Annual Report

Grant Year 10, 2018-2019

Wisconsin Alzheimer's Disease Research Center
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH

Hector Salazar, outreach and recruitment specialist, offers an attendee educational materials during the Wisconsin ADRC's Annual Fall Lecture.

Who We Are

The Wisconsin Alzheimer's Disease Research Center (ADRC) combines academic, clinical, and research expertise from the UW School of Medicine and Public Health and the Geriatric Research, Education and Clinical Center (GRECC) of the William S. Middleton Memorial Veterans Hospital in Madison, Wisconsin. Founded in 2009, the ADRC receives funding from private, university, state, and national sources, including a National Institutes of Health/National Institute on Aging grant for Alzheimer's Research Centers (P30-AG534255).

What We Do

The Wisconsin ADRC provides infrastructure and promotes collaboration for Alzheimer's disease research and scientist training at UW-Madison. The center also educates research participants and the general public on the latest news and updates concerning Alzheimer's disease research, prevention, and care.

Get Involved

There are several ways you can get involved in our work and support our center. Volunteer to be a study participant, attend one of our public events, listen to our *Dementia Matters* podcast, follow us on social media, or make a financial contribution through the UW Foundation's Initiative to End Alzheimer's.

Cover:
Luigi Puglielli, MD, PhD, working in his lab, where he conducts basic science research into how and why neurodegeneration occurs.

Stay connected!

Wisconsin Alzheimer's Disease Research Center
600 Highland Avenue, MC2420
Madison, Wisconsin 53792
adrc.wisc.edu

Director's Message

This year marks the 10th anniversary of the founding of the Wisconsin Alzheimer's Disease Research Center (ADRC). Established through a grant from the National Institutes on Aging (NIA), the center is one of only 32 NIA-supported Alzheimer's Disease Centers in the country. This national network of scientists is working toward the common goal of finding a cure for Alzheimer's disease.

At the Wisconsin ADRC, our investigators support the national strategy on several fronts. They are focused on early detection of the disease, identifying prevention strategies, and developing research programs that include groups of people who are traditionally underrepresented in research.

Our recent 5-year center renewal grant from the NIA will allow us to expand our program even further. Our new Biomarker Core is focused on understanding how Alzheimer's disease transitions from its preclinical stage to the point in the disease when patients experience noticeable cognitive changes. A first-of-its-kind Care Research Core will identify improved treatments for people living with the disease and their caregivers. Another new area the renewal grant will support is the Research Education Component, which I believe will help us establish the University of Wisconsin as an internationally recognized destination for training academic Alzheimer's disease scientists and doctors.

We are extremely fortunate that our center and its investigators have been successful in winning federal grants to support their work, but our center cannot run on grants alone. We receive funding from the UW School of Medicine and Public Health, the state, private organizations, associations and foundations, and monetary donations. These dollars offer us the flexibility to test new ideas and support our educational outreach programs.

This Annual Report serves as a review of our Grant Year 10 accomplishments, as well as a look at the center's new initiatives. Every way in which research participants, philanthropic donors, and other supporters contribute to our program can be seen throughout this report. We could not do our work without you. Thank you.

Sanjay Asthana, MD
Duncan G. and Lottie H. Ballantine Chair in Geriatrics
Associate Dean for Gerontology
Director, Wisconsin ADRC and Madison VA GRECC
UW School of Medicine & Public Health

Investigators & Affiliate Faculty

Andy Alexander, PhD
Department of Medical Physics

Sanjay Asthana, MD*†
Department of Medicine
Division of Geriatrics and Gerontology

Craig Atwood, PhD
Department of Medicine
Division of Geriatrics and Gerontology

Jill Barnes, PhD
Department of Kinesiology

Barbara Bendlin, PhD*
Department of Medicine
Division of Geriatrics and Gerontology

Cynthia Carlsson, MD, MS*
Department of Medicine
Division of Geriatrics and Gerontology

Rick Chappell, PhD*
Department of Statistics

Nathaniel Chin, MD
Department of Medicine
Division of Geriatrics and Gerontology

Brad Christian, PhD
Department of Medical Physics

Lindsay Clark, PhD
Department of Medicine
Division of Geriatrics and Gerontology

Joshua Coon, PhD
Department of Chemistry

Corinne Engelman, MSPH, PhD
Department of Population Health Sciences

Dorothy Farrar-Edwards, PhD*
Department of Kinesiology
Department of Medicine

Catherine Gallagher, MD
Department of Neurology

Andrea Gilmore-Bykovskyi, PhD, RN
School of Nursing

Carey Gleason, PhD, MS*
Department of Medicine
Division of Geriatrics and Gerontology

Sterling Johnson, PhD*‡
Department of Medicine
Division of Geriatrics and Gerontology

Amy Kind, MD, PhD*
Department of Medicine
Division of Geriatrics and Gerontology

Frank Koresec, PhD
Department of Radiology

Yue Ma, PhD
Department of Medicine
Division of Geriatrics and Gerontology

Kimberly Mueller, PhD, CCC-SLP
Department of Communication Sciences and Disorders

Ozioma Okonkwo, PhD
Department of Medicine
Division of Geriatrics and Gerontology

Robert Przybelski, MD
Department of Medicine
Division of Geriatrics and Gerontology

Luigi Puglielli, MD, PhD
Department of Medicine
Division of Geriatrics and Gerontology

Nicole Rogus-Pulia, PhD, CCC-SLP
Department of Medicine
Division of Geriatrics and Gerontology

Howard Rowley, MD
Department of Radiology

Subhojit Roy, MD, PhD*
Department of Pathology and Laboratory Medicine

Shahriar Salamat, MD, PhD
Department of Pathology and Laboratory Medicine

Robert Sanders, MD
Department of Anesthesiology

Susanne Seeger, MD
Department of Neurology

Manish Shah, MD, MPH
Department of Emergency Medicine

Vikas Singh, PhD
Department of Biostatistics and Medical Informatics

Art Walaszek, MD
Department of Psychiatry

* Core leader
†Director
‡Associate Director

Early Diagnosis through Cutting-edge Science

Biomarkers are the new frontier of Alzheimer's disease research. Our investigators are using biomarkers collected through brain imaging and cerebrospinal fluid to establish early diagnosis techniques and to better understand disease progression.

Sterling Johnson, PhD, Wisconsin ADRC associate director and leader of the Biomarker Core, offers a presentation on the evolution of brain imaging to an audience of research participants.

Redefining Alzheimer's Disease

In the last decade, scientists have discovered that Alzheimer's disease is a much longer disease than previously thought. Using biomarker studies, they found Alzheimer's disease-related brain changes can start more than a decade before people recognize the clinical symptoms, such as memory loss, a decline in thinking skills, and personality changes. Through this work, scientists have defined both preclinical and clinical stages of Alzheimer's disease.

The new Biomarker Core will combine and expand the Wisconsin ADRC's brain imaging and cerebrospinal fluid collection programs under one biomarker research strategy. Biomarker studies help researchers diagnose preclinical Alzheimer's disease and track its rate of progression. The ability to measure early disease is a major key to prevention, because researchers believe medicines or lifestyle changes will be most effective before symptoms start.

Culturally Tailored Research Programs

Alzheimer's disease is more prevalent among African Americans and Native Americans, with some studies showing twice the risk for the disease among people in these groups. The Wisconsin ADRC is dedicated to ensuring developing treatments and prevention strategies will help everyone, regardless of racial and ethnic background, through its Inclusion of Underrepresented Groups Core.

Engaging the African American Community

Over the last decade, researchers and recruitment staff at the Wisconsin ADRC have engaged a diverse population of research participants for its studies — 25 percent of participants in the Clinical Core longitudinal study are from groups traditionally underrepresented in research. Center staff accomplished this by partnering with community groups who provide advice and guidance to ensure that research practices are respectful and responsive.

Several center-sponsored programs keep current research participants engaged and also give back to Madison's African American community. These programs include free exercise classes, beginner computer education, and a special research participation appreciation event. The largest center-sponsored celebration of brain health in African Americans is the Solomon Carter Fuller Brain Health Brunch, named in honor of the first African American psychiatrist and a scientist who trained and worked with Dr. Aloise Alzheimer.

The 2019 Solomon Carter Fuller Brain Health Brunch included a community breakfast, educational resources, tips for caregivers, a healthy cooking demonstration, and a performance by the "Amazing Grace" chorus, a musical group made up of people with dementia and their caregivers.

Building Tribal Partnerships

In 2016, the Wisconsin Alzheimer's Disease Research Center held its first memory screening event at the Oneida Nation community center in Oneida, Wisconsin. Since then, the Wisconsin ADRC has forged a partnership with the Oneida tribe to raise awareness of Alzheimer's disease and related dementias in Native American people.

Last year, the partnership expanded beyond the Oneida Nation when the Wisconsin Partnership Program awarded Wesley Martin Jr., chair of the Great Lakes Native American Elder Association (GLNAEA), a Community Catalyst Grant. With the Wisconsin ADRC, GLNAEA sponsors quarterly dementia education events in tribal communities. The events provide education about dementia in Indian Country and promote access to resources supporting families affected by dementia.

Carey Gleason, PhD,
Inclusion of
Underrepresented Groups
Core Leader

Dorothy Farrar-Edwards, PhD,
Inclusion of
Underrepresented Groups
Core Co-leader

Attendees at a recent Dementia in Indian Country event at the Lac Courte Oreilles Sevenwinds Conference Center in Hayward, Wisconsin, pick up health education materials at a Wisconsin ADRC outreach booth.

Training for the Next Generation of Researchers

The Wisconsin ADRC created a new infrastructure to train the next generation of Alzheimer's disease scientists. Led by Barbara Bendlin, PhD, the Research Education Component (REC) will support education activities for learners at all levels, from high schoolers to early investigators.

3 Wisconsin ADRC graduate students are in the **Medical Scientist Training Program (MSTP)** at the UW School of Medicine and Public Health. MSTP provides integrated graduate training in scientific research and clinical medicine, leading to a combined MD-PhD degree.

5 Wisconsin ADRC graduate students are in the **Neuroscience Training Program**, which prepares students for careers in research and teaching. 10 ADRC investigators serve as program faculty or affiliates.

1 Wisconsin ADRC postdoctoral fellow studies on the NIH-supported **T32 training grant, Biology of Aging and Age Related Diseases**. Sanjay Asthana, MD, is PI on the grant, and 10 ADRC investigators serve as faculty trainers.

Meet the REC Scholars

The Wisconsin ADRC introduced its Research Education Component (REC) Scholars Program in April 2019. The goal of the REC Scholars Program is to identify exceptional junior investigators and support their educational and career development through intensive training, research support, and mentoring.

Andrea Gilmore-Bykovskyi, PhD, RN
Assistant Professor of Nursing
Career goal: Develop a clinical research program focused on improving Alzheimer's disease diagnosis as well as access to care and treatments, especially for high-risk and disadvantaged populations.

Nicole Rogus-Pulia, PhD, CCC-SLP
Assistant Professor of Medicine
Career goal: Utilize her training as a scientist and speech-language pathologist to develop an evidence-based treatment for dysphagia, or swallowing dysfunction, in patients with Alzheimer's disease.

Robert Sanders, MD, PhD
Assistant Professor of Anesthesiology
Career goal: Develop a better understanding of delirium and its relationship to dementia by introducing neuroimaging and cerebrospinal fluid biomarker research into his work.

Leveraging its expertise in geriatric medicine and the field of gerontology, the Wisconsin ADRC launched a unique Care Research Core, focused on improving health care for Alzheimer's disease patients and reducing caregiver stress.

Innovative Studies into Improved Patient Care

Amy Kind, MD, PhD, Care Research Core Leader, explains data points on a screen shot of the Neighborhood Atlas, a tool she and her research team developed that ranks neighborhood disadvantage in more than 69 million neighborhoods in the U.S. and Puerto Rico. The Neighborhood Atlas is free for anyone to use in research, program planning, and policy development, and can be an important resource for health care providers when developing care plans for patients.

Improving Health Care for Wisconsin's Aging Population

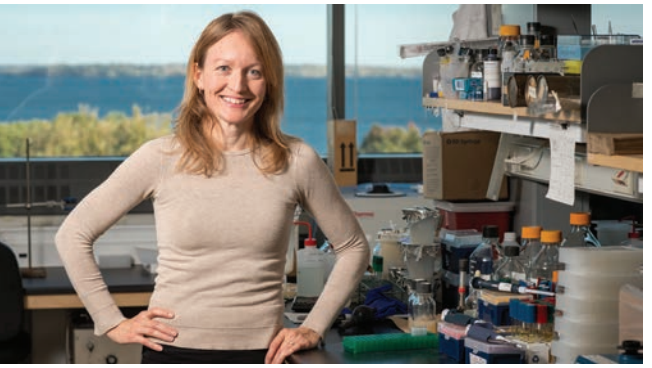
While the research community is desperately seeking effective treatments and prevention strategies for patients with Alzheimer's disease, those solutions will be too late for the nearly 6 million Americans currently living with the disease — 110,000 of them here in Wisconsin. The goal of the new Care Research Core is to improve health and quality of life for people with dementia and their caregivers. This unique program is the first of its kind among Alzheimer's disease research programs in the United States.

Care Research Core leaders and staff will facilitate research studies that examine health care quality, access, cost, and delivery. Based on these research findings, the team will work to integrate best practices and health care system improvements into hospitals, clinics, nursing homes, and other caregiving institutions across the state and beyond.

Funding Highlights from Grant Year 10

NIH Grants

Synapses are points in the brain where two brain cells connect and communicate. Scientists suspect it's the degeneration of these synapses that rob people of memories and abilities as Alzheimer's disease progresses, but it's an understudied field.



With a new R01 from the NIA, multi-PIs **Barbara Bendlin, PhD**, **Sterling Johnson, PhD**, and **Brad Christian, PhD**, will use longitudinal positron emission tomography (PET) imaging to learn how synaptic loss changes throughout the course of Alzheimer's disease. The study will examine people with and without Alzheimer's disease, as well as those at risk for the disease. This first-in-the-field research into synaptic change and its relationship to memory loss might one day lead to a new tool for early diagnosis of Alzheimer's disease.

SV2A PET Imaging in Alzheimer's Disease
9/30/2018 – 5/31/2023

Since 2007, the Wisconsin Registry for Alzheimer's Prevention (WRAP) has studied people who have at least one parent with Alzheimer's disease. Today the study has more than 1,500 research participants and is recognized as the largest family history study of Alzheimer's disease in the world. **Sterling Johnson, PhD**, PI of the WRAP study, received an R01 renewal grant from the NIA that will allow him to introduce biomarker research to WRAP and permit the study to collect brain imaging and spinal fluid samples from participants, which will contribute to the center's focus on biomarker research.

Wisconsin Registry for Alzheimer's Prevention (WRAP)
9/1/2018 – 6/30/2023

While a cure for Alzheimer's disease is the ultimate goal for medical and scientific communities, finding effective prevention strategies is an equally important achievement. **Ozioma Okonkwo, PhD**, has long studied the positive effects that fitness and physical activity have on brain health. A new R01 from the NIA will allow him to conduct a longitudinal study to see if cardiorespiratory fitness in midlife — when Alzheimer's disease-related changes begin to take place — delays the progression of brain changes or the development of clinical symptoms of the disease. Dr. Okonkwo's research will provide insight into using exercise as a viable preventive measure against Alzheimer's disease and as a way to delay the loss of memory and thinking skills.

Dr. Ozioma Okonkwo

Longitudinal Investigation of Cardiorespiratory Fitness and AD Biomarkers in an At-Risk Cohort
1/15/2019 – 11/30/2023

Difficulty swallowing is a common problem for people with Alzheimer's disease. This condition, called dysphagia, impacts a patient's quality of life and can lead to malnutrition and pneumonia. There are no rehabilitative treatments for dysphagia in people with Alzheimer's disease, but **Nicole Rogus-Pulia, PhD, CCC-SLP**, is developing one. She received a K23 from the National Institute on Aging to test whether tongue strengthening exercises and use of a saliva substitute can improve swallowing in people with Alzheimer's disease.

Dr. Nicole Rogus-Pulia uses a special device designed to strengthen tongue and throat muscles. Her research will determine whether these exercises improve swallowing function in Alzheimer's disease patients.

Novel Therapeutic Interventions for Patients with Alzheimer's Disease and Comorbid Dysphagia
09/01/2018 – 05/31/2023

Individuals from underrepresented backgrounds carry a higher risk for Alzheimer's disease; they are also underrepresented in research studies that aim to find treatments. **Andrea Gilmore-Bykovskyi, PhD, RN**, will assess recruitment strategies that encourage diverse populations to join Alzheimer's disease studies and help researchers ensure the work they are doing to find a cure for Alzheimer's disease will be a cure that works for everyone, regardless of racial and ethnic background or socioeconomic status.

Novel Approaches to Identifying and Engaging Disadvantaged Patients with AD in Clinical Research
09/01/2018 – 06/30/2023

Foundation Grant

The Alzheimer's Association named **Tobey Betthauser, PhD**, a postdoctoral fellow with the Wisconsin Alzheimer's Disease Research Center, recipient of a Research Fellowship to study advancements in medical brain imaging and their usefulness in early diagnosis of Alzheimer's disease. Dr. Betthauser will use positron emission tomography (PET) imaging and sensitive tests of mental performance to determine if early brain changes can predict when or if people go on to develop the clinical symptoms of Alzheimer's disease.

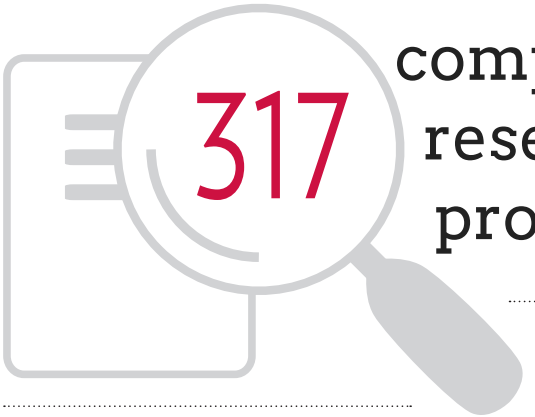
Wisconsin ADRC By the Numbers

The Wisconsin Alzheimer's Disease Research Center (ADRC) studies the causes, diagnosis, treatment, and prevention of Alzheimer's disease, as well as related topics such as caregiver stress and patient care. The following is a summary of our accomplishments since the center was formally established in April 2009 through March 31, 2019.

33
SCIENTISTS

50+
ACTIVE RESEARCH STUDIES IN BASIC SCIENCE AND CLINICAL RESEARCH

61
RESEARCH PAPERS PUBLISHED
last year



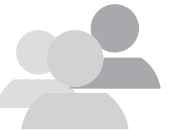
317
completed research projects

41
episodes of *Dementia Matters* podcast

40,880
episode downloads

20% international listenership from **88** countries

150+
community outreach and educational events in 2018



964
participants in Clinical Core

25%
from underrepresented groups (URGs)

770
participants received Magnetic Resonance Imaging (MRI) scans

535
participants received Lumbar Punctures (LPs)

511
participants received combined MRI and LP