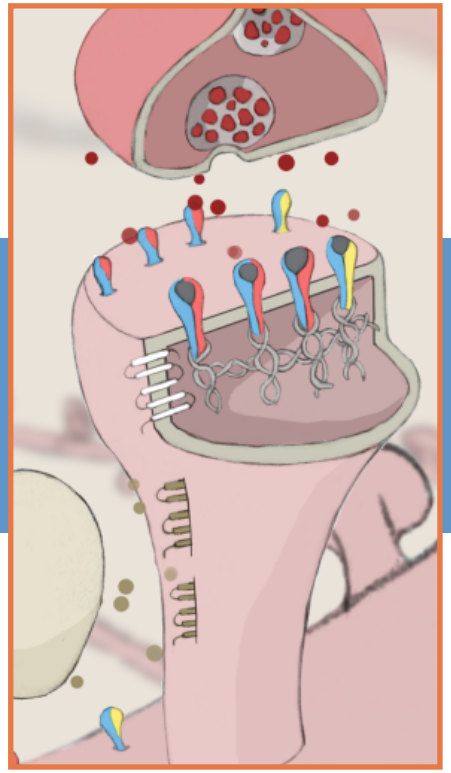

Neuroscience funding and policy

Monica DiLuca
FENS President

Brain Research in Europe

Brain research is a rapidly evolving field, and increasingly at the forefront of science, but highly needed for our understanding of the still unknown basic functions of the nervous system

The complexity of understanding brain function brings responsibilities as well as opportunities : responsibility to develop novel tools and approaches in order to integrate and advance our knowledge; opportunities to provide a better understanding of the underlying pathogenic mechanisms of brain diseases, and thus to generate novel therapeutic approaches for the benefit of society.

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The Cost of Brain Diseases: A Burden or a Challenge?

The cost of brain diseases in Europe has been estimated 798 billion euros

(The economic cost of brain disorders in Europe. Olesen et al, Eur J Neurol. 2012; DiLuca, Neuron 2014)

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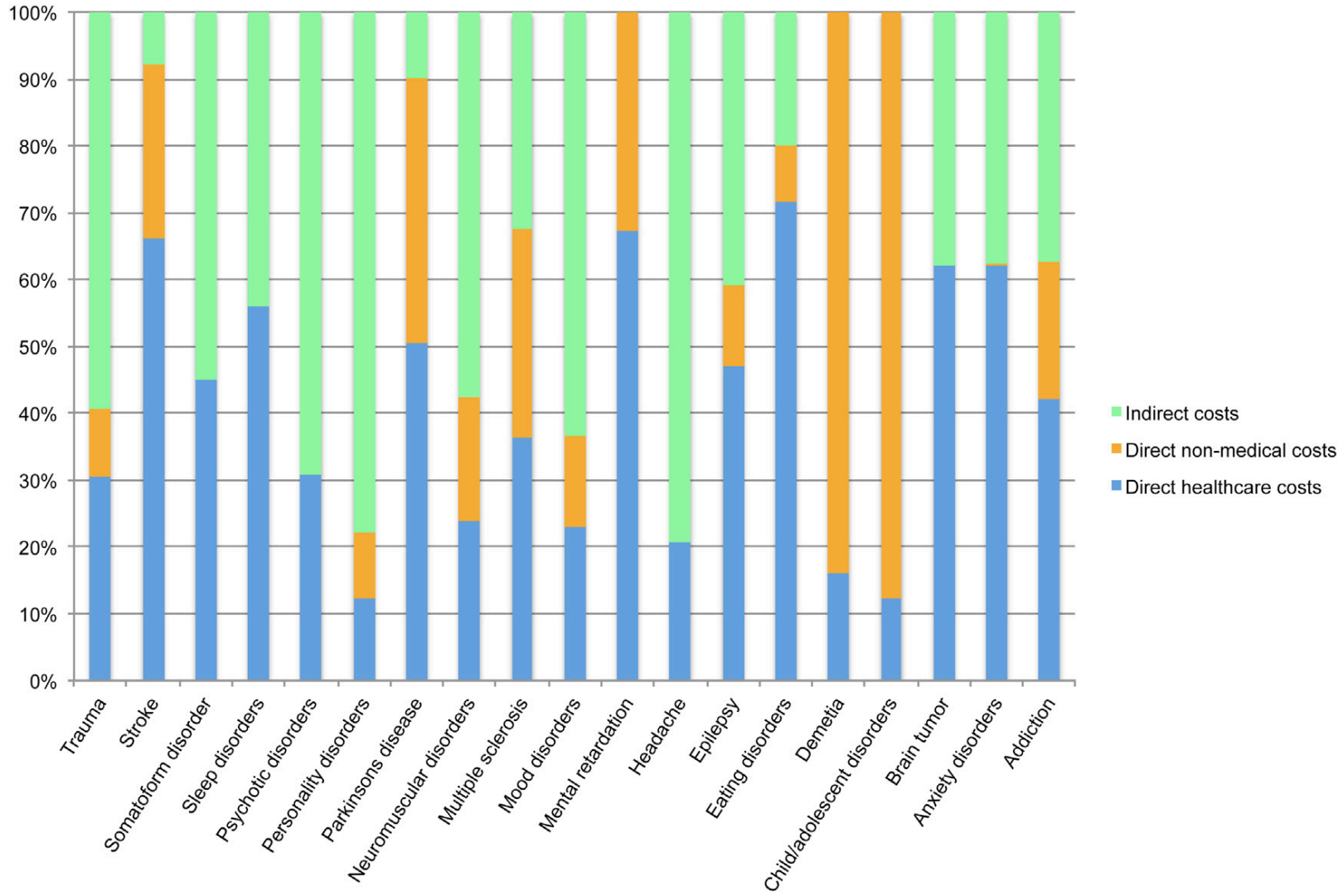
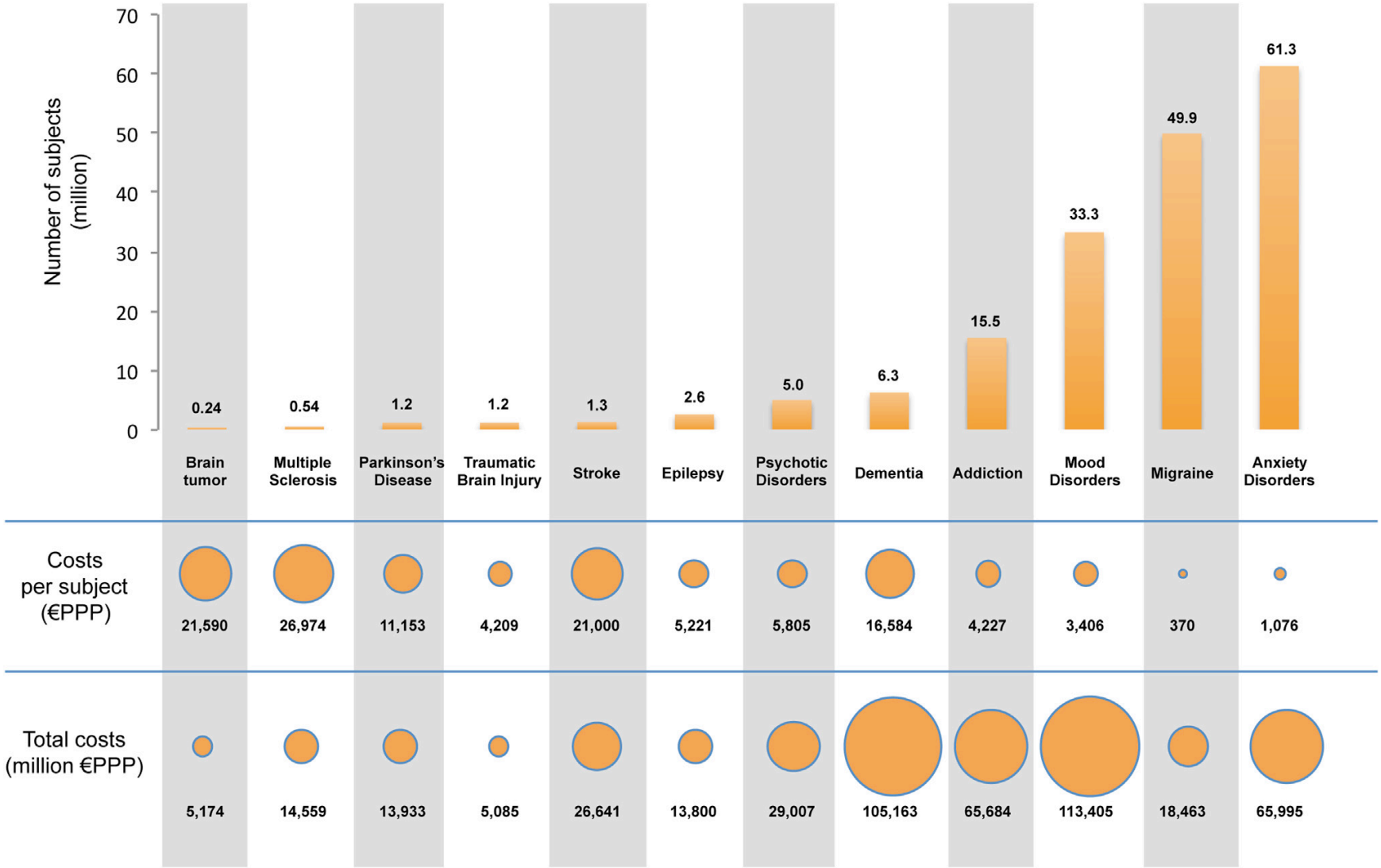
Cost distribution of Brain Diseases



M DiLuca, J Olesen Neuron, 2014

The Cost of Brain Diseases: A Burden or a Challenge?



M DiLuca, J Olesen Neuron, 2014

- **5.1 Making the brain: developmental neuroscience**
- The development of body and brain is nothing short of a miracle. From a fertilized ovum, there emerges a fully formed body with all its diverse organs and ability to survive – all happening within the space of nine months. At birth, a baby's brain may be immature, but it already has approximately 100 billion brain cells to help it understand the booming buzzing confusion of life outside the womb.
- Developmental neuroscience is now a mature field within the brain sciences – with numerous critical genes and processes identified. The challenge is now to apply our new knowledge on developmental programs such as migration or axon guidance to systems neuroscience and, importantly, to developmental diseases.

- **5.2 Understanding causal mechanisms: linking cellular/molecular mechanisms to complex behaviours**
- Another major challenge in neuroscience is a variety of 'bridging' problems. Specifically, understanding the mechanisms that bridge multiple spatial and temporal scales, namely the task of linking the activity of individual components (e.g., molecular biology, genetics, and neuron networks) to the overall complex dynamic behavior of the brain and nervous system remains very difficult. It is, however, vital for progress.

- **5.3 Information processing: what the brain does.**
- The brain controls behaviour, and it succeeds in doing this through an interlinked set of elaborate mechanisms: sensing the world around us (e.g. seeing), and the world within (e.g. proprioception); the transformation of this sensory input into an object-oriented understanding (via perception); linking this knowledge with stored information from memory; and the organisation of actions and habits guided by emotion and motivation. We understand a lot, but so many aspects of these processes remain a mystery, especially fundamental concepts like numerosity and decision-making, but also how they are impaired in mental health disorders.

- **5.4 Emerging new technologies**
- It is a truism in science that new technologies open new windows on discovery. Europe is at serious risk of falling behind in this respect, despite the imagination of many of our scientists. Examples suggested of issues that need to be considered:

5.5 Brain and mental health disorders

5.6. Computational Neuroscience and data repositories

Issues at stake of brain research

- Understanding the brain and its diseases remains one of the greatest scientific challenge
- Complex and highly multidisciplinary research
- Brain diseases constitute a major burden to our society, with a cost of about €800 billion in 2010

  => € 1.5 million per minute
- Europe's population is getting older

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By 2025 20% of European citizens will be 65 or over

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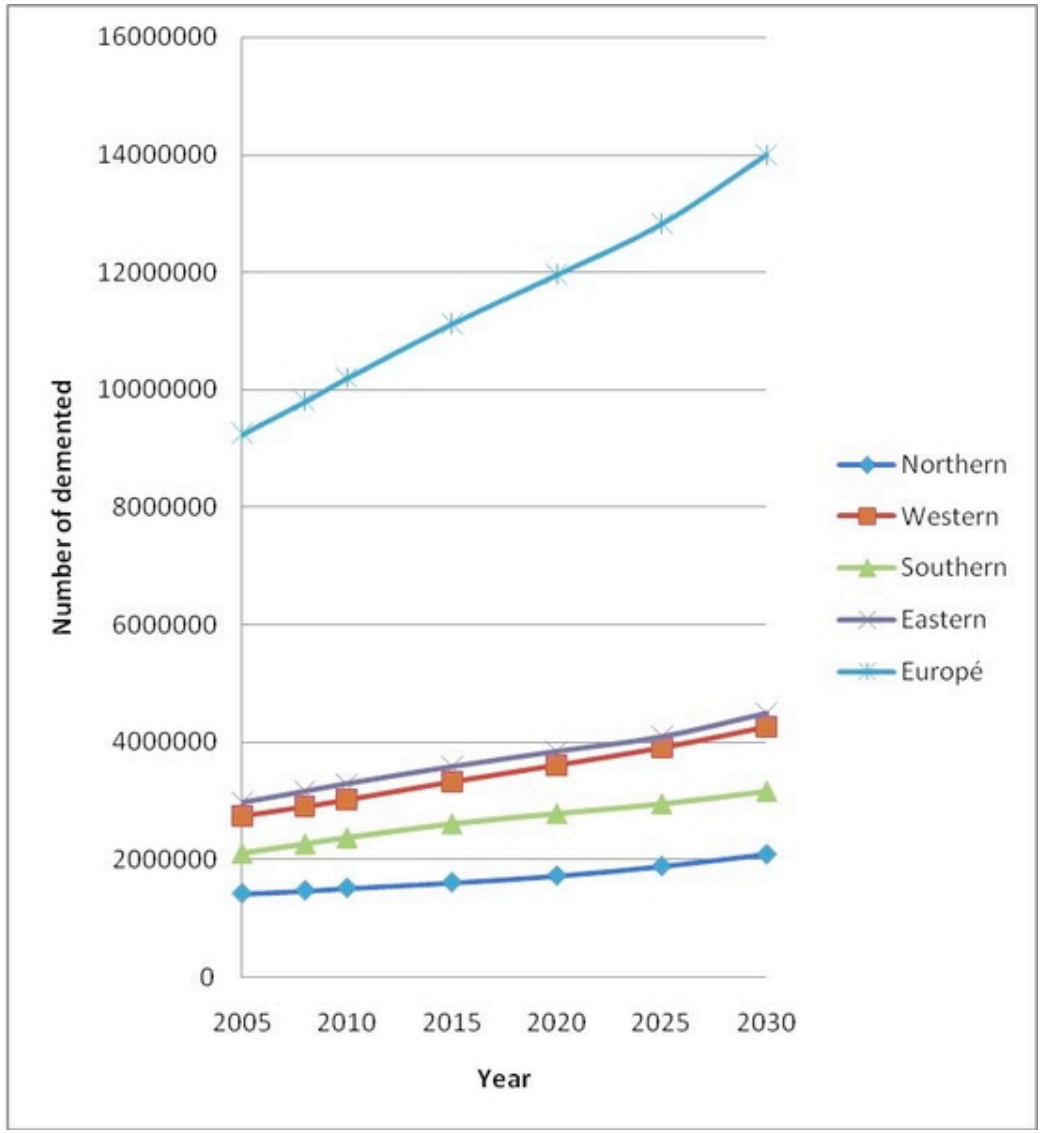
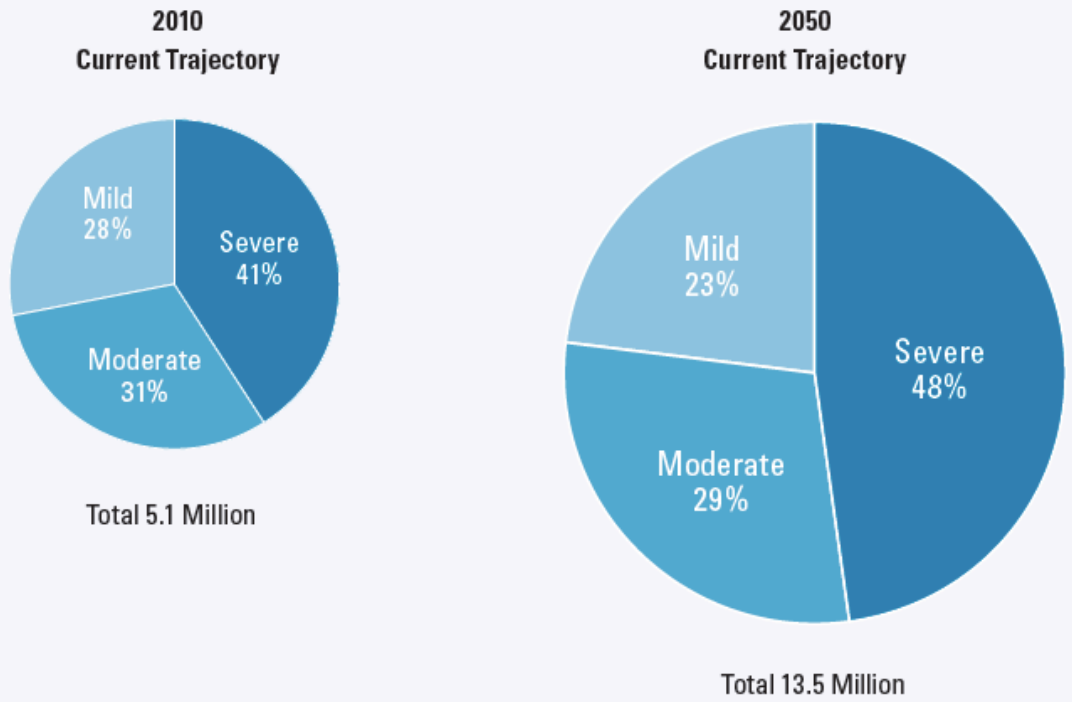
A major societal challenge for the coming years

Prospective study on dementia in Europe: number of patients in 2030



The “Change Trajectory” study in US

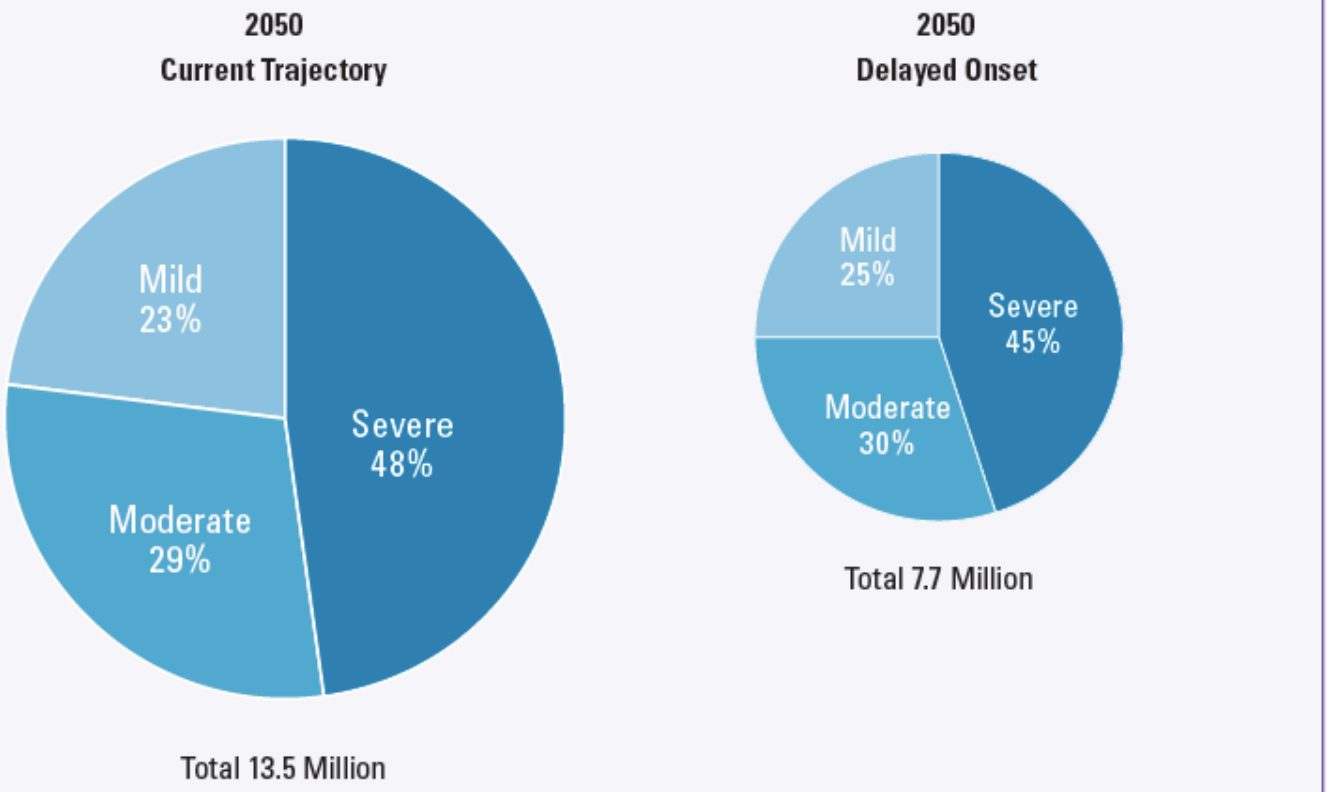
Figure 2:
Proportion of Americans Age 65 and Older with Alzheimer’s Disease by Stage of Disease, 2010–2050



What if we delay the onset and progression?

Changing the trajectory

Figure 5:
Impact of a 5-Year Delay in Onset by Stage of Disease, Americans Age 65 and Older with Alzheimer's Disease, 2050



Neuroscience at the cross-road

Tackling societal challenges and making breakthrough discoveries is not a linear process, and therefore what is needed is support for science and innovation as a holistic system.

In particular, the challenges presented by brain diseases for which insight into basic functional mechanisms are still poorly understood, requires support for the full breadth of neuroscience research.

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EU response to this challenge

- Provided a comprehensive support for brain research in FP7
- Dedicated financial resources unmatched by any previous research framework programme
- More than EUR 2.5 billion dedicated to brain-related research since 2007 (yearly allocation of more than EUR 300 million)
- 1,268 projects
- 4,312 participations of 1,515 institutions

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Major initiatives to support brain research

- Different funding measures
  - ERA-NET neuron
  - JPND
  - Roamer
  - International Initiative for traumatic Brain Injury research
  - International Neuroinformatic Coordinating Facility
  - Human Brain Project
  - IMI (public-private)

Issues at stake of brain research

- In the last few years, several pharmaceutical companies reduced or closed their neurosciences R&D facilities because of lower perspectives of return on investment

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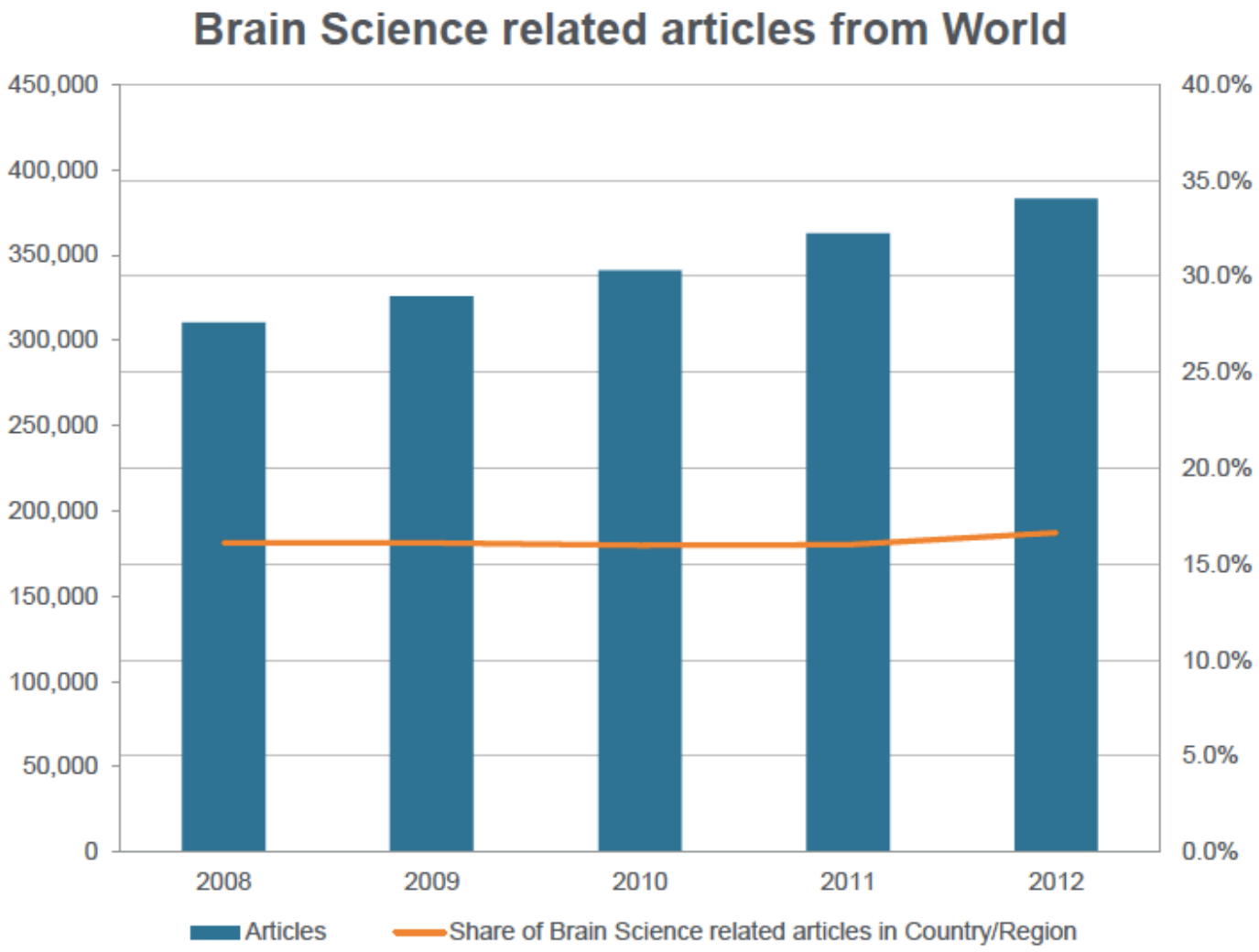
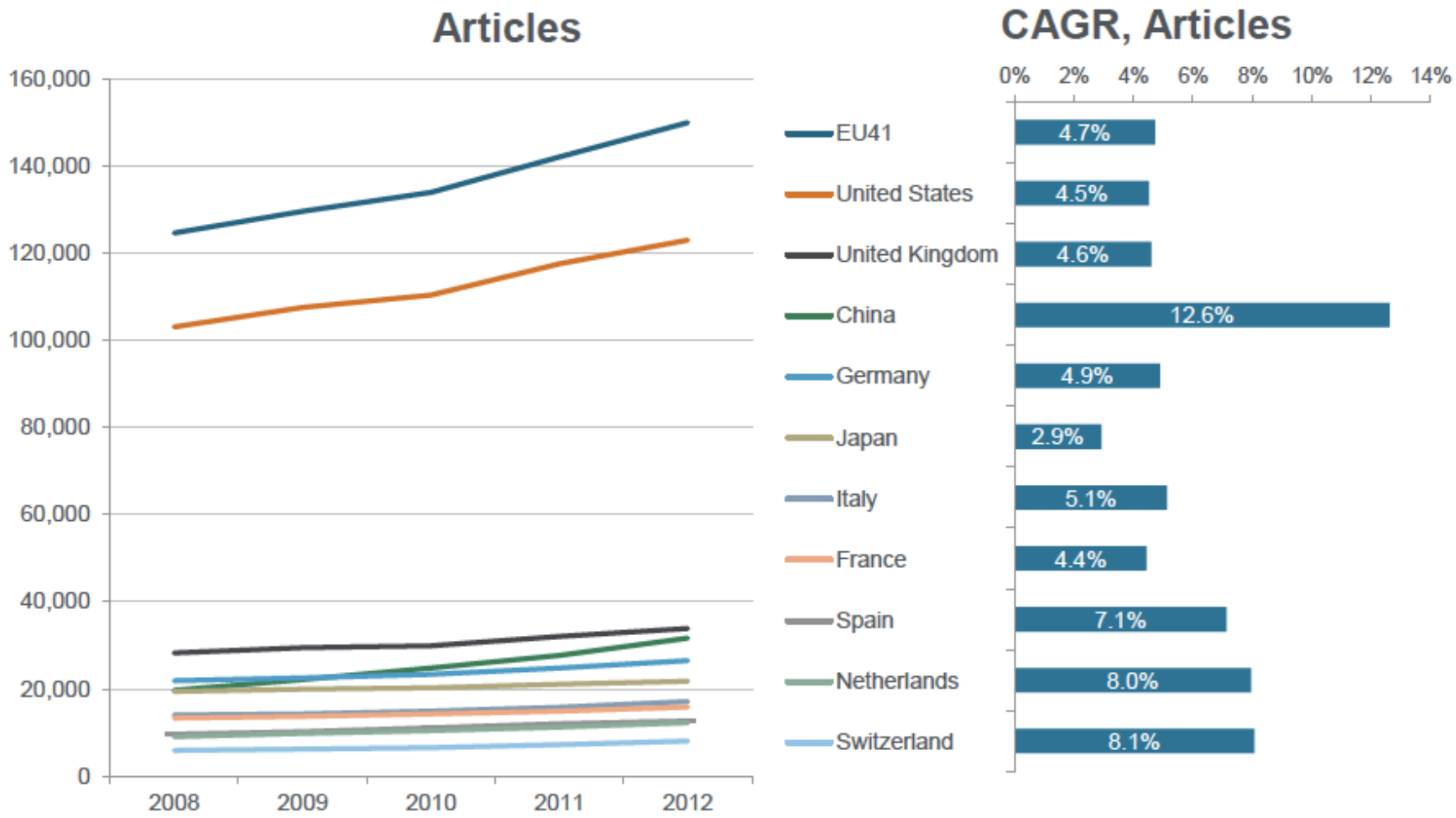
The outcomes

Increasing publication output in Brain Science with stable share at ~16% of world output



The top 10 most prolific countries in Brain Research and the EU41 all show growth in the last 5 years



Neuroscience at the cross-road

Continued support to open, basic brain research and the ambition to increase European and cross-sectoral research collaboration keeping in mind that research excellence needs to be balanced by a complementary focus on policy priorities, societal challenges and emerging lead technologies.

Support for European education and integration according to these priorities is central to prepare Europe for the challenges of the future.

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Neuroscience funding and policy

Best funding methods and models for public-private partnerships to address the challenge

Martin Vetterli, Swiss National Science Foundation

Pierre Magistretti, KAUST,EPFL,IBRO

Bernard Puolain, CNRS

Shumin Duan, Chinese Neuroscience Society

A new starting point

Modern brain research can capitalize on great progresses made in holistic 'omics' research (proteomics, genomics...) imaging, advanced technologies...

Tangible outcomes of fundamental research for society:

- ✓ Provide biological foundation for drug development
- ✓ Improve diagnostic tests
- ✓ Better use of health care resources
- ✓ Reduce stigma through better understanding of brain function and disease mechanisms

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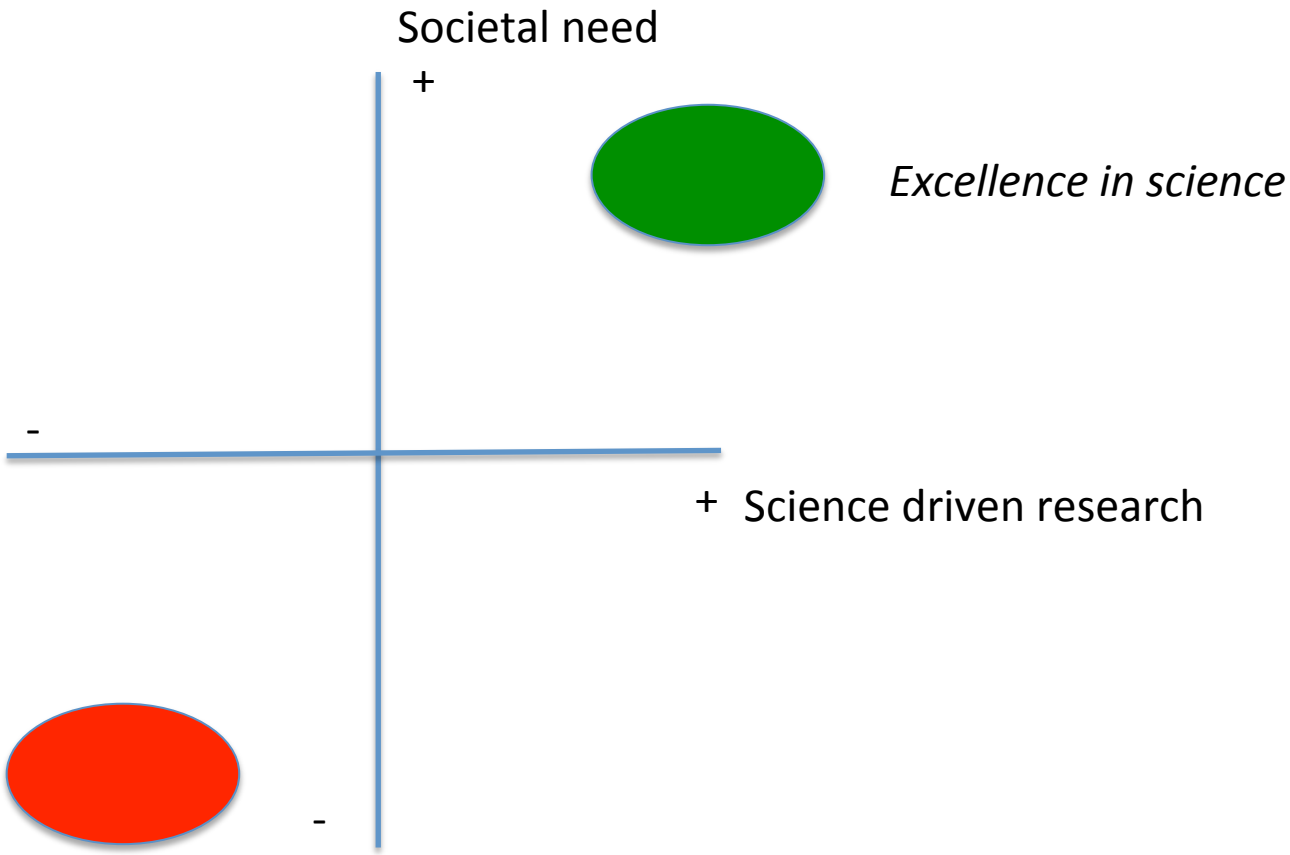
Getting the balance right



R. Morris, EMoB, May 14th, 2013

The importance of continuously supporting brain research for the benefit of our society.

The main goal in the European scenario is to eliminate the discrepancy between the huge impact of brain diseases and the implications of understanding normal brain function and the modest financial and time resources allocated to brain research, teaching and the care of brain diseases still existing at European level and to **maintain an active dialogue with decision-making bodies**

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