant Secretary for Planning and Evaluation and several private organizations, to convene the first National Research Summit on Dementia Care in October 2017. The goal of this seminal meeting was to identify research directions for accelerating improvements in comprehensive care, services, and supports for persons with dementia, families, and other caregivers. The Summit yielded 58 final recommendations across multiple areas of research. NIA has used those recommendations to set

milestones for future research focus and priority-setting, and leads an NIH-wide effort to address these milestones through funding initiatives targeting specific research priorities.

For example, FOAs directed at the small business community soliciting applications for research on socially assistive robots and other assistive technologies for persons with dementia and their caregivers have led to the ongoing development of home technologies to sustain the ability of persons with dementia to dress themselves; a non-invasive sensor that both detects difficulty swallowing and helps re-train the person with dementia to swallow safely, reducing the individual's risk of food aspiration; and a friendly robotic "coach" that encourages people with MCI to exercise.

Other investigators are testing the ability of web-based and distance learning interventions to improve the health and well-being of dementia caregivers, who may be isolated by geography or circumstance. And this year the NIA will expand the Edward R. Roybal Centers for Translational Research in the Behavioral and Social Sciences of Aging to include 6-8 new Centers focused on translation of interventions to improve dementia care and support for caregivers.

Recently, NIA released a new FOA aiming to improve care for persons with dementia and their caregivers through health systems. Through the Alzheimer's Disease and Alzheimer's Disease-Related Dementias Health Care Systems Research Collaboratory, NIA will support a center for collaborative research within and among health and long-term care systems to encourage pragmatic trials of innovative dementia care. The Collaboratory will build investigator capacity, support AD/ADRD pragmatic trial design, and maintain the resource and knowledge base for AD/ADRD pragmatic trials.

Another upcoming NIA initiative, recently approved in concept by NACA, is an FOA on Home and Community-Based Services (HCBS). Community-based services—that is, services obtained in the community versus nursing homes or other residential long-term care facilities—can provide needed assistance and respite to overwhelmed family members of persons with dementia, but significant barriers to their use may exist. For example, a caregiver may lack the resources to pay for community-based services, or be unable to transport a loved one with dementia to an adult day program, or be subject to insurance caps limiting how long or how often a service may be used. This FOA will address gaps in our understanding of these barriers and the degree to which they affect use of non-residential services. Research funded under this FOA will

also help us to better understand what services are being utilized in the community, as well as outcomes associated with varied use of services accounting for needs of diverse populations, including those who live alone.

In addition, in September 2018, NIA launched the Improving Care for People with Alzheimer's Disease and Related Dementias Using Technology (iCare-AD/ADRD) Challenge. This Eureka prize competition seeks to spur the development of technology applications to improve dementia care coordination and/or care navigation, as part of the implementation of the 21st Century Cures Act. Up to $400,000 in cash prizes may be awarded to teams or individuals that successfully complete in the challenge. Entries will be accepted through June 30, 2019.

**Recruiting New Talent**

A final point that I'd like to make is that the explosion in research opportunities has required us to reach out to the best and brightest scientific minds in the nation and motivate them to turn their considerable talents to the challenges of AD/ADRD. We have been particularly successful in encouraging young investigators as well as established investigators not previously focusing on AD/ADRD to apply for AD/ADRD-related research funding. An internal NIA analysis showed that between 2015 and 2018, over a quarter of the Institute's Research Project Grant (R01) equivalent AD/ADRD awardees were either NIH-designated New Investigators (i.e., this was their first competitive NIH grant) or Early-Stage Investigators (not only was this their first competitive NIH grant, but they were also within 10 years of their terminal degree). Over a third of the R01 AD/ADRD awardees had not previously applied for AD/ADRD funding from NIH – half of whom were established investigators previously pursuing other lines of research. We anticipate that the success of these investigators in securing funding will ensure an active pipeline of energetic researchers looking at AD/ADRD from new perspectives for years to come.

NIA also released a notice in 2018 inviting researchers holding non-AD/ADRD grants from other NIH Institutes and Offices to apply for supplemental funding for new research that was relevant to both AD/ADRD and the topic of their research grant. The response was tremendous. Over 300 supplements were awarded to investigators representing some 25 NIH Institutes, Centers, and Offices, broadening the spectrum of research and inspiring investigators

to think creatively about how their area of study could interface successfully with research on AD/ADRD. A few of these research topics included:

- A study to evaluate the effects of alcohol drinking on AD-linked neural and behavioral pathologies in a mouse model (National Institute on Alcohol Abuse and Alcoholism)
- A gene-environment study of the association between early-life exposure to air pollutants and later-life development of AD-related pathology (National Institute of Environmental Health Sciences)
- A study examining the interrelationships among psychosocial stress due to discrimination, markers of vascular risk, and cognitive function in early middle-aged African-American women (National Heart, Lung, and Blood Institute)
- A study to identify trends in infection management and palliative care in facility-bound AD/ADRD patients at the end of life (National Institute of Nursing Research)
- Validation of a novel biomarker—changes in blood flow, as determined by neuroimaging—to measure AD initiation and progression (National Institute of Neurological Disorders and Stroke)

This highly successful program has been repeated in FY 2019.

The past five years have been an era of unprecedented growth and discovery for AD/ADRD. The most highly-anticipated discovery of all—an effective treatment or preventive intervention for these diseases—remains in the future. This future can't arrive quickly enough for the millions of Americans who are afflicted today, but I believe that working together in partnership, the scientific, advocacy, patient, and legislative communities will get there.

This concludes my testimony, and I welcome your questions.

## Statements for the Record

**Alzheimer's Association and Alzheimer's Impact Movement Statement for the Record**

**United States Senate Special Committee on Aging**
**Hearing on "Alzheimer's: New Directions in Biomedical Research and Caregiving"**

**April 2, 2019**

The Alzheimer's Association and Alzheimer's Impact Movement (AIM) appreciate the opportunity to submit this statement for the record for the Senate Special Committee on Aging's hearing entitled "Alzheimer's: New Directions in Biomedical Research and Caregiving." The Association and AIM thank the Committee for its continued leadership on issues important to the millions of people living with Alzheimer's and related dementias and their caregivers. This statement provides an overview of our 2019 top policy priorities, including increased Alzheimer's research funding, full funding for the Building Our Largest Dementia (BOLD) Infrastructure for Alzheimer's Act (P.L. 115-406), the Improving Health Outcomes, Planning, and Education (HOPE) for Alzheimer's Act (S.880/H.R.1873), and the Younger Onset Alzheimer's Disease Act (S.901/H.R. 1903).

Founded in 1980, the Alzheimer's Association is the world's leading voluntary health organization in Alzheimer's care, support, and research. Our mission is to eliminate Alzheimer's and related dementias through the advancement of research; to provide and enhance care and support for all affected; and to reduce the risk of dementia through the promotion of brain health. The Alzheimer's Impact Movement is the Association's sister organization, working in strategic partnership to make Alzheimer's a national priority. Together, the Alzheimer's Association and AIM advocate for policies to fight Alzheimer's disease, including increased investment in research, improved care and support, and development of approaches to reduce the risk of developing dementia.

**Alzheimer's Research Funding**

According to a study funded by the National Institutes of Health (NIH) and published in the *New England Journal of Medicine,* Alzheimer's is the most expensive disease in the United States. In 2019, the United States will spend $290 billion caring for individuals with Alzheimer's and other dementias, with $195 billion of that amount paid by Medicare and Medicaid. Unfortunately, our work is only growing more urgent. More than 5 million Americans are living with Alzheimer's and, without significant action, nearly 14 million Americans will have Alzheimer's by 2050, costing the nation over $1 trillion dollars (not adjusted for inflation).

After the unanimous passage and enactment of the bipartisan National Alzheimer's Project Act (NAPA) (P.L. 111-375) in the 111th Congress, the Alzheimer's Association has dedicated its chapters, advocates, and the entire organization to support a robust, achievable, and accountable strategy in the *National Plan to Address Alzheimer's Disease*. To achieve the primary research goal of the *National Plan to Address Alzheimer's Disease* of preventing and effectively treating Alzheimer's by 2025, Congress enacted the Alzheimer's Accountability Act as part of the Fiscal Year 2015 omnibus appropriations bill (P.L. 113-235) to require the scientists at the NIH to submit an annual Alzheimer's research budget proposal directly to Congress. This budget proposal – officially known as a "Professional Judgment Budget" – specifies the resources that scientists need to fulfill the research goal of the *National Plan to*

*Address Alzheimer's Disease*. The Alzheimer's Association and AIM urge Congress to fund the promising research targets outlined in the Professional Judgment Budget by supporting an additional $350 million for Alzheimer's funding at NIH in FY 2020.

**BOLD Infrastructure for Alzheimer's Act (P.L. 115-406)**

As scientists continue to search for a way to prevent, cure, or slow the progression of Alzheimer's through medical research, public health plays an important role in promoting cognitive function and reducing the risk of cognitive decline. Investing in a nationwide Alzheimer's public health response will help create population-level improvements, achieve a higher quality of life for those living with the disease and their caregivers, and reduce associated costs.

Congress overwhelmingly recognized Alzheimer's as an urgent public health crisis through the enactment of the bipartisan Building Our Largest Dementia (BOLD) Infrastructure for Alzheimer's Act. This important law will create an Alzheimer's public health infrastructure across the country to implement interventions focused on increasing early detection and diagnosis, reducing risk, preventing avoidable hospitalizations, reducing health disparities, meeting the needs of caregivers, and supporting care plan management. The law will accomplish these priorities by establishing Alzheimer's and Related Dementias Public Health Centers of Excellence; providing funding to state, local, and tribal public health departments; and increasing data analysis and timely reporting.

The Alzheimer's Association and AIM thank the Committee for its efforts to address the growing Alzheimer's public health crisis, including last year's hearing, "Changing the Trajectory of Alzheimer's: Reducing Risk, Detecting Early Symptoms, and Improving Data." We urge Congress to fully fund the authorization in BOLD with $20 million for the Centers for Disease Control and Prevention in FY 2020.

**Improving HOPE for Alzheimer's Act (S.880/H.R.1873)**

For the millions of families affected by Alzheimer's, care planning is essential to accessing medical and non-medical treatments, clinical trials, and support services available in their communities. These important services not only result in a higher quality of life for people living with the disease and their caregivers, but they can result in fewer hospitalizations, fewer emergency room visits, and better medication management. The Centers for Medicare & Medicaid Services (CMS) began reimbursing Medicare clinicians for care planning sessions for people with cognitive impairment in 2017. However, many medical providers, patients, and caregivers are not aware of this resource. In 2017, the first year the care planning reimbursement code was available, fewer than 1% of seniors living with Alzheimer's received this crucial care planning benefit.

The Improving HOPE for Alzheimer's Act directs CMS to implement a provider education campaign to educate Medicare clinicians on available Alzheimer's and related dementia care planning services. This will give clinicians the knowledge and tools to better help their patients and families living with dementia. The legislation also requires the Department of Health and Human Services (HHS) to send a report to Congress on the provider outreach conducted, the utilization rates of the care planning code, and any access barriers to care planning services Medicare beneficiaries encounter. Thank you to Chairman Collins for her leadership on this bill.

Alzheimer's Association and AIM urge Congress to enact the bipartisan Improving HOPE for Alzheimer's Act.

**Younger Onset Alzheimer's Disease Act (S.901/H.R. 1903)**

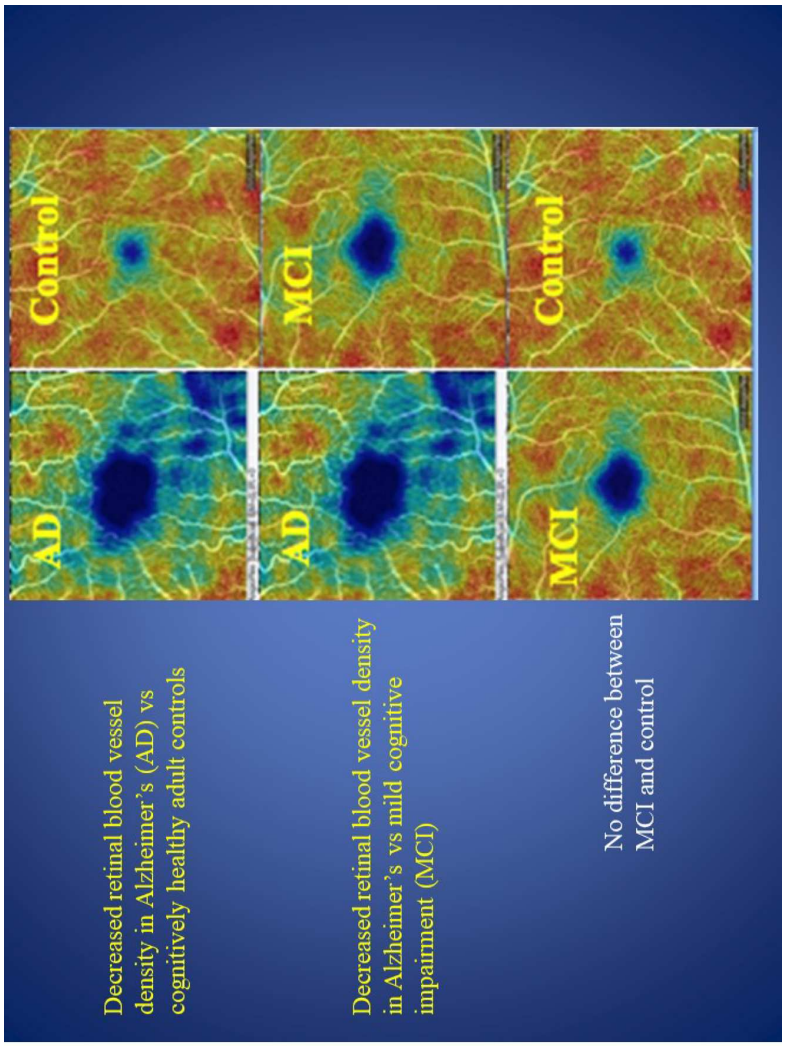
Approximately 200,000 Americans under the age of 65 are living with younger-onset Alzheimer's and related dementias. These individuals face unique challenges when it comes to managing the disease, their families, work, and finances. They may be parenting young children at home or working as the primary income provider for their families. Due to their young age, they may have more trouble receiving an early and accurate diagnosis, and even family and friends may question that diagnosis. The stigma associated with younger-onset Alzheimer's can have a significant impact on their well-being and quality of life.

The services and supports available to older Americans living with Alzheimer's are vast compared to those available to the younger-onset population. For example, under the Older Americans Act (OAA), individuals over the age of 60 are able to access helpful programs related to support services and respite care through the National Family Caregiver Support Program. These programs would have a meaningful impact on the lives of Americans living with younger-onset if they were able to access them. The bipartisan Younger-Onset Alzheimer's Disease Act would expand eligibility under OAA to allow this population to access these important services. Additionally, the legislation requires the Assistant Secretary for Aging to submit a report to Congress about Alzheimer's-related programs and program performance, and identify any gaps in the programs for the unique needs of individuals living with younger-onset Alzheimer's disease. The Alzheimer's Association and AIM are thankful to Chairman Collins, Ranking Member Casey, Senator Jones and Senator Capito for their leadership of this important legislation. The Alzheimer's Association and AIM urge Congress to enact the bipartisan Younger-Onset Alzheimer's Disease Act.

**Conclusion**

The Alzheimer's Association and AIM appreciate the steadfast support of the Committee and its continued commitment to advancing policies important to the millions of families affected by Alzheimer's and related dementias and their caregivers. We look forward to working with the Committee and other members of Congress in a bipartisan way to increase Alzheimer's research funding, provide full funding for the Building Our Largest Dementia (BOLD) Infrastructure for Alzheimer's Act (P.L. 115-406), enact the Improving Health Outcomes, Planning, and Education (HOPE) for Alzheimer's Act (S.880/H.R.1873), and enact the Younger-Onset Alzheimer's Disease Act (S.901/H.R. 1903).

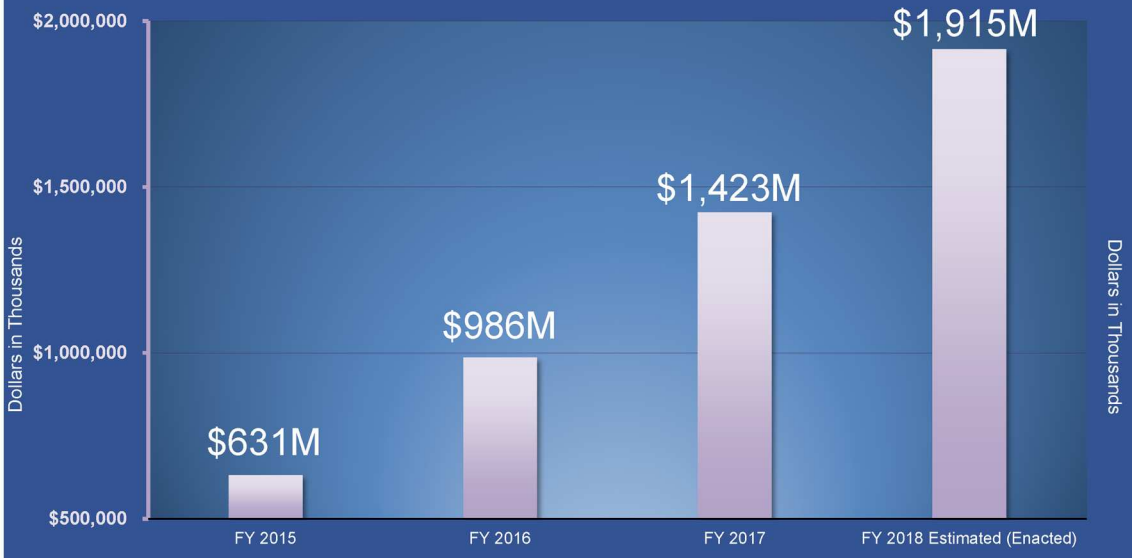
**Slide presented by Dr. Fekrat, M.D., Professor of Ophthalmology and Associate Professor of Surgery**



**Slides presented by Dr. Hodes, M.D.,Director of National Institute on Aging and National Institutes of Health**

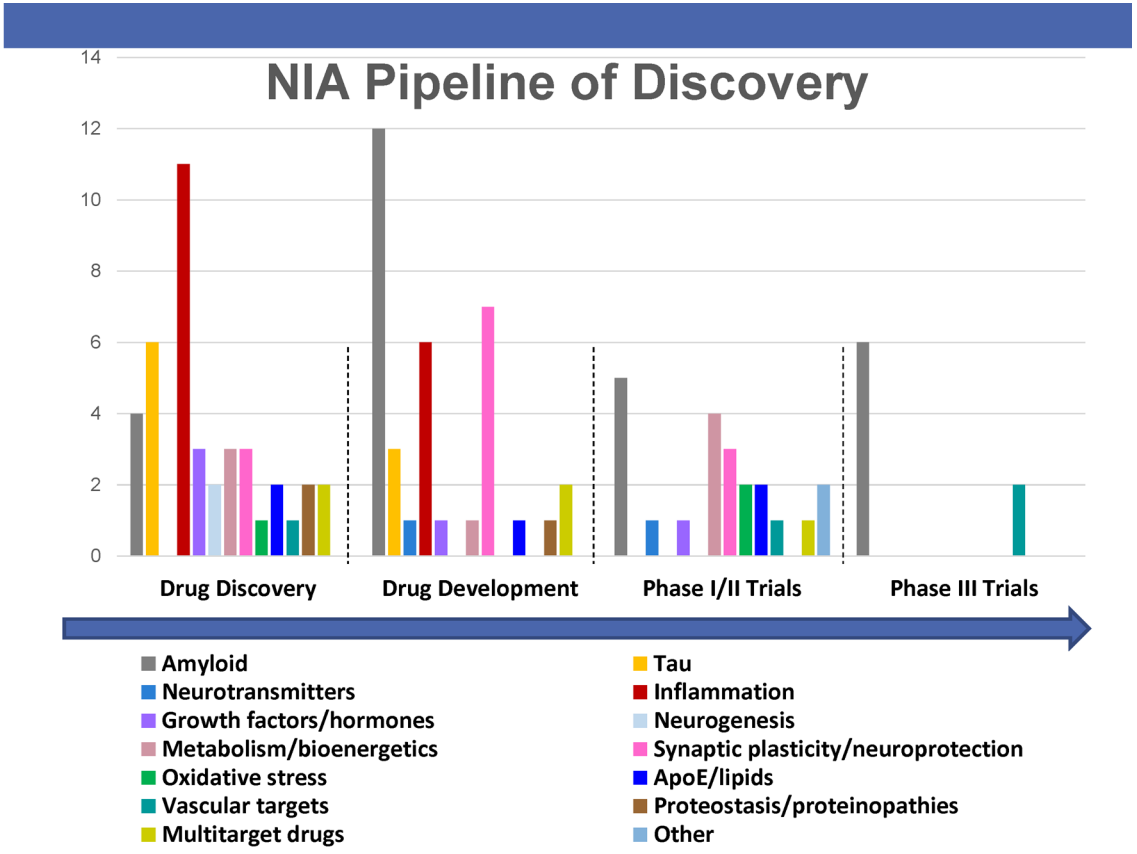
# AD and Related Dementias (AD/ADRD) Research

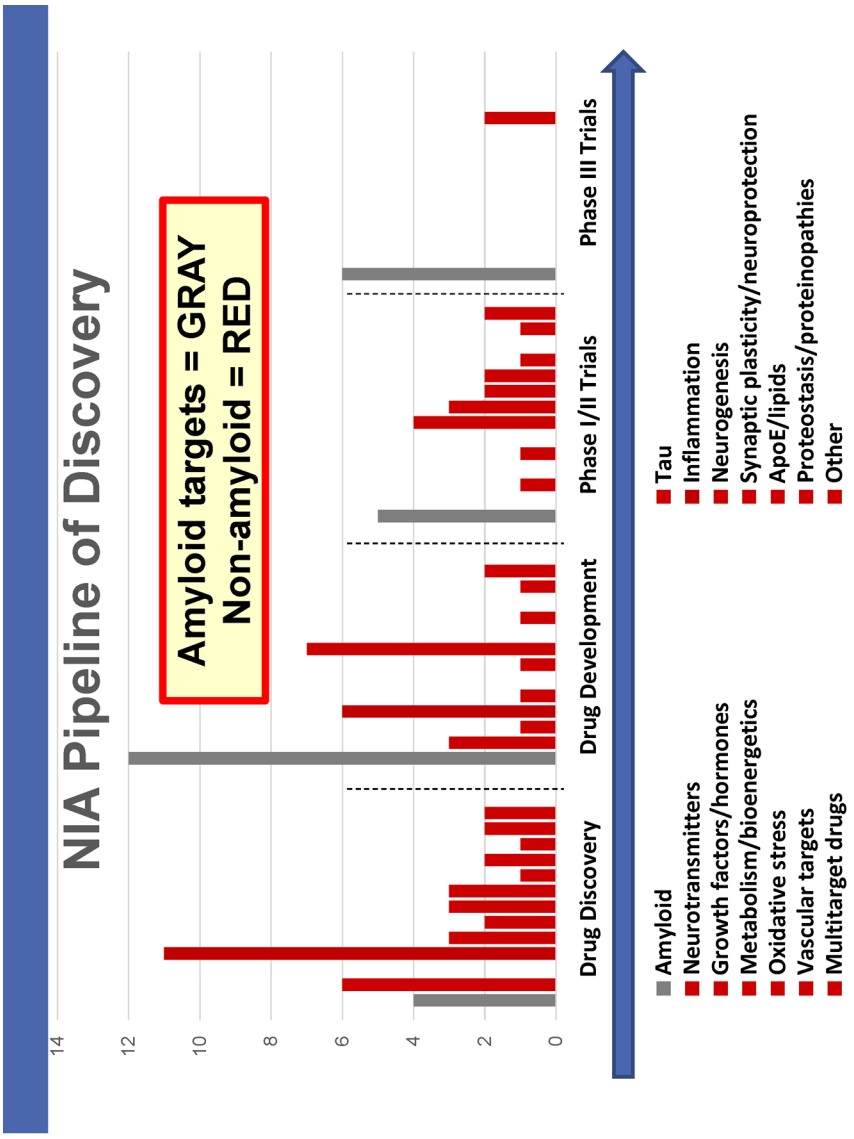
## *How Much Are We Spending?*




NIH Funding to AD/ADRD Has Increased Three Fold!

*FY19 Funding includes an Additional $425M for AD/ADRD*

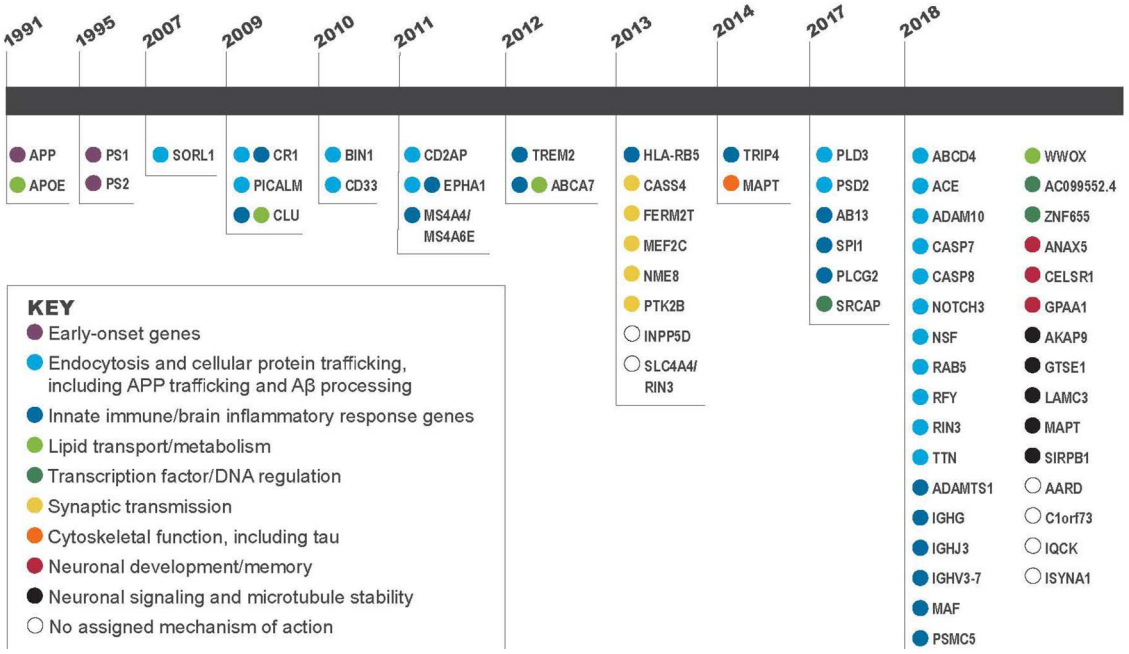

NIA Pipeline of Discovery
14
12
10
8
6
4
2
0
Drug Discovery
Drug Development
Phase I/II Trials
Phase III Trials
Amyloid
Tau
Neurotransmitters
Inflammation
Growth factors/hormones
Neurogenesis
Metabolism/bioenergetics
Synaptic plasticity/neuroprotection
Oxidative stress
ApoE/lipids
Vascular targets
Proteostasis/proteinopathies
Multitarget drugs
Other


NIA Pipeline of Discovery
Amyloid targets = GRAY
Non-amyloid = RED
14
12
10
8
6
4
2
0
Drug Discovery
Drug Development
Phase I/II Trials
Phase III Trials
Amyloid
Neurotransmitters
Growth factors/hormones
Metabolism/bioenergetics
Oxidative stress
Vascular targets
Multitarget drugs
Tau
Inflammation
Neurogenesis
Synaptic plasticity/neuroprotection
ApoE/lipids
Proteostasis/proteinopathies
Other

# Genetic Regions of Interest in Alzheimer's Disease

By year of discovery

NOTE: Color indicates mechanism of action in the body. See key below.



## Accelerating Caregiving Research

- Multiple funding solicitations
- 2017 & 2020 care/caregiving research summits
- AD/ADRD Health Care Systems Research Collaboratory
- Systematic review of care/caregiving interventions
- NIA's first Alzheimer's prize