

Chapter 2

Introduction

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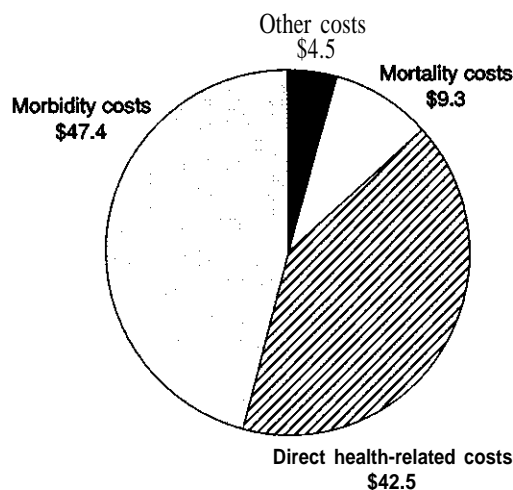
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Mental disorders can strike with savage cruelty, producing nightmarish hallucinations, crippling paranoia, unrelenting depression, a choking sense of panic, or inescapable obsessions. The sheer number of Americans with mental disorders transforms this personal tragedy into a widespread public health problem. Nearly one in three American adults will experience a mental disorder during his or her lifetime, including schizophrenia, mood disorders, anxiety disorders, antisocial personality disorder, substance abuse, or cognitive impairment (23,25) (table 2-1) (see ch. 3).¹ Altogether, approximately 1.7 to 2.4 million Americans currently suffer from a persistent and severely disabling mental disorder (15).

What are the costs of this public health problem? The most comprehensive estimate of the total costs of mental disorders—for the year 1985—is \$103.7 billion (24) (figure 2-1) (box 2-A). A recent update of this figure estimated that the costs of mental disorders in 1991 reached \$136.1 billion (20). Dollar figures alone, however, no matter how large, do not convey the toll that mental disorders take. It has been estimated that individuals with mental disorders fill 25 percent of all hospital beds and, further, that one-third of these persons suffer from schizophrenia (10,15). In 1986, more than 2 million episodes of inpatient care in the United States were provided for persons with mental disorders (16). Many such

Figure 2-1—The Cost of Mental Disorders, 1985 (in billions of dollars)



In 1985, mental disorders cost the United States more than \$103 billion. Approximately 41 percent of that cost—\$42.5 billion—stemmed from hospital care, medication costs, and other treatment costs. Nearly half of the cost of mental disorders—\$47.4 billion—derives from lost productivity.

SOURCE: D.P. Rice, S. Kelman, L.S. Miller, et al., *The Economic Costs of Alcohol and Drug Abuse and Mental Illness*, report submitted to the Office of Financing and Coverage Policy, Alcohol, Drug Abuse, and Mental Health Administration, U.S. Department of Health and Human Services (San Francisco, CA: Institute for Health and Aging, University of California, 1990).

disorders, including depression, obsessive-compulsive disorder, and panic disorder, are associated with increased use of general health care services (25). Productivity and the ability to work are also significantly compromised by mental disorders (2, 19,44). For example, the results from one study indicate that major depression leads to a more than fourfold increase in disability days, defined as days “in which a person spent all or part of the day in bed due to illness or was kept from usual activities due to feeling ill” (4). Data show that approximately one-third of the homeless population and 10 to 15 percent of individuals incarcerated in jails and prisons have a severe mental disorder such as schizophrenia or bipolar disorder (i.e., manic-depressive illness).²

Table 2-1—Prevalence of Severe Mental Disorders

Disorder	Adults diagnosed with disorder during their lifetime (a/)
Schizophrenia	1.0
Bipolar disorder	0.8
Major depression	4.9
Obsessive-compulsive disorder	2.6
Panic disorder	1.6

SOURCE: L. F. Robins and D.A. Regier, *Psychiatric Disorders in America, The Epidemiologic Catchment Area Study* (New York, NY: Free Press, 1991).

¹ Estimate derived from the National Institute of Mental Health’s Epidemiologic Catchment Area (ECA) Program. Data resulted from interviews of more than 20,000 persons in five sites during the early 1980s. Some variation in prevalence estimates was reported between sites. See references 7 and 25 for discussion of the methods used in the ECA program.

² Research into the prevalence of mental disorders among the homeless population and among individuals in jails and prisons has resulted in divergent estimates, due to definitional problems (see ch. 3), data collection difficulties, and political views (5,12,14,30,34,35). The percentages cited in the text represent generally accepted estimates.

Box 2-A—The Cost of Mental Disorders

How big a problem do mental disorders present to our Nation? What priority should these disorders receive in the outlay of government funds for research and services? The answers to these questions are often sought in terms of a dollar figure. However, estimating the toll of mental disorders, or any illness, in economic terms is no easy or straightforward task. Everything from the cost of hospitalization, which is relatively easy to estimate, to the cost of reduced productivity, which is more difficult to assess, may be evaluated. And while rarely included in studies, the psychological and social tolls on an individual's life are substantial, though not easily quantified.

During the last 40 years, studies have reported that mental disorders cost the Nation from \$3.6 billion to more than \$100 billion each year. The variation in estimates reflects changes over time as well as the use of different methods of calculation and sources of data. Dorothy Rice and colleagues have derived the most comprehensive estimate, based on the most recently available survey data. They estimate the total costs of mental disorders—including schizophrenia major depression, bipolar disorder (manic-depressive illness), anxiety disorders, somatization disorder, antisocial personality disorder, and cognitive impairment—to be \$103.7 billion for the year 1985. When adjusted for inflation, this figure reaches \$136.1 billion in 1991.

These costs include health-related, or core, costs—that is, the expenditures made and resources lost as a consequence of having a mental disorder. Such costs make up 96 percent of the total estimated costs for 1985, or \$99.2 billion. Health-related costs can be broken down further into direct and indirect costs.

Direct health-related costs—\$42.5 billion in 1985 and more than \$58 billion in 1991—include all expenditures related to the treatment and support of persons with mental disorders. The vast majority of these direct costs—92 percent—are related to treatment and involve expenditures on hospital and nursing home care, physician and other professional services, and drugs (figure 2-1). More than 50 percent of the treatment costs—almost \$22 billion in 1985—were spent on care in institutional or hospital settings, such as Department of Veterans Affairs (VA) hospitals, State and county psychiatric hospitals, private psychiatric hospitals, residential treatment centers for emotionally disturbed children, and short-stay (general) hospitals. The costs of care provided by office-based physicians, psychologists, and social workers amounted to approximately \$5.7 billion in 1985. Approximately \$1.5 billion was spent on prescription drugs, including minor tranquilizers, antidepressants, and antipsychotics. The estimate reached more than \$2.2 billion in 1991, when adjusted for inflation. Support costs, which equaled approximately \$3.2 billion in 1985, include expenditures for research, physician and nurse training, and program administration (such as health insurance).

Indirect health-related costs estimate the burden of increased morbidity and mortality that accompanies mental disorders. These estimates, which are based on the National Institute of Mental Health's Epidemiologic Catchment Area prevalence data, include the value of lost output caused by decreased productivity, lost workdays, or premature death. Rice and colleagues do not include measures of the psychological and social effects of mental disorders on the individual's life. Morbidity and mortality costs were estimated at \$47.4 billion and \$9.3 billion, respectively, in 1985. For 1991, estimates were \$60.0 billion for morbidity costs and \$11.7 billion for mortality costs. Thus, according to these data, lost or diminished productivity is the most costly outcome of mental disorders, with morbidity accounting for nearly 50 percent of the total costs of mental disorders. Furthermore, the cost of morbidity is not primarily due to institutionalization. Additional analysis, which considers such factors as the prevalence of mental disorders in various demographic groups, the type of disorder, and income levels, shows that a very large share of the morbidity costs—\$44.1 billion in 1985 and \$55.8 billion in 1991—derives from noninstitutionalized individuals.

Mental disorders have other, nonhealth-related effects that impose a cost on society. Nonhealth effects lead to public and private expenditures on crime control and social welfare administration, the sum of which was estimated at \$1.7 billion by Rice and colleagues. Furthermore, the value of reductions or losses in productivity due to either incarceration for a criminal offense or time spent to care for a family member with a mental disorder exacts a price, estimated at approximately \$2.8 billion.

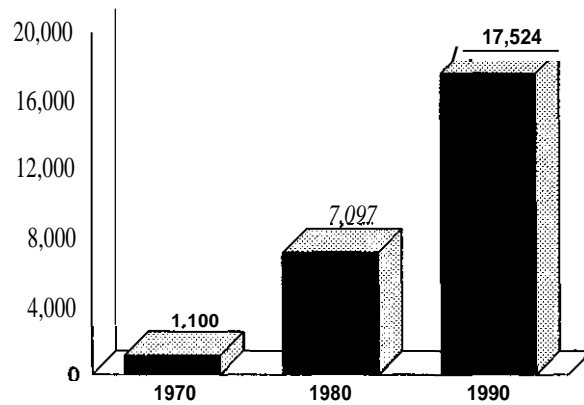
SOURCES: D.P. Rice, S. Kelman, L.S. Miller, et al., *The Economic Costs of Alcohol and Drug Abuse and Mental Illness: 1985*, report submitted to the Office of Financing and Coverage Policy, Alcohol, Drug Abuse, and Mental Health Administration, U.S. Department of Health and Human Services (San Francisco, CA: Institute for Health and Aging, University of California, 1990); The National Foundation for Brain Research, *The Costs of Disorders of the Brain* (Washington, DC: 1992).

The reality of mental disorders—their symptoms, their prevalence, and their costs—commands society's attention, but society's response is incoherent. Despite the fact that Federal, State, and local governments spend more than \$20 billion each year on mental health services, the consensus is that mental health policy is fragmented and mental health services often deficient (9,18,26,33,40,43). While a tangle of clinical, economic, social, professional, and legal issues impinges on mental health policy, the answer to the question "What causes mental disorders?" is also important in formulating rational mental health policy. As stated more than a decade ago in the *President's Commission on Mental Health* report:

Expanding our understanding of the functioning of the mind, the causes of mental and emotional illness, and the efficacy of various treatments is crucial to future progress in mental health (22).

The fundamental causes of most mental disorders are unknown. However, the 1980s witnessed an explosion of biomedical research into the nature of these disorders (3). While a number of factors, including the agenda of some professional groups and the concerns of some consumer advocacy groups,³ contribute to the emphasis on the biological aspects of mental disorders, the rapid growth and productivity of neuroscience research spearhead this trend. One indicator of the growth in neuroscience is the increased membership of the Society for Neuroscience: Membership in this professional organization grew from 1,100 at its inception in 1970 to more than 17,000 in 1990 (figure 2-2) (28). In 1992, the Society for Neuroscience has more than 19,000 members (29). The 1980s saw a nearly 70 percent increase in the number of papers published in neuroscience and behavioral research (27). Congress captured this enthusiasm for neuroscience in its Decade of the Brain resolution, approved in 1989, to make "the Nation . . . aware of the exciting research advances on the brain. . . ." (Public Law 101-58; see also app. A to this report).

Figure 2-2—Membership in the Society for Neuroscience



Membership in the Society for Neuroscience has grown dramatically since its inception in 1970.

SOURCE: Society for Neuroscience, 1991.

THE MODERN HISTORY OF NEUROSCIENCE

Neuroscience research focuses on how the nervous system works and how it is affected by disease. It is an interdisciplinary field, drawing on expertise from many diverse fields, including anatomy, physiology, physics, electronics, genetics, biochemistry, optics, pharmacology, psychology, neurology, psychiatry, neurosurgery, and computer science. The seeds of modern neuroscience were sown in the late 19th and early 20th centuries, when astute clinical observations and basic technical advances led to such fundamental discoveries as the location of specific functions within the brain and nerve cells. There was palpable enthusiasm about being on the brink of understanding the human mind. As is often observed by today's neuroscientist, even Sigmund Freud, the father of psychoanalysis, entertained the hope of unveiling the brain's relationship to human thought and behavior.

The slow march of progress in neuroscience research proceeded through the subsequent years. The serendipitous discovery of several agents that profoundly affect the symptoms of severe mood

³ For example, the National Alliance for the Mentally Ill (NAMI), a family-based advocacy group with approximately 130,000 members, strongly supports biomedical research into mental disorders, in part to promote the development of better treatments and, ultimately, cures for mental disorders (8). NAMI's staunch support for the biological basis of mental disorders also reflects an anti-stigma stance and a rebuttal to theories blaming the family for causing mental disorders (see ch. 7).



The congressional "Decade of the Brain" resolution, the activities of executive branch agencies, as well as the private efforts of scientists and other advocates all demonstrate enthusiasm for neuroscience research. Pictured is the logo for the National Foundation for Brain Research, a nonprofit organization that promotes brain research.

SOURCE: The National Foundation for Brain Research, 1992.

disorders and schizophrenia ushered in a new age of neuroscience research in the 1950s. The finding that chemical substances can modulate, even control, mental dysfunction was not completely alien to contemporary understanding of the brain, for the chemical nature of nerve cell communication was known. It did, however, precipitate an explosion of research in neurochemistry and psychopharmacology. In the ensuing years, many chemical substances occurring naturally in the brain—neurotransmitters and neuropeptides—were identified.

There was also a quantum leap in understanding how neurotransmitters and neuropeptides influence targeted nerve cells. Receptor molecules—proteins embedded in the surface of nerve cells that bind chemical substances—were identified and isolated. Like a key inserted into a lock, a neurotransmitter fits into a specific receptor, producing a cascade of responses in the receptive neuron (see ch. 4). A single neurotransmitter may activate several different receptors, located in distinct regions of the brain. To date, five different receptors have been found to respond to the brain chemical dopamine alone (31).

The exponential increase in neuroscience research during the last 15 years reflects, in large measure,

technological advances (for review, see 36,41). Dramatically improved methods for staining nerve cells permit researchers to observe the precise location of these cells in the brain. The electrical activity of a single channel in a nerve cell's membrane—which is less than one-trillionth of an inch in diameter—can be measured. Progress in computing and advances in microscopy, especially imaging technology, underlie the spectacular view of living brain tissue—from single nerve cells to the intact human brain. Psychological tests, which analyze and measure the components of complex behaviors and thought processes, make possible analysis of the brain's functions. And molecular biology has revolutionized the study of the brain, resulting in the labeling of specific nerve cells with monoclonal antibodies, the cloning of receptors, and the search for specific genes.

The sophisticated methods and technologies of modern neuroscience research make up the arsenal being used to expose the secrets of mental disorders. The National Institute of Mental Health (NIMH), the primary Federal agency that funds research into mental disorders, has drawn up its battle plan on the basis of developments in neuroscience (41,42). By strongly supporting neuroscience research, NIMH aims to:

... understand the workings of the human brain in sufficient detail to effectively treat or prevent the broad variety of behavioral disorders and mental illnesses (41).

A CAUTIONARY NOTE

It is easy to appreciate how excitement about neuroscience might affect the study of mental disorders and foster hope for new treatments. However, the complexity of the brain and behavior, the nature of mental disorders, and the potential repercussions of this research require a note of caution.

Neuroscience research has produced many exciting results, but it has only scratched the surface of understanding how the brain functions. The neuroscientist Wilder Penfield realized earlier in this century that "there was a thrilling undiscovered country to be explored in the mechanisms of the mammalian nervous system" (21). The brain is an immensely complicated organ: It contains 10^{11} nerve cells, and estimates suggest that the number of synapses in the brain, 10^{14} , exceeds the number of

stars in our galaxy (13). Mapping the terrain of this still largely “undiscovered country” will require continued research, cross-disciplinary cooperation, and sophisticated management of rapidly accruing information (11).

The complexity of the brain is reflected in its fictional output: thought, emotion, and behavior. Thus, mental disorders, which are identified essentially on the basis of psychological and behavioral traits (1) rather than laboratory findings, are perplexing phenomena, difficult to define and classify (see ch. 3 for detailed discussion of the definition of mental disorders). Difficulties in classifying mental disorders can present a serious challenge to biological and behavioral research.

Neuroscience is based on the concept that behavior, thoughts, and emotions are the results of nerve cell interaction (36). Mental disorders, like any other illnesses, however, cannot be understood in biological terms only. As the National Advisory Mental Health Council Report to Congress (41) acknowledged, each mental disorder “. . . represents a complex interaction of biological, psychological, and social variables.” While there is overwhelming enthusiasm for biological research into mental disorders, there is also concern that emphasizing biological factors exclusively will shortchange other important areas of research as well as care of the mentally ill.

With impressive developments in molecular biology, the neuroscience, and imaging technology, psychiatry has moved toward a more biological and medical emphasis. Although these fields hold great promise, efforts must proceed in a balanced way to provide high quality management for those currently ill while seeking more powerful technologies for the future. The history of mental health care attests to how endorsement of organic viewpoints and the professionalization of psychiatry, when it had little specific to offer in any immediate terms, undermined constructive and humane efforts for patient management and rehabilitation (17).

Great hope surrounds neuroscience research in general and biomedical research into mental disorders in particular. Some of the predicted fruits of neuroscience include new and improved treatments for mental, neurological, and substance abuse disorders; reduction, prevention, or reversal of age-related changes in cognition; and development of measures to enhance cognitive performance and productivity (6,36,41).

There can be no doubt that neuroscience research will lead to improved understanding of how the brain works and even to the development of new treatments. There also can be no doubt that improved understanding of the biology of mental disorders will raise new and difficult questions concerning the privacy of genetic information, genetic discrimination, the forcible administration of mind-altering agents, concepts of free will and personal responsibility, the way third-party payers cover mental disorders, and other issues (6,36). Eugenic policies (see ch. 5) and treatment approaches used earlier in this century, which sprang from enthusiasm for (and sometimes misunderstanding of) biological theories of mental disorders, serve as a reminder of the potential misuses of biological advances. Few supporters of neuroscience research mention the potential ethical and legal dilemmas it poses; while the Federal Government has developed a detailed neuroscience research strategy, no official mechanism for considering the possible implications of this research, such as the one organized by the Human Genome Project, has been formalized or even widely discussed.

THE OTA STUDY

Approximately 40 percent of all public funds spent on mental health services—\$8 billion each year—derive from Federal sources (33). The Federal Government is also the primary source of support for research into mental disorders and mental health, with NIMH’s research budget totaling \$497.4 million in 1991 (see ch. 6). The large Federal investment in mental health research—combined with congressional interest in neuroscience research—led the House Committees on Energy and Commerce; Science, Space and Technology; Appropriations; and Veterans Affairs and the Senate Subcommittee on Science, Technology, and Space of the Committee on Commerce, Science, and Transportation to request and Senator Edward M. Kennedy to endorse an Office of Technology Assessment (OTA) report on the status and implications of biological research into mental disorders.

This report reviews the data from research on the biology of several mental disorders, including schizophrenia bipolar disorder, major depression, obsessive-compulsive disorder, and panic disorder. These disorders—some of the most severe and long-lasting ones that afflict adults—have been subjected to extensive experimental scrutiny aimed at identifying

causal factors in the brain.⁴The focus of this report reflects that of recent research—namely, the widely held opinion that biological factors contribute significantly to mental disorders and that medication and other somatic interventions generally form a critical component of the clinical management of these disorders.⁵The causative roles of psychological and social factors (which are important for a comprehensive understanding and treatment of mental disorders) and broad mental health issues are beyond the scope of this report.

In the five chapters that follow, OTA examines: 1) the nature of mental disorders in general and the clinical features of the mental disorders considered in this report; 2) results of research into biological factors that contribute to these disorders; 3) the heritability of these disorders and the clinical implications of genetic research; 4) the support for research into mental disorders and barriers to research; and 5) the impact on public attitudes and policy issues of new knowledge about the biology of mental disorders.

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⁴ A small but vociferous group of ex-patients, advocates, and others contends that labeling individuals as severely and persistently mentally ill is pejorative (32). Their antipathy stems, in large measure, from an antipsychiatry stance and rejection of involuntary hospitalization and treatment. While many in this group generally accept that individuals diagnosed with what are called mental disorders have undeniable deficits and face terrible problems, they look askance at biological theories of mental disorders because of their association with disparaging labels, forced treatment, and other civil liberty issues. The implications of biological explanations of mental disorders are considered in chapters 3 and 7. A discussion of the important legal, social, and ethical issues that surround involuntary commitment and forced treatment are beyond the scope of this report.

⁵ Addictive disorders, Alzheimer's disease, and developmental disorders such as autism have been or are being discussed in other OTA reports and therefore are not considered in any detail in this report (37,38,39).

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