

CHAPTER SEVEN

Practice Variations and the Use of Prescription Drugs

Practice Variations and the Use of Prescription Drugs

To our knowledge, this is the first statewide examination of small area variations in the use of prescription drugs. This is a timely examination, given the recent rise in health care costs, much of which is attributable to the increased use of new and costly prescription drugs.

Unlike surgery or diagnostic examinations, prescription drugs are routinely required to demonstrate “proof of efficacy” to the Food and Drug Administration before they are brought to market. In virtually all cases, the evidence of efficacy is obtained experimentally through randomized placebo-controlled clinical trials. But such evidence does not, per se, ensure that pharmaceuticals are always used rationally.

First, the FDA does not require that new (and often more expensive) drugs be compared to existing therapies.

Second, once new drugs are available in everyday practice, they can be used for conditions or levels of illness that are quite different from those of the patients enrolled in clinical trials. In everyday practice, for example, antibiotics are commonly used for a variety of infectious diseases, including some that are caused by viruses (for which antibiotics are ineffective). And patients with mild dyspepsia are sometimes treated with expensive drugs, such as proton pump inhibitors, when less costly and equally effective alternatives are available.

This chapter examines the variation in the prescription of nine drugs or classes of drugs and briefly discusses their clinical uses. Included are analyses of variation in pharmaceutical use among BCBSM members with prescription coverage:

- Beta blockers and angiotensin-converting enzyme (ACE) inhibitors given to adult BCBSM members
- Lipid lowering drugs
- Anti-anxiety medications
- Proton pump inhibitors to reduce stomach acid secretion
- Antihistamines for allergies
- Selective serotonin re-uptake inhibitors for treatment of depression
- Antibiotics given to child BCBSM members
- Drugs used to treat attention deficit disorders given to child BCBSM members

Patterns of Variation in Pharmaceutical Use

This section examines the patterns of variation of the nine prescription drugs (or classes of drugs).

Figure 7.1. gives a visual impression of the variability in patterns of prescription of common pharmaceuticals. Table 7.1 gives the corresponding quantitative measures of variability among Michigan hospital service areas. The procedures are ranked from low to high, according to the coefficient of variation (CV). Only those hospital service areas with at least 25 expected events are included in the analysis. Prescriptions for pediatric antibiotics are the least variable; prescriptions for pediatric attention deficit drugs are the most variable. The CV of lipid lowering drugs

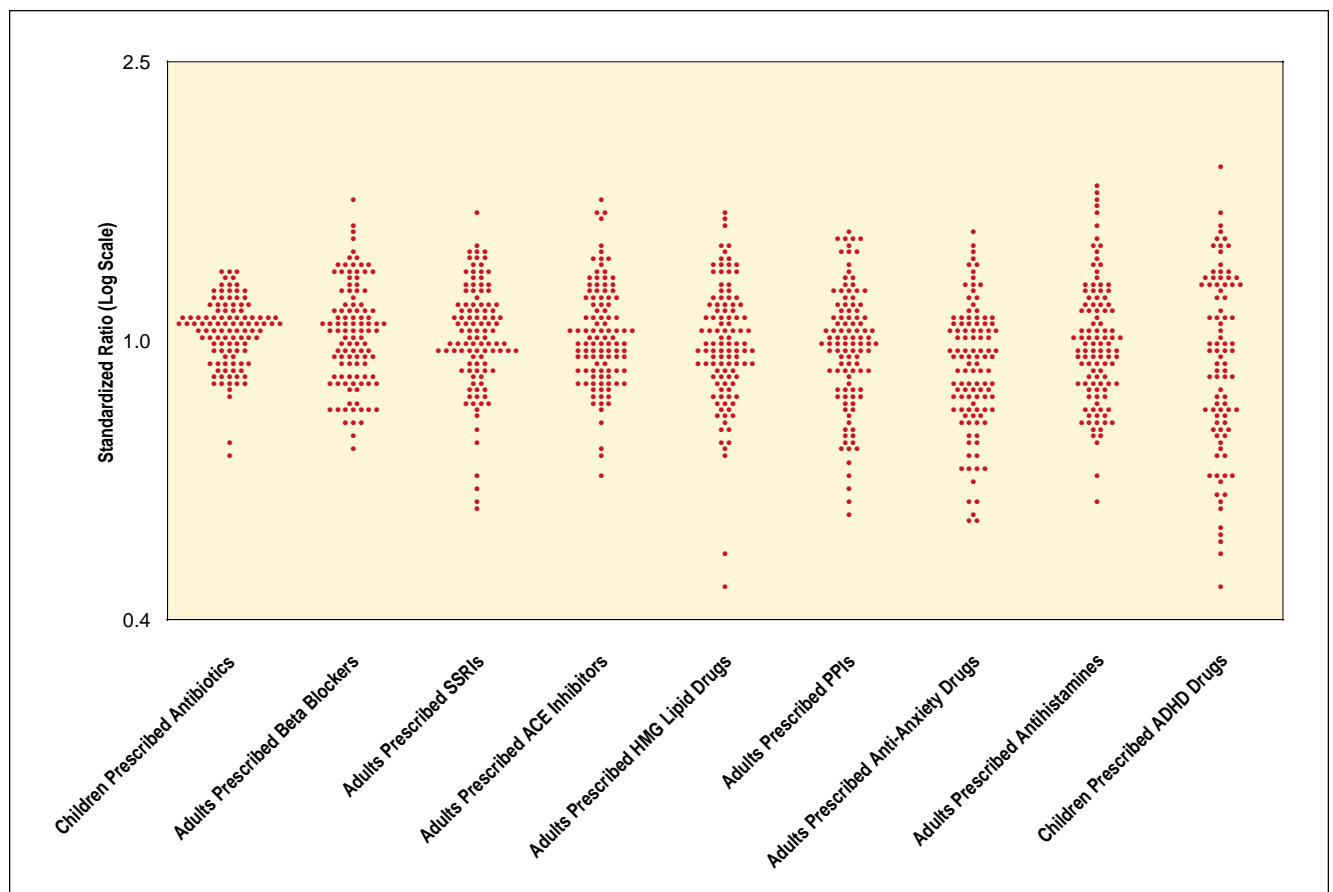


Figure 7.1. Patterns of Variation of Prescription Drugs (1997)

TABLE 7.1. QUANTITATIVE MEASURES OF VARIATION OF PRESCRIPTION DRUGS (1997)

	% of Child BCRSM Pharmacy Beneficiaries Prescribed Antibiotics (1997)	% of Adult BCRSM Pharmacy Beneficiaries Prescribed Beta Blockers (1997)	% of Adult BCRSM Pharmacy Prescribed SSRI's (1997)	% of Adult BCRSM Pharmacy Beneficiaries Prescribed ACE Inhibitors (1997)	% of Adult BCRSM Pharmacy Beneficiaries Prescribed HMG Lipid Drugs (1997)	% of Adult BCRSM Pharmacy Beneficiaries Prescribed PPI's (1997)	% of Adult BCRSM Pharmacy Anxiety Drugs (1997)	% of Adult BCRSM Pharmacy Beneficiaries Prescribed Antihistamines (1997)	% of Child BCRSM Pharmacy Beneficiaries Prescribed ADHD Drugs (1997)
Index of Variation									
Coefficient of Variation (CV)	10.7	17.0	17.1	17.2	19.3	19.5	20.0	21.2	28.7
Ratio to CV of Prescription of Antibiotics to Children	1.0	1.6	1.6	1.6	1.8	1.8	1.9	2.0	2.7
Range of Variation									
Extremal Ratio (highest to lowest region)	1.9	2.3	2.7	2.5	3.5	2.5	2.6	2.8	4.1
Interquartile Ratio (75th to 25th percentile region)	1.1	1.3	1.2	1.3	1.3	1.3	1.3	1.3	1.6
Number of Regions with High and Low Rates									
Rates more than 25% below average	2	2	6	4	8	14	16	7	28
Rates 30% or more above average	0	6	6	8	7	9	3	11	12

is almost twice that of pediatric antibiotics. The table also reports the extremal ratio (the ratio of the highest rate to the lowest). The extremal ratio of pediatric antibiotics is 1.9. The extremal ratio of attention deficit drugs is 4.1 — meaning that these drugs are prescribed 4.1 times more frequently in the highest-rate region than in the lowest.

Epidemiologists sometimes use the interquartile ratio as a measure of variation. This statistic is the ratio of the rate in the region ranked at the 75th percentile to the region ranked at the 25th percentile. The interquartile ratio of pediatric antibiotics is 1.1. Among the procedures listed in the table, the interquartile ratio of prescriptions for attention deficit disorders is the highest; the region ranked at the 75th percentile is 1.6 times higher than the region ranked at the 25th percentile.

Treatment of Elevated Cholesterol

Many Americans have troublesomely high cholesterol levels. One reason is that dietary habits in the United States, in which a significant proportion of calories come from saturated fats, result in high blood lipids. Second, the bar defining “abnormal” is lower than that commonly used to define medical conditions. According to the National Cholesterol Education Program, a total cholesterol level of >240 mg/dl, or >200 mg/dl with two or more other cardiac risk factors, is now considered abnormal. This definition of abnormal means that approximately 20% of the adult population has abnormally high cholesterol. The reasons for the lower cut-off, however, are not irrational: at the population level there is an inverse, linear relationship between cholesterol and survival and there is no clear cut-off point below which an increase in cholesterol is not associated with an increase in mortality.

Recommendations about whom to treat, how to treat, and treatment goals depend on whether or not a person has coronary artery disease and, if not, the risk of developing it. In the absence of coronary artery disease, the goal is a total cholesterol of less than 200 mg/dl. For those with coronary artery disease, the goal is an LDL cholesterol (the ‘bad’ cholesterol) of less than 100 mg/dl. If altering lifestyle does not result in clinically important improvement in the lipid profile, treatment with lipid lowering drugs is recommended. Currently, the most common drug class used to treat patients with elevated cholesterol are the HMG coenzyme A reductase inhibitors — the so-called “statins” — and for good reason. These drugs are easy to take, have favorable side effect profiles and, most importantly, have been shown in large trials to reduce the incidence of clinically important endpoints including acute myocardial infarction, revascularization and death.

The state of the science is good; statin drugs are known to be effective. Several large randomized trials have compared statin agents to placebos in patients with established disease, and almost every study found that active treatment resulted in a 30-50% reduction in the occurrence of revascularization, acute myocardial infarction or death, compared to placebos. Two large primary prevention trials found that the use of statin drugs resulted in a reduction in primary cardiac events without a concomitant increase in other causes of death.

The dilemma of choice relates to the lifelong commitment necessary to achieve the benefits of lipid lowering efforts. Life style changes (principally exercise and diet) are effective but difficult to maintain. Statins are not completely risk-free, and must be taken essentially forever. These considerations are taken into account when patients and their physicians embark on lipid lowering treatment with these (or any) drugs.

The Use of HMG Lipid (Statin) Drugs

In 1997, about 6% of adult BCBSM pharmacy beneficiaries received one or more prescriptions for lipid lowering HMG drugs. There was considerable variation in the proportion of beneficiaries receiving statins according to hospital service area of residence.

Beneficiaries in some hospital service areas were more likely than the state average of 5.5% to receive prescriptions for statin drugs, including Taylor (7.6%); Garden City (7.6%); Trenton (7.0%); Dearborn (7.0%); Wayne (6.7%); Muskegon (6.3%) and Royal Oak (6.0%).

In other hospital service areas, residents were less likely than the average to receive prescriptions for statins, including those in Ironwood (3.8%); Grand Haven (3.9%); Grosse Pointe (4.2%); Zeeland (4.3%) and St. Joseph (4.5%).

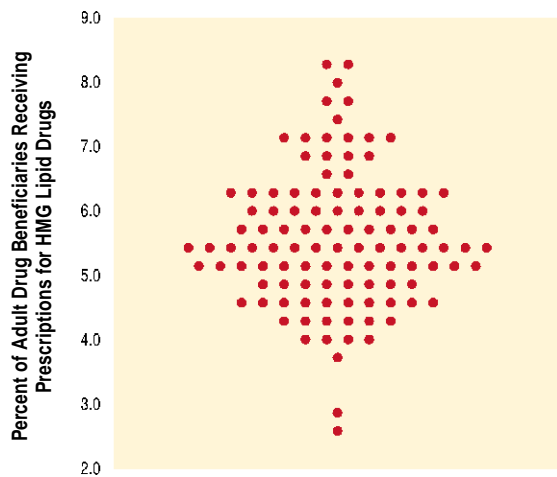
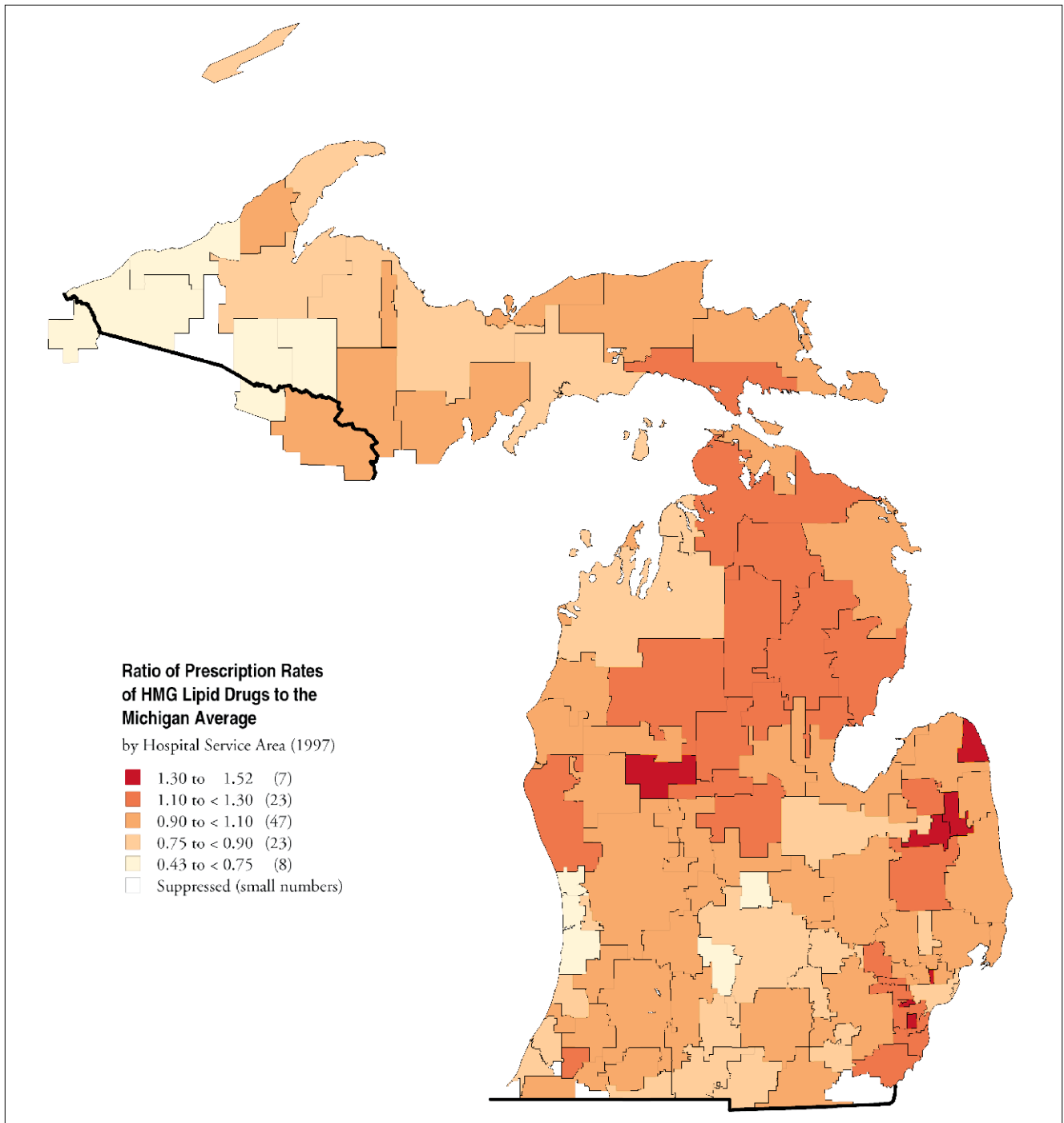


Figure 7.2. Adult HMG Lipid Use (1997)

Use of HMG lipid lowering drugs varied from fewer than 3% of beneficiaries with pharmaceutical benefits to more than 8%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.1. Adult HMG Lipid Use (1997)

In seven hospital service areas, rates of prescriptions of lipid lowering drugs were at least 30% higher than the state average. In eight hospital service areas, prescriptions were more than 25% below the state average.

The Use of Angiotensin-converting Enzyme (ACE) Inhibitors and Beta Blockers

ACE inhibitors and beta blockers are used to treat a wide variety of cardiovascular conditions. Both are also used for hypertension. The most recent report from the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of Hypertension recommended that beta blockers, along with diuretics, should be considered first line agents in uncomplicated hypertension. ACE inhibitors reduce the work of the heart. The AHCPR's guideline on the treatment of congestive heart failure identified ACE inhibitors as the cornerstone of congestive heart failure treatment. Beta blockers slow the heart rate, and are anti-arrhythmic, making them a critical component of care in both acute and chronic coronary syndromes. Recent guidelines from the American College of Cardiology, American Heart Association and AHCPR emphasize this. Finally, more recent evidence suggests that beta blockers are also effective in prolonging life in patients with congestive heart failure.

The state of the science is good. Randomized trials have been performed in a variety of clinical settings. It appears that the effects of these agents are more related to class than to individual agents.

The dilemma of choice relates to under-use of effective treatment, as well as the monetary costs and side effects. Multiple studies have demonstrated significant under-prescription of beta blockers following acute coronary events. Similarly, ACE inhibitors are under-used in patients with congestive heart failure. Both classes of drugs have been available for many years, and generic formulations are available for

many individual drugs. Newer formulations are in some cases substantially more expensive than older treatment options; for example, in uncomplicated hypertension, diuretics are much less expensive than newer drugs, and they are equally effective. Finally, many of these drugs cause significant side effects, such as cognitive slowing and coughing, which can be troublesome enough to require different therapeutic approaches.

The Use of ACE Inhibitors Among BCBSM Pharmacy Beneficiaries

In 1997, about 6.2% of adult BCBSM pharmacy beneficiaries received one or more prescriptions for ACE inhibitors. The percent varied from fewer than 4% to almost 10%.

In some hospital service areas, beneficiaries were more likely than the state average to receive prescriptions for ACE inhibitors, including those in Bad Axe (8.3%); Garden City (8.1%); Detroit (7.9%); Trenton (7.7%) and Wyandotte (7.7%).

In other hospital service areas, fewer beneficiaries received ACE inhibitors, including those in Grosse Pointe (4.3%); Rochester (4.7%); Traverse City (5.2%); Lansing (5.2%); Troy (5.3%); Kalamazoo (5.3%) and Petoskey (5.5%).

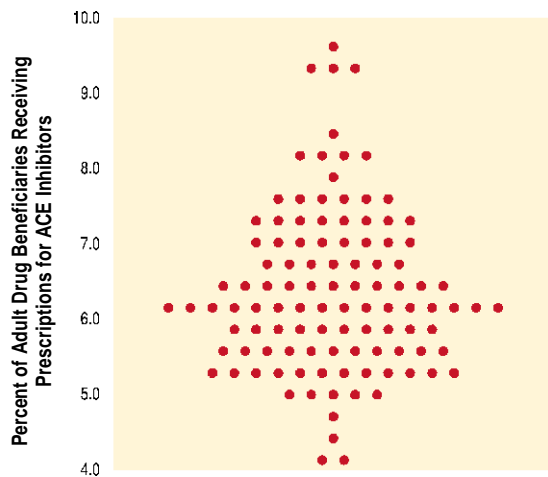
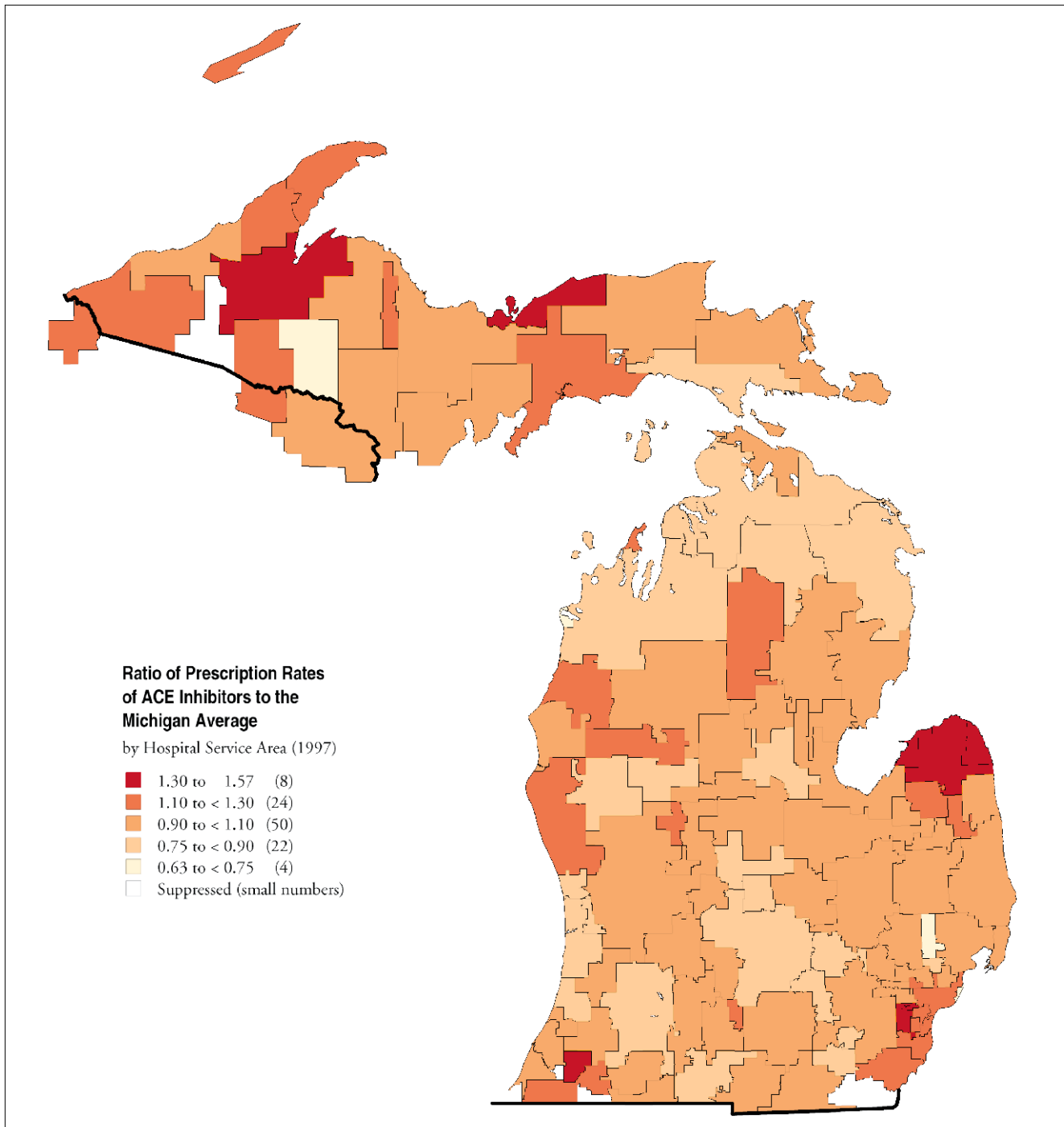


Figure 7.3. Prescription of ACE Inhibitors for Adult Pharmacy Beneficiaries (1997)
Prescription of ACE inhibitors varied from about 4% of pharmacy beneficiaries to more than 9.5%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.2. Prescription of ACE Inhibitors for Adult Pharmacy Beneficiaries (1997)

In eight hospital service areas, rates of prescriptions for ACE inhibitors were at least 30% higher than the state average. In four hospital service areas, prescriptions were more than 25% below the state average.

The Use of Beta Blockers Among BCBSM Pharmacy Beneficiaries

In 1997, about 5.7% of adult BCBSM pharmacy beneficiaries received one or more prescriptions for beta blockers. Use of beta blockers varied by a factor of 2.8, from about 4% of eligible beneficiaries to about 9%.

In some hospital service areas, more than 7.0% of beneficiaries received beta blockers, including Monroe (9.0%); Trenton (7.5%); Wyandotte (7.2%); Jackson (7.1%) and Wayne (7.1%).

In other hospital service areas, beneficiaries were less likely than the average to receive beta blockers, including Marquette (4.3%); St. Joseph (4.3%); Rochester (4.6%); Pontiac (4.8%); Lansing (5.0%) and Traverse City (5.0%).

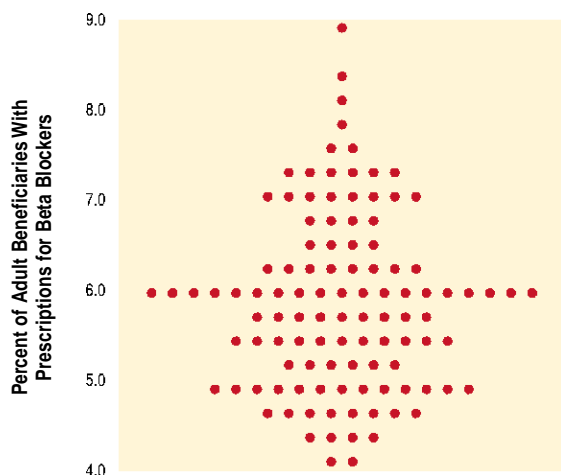
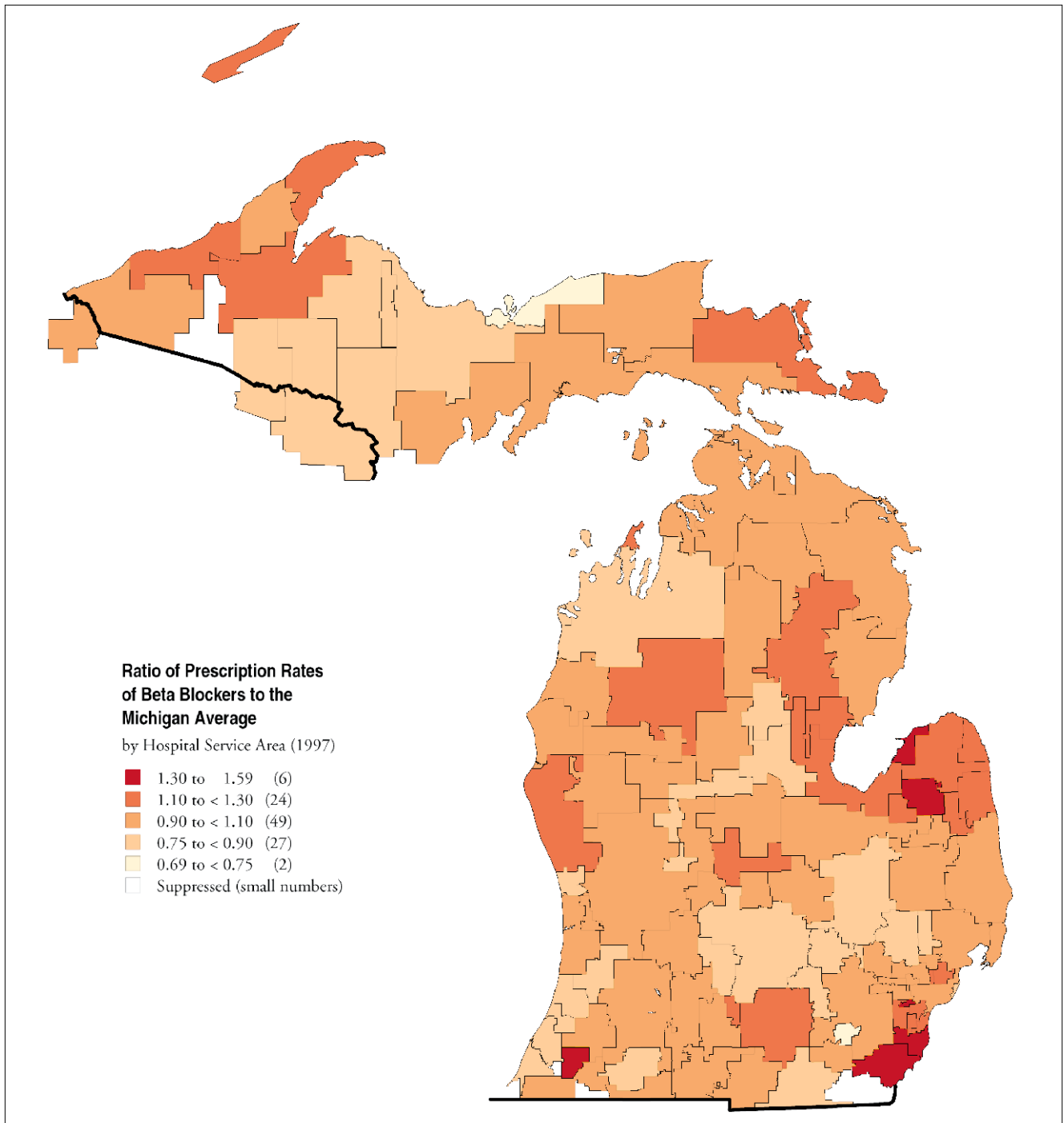


Figure 7.4. Prescription of Beta Blockers for Adult Pharmacy Beneficiaries (1997)

Use of beta blockers varied from 4% of pharmacy beneficiaries to 9%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.3. Prescription of Beta Blockers for Adult Pharmacy Beneficiaries (1997)

In six hospital service areas, rates of prescriptions for beta blockers were at least 30% higher than the state average. In two hospital service areas, rates were more than 25% below the state average.

The Treatment of Conditions Associated with Gastric Acid Secretion

Peptic ulcer disease, gastroesophageal reflux disease and dyspepsia are conditions associated with gastric acid secretion. The most common causes of peptic ulcer disease are infections of the gastric lining by the bacterium *Helicobacter pylori* resulting in stomach or duodenal ulcers, and breaks in the gastric lining associated with nonsteroidal anti-inflammatory agents and smoking. Gastroesophageal reflux is caused by the reflux of acid from the stomach into the esophagus. This can result in mild to severe pain, or “heartburn.” Gastroesophageal reflux can also result in erosive esophagitis (severe inflammation of the lining of the esophagus) and changes in the lining of the esophagus, which can lead to cancer of the esophagus. Dyspepsia is a more confusing syndrome when there is associated heartburn but no definitive pathology.

Decreasing gastric acid is the goal of therapy in all three conditions. There are three basic pharmacological treatments: antacids, H₂ blockers (such as cimetidine) and proton pump inhibitors (PPIs). Additionally, life style changes, such as eating smaller meals and remaining upright after eating, can also reduce reflux. PPIs are the newest class of drugs for treating acid, and are by far the most expensive. In addition to the usual methods of advertising new therapies, such as print advertisements in medical journals and drug detailing, there have been several national direct-to-consumer campaigns to heighten awareness of the availability of PPIs. This has resulted in explosive growth in the use of these drugs.

The state of the science is mixed. For gastroesophageal reflux and peptic ulcer disease, randomized trials have shown that PPIs are superior to placebos. Compared to the less expensive H₂ blockers, PPIs result in more rapid healing, particularly at higher PPI dosages. In more mild gastroesophageal reflux and in dyspepsia, more common conditions, there is less evidence to support the use of PPIs, but many people with milder symptoms are currently taking PPIs, and some research has shown a benefit for milder forms of disease.

The dilemma of choice lies in the trade-offs in efficacy, cost, and long term safety. In patients with documented peptic ulcer disease, erosive esophagitis or more severe symptoms of gastroesophageal reflux, PPIs are reasonable choices. For those with milder disease, antacids or H2 blockers, as well as lifestyle changes, might be as effective, and are much less expensive choices.

The Use of Proton Pump Inhibitors

In 1997, about 4.3% of adult BCBSM pharmacy beneficiaries received one or more prescriptions for proton pump inhibitors. The percent of eligible beneficiaries who had prescriptions for proton pump inhibitors varied by a factor of two, from fewer than 3% to more than 6%.

In some hospital service areas, rates of prescription of PPIs were substantially higher than the state average, including Tecumseh (6.1%); Taylor (6.0%); Adrian (5.7%) and Dearborn (5.7%).

Other hospital service areas had rates substantially below the state average, including Grosse Pointe (2.7%); St. Joseph (3.0%); Alma (3.0%) and Marquette (3.0%).

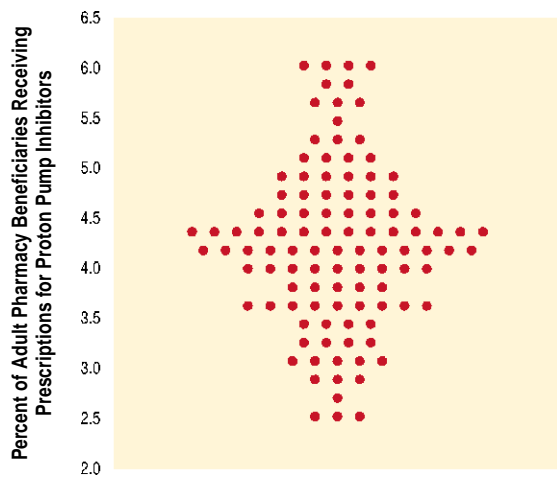
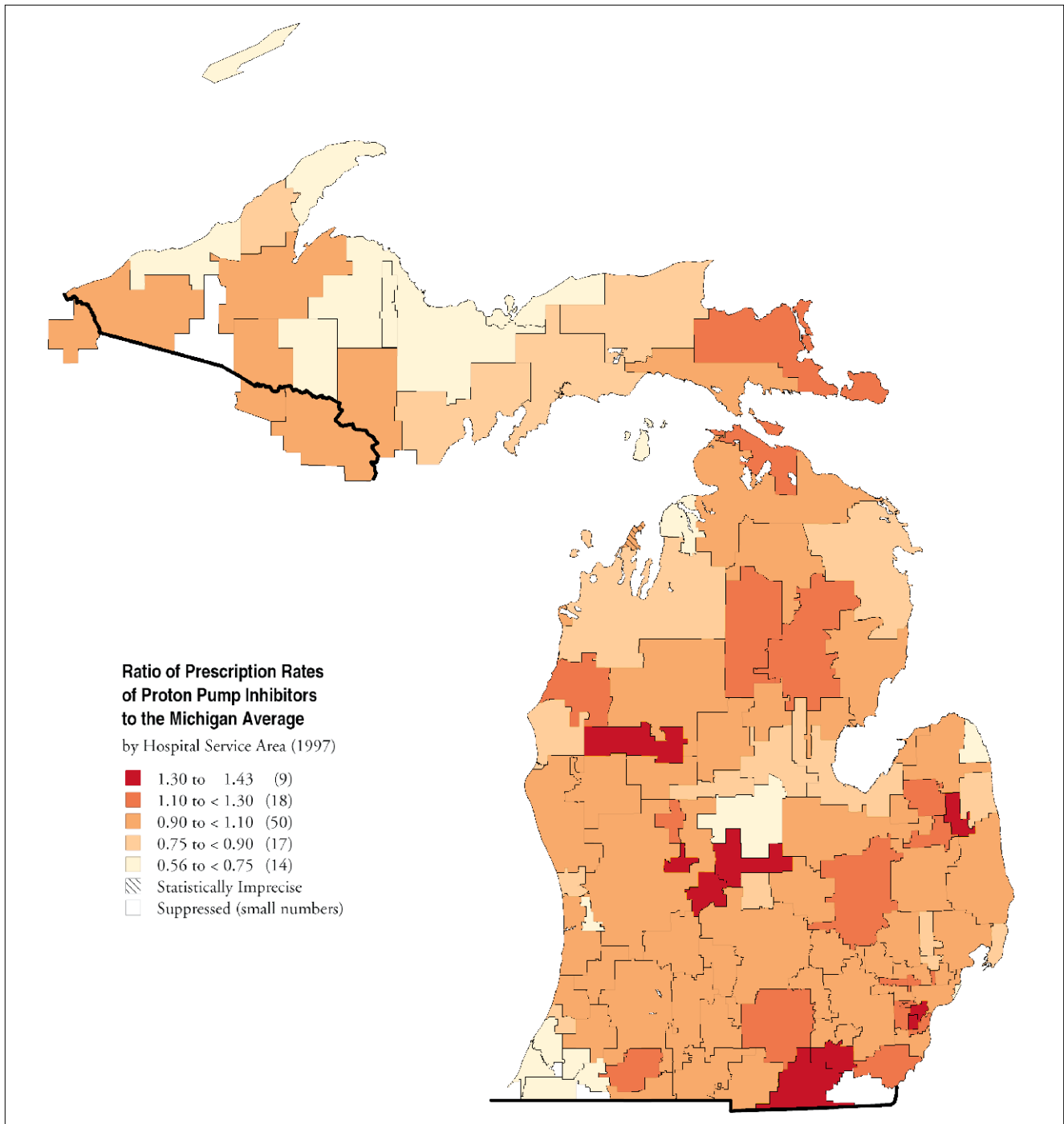


Figure 7.5. Prescription of Proton Pump Inhibitors for Adult Pharmacy Beneficiaries (1997)

Use of proton pump inhibitors varied from fewer than 3% of pharmacy beneficiaries to more than 6%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.4. Prescription of Proton Pump Inhibitors for Adult Pharmacy Beneficiaries (1997)

In nine hospital service areas, rates of prescriptions for proton pump inhibitors were at least 30% higher than the state average. In fourteen hospital service areas, rates were more than 25% below the state average.

The Treatment of Allergies

Allergic rhinitis and related conditions affect a large number of people, causing unpleasant symptoms that, while not dangerous, sometimes interfere with life and work. Symptoms can be seasonal or can occur chronically in response to specific allergens. Both over-the-counter and prescription medications can be used to treat allergies; both are designed to block the allergic response that leads to symptoms. A relatively new class of drugs, the non-sedating antihistamines, is increasingly prescribed for this problem. As a result, in part, of direct-to-public advertisement, the use of non-sedating antihistamine drugs has increased dramatically.

The state of the science. There is substantial evidence that drug treatment of allergic rhinitis is effective for most people, although there is some disagreement about the threshold at which drug treatment should be initiated. Patients with severe symptoms might require medication in order to maintain their productivity and to avoid the use of stronger medications, such as steroids. Patients with milder symptoms can function well without any medication.

The dilemma of choice is whether to treat with medication, and which medications to use. Some patients are averse to the use of drugs for mild symptoms. Older drugs are inexpensive and can often be obtained conveniently without a prescription, but some patients experience side effects, the most troublesome of which is drowsiness that interferes with functioning and productivity. The newer non-sedating antihistamines provide symptom relief without drowsiness, but require a prescription and are substantially more expensive, especially if a physician visit is required to obtain the prescription.

The Use of Prescription Antihistamines

In 1997, about 12% of adult BCBSM pharmacy beneficiaries received one or more prescriptions for antihistamines. The proportion of beneficiaries who received one or more prescriptions for antihistamines varied from about 7% to almost 20%.

Almost 20% of beneficiaries living in Pigeon were prescribed antihistamines; other regions with high prescription rates included Bad Axe (19.0%); Coldwater (16.1%); Garden City (15.8%); Dearborn (15.2%) and Royal Oak (14.8%).

Residents of other hospital service areas received many fewer prescriptions for antihistamines, including those in Charlevoix (7.1%); Ironwood (7.7%); Marquette (8.5%); Alpena (8.7%); Petoskey (8.7%) and Cheboygan (8.8%).

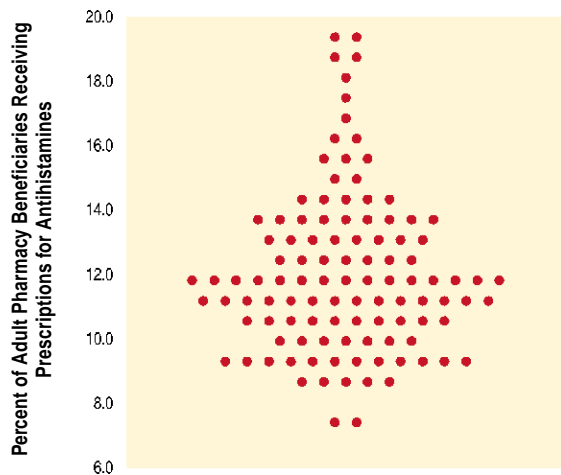
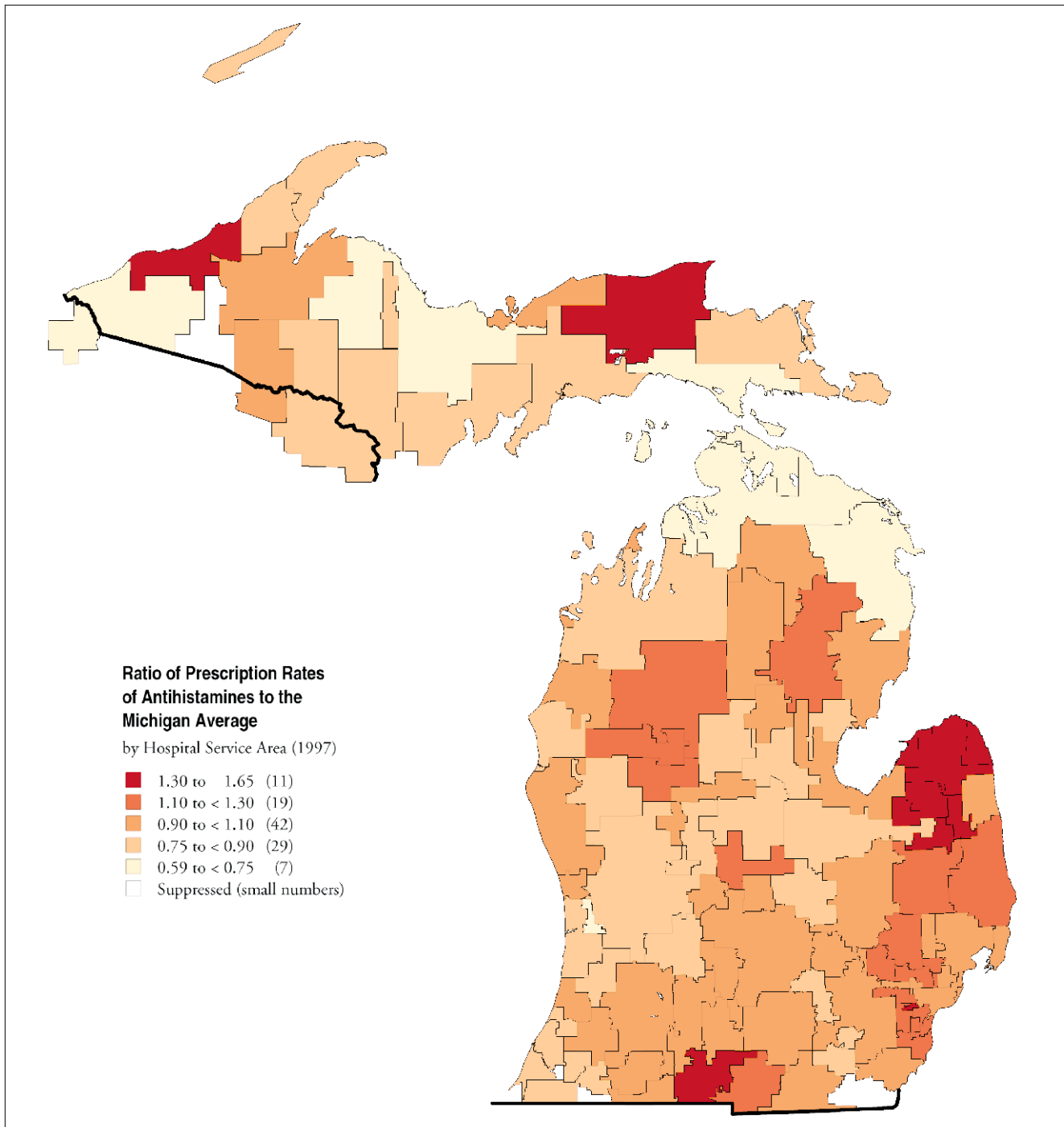


Figure 7.6. Prescription of Antihistamines for Adult Pharmacy Beneficiaries (1997)
Use of antihistamines varied from 7% of pharmacy beneficiaries to more than 19%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.5. Prescription of Antihistamines for Adult Pharmacy Beneficiaries (1997)

In 11 hospital service areas, rates of prescriptions for antihistamines were at least 30% higher than the state average. In seven hospital service areas, rates were more than 25% below the state average.

Treatment of Depression

Depression is a highly prevalent psychiatric disorder characterized by feelings of sadness and/or hopelessness and a constellation of associated symptoms such as appetite and sleep disturbances. Depression can lead to suicide and other violent acts; it also has profound effects on productivity and personal relationships. Research suggests that about 10% of Americans suffer from depressive episodes over the course of a year. Depression is usually treated with drug therapy or some form of counseling or psychotherapy, or both. There is a wide variety of drugs available to treat depression.

The state of the science. Patients with severe depression usually come to medical attention, although sometimes only after a suicide attempt. Those with milder forms of the disease might only be diagnosed and treated in the course of a primary care physician encounter; primary care physicians are variably sensitive to the detection of depression in their patients, and there is some evidence that depression might be under-diagnosed, especially among the elderly. Clinical trials have established the efficacy of anti-depressant drugs to combat depression. For some patients, drug treatment is most effective when combined with some form of counseling. The choice of drug is more problematic. While the tricyclic antidepressant drugs have been available for many years and treat depression effectively, they have many side effects; more importantly, there is substantial potential for overdose. The selective serotonin re-uptake inhibitors (SSRIs) were developed in an attempt to provide the anti-depressant effect of the tricyclics with fewer, and less dangerous, side effects. Although clinical trials have established the efficacy of SSRIs, they have suffered adverse publicity, and their long-term effects have not been established.

The dilemma of choice. While severely depressed patients almost always require and benefit from drug therapy, patients suffering milder forms of depression can sometimes be successfully treated with counseling alone. Some patients are resistant to the use of medication, and might prefer the latter strategy. For patients who need or prefer to use drugs, the dilemma is in the choice of among available options. The tricyclics have a long history of use, are effective, and are relatively cheap, but come with troublesome side effects. The SSRIs are almost universally prescribed as the drug of first choice. They are considerably more expensive than the older drugs, but are effective, are safer in terms of risk of overdose, and have a different set of side effects. However, some patients might be intimidated by adverse publicity associated with SSRIs.

The Use of Selective Serotonin Re-uptake Inhibitors

In 1997, about 6.2% of adult BCBSM pharmacy beneficiaries received one or more prescriptions for selective serotonin re-uptake inhibitors. The proportion who received the drugs varied from fewer than 4% to more than 9%.

In some hospital service areas, more than 8% of beneficiaries received prescriptions for SSRIs, including those in Muskegon (9.4%); Grand Haven (8.5%); Marquette (8.3%); Iron Mountain (8.3%); Kalamazoo (8.2%) and Petoskey (8.1%).

Residents of other hospital service areas were much less likely to receive prescriptions for SSRIs, including those in Detroit (3.8%); Troy (4.6%); Bad Axe (4.9%); Mount Clemens (5.0%) and Rochester (5.2%).

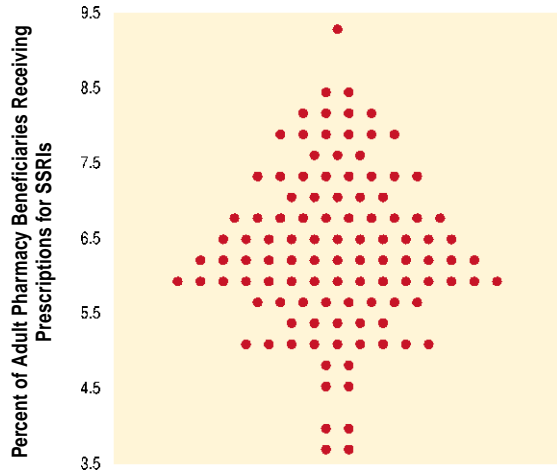
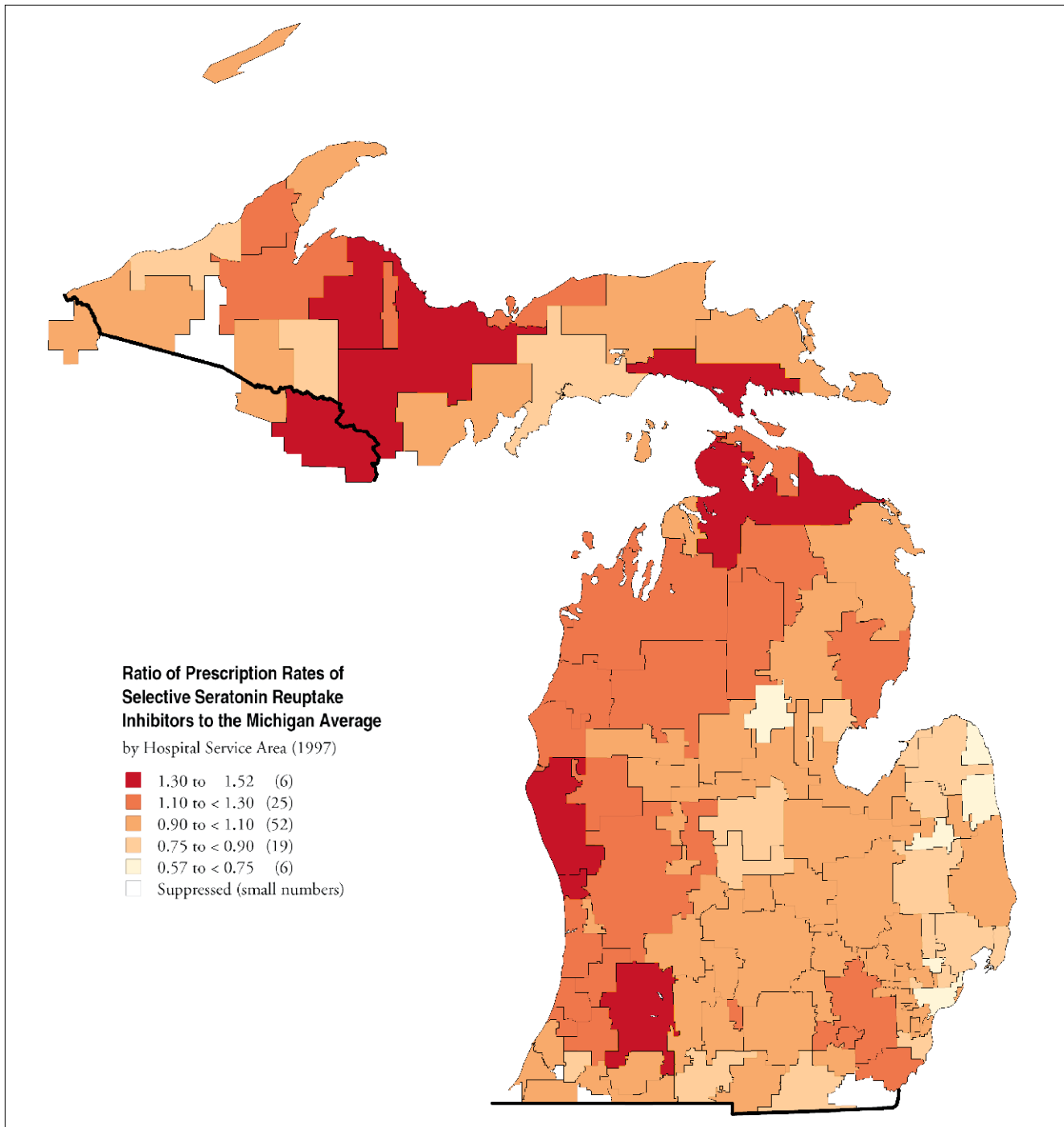


Figure 7.7. Prescription of Selective Serotonin Re-uptake Inhibitors for Adult Pharmacy Beneficiaries (1997)

Use of selective serotonin reuptake inhibitors varied from fewer than 4% of pharmacy beneficiaries to more than 9%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.6. Prescription of Selective Serotonin Re-uptake Inhibitors for Adult Pharmacy Beneficiaries (1997)

In six hospital service areas, rates of prescriptions for selective serotonin reuptake inhibitors were at least 30% higher than the state average. In six hospital service areas, rates were more than 25% below the state average.

Treatment of Anxiety

Virtually everyone experiences anxiety, but the condition can be defined as a medical problem that requires intervention under either acute or chronic circumstances. Anxiety can be an appropriate response to extreme life stresses, requiring treatment for a limited time, or can be associated with chronic psychiatric disorders and require long-term or lifetime treatment. In either case, pharmacotherapy is usually a part of treatment, along with counseling and/or behavioral intervention. Valium was, at one time, the most prescribed drug in the United States, and anxiolytics are still widely used.

The status of the science. Anxiolytics are very effective in ameliorating the unpleasant symptoms of anxiety and in allowing patients with anxiety disorders to function relatively normally. Some of these drugs have been available for many years, but new ones continue to be developed and aggressively marketed by pharmaceutical companies. Some drugs in this class result in habituation and/or addiction. They can cause drowsiness, requiring caution in driving and operating machinery, and their use in the elderly is associated with disorientation and falls. While the need for pharmacologic intervention in cases of severe acute distress and in cases of paralyzing chronic anxiety are agreed upon, the more discretionary uses of these medications are not.

The dilemma of choice. The risks and benefits of anxiolytics depend on how troublesome the patient's anxiety symptoms are; patients with severe symptoms that interfere with their lives derive the greatest benefit. In patients with milder symptoms, the risks of side effects can make the use of these medications less attractive, and the risks increase in older patients. Some patients express fear of addiction; some feel that use of these medications indicates a moral weakness on their part; and some want to avoid any treatment suggestive of a psychiatric diagnosis.

The Use of Anti-Anxiety Drugs

In 1997, about 7.8% percent of adult BCBSM pharmacy beneficiaries received one or more prescriptions for a drug to treat anxiety; the proportion varied from fewer than 4.5% to about 11%.

In some hospital service areas, the rates of prescription of anti-anxiety drugs were well above the state average of 7.8%, including Taylor (11.0%); Wyandotte (10.1%); Dearborn (9.8%); Warren (9.3%); Royal Oak (8.8%) and Flint (8.7%).

In other hospital service areas, residents were much less likely than the average to be prescribed anxiolytics, including Marquette (4.3%); Ironwood (4.9%); Escanaba (5.1%); Big Rapids (5.5%) and Alma (5.6%).

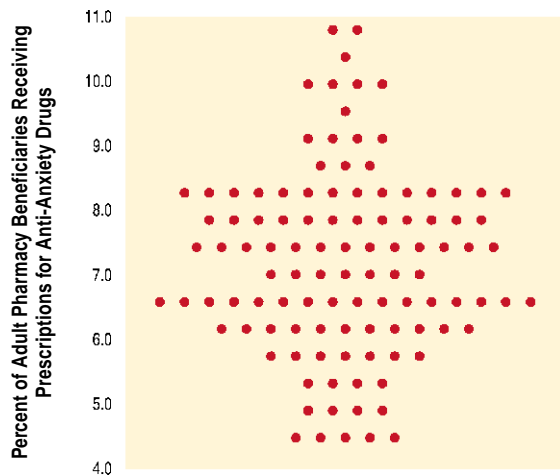
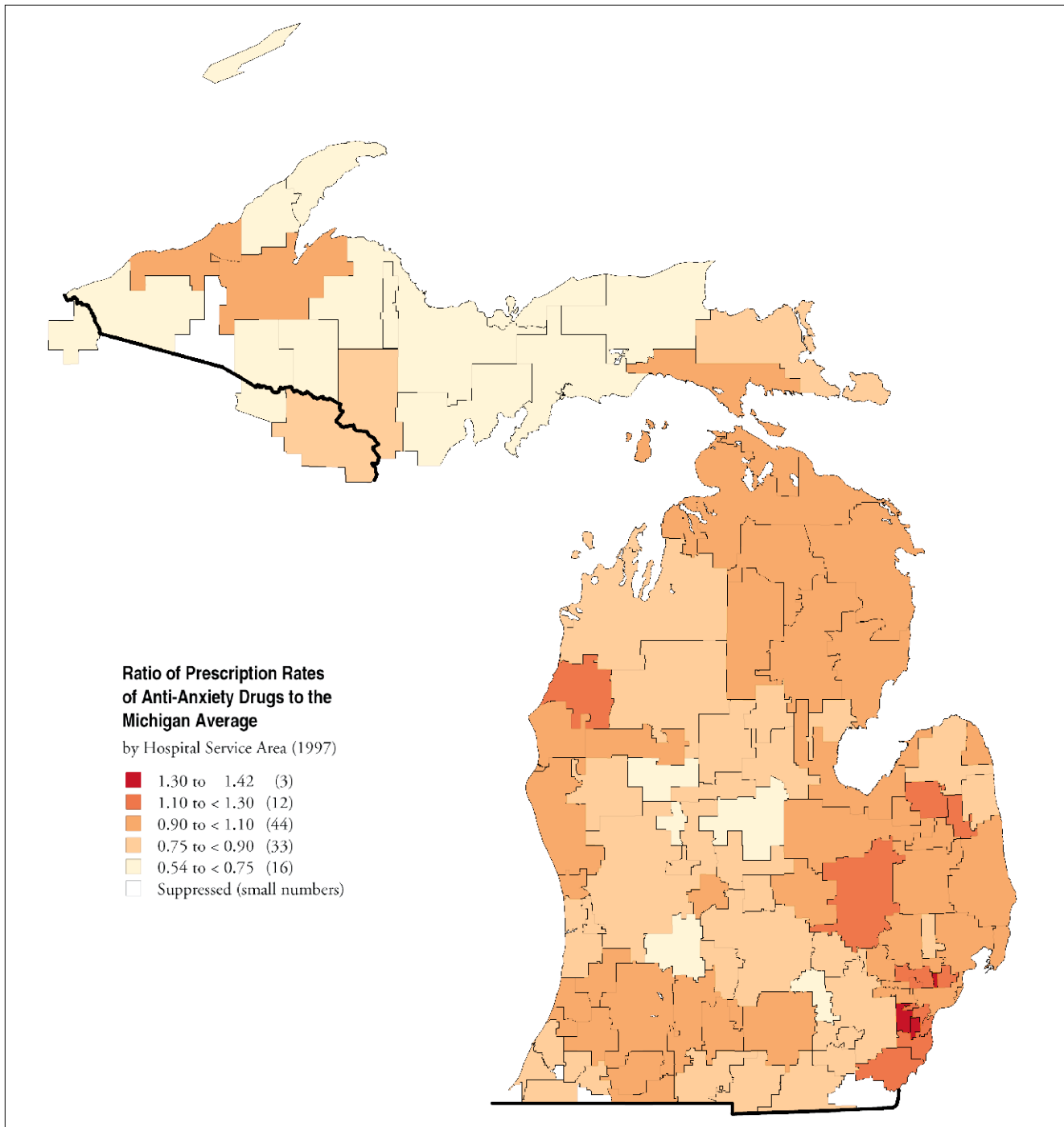


Figure 7.8. Prescription of Anti-Anxiety Drugs for Adult Pharmacy Beneficiaries (1997)

Use of anti-anxiety medications varied from fewer than 4.5% of pharmacy beneficiaries to 11%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.7. Prescription of Anti-Anxiety Drugs for Adult Pharmacy Beneficiaries (1997)

In three hospital service areas, rates of prescriptions for anti-anxiety drugs were at least 30% higher than the state average. In 16 hospital service areas, rates were more than 25% below the state average.

Pediatric Antibiotics

The most common causes of illness in children are unpleasant but self-limiting respiratory and gastrointestinal viral infections. Less commonly, children become infected with bacteria, which results in more severe illness and the potential for serious complications. Ear infections, pneumonia, sore throats, and sinusitis are frequently caused by bacteria, although viruses are also important pathogens. Antibiotics are usually effective in treating bacterial infection but the physician is often unable to distinguish bacterial from viral illnesses even with the best available diagnostic tools. Sometimes the need to “do something” influences the decision to prescribe antibiotics when the possibility of a bacterial infection is unlikely. As a result, prescription rates for antibiotics in children are high and vary from one community to another.

One national study found that 44% of children with common colds were prescribed antibiotics. The downsides of inappropriate antibiotic use go well beyond the costs involved. As prescription rates have increased, bacteria have become increasingly resistant, and some infections that were once easy to treat are now beyond the reach of any known antibiotic. More frequent courses of antibiotics also raise the chance of allergic reactions. While these are usually not life-threatening, an allergic reaction eliminates one more class of drugs as a cure for future infections.

The status of the science. This is one of the most intensively studied areas of pediatric therapeutics; there have been almost innumerable randomized clinical trials. But research trials have strict and narrow diagnostic criteria for subject entry; this corresponds poorly to the variety of signs and symptoms clinicians see in practice. The status of the diagnostic science of identifying children whose otitis media, pneumonia, or sinusitis are specifically caused by bacteria remains very poor.

The dilemma of choice. Physicians should not prescribe and parents should not expect antibiotics when a virus is the certain cause, as in common colds. When the possibility of a bacterial infection is low, watchful waiting is a reasonable choice that spares children from needless antibiotics while still allowing for the safe identification of children whose infections are in fact bacterial. When the probability of a bacterial infection is moderate, limiting antibiotics to short courses of narrow spectrum agents is a middle path that safely reduces overall antibiotic exposure.

Pediatric Antibiotics

In 1997, 46.4% of child BCBSM pharmacy beneficiaries received one or more prescriptions for antibiotics. In the hospital service areas with the highest prescription rate, 58.2% of children received one or more prescriptions; in the region with least prescribing, 31% received a prescription.

Among the hospital service areas where rates of antibiotic prescriptions were highest were Cass City (58.2%); Bad Axe (56.2%); Ishpeming (55.6%); Bay City (53.6%); Dearborn (52.4%) and Pontiac (51.0%).

In other hospital service areas, rates were substantially lower, including Detroit (31.4%); Southfield (33.1%); Niles (39.4%); Charlevoix (40.1%); Battle Creek (40.5%); South Haven (40.7%) and Muskegon (42.4%).

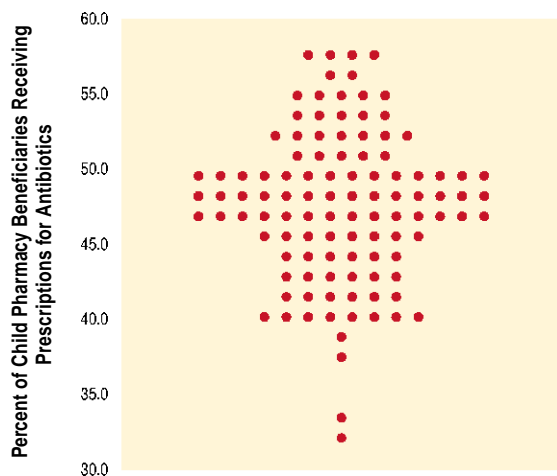
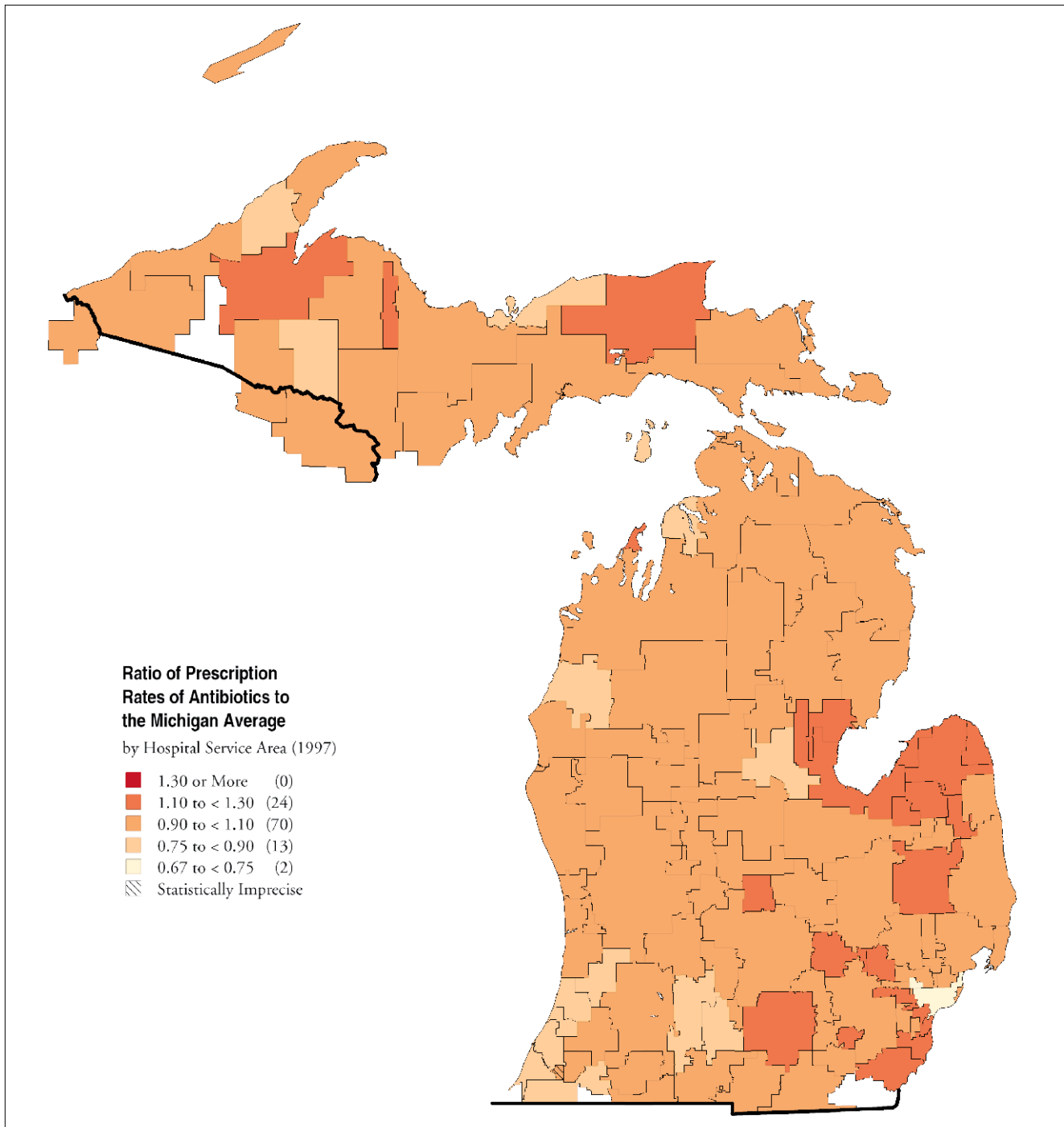


Figure 7.9. Prescription of Antibiotics for Child Pharmacy Beneficiaries (1997)
Antibiotic use varied from about 30% of pharmacy beneficiaries to almost 60%. Each point represents one of the 109 hospital service areas in Michigan.

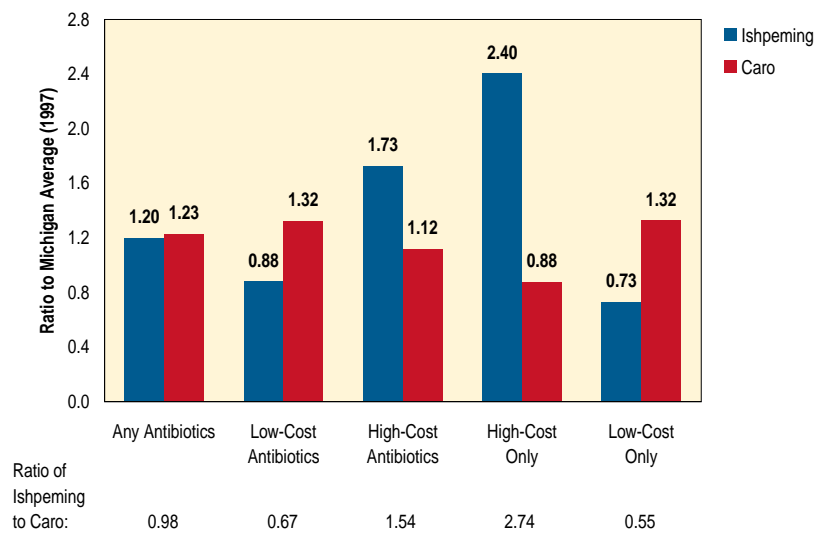


Map 7.8. Prescription of Antibiotics for Child Pharmacy Beneficiaries (1997)

In no hospital service areas were rates of prescriptions for pediatric antibiotics at least 30% higher than the state average. In two hospital service areas, rates were more than 25% below the state average.

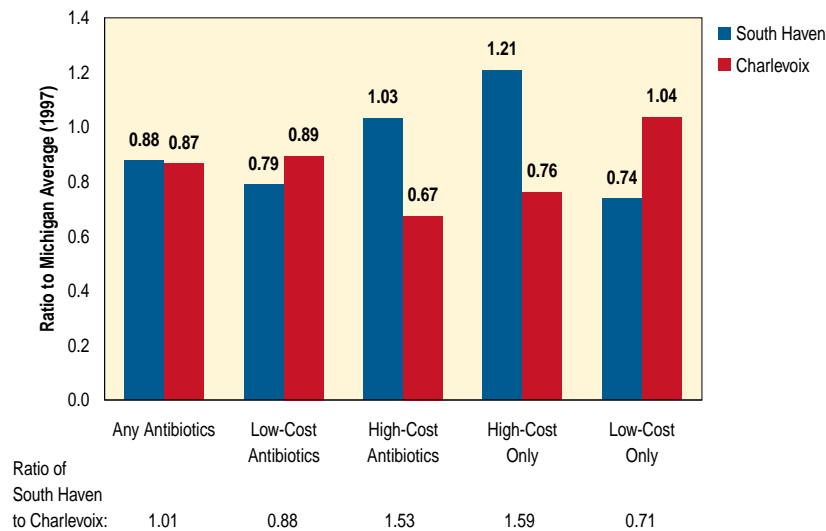
The Use of Low and High Cost Antibiotics by Children

There was considerable variation among hospital service areas in the kinds as well as the numbers of antibiotics prescribed. In some hospital service areas, physicians were more likely to favor high cost antibiotics than their counterparts elsewhere.



For example:

Ishpeming and Caro. In both communities, more than 55% of children received one or more prescriptions for antibiotics in 1997. Physicians in Ishpeming, however, favored more expensive forms of antibiotics than physicians in Caro; 37.6% of pediatric prescriptions for children in Ishpeming were high cost antibiotics, compared to 24.4% in Caro. In Ishpeming, 23.4% of children who were prescribed antibiotics received only the expensive forms of the drug, compared to 8.5% of Caro children.



South Haven and Charlevoix. Both South Haven and Charlevoix were more conservative in overall use of antibiotics than Ishpeming and Caro. Fewer than 41% of children received an antibiotic prescription in 1997. Children in South Haven and Charlevoix received different kinds of antibiotics; those in South Haven received expensive antibiotics at a rate more than 50% higher than children in Charlevoix.

Prescribing patterns in some of the largest hospital referral regions also differed:

Royal Oak and Flint. Rates of overall use of antibiotics in Royal Oak and Flint were about equal. However, the rate of use of expensive antibiotics was about 30% higher among children in Royal Oak, where 11.6% of children were prescribed only the more expensive antibiotics, compared to 7.2% in Flint.

Pontiac and Detroit. There were remarkable differences in overall use of antibiotics among children living in Pontiac and those in Detroit. In Pontiac, 51% of children received one or more antibiotics, a proportion 1.62 times higher than the 31.4% of children who received antibiotics in Detroit. The difference in rates of prescription of expensive antibiotics was even more remarkable. Children in Pontiac were 2.15 times more likely to receive a high cost antibiotic than children in Detroit (27.1% of Pontiac children versus 12.6% of Detroit children).

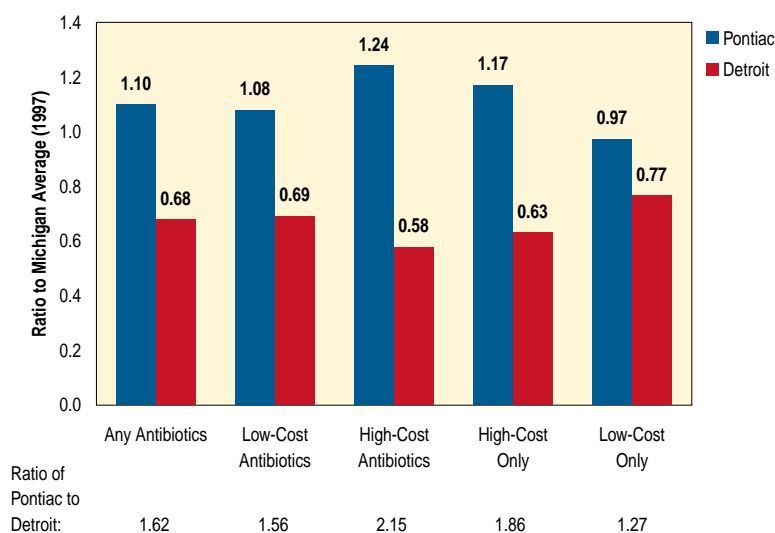
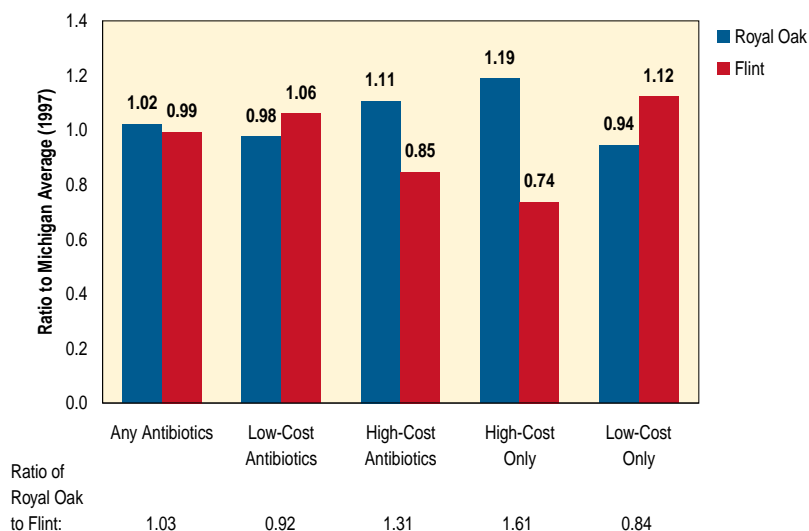


Figure 7.10. Patterns of Prescriptions for Antibiotics Among BCBSM Children in Selected Michigan Hospital Service Areas

Comparisons are made for percent of BCBSM children receiving one or more antibiotic prescription for all forms of antibiotics and for low cost and high cost antibiotics. Comparisons are also made for percent of children receiving only low and only high cost antibiotics.

Treatment of Attention Deficit Disorders In Children

Attention deficit hyperactivity disorder (ADHD) is characterized by inattention, impulsivity and/or hyperactivity. It is usually first diagnosed in school aged children and the presenting complaint is often school difficulties; it is not known if children outgrow ADHD. Epidemiologic studies suggest that approximately 5% of school aged children suffer from ADHD. The most common interventions are treatment with stimulant medications in conjunction with educational and behavioral interventions.

The status of the science. There is good evidence that stimulant medication reduces or eliminates the bothersome symptoms of ADHD in many children, reducing disruptive behavior in the classroom and resulting in improved attentiveness to educational tasks and increased academic achievement. However, a response to stimulant medication can occur even without ADHD, so response does not confirm presence of the disorder; and long term outcomes in children with ADHD are not known. As a result, there is disagreement in the professional and lay communities about the diagnosis and treatment of ADHD. Research suggests that ADHD is both over-diagnosed and under-treated, reflecting the lack of consensus in the medical and educational communities.

The dilemma of choice. Because ADHD presents in childhood, preferences are usually initially expressed by the parents to the prescribing physician; older children can also have preferences of their own to be considered. In addition, the school community has influence over both the diagnosis and treatment of ADHD; it is often first recognized by a classroom teacher and a school psychologist or counselor, who make referrals to physicians for medication evaluations. Parents can be resistant to the idea of long term medication, and concerned about side effects. Some children need to take the medication in school and feel a stigma associated with going to the

nurse's office. On the other hand, educators can be eager to find a pharmacologic solution to behavior problems, in lieu of educational interventions. While stimulant medication can control symptoms and improve behavior and learning in the short term, the improvement comes at the cost of long term daily medication, the small possibility of side effects, and the effects of a lifetime diagnosis.

Use of Attention Deficit Hyperactivity Disorder Drugs by Children

In 1997, 3.6% of child BCBSM pharmacy beneficiaries received one or more prescriptions for drugs to treat attention deficit hyperactivity disorder. The use of these drugs was the most variable of the drugs under study (Figure 7.1). In the hospital service area with the highest rate of such prescriptions, 6.3% of children received one or more prescriptions; in the region with the lowest rate, 1.6% received prescriptions.

Among the hospital service areas where children were more likely than the average to receive prescriptions of ADHD drugs were Grosse Pointe (6.3%); Warren (5.4%); Traverse City (5.1%) and Kalamazoo (4.9%).

In other hospital service areas, children were less likely than the average to receive prescriptions, including those who lived in Alpena (1.8%); Detroit (2.0%); Saginaw (2.3%); St. Joseph (2.3%) and Flint (2.7%).

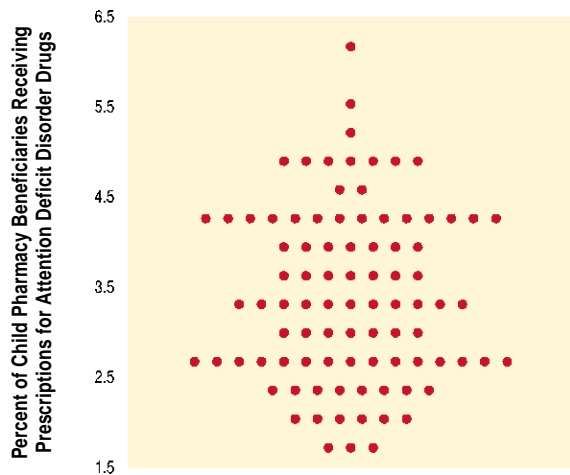
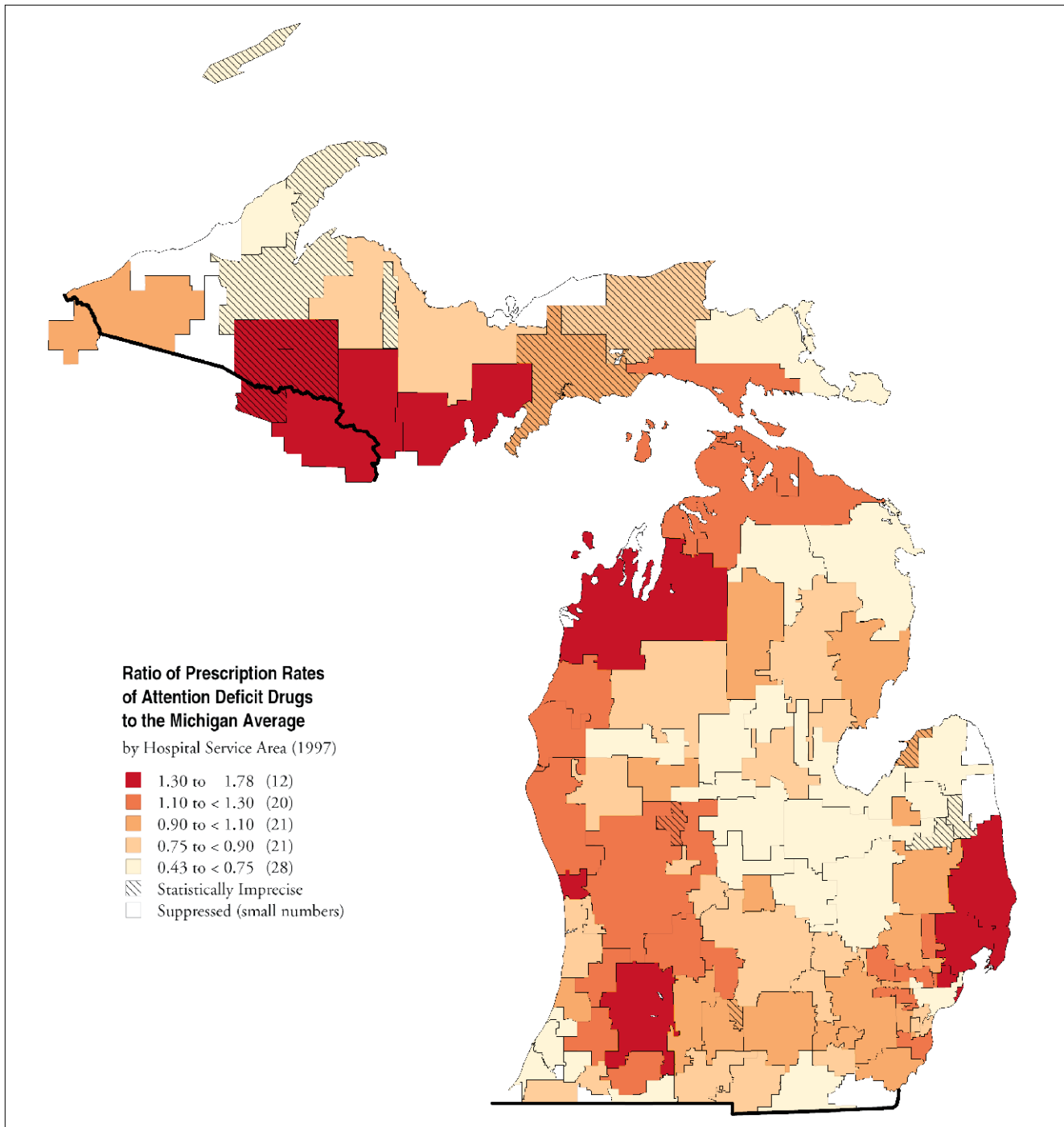


Figure 7.11. Prescription of Attention Deficit Hyperactivity Disorder Drugs for Child Pharmacy Beneficiaries (1997)
Use varied from 1.6% of child pharmacy beneficiaries to 6.3%. Each point represents one of the 109 hospital service areas in Michigan.



Map 7.9. Prescription of Attention Deficit Hyperactivity Disorder Drugs for Child Pharmacy Beneficiaries (1997)

In 12 hospital service areas, rates of prescriptions of attention deficit disorder drugs were at least 30% higher than the state average. In 28 hospital service areas, rates were more than 25% below the state average.

Chapter Seven
Table Notes

The table gives the percent of BCBSM members eligible for pharmacy benefits receiving prescriptions for nine drugs or class of drugs in 1997. Rates have been adjusted for the age and sex composition of local populations. Numbers in parentheses indicate lack of statistics (fewer than 26 eligible beneficiaries receiving prescriptions).

For more details regarding methods, please refer to the Appendix on Methods.

CHAPTER SEVEN TABLE

Use of Prescription Drugs by Hospital Service Area (1997)

HSA City	Adult BCBSM Pharmacy Beneficiaries (1997)	Child BCBSM Pharmacy Beneficiaries (1997)	% of Adult Pharmacy Beneficiaries Prescribed HMG Lipid Drugs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Inhibitors (1997)	% of Adult Pharmacy Beneficiaries Prescribed ACE Beta Blockers (1997)	% of Adult Pharmacy Beneficiaries Prescribed PPIs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Antihistamines (1997)	% of Adult Pharmacy Beneficiaries Prescribed SSRIs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Anti-Anxiety Drugs (1997)	% of Child Pharmacy Beneficiaries Prescribed Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed Inexpensive Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed Expensive Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed ADHD Drugs (1997)
Adrian	13,771	5,668	5.0	6.1	4.5	5.7	11.9	5.5	6.2	49.2	38.6	24.9	2.5
Albion	2,345	743	4.5	7.2	6.3	4.5	12.6	6.9	8.0	43.8	33.5	20.1	(3.4)
Allegan	3,039	1,247	5.3	6.1	4.9	4.2	9.5	7.3	7.4	40.4	34.3	15.6	4.4
Alma	9,427	3,736	6.2	5.9	6.1	3.0	9.4	5.3	5.6	43.1	33.6	20.5	1.9
Alpena	12,263	4,290	5.4	5.3	5.8	3.5	8.7	5.9	7.5	48.4	34.8	26.7	1.8
Ann Arbor	64,418	21,169	5.3	5.9	5.5	4.2	11.4	6.9	7.0	45.4	37.2	18.8	3.8
Bad Axe	3,391	1,272	5.8	8.3	7.3	4.1	19.0	4.9	6.4	56.2	42.6	29.6	2.7
Battle Creek	16,634	6,315	5.7	6.1	5.4	3.9	11.2	6.4	8.1	40.5	30.7	19.7	3.3
Bay City	25,632	8,480	5.7	6.1	6.6	3.9	11.7	6.3	8.3	53.6	44.7	24.0	2.4
Berrien Center	132	49								(43.7)	(39.5)		
Big Rapids	5,288	1,777	7.3	5.4	5.8	4.4	13.5	6.0	5.5	48.2	37.8	23.7	3.4
Cadillac	7,423	2,954	6.1	5.6	7.4	4.4	13.9	6.9	6.5	45.0	36.4	19.3	2.8
Caro	3,085	1,071	5.4	6.4	7.2	4.5	15.7	6.1	7.3	56.9	48.4	24.4	3.4
Carson City	3,120	1,150	5.2	5.5	6.4	5.9	14.3	5.0	6.2	46.2	35.8	20.7	1.6
Cass City	1,976	749	6.9	7.5	8.3	5.0	18.4	5.4	10.0	58.2	45.9	30.4	1.9
Charlevoix	4,572	1,856	4.8	5.0	5.6	2.8	7.1	6.3	8.2	40.1	32.7	14.7	4.3
Charlotte	4,297	1,552	4.2	6.0	4.6	4.3	11.3	6.6	5.9	46.6	37.2	22.0	3.9
Cheboygan	3,435	1,163	6.0	6.7	5.9	4.8	8.8	8.0	7.8	49.5	38.1	24.0	4.4
Chelsea	2,943	989	4.3	5.6	4.5	4.4	9.4	6.7	4.3	49.3	41.8	17.4	3.2
Clare	5,723	2,044	6.4	5.8	5.4	4.4	10.4	5.7	6.6	42.2	29.5	23.8	2.1
Coldwater	7,583	3,061	4.6	4.9	6.1	4.6	16.1	5.4	7.0	48.5	35.0	26.3	3.1
Crystal Falls	771	239	2.4	4.4	4.3	2.4	10.5	5.2	5.1	37.9	28.6	16.1	(6.3)
Dearborn	17,532	6,172	7.0	6.9	6.9	5.7	15.2	6.1	9.8	52.4	42.0	25.0	3.0
Deckerville	867	347	5.3	6.6	7.2	3.7	13.1	3.5	5.9	49.3	42.0	18.8	
Detroit	99,273	31,891	4.9	7.9	5.9	4.1	11.7	3.8	8.3	31.4	25.3	12.6	2.0
Dowagiac	2,019	771	7.2	8.4	7.9	3.0	10.7	5.4	6.5	41.9	30.6	20.8	1.8
Escanaba	5,220	1,952	5.2	6.7	5.8	3.6	9.1	6.6	5.1	45.0	36.0	20.2	4.8
Farmington Hills	15,024	5,104	6.1	5.8	6.1	4.7	12.9	6.0	8.0	49.6	37.7	25.3	3.6
Flint	118,991	38,124	5.8	6.3	5.0	4.8	12.0	6.3	8.7	46.0	38.9	18.5	2.7
Frankfort	758	269	5.2	4.0	4.9	4.3	11.2	7.2	6.4	48.6	36.2	23.7	
Fremont	3,827	1,612	5.4	5.4	5.4	4.6	9.3	6.9	6.5	48.2	36.5	24.4	2.8
Garden City	9,228	3,006	7.6	8.1	7.6	5.0	15.8	6.7	9.9	55.0	41.7	28.5	4.4
Gaylord	7,221	2,897	6.6	5.4	5.7	4.3	11.1	7.5	7.8	50.1	35.9	28.2	2.2
Gladwin	2,915	970	7.1	5.8	4.9	4.6	11.5	4.4	6.7	43.6	35.5	18.5	2.1
Grand Haven	7,021	2,637	3.9	5.6	4.9	3.4	12.4	8.5	8.2	48.2	40.2	19.5	4.9
Grand Rapids	92,675	37,954	5.1	5.8	5.2	4.2	9.9	7.3	6.5	42.7	34.3	18.0	4.3
Grayling	7,423	2,565	6.9	7.0	5.9	4.9	11.9	7.8	7.2	48.3	34.9	26.1	3.4
Greenville	2,425	1,001	5.9	6.1	4.7	5.7	9.9	6.4	6.1	46.0	36.1	20.9	2.9
Grosse Pointe	10,780	3,801	4.2	4.3	5.0	2.7	12.1	5.9	8.5	49.1	37.5	25.8	6.3

HSA City	Adult BCBSM Pharmacy Beneficiaries (1997)	Child BCBSM Pharmacy Beneficiaries (1997)	% of Adult Pharmacy Beneficiaries Prescribed HMG Lipid Drugs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Inhibitors (1997)	% of Adult Pharmacy Beneficiaries Prescribed ACE Beta Blockers (1997)	% of Adult Pharmacy Beneficiaries Prescribed PPIs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Antihistamines (1997)	% of Adult Pharmacy Beneficiaries Prescribed SSRIs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Anti-Anxiety Drugs (1997)	% of Child Pharmacy Beneficiaries Prescribed Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed Inexpensive Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed Expensive Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed ADHD Drugs (1997)
Hancock	2,397	904	5.1	7.1	5.4	3.6	10.3	7.8	5.3	40.5	28.2	20.6	2.3
Harbor Beach	1,111	445	8.4	9.4	7.1	3.1	16.1	3.7	7.4	58.2	43.2	27.9	
Hastings	6,494	2,611	5.1	5.6	5.2	4.3	10.4	6.2	5.7	44.6	35.1	21.3	4.2
Hillsdale	5,977	2,368	4.9	5.7	5.8	3.9	13.8	5.6	6.7	50.8	42.1	20.6	2.8
Holland	9,442	3,709	4.1	5.5	5.5	4.1	10.2	7.0	6.8	44.8	37.6	18.9	2.9
Howell	10,096	3,792	4.9	5.0	5.0	4.2	11.1	5.7	5.9	53.4	44.7	24.6	2.8
Ionia	3,058	1,164	5.3	6.0	6.2	6.0	13.1	6.5	7.3	50.8	33.4	29.9	3.1
Iron Mountain	3,793	1,420	5.2	6.3	5.0	4.4	10.1	8.3	6.1	50.3	37.9	25.0	4.9
Iron River	1,238	435	3.9	7.3	4.5	4.2	11.2	6.6	5.0	42.3	29.8	23.4	(5.0)
Ironwood	2,145	716	3.8	7.4	6.0	3.9	7.7	6.6	4.9	42.1	36.7	14.5	3.5
Ishpeming	1,674	633	5.2	6.9	5.1	3.2	9.2	7.8	5.3	55.6	32.2	37.6	(2.1)
Jackson	19,185	6,899	6.0	6.0	7.1	5.5	11.4	6.4	7.5	51.9	38.7	29.3	3.5
Kalamazoo	46,041	17,719	5.6	5.3	5.3	4.0	11.9	8.2	7.7	48.8	37.7	24.4	4.9
L'Anse	1,494	575	4.4	9.3	6.7	4.2	12.4	7.3	7.3	52.3	41.8	27.6	(2.7)
Lakeview	814	334	5.7	7.6	5.1	4.8	10.9	5.9	4.3	49.3	39.1	22.5	(3.9)
Lansing	55,797	18,784	4.9	5.2	5.0	3.9	11.5	6.5	6.7	48.2	36.9	25.4	3.2
Lapeer	20,597	7,680	6.2	6.3	5.9	4.4	13.7	4.8	7.3	53.0	42.8	24.3	3.7
Laurium	1,729	679	4.4	7.4	6.8	3.2	9.1	5.9	4.5	49.1	32.6	29.8	(2.2)
Livonia	28,359	8,959	6.1	6.1	6.0	4.3	14.4	6.1	8.2	52.7	39.5	26.9	4.3
Ludington	5,208	1,942	5.1	6.8	5.2	3.5	9.7	7.2	8.1	45.2	33.0	23.1	4.2
Madison Heights	7,750	2,615	7.4	7.3	7.3	5.2	14.3	5.6	10.3	47.2	38.7	20.2	4.4
Manistee	3,288	1,040	5.7	7.5	6.2	4.9	13.1	7.7	9.0	40.3	32.4	17.4	4.5
Manistique	2,005	696	4.6	7.0	5.8	3.7	10.4	5.1	4.5	48.8	33.5	29.7	(3.6)
Marlette	1,673	680	8.2	5.9	6.0	5.0	16.6	4.0	7.5	46.2	35.9	21.7	(2.4)
Marquette	9,002	2,975	4.6	6.3	4.3	3.0	8.5	8.3	4.3	44.7	34.4	21.8	2.8
Marshall	4,957	1,545	4.3	6.3	5.9	3.9	11.7	6.0	8.4	41.1	34.0	15.6	3.4
Midland	11,527	3,996	5.4	5.1	4.9	3.2	9.1	5.9	6.4	41.2	31.4	19.6	2.8
Milford	20,717	7,264	6.3	6.2	5.3	4.3	13.3	6.3	7.7	53.3	39.6	28.9	4.3
Monroe	11,048	4,125	7.0	7.0	9.0	5.2	11.9	7.4	9.2	54.6	45.0	24.8	3.7
Mount Clemens	71,918	24,558	5.4	6.0	6.0	4.1	12.4	5.0	8.3	48.6	38.6	23.9	4.8
Mount Pleasant	8,529	3,393	6.3	6.3	4.6	3.3	10.9	6.1	6.3	46.5	34.5	25.0	2.5
Munising	844	262	5.9	9.3	4.0	2.6	12.3	8.0	5.1	40.2	31.3	16.6	
Muskegon	26,001	10,299	6.3	7.3	6.7	4.2	11.2	9.4	8.0	42.4	36.2	15.2	4.0
Newberry	1,329	467	5.3	6.4	6.0	3.4	19.5	6.1	5.5	57.7	43.8	31.4	(3.1)
Niles	5,174	1,745	5.1	7.6	6.2	3.1	9.5	6.1	6.0	39.4	31.6	17.3	2.7
Northport	411	130	5.5	7.3	6.6	(4.4)	11.0	7.1	6.2	52.3	40.6	24.9	
Ontonagon	563	198	2.8	6.3	6.9	3.1	17.5	5.0	7.4	47.1	29.6	32.2	
Owosso	14,633	5,411	5.1	6.2	5.6	4.4	10.0	6.8	7.9	48.7	39.1	22.3	2.6
Paw Paw	4,075	1,626	5.4	5.9	5.6	3.9	12.5	7.7	7.0	48.8	38.0	25.3	4.6
Petoskey	15,512	5,980	6.2	5.5	5.8	3.9	8.7	8.1	7.5	46.8	35.7	23.4	4.3
Pigeon	1,341	421	5.6	9.8	8.1	4.3	19.7	5.1	7.9	54.8	42.0	28.2	(3.5)
Pontiac	75,902	24,303	5.5	6.0	4.8	4.6	13.9	5.9	8.4	51.0	39.6	27.1	3.8
Port Huron	29,798	11,621	5.7	6.6	6.3	4.1	13.6	5.9	8.1	49.2	37.1	26.7	4.8
Reed City	4,597	1,835	5.4	7.4	6.0	5.9	14.4	6.7	7.9	48.0	38.1	22.6	2.3
Rochester	26,295	8,261	4.6	4.7	4.6	3.4	11.6	5.2	6.7	47.2	37.2	24.1	4.1
Royal Oak	62,231	19,239	6.0	5.6	5.8	4.7	14.8	6.8	8.8	47.3	35.8	24.1	4.4

HSA City	Adult BCBSM Pharmacy Beneficiaries (1997)	Child BCBSM Pharmacy Beneficiaries (1997)	% of Adult Pharmacy Beneficiaries Prescribed HMG Lipid Drugs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Inhibitors (1997)	% of Adult Pharmacy Beneficiaries Prescribed ACE Inhibitors (1997)	% of Adult Pharmacy Beneficiaries Prescribed Beta Blockers (1997)	% of Adult Pharmacy Beneficiaries Prescribed PPIs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Antihistamines (1997)	% of Adult Pharmacy Beneficiaries Prescribed SSRIs (1997)	% of Adult Pharmacy Beneficiaries Prescribed Anti-Anxiety Drugs (1997)	% of Child Pharmacy Beneficiaries Prescribed Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed Inexpensive Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed Expensive Antibiotics (1997)	% of Child Pharmacy Beneficiaries Prescribed ADHD Drugs (1997)
Saginaw	48,980	16,500	4.8	6.3	6.1	4.2	9.3	5.7	7.4	41.9	35.2	15.8	2.3	
Saline	2,115	794	4.6	5.2	4.1	4.5	10.3	7.2	6.2	52.2	46.0	19.6	3.9	
Sandusky	1,673	702	8.1	7.4	6.3	5.9	18.0	6.7	9.4	54.5	44.1	24.8	(2.1)	
Sault Ste Marie	6,466	2,352	5.9	5.6	7.3	5.0	10.4	6.1	6.7	44.3	33.1	21.7	2.1	
South Haven	3,593	1,405	4.5	5.3	4.5	4.0	11.2	7.6	7.0	40.7	28.9	22.5	3.2	
Southfield	8,352	2,063	5.5	7.1	5.4	5.2	13.2	5.2	8.8	33.1	24.7	15.0	2.4	
St Clair	6,080	2,136	5.9	6.4	6.2	3.6	11.8	5.5	8.1	47.3	36.4	23.5	5.0	
St Johns	3,138	1,078	3.9	5.0	5.6	3.7	11.5	5.8	6.0	54.4	43.3	28.8	3.5	
St Joseph	13,367	4,794	4.5	6.0	4.3	3.0	9.0	6.3	5.9	41.3	32.1	20.4	2.3	
Standish	2,641	1,014	6.4	6.2	6.8	4.4	9.3	5.5	6.4	53.7	42.7	26.9	2.7	
Sturgis	3,402	1,363	4.8	5.9	6.2	4.6	13.0	6.7	7.8	47.4	33.7	25.5	2.6	
Tawas City	6,559	2,019	6.4	6.8	5.5	4.1	12.2	7.8	7.9	49.7	35.4	29.4	3.3	
Taylor	8,175	2,870	7.6	8.0	7.1	6.0	15.4	6.4	11.0	49.9	39.0	24.9	3.2	
Tecumseh	4,474	1,712	4.9	5.4	5.2	6.1	10.7	5.9	6.0	49.8	35.3	30.5	2.9	
Three Rivers	4,747	1,883	5.7	5.6	4.8	4.8	11.2	6.0	7.0	46.6	36.3	22.2	4.2	
Traverse City	27,084	10,325	4.6	5.2	5.0	3.8	10.6	7.3	6.4	45.3	38.2	16.0	5.1	
Trenton	13,640	4,508	7.0	7.7	7.5	4.7	13.3	5.4	9.2	51.6	41.2	24.9	4.1	
Troy	24,606	7,596	5.1	5.3	5.5	3.6	13.5	4.6	7.3	47.0	37.0	22.9	3.5	
Warren	38,738	11,564	5.9	6.5	6.4	4.1	12.0	5.0	9.3	47.3	38.9	20.7	5.4	
Watervliet	1,813	730	5.0	6.6	4.5	3.6	10.1	6.9	7.2	40.2	30.3	19.4	2.6	
Wayne	20,159	6,827	6.7	8.1	7.1	5.3	13.6	6.7	10.6	46.9	34.4	24.4	3.8	
West Branch	6,890	2,492	7.0	6.6	7.0	5.0	13.9	6.2	8.3	50.1	38.7	27.1	2.7	
Wyandotte	15,688	5,414	6.9	7.7	7.2	5.1	14.5	5.9	10.1	51.5	41.7	23.6	3.2	
Zeeland	1,673	811	4.3	5.3	5.8	2.5	8.9	6.5	6.6	42.5	34.1	19.4	2.9	
Michigan	1,526,286	532,054	5.5	6.2	5.7	4.3	12.0	6.2	7.8	46.4	36.6	21.8	3.6	

