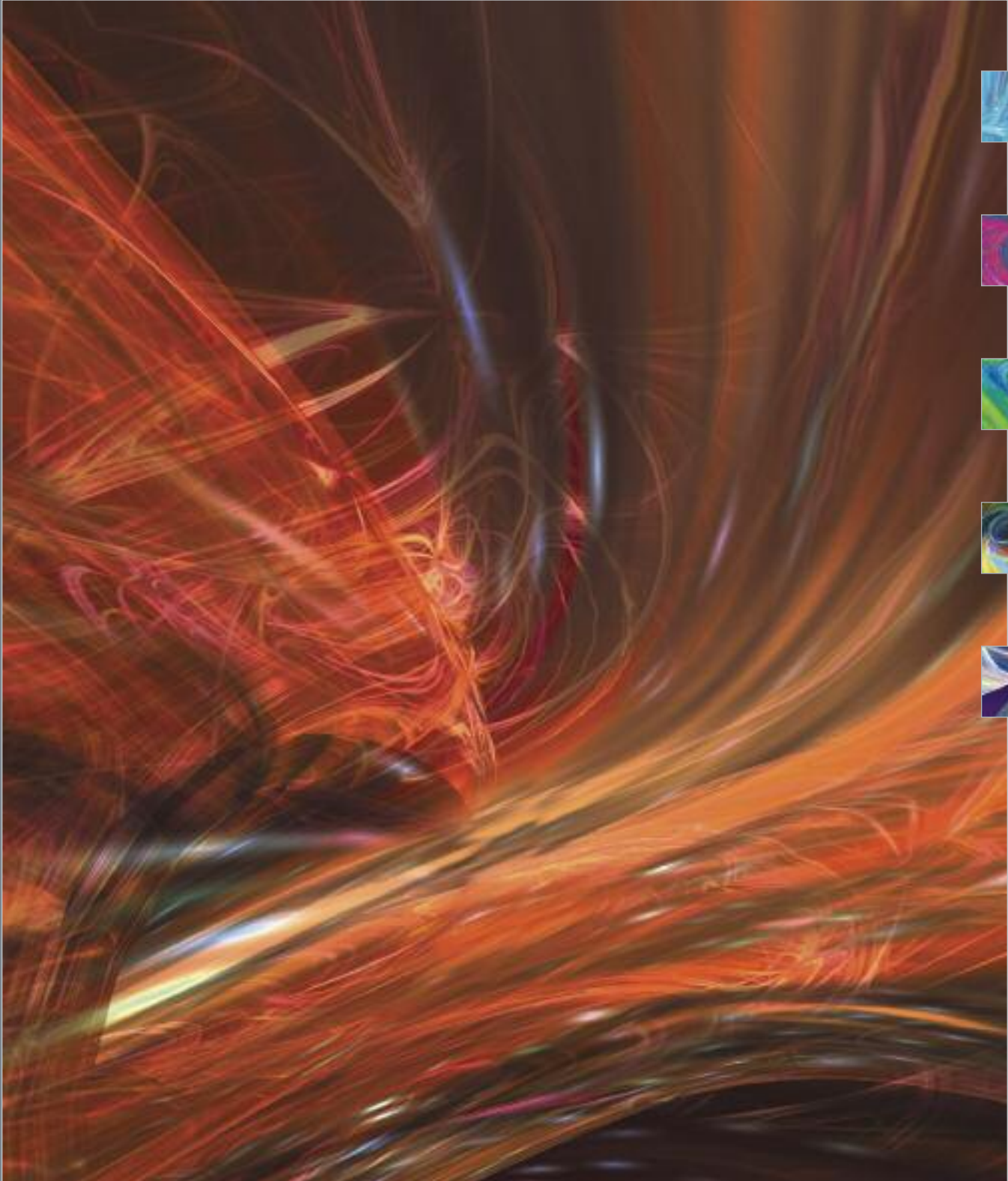


Chronic Disease and Medical Innovation in an Aging Nation

The Silver Book[®]: Neurological Disease



Introduction

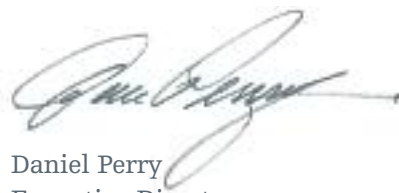
Americans are living longer than ever before. Unfortunately for too many people those added years are not always experienced in good health. Chronic disability that can accompany aging accounts for 85% of all health care spending in the U.S., which will escalate as the population grows older with each passing day.

Trillions of tax dollars and consumer spending are at stake in the debate over reforming the financing of U.S. health care. What is too often missing from the current debate is the critical need for scientific and medical advances with the potential to blunt future cost increases posed by increasing encounters with cancer, Alzheimer's or Parkinson's diseases. We cannot undermine the continuous process of innovation that promises newer and better therapies and more effective health and preventive care in the future.

In order to promote pro-innovation policies, the not-for-profit Alliance for Aging Research publishes *The Silver Book®: Chronic Disease and Medical Innovation in an Aging Nation*. *The Silver Book* is a unique almanac of nearly 2,000 compelling statistics and eye-opening facts that spotlight the mounting burden of chronic disease and the promise of innovation in mitigating that burden. While much of this information is usually buried in dense reports and technical studies, *The Silver Book* extracts key findings and brings the well-referenced information to the fingertips of those shaping policy.

The first volume of *The Silver Book* was launched in 2006 and has quickly become a trusted resource. We are pleased to introduce the latest volume in this important collection, *The Silver Book®: Neurological Disease*, which paints a comprehensive picture of the burden of neurological disease (**Information pertaining specifically to the older population is noted in silver type**). All data is thoroughly referenced to validate original sources. This information is also available and continuously updated at www.silverbook.org, along with data on other chronic diseases including cancer, cardiovascular disease, diabetes, osteoporosis, and vision loss.

Alzheimer's and Parkinson's diseases alone cost our nation as much as \$175 billion a year in direct and indirect health care expenses. Fortunately, innovation in the field is bringing hope for major advances and breakthroughs. It is still critical that we ensure support for research and incentives for innovation are a top national priority.



Daniel Perry
Executive Director
Alliance for Aging Research



Advancing Science. Enhancing Lives.

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The Human and Economic Burden

Cost of Neurological Disease

■ Alzheimer's disease and other dementias slowly but inevitably destroy the qualities that make us thinking, remembering, human beings with our own personalities. These disorders rob our memories, our judgment, and our capacity to comprehend the world around us and to function effectively within it. It is an uncomfortable reality that neurological disorders are more prevalent than ever before. In the United States someone is diagnosed with Parkinson's disease every nine minutes; and nearly eight more are diagnosed with Alzheimer's disease in that same interval. Not surprisingly, Alzheimer's is our most feared illness after cancer.

■ As functional independence is lost due to dementia, increasing levels of supervision are needed from professional and family caregivers. These conditions exact a toll on the entire family. Caregivers often report a decrease in their own health and wellbeing as they experience hours of stress caring for a loved one. The consequences of these diseases can be seen in our communities and across the nation as workplace productivity is compromised and as health care costs strain families and national budgets.

Advancing age is the most significant risk factor for neurological disease. As the U.S. population grows older, the burden of neurological disease becomes ever more apparent. Costs associated with neurological diseases are expected to increase dramatically within the next few years and decades. Currently, hospital costs paid by Medicare and Medicaid are almost three times higher for those with neurological disease than for other conditions. Unless new and better means are discovered and deployed to manage these impairments, their costs are expected to increase 300% in the decade ending 2014.

Investments must be maintained and even increased in neurological disease research to hold out hope that such discoveries will come to our rescue. Awareness of Alzheimer's disease and other dementias has increased due to media exposure, education and experience. However, funding for research and development has not kept pace. Unless research advances are well financed and rewarded, the personal and public costs of neurodegenerative diseases will become a national nightmare.

Prevalence and Incidence of Neurological Disease

Alzheimer's Disease

- Alzheimer's disease is the most common neurodegenerative disease in the U.S.
Nussbaum & Ellis 2003, Alzheimer's Disease and Parkinson's Disease
- An estimated 5.3 million Americans currently have Alzheimer's disease.
Alzheimer's Association 2009, 2009 Alzheimer's Disease Facts and Figures
- Every 70 seconds, someone in the U.S. develops Alzheimer's disease.
Alzheimer's Association 2009, 2009 Alzheimer's Disease Facts and Figures
- As many as 411,000 new cases of Alzheimer's disease are diagnosed every year.
Hebert et al. 2001, Annual Incidence of Alzheimer Disease in the United States Projected to the Years 2000 through 2050
- The lifetime risk of Alzheimer's disease among those who reach the age of 65 is approximately 1 in 5 for women and 1 in 10 for men.
Seshadri et al. 2006, The Lifetime Risk of Stroke

- Alzheimer's disease is the most common cause of dementia—accounting for around 70% of all cases.
Plassman et al. 2007, Prevalence of Dementia in the United States

Parkinson's Disease

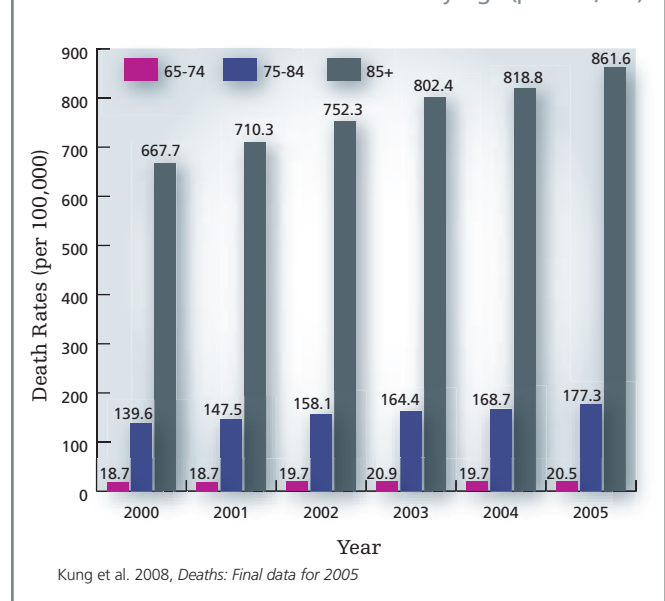
- Parkinson's disease is the second most common neurodegenerative disease in the U.S., second only to Alzheimer's disease.
Nussbaum & Ellis 2003, Alzheimer's Disease and Parkinson's Disease
- An estimated 1.5 million Americans currently have Parkinson's disease.
National Parkinson Foundation, About Parkinson's Disease
- Every nine minutes someone in the U.S. is diagnosed with Parkinson's disease—60,000 new cases every year.
National Parkinson Foundation, About Parkinson's Disease
- The lifetime risk at birth of developing Parkinson's disease is around 2% for men and 1.3% for women.
Elbaz et al. 2002, Risk Tables for Parkinsonism and Parkinson's Disease

Age—A Major Risk Factor

Alzheimer's Disease

- One in eight people age 65 and older have Alzheimer's disease—13% of the 65 and older population.
Alzheimer's Association 2009, 2009 Alzheimer's Disease Facts and Figures
- In 2006, while Alzheimer's disease was the sixth-leading cause of death in the U.S., it was actually the fifth-leading cause of death for Americans age 65 and older.
Heron et al. 2008, Deaths: Preliminary data for 2006
- Of the estimated 72,914 deaths in 2006 from Alzheimer's disease—72,135 of them were people age 65 and older.
Heron et al. 2008, Deaths: Preliminary data for 2006

■ Alzheimer's Death Rates in the U.S. by Age (per 100,000)





Parkinson's Disease

- The average diagnosis age for Parkinson's disease in the U.S. is 70.5 years.

Van Den Eeden et al. 2003, *Incidence of Parkinson's Disease*

- The incidence of Parkinson's disease rapidly increases over the age of 60 years—with only 4% of cases occurring under the age of 50.

Van Den Eeden et al. 2003, *Incidence of Parkinson's Disease*

- The prevalence of Parkinson's disease increases dramatically with age. For every 100,000 Americans, 6,317 people age 80 and over have the disease, compared with 2,785 age 70-80 and 704 age 60-70.

Strickland & Bertoni 2004, *Parkinson's Prevalence Estimated by a State Registry*



The Burden of Neurological Disease

The Human Burden

Alzheimer's Disease

- In 2006, Alzheimer's disease was the 6th leading cause of death in the U.S. and was the documented cause of death for 72,914 people.

Heron et al. 2008, *Deaths: Preliminary data for 2006*

- Almost 1/2 of all people with Alzheimer's disease have 4 or more other chronic conditions that can complicate treatment, hospital stays, and other aspects of care.

Partnership for Solutions 2002, *Alzheimer's Disease*

- Severe Alzheimer's disease can cause problems with mobility, eating, and breathing. These complications can significantly increase risk for pneumonia—the most commonly identified cause of death in end-stage Alzheimer's patients.

Kalia 2003, *Dysphagia and Aspiration Pneumonia in Patients with Alzheimer's Disease*

- At any given time, around 1/4 of all hospital patients age 65 and older are individuals with Alzheimer's disease and other dementias.

Maslow 2005, *How Many Hospital Patients Have Dementia?*

- Various studies estimate that 40-67% of assisted living facility residents have Alzheimer's disease or other dementias.

Hyde et al. 2007, *Dementia and Assisted Living*

- In 2008, 73% of beds in dedicated special care units of U.S. nursing facilities were for Alzheimer's patients.

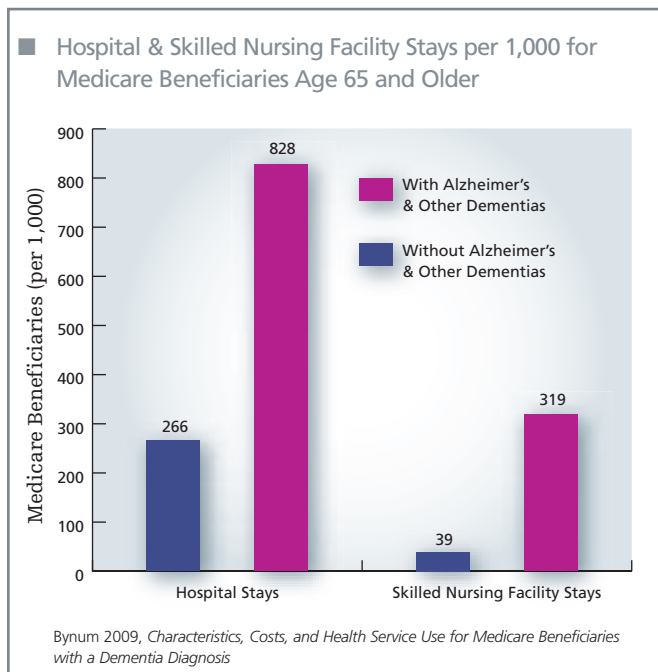
American Health Care Association 2008, *Nursing Facility Beds in Dedicated Special Care Units*

- In 2007, around 10% of all hospice admissions were for people with a primary diagnosis of Alzheimer's disease or other dementia.

National Hospice and Palliative Care Organization 2008, *NHPCO Facts and Figures*

- In 2005, the average length of hospice stays for Medicare beneficiaries with Alzheimer's disease was 99 days.

Medpac 2008, *Report to the Congress*



- In 2008, 9.9 million Americans provided unpaid care for a family member, friend, or neighbor with Alzheimer's disease or other dementia—more than ¼ of all unpaid caregivers of older adults in the U.S. They provided 8.5 billion hours of unpaid care—an average of 16.6 hours of care per caregiver each week.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- In the year before a person's death, half of family caregivers of someone with Alzheimer's disease or other dementia reported spending at least 46 hours per week giving care—59% of these caregivers felt that they were "on duty" 24-hours a day.

Schulz et al. 2003, *End-of-Life Care and the Effects of Bereavement on Family Caregivers of Persons with Dementia*

- Two-thirds of Alzheimer's caregivers help with one or more ADLs (Activities of Daily Living) such as getting dressed and getting out of bed. They are also more likely than other caregivers to help with the most difficult ADLs like dealing with incontinence (32% versus 13%), bathing (35% versus 25%), and feeding (28% versus 18%).

Alzheimer's Association & National Alliance for Caregiving 2004, *Families Care*

Parkinson's Disease

- In 2006, Parkinson's disease was the document cause of death of 19,660 people.

Heron et al. 2008, *Deaths: Preliminary data for 2006*

- The risk of death in people with Parkinson's disease is 1.6 times that of the general population

Elbaz et al. 2003, *Survival Study of Parkinson Disease in Olmstead County, Minnesota*

- Parkinson's disease has a substantial impact on health related quality of life including increased stress, decreased physical mobility, increased pain, and impact on social isolation and emotional reactions.

Karlsen et al. 2000, *Health Related Quality of Life in Parkinson's Disease*

- Each year around 68% of Parkinson's disease patients suffer from falls.

Wood et al. 2002, *Incidence and Prediction of Falls in Parkinson's Disease*

- More than ¾ of Parkinson's disease patients developed dementia during an 8-year study.

Aarsland et al. 2003, *Prevalence and Characteristics of Dementia in Parkinson Disease*

- Major depression is present in around 20-40% of Parkinson's disease patients.

Lieberman 2005, *Depression in Parkinson's Disease*

- Patients with Parkinson's disease account for between 2.2% and 6.8% of the nursing home population in the U.S.

Goetz et al. 1993, *Risk Factors for Nursing Home Placement in Advanced Parkinson's Disease*

- Patients with Parkinson's disease have twice the risk of suffering a fracture, and more than 3 times the risk of a hip fracture.

Melton et al. 2006, *Fracture Risk After the Diagnosis of Parkinson's Disease*

- Among nursing home residents with Parkinson's disease, the 3-year mortality was 50%.

Fernandez & Lapane 2002, *Predictors of Mortality Among Nursing Home Residents with a Diagnosis of Parkinson's Disease*

- Health related quality of life (HRQOL) is severely affected in Parkinson's disease. In a study of veterans, HRQOL was more impaired in Parkinson's disease patients than those with any other condition.

Gage et al. 2003, *The Relative Health Related Quality of Life of Veterans with Parkinson's Disease*

The Economic Burden

Alzheimer's Disease

- In 2005, the direct costs to Medicare and Medicaid for individuals with Alzheimer's disease and other dementias, plus the estimated indirect costs to businesses of employees who were caregivers to these individuals, totaled more than \$148 billion. This included \$91 billion in Medicare costs, \$21 billion in state and federal Medicaid costs for nursing home care, and \$36.5 billion in indirect costs to business.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- Alzheimer's disease triples the healthcare costs of Americans age 65 and older.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- In 2004, total per-person payments for Medicare beneficiaries age 65 and older with Alzheimer's disease and other dementias (including all sources for health and long-term care) were \$33,007—compared to \$10,603 per person for other beneficiaries in the same age group.

Bynum 2009, *Characteristics, Costs, and Health Service Use for Medicare Beneficiaries with a Dementia Diagnosis*

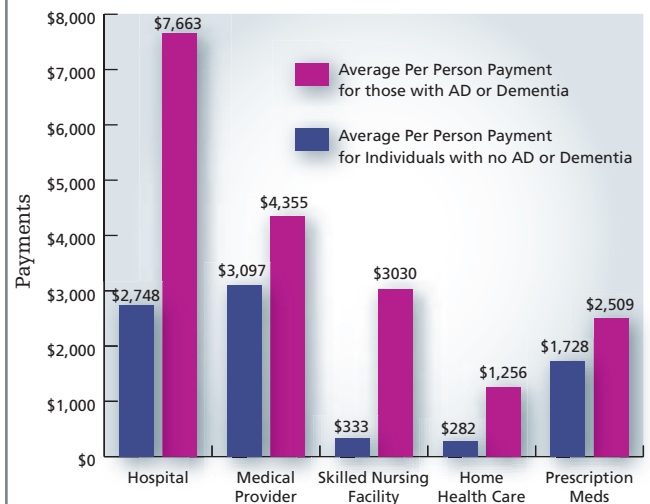
- In 2004, average Medicaid payments per person for Medicare beneficiaries age 65 and older with Alzheimer's disease and other dementias were more than nine times as high as the average Medicaid payments for other Medicare beneficiaries in the same age group—\$6,605 compared to \$718.

Bynum 2009, *Characteristics, Costs, and Health Service Use for Medicare Beneficiaries with a Dementia Diagnosis*

- The cost of Alzheimer's to businesses in 2002 was projected to reach more than \$61 billion—equal to the net profits of the top ten Fortune 500 companies.

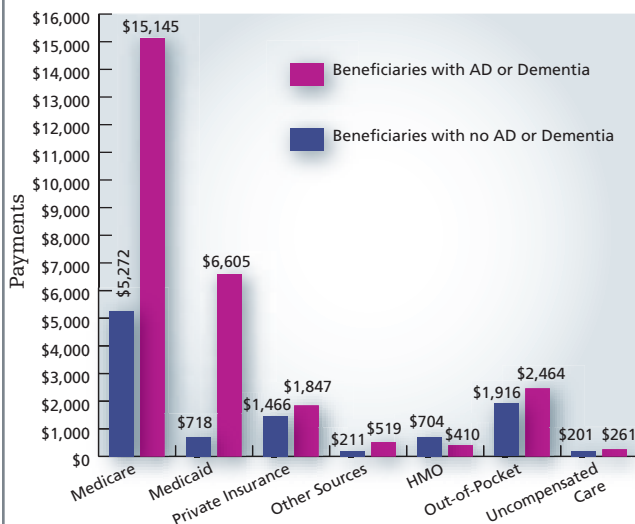
Koppel 2002, *Alzheimer's Disease: The costs to U.S. businesses in 2002*

- Average Per Person Payments for Healthcare Services in 2004, for Medicare Beneficiaries Age 65 and Older—with and without Alzheimer's and Other Dementias



Bynum 2009, *Characteristics, Costs, and Health Service Use for Medicare Beneficiaries with a Dementia Diagnosis*

- Average Per Person Payments for Healthcare and Long-Term Care Services—by Source, for Medicare Beneficiaries Age 65 and Older with and Without Alzheimer's Disease and Other Dementias, 2004



Bynum 2009, *Characteristics, Costs, and Health Service Use for Medicare Beneficiaries with a Dementia Diagnosis*

- In 2008, 52% of assisted living facilities provided specialized Alzheimer's disease and other dementia care—charging an average of \$4,267 a month and \$51,204 a year.

MetLife Mature Market Institute 2008, *The MetLife Market Survey of Nursing Home and Assisted Living Costs*

- In Alzheimer's special care units or wings of nursing homes, the average cost for a private room in 2008 was \$219 a day and \$79,935 a year. The average cost for a semi-private room for \$198 a day and \$72,270 a year.

MetLife Mature Market Institute 2008, *The MetLife Market Survey of Nursing Home and Assisted Living Costs*

- Out-of-pocket costs for Medicare beneficiaries age 65 and older with Alzheimer's disease and other dementias who were living in the community, were 1.2 times higher than the average for all other beneficiaries in that age group—\$2,298 compared to \$1,916.

Bynum 2009, *Characteristics, Costs, and Health Service Use for Medicare Beneficiaries with a Dementia Diagnosis*

- In 2004, the average per-person payments for hospice care of beneficiaries age 65 and older with Alzheimer's disease or other dementia were 8 times higher than for other beneficiaries in the same age group—\$976 per person compared to \$120 per person.

Bynum 2009, *Characteristics, Costs, and Health Service Use for Medicare Beneficiaries with a Dementia Diagnosis*

- In 2008, the economic value of care provided by an unpaid caregiver of someone with Alzheimer's disease or other dementia was \$94 billion.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

Parkinson's Disease

- In 2005, the total annual direct and indirect costs to the nation for Parkinson's disease was projected to be at least \$23 billion.

Huse et al. 2005, *Burden of Illness in Parkinson's Disease*

- In late stage Parkinson's disease, as much as 80% of total costs of disease are due to indirect costs such as loss of income from patient and caregiver and poor quality of life.

Dowding et al. 2006, *A Review of the Health-Related Quality of Life and Economic Impact of Parkinson's Disease*

- Direct medical costs of Parkinson's disease are more than double costs of those without the disease by 5 years after diagnosis.

Leibson et al. 2006, *Direct Medical Costs Associated with Parkinson's Disease*

- About 34% of Parkinson's patients received informal care. The caregiver contributed an average of 22 hours of care per week.

Whetten-Goldstein et al. 1997, *The Burden of Parkinson's Disease on Society, Family, and the Individual*

- Of those Parkinson's patients with private insurance (including those who also had Medicare), total annual healthcare expenditures were \$16,634 per patient (in 2002 dollars). This figure was 2.5 times the national average expenditures for Medicare patients without Parkinson's. The largest drivers of these expenditures were inpatient admissions (\$9,362), outpatient pharmaceuticals (\$3,148), and rehabilitative nursing home care (\$2,282).

Orsini et al. 2004, *Healthcare Utilization and Expenditures Among Privately Insured Patients with Parkinson's Disease in the U.S.*

- Parkinson's disease patients use significantly more health care services in all categories and pay more out-of-pocket for their medical services than other seniors—averaging \$18,528 in annual health care expenses versus \$10,818.

Noyes et al. 2006, *Economic Burden Associated with Parkinson's Disease on Elderly Medicare Beneficiaries*

- In 2005, the total annual per person costs for patients with Parkinson's disease was \$23,101 in direct costs and \$25,326 in indirect costs.

Huse et al. 2005, *Burden of Illness in Parkinson's Disease*

The Future Cost of Neurological Disease

The Future Human Cost

Alzheimer's Disease

- In 2000, there were an estimated 4.5 million people in the U.S. with Alzheimer's disease. By 2050, this number is expected to grow by almost 300% to 13.2 million.

Hebert et al. 2003, *Alzheimer Disease in the U.S. Population*

- Currently, someone develops Alzheimer's disease every 70 seconds. By the middle of this century, that number could be as frequent as every 33 seconds.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- Across the country, many states and regions are expected to see double-digit percentage increases in the number of people with Alzheimer's disease—some over 100%—between 2000 and 2025.

Hebert et al. 2004, *State-Specific Projections Through 2025 of Alzheimer Disease Prevalence*

- Because of the rapid aging of the U.S. population, the number of people with Alzheimer's disease who are 85 years and older will more than quadruple from 1.8 million in 2000 to 8 million by 2050. When the first wave of Baby Boomers turn 85 in 2031—that number will be at around 3.5 million.

Hebert et al. 2003, *Alzheimer Disease in the U.S. Population*



■ **Current and Projected Number of Americans With Alzheimer Disease (in Millions) Older Than 65 Years**

	65-74	75-84	85+	Total
2000	0.3	2.4	1.8	4.5
2010	0.3	2.4	2.4	5.1
2020	0.3	2.6	2.8	5.7
2030	0.5	3.8	3.5	7.7†
2040	0.4	5.0	5.6	11.0
2050	0.4	4.8	8.0	13.2

* Estimates are projected by the middle-series estimates of population growth of the U.S. Census Bureau based on the 2000 U.S. census.

† Value does not total precisely because of rounding.

Hebert et al. 2003, *Alzheimer Disease in the U.S. Population*

- In 2000, there were an estimated 411,000 new cases of Alzheimer’s disease. By 2010, that number is expected to increase to nearly half a million new cases each year (454,000), and by 2050, there will be nearly a million new cases annually (959,000).

Hebert et al. 2001, *Annual Incidence of Alzheimer Disease in the United States Projected to the Years 2000 through 2050*

- As the U.S. population ages, researchers estimate that the prevalence of Alzheimer’s disease will come close to quadrupling over 50 years (between 1998 and 2048), when 1 in 45 people may be living with the disease.

Brookmeyer et al. 1998, *Projections of Alzheimer’s Disease in the United States and the Public Health Impact of Delaying Disease Onset*

Parkinson’s Disease

- The prevalence of Parkinson’s disease is projected to grow to between 1.3 million and 1.7 million by 2040.

Lilienfeld and Perl 1993, *Projected Neurodegenerative Disease Mortality in the United States, 1990-2040*

- Between 2005 and 2030, the prevalence of Parkinson’s disease is projected to almost double.

Dorsey et al. 2007, *Projected Number of People with Parkinson Disease in the Most Populous Nations, 2005 Through 2030*

The Future Economic Cost

Alzheimer’s Disease

- The number of Medicare claims for Alzheimer’s disease treatment grew by 250% during the 1990s, and are expected to increase 300% between 2004 and 2014.

Peck 2004, *Alzheimer’s Disease Costs Expected to Triple*

- State and federal Medicaid spending for people with Alzheimer’s disease, for nursing home care only, is projected to increased to \$32 billion by 2025 and to \$118 billion by 2050—a 6-fold increase from 2000.

The Lewin Group 2004, *Saving Lives. Saving Money*

- Medicare spending for those with Alzheimer’s disease will triple by 2015—to \$189 billion from \$62 billion in 2000. By 2050, Medicare will be spending more than \$1 trillion on beneficiaries with Alzheimer’s and related dementias (4 out of every 10 dollars spent in Medicare).

The Lewin Group 2004, *Saving Lives. Saving Money*

Parkinson’s Disease

To the best of our knowledge, this data is not available.





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Investing in Science

Innovative Medical Research

- As the absolute number and relative percentage of Americans age 65 and older increases at an accelerated clip after 2011, the goal of reversing or ameliorating the effects of neurological disease becomes critical to easing a looming financial and human burden that these diseases will impose on society. Even with all the advancements made to date, researchers and physicians still know very little about how the human brain functions. As the threat of these diseases increases in U.S. communities, Americans must make an unwavering commitment of resources to tame the threat and reduce its impact on our people, just as we did in the past with polio, smallpox and many other scourges.
- Current research is showing potential in increasing the quality of life and delaying cognitive decline for those diagnosed with neurological disease. Scientists are beginning to learn the genes that affect the development of Alzheimer's. These discoveries could accelerate research into finding a way to reverse or eliminate the affects of the disease. It is estimated that a delay of 6 years in the onset of Alzheimer's disease would translate to a Medicare savings of \$51 billion by 2015. Slowing the onset of Parkinson's disease by just ten percent would save the U.S. \$327 million annually.

Progress in research that provides prevention and treatment options for neurological disease would likely produce health gains that far outweigh the initial financial investments. As the national debate over health care costs continues, we must consider both the financial and human impact that medical innovation can have on Alzheimer's, Parkinson's and other dementias. Short-sighted tactics to reduce health care spending are tempting to pursue, especially in stringent budgetary times. However, too often such gambits have a devastating impact on early-stage investments in medical innovation, while short-circuiting the remarkable returns that can come from medical investments.



The Human Value

Alzheimer's Disease

- The U.S. Food and Drug Administration (FDA) has approved 5 drugs for the treatment of Alzheimer's disease. These drugs have been found to temporarily slow the worsening of Alzheimer's symptoms for an average of 6-12 months, for around half of those individuals who take the drugs.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- Studies have shown that active medical management of Alzheimer's disease can significantly improve quality of life for the individual through all stages of the disease.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- Some studies indicate that the management of high cholesterol, type 2 diabetes, high blood pressure, overweight or obesity, and other cardiovascular risk factors may help avoid or delay cognitive decline.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- Recent studies suggest that a low-fat diet which is rich in fruits and vegetables, may support brain health. Other studies suggest that remaining socially active and intellectually engaged may also support brain health.

Alzheimer's Association 2009, *2009 Alzheimer's Disease Facts and Figures*

- A study of memantine—a medicine approved to treat moderate-to-severe Alzheimer's, found a significant slowing of patients' cognitive decline and a reduced need for caregiving of 45.8 hours per month.

Reisberg et al. 2003, *Memantine in Moderate-to-Severe Alzheimer's Disease*

- Four genes have been shown conclusively to affect development of Alzheimer's, and the search is underway for others suspected of playing a role.

National Institutes of Health, *Alzheimer's Disease*

Parkinson's Disease

- One study found that dopaminergic therapies, for Parkinson's disease patients, resulted in lower dyskinesias as well as lower incidences of freezing, drowsiness, and edema—resulting in better quality of life through symptom control.

Holloway et al. 2004, *Pramipexole vs Levodopa as Initial Treatment for Parkinson Disease*

- In a study of different treatments for Parkinson's disease, results showed that the disease can be managed for up to 5 years with a reduced risk of dyskinesia.

Rascol et al. 2000, *A Five-Year Study of the Incidence of Dyskinesia in Patients with Early Parkinson's Disease Who Were Treated with Ropinirole or Levodopa*

- A study of rasagiline mesylate in Parkinson's disease patients showed improved motor fluctuations and other Parkinson's disease symptoms.

Parkinson Study Group 2005, *A Randomized Placebo-Controlled Trial of Rasagiline in Levodopa-Treated Patients with Parkinson Disease and Motor Fluctuations*



The Economic Value

Alzheimer's Disease

- In 2004, the potential return on a short-term investment in Alzheimer's research was projected at 10 to 1 to the federal government. By 2025, the annual return was projected to be as high as 28 to 1, and by 2050, almost 100 to 1. The return could be even greater if savings in federal and state Medicaid spending were factored in.

The Lewin Group 2004, *Saving Lives. Saving Money*

- Slowing the onset of Alzheimer's disease by six to seven years could produce annual Medicare savings of \$51 billion by 2015, \$126 billion by 2025, and \$444 billion by 2050.

The Lewin Group 2004, *Saving Lives. Saving Money*

- Slowing the onset of Alzheimer's disease by six or seven years would also reduce projected Medicaid spending on nursing home care. By 2015, spending would decline by 37%—from \$27 billion in 2010 to \$17 billion in 2015. By 2025, Medicaid would see a 60% decline on spending.

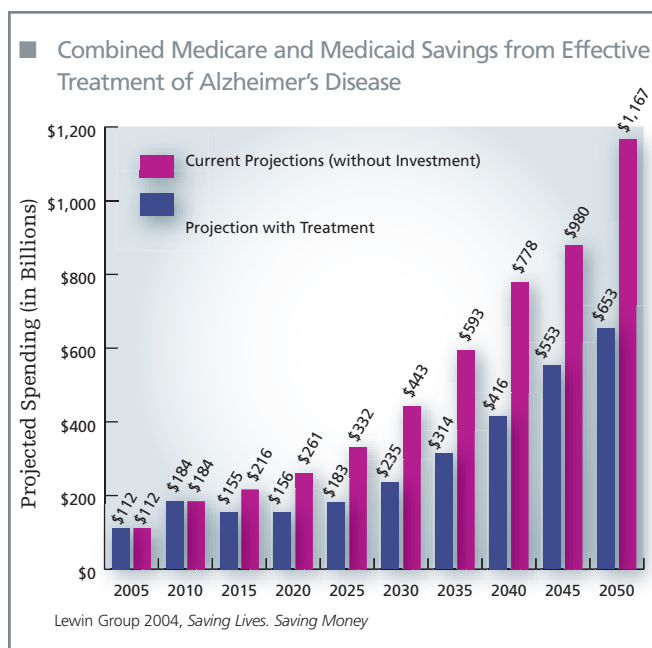
The Lewin Group 2004, *Saving Lives. Saving Money*

- In one study, Alzheimer's patients who took donepezil had an increase in their prescription costs of \$1,000 per patient, but saw reduced total medical costs of about one-third—from \$11,947 to \$8,056.

Hill et al. 2002, *The Effect of Donepezil Therapy on Health Costs in a Medicare Managed Care Plan*

- A research study showed that billions of dollars could be saved if physicians could intervene before someone becomes symptomatic. This positive net savings occurred with both drug treatment and caregiver-support programs; the greatest benefits with a combination of both.

Weimer & Sager 2009, *Early Identification and Treatment of Alzheimer's Disease*



Parkinson's Disease

- Slowing of the progression of Parkinson's disease by just 10% would save \$327 million (in direct and indirect costs) to the U.S. annually.

Kurlan et al. 1988, *Economic Impact of Protective Therapy for Early Parkinson's Disease*

- A study of Parkinson's disease treatments found that pramipexole is a cost-effective treatment for early and advanced Parkinson's disease. The total cost-effectiveness ratio was \$8,837/QALY for patients with early Parkinson's disease and \$12,294/QALY for patients with advanced disease.

Hoerger et al. 1998, *Cost Effectiveness of Pramipexole in Parkinson's Disease in the U.S.*



The Future Value

Alzheimer's Disease

- Use of existing or new drugs/compounds for Alzheimer's prevention could result in a delay of onset of between 2 and 5 years.

Shekelle et al. 2005, *Identifying Potential Health Care Innovations for the Future Elderly*

- Delaying the onset of Alzheimer's by only 5 years could reduce the number of people with Alzheimer's by almost 50% after 50 years.

Brookmeyer et al. 1998, *Projections of Alzheimer's Disease in the United States and the Public Health Impact of Delaying Disease Onset*

- A \$1 billion-investment in Alzheimer's research that led to research breakthroughs by 2010 could have a 13-to-1 return by 2015, and a 100-to-1 return by 2050.

The Lewin Group 2004, *Saving Lives. Saving Money*

- Based on rates of admission in 1998, delaying admission of Alzheimer's patients to nursing homes by 1 month could save as much as \$1.12 billion a year.

Leon et al. 1998, *Alzheimer's Disease Care*

- Eighty-two Alzheimer's disease medications are currently in development.

PhRMA 2008, *Medicines in Development for Neurological Disorders*

- Valuing a QALY at \$175,000, new drugs that would produce a 5-year delay in Alzheimer's disease onset for all new cases between 2010 and 2050 would yield a benefit of close to \$4 trillion per year (in 2006 dollars).

Vernon et al. 2007, *Alzheimer's Disease and Cost-Effectiveness Analyses*

- If interventions delayed the disease by 2 years, after 50 years there could be nearly 2 million fewer cases than projected. If delayed by 1 year, there could be close to 800,000 fewer cases than projected.

Brookmeyer et al. 1998, *Projections of Alzheimer's Disease in the United States and the Public Health Impact of Delaying Disease Onset*

- Slowing the onset of Alzheimer's disease by six to seven years would significantly reduce the number of people with the disease. By 2015 that number could be 3.7 million instead of the projected 5.3 million. In 2050, 8.1 million could have the disease instead of the projected 13.4 million.

The Lewin Group 2004, *Saving Lives. Saving Money*

Parkinson's Disease

- Thirty medicines are currently in development for Parkinson's disease.

PhRMA 2008, *Medicines in Development for Neurological Disorders*

- One study shows that electrical spinal cord stimulation significantly improved motor function in an animal model of Parkinson's disease.

Fuentes et al. 2009, *Spinal Cord Stimulation Restores Locomotion in Animal Models of Parkinson's Disease*

- A new study reports that using optogenetics, stimulating specific brain cells using light, may provide better results for Parkinson's patients than traditional deep brain stimulation because of the ability to control different cells at specific times.

Gradinaru et al. 2009, *Optical Deconstruction of Parkinsonian Neural Circuitry*

- In one study, deep-brain stimulation for Parkinson's patients significantly reduced their required dosages of antiparkinsonian medications, consequently decreasing their medication costs by 32% 1 year after surgery, and 39% 2 years after.

Charles et al. 2004, *Deep Brain Stimulation of the Subthalamic Nucleus Reduces Antiparkinsonian Medication Costs*

- A large set of NIH clinical trials are assessing interventions (including dietary supplements—creatine and coenzyme Q10) that may slow the progression of Parkinson's disease.

Ravina et al. 2003, *Neuroprotective Agents for Clinical Trials in Parkinson's Disease*

- A medicine currently in development uses normal human cells to enhance levels of dopamine in the brain—dopamine is the neurotransmitter that is deficient in Parkinson's disease patients.

PhRMA 2008, *Medicines in Development for Neurological Disorders*



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Conclusion

- *The Silver Book®: Neurological Disease* volume projects a growing human and economic burden of neurological disease in America and makes a strong case for the value of innovation in reducing that burden. We fully expect this volume to join The Silver Book collection as an invaluable tool for encouraging policy formulation that invests in medical research and innovation. If breakthroughs are not made soon, the number of Americans diagnosed with Alzheimer’s disease could nearly triple by 2050. If this comes to pass it would add an intolerable burden on American families and the U.S. health care system.
- Sound public policy should strive for cost containment strategies that assure high quality health care that is patient-centered, values-driven, knowledge-intensive, innovation-rich, and prevention-oriented. We must have sound long-range plans for deploying research and medical innovation to reduce the burdens imposed by neurological disease.
- Historically, investments that produce new medical innovations have paid for themselves many times over through decreased medical expenses and increased human productivity. Medical innovation will be essential to containing the costs of health care as the Baby Boom generation grows older. Research and discovery, properly applied to health care and prevention, will be essential to avoid an unacceptably high toll of neurological disease.

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