



JPND Mapping Exercise Report

July 2018

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1. Executive Summary

- 27 JPND member countries and the European Commission contributed to mapping data on neurodegenerative disease research that was active on 1st January 2016
- The total research portfolio was calculated at €2,217 million (€566 million/year) from 2,672 projects, representing a 53% increase on overall annual investment reported in 2011 (€370 million/year). Annual spending on investments >€500k increased by 55% (€150 million/year), with a similar increase (48%, €46 million/year) observed for investments <€500k since 2011
- Accounting for the growth in JPND membership since the last mapping exercise, we also compared only those countries (20 countries and the EC) that participated in both exercises and identified a 34% increase (€124 million/year) in annualised investment
- Notably since 2011, an approximate two-fold increase in annual spending on clinical and health & social care research as a proportion of total funding was reported, with a small decrease in basic research spend
- An increase in spend on Alzheimer's disease (AD), Parkinson's disease (PD) and motor neurone diseases (MND) as a proportion of total funding was identified since 2011, while there was a significant reduction in research in the general neurodegenerative disease category
- Greater involvement of JPND member countries in larger research projects was observed with 81% of countries contributing to at least one investment >€500k, representing a 15% increase from 2011. JPND calls were a major factor in this change.

2. Background and Purpose

The Joint Programme for Neurodegenerative Disease (JPND) is the largest global research initiative aimed at tackling the growing societal challenge presented by age-related neurodegenerative disease. Spanning biomedical, healthcare and social science domains, JPND aims to increase investment between participating countries in research directed at finding causes, developing cures and identifying appropriate ways to care for those with neurodegenerative disease.

To promote research co-ordination among JPND member countries it is important to understand the current landscape in neurodegenerative disease research amongst member states. This report maps the 2016 national and global research infrastructure in JPND member countries and those funded by the European Commission (EC) relevant to neurodegenerative disease, following up on the successful mapping exercise conducted in 2011 and published in 2012. It will help JPND to identify gaps and opportunities and clarify medium to long-term biological, medical, social and public health research needs, objectives and priorities.

The mapping exercise aims to:

- Provide an objective view of the scale and scope of research activity in neurodegenerative disease live at **1st January 2016** amongst JPND member countries
- Generate an update to the publicly accessible online database on the JPND website
- Enable a comparison of the research funding landscape before and after the publication of [JPND Strategic Research Agenda](#) and its subsequent implementation

The information held on the online database is expected to be a useful resource for the scientific community and be valuable for anyone interested in finding out about ongoing research relevant to neurodegenerative disease. It is hoped that the update and expansion of this open-access, searchable database, containing detailed information on funded research and infrastructures, will encourage networking, collaboration and resource sharing. The database is available through the JPND website at:

<http://www.neurodegenerationresearch.eu/search-our-database>

2.1 New JPND Membership

Over the last five years, JPND has expanded its membership from 23 to 30 countries to include Australia, Austria, Bulgaria, Canada, Croatia, Israel and Romania. The current exercise requested data from both the existing 23 and the seven new member countries, providing a fuller picture of neurodegenerative disease research funding.

3. Methodology

3.1 Data Collection

The core parameters and specifications used for the 2012 mapping exercise remain largely the same in the current exercise. These were designed in conjunction with the [JPND Scientific Advisory Board](#) (SAB) to ensure that the data captured would be useful for JPND and researchers working in the field. Member countries that had previously participated in the exercise would be expected to be more familiar with the protocols implemented. Furthermore, since 2012, reporting systems for funding research in many countries are probably more optimal for information retrieval.

Data collection ran for approximately 10 months from August 2016 to May 2017. Data were subject to interim analysis and validation throughout this period and were presented to the JPND Management Board at regular intervals to highlight progress and help identify any areas of concern.

Data were collected offline using a spreadsheet-based approach. This was chosen over the previous web-based system to simplify the process for data collection and to increase interactions and feedback between JPND countries and the WP3 coordinating team. Spreadsheet questionnaires were designed using Microsoft Excel to sub classify and catalogue the data. The different categories of research funding broadly fell into two types (designated sections A and B of the questionnaire, see below). Within these sections, different worksheets within a spreadsheet file were used to further subdivide the questionnaire into smaller sub-categories as detailed below.

A. Research funding information and capital infrastructures relevant to ND

- Investments >€500k
- Investments <€500k
- Fellowships (>€100k)
- Capital Infrastructure

B. Population studies and resources relevant to ND

- Population studies
 - Population cohorts
 - Case control studies
 - Disease registers
- Research networks
- Biobanks
- Experiments models (animal/cell)
- Bio/neuroinformatic resources.

We defined the data we were interested in within the 'Specifications' section of the spreadsheet. To assist with the classification of research as either basic, clinical or health and social care, we included a 'Research Classification' definition worksheet within the questionnaire and in the supporting documentation (see [Annex 1](#)) which is summarised below ([3.3 Diseases Definitions and Research Classification](#)).

Questionnaires relating to research funding and infrastructures were completed by government or charitable organisations responsible for funding research within JPND member countries. The mapping questionnaire was disseminated by the WP3 coordinating team via email to designated National Mapping Contact (NMCs) within each JPND member country. The NMC was responsible for collecting and returning validated data about research activity from all relevant national funding organisations and individual experts within their country. Therefore, the exercise extends to funding organisations beyond those represented on the JPND Management Board. This process is depicted below in Figure 1.

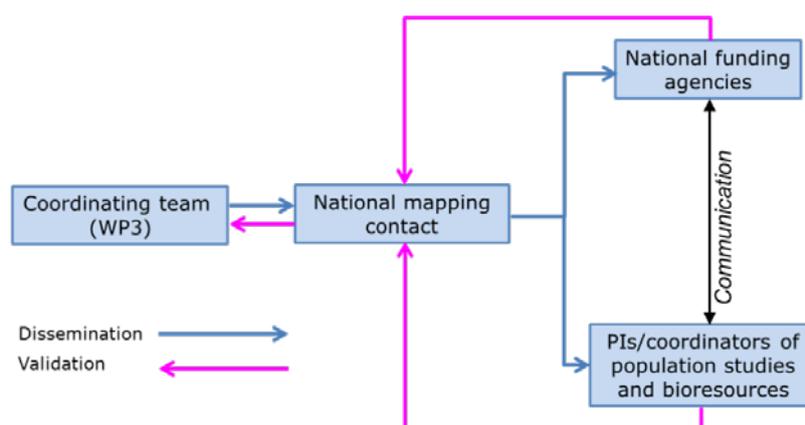


Figure 1. Interactions during the mapping exercise to show the role of the WP3 coordinating team and the National Mapping Contact within each JPND member country.

The NMCs nominated other funding organisations and experts within their countries to complete specific sections of the questionnaire covering population studies and other resources relevant to neurodegenerative disease with the detailed information provided by the principal investigator or resource co-ordinator. A list of organisations providing funding information can be found in the section [Research Funding - Country Specific Information](#). No information was requested from commercial organisations working in the neurodegenerative disease area.

3.2 Data Validation

To ensure that data met the agreed inclusion criteria, and that there was no duplication of projects, studies or resources, all data were checked and validated at two levels; firstly, by the NMC at the national level, and then by the WP3 team to ensure overall consistency and accuracy.

Two separate validation periods were implemented during data collection to improve interaction between the NMCs and the WP3 team. The first validation was to verify that the data were being inputted correctly and enabled feedback to be provided on inclusion criteria. It was also an opportunity to help with any problems experienced during data collection. A second period of data validation involved checking the full dataset submitted by each country and sending any proposed modifications to the data and/or feedback on the final submission to the NMCs.

A comprehensive guidance document was produced to assist research organisations and individual experts completing the questionnaire and to improve overall data quality. This included overview information about the mapping exercise and the sub categories of data collection, instructions on inputting data, JPND portfolio search terms for neurodegenerative disease ([Annex 2](#)) and a template letter that could be used to request the participation of additional research organisations and/or individual experts.

A method was developed for transferring the validated spreadsheet data to the online research database. This involved the creation of Excel files containing mapping data in the comma separated values (csv) format for bulk import to the online database via the back-end of the JPND website.

3.3 Diseases Definitions and Research Classification

i. Disease Definitions

To be included in the exercise, research needed to be specifically relevant to one or more of the neurodegenerative diseases included under the JPND initiative (below):

- Alzheimer's disease and other dementias (AD)
- Parkinson's disease (PD) and PD-related disorders
- Prion disease (Prion)
- Motor neurone diseases (MND)
- Huntington's disease (HD)
- Spinocerebellar ataxia (SCA)
- Spinal muscular atrophy (SMA)

The following conditions are not included in the JPND initiative and were excluded:

- Multiple sclerosis and age-related macular degeneration, and other conditions where the primary lesion is not neurodegenerative
- Loss of neuronal function or cell death due directly to cancer, oedema, haemorrhage, trauma, poisoning and hypoxia
- Other comorbid conditions

Research that was not specifically, or for the most part, focused on neurodegenerative disease was excluded; for example, research into broader areas of neuroscience was not captured. It should be noted that there is much supporting and underpinning research that may contribute to the overall neurodegenerative disease research effort, but which did not meet the criteria for inclusion in the mapping exercise.

ii. Research Classification

All programmes and grants were assigned to one of three research classifications that spanned the scope of the research agenda covered by JPND. The full set of criteria can be found in the [Annex](#), but are briefly summarised as follows:

- **Basic:** Aetiological and underpinning research and research relating to detection, screening, diagnosis or development of treatments and therapeutic interventions carried out in model systems or preclinical settings (i.e. not in human patients)
- **Clinical:** Research relating to detection, screening, diagnosis, prevention or treatment of disease or promotion of patient well-being, conducted in/on (live) humans, and patient-oriented at some level
- **Health and social care:** Research relating to care or management of disease, provision and delivery of health and social care services (including health economics, health policy, research governance etc.), and the social or societal impact of disease.

iii. Research Type

Research funding was collected under the following four categories. For the current exercise, two new categories were included to capture data on fellowships and capital infrastructure relevant to neurodegenerative disease. For JPND funded projects involving multiple countries, the total investment amount for the entire project was used as the basis for its classification, as opposed to the individual contributions of JPND member countries.

- **Investments > €500k:** As in the previous exercise, programmes or research grants were classified as '*Investments > €500k*' (formerly known as Major Investments) if the total investment i) exceeded €500,000 for basic or clinical research or ii) exceeded €200,000 for health and social care research. For programmes or grants above these thresholds, details of the title, principal investigator(s), project abstract and disease relevance (up to three diseases) were recorded alongside the total amount and timeframe of investment
- **Investments < €500k:** In the current exercise, for investments below these thresholds (classified as '*Investments < €500k*', formerly known as Smaller Investments), details were collected on the total number of projects and aggregate investment amount for each research classification category (i.e. basic, clinical or health and social care). In addition to this, on an optional basis, the collection of details of individual projects or grants was encouraged for the 2016 exercise, including the title, principal investigator(s), the investment amount and timeframe and the project abstract or summary. This additional detail, not collected in the previous exercise, enables these investments to appear in the online database, thus increasing visibility for all JPND member countries and also building in future interoperability with the [International Alzheimer's and Related Dementias Research Portfolio \(IADRP\)](#) a database developed by the [National Institute on Aging \(NIA\)](#), part of the National Institutes of Health (NIH), in collaboration with the US [Alzheimer's Association \(AA\)](#)

- **Fellowships:** Data was collected on investments made in the form of intermediate or senior fellowship awards (clinical and non-clinical) that were €100k or more. For non-clinical fellowships, awards were captured that were made to individuals who are at postdoctoral-level (or above) and are in the process of transitioning towards independence or leadership (including career development awards). For clinical fellowships, awards were also captured for predoctoral fellowships. Non-clinical PhD studentships or related awards were excluded
- **Capital Infrastructure:** Data was collected on key infrastructure with a significant use for neurodegenerative disease research. This included infrastructure (or equipment) costing €500k or more that had been funded (or where funding had been committed) between 1st January 2013 to the 1st January 2016. This included infrastructure that was either in planning/development, under construction or completed. It excluded routine laboratory facilities and infrastructure below the financial threshold.

3.4 Online Research Database

The online database that resulted from the 2011 mapping exercise underwent redevelopment from a basic portal to increase its visual impact and operability and to enhance navigation of the JPND research portfolio. This included a new landing page of different coloured circles visualising the different resources/funding categories. Options were also provided to search the database by disease category or JPND member country from a global map display. The free text search on the current database was maintained across the three sections of the landing page.

Consideration was also given to the display of 2016 data and how this would relate to the existing data. It was decided to retain the 2011 data alongside the new data. A system of tagging was developed in which 2011 and 2016 projects were colour coded. Data on research funding that was no longer active was retained as a historical record, while existing projects were updated. It was decided that initial searches performed from the database would be for the 2016 data only which was more relevant to the current research landscape. Historical 2011 data would be available to select on the subsequent search results page. The database is available through the JPND website at:

<http://www.neurodegenerationresearch.eu/search-our-database/>

3.5 Additional Information

A number of countries were unable to provide data on senior or intermediate fellowships as either the agency recording systems were not fully centralised or the allocation of funding to specific research areas was determined at the level of universities (as opposed to research organisations). Despite these difficulties, fellowship data was provided by 16 of the 27 participating countries and the EC, and were included in the overall analysis.

Information collected on capital infrastructure proved to be an incomplete dataset (11 out of 27 participating countries and the EC submitted data). For many of the investments submitted, it was difficult to classify the element that was relevant to neurodegenerative disease research which varied from 5% to 100%. For these reasons, capital infrastructure

data were not included in the overall analysis and were instead reported within the summaries for individual countries (see [Research Funding - Country Specific Information](#)).

Euro conversion rates as of 01.01.2016 were used for consistency of reporting. Subsequent data in this report do not take into account any fluctuations in exchange rate between countries.

3.6 Future Plans

Prior to finalising the design of the mapping questionnaire, we consulted the custodians of the NIA-AAA [International Alzheimer's and Related Dementias Research Portfolio \(IADRP\)](#), with a view to future linkages and sharing of data. As a result, we collected additional details on individual awards for investments <€500k, to increase the completeness of the research portfolio for any future data exchanges (see Research Type under [Diseases Definitions and Research Classification](#) for further details).

During 2017, JPND Management Board agreed to share and display data collected in the current exercise on the IADRP database. This would further increase the visibility of JPND research, promote global collaborations and resource sharing and strengthen links with the US/NIH. It would also avoid some duplication of effort by countries that already contribute to IADRP. Importantly, the data displayed by IADRP will be clearly identifiable in terms of the funding agency, country and JPND descriptor.

Reciprocally, JPND Management Board agreed to display [National Institute on Aging \(NIA\)](#) and [National Institute of Neurological Disorders and Stroke \(NINDS\)](#) data that met JPND criteria on the JPND online mapping database. This data would be integrated once the main mapping exercise was complete.

For the future, there is the potential to co-design mapping exercises working together with IADRP and the [WHO Global Dementia Observatory \(GDO\)](#) custodians, which are two major collections of trans-national data working towards display of global research portfolios.

4. Results

4.1 Research Funding by Type

The mapping exercise collected details of research funding in JPND member countries and the EC relevant to neurodegenerative disease that was active on 1st January 2016 i.e. the exercise captured a 'snapshot' of research funding existing at the beginning of 2016. Gross (full value) and per year figures for investment in research funding identified through the exercise as specifically relevant to neurodegenerative disease are presented in Table 1.

	Number of projects	Full value (€millions)	%	Per year (€millions)	%
Total research funding	2672	2,217	-	566	-
Investments >€500K	881	1,722	77.7	425	75.1
Investments <€500k	1292	256	11.5	87	15.3
Fellowships	499	239	10.8	54	9.6
Funding by research category					
Basic	1670	1,336	60.3	357	62.8
Clinical	662	595	26.8	142	25.2
Health and social care	340	286	12.9	67	12.0

Table 1. Total investment in programmes and projects live at 1st January 2016: Gross and annualised totals for investment in research funding identified across participating JPND countries and the EC. Totals have been rounded to the nearest million euros. Figures are broken down by type of investment and by research category. Per year figures were calculated by dividing the total amount of investment by the number of years it was allocated over at the level of individual projects. In some instances, the timeframe of projects was not recorded for investments <€500k, for this calculation it was assumed that the average length of investment was three years.

Overall the total JPND portfolio was calculated as €2,217 million (€566 million per year) from a total of 2672 projects. In terms of the type of research, 77.7% of the total value was attributed to investments >€500k, these would typically represent major programmes or longer term research initiatives that are intended answer questions across a broad scientific area. The remaining 22.3% of funding was attributed to smaller investments, classified as either investments <€500k (11.5%) or fellowship awards (10.8%).

In terms of annual investment, the majority (62.8%, €357 million/year) of research investment identified across JPND member countries and the EC can be classified as basic (or preclinical) research. The other categories were clinical and health and social care research, which represented 25.2% (€142 million/year) and 12% (€67 million/year) of the total portfolio respectively.

4.2 Research Funding by Disease

Information on disease relevance was captured only for individual investments >€500k (>€200k for health and social care research). Across JPND, the highest percentage of investment was committed to projects relevant to Alzheimer's disease (46.2%, €196.5 million/year) followed by Parkinson's disease (20.5%, €87.3 million/year) and then to investments spanning several neurodegenerative diseases classified as the 'ND in general' category (20.1%, €85.4 million/year). See Table 2 and Figure 2 below.

Disease	Number of projects	Full value (€millions)	%	Per year (€millions)	%
AD	511	828.8	48.1	196.5	46.2
MND	101	103.8	6.0	27.6	6.5
Prion	30	98.4	5.7	20.5	4.8
PD	205	334.3	19.4	87.3	20.5
HD	31	24.0	1.4	6.0	1.4
SMA	13	3.4	0.2	0.9	0.2
SCA	11	3.1	0.2	1.0	0.2
ND in general	119	326.5	19.0	85.4	20.1

Table 2. Investment >€500k categorised by disease: Full value and per year totals for investments >€500k identified across the eight disease categories for participating JPND countries and the EC. Totals have been rounded to the nearest million Euros.

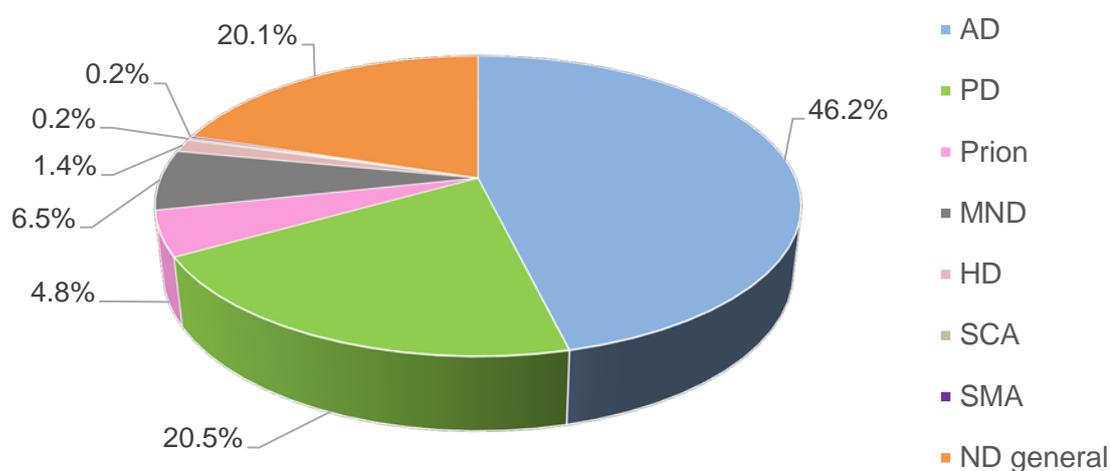


Figure 2. Annualised funding for Investments >€500k categorised by disease: Percentage of total annual investment across the eight disease categories for participating JPND countries and EC.

4.3 Research Funding by County¹

The level of annual investment in research specifically relevant to neurodegenerative disease research identified through the exercise varied significantly across JPND member countries (Figure 3, see next page). Similarly, the percentage investment allocated to the three research domains (basic, clinical, health and social care) exhibited similar differences between countries, although for most JPND members, basic and clinical research constituted ~85% of the total annual investment (Figure 4A). Annualised investment across the three domains is shown in Figure 4B. More detailed summaries for individual JPND member country and the EC are given in the later section on: [Research Funding - Country Specific Information](#).

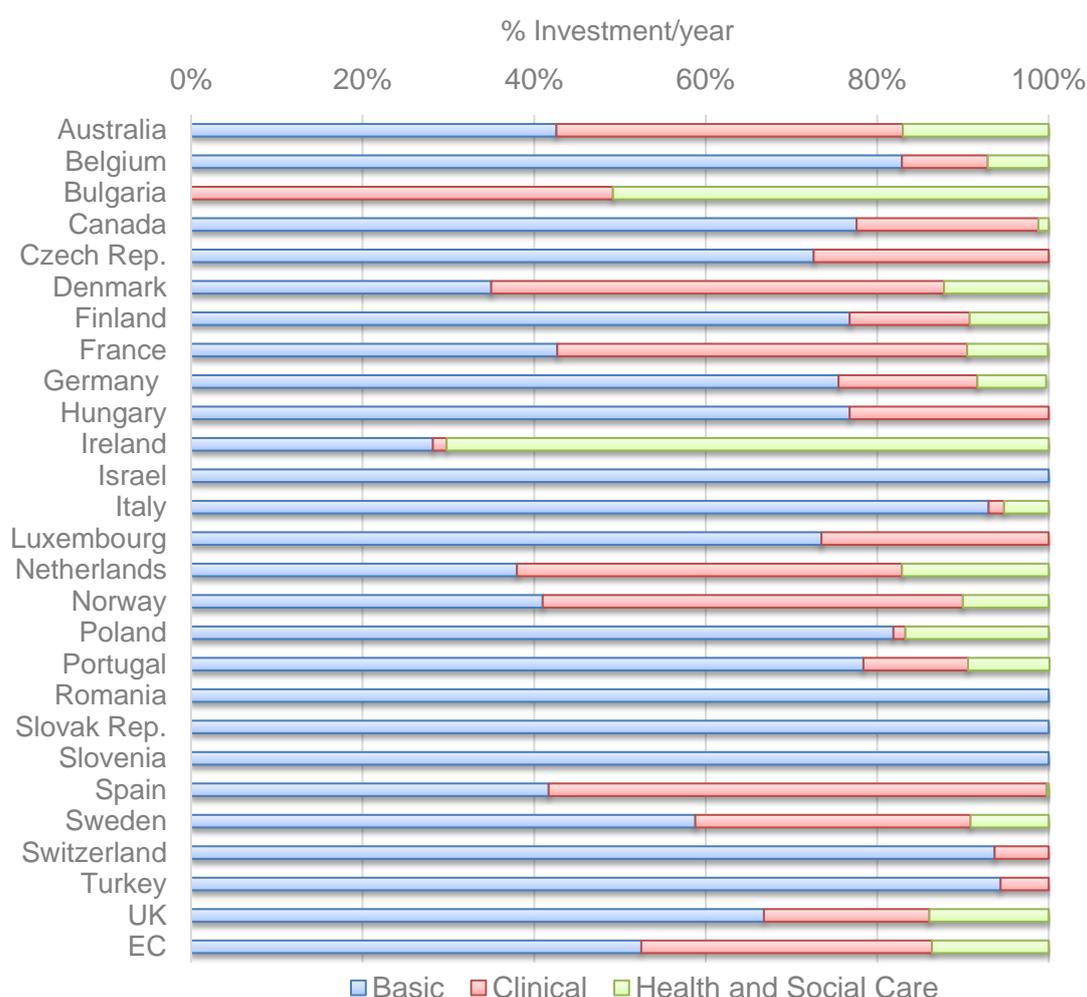


Figure 4A. Investment by research domain (percentage of total investment): Percentage annualised investment for JPND countries and the EC classified as basic, clinical or health and social care research. A breakdown of the full value and annualised amounts for each country can be found in the section: *Research Funding – Country Specific Information*.

¹ The reported investment figures may not reflect the full breadth of funding activity within a country (see individual commentaries provided in 5. Research Funding - Country Specific Information, page 26-67).

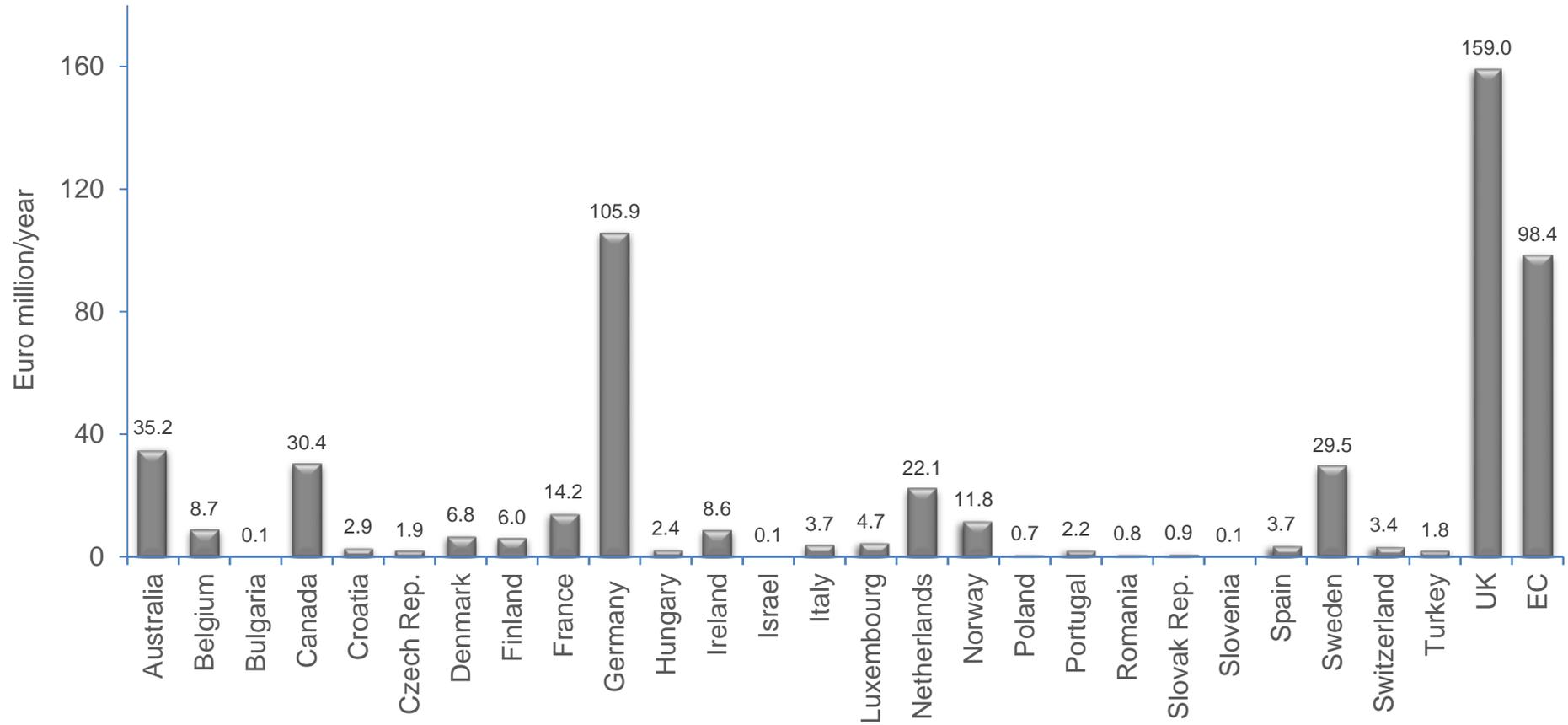


Figure 3. Annualised investment by country: Annualised investment in neurodegenerative disease research (€ million/ year) identified through the mapping exercise across JPND member countries and the EC. This includes annualised data collected for investments >€500k, investments <€500k and fellowships. Annualised values in Euro (million/year) are indicated for each country above the respective bar graph.

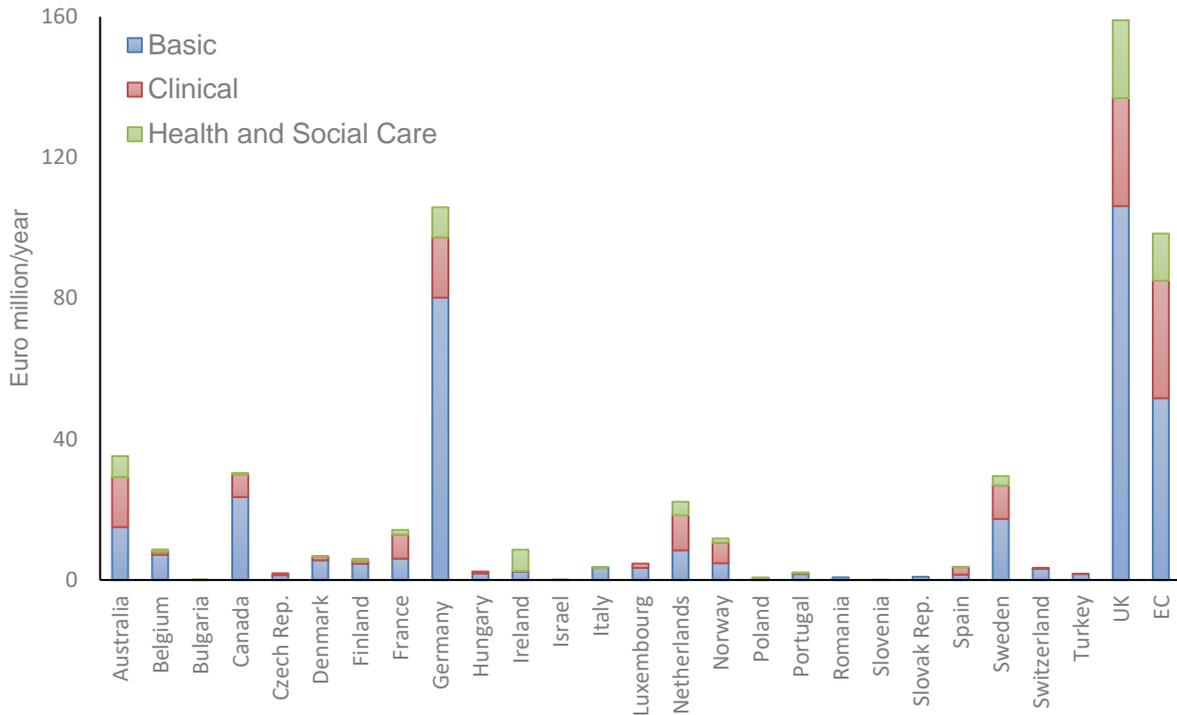


Figure 4B. Investment by research domain (annualised investment): Annualised investment (€ million/ year) by research domain (basic, clinical, health and social care) identified across JPND member countries and the EC. The totals shown in the figure include annualised data collected for investments >€500k, investments <€500k and fellowships.

Data on intermediate/senior fellowships >€100k was collected from 16 countries and the EC. This equated to an annual investment of €54 million from 499 fellowship awards. From the data submitted, the UK (€19.5 million/year) followed by the EC (€10.1 million/year) and Australia (€9.9 million/year) provided the highest annual funding for fellowships (Figure 5).

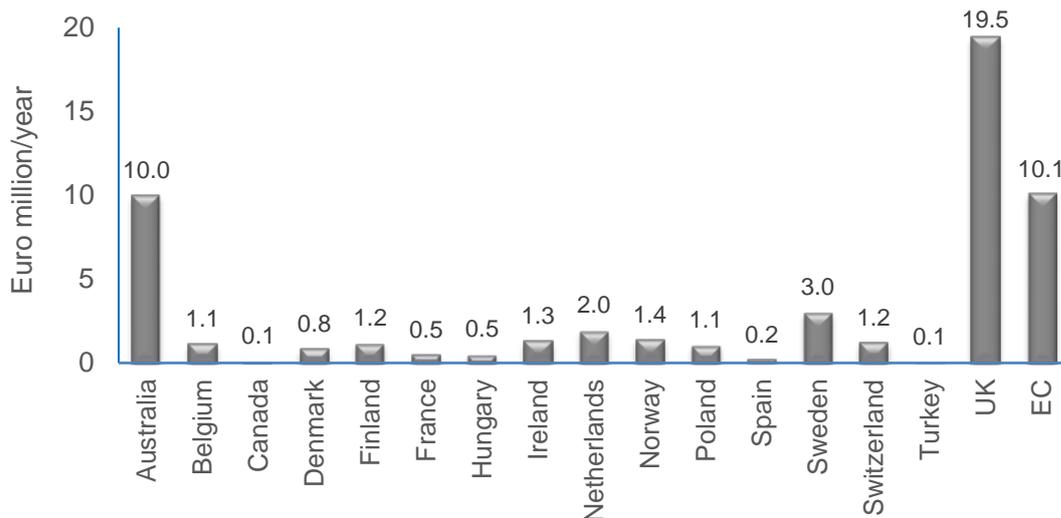


Figure 5. Annualised investment in fellowships by country. Information was collected on intermediate/senior fellowships that were €100k or greater in value. Note only 16 JPND member countries and the EC submitted data on fellowships. Values above bars indicate Euros in million/year

4.4 Analysis of data trends from 2011 to 2016²

The JPND research portfolio increased by €596 million (+36.8%) from €1,621 million in 2011 to €2,217 million in 2016 (Table 3). This increase in investment would be expected since data was collected from seven additional countries in the current exercise including Australia and Canada. The number of projects in the investments >€500k category increased by over five hundred, however, there was a small reduction in the number of investments <€500k. Despite this, in terms of per year value, both sizes of investments increased by 54.5% and 48.4% respectively (Table 3 and Figure 6). It was anticipated that research funded in 2016 (vs 2011) would cost more to fund due to inflation, which could account for part of the increase in the value and number of investments over the €500k threshold.

	Number of projects	Full value (€ millions)	% vs 2011	Per year (€ millions)	% vs 2011
Total research funding	+430	+596	+36.8	+196	+53.0
Investments >€500K	+521	+386	+28.9	+150	+54.5
Investments <€500k	-91	+210	+73.9	+46	+48.4
Funding by research category					
Basic	+135	-26	-1.9	+56	+18.6
Clinical	+147	+412	+225	+95	+202.0
Health and social care	+148	+210	+10.8	+45	+204.6

Table 3. Change in investment in projects from 2011 to 2016: Change in gross and annualised investment in research funding identified across JPND countries and the EC from 2011 to 2016. Totals have been rounded to the nearest million Euros. Note funding for fellowships in the current exercise are included in Investments <€500k for comparison with 2011 data. Percentage vs. 2011 denotes the change from the initial 2011 to the 2016 value, i.e. +50% indicates an increase of half the original 2011 value.

² Unless an exception is noted within a specific table or figure (e.g. Figure 8), the number of countries contributing to the totals presented for the 2011 and 2016 data differs due to the increase in JPND member countries since the initial exercise. For the 2011 exercise, 20 of the 23 JPND members provided data, while in 2016, 27 of the 30 JPND member countries provided data.

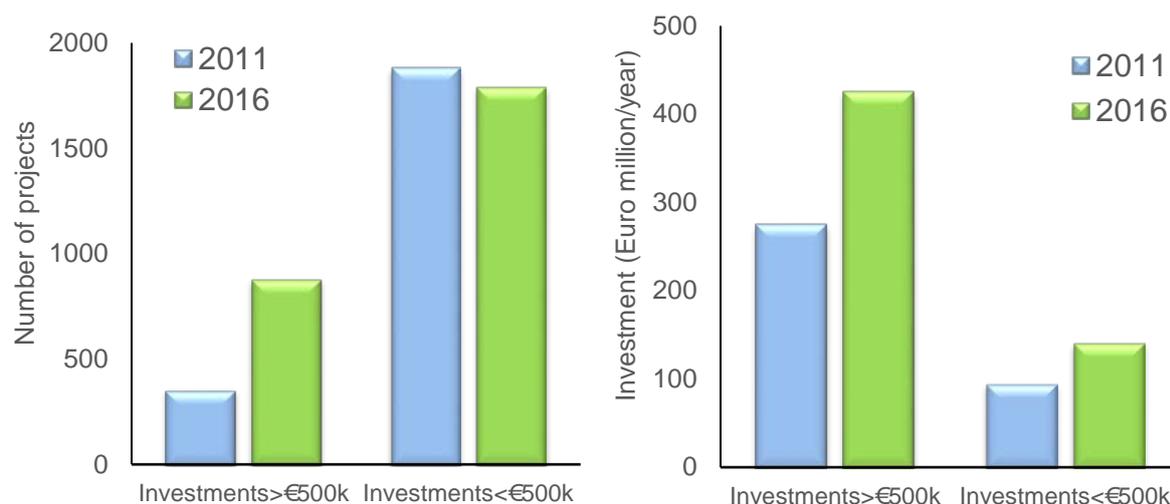


Figure 6. Comparison of the total number of projects (left) and annualised investment (right) for investments >€500k and investments <€500k for research funding in 2011 and 2016. Note fellowships were considered part of Investments <€500k for the above analysis since these were not collected independently in the previous mapping exercise.

Across all investments, the proportion of research that was basic (preclinical) in nature decreased by 18.4% from 2011 to 2016, while clinical research and health and social care research increased approximately two-fold by 12.4% and 6% respectively (Figure 7).

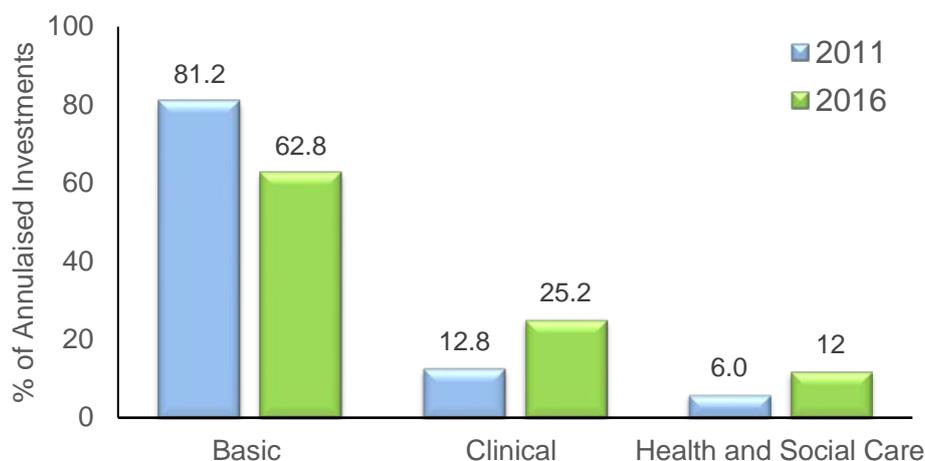


Figure 7. Percentage of annualised funding by research category across all investments in 2011 and 2016. Values indicate the proportion of all investments within either 2011 or 2016 that were classified as either basic, clinical or health and social care research.

To further examine the trend in annualised investment independent of the increase attributed to the growth in JPND membership, we compared directly only the 20 countries and the EC that participated in both exercises. From this analysis, annualised investment increased by €124 million from €370 million in 2011 to €494 million in 2016, representing a 34% increase. The countries showing the greatest increase in investment from 2011 levels in order were the Czech Republic, Luxembourg, Slovak Republic, Sweden, UK and Norway (Figure 8). Some countries showed an apparent decrease in investment, this could be the case if reported values do not reflect the full breadth of funding activity in that country (see footnote 1, page 12).

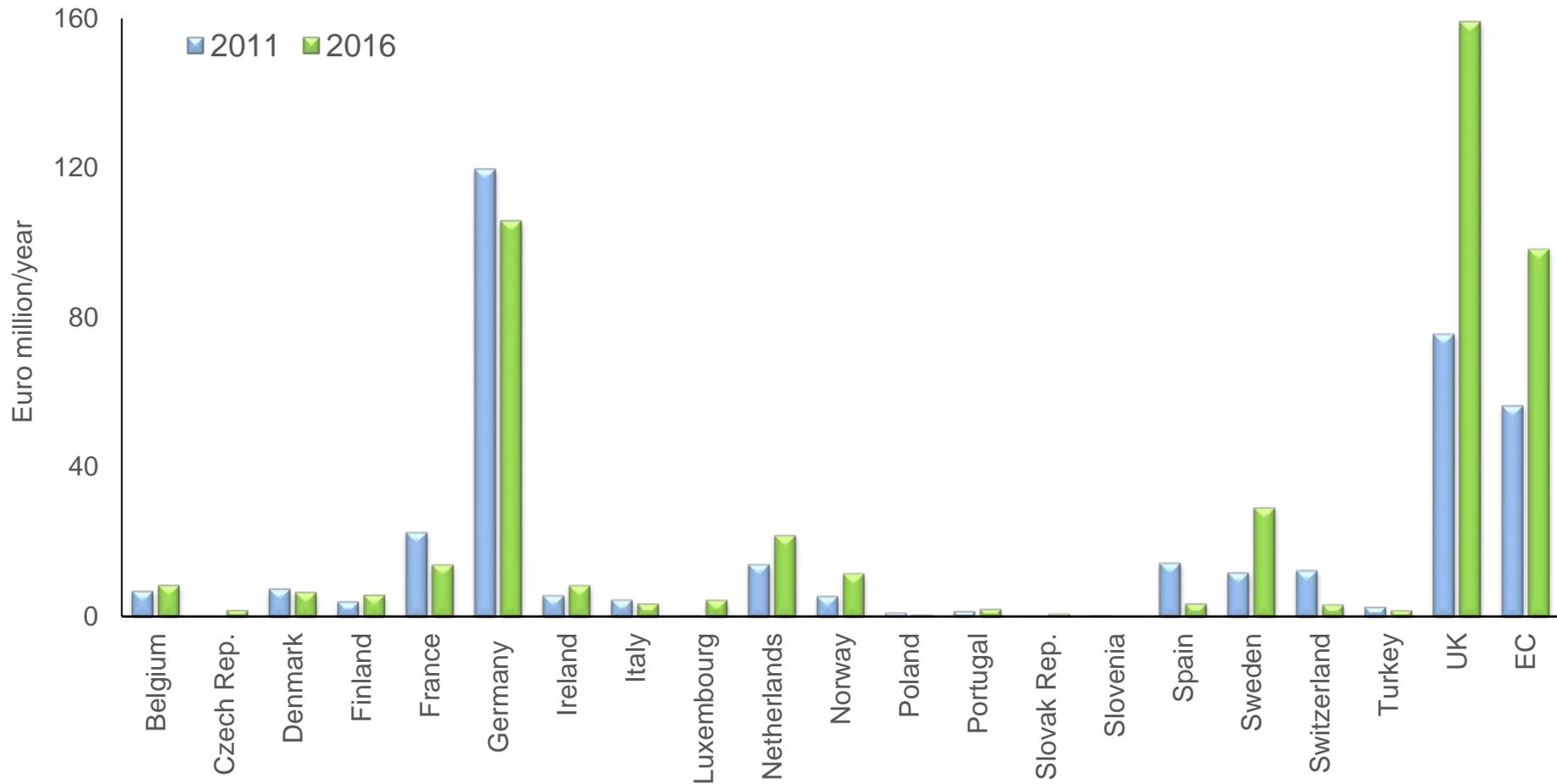
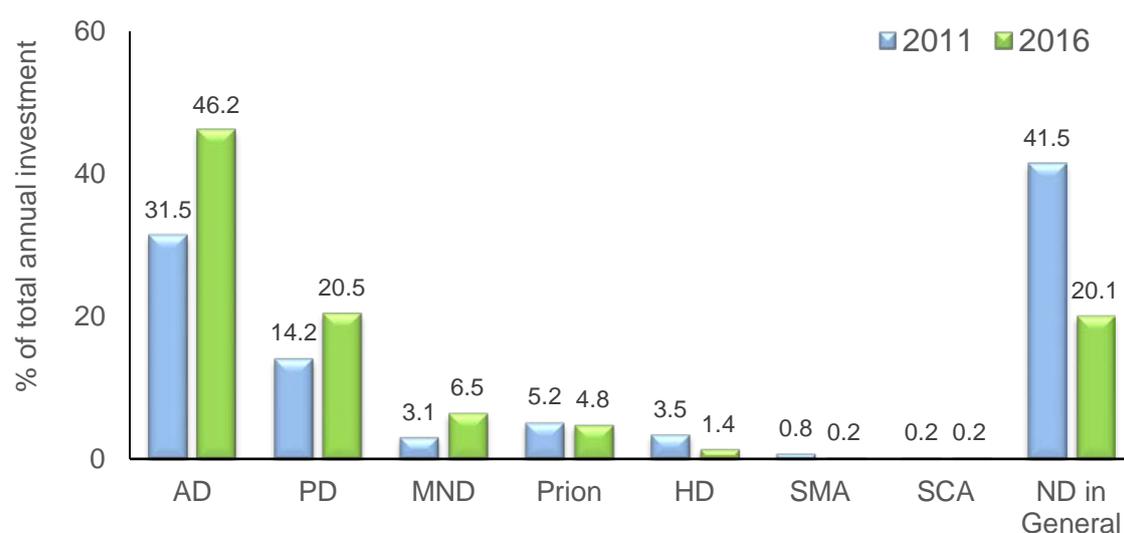


Figure 8. Investment by country comparing annualised investment from the 2011 and 2016 mapping exercises. Annualised investment in research (€ million/year) across JPND member countries and the EC. Note that countries that did not participate in the 2011 mapping exercise were omitted from this analysis. Total annualised investment in 2011 for all participating countries and the EC was €370.13 million, increasing to €494.2 million in 2016.

In terms of disease areas, the largest increase as a proportion of total annual investment from 2011 to 2016 was observed for AD (+14.7%), PD (+6.3%) and MND (+3.4%). There were small decreases in investment for prion diseases, HD and SMA. The largest decrease was observed in the ND in general (-21.4%) category (Figure 9A). This may suggest a trend for funding to be awarded to projects more focused on specific diseases. Alternatively, it may indicate an improvement in the categorisation of projects by disease in the second mapping exercise that involves 20 countries who also participated in 2011. The number of projects increased for all the disease categories, although the largest increases were observed for AD, PD and MND (Figure 9B).

A



B

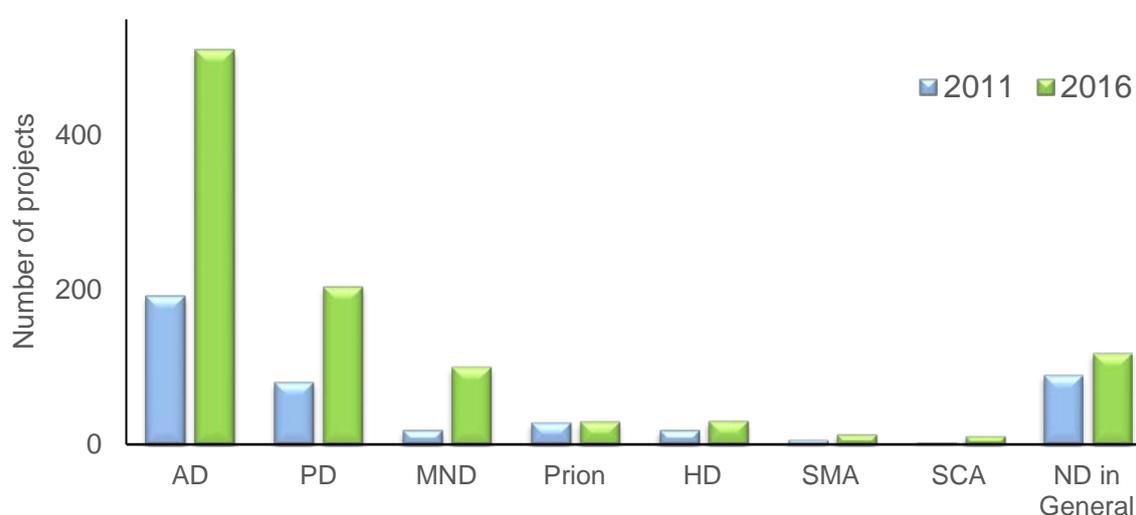


Figure 9. Research funding in Investments >€500k by disease area in 2011 and 2016:

A. Annualised investment in investments >€500k across the eight categories of diseases classified in the 2011 and 2016 JPND mapping exercise. **B.** Number of individual projects for investments >€500k categorised by disease.

4.5 Research Infrastructure and Resources

Information captured during the mapping exercise from JPND member countries included details relating to the characteristics and accessibility of relevant research infrastructure and resources. To be included in the exercise these needed to be relevant to, or potentially useful for investigation of, one or more of the neurodegenerative diseases included under the JPND initiative or to the 'ND in general' category (see [3.3 Diseases Definitions and Research Classification](#) for further information).

Figures and analysis presented in this section are reflective of the resources submitted by JPND member countries (summarised in Table 4). The numbers captured have not been updated with any additional resources, including those that were identified in the previous exercise, however all resources will be displayed in the online database. In comparison with the number of infrastructure/resources reported in 2011, there was a small decrease across categories in 2016, except for the experimental models category.

Infrastructure/Resource	Number captured
National/Regional Research Networks	15
Population cohorts	46
Case-control studies	21
Disease registers	15
Biobanks	42
Experimental Models	17
Bio/neuroinformatic resources	9

Table 4. Summary of research infrastructure and resources submitted by JPND member countries.

National/Regional Research Networks

National/regional research networks may take different forms but were broadly defined as infrastructures and/or co-ordination activities to support high quality research studies at the regional, national or global level. A total of 15 research networks were captured with the majority relevant to AD, PD or the ND in general category (Table 5).

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
9	1	0	6	1	0	0	8

Table 5: Research networks relevant to specific neurodegenerative diseases: A total of 15 research networks relevant to the full range of neurodegenerative disease were captured; some are relevant to more than one disease.

All research networks could broadly be assigned to one of five groups:

- Neurodegenerative disease specific research network
- General neuroscience/aging network
- Brain/biobanking network
- Imaging/other infrastructure network
- Animal model network

Population Cohorts

Population cohorts were defined as large, long-term studies collecting data from a population rather than a (specific) group of patients. Only population cohorts with greater than 1000 participants were included. 46 population cohorts were captured by the mapping exercise (Table 6). Additional general population cohorts have been identified and displayed on the [JPND Global Cohort Portal](#) and were not included in the current mapping analysis.

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
27	1	1	10	0	2	0	27

Table 6. Population cohorts relevant to specific neurodegenerative diseases: 46 population cohorts were captured; some are relevant to more than one neurodegenerative disease.

The range of participants enrolled in the various population cohorts is indicated in Figure 10, (below). Approximately 60% of cohorts had 1,000-5,000 participants enrolled and over 25% of those captured have more than 15,000 participants.

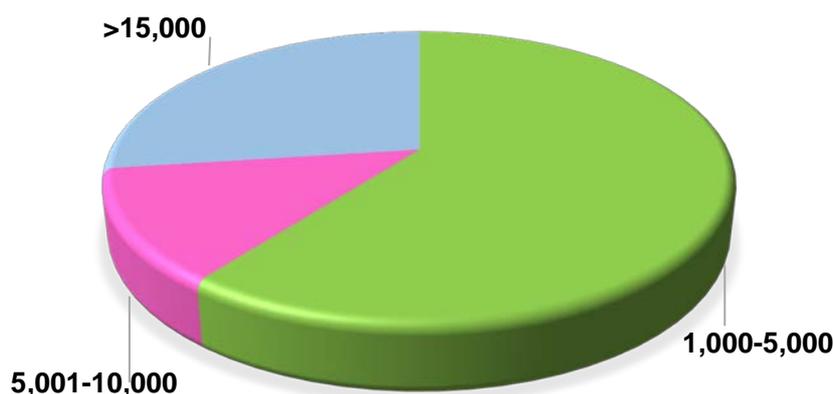


Figure 10. Size of population cohorts: Number of participants enrolled in the identified cohorts was indicated by selecting one of four size ranges in the questionnaire. A minimum threshold of 1000 participants was required for inclusion in the exercise. No cohorts were identified with between 10,001-15,000 participants.

Other information captured included inclusion/exclusion criteria, study design, case matching and data/sample collection, storage and distribution or access. In terms of the study design, the majority of population cohorts were found to be prospective and longitudinal in nature (Figure 11).

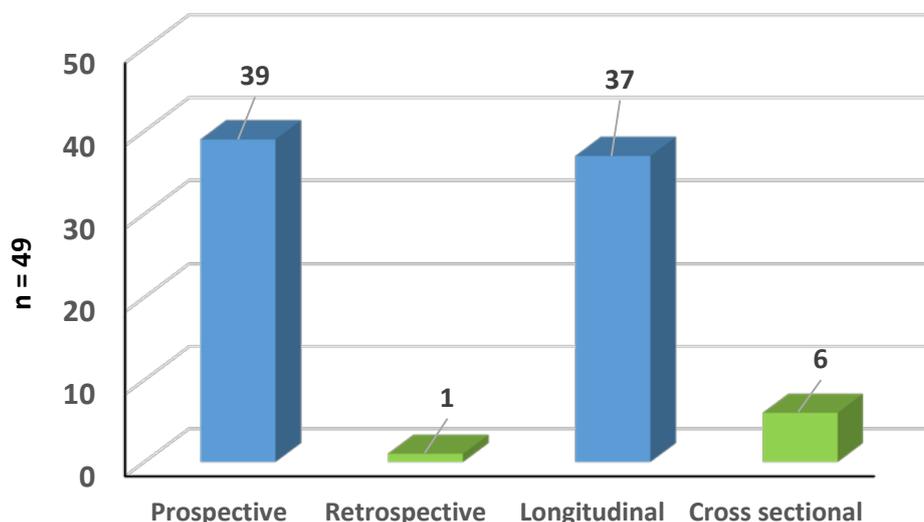


Figure 11. Population cohort study design: One or more of four possible options relating to study design could be selected in the questionnaire for each cohort. The majority of cohorts were both longitudinal and prospective in nature.

Case-control studies

Case-control studies are designed to collect data – and often samples – from an extensively phenotyped group of patients to identify factors associated with disease. In these studies, data from patients is compared with data captured from a specified set of control participants. 21 case-control studies were captured by the mapping exercise (Table 7).

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
16	6	1	5	0	0	0	2

Table 7. Case-control studies relevant to specific neurodegenerative diseases: The total number captured was 21 with some indicated to be relevant to more than one neurodegenerative disease.

Studies with the following number of participants were captured in the exercise:

- 1-1,000 participants: 15
- 1,001-5,000 participants: 8
- >15,000 participants: 1

As for population cohorts information captured included inclusion/exclusion criteria, study design, case matching and data/sample collection, storage and distribution or access. 18 of the 21 studies captured were indicated to be prospective in design. For the majority of

studies captured (75%), cases/patients were matched by both age and sex and approximately a third of studies also matched by cognitive function (Figure 12 below).

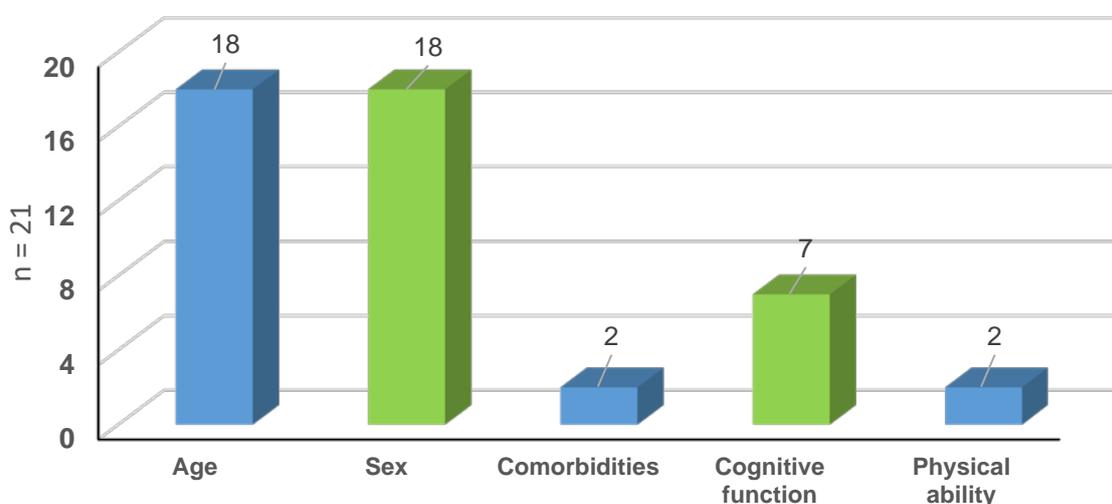


Figure 12. Case matching in case-control studies: One or more of five possible options relating to case matching could be selected from the questionnaire. There was also the option to provide additional comments if required.

Disease Registers

Registers of patients who have offered to participate in research studies on neurodegenerative disease and studies involving relevant groups of patients not captured as population cohorts or case-control studies were captured under the collective heading of disease registers. 15 disease registers were reported in total, as summarised in Table 8.

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
3	8	3	3	2	2	2	5

Table 8. Disease registers relevant to specific neurodegenerative diseases: 15 disease registers were captured. Some were indicated to be relevant to more than one disease or have details of patients with distinct diseases.

Registers involving the following number of clinical cases were captured in the mapping exercise:

- 0–500 clinical cases: 3
- 501–1,000 clinical cases: 3
- 1,001–5,000 clinical cases: 7
- >10,000 clinical cases: 2

Information captured included inclusion/exclusion criteria, measures used to characterise participants and data/sample collection, storage and distribution or access. 9 of the disease

registers captured indicated that tissues/samples/DNA could be made available to other groups with three of the registers able to supply DNA samples from living patients.

Biobanks

Details of 42 repositories holding collections of (human) biological material for use in research studies were captured (Table 9).

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
18	3	3	6	0	0	0	14

Table 9. Biobanks holding material for specific ND: Many biobanks ($n = 42$) hold biological material relevant to multiple diseases.

Principal investigators or managers of biobanks were asked to provide information on the material held, how it was obtained and relating to storage and external access. Of the 42 biobanks, 25 hold tissue or samples from a variety of relevant locations, 24 hold DNA samples and 6 hold relevant human cell lines (see Tables 10 and 11, below).

Tissue (donors)		Tissue (source)	
1-100	7	Nerve biopsy	2
101-1000	11	Muscle biopsy	3
1001-5000	6	CSF	19
> 5000	1	Brain	19
Total	25	Spinal-cord	11

Table 10: Number of tissue/sample donors and source of material.

DNA (donors)		Cell lines	
1-100	2	1-50	1
101-1000	9	51-100	2
1001-5000	10	101-500	2
> 5000	3	> 5000	1
Total	24	Total	6

Table 11: Number of DNA donors and distinct cell lines held by biobanks: The total number of biobanks holding DNA or cell lines is indicated at the foot of each column.

Brain banks

20 repositories indicated they hold post-mortem brain material, with 17 also holding material from healthy individuals or controls. All brain-banks apart from one indicated that at least some records could be linked to clinical information. A breakdown of what clinical information is linked to tissue samples is indicated in Figure 13 below. Note that records could potentially be linked to more than one type of clinical information or only some records could be linked.

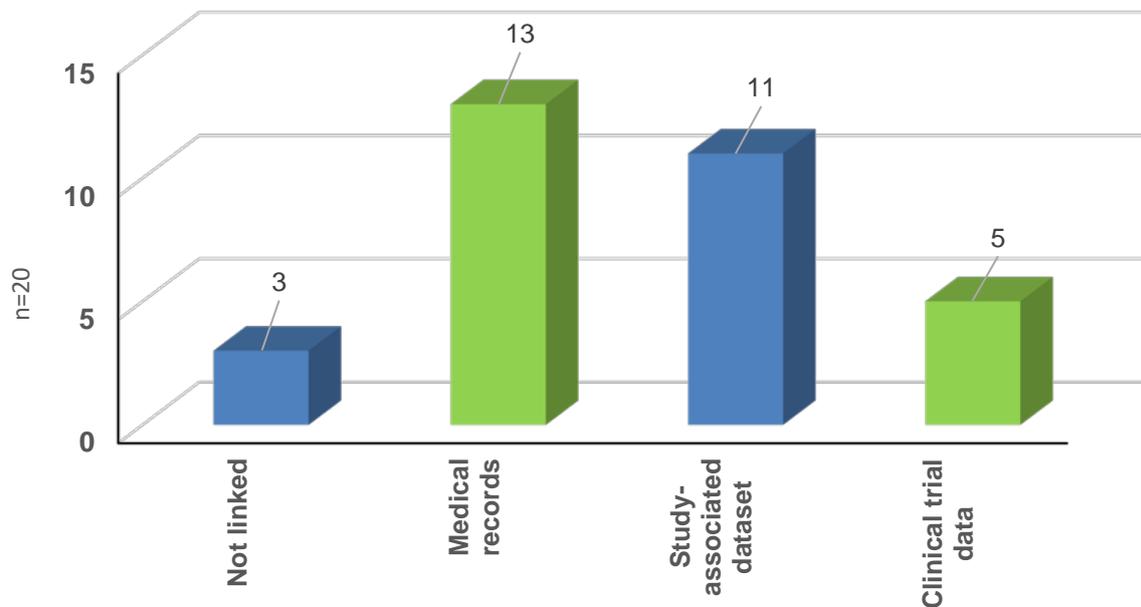


Figure 13: Linkage of post-mortem brain samples to clinical information.

18 of 20 the repositories collecting post-mortem brain material provided information on the number of donors from which tissue was obtained. As indicated in Figure 14 below at least 14 brain-banks hold material from over 100 different donors.

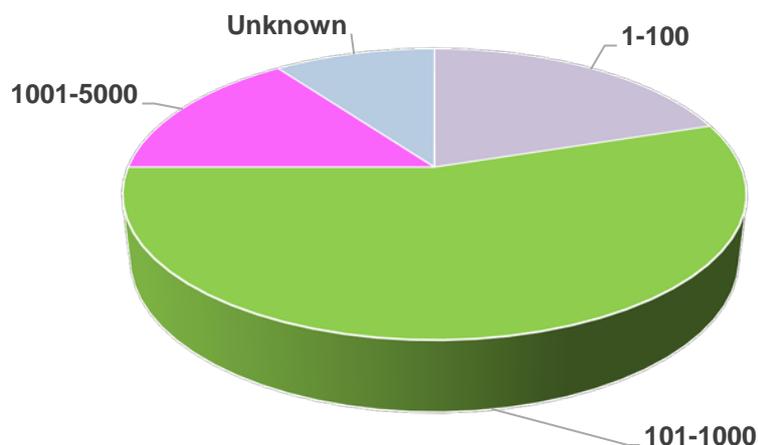


Figure 14: Number of donors providing tissue per brain-bank: The number of donors providing samples was indicated by selecting one of four size ranges; the unknown category represents those repositories not selecting an option.

Experimental Models (animal and cell)

Inclusion in the mapping exercise was limited to sites holding and maintaining animal or cell models of neurodegenerative disease and acting as access and distribution centres for external researchers. 17 animal or cell repositories relevant to neurodegenerative disease were captured (Table 12).

Detailed information, such as genotype and phenotype, on models of ND and other relevant models (cognitive, motor etc) held by the repository was captured as was information relating to access, distribution and development of models. Repositories primarily held rodent models (8), but models in mini-pigs, non-human primate, *Drosophila* (fly), *C. elegans* (worm) were also recorded. 14 of the repositories held (live) animals, with four holding cell models including either gene edited cell lines (e.g. APP, Tau), induced pluripotent stem cells and isolated microglia. Note, data from the new [JPND Experimental Models for Parkinson's Disease database](#) was not included as this resource has been developed since 2016.

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
6	1	1	7	2	0	0	5

Table 12: Number of repositories holding animal/cell models relevant to specific ND: Some of the 17 repositories hold models for multiple diseases.

Bio/NeuroInformatic Resources

Bio/neuroinformatic resources were broadly defined as databases, networks, or infrastructures to share or distribute data relevant to ND or to develop/provide computational or analytical tools to acquire, store, organise, archive, analyse, or visualise such data.

AD	MND	Prion	PD	HD	SCA	SMA	ND gen
5	4	0	2	2	0	0	2

Table 13: Bio/neuroinformatic resources relevant to specific neurodegenerative diseases: The total number of bio/neuroinformatic was 9; some are relevant to multiple diseases.

Details of 9 resources were captured during the exercise and could broadly be assigned to three different groups.

- Neuroinformatics:
- Genomics and sequencing:
- Neuroimaging/imaging:

5. Research Funding - Country Specific Information

Funding totals and analysis for JPND member countries and the EC at 1st January 2016 collected during mapping exercise are provided below. Where supplied by the designated JPND National Mapping Contact/Management Board member, a commentary giving context to the figures and outlining the national funding landscape has been included.

5.1 *Albania*

No funding data or commentary supplied

5.2 Australia

Organisations providing funding data:

- Australian Research Council
- National Health and Medical Research Council
- The Mason Foundation
- Alzheimer's Australia Dementia Research Foundation

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	282	158,403,932	-	35,202,342	-
Investments >€500K	46	92,543,968	58.4	17,391,302	49.4
Investments <€500k	104	22,556,301	14.2	7,821,849	22.2
Fellowships*	132	29,406,511	27.3	9,989,191	28.4
Funding by research category					
Basic	140	57,255,537	36.1	15,013,587	42.6
Clinical	102	71,741,884	45.3	14,214,460	40.4
Health and social care	40	29,406,511	18.6	5,974,294	17.0

* excludes 8 fellowships submitted under the threshold of €0.1m, totalling €545,735

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	38	15,965,105	91.8
Motor neurone disease	3	571,333	3.3
Parkinson's disease	5	743,773	4.3
ND in general	1	111,091	0.6

Commentary

The Australian data set includes funding from the two Federal Government Agencies that fund Research, the National Health and Medical Research Council (NHMRC; www.nhmrc.gov.au) and Australian Research Council (ARC; www.arc.gov.au). NHMRC is the most significant source of research funding in neurodegeneration in Australia. No research funding from Federal Government Departments or State Government sources have been included. Funding from a number of philanthropic sources have also been included, although there are additional philanthropic funders active in neurodegeneration research in Australia that have not supplied data.

5.3 Austria

No official funding data or commentary was supplied from Austria.

Austria, through the Federal Ministry of Science, Research and Economy (BMWFW) participated in the 2015 JPco-fuND and provided funding on the following projects which was included in the mapping exercise:

- *3DPD: Advanced modelling of Parkinson's disease with three-dimensional human midbrain organoids, €318,000 (P. Ertl)*
- *BRIDGET: BRain Imaging, cognition, Dementia and next generation GENomics: a Transdisciplinary approach to search for risk and protective factors of neurodegenerative disease, €499,654 (H.Schmidt)*

5.4 Belgium

Organisations providing funding data:

- Flanders Innovation & Entrepreneurship
- Research Foundation - Flanders (FWO)
- Scientific Institute of Public Health

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	62	30,372,532	-	8,689,691	-
Investments >€500K	17	20,311,074	66.9	5,922,409	68.2
Investments <€500k	17	5,534,842	18.2	1,635,628	18.8
Fellowships*	28	4,526,616	14.9	1,131,654	13.0
Funding by research category					
Basic	54	25,497,143	83.9	7,201,950	82.9
Clinical	3	3,421,000	11.3	871,917	10.0
Health and social care	5	1,454,389	4.8	615,824	7.1

* excludes 11 fellowships submitted under the threshold of €0.1m, totalling €895,000

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	11	2,681,158	45.3
Motor neurone disease	3	983,492	16.6
Parkinson's disease	6	2,252,759	38.0
Prion disease	1	5,000	0.1

Commentary

In Belgium, there are no dedicated research programmes, science policy is according to the bottom up principle and selection of funded projects according to excellence and/or valorisation criteria.

In Flanders, additional funding is governed by the universities, including BOF (Special research fund) and IOF (Industrial research fund) funding.

Organisations funding research in this area:

- BioWin
- EWI: Economy, Science and Innovation

- Fonds de la Recherche Scientifique (FNRS)
- Fonds Wetenschappelijk Onderzoek (FWO): www.fwo.be
- Agentschap voor Innovatie door Wetenschap en Technologie (IWT): www.iwt.be*

*In the process of simplifying the government of Flanders, the activities of IWT and Enterprise Flanders merged into one agency as of January 2016: Flanders Innovation & Entrepreneurship (VLAIO) (in Dutch: Agentschap Innoveren & Ondernemen).
<https://www.iwt.be/english/welcome>

5.5 Bulgaria

Organisations providing funding data:

- German Ministry for Education and Research
- National Science FUND
- International Atomic Energy Agency (IAEA)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	4	133,000	-	88,500	-
Investments >€500K	0	0	0	0	0
Investments <€500k	4	133,000	100	88,500	100
Funding by research category					
Basic	0	0	0	0	0
Clinical	3	88,000	66.2	43,500	49.2
Health and social care	1	45,000	33.8	45,000	50.8

5.6 Canada

Organisations providing funding data:

- Public Health Agency of Canada
- Brain Canada
- CQDM
- ALS Society of Canada
- Michael Smith Foundation for Health Research
- Genome BC
- Pacific Alzheimer Research Foundation (PARF)
- Fonds de la recherche en santé du Québec (FRSQ)
- Krembil Foundation
- Chagnon Family
- AB Innov. Health Sol
- Alz. Soc. AB & North. Territories
- Campus AB Neurosci
- DMC for Brain Health
- Centre de recherche de l'Institut universitaire de gériatrie de Montréal (CRIUGM)
- CIUSSS-CHUS
- Baycrest Centre
- SickKids
- Centre for Addiction and Mental Health (CAMH)
- Sunnybrooke
- University Health Network (UHN)
- Ontario Brain Institute (OBI)
- Canadian Institutes of Health Research (CIHR)
- Heart and Stroke Foundation
- Research Manitoba
- Vancouver Coastal Health

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	168	135,226,434	-	30,384,942	-
Investments >€500K	75	105,386,455	77.9	23,501,319	77.3
Investments <€500k	90	29,510,104	21.8	6,765,787	22.3
Fellowships*	3	329,875	0.2	117,837	0.4
Funding by research category					
Basic	121	108,495,489	80.2	23,579,808	77.6
Clinical	42	25,693,753	19.0	6,437,737	21.2
Health and social care	5	1,037,193	0.8	367,398	1.2

* Excludes 10 fellowships below the financial threshold (<€0.1m) with a total value of €841,751

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	38	15,721,885	66.9
Motor neurone disease	8	2,222,504	9.5
Parkinson's disease	15	2,111,330	9.0

Huntington's disease	5	575,602	2.4
Prion disease	1	55,482	0.2
ND in general	11	2,814,516	12.0

5.7 Croatia

Organisations providing funding data:

- Croatian Science Foundation

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	73	8,762,416	-	2,920,805*	-
Investments >€500K	0	0	0	0	0
Investments <€500k	73	8,762,416	100	2,920,805*	100
Funding by research category					
Basic	71	8,496,750	96.9	2,832,250*	96.9
Clinical	2	265,666	3.1	88,555*	3.1
Health and social care	0	0	0	-	-

Note, data for Croatia was supplied as an aggregated value for basic and clinical research. It was therefore not possible to validate individual projects against JPND criteria.

** For calculation of per year amounts of funding data it was assumed that the average length of investment was 3 years.*

5.8 Czech Republic

Organisations providing funding data:

- Ministry of Education, Youth and Sports
- Czech Science Foundation
- Ministry of Health of the Czech Republic

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	22	8,373,926	-	1,916,457	-
Investments >€500K	1	3,274,407	39.1	467,772	24.4
Investments <€500k	21	5,099,519	60.9	1,448,685	75.6
Funding by research category					
Basic	14	6,280,926	75.0	1,390,824	72.6
Clinical	9	2,093,000	25.0	525,633	27.4
Health and social care	0	0	0.0	0	0

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	1	467,772	100

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	2	2,199,224

* Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €23,730,507.

Commentary

Please note that all the information provided in this questionnaire for the Czech Republic is based on publicly available data. The number of projects and the total sum awarded to neurodegenerative research are indicative; there may be more projects which are not included in this questionnaire. The Ministry of Education, Youth and Sports is the central administrative body responsible for research and development, however, it has no specific-oriented programme or budgetary chapter aimed at support of neurodegenerative disease research. The Ministry of Education, Youth and Sports provides support to these projects via thematically cross-cutting programmes and therefore has no separate evidence on neurodegenerative research projects.

5.9 Denmark

Organisations providing funding data:

- Danish Council for Independent Research
- Lundbeckfonden
- Novo Nordisk Fonden
- Velux Fonden

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	57	20,906,724	-	6,810,436	-
Investments >€500K	11	8,594,419	41.1	2,381,977	35.0
Investments <€500k	40	9,587,014	45.9	3,594,791	52.8
Fellowships	6	2,725,290	13.0	833,668	12.2
Funding by research category					
Basic	52	16,648,818	79.6	5,616,697	82.5
Clinical	3	3,703,606	17.7	1,055,165	15.5
Health and social care	2	554,300	2.7	138,575	2.0

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	7	1,028,953	43.2
Parkinson's disease	4	975,903	41.0
ND in general	2	377,121	15.8

Commentary

The Danish projects and resources presented in the 2016 JPND Mapping do not give the complete picture for Denmark, although it is very likely to cover all the largest and most relevant projects. The data and projects included in the mapping exercise are all collected from national, regional and charity research funding organizations which provide funding through open calls and competition.

However, both the universities (Higher Education Sector) and the hospitals receive a block funding for research (mode 1), which in fact is higher than the funding channelled through the call based funding arenas (mode 2). The mapping data includes only a limited extent of the block funding.

5.10 Finland

Organisations providing funding data:

- Academy of Finland
- Tekes

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	44	20,272,917	-	6,028,667	-
Investments >€500K	8	7,889,725	38.9	2,432,453	40.3
Investments <€500k	21	7,013,389	34.6	2,387,084	39.6
Fellowships	15	5,369,803	26.5	1,209,131	20.1
Funding by research category					
Basic	29	14,943,232	73.7	4,630,199	76.8
Clinical	8	3,090,097	15.2	842,505	14.0
Health and social care	7	2,239,588	11.0	555,963	9.2

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	6	643,025	26.4
Parkinson's disease	2	984,748	40.5
ND in general	3	804,681	33.1

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure	3	1,459,068

**Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €2,431,780*

5.11 France

Organisations providing funding data:

- Agence Nationale de la Recherche (ANR)
- Direction générale de l'offre de soins (DGOS)
- Fondation Plan Alzheimer

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	133	51,245,737	-	14,241,117	-
Investments >€500K	53	31,298,554	61.1	8,297,534	58.3
Investments <€500k	74	18,014,608	35.2	5,452,891	38.3
Fellowships	6	1,932,575	3.8	490,691	3.4
Funding by research category					
Basic	66	23,201,201	45.3	6,086,328	42.7
Clinical	52	23,502,513	45.9	6,811,185	47.8
Health and social care	15	4,542,023	8.9	1,343,604	9.4

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	34	4,625,635	55.7
Parkinson's disease	20	2,705,539	32.6
Huntington's disease	2	198,169	2.4
Motor Neurone disease	2	417,815	5.0
Spinal muscular atrophy	1	23,335	0.3
Spinocerebellar ataxia	1	27,540	0.3
Prion diseases	1	56,250	0.7
ND in general	3	243,251	2.9

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	31	68,814,000

** Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €117,014,000.*

Commentary

To date, given both the information required by the mapping exercise database and the special status of French scientific and technological public institutions (i.e. Inserm, CNRS), financial data (recurrent budget and staff salaries) from several research teams of these institutions could not be filled in the database. Besides, data for some programs and foundations are not available. Therefore, investments listed for France are underestimated.

5.12 Germany

Organisations providing funding data:

- Federal Ministry of Education and Research (BMBF)
- Federal Ministry of Family Affairs, Senior Citizens, Women and Youth (BMFSFJ)
- Federal Ministry of Health (BMG)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	103	327,916,384	-	105,884,816	-
Investments >€500K	78	322,660,026	98.4	103,701,002	97.9
Investments <€500k	25	5,256,359	1.6	2,183,814	2.1
Funding by research category					
Basic	51	240,965,455	73.5	80,200,510	75.7
Clinical	23	63,212,687	19.3	17,163,807	16.2
Health and social care	29	23,738,241	7.2	8,520,499	8.0

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	47	39,344,871	37.9
Parkinson's disease	15	29,400,860	28.4
Motor neurone disease	9	3,341,182	3.2
Huntington's disease	1	27,379	0.0
Prion diseases	1	92,307	0.1
Spinal muscular atrophy	1	66,489	0.1
Spinocerebellar ataxia	2	383,854	0.4
ND in general	13	31,044,060	29.9

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	1	111,647,000

*Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €111,647,000.

5.13 Greece

No funding data or commentary supplied

5.14 Hungary

Organisations providing funding data:

- National Research, Development and Innovation Office (NKFIH)
- Hungarian Scientific Research Fund (OTKA)
- Hungarian Academy of Sciences

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	29	10,117,681	-	2,406,978	-
Investments >€500K	5	3,889,791	38.4	972,448	40.4
Investments <€500k	20	3,551,989	35.1	899,350	37.4
Fellowships	4	2,675,901	26.4	535,180	22.2
Funding by research category					
Basic	21	7,885,681	77.9	1,848,978	76.8
Clinical	8	2,232,000	22.1	558,000	23.2
Health and social care	0	0	0	0	0

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	3	286,373	29.4
Parkinson's disease	1	117,141	12.0
ND in general	5	568,935	58.5

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	1	127,272

**Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €636,358.*

Commentary

In Hungary there are no programmes specifically dedicated to neurodegenerative disease research. There is one major programme in brain research in general and there are different programmes/sub-programmes for life sciences and health within which projects relating to neurodegenerative disease research can be funded. Therefore the amount of

funding relevant to neurodegenerative disease varies year by year. Please note that at that time if the exercise it was not possible to obtain all relevant information on capital infrastructure and population cohorts.

5.15 Ireland

Organisations providing funding data:

- Health Research Board
- Irish Research Council
- Science Foundation Ireland
- The Atlantic Philanthropies
- The Alzheimer Society of Ireland

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	51	76,630,743	-	8,622,607	-
Investments >€500K	20	55,083,979	71.9	5,883,263	68.2
Investments <€500k	28	3,845,536	5.0	1,421,790	16.5
Fellowships	3	17,701,228	23.1	1,317,554	15.3
Funding by research category					
Basic	26	8,386,030	11.0	2,428,614	28.2
Clinical	2	477,296	0.6	139,832	1.6
Health and social care	23	67,767,417	88.4	6,054,161	70.2

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	14	3,072,471	52
Parkinson's disease	1	29,563	1
Motor neurone disease	4	814,632	14
Huntington's disease	1	29,563	1
ND in general	3	1,937,035	33

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	2	15,828,887

* Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €21,105,183.

Commentary

The three largest funders of current ND research in the Republic of Ireland are The Atlantic Philanthropies, the Health Research Board and Science Foundation Ireland.

[The Atlantic Philanthropies](#) was founded by entrepreneur Chuck Feeney in 1982 to devote his wealth to the service of humanity. At the end of 2016 AP completed its grant-making. Over the course of 35 years, AP has invested a total of \$8 billion in promising programmes such as the [Global Brain Health Initiative](#) which offers career development and research programs for health brain ageing.

The [Health Research Board](#) is the lead agency in Ireland supporting and funding health research. The HRB mission is to improve people's health, patient care and health service delivery by leading and supporting excellent research by outstanding people within a coherent health research system. The HRB also generates knowledge and promotes its application in policy and practice; and, in doing so, plays a key role in health system innovation and economic development.

[Science Foundation Ireland](#) invests in academic researchers and research teams who are most likely to generate new knowledge, leading edge technologies and competitive enterprises in the fields of science and engineering. SFI also advances co-operative efforts among education, government, and industry that support its fields of emphasis and promotes Ireland's ensuing achievements around the world.

Other agencies that fund neurodegenerative disease research in Ireland include:

- [Irish Research Council](#)
- [Joint Programme – Neurodegenerative Disease Research \(JPND\)](#)
- [The Alzheimer's Society of Ireland](#)

5.16 Israel

Organisations providing funding data:

- The Chief Scientist Office (CSO) of Israeli Ministry of Health (MOH)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	5	416,500	-	138,833	-
Investments >€500K	4	369,000	88.6	123,000	88.6
Investments <€500k	1	47,500	11.4	15,833	11.4
Funding by research category					
Basic	5	416,500	100	138,833	100
Clinical	0	-	-	-	-
Health and social care	0	-	-	-	-

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	1	33,333	27.1
Parkinson's disease	2	56,333	45.8
Motor neurone disease	1	33,333	27.1

Commentary

Please note that the mapping information provided by Israel is only partial.

5.17 Italy

Organisations providing funding data:

- MIUR

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	26	11,029,998	-	3,676,666	-
Investments >€500K	25	10,680,475	96.8	3,560,158	96.8
Investments <€500k	1	349,523	3.2	116,508	3.2
Funding by research category					
Basic	22	10,259,498	93.0	3,419,833	93.0
Clinical	1	200,000	1.8	66,667	1.8
Health and social care	3	570,500	5.2	190,167	5.2

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	16	1,254,039	35.2
Parkinson's disease	9	902,514	25.4
Motor Neurone disease	5	335,000	9.4
Huntington's disease	4	441,568	12.4
Prion disease	1	107,776	3.0
Spinocerebellar ataxia	1	85,307	2.4
Spinal muscular atrophy	2	174,324	4.9
ND in general	3	259,631	7.3

Commentary

For Italy in particular, due to the methodology used for this mapping exercise, the data included in this report contains only a small portion of the investments made for R&D activities in ND fields. The data available are the projects funded by Ministry of Education, University and Research through international calls and data from the Ministry of Health are not included.

5.18 Luxembourg

Organisations providing funding data:

- Centre Hospitalier de Luxembourg
- Luxembourg Institute of Health
- University of Luxembourg

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	30	18,611,081	-	4,666,307	-
Investments >€500K	4	14,278,745	76.7	3,186,149	68.3
Investments <€500k	26	4,332,336	23.3	1,480,157	31.7
Funding by research category					
Basic	26	12,881,481	69.2	3,430,820	73.5
Clinical	4	5,729,599	30.8	1,235,487	26.5
Health and social care	0	0		0	0

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Parkinson's disease	7	3,107,482	98
Spinocerebellar ataxia	1	78,667	2

5.19 The Netherlands

Organisations providing funding data:

- Alzheimer Nederland
- Erasmus Alzheimer Centre, Rotterdam
- Hersenstichting
- Ministry of Health, Welfare and Sport
- Maastricht University/ Alzheimer Centre Limburg
- Netherlands Organisation for Health Research and Development (ZonMw)
- The Netherlands Organisation for Scientific Research (NWO-FCB)
- Radboud Alzheimer Centre Nijmegen (RAC)
- Stichting ALS
- Parkinson Vereniging
- Utrecht University (UU)
- University Medical Center Groningen (UMCG)
- VU University Medical Centre / Alzheimer Centre Amsterdam

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	174	83,997,470	-	22,225,131	-
Investments >€500K	69	64,006,077	76.2	15,317,535	68.9
Investments <€500k	85	12,629,072	15.0	4,952,506	22.3
Fellowships	20	7,362,321	8.8	1,955,089	8.8
Funding by research category					
Basic	50	31,857,906	37.9	8,450,948	38.0
Clinical	61	41,417,256	49.3	9,972,679	44.9
Health and social care	43	10,722,308	12.8	3,801,504	17.1

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	44	8,685,751	56.7
Parkinson's disease	10	1,004,457	6.6
Motor neurone diseases	11	4,073,843	26.6
Spinal muscular atrophy	1	116,225	0.8
Spinocerebellar ataxia	2	84,403	0.6
ND in general	3	1,352,857	8.8

Commentary

The survey was conducted by the Netherlands Organisation for Health Research and Development (ZonMw) in collaboration with Alzheimer Nederland and the National Initiative Brain and Cognition. After joint efforts, the given response was sufficient, resulting in a survey of 52 major investments and 102 smaller projects. 39% of the funding is about "clinical research", 33% 'basic research' and 27% 'health and social care research'. The main funding resources for ND-research are government, academia (including private funding) and Alzheimer Nederland.

www.alzheimernederland.nl

www.brainandcognition.nl

www.zonmw.nl

5.20 Norway

Organisations providing funding data:

- Norwegian Extra Foundation for Health and Rehabilitation
- Norwegian Health Association
- Research Council of Norway
- Southern-Eastern Norway Regional Health Authority
- Western Norway Regional Health Authority

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	80	40,208,732	-	11,816,106	-
Investments >€500K	27	25,187,361	62.6	7,703,298	65.2
Investments <€500k	38	10,002,590	24.9	2,708,861	22.9
Fellowships	15	5,018,782	12.5	1,403,947	11.9
Funding by research category					
Basic	35	15,434,585	38.4	4,782,186	40.5
Clinical	34	20,335,580	50.6	5,822,033	49.3
Health and social care	11	4,438,568	11.0	1,211,886	10.3

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	21	5,953,762	77.4
Parkinson's disease	7	1,183,151	15.4
Huntington's disease	1	32,914	0.4
Prion disease	1	62,040	0.8
ND in general	4	448,188	6.0

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	3	2,901,145

* Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €29,011,446.

Commentary

The Norwegian projects and resources presented in the 2016 JPND Mapping do not give the complete picture for Norway, although it is very likely to cover all the largest and most relevant projects. The data and projects included in the mapping exercise are all collected from national, regional and charity research funding organizations which provide funding through open calls and competition.

However, both the universities (Higher Education Sector) and the hospitals receive a block funding for research (mode 1), which in fact is higher than the funding channelled through the call based funding arenas (mode 2). The mapping includes only to a limited extent the block funding.

5.21 Poland

Organisations providing funding data:

- National Science Centre
- Medical University of Białystok
- Ministry of Science and Higher Education
- The National Centre for Research and Development

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	17	2,362,309	-	682,463	-
Investments >€500K	4	1,507,468	63.8	385,517	56.5
Investments <€500k	13	854,841	36.2	296,945	43.5
Funding by research category					
Basic	12	1,995,887	84.5	558,600	81.9
Clinical	3	23,785	1.0	9,651	1.4
Health and social care	2	342,637	14.5	114,212	16.7

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	2	198,457	51.5
Motor neurone diseases	2	187,060	48.5

5.22 Portugal

Organisations providing funding data:

- Foundation for Science and Technology (FCT)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	61	9,304,672	-	2,161,443	-
Investments >€500K	10	1,649,903	17.7	549,968	25.4
Investments <€500k	9	1,526,667	16.4	510,847	23.6
Fellowships	42	6,128,102	65.9	1,100,628	50.9
Funding by research category					
Basic	50	7,481,954	80.4	1,694,424	78.4
Clinical	5	1,097,383	11.8	262,621	12.2
Health and social care	6	725,336	7.8	204,399	9.5

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	4	180,202	32.8
Parkinson's disease	3	135,150	24.6
Motor neurone diseases	2	69,808	12.7
Spinal muscular atrophy	1	23,141	4.2
Spinocerebellar ataxia	2	141,667	25.8

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	1	526,206

*Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €3,508,042.

Commentary

Fundação para a Ciência e a Tecnologia (FCT), the Portuguese Foundation for Science and Technology, is the national funding agency for science, technology and innovation, under responsibility of the Ministry of Science, Technology and Higher Education. FCT started its activities in August 1997, succeeding the Junta Nacional de Investigação Científica e Tecnológica (JNICT).

FCT aims to continuously promote the advancement of scientific and technological knowledge in Portugal, achieving the highest international standards in quality and competitiveness in all scientific and technological domains, and encouraging its dissemination and active role in society and in the economic development of the country.

FCT pursues its mission by supporting researchers through fellowships, studentships and research contracts for scientists, by funding the development of research projects and supporting internationally competitive research centres, as well as state-of-the-art infrastructures, and ensuring Portugal's participation in international scientific organisations. FCT promotes knowledge transfer between R&D centres and industry and establishes partnerships with universities and other public or private institutions, in Portugal and abroad, through cooperation agreements and other types of support.

The results of FCT activities are, in essence, the result of the contributions of the individual scientists, research groups and institutions that are funded by FCT.

5.23 Romania

Organisations providing funding data:

- Ministry of Research and Innovation
- The Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	6	2,659,197	-	768,459	-
Investments >€500K	1	1,901,358	71.5	475,340	61.9
Investments <€500k	5	757,839	28.5	293,119	38.1
Funding by research category					
Basic	6	2,659,197	100	768,459	100
Clinical	0	0	0	0	0
Health and social care	0	0	0	0	0

Annualised spend by disease for investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	1	237,670	50
ND in General	1	237,670	50

5.24 Slovak Republic

Organisations providing funding data:

- Ministry of Education, Science, Research and Sport of the Slovak Republic
- Slovak Research and Development Agency

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	23	2,356,686	-	917,671	-
Investments >€500K	0	0	0	0	0
Investments <€500k	23	2,356,686	100	917,671	100
Funding by research category					
Basic	23	2,356,686	100	917,671	100
Clinical	0	0	0	0	0
Health and social care	0	0	0	0	0

5.25 Slovenia

Organisations providing funding data:

- Slovenian State Research Agency (ARRS)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	4	279,107	-	93,036	-
Investments >€500K	0	0	0	0	0
Investments <€500k	4	279,107	100	93,036	100
Funding by research category					
Basic	4	279,107	100	93,036	100
Clinical	0	0	0	0	0
Health and social care	0	0	0	0	0

5.26 Spain

Organisations providing funding data:

- Instituto de Salud Carlos III
- Centre for Technological Development (CDTI)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	103	10,895,842	-	3,668,775	-
Investments >€500K	8	2,478,820	22.8	854,152	23.3
Investments <€500k	90	7,809,523	71.7	2,612,123	71.2
Fellowships	5	607,500	5.5	202,500	5.5
Funding by research category					
Basic	50	4,559,469	41.8	1,528,771	41.7
Clinical	52	6,316,374	58.0	2,133,337	58.1
Health and social care	1	20,000	0.2	6,667	0.2

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	5	669,872	78.4
Parkinson's disease	2	143,333	16.8
Motor neurone diseases	3	21,568	2.5
Spinal muscular atrophy	2	13,824	1.6
ND in general	1	5,555	0.7

5.27 Sweden

Organisations providing funding data:

- Swedish Foundation for Strategic Research
- Swedish Research Council
- Ragnar Soderberg Foundation
- VINNOVA
- Formas
- The Wallenberg Foundations
- Forte, the Swedish Research Council for Health, Working Life and Welfare
- The Swedish Brain Foundation

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	201	131,065,283	-	29,540,886	-
Investments >€500K	80	87,411,730	66.7	18,342,681	62.1
Investments <€500k	103	26,030,341	19.9	8,153,257	27.6
Fellowships	18	17,623,211	13.4	3,044,947	10.3
Funding by research category					
Basic	126	72,659,846	55.4	17,373,899	58.8
Clinical	56	48,888,732	37.3	9,489,094	32.1
Health and social care	19	9,516,705	7.3	2,677,893	9.1

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	46	9,958,589	54.3
Parkinson's disease	25	5,395,539	29.4
Huntington's disease	4	446,303	2.4
Spinocerebellar ataxia	1	43,551	0.2
Spinal muscular atrophy	2	143,241	0.8
Motor neurone diseases	10	1,713,722	9.3
ND in General	4	641,736	3.5

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	2	14,581,066

**Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €14,581,066.*

5.28 Switzerland

Organisations providing funding data:

- Swiss National Science Foundation (SNSF)
- Synapsis Foundation - Alzheimer Research Switzerland (ARS)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	34	11,114,937	-	3,427,697	-
Investments >€500K	5	1,474,674	13.3	491,558	14.3
Investments <€500k	21	5,214,563	46.9	1,743,463	50.9
Fellowships	8	4,425,700	39.8	1,192,676	34.8
Funding by research category					
Basic	31	10,539,058	94.8	3,213,062	93.7
Clinical	3	575,879	5.2	214,635	6.3
Health and social care	0	0	0	0	0

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	1	60,284	12.3
Parkinson's disease	2	259,369	52.8
Motor neurone diseases	2	171,905	35.0

Commentary

For detailed information on individual grants see SNSF public database at: <http://p3.snf.ch/>

5.29 Turkey

Organisations providing funding data:

- The Scientific and Technological Research Council of Turkey (TUBITAK)

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	40	4,283,902	-	1,788,710	-
Investments >€500K	0	0	0	0	0
Investments <€500k	39	4,154,494	97.0	1,724,006	96.4
Fellowships	1	129,408	3.0	64,704	3.6
Funding by research category					
Basic	37	4,085,165	95.4	1,689,341	94.4
Clinical	3	198,737	4.6	99,369	5.6
Health and social care	0	0	0	0	0

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	9	-

* Note, the total capital cost of these projects was not provided.

5.30 United Kingdom

Organisations providing funding data:

- Age UK
- Alzheimer's Research UK
- Alzheimer's society
- Ataxia UK
- Biotechnology and Biological Sciences Research Council
- Chief Scientist Office Scottish Government Health Department
- Department of Health(DH)/NIHR
- Economic and Social Research Council
- Engineering and Physical Sciences Research Council
- Health and Care Research Wales
- Health and Social Care Services Northern Ireland
- Innovate UK
- Medical Research Council
- Motor Neurone Disease Association
- Parkinson's Disease UK
- Stroke Association
- Wellcome Trust

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	658	610,569,305	-	159,023,370	-
Investments>€500K	232	468,695,945	76.8	116,776,843	73.4
Investments<€500k	301	58,220,576	9.5	22,789,325	14.3
Fellowships [#]	125	83,652,784	13.7	19,457,202	12.2
Funding by research category					
Basic	419	403,774,674	66.1	106,228,100	66.8
Clinical	125	122,692,912	20.1	30,641,237	19.3
Health and social care	114	84,101,719	13.8	22,154,032	13.9

[#] Excludes 22 PhD studentships relevant to neurodegenerative disease with a total value of €5,616,072

Annualised spend by disease for Investments>€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	131	46,159,410	39.5
Parkinson's disease	42	14,925,857	12.8
Motor Neurone disease	23	5,512,068	4.7
Huntington's disease	9	2,123,369	1.8
Prion disease	22	19,509,938	16.7
Spinal muscular atrophy	2	161,139	0.1

Spinocerebellar ataxia	1	122,924	0.1
ND in general	41	28,262,138	24.2

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	17	67,448,429

* Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €98,763,608.

Commentary

Information on funding was provided by 17 research organisations from both the government and charitable sectors.

UK biomedical, health and socio-economic research is funded for the most part through the academic sector in both Universities and NHS Trusts. The major funders are the Research Councils ([MRC](#), [BBSRC](#), [EPSRC](#) and [ESRC](#)), funded through central Government but with operational independence, and the devolved UK Health Departments, with the largest being the [NIHR](#) funding stream of the [Department of Health](#) (England). In addition there is a significant contribution from the research charity sector, for the most part directed towards specific disease areas.

As indicated in the overall Research Funding section, the figures presented for the UK are representative of research specifically related to age-related neurodegenerative disease. However, substantive funding is provided through the UK Research Councils and Department of Health for more generic neuroscience research as well as epidemiological, imaging and clinical facilities that are supportive of this research domain that has not been captured by this exercise. In addition, investments in broad areas such as assisted living technologies also contribute to this landscape.

The UK also support high quality research of direct relevance to ND is being conducted through PhDs and postdoctoral fellowships which were not included in the mapping exercise.

5.31 European Commission

This includes the following EC programmes:

- Horizon 2020
- FP7-Seventh Framework Programme/Innovative Medicines Initiative

	No. projects	Full value (€)	%	Per year (€)	%
Total research funding	182	429,048,355	-	98,429,402	-
Investments >€500K	95	391,710,486	91.3	86,670,792	88.1
Investments <€500k	19	2,163,460	0.5	1,661,029	1.7
Fellowships	68	35,174,408	8.2	10,097,580	10.3
Funding by research category					
Basic	133	237,790,819	55.4	51,668,398	52.5
Clinical	35	146,750,965	34.2	33,384,307	33.9
Health and social care	14	44,506,571	10.4	13,376,696	13.6

Annualised spend by disease for Investments >€500K:

Disease	No. projects	Per year (€)	%
Alzheimer's disease	41	40,209,796	46.4
Parkinson's disease	29	22,130,160	25.5
Huntington's disease	4	2,099,969	2.4
Motor neurone diseases	8	5,072,837	5.9
Prion disease	2	620,357	0.7
Spinal muscular atrophy	1	220,407	0.3
ND in General	21	16,317,267	18.8

	No. projects	Estimated ND-relevant investment of total investment (€)
Capital Infrastructure*	7	40,509,762

* Note, funds for capital infrastructure are not included in the total research funding given above. Capital infrastructure invariably covers more than one scientific area; therefore, for each infrastructure an estimate was made for the ND-relevant portion. The total investment reported was €197,149,427.

Commentary

In addition to the above programmes the EC funds:

- [JPsustaiND](#), A Coordination Action in support of the sustainability and globalisation of the Joint Programming Initiative on Neurodegenerative Disease (€2.04 million over four years).
- [JPcofuND](#), an [ERA-NET](#) for establishing synergies between the Joint Programming on Neurodegenerative Diseases Research (JPND) and Horizon 2020 (€10 million over five years).

Annex 1: Full Research Classification

Basic research

- Underpinning Research – discovery research that underpins investigations into the cause, development, detection and treatment of disease
- Aetiology - Identification of determinants that are involved in the cause, risk or development of disease, conditions and ill health
- Detection, Screening and Diagnosis - Discovery, development and evaluation of diagnostic, prognostic and predictive markers and technologies in model systems and preclinical settings
- Development of Treatments and Therapeutic Interventions - Discovery and development of therapeutic interventions and testing in model systems and preclinical settings

Clinical research

The major part of the work must be conducted in/on (live) humans, and be patient-oriented at some level:

- Prevention of Disease and Conditions, and Promotion of Well-Being - Research aimed at the primary prevention of disease or ill health, or promotion of well-being in clinical, community or applied settings
- Detection, Screening and Diagnosis - Discovery, development and evaluation of diagnostic, prognostic and predictive markers and technologies in clinical, community or applied settings
- Evaluation of Treatments and Therapeutic Interventions - Testing and evaluation of therapeutic interventions in clinical, community or applied settings

Health & social care research

- Understanding individual care needs (patients and carers) and management of disease, conditions or ill health
- Research into the provision and delivery of health and social care services and infrastructure, health economics, health policy, ethics, research governance and studies of research design, measurements and methodologies
- Research into social or societal impact of disease

Annex 2: JPND Portfolio Search Terms

A suggested list of search terms for neurodegenerative disease in the context of JPND was provided to national mapping contacts to assist with the identification of relevant research funding. We suggested to initially perform a broad search using keywords and then to determine if the projects identified met the inclusion criteria for the exercise.

1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine	Frontotemporal Lobar Degeneration
Alpha-Synuclein	Galantamine
Alzheimer Disease	Gerstmann-Straussler-Scheinker Disease
Alzheimer Vaccines	Heredodegenerative Disorders, Nervous System
Amyloid	Huntington Disease
Amyloid beta-Peptides	Kuru
Amyloid beta-Protein Precursor	Levodopa
Amyloid Neuropathies	Lewy Bodies
Amyloid Precursor Protein Secretases	Lewy Body Disease
Amyloidosis	Lysosomal Storage Diseases, Nervous System
Amyloidosis, Familial	Machado-Joseph Disease
Amyotrophic Lateral Sclerosis	Memantine
Antiparkinson Agents	Memory Disorders
Aphasia, Primary Progressive	Mental Recall
Apolipoprotein E2	Motor Neuron Disease
Apolipoprotein E3	Multiple System Atrophy
Apolipoprotein E4	Muscular Atrophy, Spinal
Apolipoproteins E	Myoclonic Cerebellar Dyssynergia
Assisted Living Facilities	Nerve Degeneration
Brain Diseases, Metabolic	Neuregulin-1
Brain Injuries	Neuroacanthocytosis
Brain Injury, Chronic	Neurodegenerative Diseases
Bulbo-Spinal Atrophy, X-Linked	Neurofibrillary Tangles
Caregivers	Neuronal Ceroid-Lipofuscinoses
Cerebellar Ataxia	Niemann-Pick Disease, Type A
Cholinesterase Inhibitors	Niemann-Pick Disease, Type B
Creutzfeldt-Jakob Syndrome	Niemann-Pick Disease, Type C
Deep Brain Stimulation	Niemann-Pick Diseases
Delirium, Dementia, Amnestic, Cognitive Disorders	Olivopontocerebellar Atrophies
Dementia	Oxidopamine
Dementia, Multi-Infarct	Pantothenate Kinase-Associated Neurodegeneration
Dementia, Vascular	Parkinson Disease
Dihydroxyphenylalanine	Parkinson Disease, Postencephalitic
Dopamine Plasma Membrane Transport Proteins	Parkinsonian Disorders
Frontotemporal Dementia	Pick Disease of the Brain

Presenilin-1
Presenilin-2
Presenilins
Prion Diseases
Prions
PrPC Proteins
PrPSc Proteins
Pseudobulbar Palsy
Riluzole
Rotenone
Sandhoff Disease
Scrapie
Shy-Drager Syndrome
Sialic Acid Storage Disease
Sphingolipidoses
Spinocerebellar Ataxias

Spinocerebellar Degenerations
Striatonigral Degeneration
Supranuclear Palsy, Progressive
Synucleins
tau Proteins
Tauopathies
Tay-Sachs Disease
Tay-Sachs Disease, AB Variant
Trinucleotide Repeats
Tyrosine 3-Monooxygenase
Ubiquitin
Ubiquitination
Wallerian Degeneration
Wasting Disease, Chronic
Wernicke Encephalopathy