Psychopharmacology
(3 Hours/Units)

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Course Objectives: This course is designed to help you:

1. Become familiar with the concepts and foundations of psychopharmacology

2. Identify scope of practice issues

3. Identify and distinguish between medication types and categories

4. Learn common psychiatric medications and corresponding conditions treated

5. Access available resources

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1. Definitions and History

Psychopharmacology (from Greek ψῡchor, psῡkhē, "breath, life, soul"; φάρμακον, pharmakon, "drug"; and -λογία, -logia) is “the study of drug-induced changes in mood, sensation, thinking, and behavior”.

Psychoactive drugs have been used for a variety of purposes dating back to pre-recorded history. Fast forward to the scientific revolution in Europe and the United States which prompted the use of traditional herbal remedies to lose favor with the mainstream medical establishment. However, some continued to apply knowledge of traditional European herblore. In the early 20th century, scientists began reassessing this rejection of traditional herbs in medicine. A number of important psychiatric drugs have been developed as a by-product of the analysis of organic compounds present in traditional herbal remedies. In the latter half of the 20th century, research into new psychopharmacologic drugs exploded, with many new drugs being discovered, created, and tested. Many once-popular drugs are now out of favor, and there are fashions in psychiatric drugs, as with any other kind of drug. Since the 1950s, psychiatric drugs used to restore mental health has gained increasing acceptance, especially when new classes of pharmacological agents were discovered, notably tranquillizers (e.g., chlorpromazine, resperine, and other milder agents) and antidepressants (including the highly effective group known as tricyclic antidepressants), and LSD was popularized among many psychiatrists for a certain time as a mental miracle drug capable of curing all manner of problems. Lithium is widely used to allay the symptoms of affective disorders and especially to prevent recurrences of both the manic and the depressed episodes in manic-depressive individuals. The many commercially marketed antipsychotic agents (including thiothixene, chlorpromazine, haloperidol, and thioridazine) all share the common property of blocking the dopamine receptors in the brain. (Dopamine acts to help transmit nerve impulses in the brain.) Since scientists have found a direct relationship between dopamine blockage and reduction of schizophrenic symptoms, many believe that schizophrenia may be related to excess dopamine (Murray, Bridget, October, 2003. "A Brief History of RxP". APA Monitor).
These drugs contrast sharply with the hypnotic and sedative drugs that formerly were in use and that clouded the patient's consciousness and impaired his/her motor and perceptual abilities. The antipsychotic drugs can allay the symptoms of anxiety and reduce agitation, delusions, and hallucinations, and the antidepressants lift spirits and quell suicidal impulses. The heavy prescription use of drugs to reduce agitation and quell anxiety has led, however, to what many psychiatrists consider an overuse of such medications. An overdose of a tranquilizer may cause loss of muscular coordination and slowing of reflexes, and prolonged use can lead to addiction. Toxic side effects such as jaundice psychoses, dependency, or a reaction similar to Parkinson's disease may develop. The drugs may produce other minor symptoms (e.g., heart palpitations, rapid pulse, sweating) because of their action on the autonomic nervous system (Murray, Bridget, October, 2003. "A Brief History of RxP". APA Monitor).

2. Pharmacological Therapies

The past decade has seen an outpouring of new drugs introduced for the treatment of mental disorders (Nemeroff, 1998). New medications for the treatment of depression and schizophrenia are among the achievements stoked by research advances in both neuroscience and molecular biology. Through the process known as rational drug design, researchers have become increasingly sophisticated at designing drugs by manipulating their chemical structures. Their goal is to create more effective therapeutic agents, with fewer side effects, exquisitely targeted to correct the biochemical alterations that accompany mental disorders.

The process was not always so rational. Many of the older pharmacotherapies (drug treatments) that had been introduced by 1960 had been discovered largely by accident. Researchers studying drugs for completely different purposes serendipitously found them to be useful for treating mental disorders (Barondes, 1993). Thanks to their willingness to follow up on unexpected leads, drugs such as chlorpromazine (for psychosis), lithium (for bipolar disorder), and imipramine (for depression) became available. The advent of chlorpromazine in 1952 and other neuroleptic drugs was so revolutionary that it was one of the major historical forces behind the deinstitutionalization movement that is discussed later in this chapter.
The past generation of pharmacotherapies, once shown to be safe and effective, was introduced to the market generally before their mechanism of action was understood. Years of research after their introduction revealed how many of them work therapeutically. Knowledge about their actions has had two cardinal consequences: it helped probe the etiology of mental disorders, and it ushered in the next generation of pharmacotherapies that are more selective in their mechanism of action.

**Mechanisms of Action**

The mechanism of action refers to how a pharmacotherapy interacts with its target in the body to produce therapeutic effects. Pharmacotherapies that act in similar ways are grouped together into broad categories (e.g., stimulants, antidepressants). Within each category are several chemical classes. The individual pharmacotherapies within a chemical class share similar chemical structures. Table 2-9 presents several common categories and classes, along with their indication, that is, their clinical use.

Many pharmacotherapies for mental disorders have as their initial action the alteration—either increase or decrease—in the amount of a neurotransmitter. Neurotransmitter levels can be altered by pharmacotherapies in myriad ways: pharmacotherapies can mimic the action of the neurotransmitter in cell-to-cell signaling; they can block the action of the neurotransmitter; or they can alter its synthesis, breakdown (degradation), release, or reuptake, among other possibilities (Cooper et al., 1996).

Neurotransmitters generally are concentrated in separate brain regions and circuits. Within the cells that form a circuit, each neurotransmitter has its own biochemical pathway for synthesis, degradation, and reuptake, as well as its own specialized molecules known as receptors. At the time of neurotransmission, when a traveling signal reaches the tip (terminal) of the presynaptic cell, the neurotransmitter is released from the cell into the synaptic cleft. It migrates across the synaptic cleft in less than a millisecond and then binds to receptors situated on the membrane of the postsynaptic cell. The neurotransmitter’s binding to the receptor alters the shape of the receptor in such a way that the neurotransmitter can either excite the postsynaptic cell, and thereby transmit the signal to this next cell, or inhibit the receptor, and thereby block signal transmission. The neurotransmitter’s action is terminated either by enzymes that degrade it right there, in the synaptic cleft, or by transporter proteins that return unused neurotransmitter
back to the presynaptic neuron for reuse, a “recycling” process known as reuptake. The widely prescribed class of antidepressants referred to as the selective serotonin reuptake inhibitors primarily block the action of the transporter protein for serotonin, thus leaving more serotonin to remain at the synapse (Schloss & Williams, 1998). Depression is thought to be reflected in decreased serotonin transmission, so one rationale for this class of antidepressants is to boost the level of serotonin (see Chapter 4).

**Table 2-9. Selected types of pharmacotherapies**

<table>
<thead>
<tr>
<th>Category and Class</th>
<th>Example(s) of Clinical Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antipsychotics (neuroleptics)</td>
<td></td>
</tr>
<tr>
<td>Typical antipsychotics*</td>
<td>Schizophrenia, psychosis</td>
</tr>
<tr>
<td>Atypical antipsychotics**</td>
<td></td>
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<tr>
<td>Antidepressants</td>
<td></td>
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<tr>
<td>Selective serotonin reuptake</td>
<td>Depression, anxiety</td>
</tr>
<tr>
<td>inhibitors</td>
<td></td>
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<tr>
<td>Tricyclic and heterocyclic</td>
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<tr>
<td>antidepressants***</td>
<td></td>
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<tr>
<td>Monoamine oxidase inhibitors</td>
<td></td>
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<tr>
<td>Stimulants</td>
<td>Attention-deficit/hyperactivity</td>
</tr>
<tr>
<td>disorder</td>
<td></td>
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<tr>
<td>Antimanic</td>
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<tr>
<td>Lithium</td>
<td>Mania</td>
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<td>Anticonvulsants</td>
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<td>Thyroid supplementation</td>
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<tr>
<td>Antianxiety (anxiolytics)</td>
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<tr>
<td>Benzodiazepines</td>
<td>Anxiety</td>
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<tr>
<td>Antidepressants</td>
<td></td>
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<tr>
<td>B-Adrenergic-blocking drugs</td>
<td></td>
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<tr>
<td>Cholinesterase inhibitors</td>
<td>Alzheimer’s disease</td>
</tr>
</tbody>
</table>

* Also known as first-generation antipsychotics, they include these chemical classes: phenothiazines (e.g., chlorpromazine), butyrophenones (e.g.,
haloperidol), and thioxanthenes (Dixon et al., 1995).
** Also known as second-generation antipsychotics, they include these chemical classes: dibenzoxazepine (e.g., clozapine), thienobenzodiazepine (e.g., olanzapine), and benzisoxazole (e.g., risperidone).
*** Include imipramine and amitriptyline.

Source: Perry et al., 1997

Although the effects of reuptake inhibitors on neurotransmitter concentrations in the synapse occur with the first dose, therapeutic benefit typically lags behind by days or weeks. This observation has spurred considerable recent research on chronic and “downstream” actions of psychotropics, particularly antidepressants. For example, in animal models the repeated administration of nearly all antidepressants is associated with a reduction in the number of postsynaptic 12/7/99 receptors, so-called down-regulation that parallels the time course of clinical effect in patients (Schatzberg & Nemeroff, 1998). Some of the secondary effects of reuptake inhibitors may be mediated by the activation of intraneuronal “second messenger” proteins which result from the stimulation of postsynaptic receptors (Schatzberg & Nemeroff, 1998).

Receptors for each transmitter come in numerous varieties. Not only are there several types of receptor for each neurotransmitter, but there may be many subtypes. For serotonin, for example, there are seven types of receptors, designated 5-HT1 –5-HT7, and seven receptor subtypes, totaling 14 separate receptors (Schatzberg & Nemeroff, 1998). The pace at which receptors are identified has become so dizzying that these figures are likely to be obsolete by the time this paragraph is read.

A pharmacotherapy typically interacts with a receptor in either one of two ways—as an agonist or as an antagonist. When a pharmacotherapy acts as an agonist, it mimics the action of the natural neurotransmitter. When a pharmacotherapy acts as an antagonist, it inhibits, or blocks, the neurotransmitter’s action, often by binding to the receptor and preventing the natural transmitter from binding there. An antagonist disrupts the action of the neurotransmitter.

The diversity of receptors presents vast opportunities for drug development. Through rational drug design, pharmacotherapies have become increasingly selective in their actions. Generally speaking, the more selective the
pharmacotherapy’s action, the more targeted it is to one receptor rather than
another, the narrower its spectrum of action, and the fewer the side effects.
Conversely, the broader the pharmacotherapy’s action, the less targeted to a
receptor type or subtype, the broader the effects, and the broader the side
effects (Minneman, 1994). However, the interaction among neurotransmitter
systems in the brain renders some of the apparent distinctions among
medications more apparent than real. Thus, despite differential initial actions
on neurotransmitters, both serotonin and norepinephrine reuptake blockers
have similar biochemical effects after chronic dosing (Potter et al., 1985).

Complementary and Alternative Treatment

Recent interest in the health benefits of a plethora of natural products has
engendered claims related to putative effects on mental health. These have
ranged from reports of enhanced memory in people taking the herb, ginseng,
to the use of the St. John’s wort flowers as an antidepressant (see Chapter 4).

There are major challenges to evaluating the role of complementary and
alternative treatments in maintaining mental health or treating mental
disorders. In many cases, preparations are not standardized and consist of a
variable mixture of substances, any of which may be the active ingredient(s).
Purity, bioavailability, amount and timing of doses, and other factors that are
standardized for traditional pharmaceutical agents prior to testing cannot be
taken for granted with natural products. Current regulations in the United
States classify most complementary and alternative treatments as “food
supplements,” which are not subject to premarketing approval of the Food
and Drug Administration.

At present, no conclusions about the role, if any, of complementary and
alternative treatments in mental health or illness can be accepted with
certainty, as very few claims or studies meet acceptable scientific standards.
With funding from government and private industry, controlled clinical trials
are under way, including the use of St. John’s wort (Hypericum perforatum)
as a treatment for depression, and omega-3 fatty acids (fish oils) as a mood
stabilizer in bipolar depression. In addition, it is important for clinicians and
investigators to account for any herbs or natural products being taken by
their patients or research subjects that might interact with traditional
treatments.
Issues in Treatment

The foregoing section has furnished an overview of the types and nature of mental health treatment. The resounding message, which is echoed throughout this report, is that a range of efficacious treatments is available. The following material deals with four issues surrounding treatment—the placebo response, benefits and risks, the gap between how well treatments work in clinical trials versus in the real world, and the constellation of barriers that hinder people from seeking mental health treatment.

Placebo Response

Recognized since antiquity, the placebo effect refers to the powerful role of patients’ attitudes and perceptions that help them improve and recover from health problems. Hippocrates established the therapeutic principle of physicians laying their hands in a reassuring manner to draw on the inner resources of the patient to fight disease. Technically speaking, the placebo effect refers to treatment responses in the placebo group, responses that cannot be explained on the basis of active treatment (Friedman et al., 1996a). A placebo is an inactive treatment, either in the form of an inert pill for studying a new drug treatment or an inactive procedure for studying a psychological therapy. The effects of active treatment are often compared with a control group that receives a pharmacological or psychological placebo.

It is not unusual for a placebo effect to be found in up to 50 percent of patients in any study of a medical treatment (Schatzberg & Nemeroff, 1998). For example, about 30 percent of patients typically respond to a placebo in a clinical trial of a new antidepressant (see Chapter 4). The rate is even higher for an antianxiety agent (an anxiolytic) (Schweizer & Rickels, 1997). The placebo effect is of such import that a placebo group or other control group is mandated by the Food and Drug Administration in clinical trials of a new pharmacotherapy to establish its efficacy prior to marketing (Friedman et al., 1996a). If the pharmacotherapy is not statistically superior to the control, efficacy cannot be established. It is somewhat more difficult to fashion an analog of an inert pill in the testing of new and experimental psychological therapies. Psychological studies can employ a “psychological” placebo in the form of a treatment known to be ineffectual. Or they can employ a comparison group, which receives an alternative psychological therapy.
Some treatment studies employ both a “psychological” placebo, as well as a comparison group.

The basis of the placebo response is not fully known, but there are thought to be many possible reasons. These reasons, which relate to attributes of the disorder or the disease, the patient, and the treatment setting, include spontaneous remission, personality variables (e.g., social acquiescence), patient expectations, attitudes of and compassion by clinicians, and receiving treatment in a specialized setting (Schweizer & Rickels, 1997). In studies of postoperative pain, the placebo response is mediated by patients’ production of endogenous pain-killing substances known as endorphins (Levine et al., 1978).

**Benefits and Risks**

Throughout this report, currently accepted treatments for mental disorders will be described. Except where otherwise indicated, the efficacy of these interventions has been documented in multiple controlled, clinical trials published in the peer-reviewed literature. In some cases, these have been supplemented by expert consensus reports or practice guidelines.

Most studies of efficacy of specific treatments for mental disorders have been highly structured clinical trials, performed on individuals with a single disorder, in good physical health. While necessary and important, these trials do not always generalize easily to the wider population, which includes many individuals whose mental disorder is accompanied by another mental or somatic disorder and/or alcohol or substance abuse, and who may be taking other medications. Moreover, children, adolescents, and the elderly are excluded from many clinical trials, as are those in certain settings, such as nursing homes. Newer, more generalizable studies are being undertaken to address these shortcomings of the scientific literature (Lebowitz & Rudorfer, 1998).

Pending the results of these newer studies, it is important for clinical decisionmakers to review the current best evidence for the **efficacy** of treatments. People with mental disorders and their health providers should consider all possible options and carefully weigh the pros and cons of each, as well as the possibility of no treatment at all, before deciding upon a course of action. Such an informed consent process entails the calculation of a benefit-to-risk ratio" for each available treatment option. Most medications
or somatic treatments have side effects, for example, but a likelihood of significant clinical benefit often overrides side effects in support of a treatment recommendation.

**Gap Between Efficacy and Effectiveness**

Mental health professionals have long observed that treatments work better in the clinical research trial setting as opposed to typical clinical practice settings. The diminished level of treatment effectiveness in real-world settings is so perceptible that it even has a name, the “efficacy-effectiveness gap.” Efficacy is the term for what works in the clinical trial setting, and effectiveness is the term for what works in typical clinical practice settings. The efficacy-effectiveness gap applies to both pharmacological therapies and to psychotherapies (Munoz et al., 1994; Seligman, 1995). The gap is not unique to mental health, for it is found with somatic disorders too.

The magnitude of the gap can be surprisingly high. With schizophrenia medications, one review article found that, in clinical trials, the use of traditional antipsychotic medications for schizophrenia was associated with an average annual relapse rate of about 23 percent, whereas the same medications used in clinical practice carried a relapse rate of about 50 percent (Dixon et al., 1995). The magnitude of the gap found in this study may not apply to other medications and other disorders, much less to psychological therapies. Studies of real-world effectiveness are scarce. Yet some degree of gap is widely recognized. The question is, why?

Efficacy studies test whether treatment works under ideal circumstances. They typically exclude patients with other mental or somatic disorders. In the past, they typically have examined relatively homogeneous populations, usually white males. Furthermore, efficacy studies are carried out by highly trained specialists following strict protocols that require frequent patient monitoring. Finally, participation in efficacy studies is often free of charge to patients.

It is not surprising that the reasons commonly cited to explain the discrepancy between efficacy and effectiveness focus on the practicalities and constraints imposed by the real world. In real-world settings, patients often are more heterogeneous and ethnically diverse, are beset by comorbidity (more than one mental or somatic disorder), are often less compliant, and are seen more often in general medical rather than specialty
settings; providers are less inclined to adequately monitor and standardize treatment; and cost pressures exist on both patients and providers, depending on the nature of the financing of care (Dixon et al., 1995; Wells & Sturm, 1996). This constellation of real-world constraints appears to explain the gap.

3. Medication Types and Categories

In psychopharmacology, researchers are interested in substances that crosses the blood-brain barrier and thus has an effect on behavior, mood or cognition. Drugs are researched for their physicochemical properties, physical side effects, and psychological side effects. Researchers in psychopharmacology study a variety of different psychoactive substances that include alcohol, cannabinoids, club drugs, hallucinogens, opiates, nicotine and caffeine, psychomotor stimulants, inhalants, and anabolic-androgenic steroids. They also study drugs used in the treatment of affective and anxiety disorders, as well as schizophrenia (Meyer, J. S. and Quenzer, L. S., 2004. Psychopharmacology: Drugs, the Brain and Behavior. Sinauer Associates. ISBN 0-87893-534-7).

Clinical studies are often very specific, typically beginning with animal testing, and ending with human testing. In the human testing phase, there is often a group of subjects, one group is given a placebo, and the other is administered a carefully measured therapeutic dose of the drug in question. After all of the testing is completed, the drug is proposed to the concerned regulatory authority (e.g. the U.S. FDA), and is either commercially introduced to the public, introduced to the public via prescription, or deemed safe enough for over the counter sale.

Though particular drugs are prescribed for specific symptoms or syndromes, they are usually not specific to the treatment of any single mental disorder. Because of their ability to modify the behavior of even the most disturbed patients, the antipsychotic, antianxiety, and antidepressant agents have greatly affected the management of the hospitalized mentally ill, enabling hospital staff to devote more of their attention to therapeutic efforts and enabling many patients to lead relatively normal lives outside of the hospital. A somewhat controversial application of psychopharmacology is "cosmetic psychiatry" Persons who do not meet criteria for any psychiatric disorder are nevertheless prescribed psychotropic medication. The antidepressant Wellbutrin is then prescribed to increase perceived energy levels and
assertiveness while diminishing the need for sleep. The antihypertensive compound Inderal is sometimes chosen to eliminate the discomfort of day-to-day "normal" anxiety. Prozac in nondepressed people can produce a feeling of generalized well-being. Mirapex, a treatment for restless leg syndrome can dramatically increase libido in women. These and other off-label life-style applications of medications are not uncommon. Although occasionally reported in the medical literature no guidelines for such usage have been developed (Meyer, J. S. and Quenzer, L. S., 2004. Psychopharmacology: Drugs, the Brain and Behavior. Sinauer Associates. ISBN 0-87893-534-7).

There are six main groups of psychiatric medications.

- Antidepressants, which are used to treat disparate disorders such as clinical depression, dysthymic disorder, anxiety, eating disorders and borderline personality disorder.
- Stimulants, which are used to treat disorders such as attention deficit hyperactivity disorder and narcolepsy and to suppress the appetite.
- Antipsychotics, which are used to treat psychoses such as schizophrenia and mania.
- Mood stabilizers, which are used to treat bipolar disorder and schizoaffective disorder.
- Anxiolytics, which are used to treat anxiety disorders.
- Depressants, which are used as hypnotics, sedatives, and anesthetics.


**Antipsychotics**

Antipsychotics are used in the treatment of various symptoms of psychosis, such as those caused by psychotic disorders or schizophrenia. Antipsychotics are also sometimes used as mood stabilizers, most frequently to help manage such disorders as bipolar disorder, even if no symptoms of psychosis are present. Antipsychotics may also be referred to as neuroleptic drugs and some antipsychotics are branded as major tranquilizers.

There are two categories of antipsychotics, typical antipsychotics and atypical antipsychotics. Due to the nature of the drugs the majority of them require a verifiable prescription from a licensed physician (Meyer, J. S. and
Common Antipsychotics:

- Chlorpromazine (Thorazine), Typical antipsychotic
- Haloperidol (Haldol), Typical antipsychotic
- Perphenazine (Trilafon), Typical antipsychotic
- Thioridazine (Mellaril), Typical antipsychotic
- Thiothixene (Navane), Typical antipsychotic
- Trifluoperazine (Stelazine), Typical antipsychotic
- Aripiprazole (Abilify), Atypical antipsychotic
- Olanzapine (Zyprexa), Atypical antipsychotic
- Quetiapine (Seroquel), Atypical antipsychotic
- Risperidone (Risperdal), Atypical antipsychotic
- Ziprasidone (Geodon), Atypical antipsychotic

(Antidepressants

Antidepressants are drugs used in the treatment of clinical depression, and they are also often used for anxiety and other disorders. Most antidepressants will restrain the metabolism of serotonin and/or norepinephrine. Such drugs are called Selective Serotonin Reuptake Inhibitors (SSRI), and they actively attempt to prevent the aforementioned neurotransmitters from dropping to the levels at which depression is experienced. SSRIs will often take 3-5 weeks to have a noticeable effect, due to the inability of the brain to process the flood of serotonin and it reacts by downregulating the sensitivity of the autoreceptors, which can take up to 5 weeks. Currently, Bi-functional SSRIs are being researched, which will occupy the autoreceptors, bypassing the 'throttling' of serotonin. Another type of antidepressant is a Monoamine oxidase inhibitor, which are thought to block the actions of MAO, an enzyme which assists in the breakdown of serotonin and norepinephrine. MAOI's are typically only used in the event that a tricyclic antidepressant or SSRI fails to prevent or exacerbates depression (Meyer, J. S. and Quenzer, L. S., 2004. Psychopharmacology: Drugs, the Brain and Behavior. Sinauer Associates. ISBN 0-87893-534-7).
Many people manifest both depressive and anxious symptoms and are often treated with the combination of medication and psychotherapy. Several medications prescribed to treat depression are also prescribed to reduce anxiety-related symptoms.

Common Antidepressants:

- Citalopram (Celexa), SSRI
- Escitalopram (Lexapro), SSRI
- Fluoxetine (Prozac), SSRI
- Sertraline (Zoloft), SSRI
- Duloxetine (Cymbalta), SNRI
- Venlafaxine (Effexor), SNRI
- Bupropion (Wellbutrin), NDRI
- Mirtazapine (Remeron), NaSSA
- Isocarboxazid (Marplan), MAO Inhibitor
- Phenelzine (Nardil), MAO Inhibitor


Mood stabilizers

In 1949, the Australian John Cade discovered that lithium salts could control mania, reducing the frequency and severity of manic episodes. This introduced the now popular drug Lithium carbonate to the mainstream public, as well as being the first mood stabilizer to be approved by the Food & Drug Administration. Many antipsychotics are used as mood stabilizers, although typically the first resort would be a standard mood stabilizer such as Lithium carbonate. Many mood stabilizers, with the exception of Lithium, are anticonvulsants (Meyer, J. S. and Quenzer, L. S. (2004). Psychopharmacology: Drugs, the Brain and Behavior. Sinauer Associates. ISBN 0-87893-534-7).

Common Mood Stabilizers:

- Lithium Carbonate (Carbolith), Regular Mood stabilizer
- Carbamazepine (Tegretol), Anticonvulsant Mood stabilizer
- Valproic acid (Valproate), Anticonvulsant Mood stabilizer
• Valproate semisodium (Depakote), Anticonvulsant Mood stabilizer
• Lamotrigine (Lamictal), Atypical Anticonvulsant Mood stabilizer


Stimulants

Stimulants are some of the most widely prescribed drugs today. A stimulant is any drug that stimulates the central nervous system. Adderall, a collection of Amphetamine salts, is one of the most prescribed pharmaceuticals in the treatment of ADHD. Typically prescribed to treat adolescents with Attention Deficit Hyperactivity Disorder and an increasing number of adults, it is very common as a treatment. Patients respond differently to each drug. Most frequently used are timed-release mediums but if such a method doesn't work there are many options to try. Stimulants have the potential to be addictive and patients with a history of drug abuse are typically monitored closely or even barred from the usage and given an alternative. Discontinuing treatment without tapering the dosage is not advisable (Meyer, J. S. and Quenzer, L. S., 2004. Psychopharmacology: Drugs, the Brain and Behavior. Sinauer Associates. ISBN 0-87893-534-7).

Common Stimulants:

• Caffeine, Typical Stimulant found in many edibles worldwide
• Methylphenidate (Ritalin), (Concerta), (Daytrana) atypical stimulant
• Dexamethasone (Focalin) D-isomer of Methylphenidate stimulant
• Dextroamphetamine (Dexedrine), (Dextrostat), (Vyvanse) D- Amphetamine-based stimulant
• Dextroamphetamine & Levoamphetamine (Adderall), D,l- Amphetamine salt mix stimulant
• Methamphetamine (Desoxyn), D-methamphetamine-based stimulant
• Modafinil (Provigil), stimulant


Anxiolytics & Hypnotics
Barbiturates were first used as hypnotics and as anxiolytics, but as time went on, benzodiazepines (Lowell Randall and Leo Sternbach, 1957) were developed in the 1960s and 1970s. Eventually they led to billions of doses being consumed annually, but as prescriptions were increasing, even more were problems with addiction and dependence on these medications.

Common Anxiolytics & Hypnotics:

- Diazepam (Valium), Benzodiazepine derivative
- Nitazepam (Mogadon), Benzodiazepine derivative
- Zolpidem (Ambien, Stilnox), an Imidazopyridine
- Chlordiazepoxide (Librium), Benzodiazepine derivative
- Alprazolam (Xanax), Benzodiazepine derivative
- Temazepam (Restoril), Benzodiazepine derivative
- Clonazepam (Klonopin), Benzodiazepine derivative
- Lorazepam (Ativan), Benzodiazepine derivative


4. The Neuroscience of Mental Health

The Fundamentals of Mental Health and Mental Illness

A vast body of research on mental health and, to an even greater extent, on mental illness constitutes the foundation of this Surgeon General’s report. To understand and better appreciate the content of the chapters that follow, readers outside the mental health field may desire some background information. Thus, this chapter furnishes a “primer” on topics that the report addresses.

The chapter begins with an overview of research under way today that is focused on the neuroscience of mental health. Modern integrative neuroscience offers a means of linking research on broad “systems level” aspects of brain function with the remarkably detailed tools and findings of molecular biology. The report begins with a discussion of the brain because it is central to what makes us human and provides an understanding of mental health and mental illness. All of human behavior is mediated by the brain. Consider, for example, a memory that most people have from
childhood—that of learning to ride a bicycle with the help of a parent or friend. The fear of falling, the anxiety of lack of control, the reassurances of a loved one, and the final liberating experience of mastery and a newly extended universe create an unforgettable combination. For some, the memories are not good ones: falling and being chased by dogs have left marks of anxiety and fear that may last a lifetime. Science is revealing how the skill learning, emotional overtones, and memories of such experiences are put together physically in the brain. The brain and mind are two sides of the same coin. Mind is not possible without the remarkable physical complexity that is built into the brain, but, in addition, the physical complexity of the brain is useless without the sculpting that environment, experience, and thought itself provides. Thus the brain is now known to be physically shaped by contributions from our genes and our experience, working together. This strengthens the view that mental disorders are both caused and can be treated by biological and experiential processes, working together. This understanding has emerged from the breathtaking progress in modern neuroscience that has begun to integrate knowledge from biological and behavioral sciences.

An overview of mental illness follows the section on modern integrative brain science. The section highlights topics including symptoms, diagnosis, epidemiology (i.e., research having to do with the distribution and determinants of mental disorders in population groups, including various racial and ethnic minority groups), and cost, all of which are discussed in greater and more pointed detail in the chapters that follow. Etiology is the study of the origins and causes of disease, and that section reviews research that is seeking to define, with ever greater precision, the causes of mental disorders. As will be seen, etiology research examines fundamental biological, behavioral, and sociocultural processes, as well as a necessarily broad array of life events. The section on development of temperament reveals how mental health science has attempted over much of the past century to understand how biological, psychological, and sociocultural factors meld in health as well as in illness. The chapter then reviews research approaches to the prevention and treatment of mental disorders and provides an overview of mental health services and their delivery. Final sections cover the growing influence on the mental health field of the need for attention to cultural diversity, the importance of the consumer movement, and new optimism about recovery from mental illness—that is, the possibility of recovering one’s life.
The Neuroscience of Mental Health

Complexity of the Brain I: Structural

As befits the organ of the mind, the human brain is the most complex structure ever investigated by our science. The brain contains approximately 100 billion nerve cells, or neurons, and many more supporting cells, or glia. In and of themselves, the number of cells in this 3-pound organ reveal little of its complexity. Yet most organs in the body are composed of only a handful of cell types; the brain, in contrast, has literally thousands of different kinds of neurons, each distinct in terms of its chemistry, shape, and connections (Figure 2-1 depicts the structural variety of neurons). To illustrate, one careful, recent investigation of a kind of interneuron that is a small local circuit neuron in the retina, called the amacrine cell, found no less than 23 identifiable types.

But this is only the beginning of the brain’s complexity.

The workings of the brain depend on the ability of nerve cells to communicate with each other. Communication occurs at small, specialized structures called synapses. The synapse typically has two parts. One is a specialized presynaptic structure on a terminal portion of the sending neuron that contains packets of signalling chemicals, or neurotransmitters. The second is a postsynaptic structure on the dendrites of the receiving neuron that has receptors for the neurotransmitter molecules.

The typical neuron has a cell body, which contains the genetic material, and much of the cell’s energy-producing machinery. Emanating from the cell body are dendrites, branches that are the most important receptive surface of the cell for communication. The dendrites of neurons can assume a great many shapes and sizes, all relevant to the way in which incoming messages are processed. The output of neurons is carried along what is usually a single branch called the axon. It is down this part of the neuron that signals are transmitted out to the next neuron. At its end, the axon may branch into many terminals. (Figure 2-2.)

The usual form of communication involves electrical signals that travel within neurons, giving rise to chemical signals that diffuse, or cross, synapses, which in turn give rise to new electrical signals in the postsynaptic neuron. Each neuron, on average, makes more than 1,000 synaptic connections with other neurons. One type of cell—a Purkinje cell—may
make between 100,000 and 200,000 connections with other neurons. In aggregate, there may be between 100 trillion and a quadrillion synapses in the brain. These synapses are far from random. Within each region of the brain, there is an exquisite architecture consisting of layers and other anatomic substructures in which synaptic connections are formed. Ultimately, the pattern of synaptic connections gives rise to what are called circuits in the brain. At the integrative level, large- and small-scale circuits are the substrates of behavior and of mental life. One of the most awe-inspiring mysteries of brain science is how neuronal activity within circuits gives rise to behavior and, even, consciousness.

The complexity of the brain is such that a single neuron may be part of more than one circuit. The organization of circuits in the brain reveals that the brain is a massively parallel, distributed information processor. For example, the circuits involved in vision receive information from the retina. After initial processing, these circuits analyze information into different streams, so that there is one stream of information describing what the visual object is, and another stream is concerned with where the object is in space. The information stream having to do with the identity of the object is actually broken down into several more refined parallel streams. One, for example, analyzes shape while another analyzes color. Ultimately, the visual world is resynthesized with information about the tactile world, and the auditory world, with information from memory, and with emotional coloration. The massively parallel design is a great pattern recognizer and very tolerant of failure in individual elements. This is why a brain of neurons is still a better and longer-lasting information processor than a computer.

The specific connectivity of circuits is, to some degree, stereotyped, or set in expected patterns within the brain, leading to the notion that certain places in the brain are specialized for certain functions (Figure 2-3). Thus, the cerebral cortex, the mantle of neurons with its enormous surface area increased by outpouchings, called gyri, and indentations, called sulci, can be functionally subdivided. The back portion of the cerebral cortex (i.e., the occipital lobe), for example, is involved in the initial stages of visual processing. Just behind the central sulcus is the part of the cerebral cortex involved in the processing of tactile information (i.e., parietal lobe). Just in front of the central sulcus is a part of the cerebral cortex involved in motor behavior (frontal lobe). In the front of the brain is a region called the prefrontal cortex, which is involved with some of the highest integrated functions of the human being, including
the ability to plan and to integrate cognitive and emotional streams of information.

Beneath the cortex are enormous numbers of axons sheathed in the insulating substance, myelin. This subcortical “white matter,” so named because of its appearance on freshly cut brain sections, surrounds deep aggregations of neurons, or “gray matter,” which, like the cortex, appears gray because of the presence of neuronal cell bodies. It is within this gray matter that the brain processes information. The white matter is akin to wiring that conveys information from one region to another. Gray matter regions include the basal ganglia, the part of the brain that is involved in the initiation of motion and thus profoundly affected in Parkinson’s disease, but that is also involved in the integration of motivational states and, thus, a substrate of addictive disorders. Other important gray matter structures in the brain include the amygdala and the hippocampus. The amygdala is involved in the assignment of emotional meaning to events and objects, and it appears to play a special role in aversive, or negative, emotions such as fear. The hippocampus includes, among its many functions, responsibility for initially encoding and consolidating explicit or episodic memories of persons, places, and things.

In summary, the organization of the brain at the cellular level involves many thousands of distinct kinds of neurons. At a higher integrative level, these neurons form circuits for information processing determined by their patterns of synaptic connections. The organization of these parallel distributed circuits results in the specialization of different geographic regions of the brain for different functions. It is important to state at this point, however, that, especially in younger individuals, damage to a particular brain region may yield adaptations that permit circuits spared the damage and, therefore, other regions of the brain, to pick up some of the functions that would otherwise have been lost.

*Figure 2-1. Structural variety of neurons*
1Special thanks to Steven E. Hyman, M.D., Director, National Institute of Mental Health, and Gerald D. Fischbach, M.D., Director, National Institute of Neurological Diseases and Stroke, for their contributions to this section.

Figure 2-2. How neurons communicate

Figure 2-3. The brain: Organ of the mind
Complexity of the Brain II: Neurochemical

Superimposed on this breathtaking structural complexity is the chemical complexity of the brain. As described above, electrical signals within neurons are converted at synapses into chemical signals which then elicit electrical signals on the other side of the synapse. These chemical signals are molecules called neurotransmitters. There are two major kinds of molecules that serve the function of neurotransmitters: small molecules, some quite well known, with names such as dopamine, serotonin, or norepinephrine, and larger molecules, which are essentially protein chains, called peptides. These include the endogenous opiates, Substance P, and corticotropin releasing factor (CRF), among others. All told, there appear to be more than 100 different neurotransmitters in the brain (Table 2-1 contains a selected list).

A neurotransmitter can elicit a biological effect in the postsynaptic neuron by binding to a protein called a neurotransmitter receptor. Its job is to pass the information contained in the neurotransmitter message from the synapse to the inside of the receiving cell. It appears that almost every known neurotransmitter has more than one different kind of receptor that can confer rather different signals on the receiving neuron. Dopamine has 5 known neurotransmitter receptors; serotonin has at least 14.

Table 2-1. Selected neurotransmitters important in psychopharmacology
Excitatory amino acid
Glutamate

Inhibitory amino acids
Gamma aminobutyric acid
Glycine

Monoamines and related neurotransmitters
Norepinephrine
Dopamine
Serotonin
Histamine
Acetylcholine (quaternary amine)

Purine
Adenosine

Neuropeptides

  Opioids
  Enkephalins
  Beta-endorphin
  Dynorphin

  Tachykinin
  Substance P

Hypothalamic-releasing factors
Corticotropin-releasing hormone

Although there are many kinds of receptors with many different signaling functions, we can divide most neurotransmitter receptors into two general classes. One class of neurotransmitter receptor is called a ligand-gated channel, where “ligand” simply means a molecule (i.e., a neurotransmitter) that binds to a receptor. When neurotransmitters interact with this kind of receptor, a pore within the receptor molecule itself is opened and positive or negative charges enter the cell. The entry of positive charge may activate additional ion channels that allow more positive charge to enter. At a certain threshold, this causes a cell to fire an action potential—an electrical event that leads ultimately to the release of neurotransmitter. By definition,
therefore, receptors that admit positive charge are excitatory neurotransmitter receptors. The classic excitatory neurotransmitter receptors in the brain utilize the excitatory amino acids glutamate and, to a lesser degree, aspartate as neurotransmitters. Conversely, inhibitory neurotransmitters act by permitting negative charges into the cell, taking the cell farther away from firing. The classic inhibitory neurotransmitters in the brain are the amino acids gamma amino butyric acid, or GABA, and, to a lesser degree, glycine.

Most of the other neurotransmitters in the brain, such as dopamine, serotonin, and norepinephrine, and all of the many neuropeptides constitute the second major class. These are neither precisely excitatory nor inhibitory but rather act to produce complex biochemical changes in the receiving cell. Their receptors do not contain intrinsic ion pores but rather interact with signaling proteins, called “G proteins” found inside the cell membrane. These receptors thus are called G protein-linked receptors. The details are less important than understanding the general scheme. Stimulation of G protein-linked receptors alters the way in which receiving neurons can process subsequent signals from glutamate or GABA. To use a metaphor of a musical instrument, if glutamate, the excitatory neurotransmitter, is puffing wind into a flute or clarinet, it is the modulatory neurotransmitters such as dopamine or serotonin that might be seen as playing the keys and, thus, altering the melody via G protein-linked receptors.

The architecture of these systems drives home this point. The precise brain circuits that carry specific information about the world and that are involved in precise point-to-point communication within the brain use excitatory or inhibitory neurotransmission. Examples of such circuits, which are massively parallel, can be found in the visual and auditory cortex. Overlying this pattern of precise, rapid (timing in the range of milliseconds) neurotransmission are the modulatory systems in the brain that use norepinephrine, serotonin, and dopamine. In each case, the neurotransmitter in question is made by a very small number of nerve cells clustered in a limited number of areas in the brain. Of the hundred billion neurons in the brain, only about 500,000, for example, make dopamine—that is, for every 200,000 cells in the brain, only one makes dopamine. Even fewer make norepinephrine. The cell bodies of the dopamine neurons are clustered in a few brain regions, most importantly, regions deep in the brain, in the midbrain, called the substantia nigra, and the ventral tegmental area. Norepinephrine neurons are made in the nucleus locus coeruleus even
farther down in the brain stem in a structure called the pons. Serotonin is made by a somewhat larger number of nuclei but, still, not by many cells. Nuclei called the raphe nuclei spread along the brain stem. While each of these neurotransmitters is made by a small number of neurons with clustered cell bodies, each sends its axons branching throughout the brain, so that in each case a very small number of neurons, which largely appear to fire in unison when excited, influence almost the entire brain. This is not the picture of systems that are communicating precise bits of information about the world but rather are intrinsic modulatory systems that act via other G protein-linked receptors to alter the overall responsiveness of the brain. These neurotransmitters are responsible for brain states such as degree of arousal, ability to pay attention, and for putting emotional color or significance on top of cold cognitive information provided by precise glutaminergic circuits. It is no wonder that these modulatory neurotransmitters and their receptors are critical targets of medications used to treat mental disorders—for example, the antidepressant and antipsychotic drugs—and also are the targets of drugs of abuse.

**Complexity of the Brain III: Plasticity**

The preceding paragraphs have illustrated the chemical and anatomic structure of the brain and, in so doing, provided some picture of its complexity as well as some picture of its function. The crowning complexity of the brain, however, is that it is not static. The brain is always changing. People learn so much and have so many distinct types of memory: conscious, episodic memory of the sort that is encoded initially in the hippocampus; memory of motor programs or procedures that are encoded in the striatum; emotional memories that can initiate physiologic and behaviorally adaptive repertoires encoded, for example, in the amygdala; and many other kinds. Every time a person learns something new, whether it is conscious or unconscious, that experience alters the structure of the brain. Thus, neurotransmission in itself not only contains current information but alters subsequent neurotransmission if it occurs with the right intensity and the right pattern. Experience that is salient enough to cause memory creates new synaptic connections, prunes away old ones, and strengthens or weakens existing ones. Similarly, experiences as diverse as stress, substance abuse, or disease can kill neurons, and current data suggest that new neurons continue to develop even in adult brains, where they help to incorporate new memories. The end result is that information is now routed over an altered circuit. Many of these changes are long-lived, even permanent. It is in this
way that a person can look back 10 or 20 or 50 years and remember family, a home or school room, or friends. The general theme is that to really understand the kind of memory—indeed, any brain function—one must think at least at two levels: one, the level of molecular and cellular alterations that are responsible for remodeling synapses, and, two, the level of information content and behavior which circuits and synapses serve.

To summarize this section, scientists are truly beginning to learn about the structure and function of the brain. Its awe-inspiring complexity is fully consistent with the fact that it supports all behavior and mental life. Implied in the foregoing, is the fact that brains are built not only by genes—and again, it is the lion’s share of the 80,000 or so human genes that are involved in building a structure so complex as the brain. Genes are not by themselves the whole story. Brains are built and changed through life through the interaction of genes with environment, including experience. It is true that a set of genes might create repetitive multiples of one type of unit, yet the brain appears far more complex than that. It stands to reason that if 50,000 or 60,000 genes are involved in building a brain that may have 100 trillion or a quadrillion synapses, additional information is needed, and that information comes from the environment. It is this fundamental realization that is beginning to permit an understanding of how treatment of mental disorders works—whether in the form of a somatic intervention such as a medication, or a psychological “talk” therapy—by actually changing the brain.

**Imaging the Brain**

There are many exciting developments in brain science. Of great relevance to the study of mental function and mental illness is the ability to image the activity of the living human brain with technologies developed in recent decades, such as positron emission tomography scanning or functional magnetic resonance imaging. Such approaches can exploit surrogates of neuronal firing such as blood flow and blood oxygenation to provide maps of activity. As science learns more about brain circuitry and learns more from cognitive and affective neuroscience about how to activate and examine the function of particular brain circuits, differences between health and illness in the function of particular circuits certainly will become evident. We will be able to see the action of psychotropic drugs and, perhaps most exciting, we will be able to see the impact of that special kind of
learning called psychotherapy, which works after all because it works on the brain.

Different brain chemicals, brain receptors, and brain structures will come up in the discussion of particular illnesses throughout this document. This section is meant to provide a panoramic, not a detailed, introduction and also to provide certain overarching lessons. When something is referred to as biological or brain-based, that is not shorthand for saying it is genetic and, thus, predetermined; similarly, references to “psychological” or even “social” phenomena do not exclude biological processes. The brain is the great integrator, bringing together genes and environment. The study of the brain requires reducing problems initially to bite-sized bits that will allow investigators to learn something, but ultimately, the agenda of neuroscience is not reductionist; the goal is to understand behavior, not to put blinders on and try to explain it away. As the foregoing discussion illustrates, the brain also is complex. Thus, having a disease that affects one or even many critical circuits does not overthrow, except in extreme cases, such as advanced Alzheimer’s disease, all aspects of a person. Typically, people retain their personality and, in most cases, their ability to take responsibility for themselves.

In retrospect, early biological models of the mind seem impoverished and deterministic—for example, models that held that “levels” of a neurotransmitter such as serotonin in the brain were the principal influence on whether one was depressed or aggressive. Neuroscience is far beyond that now, working to integrate information coming “bottom-up” from genes and molecules and cells, with information flowing “top-down” from interactions with the environment and experience to the internal workings of the mind and its neuronal circuits. Ultimately, however, the goal is not only human self-understanding. In knowing eventually precisely what goes wrong in what circuits and what synapses and with what chemical signals, the hope is to develop treatments with greater effectiveness and with fewer side effects. Indeed, as the following chapters indicate, the hope is for cures and ultimately for prevention. There is every reason to hope that as our science progresses, we will achieve those goals.
5. Children, Adolescents, and Medication

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Treatment Strategies

Children and adolescents receive most of the traditional treatments particularly psychosocial treatments, such as psychotherapies, and various medications. Specific psychosocial and pharmacological treatment approaches are described in subsequent sections on specific mental disorders. Much of the research, however, has been conducted on adults, with results extrapolated to children. Some of the treatments, such as interactive or play therapy with young children, are unique to clinical work with this group, while others, such as individual psychotherapy with adolescents, are similar to clinical work with adults. Many of the treatment interventions have been “packaged” together in particular arrangements for delivery in specific clinical settings.

More attention is being paid to the value of multimodal therapies, that is, the combination of pharmacological and psychosocial therapies. While research is limited, multimodal studies have shown benefits for treatment of ADHD (see later section), anxiety (Kearney & Silverman, 1998), and depression. Tempering the value of psychotherapy as well as pharmacotherapy, which is discussed below, is that the efficacy of these therapies in the research setting is greater than that in the real world. The problem of the gap between research and clinical practice is discussed in greater depth elsewhere in this chapter.

Psychotherapy

The major types of psychotherapy for children are supportive, psychodynamic, cognitive-behavioral, interpersonal, and family systemic. With the exception of the latter, these therapies originally were developed for adults and then tailored for use in children.

Most psychotherapies are deemed effective for children and adolescents because they improve more than with no treatment, as discussed later in this chapter under Treatment Interventions (Casey & Berman, 1985; Hazelrigg et al., 1987; Weisz et al., 1987; Kazdin et al., 1990; Baer & Nietzel, 1991; Grossman & Hughes, 1992; Shadish et al., 1993; Weisz & Weiss, 1993; Weisz et al., 1995). But despite this strong body of research on children
comparing treatment with no treatment, far less attention has been paid to, and guidance provided about, the efficacy of a given psychotherapy for a specific diagnosis (Lonigan et al., 1998). In other words, it is not clear which therapies are best for which conditions. The American Psychological Association sought to rectify this problem by convening two task forces, the second of which exhaustively reviewed the professional literature to evaluate the strength of the evidence for treating individual disorders in children. The second task force refined two sets of criteria against which to evaluate the evidence: the first, and more rigorous, set of criteria was for *Well-Established Psychosocial Interventions*, while the other was for *Probably Efficacious Psychosocial Interventions* (Lonigan et al., 1998). The findings of the task force’s comprehensive evaluation were published, disorder by disorder, in an entire issue of the *Journal of Clinical Child Psychology* in June 1998. While findings relating to individual disorders are presented in the next section of this chapter, this was the overarching conclusion: “... the majority of these [psychosocial] interventions do not meet criteria for the highest level of empirical support, the well-established criteria” (Lonigan et al., 1998). The problem, according to these authors, is that too few well-controlled studies have been performed for each disorder. To meet the criteria for a *Well-Established Psychosocial Intervention*, there must be at least two well-conducted group-design studies conducted by different teams of researchers, among other criteria. Hereafter, these criteria are referred to as the American Psychological Association Task Force Criteria.

Some other general points are warranted about the value of psychotherapies for children. Psychotherapies are especially important alternatives for those children who are unable to tolerate, or whose parents prefer them not to take, medications. They also are important for conditions for which there are no medications with well-documented efficacy. They also are pivotal for families under stress from a child’s mental disorder. Therapies can serve to reduce stress in parents and siblings and teach parents strategies for managing symptoms of the mental disorder in their child (see later sections on Disruptive Disorders and Home-Based Services).

*Psychopharmacology*

Dramatic increases have occurred over the past decade in the use of pharmacological therapies for children and adolescents with mental disorders, but research has lagged behind the surge in their use (Jensen et al., 1999). Our gaps in knowledge span three areas in particular. First, for most prescribed medications, there are no studies of safety and efficacy for
children and adolescents. This is true for medications for mental disorders as well as for somatic disorders. Depending on the specific medication, evidence may be lacking for short-term, or most commonly, for long-term safety and efficacy. The problem is even more pronounced with newer medications, most of which have been introduced into the market for adults. Only in the case of psychostimulants for ADHD is there an adequate body of research on their safety and efficacy in children and adolescents, albeit short-term information only (Greenhill et al., 1998) (see later section on ADHD). Second, there is often limited information about pharmacokinetics, that is, drug concentrations in body fluids and tissues over time (Clein & Riddle, 1996). Most of what is known about pharmacokinetics comes from studies of adults. But pediatric pharmacokinetic studies are crucial to identifying the appropriate dose and dose frequency for children of different ages and body sizes. Third, the combined effectiveness of pharmacological and psychosocial treatments, that is, multimodal treatments, is seldom studied. Multimodal treatments have the potential to yield dose reductions in pharmacological treatments, thereby improving the side-effect profile, parental acceptance, and patient compliance.

The dearth of research on children and adolescents has allowed for widespread “off-label” use of medications. This means that, for this population, physicians who are prescribing a given drug do not have the benefit of research and drug labeling information developed by the sponsor and approved by the Food and Drug Administration (FDA). Under U.S. food and drug law, a drug is approved by the FDA only for a defined population. Yet after its approval and market availability, physicians are at liberty to prescribe it for anyone, even though the sponsor only is allowed to market the drug for the approved population (which typically is adults) (FDA, 1998). Fortunately, there is a large body of clinical experience with children and adolescents to guide prescribing practices, despite few controlled studies (Green, 1996).

There are several reasons for the paucity of research on medications for children and adolescents. One is greater caution on the part of both the medical profession and parents to experiment with children or to prescribe drugs with potentially serious side effects. Another reason is the need for compliance with dosing requirements of the clinical trial protocol. When children are research subjects, enforcing compliance is generally perceived to be more difficult. Researchers must rely on parents to assess the degree of compliance. A final reason is the cost of research. Once drugs have reached
the market for adults, pharmaceutical companies have fewer financial incentives to conduct expensive and methodologically demanding studies with children, to whom drugs may be given through off-label prescribing. The problem has been significant enough to have galvanized Congress into passing legislation, the FDA Modernization Act of 1997, to create financial incentives for drug sponsors to conduct research with pediatric subjects [FDA, 1999 Title 21 USC 505A(g)]. The FDA Modernization Act may help alleviate this problem, but it is too early to tell.

Despite the relative lack of information concerning safety and efficacy of psychotropic agents in children, six scientific reviews have been completed recently; these reviews comprehensively surveyed all available published research concerning the safety and efficacy of psychotropic medication, focusing on six general classes of medication: the psychostimulants (Greenhill et al., 1998), the mood stabilizers and antimanic agents (Ryan et al., 1999), the selective serotonin reuptake inhibitors (SSRIs) (Emslie et al., 1999), antidepressants (Geller et al., 1998), antipsychotic agents (Campbell et al., 1999), and other miscellaneous agents (Riddle et al., 1998).

Review of this comprehensive body of research evidence indicates strong support for the safety and efficacy of several classes of agents for several conditions, specifically, SSRIs for childhood/adolescent obsessive-compulsive disorder, and the psychostimulants for ADHD. For many other disorders and medications, however, information from rigorously controlled trials is sparse or altogether absent (see Figure 3-2). Further, only in the area of ADHD is information now emerging on longer term safety and efficacy, as well as on the merits of combining psychopharmacologic and psychotherapeutic treatments.

Given the inadequacy of efficacy data for most nonstimulant psychotropics, studies are needed for the majority of agents. However, efficacy data appear to be most urgently needed for SSRIs, mood stabilizers, and novel antipsychotics, since the level of usage of these medications appears to be highest among the growing list of psychotropic medications used in youth (Fisher & Fisher, 1996). In contrast to adult psychopharmacology that is focusing on differential efficacy and speed of onset of these categories of psychotropics, pediatric psychopharmacology needs basic studies of efficacy.
Additional information on specific medication treatment is presented in the succeeding sections, providing more detailed discussion of particular disorders. In-depth information is presented on two disorders where a great deal of research has been done, namely, ADHD and major depressive disorder, followed by briefer discussions of other childhood mental disorders.

6. Psychiatric Medications and Conditions Treated

**Anxiety disorders**

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<tr>
<td>Alprazolam</td>
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<td>Lorazepam</td>
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Reboxetine, Edronax, Norebox, Prolift, Solvex, Vestra

Citalopram, Chlorpromazine, sometimes used

**Bipolar Disorder**

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Risperidone | Risperdal
---|---
Chlorpromazine and Fluphenazine sometimes used

**Major Depressive Disorder or Dysthymia**

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<td>Efectin, Efexor, Effexor, Efexor XR <em>(Slow Release)</em></td>
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**Insomnia**

<table>
<thead>
<tr>
<th>Generic name</th>
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<tr>
<td>Lorazepam</td>
<td>Ativan, Temesta, Tavor</td>
</tr>
<tr>
<td>Flurazepam</td>
<td>Dalmane</td>
</tr>
<tr>
<td>Cyproheptadine</td>
<td>Periactin</td>
</tr>
<tr>
<td>Trazodone</td>
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**Nicotine addiction**

<table>
<thead>
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<tr>
<td>Bupropion</td>
<td>Zyban, Wellbutrin</td>
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<tr>
<td></td>
<td>Chantix</td>
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**Psychosis**

<table>
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</thead>
<tbody>
<tr>
<td>Aripiprazole</td>
<td>Abilify</td>
</tr>
<tr>
<td>Drug</td>
<td>Brand Names</td>
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<tr>
<td>----------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Amisulpride</td>
<td>Solian</td>
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<tr>
<td>Benztropine</td>
<td>Cogentin</td>
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<td>Bromperidol</td>
<td>Impromen</td>
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<td>Chlorpromazine</td>
<td>Largactil, Thorazine</td>
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<td>Truxal</td>
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<td>Clozapine</td>
<td>Clozaril, Fazaclo, Leponex</td>
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<tr>
<td>Fluphenazine decanoate</td>
<td>Anatensol, Dapotum D, Deconoat, Fludecate, Modecate, Prolixin Decanoate, Sinqualone</td>
</tr>
<tr>
<td>Fluphenazine enanthate</td>
<td>Dapotum Injektion, Flunanthate, Moditen Enanthate Injection, Sinqualone Enantat</td>
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<td>Fluphenazine hydrochloride</td>
<td>Dapotum, Permitil, Prolixin, Lyogen, Moditen, Omca, Sediten, Selecten, Sevinol, Siqualone, Trancin</td>
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<td>Depixol, Fluanxol</td>
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<td>Zyprexa</td>
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<td>Paliperidone</td>
<td>Invega</td>
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<td>Penfluridol</td>
<td>Semap</td>
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<td>Navane</td>
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<td>Ziprasidone</td>
<td>Geodon</td>
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<td>Zuclopenthixol</td>
<td>Cisordinol, Clopixol</td>
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<tr>
<td>Carbamazepine, Valproic acid sometimes used</td>
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</tbody>
</table>
6. Scope of Practice and Psychopharmacology

**LMFT**

The following are definitions from the Business and Professions Code regarding the scope and practice of licensees regulated by the Board of Behavioral Sciences.

**Section: 4980.02. PRACTICE OF MARRIAGE, FAMILY, AND CHILD COUNSELING; APPLICATION OF PRINCIPLES AND METHODS**

“For the purposes of this chapter, the practice of marriage and family therapy shall mean that service performed with individuals, couples, or groups wherein interpersonal relationships are examined for the purpose of achieving more adequate, satisfying, and productive marriage and family adjustments. This practice includes relationship and premarriage counseling.

The application of marriage and family therapy principles and methods includes, but is not limited to, the use of applied psychotherapeutic techniques, to enable individuals to mature and grow within marriage and the family, the provision of explanations and interpretations of the psychosexual and psychosocial aspects of relationships, and the use, application, and integration of the coursework and training required by Sections 4980.37, 4980.40, and 4980.41.”

CAMFT Ethical Standards state, “3.9 SCOPE OF COMPETENCE: Marriage and family therapists do not assess, test, diagnose, treat, or advise on problems beyond the level of their competence as determined by their education, training, and experience. While developing new areas of practice, marriage and family therapists take steps to ensure the competence of their work through education, training, consultation, and/or supervision.”

**National Board of Certified Counselors (NBCC)**

According to the National Board of Certified Counselors Code of Ethics:

“Certified counselors offer only professional services for which they are trained or have supervised experience. No diagnosis, assessment, or treatment should be performed without prior training or supervision. Certified counselors are responsible for correcting any misrepresentations of their qualifications by others…..Certified counselors recognize their
limitations and provide services or use techniques for which they are qualified by training and/or supervision. Certified counselors recognize the need for and seek continuing education to assure competent services”.

**LCSW**

The following are definitions from the Business and Professions Code regarding the scope and practice of licensees regulated by the Board of Behavioral Sciences.

**Section: 4996.9. CLINICAL SOCIAL WORK AND PSYCHOTHERAPY DEFINED**

“The practice of clinical social work is defined as a service in which a special knowledge of social resources, human capabilities, and the part that unconscious motivation plays in determining behavior, is directed at helping people to achieve more adequate, satisfying, and productive social adjustments. The application of social work principles and methods includes, but is not restricted to, counseling and using applied psychotherapy of a nonmedical nature with individuals, families, or groups; providing information and referral services; providing or arranging for the provision of social services; explaining or interpreting the psychosocial aspects in the situations of individuals, families, or groups; helping communities to organize, to provide, or to improve social or health services; or doing research related to social work.

Psychotherapy is defined as the use of psychosocial methods within a professional relationship, to assist the person or persons to achieve a better psychosocial adaptation, to acquire greater human realization of psychosocial potential and adaptation, to modify internal and external conditions which affect individuals, groups, or communities in respect to behavior, emotions, and thinking, in respect to their intrapersonal and interpersonal processes.

Prescription psychiatric medications, like any prescription medication, usually require a prescription from a physician, such as a psychiatrist, before it can be obtained. Some U.S. states and territories, following the creation of the prescriptive authority for psychologists movement, have granted prescriptive privileges to clinical psychologists that have undergone additional specialized education and training in medical psychology.”
Social Workers and the NASW

Although social workers may work in a wide range of health care settings where medical interventions are utilized, they are not authorized to prescribe or administer medication, including the use of psychotropic medication. Traditionally, prescribing medication has been the role of the physician and “physician extenders” such as pharmacists and nurse practitioners or physician's assistants (Svensson, 1997).

A 2004 NASW NEWS article has identified several key skills employed by social workers, “Social workers monitor the effects of medication, detect problems and work with the health care team. Social workers can also teach patients to advocate for themselves should the medication or dosage no longer be effective. And social workers can develop adherence support groups or add adherence issues to the agendas of existing groups. On another front, they can offer support to the patient and caregiver — for example, helping them cope when a change in functioning causes an inability to work or when the drug's price becomes an issue” (Slavin)

8. ADHD and Psychopharmacologic Prevalence

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Status of Mental Health Services at the Millennium

Pharmacoepidemiology of Methylphenidate and Other Medications for the Treatment of ADHD

This paper aims to describe the clinical and social characteristics associated with the treatment of Attention Deficit Hyperactivity Disorder (ADHD) in the United States during the 1990's. The objectives are the following: to review the 10-year psychopharmacologic prevalence trends for the stimulants and related medications based on community treatment patterns; to discuss the epidemiology of these treatments in terms of host (person), agent (psychotropic medications), and environment (clinical, educational, and public issues) so that variations in prevalence can be best understood; to interpret the findings broadly in light of trends in the United States regarding clinical factors, nosology, educational policy, public attitudes, and media effects; and to suggest both future research to understand the appropriateness of the increase in psychotropic medication during the past decade, and changes in clinical practice guidelines.
Research Methods

The methods used to ascertain health service utilization in the United States are far from ideal because a national health insurance system is lacking and no comprehensive system of gathering national medical treatment data exists. As a result, only a few population-based databases have been used to estimate the medication usage patterns in the usual practice setting (Zito & Safer, 1997). Consequently, analysts and the lay press often rely on marketing data, such as IMS America, a proprietary prescription survey that tracks market share principally for the pharmaceutical industry. A second source, the National Ambulatory Medical Care Survey (NAMCS), involves a national probability sampling of physician office visits; but this resource is limited, in part, because child mental health services involving prescription medications represent a very small, unreliable sample of these data. A larger, more promising source is administrative claims data from various clinical practice settings such as the Medicaid health insurance system, which covers persons with low income, impairment (Supplemental Security Income), or special placement (e.g., foster care).

In studies by the author and her colleagues, two large population data sets were obtained at three sites. Two sets of Medicaid data were selected: the first was from a Mid-Western Medicaid (MWM) State and the second was from a Mid-Atlantic Medicaid (MAM) State. The third data set included employed, insured individuals and their families. Health records of these families were gathered from a nonprofit health maintenance organization (HMO) from the northwestern region of the United States. After organizing the enrollment data from these systems and the administrative claims for reimbursement of medical and prescription services (for Medicaid) or prescription records (for the HMO), we undertook a comprehensive analysis of psychotropic medication prevalence. The analysis focused on stimulants, the psychotropic drug class most commonly used among children, and methylphenidate, the most common medication within the stimulant class. Prevalence was defined as the number of individuals with one or more prescriptions for a specific medication or medication class during the study year per 1,000 individuals enrolled in the Medicaid or the HMO health service system.
Ten-Year Prevalence Trends for Stimulants

The trends for population-based total stimulant prevalence are illustrated in Figure 1. Stimulant use among those less than 20 years old who were treated in the HMO setting showed a 606 percent increase in use (from 0.36 percent in 1987 to 2.54 percent in 1996) while the HMO enrollment rose only 17 percent. Figure 2 shows that stimulant use among 5-to 14-year-olds in the Medicaid setting (MAM and MWM) was nearly twice that in the HMO setting. One-year stimulant prevalence was eight percent among 5-to 14-year-olds in MAM but only four percent in the HMO. These differences could be accounted for both by geographic differences and by target population differences as well as by possible prescribing practice differences.

Host (Sociodemographic) Factors That Influence Stimulant Prevalence

Host factors that influence drug prevalence include age, gender, ethnicity, geographical locale, and socioeconomic status. An analysis of these factors produced the following results:

(3) As illustrated in Figure 3, age-specific prevalence differed substantially among the four age groups (0–4; 5–9; 10–14; and 15–19 years old). For example, in MWM, the lower (0–4) and upper (15–19) age groups had a very low stimulant prevalence relative to the treatment of ADHD at the typical ages of 5–14 years (7 and 12 per 1,000 for 0–4 and 15–19-year-olds, respectively). When the age rates are compared with the stimulant prevalence of 70 and 68 per 1,000 for the 5–9 and 10–14-year-olds, the difference was sixfold to tenfold. Between 1987 and 1996, there was a threefold and fivefold rate increase, respectively, among 5–9 and 10–14-year-olds. However, the increase in use during this decade was most dramatic (sixfold) for the 15–19-year-olds, suggesting a longer duration of treatment with stimulants than in the previous decade. When the preschoolers in MWM were examined by year of age, 3-and 4-year-olds had stimulant rates of 1 and 2 percent by 1996, up approximately threefold over the previous decade (Figure 4).

(4) Gender-specific prevalence data typically illustrate the predominance of ADHD treatment among boys. However, when male-to-female preschooler ratios were compared across the decade, there was a marked change in the gender disparity. This is well illustrated among HMO youths. By 1995, the
male: female ratio was half of the 1991 ratio (4.6:1 versus 9.8:1). This change suggests that girls entered treatment in increasing numbers during the 1990's.

(5) A racial disparity in stimulant use is observable from the race-specific data and this effect is influenced by age. Stimulant prevalence for Caucasian youths was approximately twice that of non-Caucasians in the MAM data source. The disparity is greatest for the oldest age group—a fact that may be consistent with differential school dropout rates among high schoolers or variable time in treatment.

(6) Geographical locale-specific prevalence for stimulants in 1996 showed a 5.1-fold variation across eight regions of the MAM system (Figure 5). Further analysis of race-specific and geographical locale-specific prevalence is instructive. It is important to consider the interaction of race and region, since each factor may independently influence health service utilization. To accomplish this analysis, a logistic regression model was developed with race and region as predictors of the odds of receiving methylphenidate. Caucasians were 2.6-fold more likely to receive this treatment compared with non-Caucasians, a ratio that dropped to 2.2-fold when region was accounted for in the model. The interaction of race and region was significant (p < 0.001), which suggests that race-specific prevalence varies according to the geographical locale. These 1996 data corroborate our earlier findings regarding Caucasian and African-American youths ages 5–14 years old who participate in Medicaid (Zito, dosReis, Safer, & Riddle, 1998).

When a comparison of Caucasian to African-American prevalence ratios was made for the leading psychopharmacologic classes of medication (stimulants, antidepressants, antipsychotics, and lithium) in relation to the leading nonpsychopharmacologic medication classes (e.g., antibiotics, topical agents, antitussives, and eye/ear/nose and throat remedies), the racial disparity was 58–79 percent greater for psychopharmacologic agents used to treat mental or behavioral disorders than for medications used to treat medical disorders. This fact suggests that cultural differences explain the lower psychopharmacologic use relative to medical drug use.

(7) Socioeconomic factors explain several differences in the attitudes, satisfaction, and knowledge of the medication experience reported in a survey of parents with children receiving methylphenidate. Survey responses from parents in the low socioeconomic class category who were receiving
service in a State-supported mental health clinic were compared with higher income parents who were participating in an advocacy and support group for ADHD. Pronounced differences were noted: school referrals were 2.5-fold more frequent for the low-income group; school-day-only treatment regimens were more likely in the low-income group; and counseling was less likely in low-or middle-income groups. Better knowledge scores and fewer fears about medication but less satisfaction with social functioning were reported by the high-socio-economic-class parent group (dosReis, Zito, Safer, & Soeken, 1998).

Medication and Medication-Related Factors That Influence Stimulant Prevalence

Medication and medication-related factors influence drug prevalence. Among these factors are (1) marketing and promotion; (2) physician prescribing patterns within the class of stimulants; (3) the growing use of stimulants along with ancillary medications, most of which are off-label (without indications in the Food and Drug Administration (FDA)-approved labeling information for the product package insert); and (4) Federal and local advocacy issues influencing stimulant treatment in the United States.

Results of the medication analyses suggest the following inferences. First, promotion of a combination of four amphetamine salts (Adderall®) was very successful during the late 1990's and the effect is evident in the increase in sales according to recent National Prescription Audit data. From January 1996 to March 1999, Adderall sales increased more than fortyfold and, in March 1999, exceeded prescription sales of brand-name methylphenidate (Ritalin®) by 1.5-fold. Second, changes in the proportional data within the stimulant class suggest that other amphetamines and Adderall are enjoying increased use while methylphenidate and pemoline have slightly reduced proportions (Figure 6). Recent clinical reports of serious liver toxicity associated with pemoline use (Rosh, Dellert, Narkewicz, Birnbaum, & Whittington, 1998) were largely ignored until 1999. This fact reminds us of the length of time it takes to change clinical practice when we rely on voluntary reporting of adverse medication events. Third, trends in MWM between 1987 and 1996 for selected psychopharmacologic agents show that alphaagonists (clonidine and guanfacine) increased 53-fold while antidepressants increased 3.6 times and stimulants increased 3.7 times (Figure 7). Thus, considerable increased psychotropic medication use is observed and is likely to be explained by more youths in treatment, longer
times in treatment, and the concurrent use of stimulants and ancillary medications (e.g., an alpha-agonist for insomnia related to ADHD or to stimulant use, or an antidepressant for comorbid depression).

**Clinical and Environmental Factors That Influence Stimulant Prevalence**

Clinical and environmental factors that influence stimulant prevalence include (1) nosological changes; (2) comorbidities and multiple medication practices; and (3) health service system changes. First, we note changes in the clinical symptoms to meet diagnostic criteria according to the latest version of the *Diagnostic and Statistical Manual* (DSM-IV; APA, 1994) relative to earlier versions and to the International Classification of Diseases. The 1994 DSM criteria make it easier for youth to meet criteria based on inattention alone (Wolraich, Hannah, Pinnock, Baumgaertel, & Brown, 1996). A second factor involves the increasing identification of comorbidities among those with ADHD. This trend partially explains the use of multiple medications, particularly antidepressants for comorbid depression. A review of the diagnoses related to stimulant use among youths in the MAM and MWM systems suggests that only 67 percent and 74 percent, respectively, of the stimulant-treated individuals had a diagnosis of ADHD (*Figure 8*). Nearly 20 percent of the stimulant-treated youths had no diagnosis during the study year (which may be an artifact of the cross-sectional research design) and a substantial proportion had psychiatric diagnoses other than ADHD, a finding that suggests that symptomatic treatment with stimulants is expanding among those with related psychiatric disorders. This conclusion is also supported by the MWM data comparing 1987 or 1991 with 1995 for individuals with ADHD alone and those with additional (comorbid) diagnoses (*Figure 9*). The disparity between ADHD and ADHD with comorbidities was greater in 1987 than in 1995. Prominent among the comorbidities were disruptive disorders such as conduct disorder and oppositional defiant disorder, which grew 27 percent, and depression, which had a 270 percent increase in prevalence during that 9-year period (*Figure 10*). When those with an ADHD diagnosis alone were reviewed, the increased use of other medications from 1987 through 1995 was pronounced. Examples include a 35-fold increase in the use of alpha-agonists (clonidine or guanfacine) and a 2.4-fold increase in the use of antidepressants. Methylphenidate treatment alone proportionately decreased by 9.2 percent over the same period. Finally, when youths in MWM receiving multiple medications in 1987 were compared with those in 1995,
those with two or more increased from 16 percent to 27 percent, while those receiving only one medication class decreased proportionately.

A third clinical area that explains variations in the prevalence for ADHD medication treatments concerns the treatment setting as defined by the health service system. From our 8-year analysis of NAMCS data, we reported the following findings: primary care providers (pediatrics, general practice, family practice, and internal medicine specialists) differ from psychiatrists when ADHD visits are compared to non-ADHD visits. Primary care provided 61 percent while psychiatry provided 25 percent of ADHD visits. Second, HMO insurance coverage, publicly insured (Medicaid), and privately insured (e.g., preferred provider organization insured) were significantly different with respect to ADHD and total other visits. HMO had only 11.7 percent of ADHD visits, although its share of non-ADHD visits was 17.9 percent. Private insurance had 51 percent and public insurance had 23.7 percent of ADHD visits. ADHD visits increased across the 8-year span, doubling in the latter half of the interval. Stimulant treatment as a proportion of ADHD visits increased from a mean of 62.6 percent in 1989 to a mean of 76.6 percent in 1996 (Zito et al., 1999).

Educational policy changes in 1990 expanded the identification of ADHD and led to an increased role for schools in assessing the emotional health needs of students. As a result, school staffs became more accommodating and responded more to parental demands for psychological and educational testing of restless and inattentive youths for special education services, which increased their role in assessing ADHD. The role of the media has moved from largely negative reporting in the 1960's through the late 1980's to a more balanced, if not more positive, viewpoint. U.S. Federal mental health programs promoting the "decade of the brain" in the 1990's is a related development that may explain the greater acceptance of somatic treatments for ADHD by both teachers and families. Baltimore County, Maryland, public school survey data illustrate the increased duration of treatment among school-age youths from 1971 through 1997. No children from middle or high school were medicated during the school day according to the 1971 data, but 5.6 percent of middle schoolers and 1.6 percent of high schoolers were reported to be receiving medication for ADHD during the school day in April 1997 (Safer & Zito, 2000). The negative media effect is shown in the dip in stimulant prevalence during 1988 and 1989, years when newspapers in Baltimore carried details of a lawsuit against the county
school system. The result was a 39 percent drop in stimulant treatment for public school students from 1987 to 1991 (Safer & Krager, 1992).

Conclusions from our findings to date are as follows: (1) there is a substantial difference in stimulant prevalence in public versus private health service systems, and (2) medication utilization for ADHD has increased substantially over the past decade. The stimulant prevalence increase is attributable to (1) expanded diagnostic criteria; (2) longer time in treatment, resulting in more teenage youths in treatment; (3) more girls in treatment; (4) a threefold increase in stimulant prevalence among 2–4 year olds (Zito et al., 2000); (5) an increased role of schools; and (6) more favorable attitudes of families and professionals. Concerns are raised in regard to (1) the appropriateness of medicating pre-schoolers for ADHD; (2) the long-term effectiveness of stimulants for the treatment of inattention as the sole symptom of ADHD; (3) long-term safety issues; (4) the efficacy and safety of off-label medications particularly when used in combinations for the treatment of ADHD; (5) racial and socioeconomic disparities; and (6) the role of cultural differences in the acceptability of ADHD and its treatment with medication.

**Implications for Clinical Research and Clinical Practice**

The appropriateness and the outcome of treatment in the usual practice setting need to be more intensively researched. Measures should include symptom improvement and consumer satisfaction as well as functional assessments in the crucial areas of academic performance, behavior, and social relations.

The results of this investigation clearly call for considerable additional research to help us understand the nature and extent of ADHD and its appropriate treatment in children and adolescents. Some key questions include: What is the prevalence of ADHD? Is it increasing or decreasing? In which age groups? Has accurate case finding improved over time with better diagnostic criteria and improved knowledge? Are children with ADHD getting appropriate treatment according to current knowledge about quality care? What is the appropriate mix of psychopharmacology and psychotherapy in the treatment of ADHD? Which children with ADHD are not getting any care at all? What is the role of the family, the school, and the community in the delivery of quality care? How can we implement new knowledge about improved assessment and treatment of ADHD? Each of
these questions is of very high priority. The importance of our children to our future as a society demands no less.
9. Resources

Psychwatch.com (useful links)
www.psychwatch.com/psychopharm_page.htm

Psychopharmacology Resources
www.umdnj.edu/psyevents/psychopharm.html

Basic psychopharmacology of antidepressants
www.biopsychiatry.com/options.htm

Drug Therapy of Mood Disorders
www.psycom.net

Mental Help Net Resource
http://mentalhelp.net/guide/pro22.htm

Internet Mental Health
www.mentalhealth.com

Psychopharmacology
http://www.brookeredu.unet.com/Psychopharmacology%20antipsychotics_files/frame.htm

Dual Recovery Anonymous
http://www.draonline.org/

Neuropsychology & Medical Psychology Resources
http://www.driesen.com

Psychopharmacology During Pregnancy
www.fda.gov/cder/present/clinpharm2000/Wisner/sld001.htm

Medication and Pregnancy
http://panicdisorder.about.com/cs/medspregnancy/

Psychopharmacology Reference Lists
Use of Psychoactive Medication During Pregnancy/Possible Effects on the Fetus and Newborn
http://www.aap.org/policy/re9866.html

Basic Pharmacology
http://www.nurse-prescriber.co.uk/education/modules/pharmacology/pharmacy1.htm

10. References


