



# Alzheimer's disease research insights: impacts, trends, opportunities

# Executive summary

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An estimated 45 million people are living with Alzheimer's disease worldwide. While the peptide amyloid- $\beta$  has been a major focus in research related to the disease, recently emerging research on behaviors for prevention and treatment offer new strategies for controlling the disease.

Accounting for up to 70% of dementia cases worldwide, Alzheimer's disease places a major burden on older people, with 96 new cases per 1,000 individuals in 2017. While the incidence of the disease is increasing, this is largely due to longer lifespans. Research output for Alzheimer's disease exceeded the growth seen for all research between 2008 and 2012; however, this subsequently slowed and has tracked average growth in global research output since 2013.

Although the volume of research has been constant, the content is shifting. Since the 1990s, there has been a major focus on the peptide amyloid- $\beta$  in Alzheimer's disease research, but more recently, behavioral topics such as learning, sleep and gait have emerged as a focus.

The United States produces by far the most output – almost double that of China, which is in second place. When this is put into context of each country's overall research portfolio,

the focus on Alzheimer's disease research is highest in high-income countries, with Sweden, Italy and Spain at the top. This reflects the high priority this research has taken in countries where lifespan is longer and therefore incidence and burden of Alzheimer's disease is higher.

Collaboration is prominent across the board, both across countries and sectors. At the institutional level, Sweden's Karolinska Institutet stands out with 82.4% of its research resulting from international collaboration.

Analysis of the content of the publications also reveals an opportunity for future research: although Alzheimer's disease disproportionately affects women, research using animal models disproportionately features men or male subjects.

# Key findings

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Disability Adjusted Life Years (DALYs) per 1000 individuals in each country

412.6 global Disability Adjusted Life Years rate  
323.7 years life lost per 1,000 people



Top 10 countries based on publication count

- |                   |               |
|-------------------|---------------|
| 1. United States  | 6. France     |
| 2. China          | 7. Canada     |
| 3. United Kingdom | 8. Japan      |
| 4. Germany        | 9. Spain      |
| 5. Italy          | 10. Australia |



Top 10 institutions based on publication count

- Harvard University
- Institut National de la Santé et de la Recherche Médicale
- University College London
- CNRS
- University of California at San Francisco
- Karolinska Institutet
- Department of Veterans Affairs
- University of Pennsylvania
- German Center for Neurodegenerative Diseases
- National Institutes of Health

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## Chapter 1

# Global impact of Alzheimer's disease



# Global impact of Alzheimer's disease

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## Alzheimer's disease is a progressive brain disease that causes dementia in an estimated 45 million people worldwide.<sup>1</sup>

Accounting for up to 70% of dementia cases, Alzheimer's is a spectrum disease, ranging from an asymptomatic preclinical phase to dementia. Most people first experience memory loss, forgetting recent events. This is often followed by symptoms in different cognitive areas, including language, processing speed, executive function and visuospatial abilities.

Alzheimer's disease is most often seen in people aged over 65; with increases in life span, the incidence of Alzheimer's disease has also increased over the years. According to data on Alzheimer's disease and other dementias, the incidence has risen from 63 new cases per 1,000 individuals in 1990 to 96 in 2017; that represents 7.3 million new cases in 2017. However, when this incidence rate is based on age standardized data, it can be shown that there has been a small decline, from 103 new cases per 1,000 individuals in 1990 to 97 in 2017.<sup>2</sup>

According to the World Health Organization (WHO), people suffering from depression, less educated people, and those who are socially isolated have a higher risk of developing Alzheimer's disease.<sup>3</sup>

There is no known prevention for Alzheimer's disease, and prevention recommendations are based on dementia more generally; people can reduce their risk by staying cognitively active, exercising regularly, not smoking or drinking alcohol, controlling their weight and eating healthily.

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<sup>1</sup> World Health Organization (WHO). Dementia Fact Sheet. Available from <https://www.who.int/news-room/fact-sheets/detail/dementia>.

<sup>2</sup> Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2017 (GBD 2017) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2018. Available from <http://ghdx.healthdata.org/gbd-results-tool>.

<sup>3</sup> World Health Organization (WHO). Dementia Fact Sheet. Available from <https://www.who.int/news-room/fact-sheets/detail/dementia>.

### *Diagnosis and treatment*

People with Alzheimer's disease are usually diagnosed based on their medical history and following demonstration of a cognitive deficit on a cognitive screening test, such as the Mini-Cog test or Montreal Cognitive Assessment. A diagnosis is made if no other cause has been found to result in any cognitive deficit following brain imaging and lab testing.

If a patient is able to function independently, they are diagnosed with mild cognitive impairment due to Alzheimer's disease, as opposed to dementia due to Alzheimer's disease. This can be difficult to diagnose, as people are often able to hide their symptoms; in this case, doctors may interview an informant to make an accurate diagnosis.

Biomarker testing is possible, but not recommended outside of research settings. This is because it is not possible to make predictions about the progression of the disease – if any – based on biomarker results. Plaques of amyloid-beta (A $\beta$ ) have been posited as an indicator for diagnosis, however there has been a shift in focus to additional biomarkers and indicators for diagnosis including Tau, epigenetic modifications, synaptic loss, liver dysfunction and a host of other complementary indicators.

While the symptoms of Alzheimer's disease can be treated, they do not alter the progression of the disease. Patients can be given cholinesterase inhibitors or memantine to treat the cognitive symptoms of dementia. It is also recommended to consult a psychiatrist to evaluate and manage associated symptoms, such as depression, anxiety and behavioral problems.

The burden of Alzheimer's disease from mortality and morbidity is dependent on sex, geographic location, age, and other demographics. The World Health Organization (WHO) quantifies this burden using Disability-Adjusted Life Years (DALYs).

WHO describes one DALY as one lost year of 'healthy' life. DALYs reflect the gap between the population's current health status and an ideal status, in which people lived their full lives without disease.<sup>4</sup>

DALYs are the sum of years of life lost and years lived with disability for people living with Alzheimer's disease and other dementias in this case. DALY rate is the DALY per 1,000 individuals. The DALY rate ranges from 54 to 1550 DALYs per 1000 people, with the lowest rates found in Qatar (54), United Arab Emirates (57) and Niger (83) and the highest rates in Japan (1,550), Finland (1,473) and Italy (1,253) (FIGURE 1-1).

*Unless otherwise indicated, statements on Alzheimer's disease risks, prevention and treatment were informed by Elsevier's ClinicalKey®*

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<sup>4</sup> World Health Organization (WHO). Metrics: Disability-Adjusted Life Year (DALY). Available from [https://www.who.int/healthinfo/global\\_burden\\_disease/metrics\\_daly/en/](https://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/).





FIGURE 1-1  
Disability Adjusted Life Years (DALYs) for Alzheimer's disease (and other dementias) rate per 1,000 individuals in each country.  
Source: Global Health Data Exchange (<http://ghdx.healthdata.org/>) 2017 data shown.

The risk of Alzheimer's disease increases with age and therefore, the burden of Alzheimer's disease in terms of DALY, incidence and prevalence per 1,000 individuals is greatest in nations where the life expectancy is highest, as shown in FIGURE 1-2.



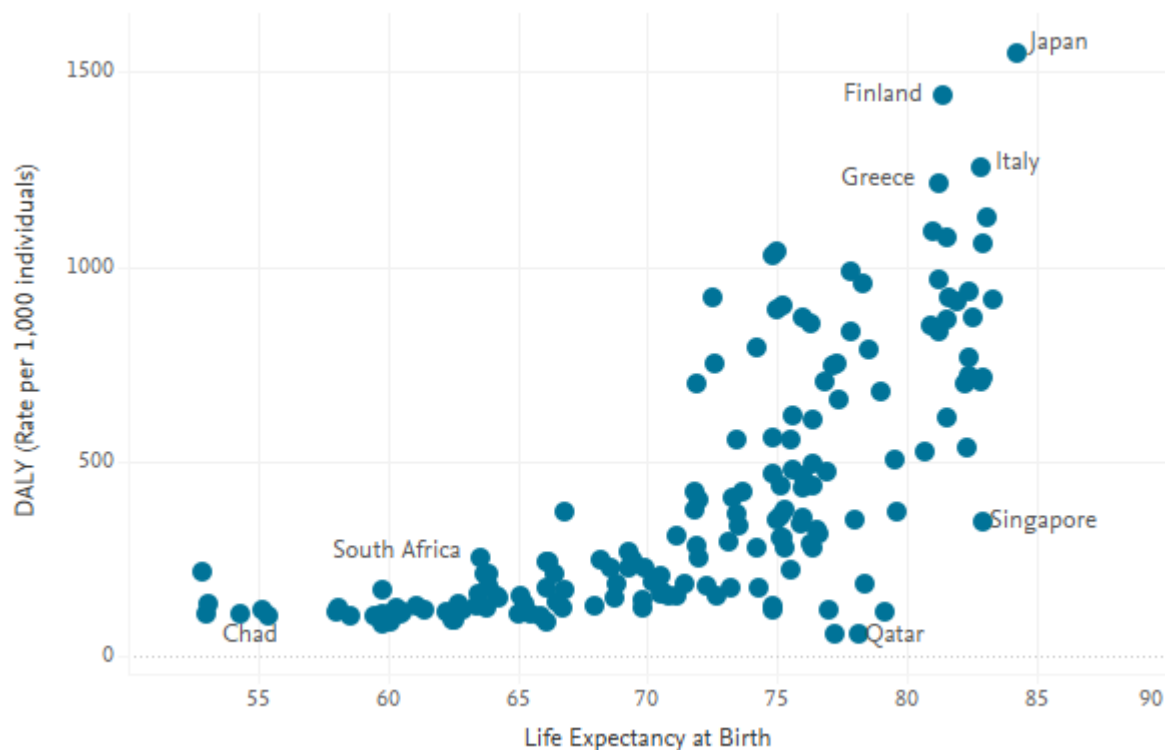


FIGURE 1-2

Disability Adjusted Life Years (DALYs) for Alzheimer's disease (and other dementias) per 1,000 individuals in each country compared to Life Expectancy at Birth.

Source: Global Health Data Exchange (<http://ghdx.healthdata.org/>, 2017 data) and World Health Organization (<http://apps.who.int/gho/data/node.main.688?lang=en>, 2016 data)

By all measures, the burden from Alzheimer's disease and other dementias is greater for women than for men, with the difference becoming greater with increasing age. For example, standardized for age, the prevalence of Alzheimer's disease is 641.3 cases per 1,000 people for women and 551.0 for men. This difference translates to DALYs, with 436.2 per 1,000 people for women and 376.8 for men, as well as deaths, at 37.6 per 1,000 people for women and 31.5 for men.<sup>5</sup>

In 2013, an international effort was launched at the G8 Dementia Summit in the UK to find a cure for Alzheimer's disease by 2025.<sup>6</sup> Funding of research related to Alzheimer's disease has since more than doubled among the biggest funder of Alzheimer's disease research, the US National Institutes of Health.<sup>7</sup>

<sup>5</sup> Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2017 (GBD 2017) Results. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2018. Available from <http://ghdx.healthdata.org/gbd-results-tool>.

<sup>6</sup> Alzheimers.net. History of Alzheimer's: Major Milestones. 2013. Available from <https://www.alzheimers.net/history-of-alzheimers/>.

<sup>7</sup> National Institutes of Health Estimates of Funding for Various Research, Condition, and Disease Categories (RCDC) [https://report.nih.gov/categorical\\_spending.aspx](https://report.nih.gov/categorical_spending.aspx)

## Chapter 2

# Alzheimer's disease research: progression and trends



# Alzheimer's disease research: progression and trends

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Alzheimer's disease research represents a steady share of global output. There is a focus on the peptide, amyloid- $\beta$ , but interesting behavioral topics are emerging.

To understand the landscape of Alzheimer's disease research, we queried Scopus, the largest abstract and citation database of peer-reviewed literature. A source-neutral database curated by independent subject matter experts, Scopus includes all publication types, such as articles, reviews, conference papers, book chapters, editorials and abstract reports.

For this report, Alzheimer's disease research was identified using the term "alzheimer" and querying against publication titles, abstracts, and keywords. In addition to this, there are a number of indexed keywords associated with a publication, which are derived from several thesauri, one of which is Elsevier's life science thesaurus Emtree. A hierarchically structured, controlled vocabulary for biomedicine and the related life sciences, Emtree is used for deep, full-text indexing of journal articles, maximizing their discoverability. The Scopus search automatically groups together different forms of the search term – it lemmatizes terms – so using the search term "alzheimer" retrieves a broad set of Alzheimer's disease-related publications.

Research on Alzheimer's disease has increased steadily in volume since 1980 and 50,614 items related to Alzheimer's disease were published from 2014-2018 (FIGURE 2-1). Compared with global research output, Alzheimer's disease research has grown at the same pace as research overall and has represented 0.35-0.4% of all research done globally between 2012 and 2018.

Looking at year-over-year growth, we see that research output for Alzheimer's disease exceeded the growth seen for all research between 2008 and 2012 (FIGURE 2-2). From 2013 to 2018, year-over-year growth in Alzheimer's disease research tracked the average growth in global research output. We anticipate that recent increases in funding will translate into increased publications in the near future.<sup>7</sup>

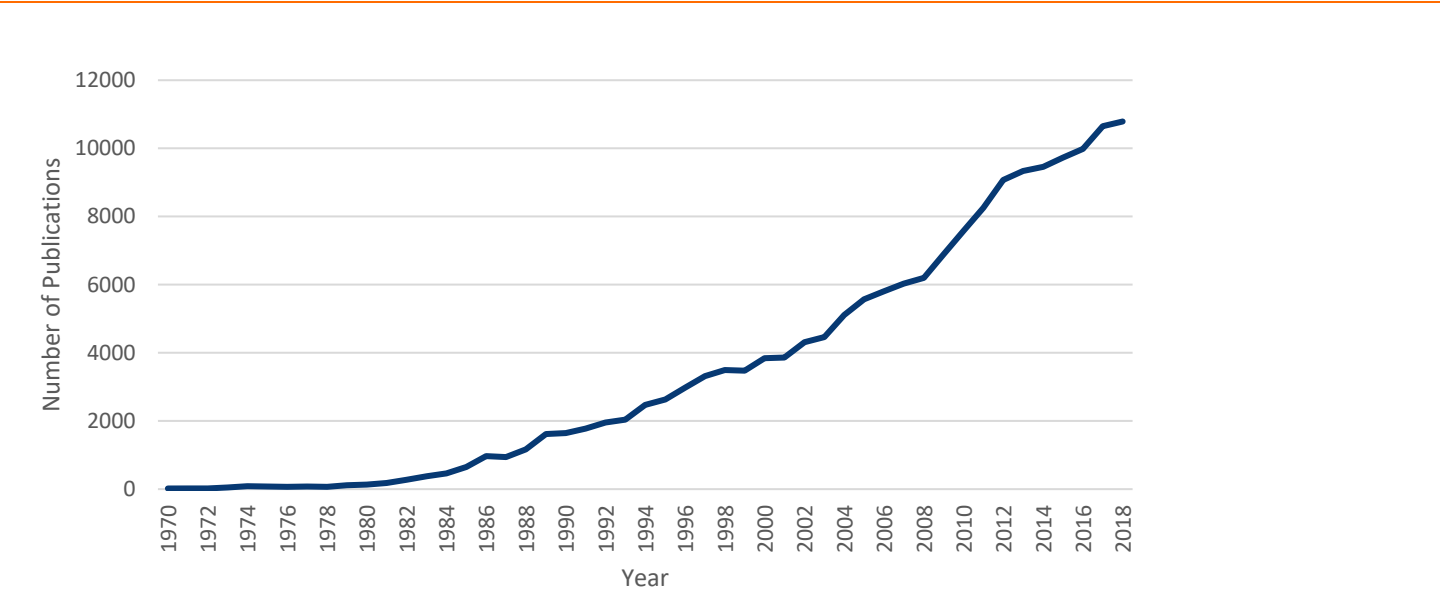


FIGURE 2-1  
Number of publications on Alzheimer’s disease, 1970 to 2018.  
Source: Scopus

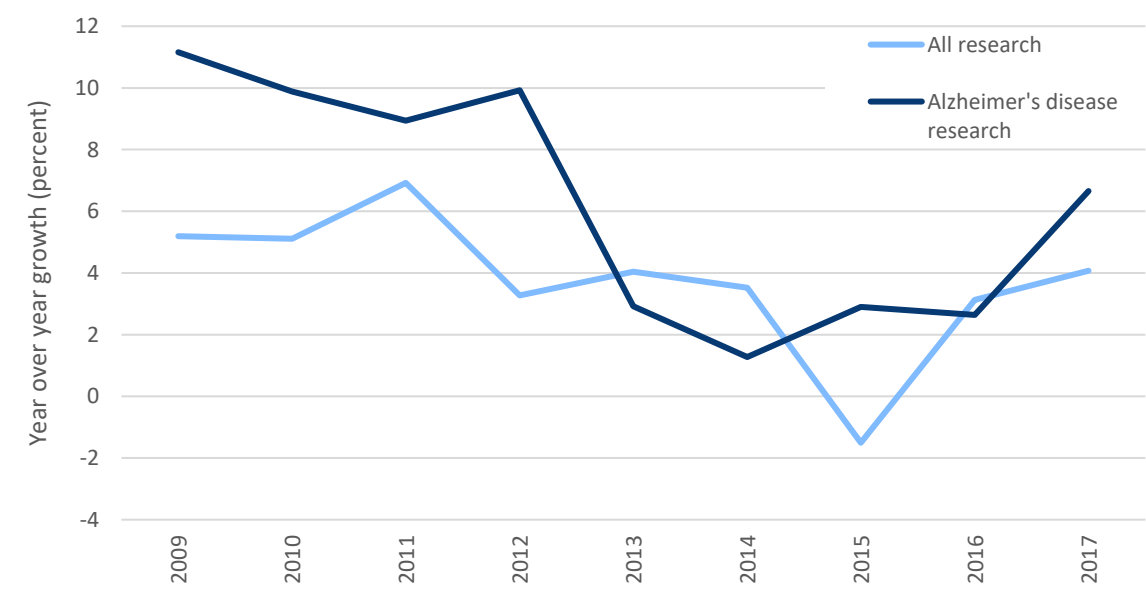


FIGURE 2-2  
Year-over-year growth in publications on Alzheimer’s disease compared to all publications. Note that Scopus data for 2018 will be >95% complete, but as small differences have significant impact on year-over-year growth figures, the 2018 growth data are excluded.  
Source: Scopus

The analyses shown in FIGURE 2-1 and FIGURE 2-2 give a picture of the overall research output trends; to gain perspective of the areas of focus of that research during the period 2014-2018, we looked at the co-occurrence of terms in Alzheimer’s disease-related publication titles and abstracts. We visualized this information using VosViewer, a software tool for constructing and visualizing bibliometric networks.

Clustering terms in research publications according to their co-occurrence gives us a high-level perspective on what broad areas are represented in the research (FIGURE 2-3). For Alzheimer’s disease research, we observe that there are two main clusters of research – one related to basic science (red; FIGURE 2-4), specifically, the molecular mechanisms involved in generating toxic entities in cells and the other related to research with human subjects (blue/green; FIGURE 2-5), specifically, clinical research (blue) and population health research (green). These two clusters are not linked by any terms, which suggests there are no major bodies of research connecting this basic science and research involving humans at this time.



FIGURE 2-3  
Main concepts represented in Alzheimer’s disease research, 2014-2018. Terms appearing at least 100 times in the title or abstract of research publications were visualized based on their co-occurrence.  
*Source: Scopus data visualized using VosViewer*

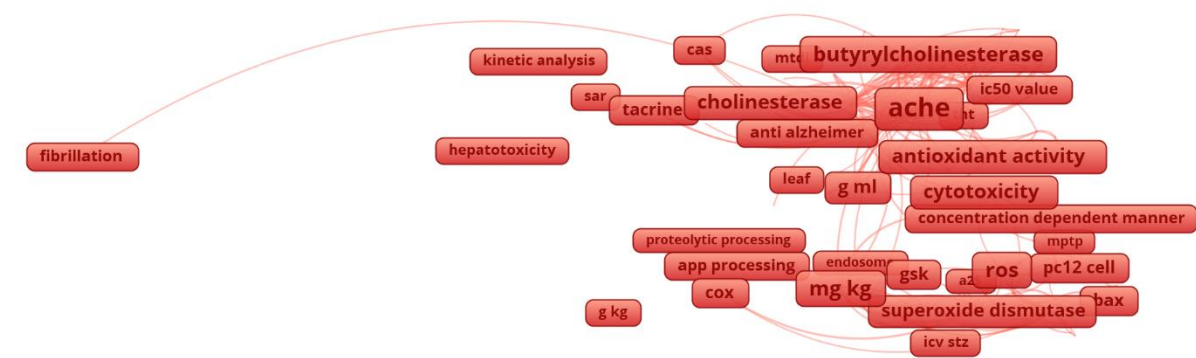


FIGURE 2-4  
Detail of the right cluster, representing basic science.  
*Source: Scopus data visualized using VosViewer*

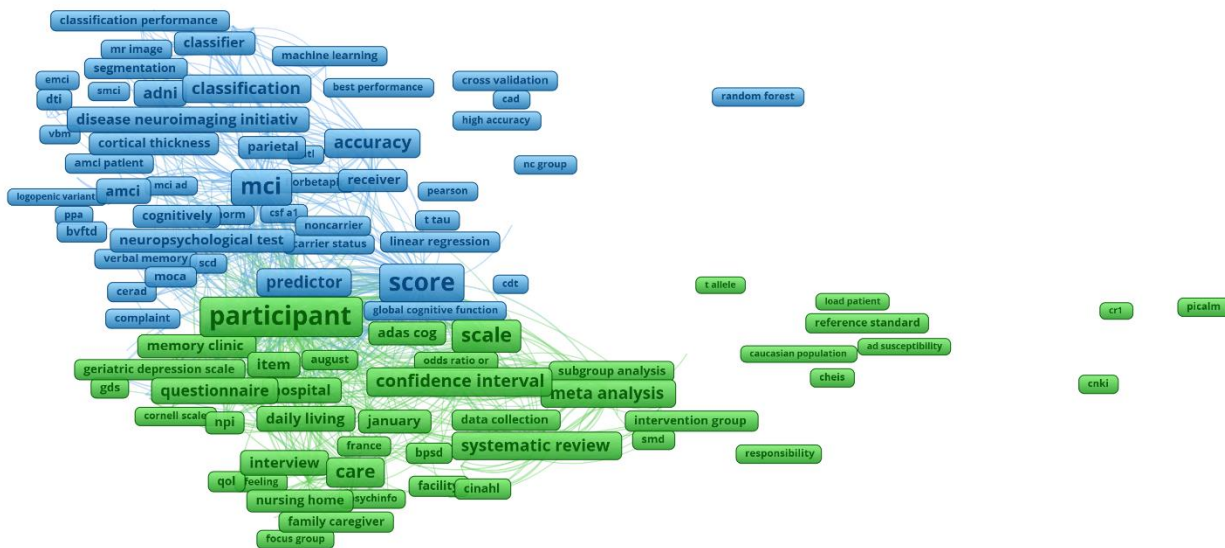


FIGURE 2-5  
Detail of the left cluster, representing research involving humans.  
*Source: Scopus data visualized using VosViewer*

In the left cluster (FIGURE 2-5), we note that there are a number of AI and machine learning terms, like ‘machine learning’, ‘classifier’ and ‘cross validation’. However, we do not see these computer science terms translate into a high number of articles in computer science journals, suggesting that studies on AI applied to Alzheimer’s disease are being published in journals related to health and life sciences.

Indeed, most Alzheimer's disease research is being published in three fields within the health and life sciences. By looking at Alzheimer's disease research published between 2014 and 2018 disaggregated by subject, we observe that medicine has 25,779 publications, followed by neuroscience with 17,815 publications and biochemistry with 15,359 publications.

Subject categories like ‘medicine’ and ‘computer science’ are broad and enable us to see major trends, but research topic clusters offer a more granular level of insight on the focus of Alzheimer’s disease research. In collaboration with research partners, Elsevier has analyzed citation patterns of Scopus-indexed publications to define nearly 100,000 research topics,<sup>8</sup> which we could use to get a more granular view.

From there, we wanted to determine the most influential publications within each topic area. To do this, we used field-weighted citation impact (FWCI), which is considered one of the most sophisticated indicators in the modern bibliometric toolkit. It is a calculation of the number of citations actually received by a publication compared to the number of citations expected for a publication of the same document type, publication year and subject indexed in the Scopus database.<sup>9</sup>

<sup>8</sup> Klavans, R and Boyack, K. Research Portfolio Analysis and Topic Prominence, *Journal of Informetrics*. (2017) v11, p1158-1174.

<sup>9</sup> Purkayastha, A, Palmaro, E, Falk-Krzesinski, H, Baas, J. Comparison of two article-level, field-independent citation metrics: Field-Weighted Citation Impact (FWCI) and Relative Citation Ratio (RCR) (2019) *Journal of Informetrics*, 13 (2), pp. 635–642.



Using these approaches, we revealed the 10 topic clusters with the most publications in Alzheimer's disease research published between 2014 and 2018 (TABLE 2-1). The data includes topic name, number of publications, prominence score (which indicates the momentum in a particular field), the number of times publications in the topic cluster have been viewed and the average FWCI.

There is interesting variety among these top 10 topic clusters. Perhaps predictably, research mentioning amyloid represents the greatest percent of Alzheimer's disease research and has a very high prominence score (98.5). But it is interesting to note that the research topics toward the bottom of the list are related to understanding and improving behaviors to reduce the impact of Alzheimer's disease. These also have high prominence scores, suggesting momentum in these more emerging areas: sleep (prominence score 95), learning (97.9), gait (96.8).

Topic Cluster name	Alzheimer's publications in Topic cluster	Percent of Alzheimer's publications represented by cluster	Topic Cluster Prominence Score	Topic Cluster Views Count	Topic Cluster FWCI
Alzheimer's Disease, Dementia, Amyloid	18,773	37.1%	98.5	770,952	1.4
Parkinson Disease, Deep Brain Stimulation, Patients	1,314	2.6%	95.2	390,214	1.2
Magnetic Resonance Imaging, Brain, Diffusion	758	1.5%	94.2	279,017	1.3
Brain-Derived Neurotrophic Factor, Neurogenesis, Neurons	701	1.4%	90.1	211,196	1.1
MicroRNAs, Long Untranslated RNA, Neoplasms	587	1.2%	99.4	603,557	1.9
Microglia, Brain, Alzheimer's Disease	549	1.1%	70.7	50,276	1.9
Sleep, Obstructive Sleep Apnea, Sleep Apnea Syndromes	351	0.7%	95.0	511,626	1.1
Attention, Brain, Learning	338	0.7%	97.9	680,345	1.1
Autophagy, Sirolimus, Neoplasms	318	0.6%	92.6	190,126	1.5
Stroke, Gait, Rehabilitation	317	0.6%	96.8	790,622	1.0

TABLE 2-1

Top 10 topic clusters represented in Alzheimer's disease research (based on publication count).

Topic clusters are ascribed names based on the three most common key phrases found in research titles and abstracts for that topic. Key phrases are generated by matching against a set of thesauri spanning all major disciplines, thus reducing the occurrence of redundant terms (e.g., neoplasm and cancer). Note that the specific Alzheimer's disease publications within the cluster are related to the topic due to citation patterns that place the paper within the cluster and may not specifically be about the terms listed in the cluster name.

Source: *Scopus and SciVal*

Looking specifically at the proteins being studied in Alzheimer's disease research (FIGURE 2-6), there is one clear outlier: amyloid precursor protein (APP). Using Pathway Studio, which enables analysis and visualization of disease mechanisms and Elsevier Text Mining, which facilitates the discovery of novel insights and relationships within the huge volume of scientific content, we searched for all proteins that are drug targets for Alzheimer's disease in some way. We then added up the number of publications from each year that reference each protein identified.

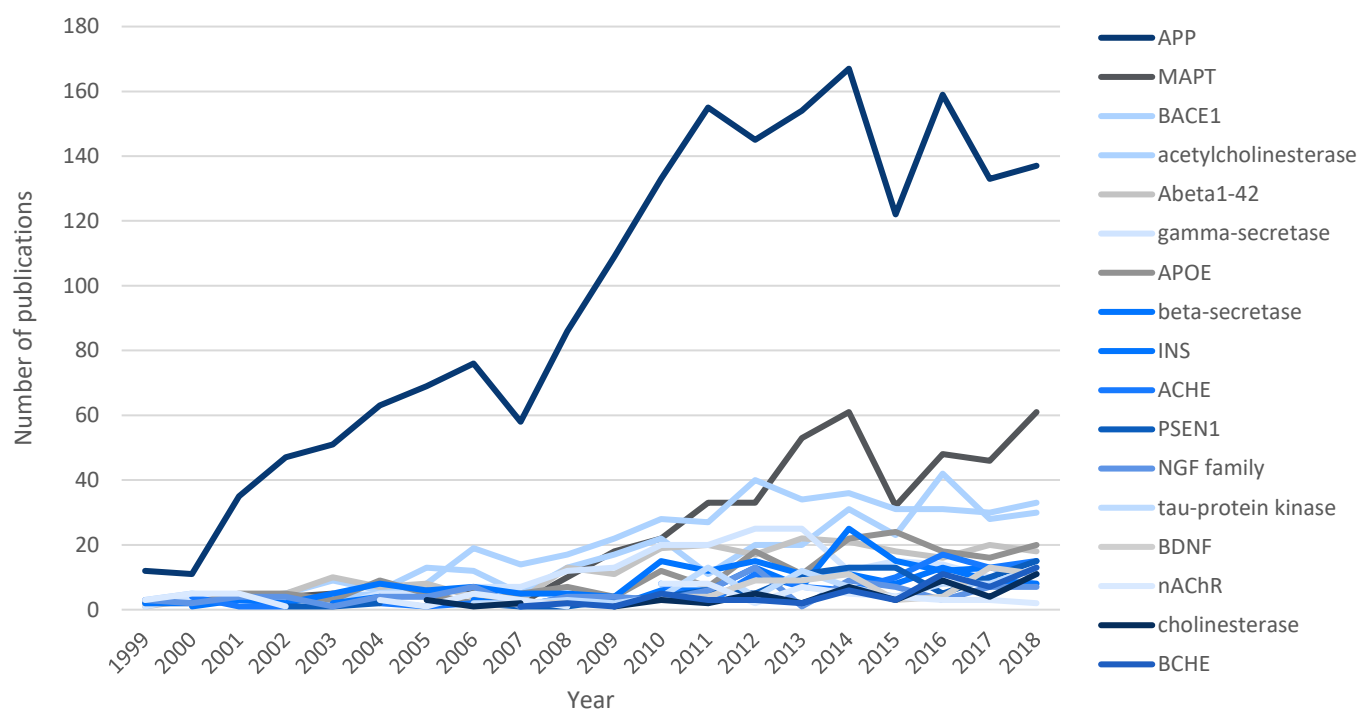


FIGURE 2-6

Trends in Alzheimer's disease targets researched from 1999-2018. Protein targets are limited to those mentioned in at least 50 publications during the period and 10 publications in a single year.

Source: PathwayStudio

Research on APP appears to dwarf all other protein studies. APP is found in the synapses of neurons and although we don't know what its primary function is, it has been identified as the precursor that generates the neurotoxic peptide, amyloid- $\beta$  in the brain in Alzheimer's disease, hence the focus in research. BACE1 (or  $\beta$ -secretase), which also appears among the top 5 protein targets studies in Alzheimer's disease research, is involved in generation of amyloid- $\beta$  peptides from APP.

After APP, other major targets for research appear, including MAPT (microtubule-associated protein tau, which structurally stabilizes neurons), and PSEN1 and PSEN2 (subunits of  $\gamma$  secretase, which is involved in producing amyloid- $\beta$  from APP), all of which have been posited to be involved in various aspect of Alzheimer's disease. Other proteins in the top 50 include those involved in immunity, DNA damage repair, cell death and protein modification.

## Chapter 3

# Countries and institutions leading the charge



# Countries and institutions leading the charge

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The United States is the top producer of Alzheimer's disease research, followed by China, the UK, Germany and Italy.

Publication output is an indicator of a country's contribution to Alzheimer's disease research. We assessed output by country using Scopus and SciVal. This analysis revealed that the United States is by far the biggest producer in terms of output, with 16,238 publications on Alzheimer's disease between 2014-2018. This is more than double the output of the second highest contributor, China.

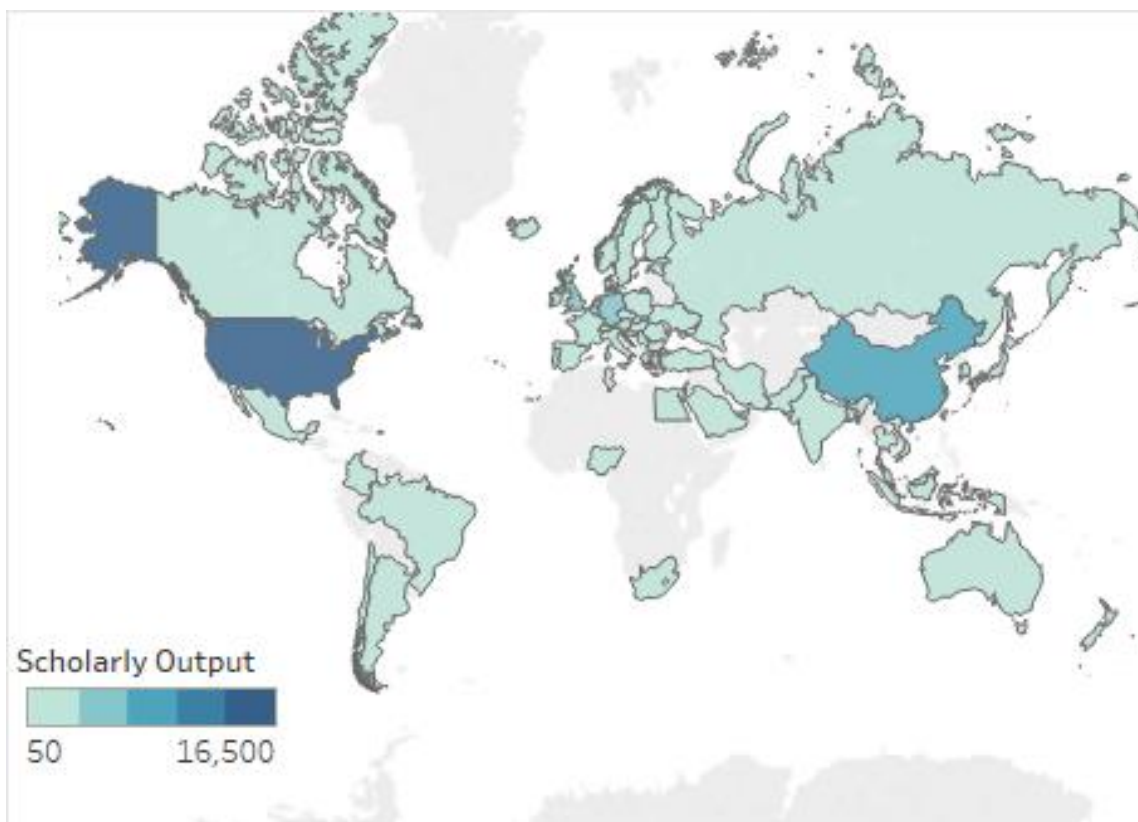


FIGURE 3-1  
Scholarly output in Alzheimer's disease research per country among nations publishing at least 50 publications in 2014-2018.  
Source: Scopus and SciVal

Our data for the top 10 countries includes publication count, outputs in top citation percentiles, percentage of international collaborations, FWCI and percentage of academic-corporate collaborations. Top citation percentiles here refers to the percent of the country's publications on Alzheimer's disease that are among the top 10 percent most cited publications compared to all publications worldwide.

TABLE 3-1 shows that countries with higher levels of collaboration tend to have higher FWCI. The high percentages of publications resulting from academic-corporate collaboration are also of interest: 3.6% (1,827) of all Alzheimer's disease research publications in 2014-2018 were the result of collaboration between academic and corporate institutions. The top three corporate institutions involved in this research are Eli Lilly (166 publications), Johnson & Johnson (110 publications) and Pfizer (85 publications). It is notable that the percentage of academic-corporate collaboration in the UK, Germany, and France exceeds that seen for the US.

Country	Scholarly Output	Outputs in Top 10 Citation Percentiles (%)	Field-Weighted Citation Impact	International Collaboration (%)	Academic-Corporate Collaboration (%)
United States	16,238	37.8	2.2	41.1	6.3
China	7,150	25.8	1.6	29.2	1.4
United Kingdom	4,883	41.1	2.7	66.3	10.3
Germany	3,392	38.3	2.7	62.1	11.8
Italy	3,305	36.7	2.4	47.8	4.8
France	2,702	33.5	2.6	56.2	9.7
Canada	2,639	34.9	2.7	55.4	5.3
Japan	2,544	22.5	2.1	29.9	5.1
Spain	2,457	32.9	2.5	53.0	5.3
Australia	2,261	40.2	3.1	58.3	7.7

TABLE 3-1  
Top 10 countries based on publication count (Alzheimer's disease, 2013-2018).  
Source: Scopus and SciVal

FIGURE 3-1 and TABLE 3-1 provide a global view based on absolute publication count; for context, we looked at the relative level of focus on Alzheimer’s disease research in each country. To do this, we used the Relative Activity Index (RAI), which is a measure of the proportion of the country’s research output in the subject (Alzheimer’s disease in this case) relative to the proportion seen globally.

When a country’s RAI for a particular subject is above 1.0, it indicates that the country’s research in this subject exceeds the proportion seen on average globally. When a country’s RAI is below 1.0, its research is below the proportion seen globally.

We looked at the relative activity in Alzheimer’s disease research in countries that produced at least 1,000 publications between 2014 and 2018. The RAI for Alzheimer’s disease research is highest in high-income countries, with Sweden, Italy and Spain at the top. This may reflect, to some extent, the high priority this research has taken in countries where lifespan is longer and therefore incidence and burden of Alzheimer’s disease is higher.

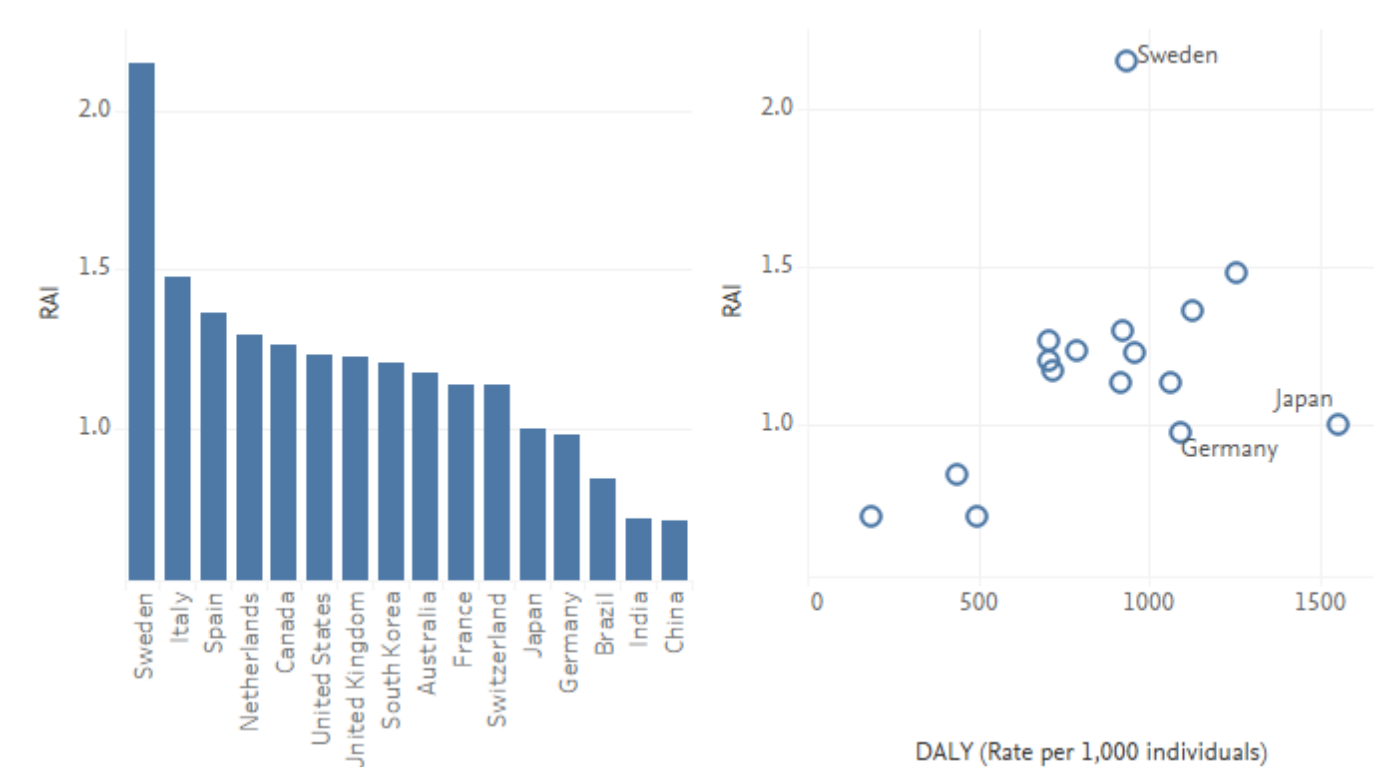


FIGURE 3-2  
Relative Activity Index (RAI) in Alzheimer’s disease research in each country for countries with 1,000 or more publications in 2014-2018. RAI compared to DALY rate per 1,000 individuals also shown.  
Source: Scopus and SciVal



Looking at the 10 institutions producing the most research, for a majority of top institutions, more than half of the output involves international collaboration; the highest percentage of collaboration is seen at Sweden’s Karolinska Institutet, with 82.4%. Again, academic-corporate collaborations are prominent among leading institutions, with 1 in 10 of their publications produced this way.

Institution	Scholarly Output	Outputs in Top Citation Percentiles (%)	Field-Weighted Citation Impact	International Collaboration (%)	Academic-Corporate Collaboration (%)
Harvard University	1,412	51.1	4.7	56.9	10.1
Institut National de la Santé et de la Recherche Médicale	1,247	39.8	3.0	56.1	11.2
University College London	1,149	50.8	4.7	75.7	15.2
CNRS	974	34.7	1.9	55.7	8.9
University of California at San Francisco	802	51.0	5.1	54.0	10.8
Karolinska Institutet	792	43.4	5.2	82.4	12.1
Department of Veterans Affairs	782	42.2	3.8	32.7	7.0
University of Pennsylvania	693	46.0	5.2	39.2	12.7
German Center for Neurodegenerative Diseases	683	51.0	3.1	61.1	13.2
National Institutes of Health	668	53.5	1.3	56.0	11.5

TABLE 3-2  
Top 10 institutions based on publication count (Alzheimer’s disease, 2013-2018).  
Source: SciVal

## Chapter 4

# Research opportunities going forward



# Research opportunities going forward

## Alzheimer's disease is a bigger burden for women, but research focuses on male subjects, providing an opportunity for future studies.

The Alzheimer's Association's 2019 global conference saw researchers going "back to the drawing board"<sup>10</sup> – there was no groundbreaking late-stage research presented, but rather a focus on behavior and basic science. According to our data, there is an opportunity to make changes by taking sex into account, particularly in animal models.

We analyzed full text from ScienceDirect content, to understand the populations and models being focused on in the research. We mined articles' methods sections to identify and categorize studies as research focused on women or females, research focused on men or male subjects, or both.

Out of 7,676 ScienceDirect articles about Alzheimer's disease research from 2014 to 2018, 2,536 mention terms related to sex or gender in the methods section, indicating that a human or animal system was likely used. We further analyzed those articles and categorized them as studying human subjects or animal models.

We find that among the publications that mention sex or gender terms, the majority of research focuses on men or male subjects. Men or male subjects were included in 80% of the studies and were used exclusively in 49%. Comparatively, women or female subjects were included in 51% of the studies and exclusively in just 20%. 31% of studies used both male and female subjects.

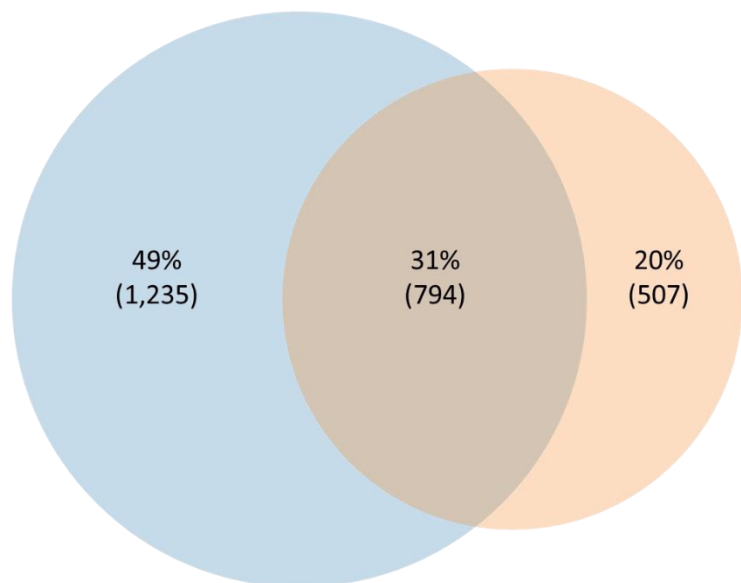


FIGURE 4-1

The proportion of Alzheimer's disease research mentioning men or male subjects (blue) versus women or female subjects (pink).

Source: ScienceDirect

<sup>10</sup> <https://www.statnews.com/2019/07/22/on-alzheimers-scientists-head-back-to-the-drawing-board-and-once-shunned-ideas-get-an-audience/>

The difference is most prominent in animal studies, which appear to be driving this skew: among the publications that mention sex related terms, 62% of research using animal models mentions males only while 14% of research mention females only. This finding is significant given that animal models can facilitate the discovery of new drug targets and sex-related factors can influence drug-related responses.

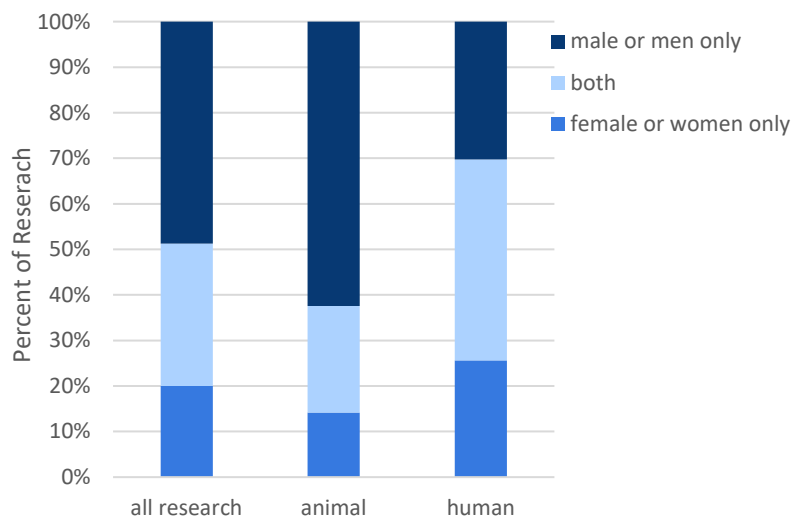


FIGURE 4-2

The percent of Alzheimer's disease research mentioning men or male subjects versus women or female subjects in the methods section, broken down by animal and human studies.

Source: ScienceDirect

Looking just at research using human subjects, among the publications that mention sex or gender terms, the number of publications mentioning a single sex is more even – 30% mention males exclusively, 26% mention females exclusively. Research publications mentioning human subjects also mention both sexes more frequently than animal studies, with 44% of studies mentioning both sexes.

This preliminary analysis suggests a need to focus more on females in animal model studies, providing an opportunity to gain more insights into a disease that, by every measure, places a higher burden on women in society.

# About

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