# CHRT Book

SEPTEMBER 2010

CHRT

CENTER FOR HEALTHCARE
RESEARCH & TRANSFORMATION

## Health Care Variation in Michigan

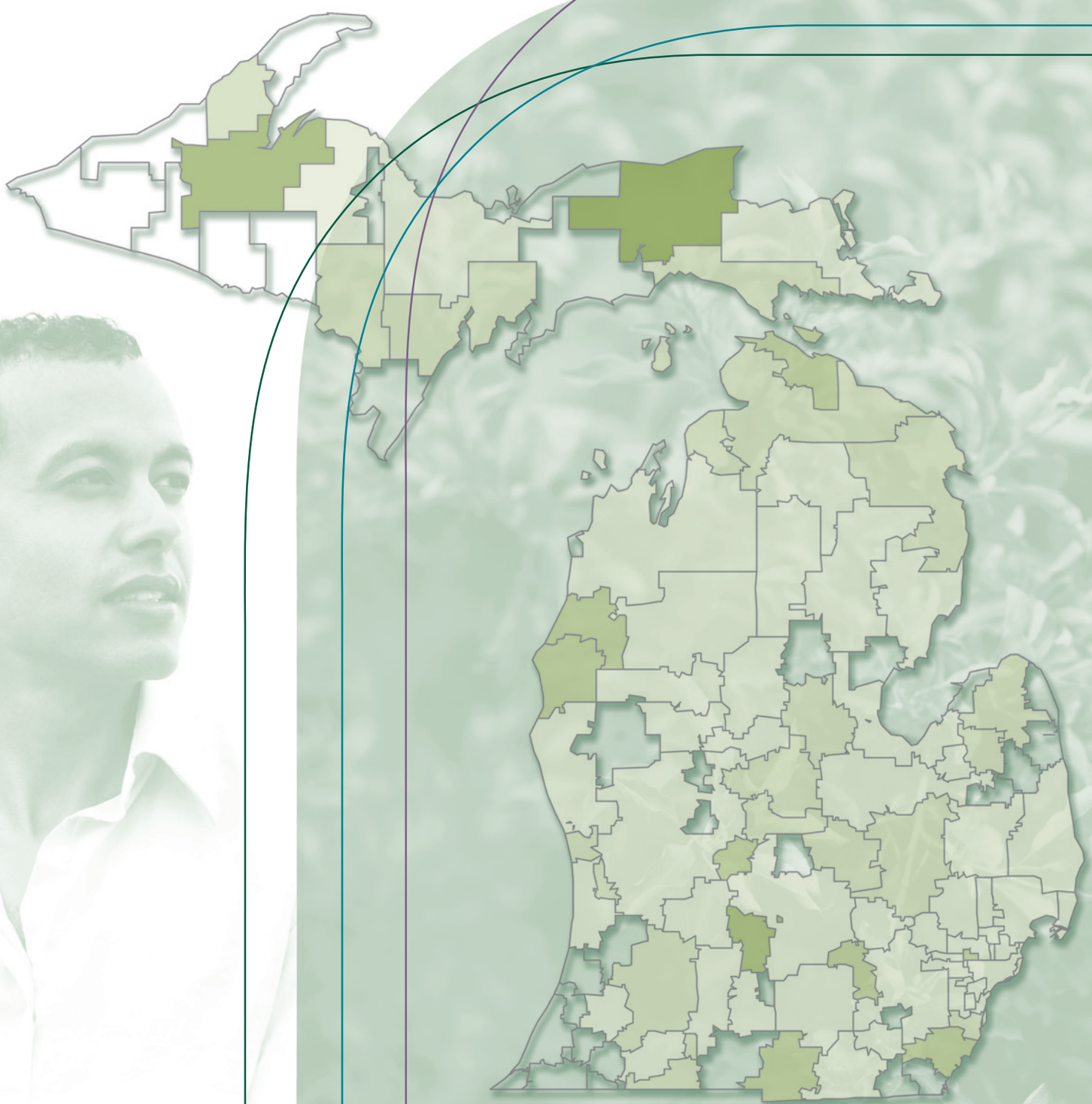


**TABLE OF CONTENTS**




The staff at the Center for Healthcare Research & Transformation would like to thank the following for their help in the development of *CHRTBook: Health Care Variation in Michigan:*

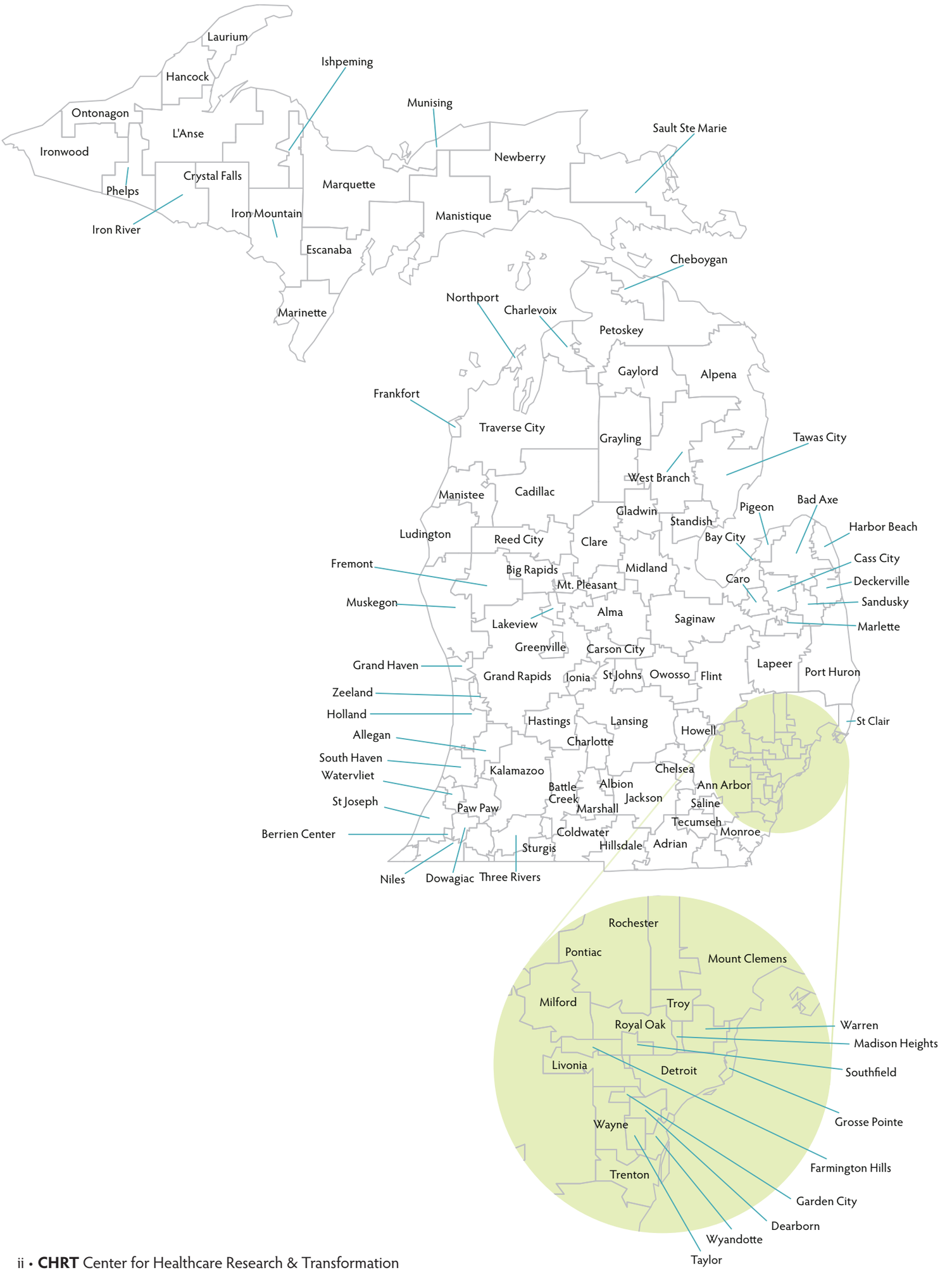
Kristin Bronner and Jon Lurie, MD, Dartmouth Institute for Health Policy and Clinical Practice; Lee Lucas, Maine Medical Center; Donisha Burt, Yusuf Chowdhury, DeShawn Mahone, Newelle Nielsen, Robyn Rontal, and David Share, MD, Blue Cross Blue Shield of Michigan; and Hitinder Gurm, MD, University of Michigan Health System.

Suggested citation: Udow-Phillips, Marianne; Ogundimu, Tomi; Ehrlich, Emily; Kofke-Egger, Heather; Stock, Karen. CHRTBook: Health Care Variation in Michigan. Ann Arbor, MI; Center for Healthcare Research & Transformation, 2010.


The Center for Healthcare Research & Transformation (CHRT) sponsors research and public information to promote evidence based care delivery, improve population health, and expand access to care. Housed at the University of Michigan, CHRT is a partnership between U-M and Blue Cross Blue Shield of Michigan to test the best ideas for improving the effectiveness and efficiency of the health care system.

Visit CHRT on the Web at: **www.chrt.org**

## Hospital Service Area (HSA) Map for Reference



## Hospital Referral Region (HRR) Map for Reference

# INTRODUCTION

For more than 20 years, researchers at Dartmouth Institute for Health Policy and Clinical Practice have been sharing data on regional variation in the use of health care services: variation that does not seem to be explained by health status or other relevant differences among the populations studied. Most of work done on geographic variation has been done on the Medicare population, and some could argue that the phenomenon of variation is unique to a senior population or some specific attribute of the Medicare structure. However, just over 10 years ago, we in Michigan were fortunate to have the opportunity to collaborate with our colleagues at Dartmouth to look at this same kind of data in the commercial Blue Cross and Blue Shield of Michigan (BCBSM) population[1]. Our findings then showed that patterns of geographic variation in the commercial population were similar to those found in the Medicare population.

In this report, we are again comparing the commercial BCBSM population to the Medicare population, but we are also looking at changes within the commercial population in overall use and geographic variation over the past 10 years.

Overall, this report depicts an improving picture in some key areas, showing notable reductions in overall use for some procedures often considered to be "over-utilized"—particularly in cardiac care and ambulatory care sensitive conditions. And, these trends look different (and better) for the BCBSM population than they do nationally.

Even among procedures with improving overall trends, however, some areas of the state continue to have very high use rates and unexplained variation. And some procedures often considered to be over-utilized do not show improving trends between 1997 and 2008; notably, Cesarean section, computed tomography (CT) scans of the low back, and back surgery.

Finally, while there are some important exceptions, patterns of regional variation are similar between BCBSM and Medicare; that is, areas with high use rates in Medicare tend to have high use rates for BCBSM. And, for the most part, areas that had high use in 1997 still had relatively high use in 2008.

Findings of particular note in this report are:

- The "Thumb"/Saginaw area had among the highest use for all procedures we studied.
- The proportion of births delivered by Cesarean section increased considerably between 1997 and 2008 to more than one third of all BCBSM births.
- Grosse Pointe, Michigan had the lowest rates of hysterectomy in the state in 1997. Today, their rates are even lower. In contrast, Monroe, Michigan had use rates more than 70 percent higher than the state average in both 1997 and 2008.
- Overall use rates for interventional cardiology services declined between 1997 and 2008, but the high use area for coronary artery bypass graft (CABG) shifted greatly: St. Joseph went from being the lowest area in 1997 to one of the highest in 2008.

[1] Dartmouth Atlas of Michigan, http://www.bcbsm.com/atlas/

- Use rates for angiography and angioplasty (PCI) among the BCBSM population declined over the last 10 years, in contrast to recently reported national trends of rising use rates for these same cardiac procedures.
- As The Dartmouth Atlas of Health Care in Michigan found in 1997, there is a direct correlation between the use of diagnostic and interventional procedures (sometimes known as the diagnostic-therapeutic cascade), i.e., areas of the state with high rates of CT scans for the low back had high rates of back surgery; areas with high rates of angiography also had high rates of PCI/coronary artery bypass graft (CABG).
- Overall rates of care for ambulatory care sensitive conditions (ACSCs) dropped dramatically among the BCBSM population between 1997 and 2008.
- Nationally, use rates for drugs to treat attention deficit hyperactivity disorder (ADHD) increased since 1997, but the debate continued about whether or not there is over-treatment with these drugs. There continues to be great variability in the rates of use of ADHD drugs in Michigan. As in 1997, Grosse Pointe, Grand Haven and Kalamazoo had the highest reported use rates in the state for the BCBSM population in 2008.

### A Note on Methodology

This report includes color-shaded maps with regional rates for certain diagnostic and surgical procedures and pharmaceutical services. With some exceptions, our methods generally replicate those of the Dartmouth Atlas project, which have been evolving over the past 20 years.

As in the Dartmouth Atlas project, geographic analyses are focused on geographical units called hospital service areas and hospital referral regions. Hospital referral regions (HRRs) are aggregations of hospital service areas (HSAs). An HSA is a collection of zip codes wherein most hospitalizations occur in hospitals within that area. Hospital referral regions represent regional health care markets for tertiary medical care.

Unlike the Dartmouth project, however, this report focuses on commercially insured non-elderly adults (ages 18 to 64) and pediatric (ages 0 to 17) populations. Furthermore, all data in this report are adjusted to the best available methods for differences in patient age, gender, and health risk. However, there are limitations to risk adjustment methodologies available today. For example, they do not account for social determinants of health, like socioeconomic status, and do not fully account for the severity of the disease state of individual patients.

National studies show that there is considerable variability of both advanced imaging and surgery for low back pain, and the appropriateness of many of these imaging procedures has been questioned.[2] Unnecessary utilization is of great concern both in terms of the risks to the health of patients as well as its contribution to excess spending in the health care system. 2008 data from BCBSM shows the direct correlation between diagnostic and therapeutic low back services. That is, areas that had the highest rates of high tech imaging for back pain (CT) were also the areas with the highest rates of back surgery: Saginaw, Marquette and Petoskey.

## Low Back Computed Tomography (CT) Scans

For certain types of clinical conditions associated with back pain, e.g. spinal stenosis or a herniated disc, or cancer, the diagnosis can be supported by imaging procedures such as computed tomography (CT). However, according to the American College of Radiology, acute low back pain without complications is usually benign and does not require early imaging studies such as X-ray, MRI or CT scans. And, according to one study, less than one percent of imaging studies actually find the cause of a case of low back pain.[3]

Exposure to unnecessary radiation is of great concern in terms of the long term effect on cancer risk. Given the clear risks from unnecessary radiation exposure, it is particularly problematic that imaging can too often be provided to patients without strong indications for the value of this procedure.

### BCBSM 2008 Use Rates—Geographic Variation

There is considerable variability in Michigan in the use of CT imaging for the low back. In 2008, a total of 2,260 low back CT scans were performed, for an average rate of one low back CT scan per 1,000 BCBSM adult members. However the number of CT scans varied by a factor of more than three: from 0.64 per 1,000 in Lansing to 2.27 per 1,000 in Marquette (125 percent above the state average).

Three HRRs had rates at least 30 percent higher than the state average of 1.01 per 1,000 adult BCBSM members: Marquette (2.27), Petoskey (1.47), and Saginaw (1.43).

Two HRRs had rates more than 25 percent below the average: Ann Arbor (0.73) and Lansing (0.64).

[2] Jon D. Lurie, MD, MS, Nancy J. Birkmeyer, PhD, and James N. Weinstein, DO, MS. SPINE. Volume 28, Number 6, pp 616–620

[3] Manek NJ, MacGregor AJ. Epidemiology of back disorders: prevalence, risk factors, and prognosis. Curr Opin Rheumatol 2005;
17 (2): 134 – 140.

FIGURE CB:1
**BCBSM Low Back CT Utilization, 2008, by HRR**

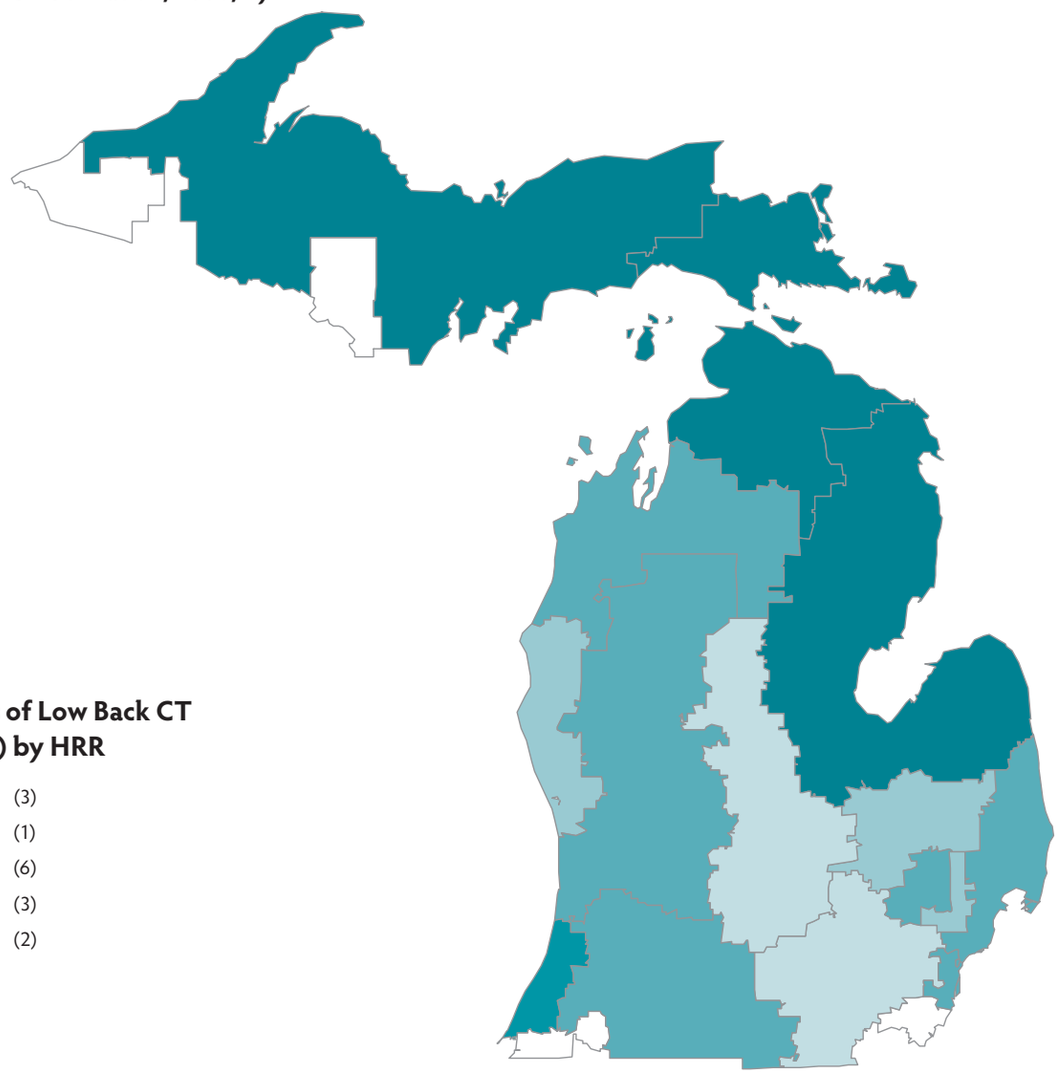



FIGURE CB:2
**BCBSM Low Back CT Scans, 2008, by HRR**

| Rank | Hospital Referral Region (HRR) | Utilization per 1,000 | Ratio of Rates to the MI Average |
|---|---|---|---|
| 1 | Marquette | 2.27 | 2.25 |
| 2 | Petoskey | 1.47 | 1.47 |
| 3 | Saginaw | 1.43 | 1.42 |
| 4 | St. Joseph | 1.19 | 1.18 |
| 5 | Kalamazoo | 1.10 | 1.09 |
| 6 | Detroit | 1.08 | 1.08 |
| 7 | Traverse City | 1.08 | 1.08 |
| 8 | Pontiac | 1.02 | 1.02 |
| 9 | Grand Rapids | 1.01 | 1.01 |
| 10 | Dearborn | 0.97 | 0.96 |
| 11 | Royal Oak | 0.88 | 0.88 |
| 12 | Flint | 0.86 | 0.86 |
| 13 | Muskegon | 0.79 | 0.78 |
| 14 | Ann Arbor | 0.73 | 0.73 |
| 15 | Lansing | 0.64 | 0.64 |
| | Michigan Overall | 1.01 | 1.00 |

## Back Surgery

Approximately half of American adults experience low back pain each year, and about two-thirds suffer from it at some point in their lives.[4] Research indicates that 90 percent of acute low back pain heals without treatment or with conservative therapy after four to six weeks. In most cases of low back pain, there is no evidence to indicate that surgery is a preferred treatment. Indeed, complications from unnecessary surgery have the potential to increase the duration of low back pain.[5,6]

### Medicare Trends

In the national Medicare population, rates of back surgery have increased over the last 10 years, going from 2.8 per 1,000 enrollees in 1996 to 4.3 per 1,000 enrollees in 2005.

### BCBSM 2008 Use Rates—Geographic Variation

In 2008, there was an average of 1.78 back surgeries per 1,000 adult BCBSM members in Michigan. Rates of surgery ranged from a low in the St. Joseph HRR of 1.23 per 1,000 to twice that rate in Petoskey, at 2.58 per 1,000 (45 percent above the state average).

Four HRRs had rates at least 30 percent higher than the state average of 1.78 per 1,000 adult BCBSM members: Petoskey (2.58), Saginaw (2.46), Marquette (2.40), and Grand Rapids (2.36).

One region had rates more than 25 percent below the average: St. Joseph (1.23).

---

[4] Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. Arthritis Rheum 2008 Jan; 58 (1): 26 – 35.

[5] Goroll AH. Clinician advisory: What is the role of surgery in back pain? In: Goroll AH, et al, Eds. Primary Care Medicine. 5th Edition. Philadelphia, Pa.:Lippincott Williams & Wilkins. 2008. http://ovidsp.tx.ovid.com/spa/ovidweb.cgi Accessed June 12, 2009.
Institute for Clinical Systems Improvement. Health care guideline: Adult low back pain. 13th Edition. 2008. http://mayoweb.mayo.edu/quality-rst/documents/LBP1108.pdf Accessed June 9, 1009.

[6] Jarvik JG, Hollingworth W, Martin B, Emerson SS, Gray DT, Overman S, et al. Rapid magnetic resonance imaging vs. radiographs for patients with low back pain: a randomized controlled trial. JAMA 2003; 289 (21): 2810 – 2818.

FIGURE CB:3

**BCBSM Back Surgery Utilization, 2008, by HRR**

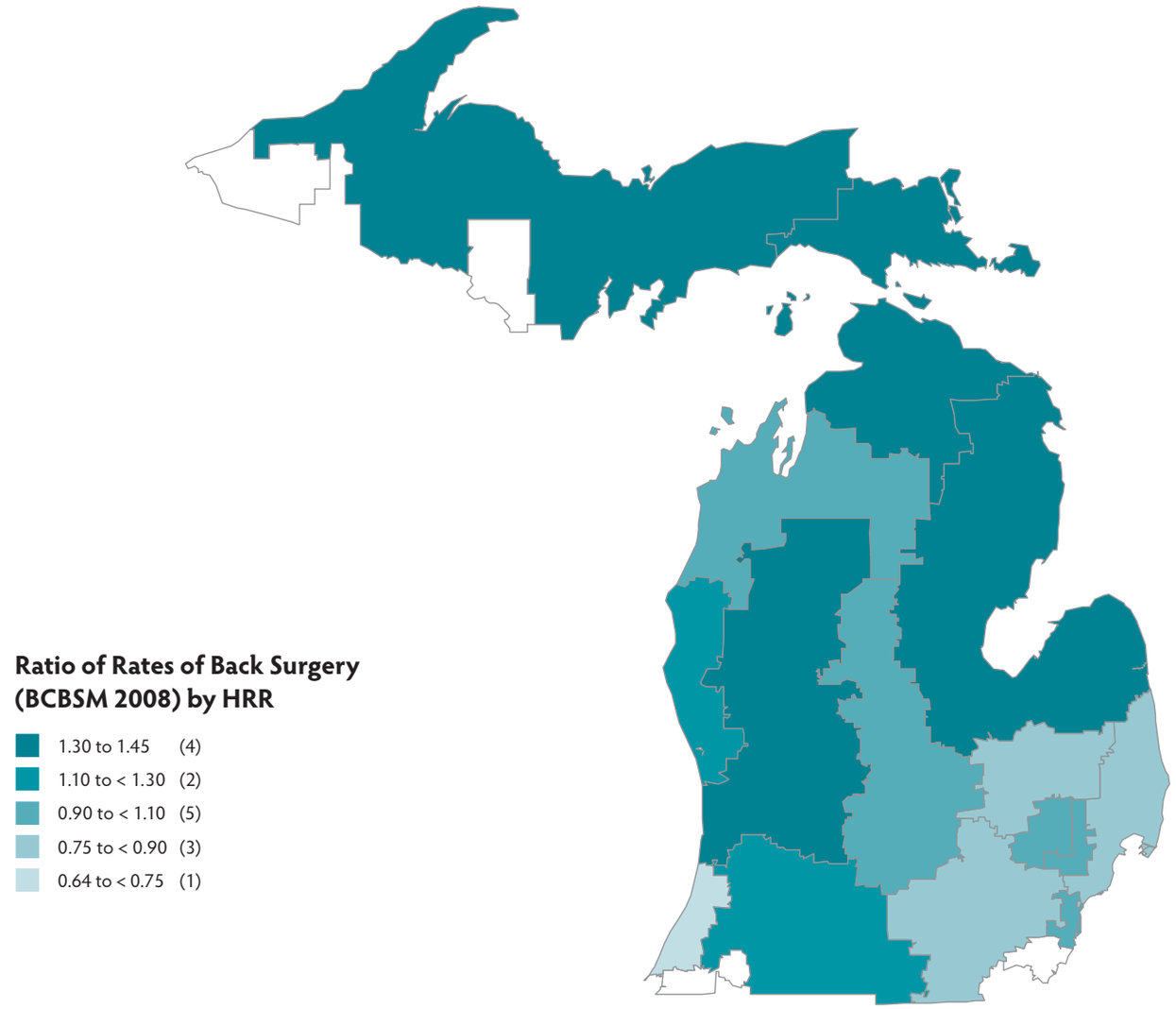



FIGURE CB:4

**BCBSM Back Surgery, 2008, by HRR**

| Rank | Hospital Referral Region (HRR) | Utilization per 1,000 | Ratio of Rates to the MI Average |
|---|---|---|---|
| 1 | Petoskey | 2.58 | 1.45 |
| 2 | Saginaw | 2.46 | 1.38 |
| 3 | Marquette | 2.40 | 1.35 |
| 4 | Grand Rapids | 2.36 | 1.33 |
| 5 | Muskegon | 2.11 | 1.19 |
| 6 | Kalamazoo | 2.01 | 1.13 |
| 7 | Traverse City | 1.91 | 1.07 |
| 8 | Dearborn | 1.78 | 1.00 |
| 9 | Pontiac | 1.69 | 0.95 |
| 10 | Royal Oak | 1.65 | 0.92 |
| 11 | Lansing | 1.62 | 0.91 |
| 12 | Flint | 1.57 | 0.88 |
| 13 | Detroit | 1.49 | 0.84 |
| 14 | Ann Arbor | 1.33 | 0.75 |
| 15 | St. Joseph | 1.23 | 0.69 |
| | Michigan Overall | 1.78 | 1.00 |

Childbirth and hysterectomy are both common procedures among women. Approximately 80 percent of women have delivered a child at some point in their lives.[7] One in three women have had a hysterectomy by age 60.[8] Many clinicians have raised concerns that a meaningful proportion of Cesarean sections are not medically necessary and may be leading to health risks as well as excess costs in the system. Nevertheless, Cesarean section rates in the country have been increasing over time. In Michigan, the highest rates of Cesarean section were found in northern Lower Peninsula and the Upper Peninsula.

Unlike Cesarean section rates, overall rates of hysterectomy in the U.S. have declined over the past 10 years. This decline is likely related to the increase in alternative (and less invasive) treatment options. Hysterectomy is often considered a preference-sensitive condition. That is, a condition where two or more medically acceptable options exist and the decision about which treatment to choose should depend on patient preference. Monroe, Michigan had the highest rate of hysterectomy in the state of Michigan in both 1997 and 2008; indeed, it was more than 70 percent higher than the state average in both years.

## Cesarean Sections

Until the 1970s, fewer than 10 percent of children were born with surgical intervention. In some situations, such as severe fetal distress, large infant size, or maternal infections, Cesarean sections (C-sections) can be life saving; however the evidence is not as clear for all C-sections. The ideal rate for C-sections has been debated; however, in 2000 the U.S. Department of Health and Human Services made a national goal of reducing C-sections to 12 percent of all births as part of the Healthy People 2010 campaign.[9]

### U.S. Trends

The Healthy People 2010 goal was never achieved. Indeed, national trends went in the opposite direction to the point where in 2006, C-sections accounted for 31.1 percent of live births nationally.[10]

### BCBSM 1997 to 2008

Among BCBSM members, the C-section use rate has also increased dramatically in the past 10 years. In 1997, 22.9 percent of deliveries were C-sections. A decade later, over one-third (34 percent) of all BCBSM babies were delivered by C-section, somewhat higher than the national average.

The increase in C-sections in Michigan is evident in every hospital service area in the state. However, there is also considerable variability in those rates within the state. In 2008, C-section rates ranged from 17.3 percent in the Marshall HSA to 52.9 percent in the Marlette HSA.

In 1997, there were 11 HSAs where C-sections represented 30 percent or more of all births, and no areas where C-sections represented greater than half of all deliveries. In 2008, C-sections were 30 percent or more of all births in 68 service areas, and there were two service areas where they represented over half of all deliveries (Marlette and Bad Axe).

### BCBSM 2008 Use Rates—Geographic Variation

In 2008, the areas with the highest proportion of births delivered by C-section were: Marlette (52.9 percent); Bad Axe (50.4 percent); Alpena (49.8 percent); Ludington (49.7 percent); and Sandusky (49.3 percent).

The areas with the lowest proportion of C-sections were: Holland (24.7 percent); Fremont (21.9 percent); Zeeland (20.5 percent); Big Rapids (19.0 percent); and Marshall (17.3 percent).

---

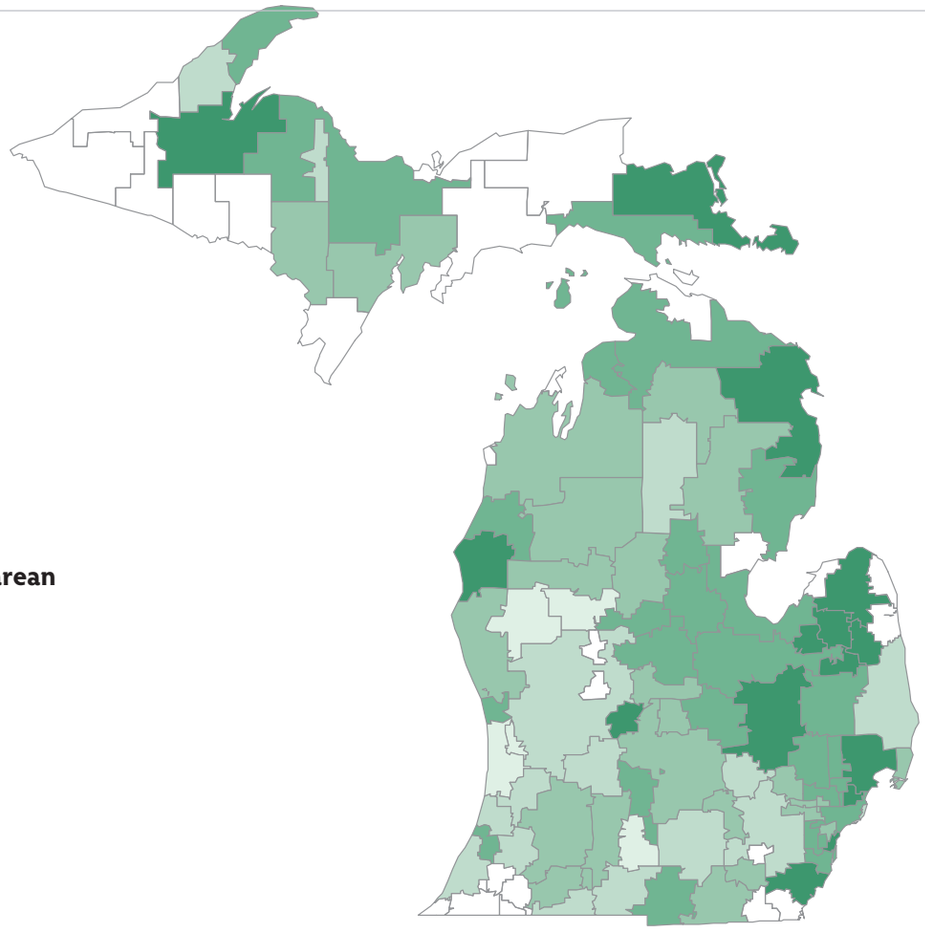
[7] Pew Research Center. Pew Research Center's. Social & Demographic Trends Project. Childlessness Up Among All Women; Down Among Women with Advanced Degrees. June, 2010.

[8] Agency for Healthcare Research and Quality (AHRQ). Health Services Research on Hysterectomy and Alternatives.

[9] The Dartmouth Atlas of Health Care in Michigan, 1997

[10] National Center for Health Statistics, final natality data.

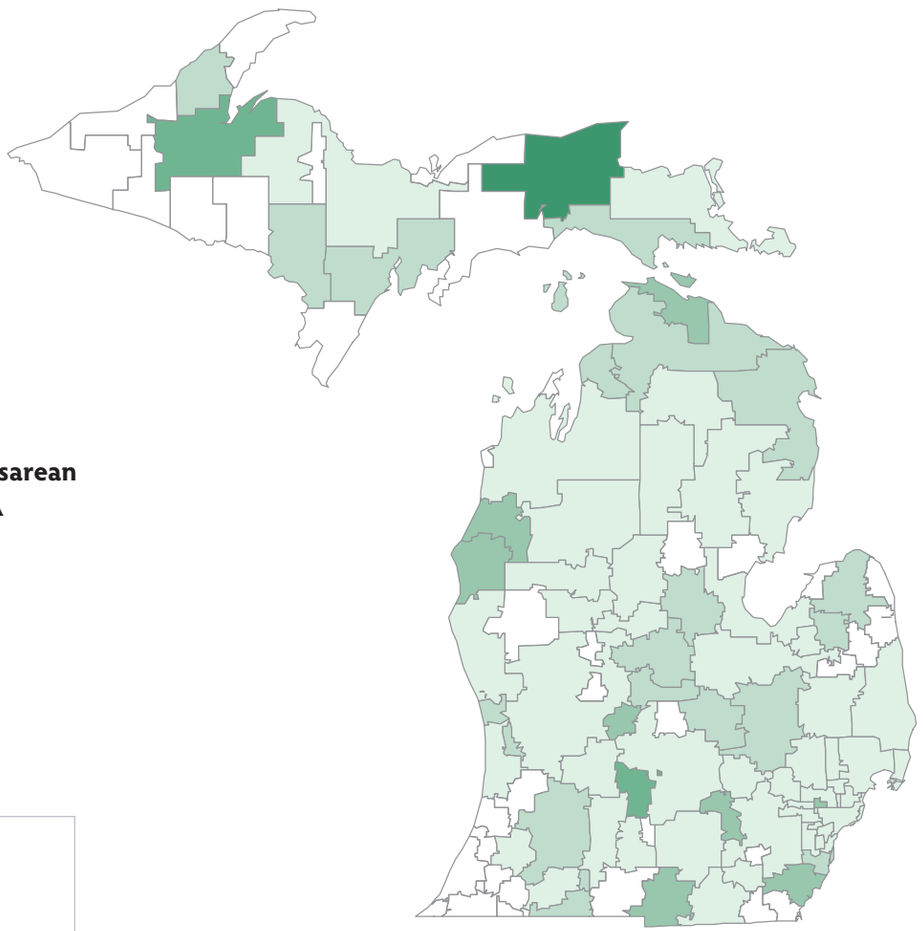
FIGURE CB:5
**Proportion of Births that were Cesarean Sections, 2008, by HSA**[11]



**Percent of Births That Were Cesarean Sections (BCBSM 2008) by HSA**

- 40 to 53 (15)
- 35 to < 40 (29)
- 30 to < 35 (24)
- 25 to < 30 (16)
- 17 to < 25 (5)

FIGURE CB:6
**Proportion of Births that were Cesarean Sections, 1997, by HSA**[11]



**Percent of Births That Were Cesarean Sections (BCBSM 1997) by HSA**

- 40 to 53 (1)
- 35 to < 40 (2)
- 30 to < 35 (8)
- 25 to < 30 (18)
- 17 to < 25 (49)

[11] Areas with fewer than 11 Cesarean sections were suppressed due to statistical imprecision, and appear in white on the map.

FIGURE CB:7
**BCBSM Cesarean Sections, 2008, by HSA**

| 2008 Rank | Hospital Service Area (HSA)[12] | Risk Adj Proportion of births that were C-Sections (2008) | Proportion of births that were C-Sections (1997) |
|---|---|---|---|
| 1 | Marlette | 52.9% | |
| 2 | Bad Axe | 50.4% | 28.0% |
| 3 | Alpena | 49.8% | 28.2% |
| 4 | Ludington | 49.7% | 34.8% |
| 5 | Sandusky | 49.3% | |
| 6 | Cass City | 48.4% | 26.4% |
| 7 | Ionia | 46.5% | 30.5% |
| 8 | L'anse | 44.2% | 36.7% |
| 9 | Monroe | 43.0% | 33.3% |
| 10 | Sault Ste Marie | 42.3% | 23.1% |
| 11 | Wyandotte | 42.1% | 21.8% |
| 12 | Warren | 41.8% | 19.6% |
| 13 | Caro | 41.5% | 22.4% |
| 14 | Flint | 41.4% | 26.7% |
| 15 | Mount Clemens | 40.3% | 21.7% |
| 16 | Charlevoix | 39.9% | 25.5% |
| 17 | Albion | 39.6% | |
| 18 | Charlotte | 39.4% | 36.7% |
| 19 | Petoskey | 39.2% | 29.0% |
| 20 | Wayne | 38.9% | 18.0% |
| 21 | Taylor | 38.8% | 16.9% |
| 22 | Madison Heights | 38.8% | 23.2% |
| 23 | Lapeer | 38.6% | 18.4% |
| 24 | Saginaw | 38.6% | 22.4% |
| 25 | Gladwin | 38.4% | |
| 26 | Pontiac | 38.2% | 24.1% |
| 27 | Midland | 38.1% | 28.7% |
| 28 | Alma | 38.0% | 29.5% |
| 29 | Manistee | 37.7% | 34.2% |
| 30 | Mount Pleasant | 37.6% | 20.5% |
| 31 | Owosso | 37.4% | 29.0% |
| 32 | Hillsdale | 37.2% | 32.0% |
| 33 | Trenton | 37.1% | 25.1% |
| 34 | Royal Oak | 36.8% | 21.5% |
| 35 | Garden City | 36.2% | 22.6% |
| 36 | Grand Haven | 36.1% | 25.7% |
| 37 | Rochester | 35.9% | 24.8% |
| 38 | Detroit | 35.8% | 22.7% |
| 39 | Bay City | 35.8% | 21.9% |
| 40 | Marquette | 35.7% | 19.3% |
| 41 | Tawas City | 35.6% | 15.1% |
| 42 | Troy | 35.5% | 23.2% |
| 43 | Watervliet | 35.4% | |
| 44 | Laurium | 35.0% | |
| 45 | Iron Mountain | 34.6% | 27.7% |
| 46 | Carson City | 34.3% | 28.6% |
| 47 | St. Johns | 34.1% | |
| 48 | Reed City | 34.1% | 22.4% |
| 49 | Muskegon | 34.0% | 22.9% |

| 2008 Rank | Hospital Service Area (HSA)[12] | Risk Adj Proportion of births that were C-Sections (2008) | Proportion of births that were C-Sections (1997) |
|---|---|---|---|
| 50 | Escanaba | 34.0% | 25.5% |
| 51 | Chelsea | 33.7% | 31.7% |
| 52 | Traverse City | 33.6% | 21.5% |
| 53 | St. Clair | 33.5% | 24.0% |
| 54 | Gaylord | 33.3% | 24.5% |
| 55 | West Branch | 33.2% | 16.5% |
| 56 | Cadillac | 33.0% | 16.3% |
| 57 | Milford | 33.0% | 21.9% |
| 58 | Clare | 31.9% | 18.5% |
| 59 | Farmington Hills | 31.8% | 23.7% |
| 60 | Kalamazoo | 31.6% | 25.2% |
| 61 | Livonia | 31.2% | 23.5% |
| 62 | Adrian | 30.7% | 23.4% |
| 63 | Lansing | 30.7% | 24.6% |
| 64 | Southfield | 30.7% | 31.6% |
| 65 | Tecumseh | 30.7% | 20.5% |
| 66 | Three Rivers | 30.5% | 21.1% |
| 67 | Battle Creek | 30.2% | 23.2% |
| 68 | Dearborn | 30.0% | 22.2% |
| 69 | Ann Arbor | 29.9% | 20.6% |
| 70 | Hancock | 29.8% | 27.6% |
| 71 | Ishpeming | 29.6% | |
| 72 | Port Huron | 29.3% | 22.4% |
| 73 | Allegan | 29.2% | |
| 74 | St. Joseph | 28.6% | |
| 75 | Jackson | 28.3% | 20.5% |
| 76 | Howell | 28.3% | 21.3% |
| 77 | Sturgis | 28.0% | 26.0% |
| 78 | Paw Paw | 27.8% | 18.1% |
| 79 | Hastings | 27.7% | 15.7% |
| 80 | Coldwater | 27.4% | |
| 81 | Grand Rapids | 27.1% | 19.7% |
| 82 | South Haven | 27.1% | |
| 83 | Grosse Pointe | 27.1% | 19.7% |
| 84 | Grayling | 25.3% | 19.3% |
| 85 | Holland | 24.7% | 21.0% |
| 86 | Fremont | 21.9% | |
| 87 | Zeeland | 20.5% | 29.3% |
| 88 | Big Rapids | 19.0% | 20.0% |
| 89 | Marshall | 17.3% | 24.6% |
| | Cheboygan | | 31.3% |
| | Newberry | | 42.9% |
| | Michigan Average | 34.0% | 22.9% |

[12] The following hospital service areas have data suppressed in both 1997 and 2008 and are not included in the table: Berrien Center, Crystal Falls, Deckerville, Dowagiac, Frankfort, Greenville, Harbor Beach, Iron River, Ironwood, Lakeview, Manistique, Munising, Niles, Northport, Ontonagon, Pigeon, Saline, and Standish.

# Hysterectomy

Benign conditions of the uterus such as endometriosis or chronic pelvic pain are common. Medical management and treatment, as well as hysterectomy (the surgical removal of the uterus) are among the methods of treatment.

## U.S. Trends

After Cesarean sections, hysterectomy is the second most frequently performed major surgical procedure for women of reproductive age in the United States.[13] In 2004, the rate among those 15 years old or older was 5.1 per 1,000. The rate has decreased from 5.4 per 1,000 in 2000.[14]

This decrease has been linked to fewer procedures among women aged 50–54, as well as a decrease in hysterectomies resulting from fibroid tumors. Another suggested reason for the decrease is that precancerous lesions are identified at an earlier stage, when they can be treated by less invasive options.[15]

## BCBSM 1997 to 2008

In 2008, the rate of hysterectomy among adult female BCBSM members in Michigan was 5.62 per 1,000 members. This is a significant decrease from the 1997 rate of 7.7 per 1,000 members.

In both time periods (1997 and 2008), hysterectomy rates were highest in Monroe (at 78 and 72 percent above the state average, respectively). In 2008, hysterectomy rates were lowest in Livonia, at 55 percent below the state average. Livonia was also among the three HSAs with the lowest hysterectomy rate in 1997, at 38 percent below the state average. In 1997, Grosse Pointe had the lowest hysterectomy rate. Today, the data for the Grosse Pointe area is suppressed because of the very low number of hysterectomies performed.

Overall in Michigan, the number of hysterectomies varied by a factor of nearly four, from 2.55 in Livonia to 9.65 in Monroe per 1,000 female members.

[13] Centers for Disease Control and Prevention. Women's Reproductive Health: Hysterectomy

[14] Whiteman MK, Hillis SD, Jamieson DJ, Morrow B, Podgornik MN, Brett KM, Marchbanks PA. Inpatient hysterectomy surveillance in the United States, 2000–2004. Am J Obstet Gynecol. 2008:198(1):34.e1–7.

[15] Babalola, E. O., Bharucha, A. E., Schleck, C. D., Gebhart, J. B., Zinsmeister, A. R., & Melton, L. J. (2007). Decreasing utilization of hysterectomy: a population-based study in Olmsted County, Minnesota, 1965-2002. American Journal of Obstetrics and Gynecology, 196(3), 214.e1-7. doi:10.1016/j.ajog.2006.10.390

FIGURE CB:8
**BCBSM Hysterectomy Utilization, 2008, by HSA**[16]

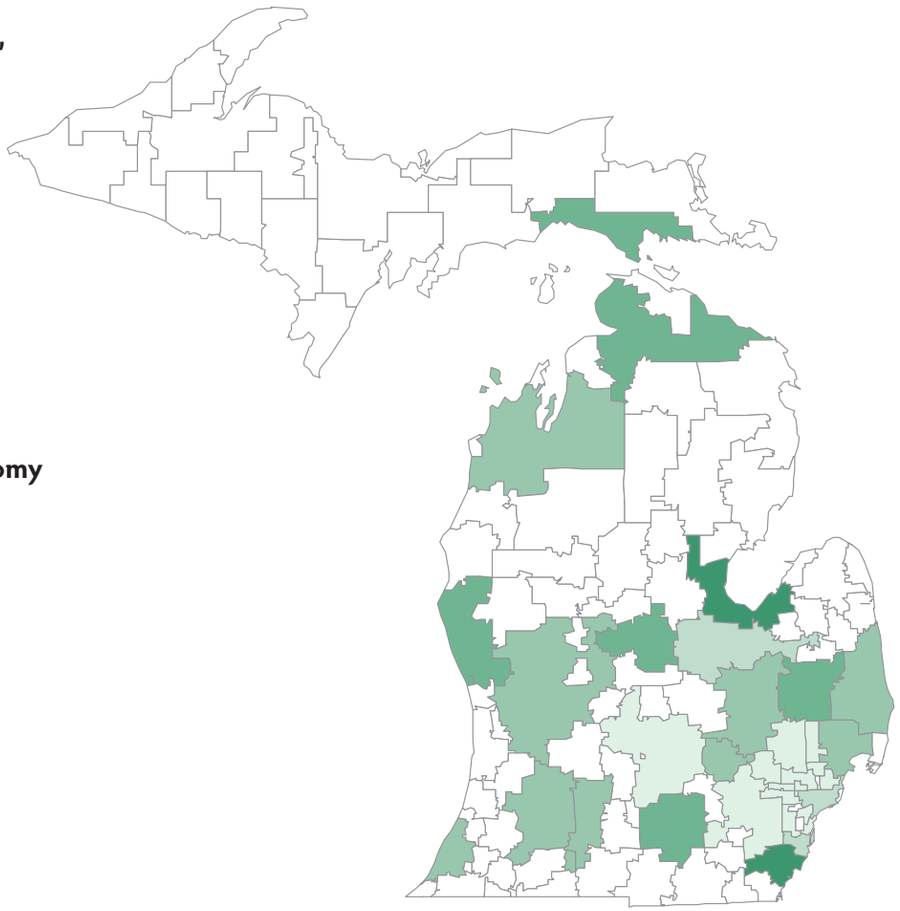
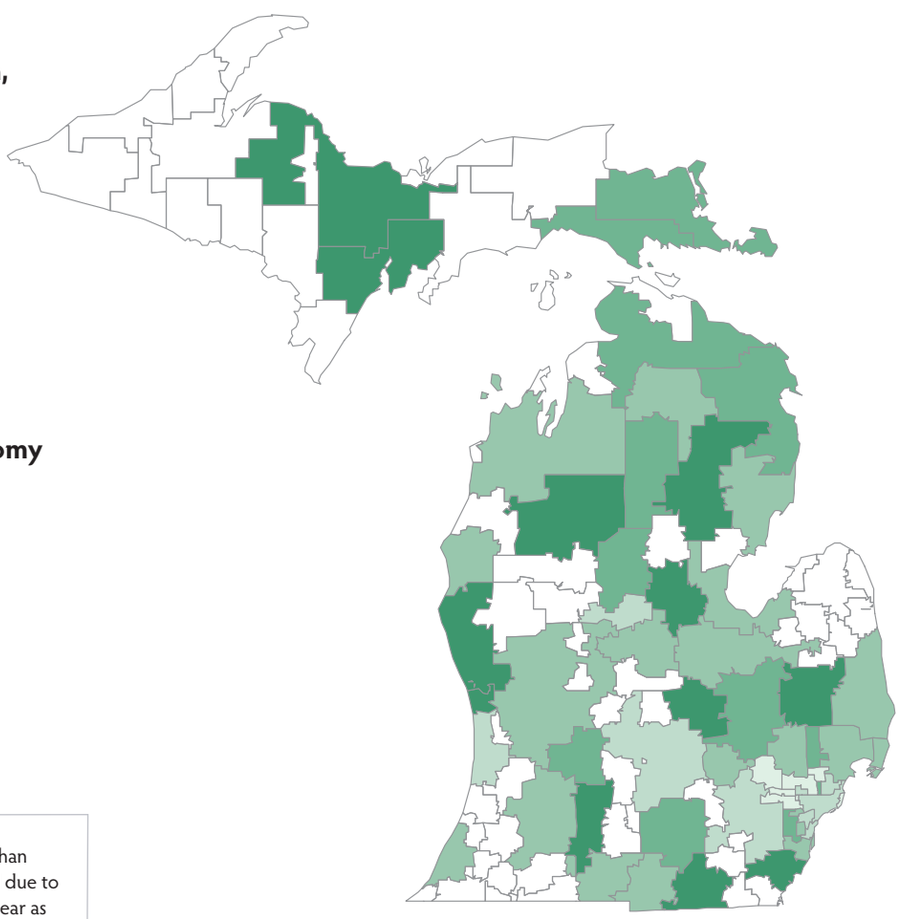



FIGURE CB:9
**BCBSM Hysterectomy Utilization, 1997, by HSA**[16]




[16] Areas with fewer than 11 procedures, or fewer than 10,000 adult BCBSM members were suppressed due to statistical imprecision or confidentiality, and appear as white areas on the map.

FIGURE CB:10
**BCBSM Hysterectomy, 1997 and 2008, by HSA**

| 2008 Rank | Hospital Service Area (HSA)[17] | Utilization per 1,000 (2008) | Ratio of Rates to the MI Average (2008) | Utilization per 1,000 (1997) | Ratio of Rates to the MI Average (1997) |
|---|---|---|---|---|---|
| 1 | Monroe | 9.65 | 1.72 | 13.7 | 1.78 |
| 2 | Bay City | 7.33 | 1.30 | 8.1 | 1.05 |
| 3 | Muskegon | 7.28 | 1.29 | 10.3 | 1.34 |
| 4 | Jackson | 6.92 | 1.23 | 9.3 | 1.21 |
| 5 | Alma | 6.89 | 1.23 | 8.2 | 1.06 |
| 6 | Petoskey | 6.58 | 1.17 | 9.4 | 1.22 |
| 7 | Lapeer | 6.26 | 1.11 | 12.4 | 1.61 |
| 8 | Battle Creek | 5.92 | 1.05 | 10.7 | 1.39 |
| 9 | St. Joseph | 5.78 | 1.03 | 7.5 | 0.97 |
| 10 | Grand Rapids | 5.72 | 1.02 | 7.0 | 0.91 |
| 11 | Kalamazoo | 5.56 | 0.99 | 8.0 | 1.04 |
| 12 | Howell | 5.49 | 0.98 | 7.0 | 0.91 |
| 13 | Mount Clemens | 5.43 | 0.97 | 8.1 | 1.05 |
| 14 | Traverse City | 5.40 | 0.96 | 8.3 | 1.08 |
| 15 | Flint | 5.26 | 0.94 | 8.6 | 1.12 |
| 16 | Detroit | 4.86 | 0.86 | 6.6 | 0.86 |
| 17 | Trenton | 4.72 | 0.84 | 6.9 | 0.90 |
| 18 | Saginaw | 4.19 | 0.75 | 7.8 | 1.01 |
| 19 | Lansing | 4.12 | 0.73 | 6.7 | 0.87 |
| 20 | Warren | 4.10 | 0.73 | 6.5 | 0.84 |
| 21 | Troy | 3.93 | 0.70 | 5.4 | 0.70 |
| 22 | Wayne | 3.89 | 0.69 | 9.5 | 1.23 |
| 23 | Wyandotte | 3.83 | 0.68 | 6.5 | 0.84 |
| 24 | Farmington Hills | 3.49 | 0.62 | 5.6 | 0.73 |
| 25 | Milford | 3.29 | 0.59 | 5.3 | 0.69 |
| 26 | Ann Arbor | 3.21 | 0.57 | 6.1 | 0.79 |
| 27 | Royal Oak | 3.05 | 0.54 | 4.6 | 0.60 |
| 28 | Southfield | 2.86 | 0.51 | 6.4 | 0.83 |
| 29 | Dearborn | 2.65 | 0.47 | 6.4 | 0.83 |
| 30 | Livonia | 2.55 | 0.45 | 4.8 | 0.62 |
| | Adrian | | | 10.1 | 1.31 |
| | Alpena | | | 9.3 | 1.21 |
| | Cadillac | | | 10.4 | 1.35 |
| | Clare | | | 8.9 | 1.16 |
| | Coldwater | | | 7.2 | 0.94 |
| | Escanaba | | | 11.3 | 1.47 |
| | Garden City | | | 7.4 | 0.96 |
| | Gaylord | | | 7.0 | 0.91 |
| | Grand Haven | | | 10.6 | 1.38 |
| | Grayling | | | 9.1 | 1.18 |
| | Grosse Pointe | | | 3.8 | 0.49 |
| | Hastings | | | 9.8 | 1.27 |
| | Hillsdale | | | 7.1 | 0.92 |
| | Holland | | | 6.3 | 0.82 |
| | Ludington | | | 8.2 | 1.06 |
| | Madison Heights | | | 8.7 | 1.13 |
| | Marquette | | | 10.7 | 1.39 |
| | Midland | | | 11.2 | 1.45 |
| | Mount Pleasant | | | 6.4 | 0.83 |
| | Owosso | | | 10.6 | 1.38 |
| | Pontiac | | | 7.8 | 1.01 |
| | Port Huron | | | 8.4 | 1.09 |
| | Rochester | | | 8.5 | 1.10 |
| | Sault Ste Marie | | | 8.9 | 1.16 |
| | St. Clair | | | 7.2 | 0.94 |
| | Tawas City | | | 7.2 | 0.94 |
| | Taylor | | | 8.4 | 1.09 |
| | West Branch | | | 12.3 | 1.60 |
| | Michigan Average | 5.62 | 1.00 | 7.7 | 1.00 |

[17] The following hospital service areas have data suppressed in both 1997 and 2008 and are not included in the table: Albion, Allegan, Bad Axe, Berrien Center, Big Rapids, Caro, Carson City, Cass City, Charlevoix, Charlotte, Cheboygan, Chelsea, Crystal Falls, Deckerville, Dowagiac, Frankfort, Fremont, Gladwin, Greenville, Hancock, Harbor Beach, Ionia, Iron Mountain, Iron River, Ironwood, Ishpeming, Lakeview, L'anse, Larium, Manistee, Manistique, Marlette, Marshall, Munising, Newberry, Niles, Northport, Ontonagon, Paw Paw, Pigeon, Reed City, Saline, Sandusky, South Haven, St. Johns, Standish, Sturgis, Tecumseh, Three Rivers, Watervliet, and Zeeland.

Nationally, interventional cardiology has changed significantly in the past 10 years. The number of coronary artery bypass grafts (CABGs) has decreased, while the number of percutaneous coronary interventions (PCIs) has increased. Overall, total cardiac surgeries (CABG and PCI combined) increased from 3.8 procedures per 1,000 in 1995 to 5.9 per 1,000 in 2005.[18] There has also been a shift in the way such care is delivered. Ten years ago, all interventional cardiology procedures were performed in the inpatient setting. Today, many PCI procedures are performed on an outpatient basis.

In Michigan, geographic variation in cardiac procedures continues. In addition, there appears to be a link between high rates of diagnostic procedures and high rates of surgery: areas with high rates of angiography are also those with high rates of cardiac surgery.

Of note: From 1997 to 2008, St. Joseph went from having the lowest rate of use of cardiac surgery in the state to having one of the highest use rates. In fact, St. Joseph's rate did not change between the two time periods while rates in the rest of the state declined.

## Coronary Angiography

Coronary angiography is a diagnostic tool used to determine if a patient has a cardiovascular condition.

### U.S. Trends

The national rate of coronary angiography in the Medicare population rose from 18.9 per 1,000 members in 1996 to 21.6 per 1,000 in 2005.[19] According to the National Hospital Discharge Survey, from 1995 to 2005 the rate remained steady at 4.1 per 1,000.

### BCBSM 1997 to 2008

In 2008, 16,883 angiographies were performed on adult BCBSM members. On average, angiographies were performed on 7.5 per 1,000 adult BCBSM members in 2008. In contrast to national trends, BCBSM use rates decreased 16.6 percent from 1997 to 2008. The rate ranged from a low in Muskegon of 3.8 per 1,000 members, to a high in Saginaw of 12 per 1,000 members (60 percent higher than the state average).

The regions in the state with the highest and lowest rate of catheterization stayed the same between 1997 and 2008 in the BCBSM population. In both years, the Saginaw, St. Joseph, and Kalamazoo HRRs had the highest use rates, and Muskegon, Grand Rapids, and Ann Arbor the lowest.

### BCBSM 2008 compared to Medicare 2005

The pattern of geographic variation in the 2008 BCBSM population was very similar to the pattern of variation in the 2005 Medicare population. Referral regions with relatively low or high rates of angiography (as compared to the state average) were generally the same for both populations.

Consistent with the BCBSM data from 1997 and 2008: the Saginaw, St. Joseph, and Kalamazoo HRRs had the highest use rates, and Muskegon, Grand Rapids, and Ann Arbor were among the lowest.

### BCBSM 2008 Use Rates—Geographic Variation

In the Saginaw HRR, angiography rates for adult BCBSM members were at least 30 percent higher than the state average (12 per 1,000).

In the Muskegon HRR, angiography rates for adult BCBSM members were more than 25 percent below the state average (3.80 per 1,000).

[18] National Hospital Discharge Survey, National Center for Health Statistics.

[19] The Dartmouth Atlas Project. Dartmouthatlas.org

FIGURE CB:11
**BCBSM Angiography Utilization, 2008, by HRR**

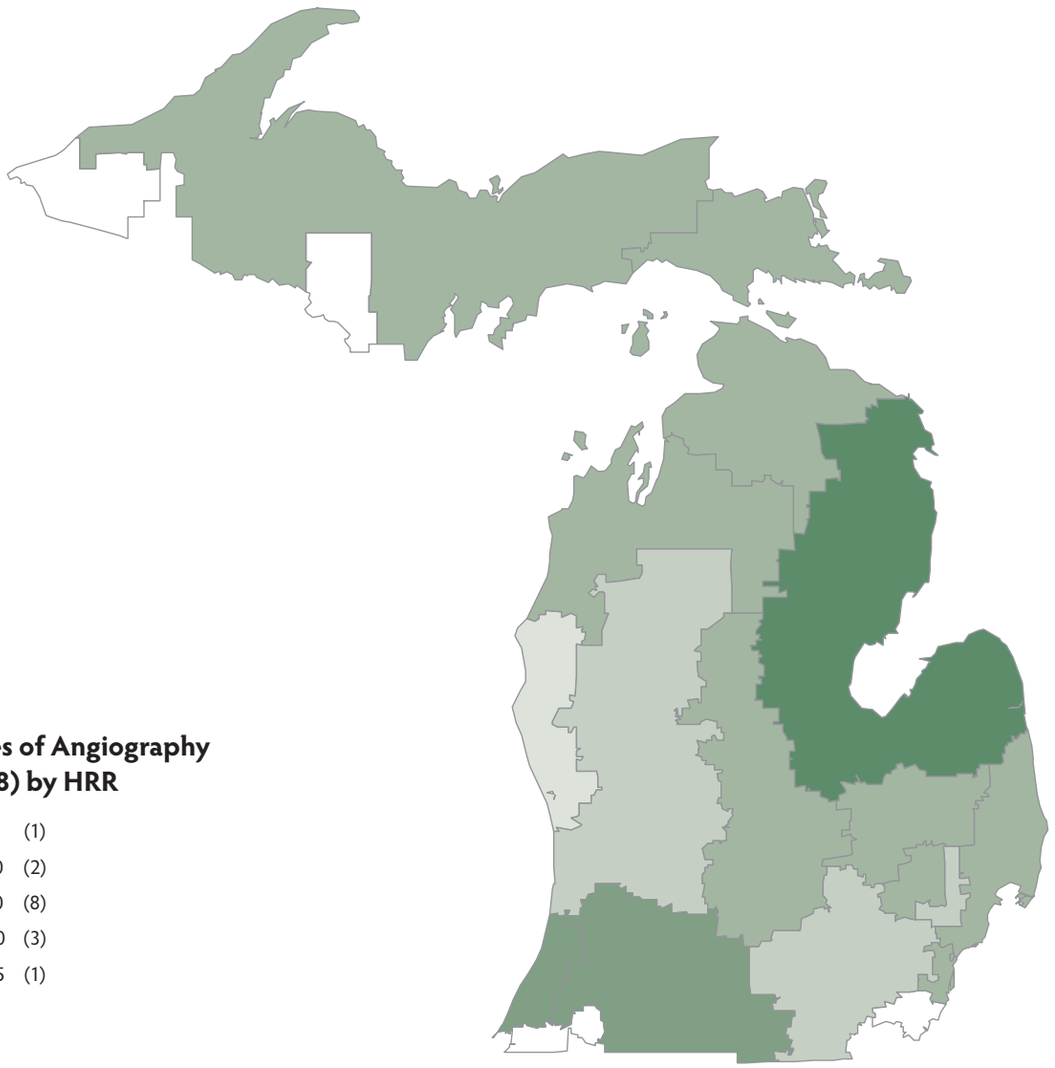



FIGURE CB:12
**BCBSM Angiography Utilization, 2008, by HRR**

| Rank | Hospital Referral Region (HRR) | Utilization per 1,000 (2008) | Ratio of Rates to the MI Average (2008) | Utilization per 1,000 (1997) | Ratio of Rates to the MI Average (1997) |
|---|---|---|---|---|---|
| 1 | Saginaw | 12.00 | 1.60 | 11.30 | 1.26 |
| 2 | St. Joseph | 9.52 | 1.27 | 10.50 | 1.17 |
| 3 | Kalamazoo | 9.33 | 1.24 | 9.60 | 1.07 |
| 4 | Traverse City | 8.17 | 1.09 | 9.10 | 1.01 |
| 5 | Detroit | 8.06 | 1.07 | 10.20 | 1.13 |
| 6 | Flint | 7.92 | 1.05 | 8.50 | 0.94 |
| 7 | Dearborn | 7.78 | 1.04 | 11.00 | 1.22 |
| 8 | Lansing | 7.38 | 0.98 | 7.50 | 0.83 |
| 9 | Petoskey | 6.84 | 0.91 | 6.70 | 0.74 |
| 10 | Marquette | 6.78 | 0.90 | 8.30 | 0.92 |
| 11 | Pontiac | 6.77 | 0.90 | 9.00 | 1.00 |
| 12 | Royal Oak | 6.23 | 0.83 | 8.80 | 0.98 |
| 13 | Ann Arbor | 5.93 | 0.79 | 8.00 | 0.89 |
| 14 | Grand Rapids | 5.79 | 0.77 | 7.00 | 0.78 |
| 15 | Muskegon | 3.80 | 0.51 | 5.40 | 0.60 |
| | Michigan Overall | 7.51 | 1.00 | 9.00 | 1.00 |

FIGURE CB:13
**Medicare Angiography Utilization, 2005, by HRR**

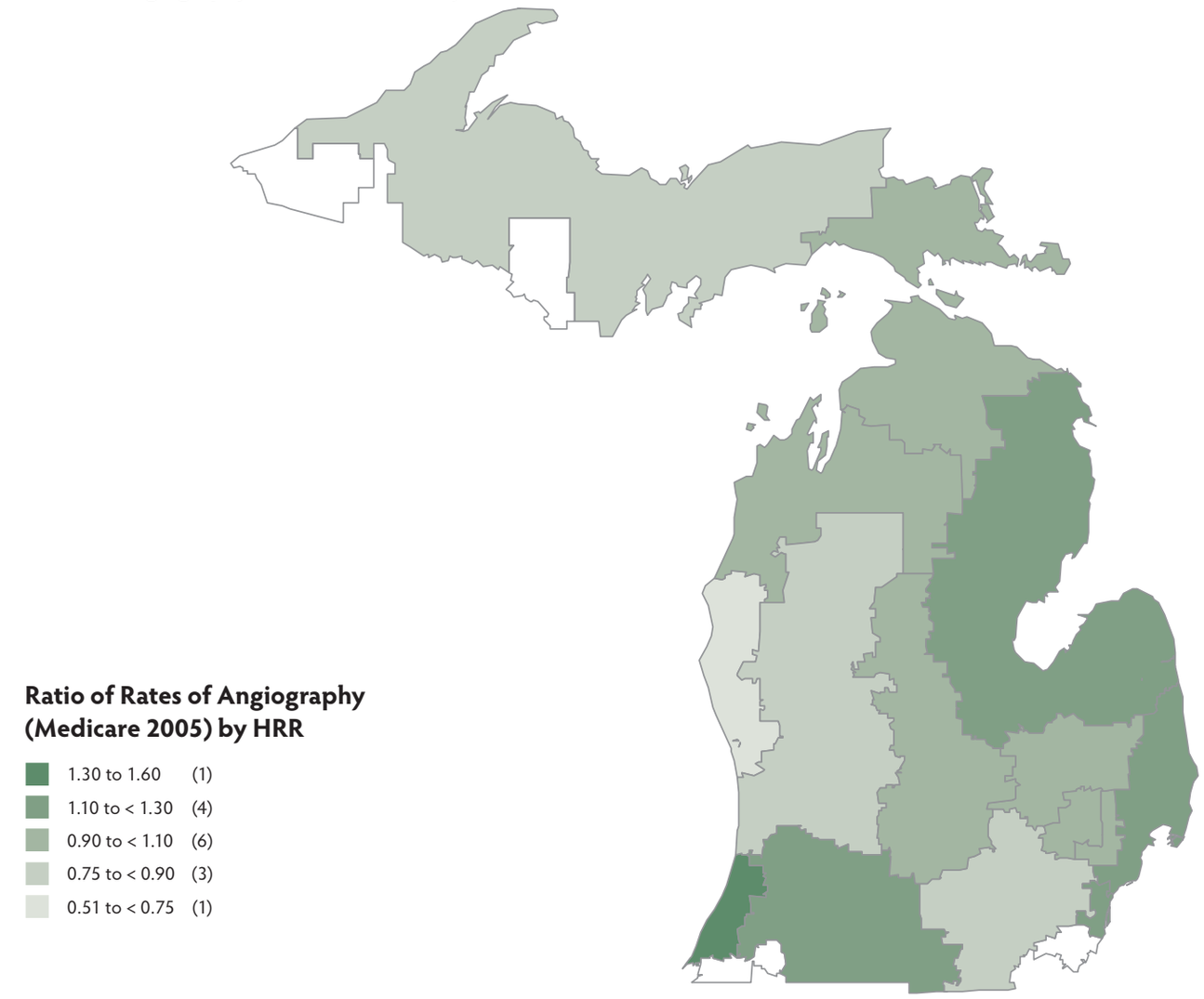



FIGURE CB:14
**Medicare Angiography Utilization, 2005, by HRR**

| Rank | Hospital Referral Region (HRR) | Utilization per 1,000 | Ratio of Rates to the MI Average |
|---|---|---|---|
| 1 | St. Joseph | 32.30 | 1.30 |
| 2 | Saginaw | 29.30 | 1.18 |
| 3 | Kalamazoo | 29.20 | 1.17 |
| 4 | Dearborn | 28.34 | 1.14 |
| 5 | Detroit | 28.07 | 1.13 |
| 6 | Flint | 26.72 | 1.07 |
| 7 | Petoskey | 26.54 | 1.07 |
| 8 | Lansing | 25.22 | 1.01 |
| 9 | Pontiac | 25.10 | 1.01 |
| 10 | Traverse City | 24.75 | 1.00 |
| 11 | Royal Oak | 24.66 | 0.99 |
| 12 | Ann Arbor | 20.88 | 0.84 |
| 13 | Grand Rapids | 19.71 | 0.79 |
| 14 | Marquette | 18.85 | 0.76 |
| 15 | Muskegon | 13.38 | 0.54 |
| | Michigan | 24.87 | 1.00 |

# Coronary Artery Bypass Grafting

While coronary artery bypass graft (CABG) is among the most frequently performed surgical procedures in the U.S., the use of CABG has been declining over the past decade. Some suggested reasons for this decline include improved preventive care and medical care (such as beta-blockers and lipid-lowering agents), resulting in a reduced need for revascularization; and the growth of angioplasty and stenting procedures, resulting in a reduced demand for CABG.[20]

## U.S. Trends

The national average rate of CABG peaked in the Medicare population in 1997 at 6.4 per thousand, and has fallen by 29.7 percent to 4.5 per 1,000 enrollees in 2005[21]. According to the American Heart Association, overall (Medicare and non-Medicare) CABG rates declined from 1.21 per 1,000 in 2002 to 0.94 per 1,000 in 2005.[22]

Similarly, the state average CABG rate for the BCBSM adult membership decreased significantly, from 1.2 per 1,000 in 1997 to 0.53 in 2008, a 55.6 percent reduction.

## BCBSM 1997 to 2008

In 2008, 1,197 CABG procedures were performed on adult BCBSM members. CABG rates ranged from 0.38 per 1,000 adult members in the Muskegon and Grand Rapids HRRs to 0.86 in Saginaw (61 percent higher than the Michigan average). Saginaw was second to Dearborn in CABG use rates for 1997, and also had the second highest CABG rate for Medicare in 2005.

CABG use rates decreased since 1997 in every HRR in the state, with the exception of the St. Joseph HRR. St. Joseph was the only region that had virtually the same utilization rate in both 1997 and 2008 (0.8 and 0.74). Its relative ranking among HRRs changed, however, due to declines in other HRRs: In 1997, St. Joseph had the lowest use rate among HRRs in the state; in 2008, the second highest.

## BCBSM 2008 compared to Medicare 2005

In 2008, the Grand Rapids, Muskegon and Pontiac HRRs had the lowest CABG use rates for the BCBSM population. These same three HRRs also had the lowest rates among the 2005 Medicare population.

## BCBSM 2008 Use Rates—Geographic Variation

CABG use rates were at least 30 percent higher than the state average of 0.53 per 1,000 members in Saginaw (0.86); St. Joseph (0.74); and Traverse City (0.70).

At 0.38 each in Muskegon and Grand Rapids the CABG rate was more than 25 percent lower than the state average of 0.53 per 1,000 members.

---

[20] Health Aff (Millwood). 2007 Jan-Feb;26(1):162-8. U.S. trends in CABG hospital volume: the effect of adding cardiac surgery programs. Wilson CT, Fisher ES, Welch HG, Siewers AE, Lucas FL.

[21] The Dartmouth Atlas Project. Dartmouthatlas.org

[22] Circulation. 2009 Jan 27;119(3):e21-181. Epub 2008 Dec 15.

Heart disease and stroke statistics—2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Lloyd-Jones D, et. al.

FIGURE CB:15
**BCBSM CABG Utilization 2008, by HRR**

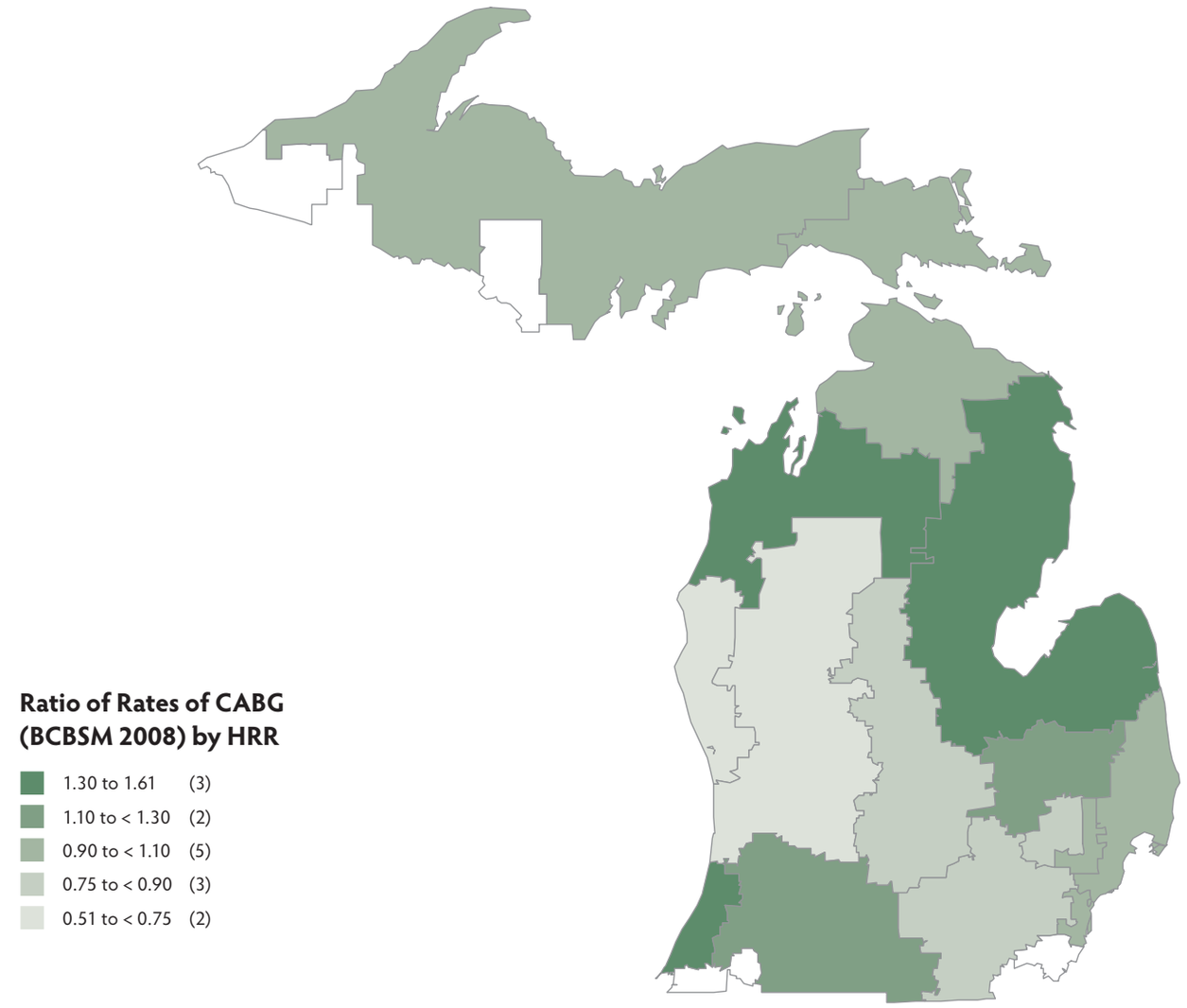



FIGURE CB:16
**BCBSM CABG Utilization, 1997 and 2008, by HRR**

| 2008 Rank | Hospital Referral Region (HRR) | Utilization per 1,000 (2008) | Ratio of Rates to the MI Average (2008) | Utilization per 1,000 (1997) | Ratio of Rates to the MI Average (1997) |
|---|---|---|---|---|---|
| 1 | Saginaw | 0.86 | 1.61 | 1.5 | 1.25 |
| 2 | St. Joseph | 0.74 | 1.40 | 0.8 | 0.67 |
| 3 | Traverse City | 0.70 | 1.31 | 1.3 | 1.08 |
| 4 | Flint | 0.67 | 1.25 | 1.4 | 1.17 |
| 5 | Kalamazoo | 0.60 | 1.13 | 1.1 | 0.92 |
| 6 | Detroit | 0.55 | 1.04 | 1.2 | 1.00 |
| 7 | Marquette | 0.49 | 0.93 | 1.1 | 0.92 |
| 8 | Royal Oak | 0.49 | 0.92 | 1.1 | 0.92 |
| 9 | Dearborn | 0.48 | 0.90 | 1.6 | 1.33 |
| 10 | Petoskey | 0.48 | 0.90 | 1.1 | 0.92 |
| 11 | Lansing | 0.47 | 0.89 | 1.1 | 0.92 |
| 12 | Ann Arbor | 0.44 | 0.83 | 1.4 | 1.17 |
| 13 | Pontiac | 0.43 | 0.81 | 1.0 | 0.83 |
| 14 | Muskegon | 0.38 | 0.72 | 1.0 | 0.83 |
| 15 | Grand Rapids | 0.38 | 0.71 | 1.1 | 0.92 |
| | Michigan Overall | 0.53 | 1.00 | 1.2 | 1.00 |

FIGURE CB:17
**Medicare CABG Utilization, 2005, by HRR**

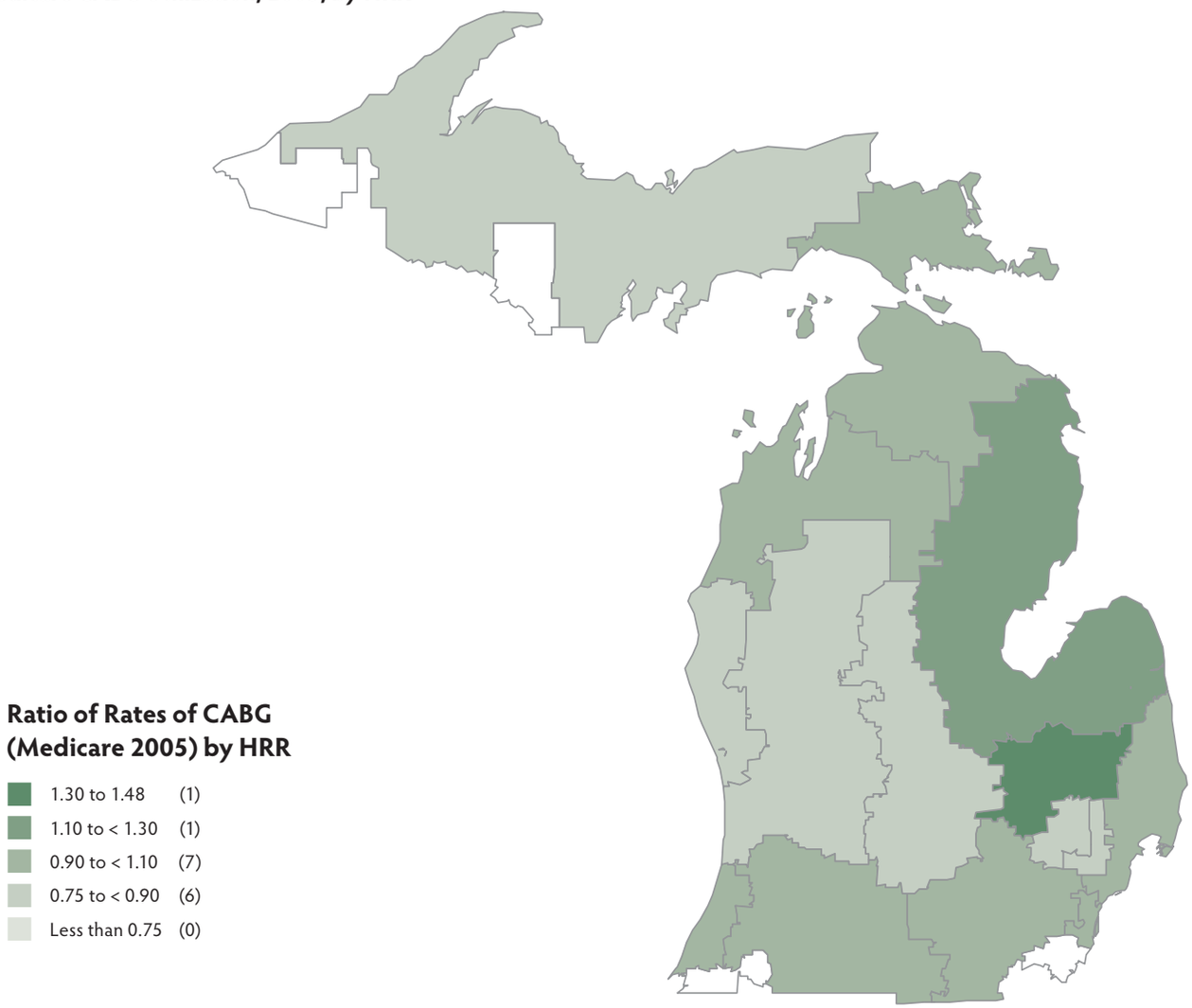



FIGURE CB:18
**Medicare CABG Utilization, 2005, by HRR**

| Rank | Hospital Referral Region (HHR) | Utilization per 1,000 | Ratio of Rates to the MI Average |
|---|---|---|---|
| 1 | Flint | 7.43 | 1.48 |
| 2 | Saginaw | 6.02 | 1.20 |
| 3 | Detroit | 5.45 | 1.09 |
| 4 | Traverse City | 5.32 | 1.06 |
| 5 | Dearborn | 5.29 | 1.06 |
| 6 | Kalamazoo | 5.24 | 1.05 |
| 7 | St. Joseph | 4.74 | 0.95 |
| 8 | Petoskey | 4.58 | 0.92 |
| 9 | Ann Arbor | 4.56 | 0.91 |
| 10 | Royal Oak | 4.47 | 0.89 |
| 11 | Marquette | 4.40 | 0.88 |
| 12 | Lansing | 4.21 | 0.84 |
| 13 | Muskegon | 4.19 | 0.84 |
| 14 | Grand Rapids | 4.04 | 0.81 |
| 15 | Pontiac | 3.93 | 0.79 |
| | Michigan | 5.00 | 1.00 |

# Percutaneous Coronary Intervention

Like coronary artery bypass surgery (CABG), percutaneous coronary intervention (PCI) is a treatment modality of invasive revascularization for patients with coronary artery disease (CAD). In patients with stable CAD, medical treatment (pharmaceutical and lifestyle interventions) is an alternative to surgical interventions. Recent research indicates that there is no difference on a population basis in life expectancy between surgical and medical interventions for patients with stable coronary artery disease. Symptom relief is, however, different for both interventions.[23]

## U.S. Trends

The national rate of PCI has increased in recent years. According to the American Heart Association, PCI rates during hospitalization increased from 2.64 per 1,000 in 2002 to 2.67 per 1,000 in 2005.[24]

## BCBSM 1997 to 2008

In 2008, 5,138 PCI procedures were performed on adult BCBSM members. In contrast to most recently reported national trends, the state average use rate decreased slightly from 2.5 interventions per 1,000 adult members in 1997 to 2.27 per 1,000 in 2008. Rates of PCI varied from 0.90 in Muskegon to 2.94 in St. Joseph (29 percent higher than the state average).

Geographic variation in the use of PCI increased between 1997 and 2008. In 2008, the HRR with the highest use rate (St. Joseph) had a rate greater than three times that of the lowest HRR (Muskegon). In 1997, the difference between the highest and lowest areas was less than double. In 1997, the HRR with the highest use rate was Saginaw—while St. Joseph ranked fourth.

Muskegon was the region with the lowest use rate of PCIs in the state in both 1997 and 2008. In addition, the utilization per 1,000 BCBSM members decreased significantly in that time period, from 1.7 to 0.90 PCIs performed per 1,000 adult BCBSM members.

Along with Muskegon, the Detroit and Dearborn HRRs had large decreases in use rates during that period (47 percent and 52 percent, respectively). These two HRRs went from being among the areas with the three highest use rates to among the lowest.

Because use rates did not decline in the Flint, Kalamazoo and St. Joseph HRRs, their use rate ranking in the state increased between 1997 and 2008 (Flint went from 12$^{th}$ to 5$^{th}$ highest, Kalamazoo from 5$^{th}$ to 2$^{nd}$ highest and St. Joseph went from 4$^{th}$ to 1$^{st}$ highest).

Of note, over the last decade PCI has moved from being a procedure performed in an inpatient setting only, to one increasingly being performed in an outpatient setting. In 2008, about one in four BCBSM PCIs occurred in an outpatient setting (vs. none in 1997). The data in this report include all settings of care.

## BCBSM 2008 Compared to Medicare 2005

In 2005, similar to the findings for the BCBSM population in 2008, the St. Joseph, Kalamazoo, and Saginaw HRRs had the highest use rates for the Medicare population, and Muskegon and Ann Arbor the lowest use rates. In two regions in the state, relative rates of use for the BCBSM and Medicare populations were quite different. Specifically, Traverse City had low use in the Medicare population, but high use in the BCBSM population. Petoskey, on the other hand, had a low use rate in the BCBSM population but a high rate among Medicare enrollees.

## BCBSM 2008 Use Rates—Geographic Variation

The highest rate of PCI was 29 percent higher than the state average of 2.27. Rates of PCI were at least 25 percent higher than the state average for the following hospital referral regions: St. Joseph (2.94) and Kalamazoo (2.88).

Detroit (1.69); Dearborn (1.47); Grand Rapids (1.45); Ann Arbor (1.21); and Muskegon (0.90) had rates that were more than 25 percent lower than the state average.

---

[23] Weintraub WS, et. al. Effect of PCI on quality of life in patients with stable coronary disease. N Engl J Med. 2008 Aug 14;359(7):677-87

[24] Circulation. 2009 Jan 27;119(3):e21-181. Epub 2008 Dec 15. Heart disease and stroke statistics--2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Lloyd-Jones D, et. al.

FIGURE CB:19
**BCBSM PCI Utilization, 2008, by HRR**

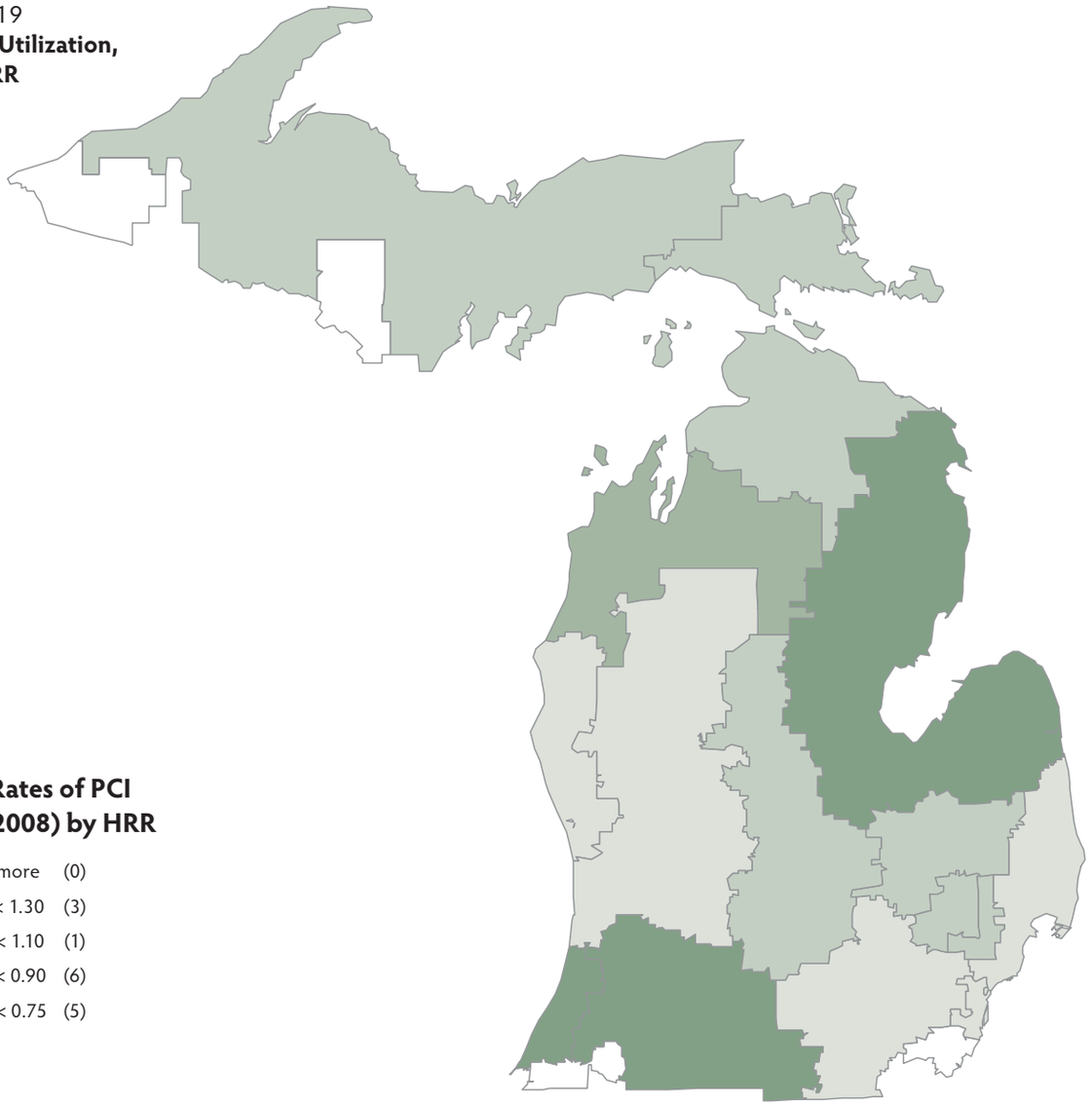



FIGURE CB:20
**BCBSM PCI Utilization, 1997 and 2008**

| 2008 Rank | HRR | Utilization per 1,000 (2008) | Ratio of Rates to the MI Average (2008) | Utilization per 1,000 (1997) | Ratio of Rates to the MI Average (1997) |
|---|---|---|---|---|---|
| 1 | St. Joseph | 2.94 | 1.29 | 3.0 | 1.20 |
| 2 | Kalamazoo | 2.88 | 1.27 | 2.9 | 1.16 |
| 3 | Saginaw | 2.79 | 1.23 | 3.3 | 1.32 |
| 4 | Traverse City | 2.41 | 1.06 | 2.8 | 1.12 |
| 5 | Flint | 1.92 | 0.85 | 1.9 | 0.76 |
| 6 | Royal Oak | 1.77 | 0.78 | 2.7 | 1.08 |
| 7 | Marquette | 1.77 | 0.78 | 1.9 | 0.76 |
| 8 | Pontiac | 1.75 | 0.77 | 2.5 | 1.00 |
| 9 | Lansing | 1.75 | 0.77 | 2.1 | 0.84 |
| 10 | Petoskey | 1.74 | 0.77 | 2.2 | 0.88 |
| 11 | Detroit | 1.69 | 0.74 | 3.2 | 1.28 |
| 12 | Dearborn | 1.47 | 0.65 | 3.1 | 1.24 |
| 13 | Grand Rapids | 1.45 | 0.64 | 1.7 | 0.68 |
| 14 | Ann Arbor | 1.21 | 0.53 | 2.1 | 0.84 |
| 15 | Muskegon | 0.90 | 0.40 | 1.7 | 0.68 |
| | Michigan Overall | 2.27 | 1.00 | 2.5 | 1.00 |

FIGURE CB:21
**Medicare PCI Utilization, 2005, by HRR**

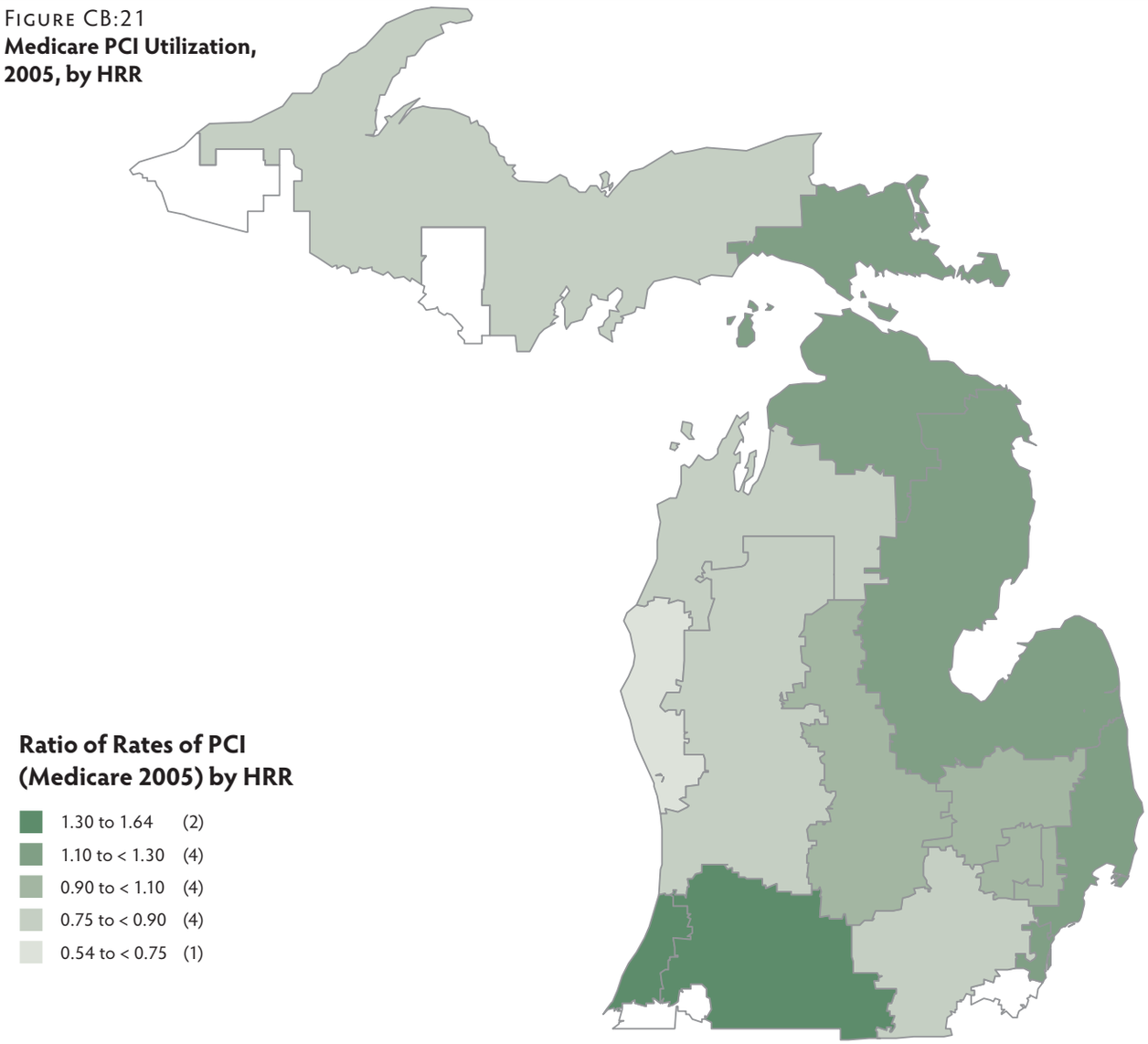



FIGURE CB:22
**Medicare PCI Utilization, 2005, by HRR**

| Rank | Hospital Referral Region (HRR) | Utilization per 1,000 | Ratio of Rates to the MI Average |
|---|---|---|---|
| 1 | St. Joseph | 23.87 | 1.64 |
| 2 | Kalamazoo | 19.92 | 1.36 |
| 3 | Saginaw | 17.47 | 1.20 |
| 4 | Dearborn | 16.39 | 1.12 |
| 5 | Petoskey | 16.25 | 1.11 |
| 6 | Detroit | 16.22 | 1.11 |
| 7 | Pontiac | 15.22 | 1.04 |
| 8 | Lansing | 14.19 | 0.97 |
| 9 | Royal Oak | 14.14 | 0.97 |
| 10 | Flint | 13.16 | 0.90 |
| 11 | Grand Rapids | 12.31 | 0.84 |
| 12 | Marquette | 11.94 | 0.82 |
| 13 | Traverse City | 11.86 | 0.81 |
| 14 | Ann Arbor | 11.33 | 0.78 |
| 15 | Muskegon | 7.93 | 0.54 |
| | Michigan | 14.59 | 1.00 |

Many hospital admissions are for conditions for which evidence suggests at least part of the hospitalization could have been prevented if managed appropriately as part of outpatient care. These conditions are referred to as "ambulatory care sensitive conditions" (ACSCs). For the purposes of our analysis we examined admissions for 16 distinct ACSCs (as defined by the Agency for Healthcare Research and Quality [AHRQ]) to determine a total ACSC rate.[25]

Due to methodological constraints between the 1997 BCBSM analysis of geographic variation and our current analysis, we cannot make direct comparisons by procedure for geographic variation over time for the Michigan BCBSM population.[26] However, when comparing rates it is clear that since 1997, the rate of admissions for ACSCs in the BCBSM population has decreased overall. In 2008, there were 36 ACSC admissions per 10,000 BCBSM members, down from 71 admissions per 10,000 adult BCBSM members in 1997.

Despite the drop in overall admissions for ACSCs, there was considerable geographic variation in these use rates. For the BCBSM population in 2008, rates ranged from 38 percent below the state average in the Muskegon HRR to 32 percent above the state average in the Dearborn HRR. Similarly, for the Medicare population in 2005, rates ranged from 34 percent below the national average in Muskegon to 31 percent higher than the national average in Dearborn.

Some health service researchers have suggested that the incidence of hospitalizations for ambulatory care-sensitive conditions is an indicator of access to primary care. They assert that when access to primary care is poor, patients with diseases that could be managed in ambulatory settings are more likely to require hospitalization.[27] In Michigan, there is little variation in the number of primary care providers by HRR: the average is 76.4 PCPs per 100,000 residents, ranging from a low of 66.6 per 100,000 (13 percent below) to 89.2 per 100,000 (17 percent above average). This compares to a national average of 71.9 per 100,000.[28]

[25] Conditions include: Diabetes Short-term Complications Admission Rate; Perforated Appendix Admission Rate; Diabetes Long-term Complications Admission Rate; Chronic Obstructive Pulmonary Disease (COPD) Admission Rate; Hypertension Admission Rate; Congestive Heart Failure (CHF) Admission Rate; Dehydration Admission Rate; Bacterial Pneumonia Admission Rate; Urinary Tract Infection Admission Rate; Angina without Procedure Admission Rate; Uncontrolled Diabetes Admission Rate; Adult Asthma Admission Rate; Rate of Lower-extremity Amputation among Patients with Diabetes.

[26] 1997 geographic variation analysis of ACSC among BCBSM members was done at the HSA level. Our current analysis is by HRR.

[27] The Dartmouth Atlas of Health Care in Michigan, 1997

[28] The Dartmouth Atlas Project, Dartmouthatlas.org

FIGURE CB:23

**BCBSM Hospitalization Rates for Ambulatory Care Sensitive Conditions, 2008, by HRR**

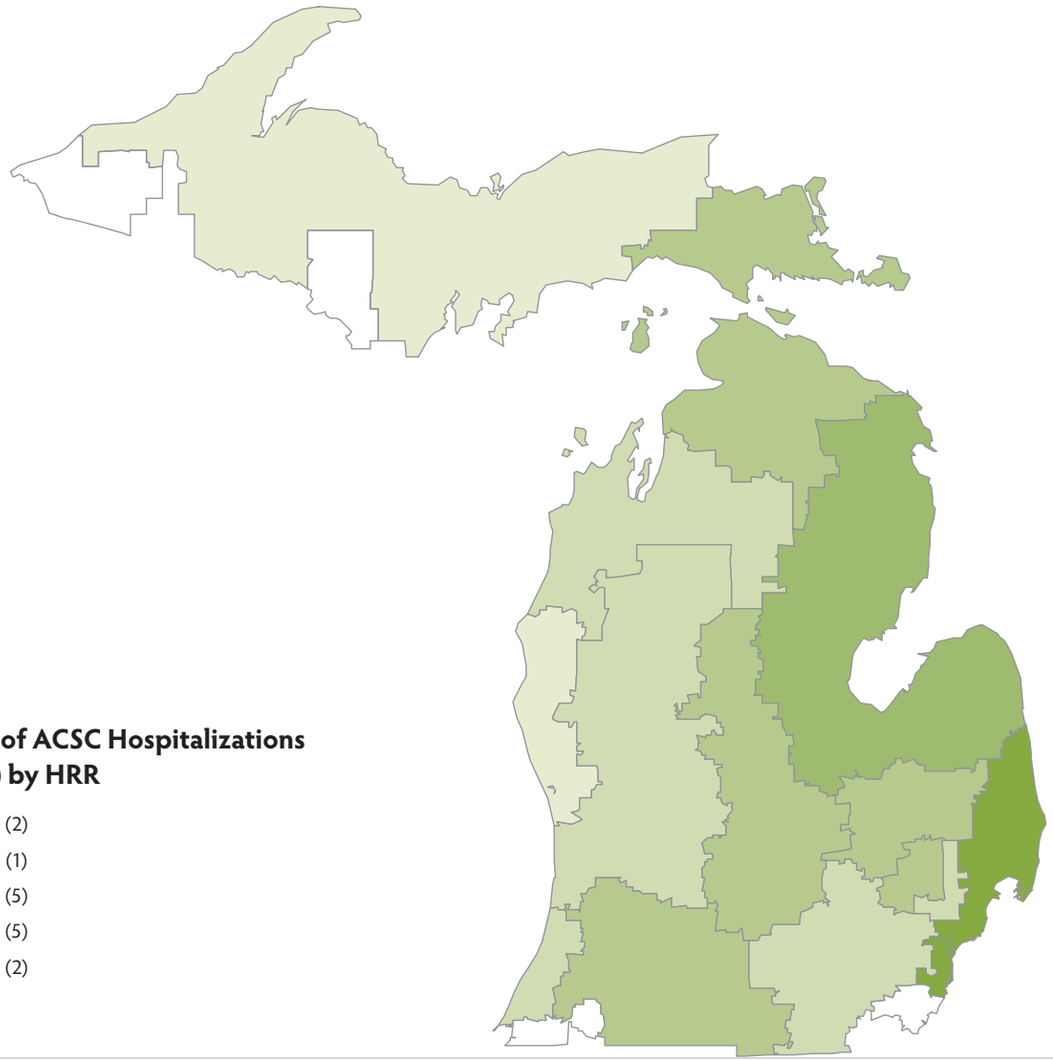



FIGURE CB:24

**BCBSM Hospitalization Rates for Ambulatory Care Sensitive Conditions, 2008, by HRR**

| Rank | Hospital Referral Region (HRR) | Utilization per 100,000 | Ratio of Rates to the MI Average |
|---|---|---|---|
| 1 | Dearborn | 4.84 | 1.32 |
| 2 | Detroit | 4.77 | 1.31 |
| 3 | Saginaw | 4.07 | 1.11 |
| 4 | Lansing | 3.85 | 1.05 |
| 5 | Flint | 3.85 | 1.05 |
| 6 | Pontiac | 3.39 | 0.93 |
| 7 | Kalamazoo | 3.37 | 0.92 |
| 8 | Petoskey | 3.31 | 0.91 |
| 9 | St. Joseph | 3.23 | 0.88 |
| 10 | Ann Arbor | 3.17 | 0.87 |
| 11 | Royal Oak | 3.09 | 0.85 |
| 12 | Grand Rapids | 2.79 | 0.76 |
| 13 | Traverse City | 2.76 | 0.76 |
| 14 | Marquette | 2.70 | 0.74 |
| 15 | Muskegon | 2.25 | 0.62 |
| | Michigan Overall | 3.66 | 1.00 |

Attention-deficit/hyperactivity disorder (ADHD) is a condition that affected 4.5 million school-aged children in the U.S. in 2006.[29] Pharmaceutical therapy is just one of several ways to treat the disorder, and medications have been available since the 1950s.

### U.S. Trends

Nationally in 2005, 4.4 percent of children (ages 0 to 19) used ADHD medications.[30] In 2003, Michigan ranked 15th highest in the country in the rate of diagnosis of ADHD among youths ages 4 to 17.[31] Rates of medication treatment strongly correlate with rates of diagnosis. Nationally, diagnosis of ADHD increased an average of three percent per year from 1997 to 2006.[32]

### BCBSM 1997 to 2008

Use of pediatric ADHD drugs among the BCBSM population was studied in 1997 as well. In fact, the use of these drugs was the most variable of the drugs studied. There was also considerable geographic variation in prescription ADHD drug rates for children in Michigan in 2008. Rates of filled prescriptions in Ironwood were 5.64 percent, 1.5 times the state average and 3.5 times higher than Alpena (1.59 percent).

In both 1997 and 2008, the Grosse Pointe, Grand Haven, and Kalamazoo HSAs were at least 30 percent higher than the state average. In both time periods, seven service areas—Cadillac, Hillsdale, Owosso, Mount Pleasant, Hancock, Cass City, and Alpena—were at least 25 percent below the state average.

### BCBSM 2008 Use Rates—Geographic Variation

Among the hospital service areas where children were more likely than the average to receive prescriptions of ADHD drugs, the highest rates were in the following HSAs: Ironwood (5.64 percent); Albion (5.64 percent); Grosse Pointe (5.42 percent); Muskegon (5.40 percent); and Dowagiac (5.08 percent).

Among the hospital service areas where children were less likely than the average to receive prescriptions for ADHD drugs, the lowest rates were in the following HSAs: Hillsdale (2.33 percent); Mount Pleasant (2.28 percent); Detroit (2.22 percent); Hancock (2.13 percent); and Alpena (1.59 percent).

---

[29] Bloom B, Cohen RA. Summary Health Statistics for U.S. Children: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10(234). 2007.

[30] Castle, Lon, Aubert, Ronald E., Verbrugge, Robert R., Khalid, Mona, & Epstein, Robert S. (2007). Trends in medication treatment for ADHD. Journal of Attention Disorders, 10(4), Retrieved from http://jad.sagepub.com/content/10/4/335 doi: 10.1177/1087054707299597

[31] Bloom B, Cohen RA. Summary Health Statistics for U.S. Children: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10(234). 2007

[32] Bloom B, Cohen RA. Summary Health Statistics for U.S. Children: National Health Interview Survey, 2006. National Center for Health Statistics. Vital Health Stat 10(234). 2007

FIGURE CB:25

**BCBSM ADHD Pediatric Prescription Rate, 2008, by HSA**

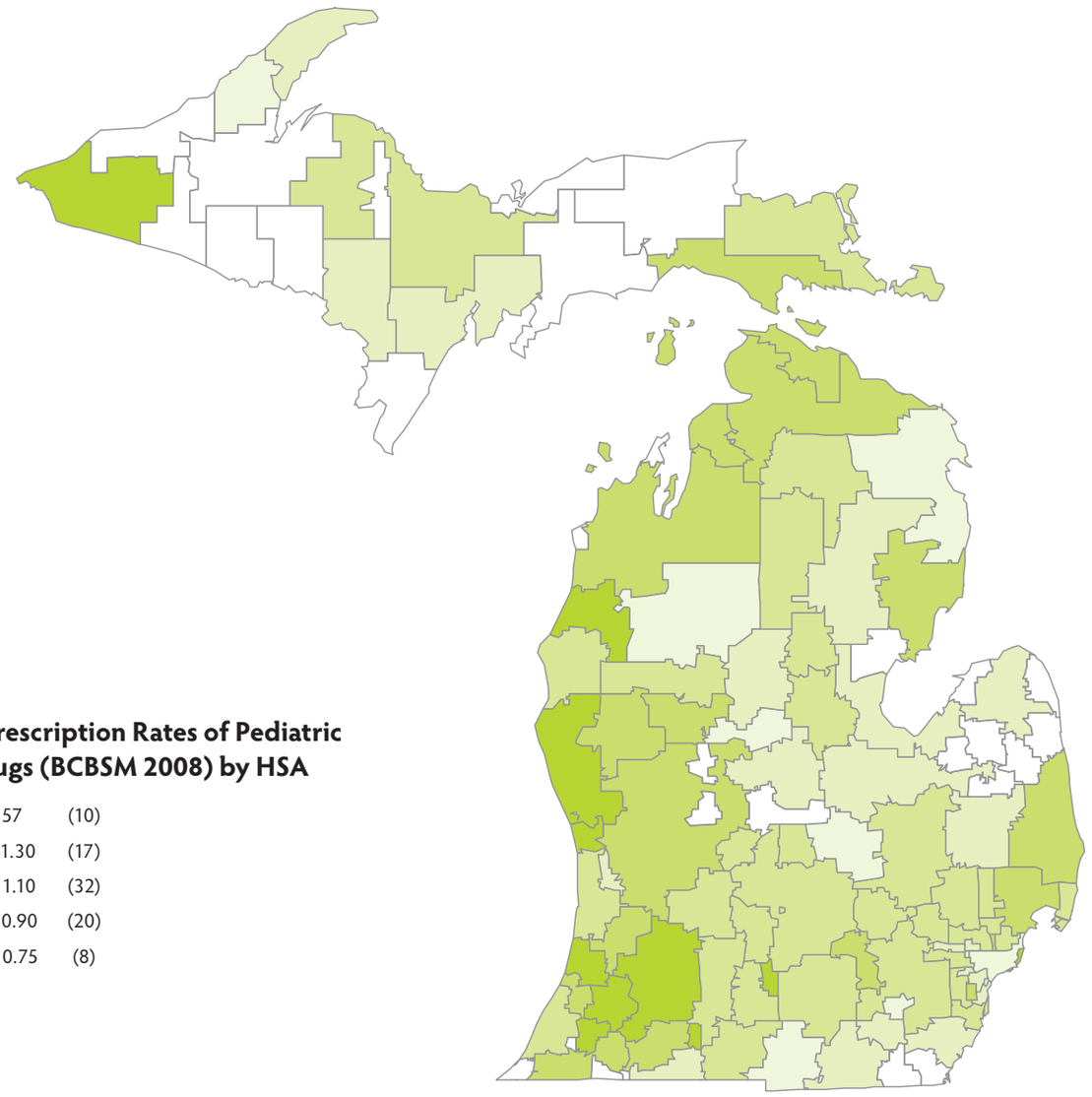


FIGURE CB:26
**BCBSM ADHD Pediatric Prescription Rate, 2008, by HSA**

| Rank | Hospital Service Area (HSA) | Prescription Rates (2008) | Ratio of Rates of Prescription to the MI Average (2008) | Prescription Rates (1997) | Ratio of Rates of Prescription to the MI Average(1997) |
|---|---|---|---|---|---|
| 1 | Ironwood | 5.64% | 1.57 | 3.5% | 0.97 |
| 2 | Albion | 5.64% | 1.57 | | |
| 3 | Grosse Pointe | 5.42% | 1.51 | 6.3% | 1.75 |
| 4 | Muskegon | 5.40% | 1.50 | 4.0% | 1.11 |
| 5 | Dowagiac | 5.08% | 1.41 | 1.8% | 0.50 |
| 6 | Grand Haven | 5.01% | 1.39 | 4.9% | 1.36 |
| 7 | Paw Paw | 4.99% | 1.39 | 4.6% | 1.28 |
| 8 | Manistee | 4.94% | 1.37 | 4.5% | 1.25 |
| 9 | Kalamazoo | 4.79% | 1.33 | 4.9% | 1.36 |
| 10 | South Haven | 4.68% | 1.30 | 3.2% | 0.89 |
| 11 | Traverse City | 4.60% | 1.28 | 5.1% | 1.42 |
| 12 | Three Rivers | 4.54% | 1.26 | 4.2% | 1.17 |
| 13 | Port Huron | 4.44% | 1.24 | 4.8% | 1.33 |
| 14 | Watervliet | 4.41% | 1.23 | 2.6% | 0.72 |
| 15 | Madison Heights | 4.41% | 1.23 | 4.4% | 1.22 |
| 16 | Charlevoix | 4.39% | 1.22 | 4.3% | 1.19 |
| 17 | Grand Rapids | 4.31% | 1.20 | 4.3% | 1.19 |
| 18 | Fremont | 4.23% | 1.18 | 2.8% | 0.78 |
| 19 | Niles | 4.16% | 1.16 | 2.7% | 0.75 |
| 20 | Tawas City | 4.11% | 1.14 | 3.3% | 0.92 |
| 21 | Big Rapids | 4.11% | 1.14 | 3.4% | 0.94 |
| 22 | Mount Clemens | 4.07% | 1.13 | 4.8% | 1.33 |
| 23 | Taylor | 4.04% | 1.12 | 3.2% | 0.89 |
| 24 | Allegan | 4.03% | 1.12 | 4.4% | 1.22 |
| 25 | Chelsea | 3.98% | 1.11 | 3.2% | 0.89 |
| 26 | Petoskey | 3.97% | 1.10 | 4.3% | 1.19 |
| 27 | Cheboygan | 3.94% | 1.10 | 4.4% | 1.22 |
| 28 | Royal Oak | 3.91% | 1.09 | 4.4% | 1.22 |
| 29 | Milford | 3.90% | 1.09 | 4.3% | 1.19 |
| 30 | Pontiac | 3.86% | 1.07 | 3.8% | 1.06 |
| 31 | Warren | 3.85% | 1.07 | 5.4% | 1.50 |
| 32 | St. Clair | 3.84% | 1.07 | 5.0% | 1.39 |
| 33 | Trenton | 3.75% | 1.04 | 4.1% | 1.14 |
| 34 | Howell | 3.74% | 1.04 | 2.8% | 0.78 |
| 35 | Jackson | 3.73% | 1.04 | 3.5% | 0.97 |
| 36 | Wayne | 3.73% | 1.04 | 3.8% | 1.06 |
| 37 | Rochester | 3.71% | 1.03 | 4.1% | 1.14 |
| 38 | Ionia | 3.68% | 1.02 | 3.1% | 0.86 |
| 39 | Holland | 3.66% | 1.02 | 2.9% | 0.81 |
| 40 | St. Joseph | 3.65% | 1.02 | 2.3% | 0.64 |
| 41 | Reed City | 3.65% | 1.01 | 2.3% | 0.64 |
| 42 | Coldwater | 3.59% | 1.00 | 3.1% | 0.86 |
| 43 | Charlotte | 3.57% | 0.99 | 3.9% | 1.08 |
| 44 | Hastings | 3.57% | 0.99 | 4.2% | 1.17 |
| 45 | Midland | 3.57% | 0.99 | 2.8% | 0.78 |
| 46 | Sault Ste Marie | 3.56% | 0.99 | 2.1% | 0.58 |
| 47 | Livonia | 3.53% | 0.98 | 4.3% | 1.19 |
| 48 | Grayling | 3.49% | 0.97 | 3.4% | 0.94 |
| 49 | Flint | 3.49% | 0.97 | 2.7% | 0.75 |

| Rank | Hospital Service Area (HSA) | Prescription Rates (2008) | Ratio of Rates of Prescription to the MI Average (2008) | Prescription Rates (1997) | Ratio of Rates of Prescription to the MI Average(1997) |
|---|---|---|---|---|---|
| 50 | Ann Arbor | 3.48% | 0.97 | 3.8% | 1.06 |
| 51 | Lansing | 3.44% | 0.96 | 3.2% | 0.89 |
| 52 | Battle Creek | 3.36% | 0.94 | 3.3% | 0.92 |
| 53 | Gaylord | 3.36% | 0.94 | 2.2% | 0.61 |
| 54 | Ludington | 3.33% | 0.93 | 4.2% | 1.17 |
| 55 | Marquette | 3.32% | 0.92 | 2.8% | 0.78 |
| 56 | Marshall | 3.28% | 0.91 | 3.4% | 0.94 |
| 57 | Troy | 3.26% | 0.91 | 3.5% | 0.97 |
| 58 | St. Johns | 3.24% | 0.90 | 3.5% | 0.97 |
| 59 | Gladwin | 3.22% | 0.90 | 2.1% | 0.58 |
| 60 | Lapeer | 3.20% | 0.89 | 3.7% | 1.03 |
| 61 | Escanaba | 3.19% | 0.89 | 4.8% | 1.33 |
| 62 | Laurium | 3.16% | 0.88 | | |
| 63 | Alma | 3.13% | 0.87 | 1.9% | 0.53 |
| 64 | Saginaw | 3.13% | 0.87 | 2.3% | 0.64 |
| 65 | Iron Mountain | 3.12% | 0.87 | 4.9% | 1.36 |
| 66 | Sturgis | 3.09% | 0.86 | 2.6% | 0.72 |
| 67 | Bay City | 3.09% | 0.86 | 2.4% | 0.67 |
| 68 | Zeeland | 3.09% | 0.86 | 2.9% | 0.81 |
| 69 | Garden City | 3.05% | 0.85 | 4.4% | 1.22 |
| 70 | West Branch | 3.01% | 0.84 | 2.7% | 0.75 |
| 71 | Monroe | 3.00% | 0.83 | 3.7% | 1.03 |
| 72 | Farmington Hills | 2.94% | 0.82 | 3.6% | 1.00 |
| 73 | Wyandotte | 2.90% | 0.81 | 3.2% | 0.89 |
| 74 | Southfield | 2.89% | 0.80 | 2.4% | 0.67 |
| 75 | Clare | 2.88% | 0.80 | 2.1% | 0.58 |
| 76 | Dearborn | 2.86% | 0.80 | 3.0% | 0.83 |
| 77 | Adrian | 2.86% | 0.79 | 2.5% | 0.69 |
| 78 | Tecumseh | 2.77% | 0.77 | 2.9% | 0.81 |
| 79 | Bad Axe | 2.74% | 0.76 | 2.7% | 0.75 |
| 80 | Saline | 2.61% | 0.73 | 3.9% | 1.08 |
| 81 | Owosso | 2.61% | 0.73 | 2.6% | 0.72 |
| 82 | Cadillac | 2.45% | 0.68 | 2.8% | 0.78 |
| 83 | Hillsdale | 2.33% | 0.65 | 2.8% | 0.78 |
| 84 | Mount Pleasant | 2.28% | 0.64 | 2.5% | 0.69 |
| 85 | Detroit | 2.22% | 0.62 | 2.0% | 0.56 |
| 86 | Hancock | 2.13% | 0.59 | 2.3% | 0.64 |
| 87 | Alpena | 1.59% | 0.44 | 1.8% | 0.50 |
| | Caro | | | 3.4% | 0.94 |
| | Carson City | | | 1.6% | 0.44 |
| | Cass City | | | 1.9% | 0.53 |
| | Greenville | | | 2.9% | 0.81 |
| | Standish | | | 2.7% | 0.75 |
| | Michigan Overall | 3.59% | 1.00 | 3.6% | 1.00 |

[33] The following hospital service areas have data suppressed in 2008 and are not included in the table: Berrien Center, Caro, Carson City, Cass City, Crystal Falls, Deckerville, Frankfort, Greenville, Harbor Beach, Iron River, Ishpeming, Lakeview, L'anse, Manistique, Marlette, Munising, Newberry, Northport, Ontonagon, Pigeon, Sandusky, and Standish.

# METHODOLOGY

This report generally replicates the methodology of the Dartmouth Atlas project, which has evolved over the past 20 years.

Unlike the Dartmouth project, however, this report focuses on commercially insured non-elderly adults (ages 18 to 64) and pediatric (ages 0 to 17) populations. Furthermore, all data in this report are adjusted for differences in patient age, gender, and health risk.

In this report, we focus on 2008 utilization data among the Blue Cross and Blue Shield of Michigan (BCBSM) non-Medicare adult population for the following hospital admissions, diagnostic tests, and procedures, and a pediatric population for prescription drugs:

- Low Back Computed Tomography (CT) Scans
- Back Surgery
- Cesarean Sections (C-Sections)
- Hysterectomy
- Coronary Artery Bypass Graft (CABG)
- Percutaneous Coronary Intervention (PCI)
- Cardiac Catheterization
- Ambulatory Care Sensitive Conditions (ACSC)
- Pediatric Attention-deficit/Hyperactivity Disorder (ADHD) Drugs

These procedures were chosen because they are either among the services that are often analyzed nationally for variation in the use of discretionary treatment (such as elective surgery) or because they are indicative of a variation in the intensity of care (such as hospitalizations for ambulatory care sensitive conditions). In addition, because of the wide variation shown in the 1997 analysis of BCBSM members, we also included an update on the use of the prescription drugs for ADHD.[34] As in the Dartmouth Atlas project, geographic analyses are focused on geographical units called hospital service areas and hospital referral regions. Hospital referral regions (HRRs) are aggregations of hospital service areas (HSAs). An HSA is a collection of zip codes wherein most hospitalizations occur in hospitals within that area. Hospital referral regions represent regional health care markets for tertiary medical care. All of our analyses are based on member residence. In order to compare variation trends from 1997, this report uses HRR and HSA data for the same procedures used by the 1997 analysis of BCBSM members.

The numbers of surgical and diagnostic procedures performed are expressed as procedures per 1,000 BCBSM members in the hospital referral region. Some data have been suppressed for any HSA or HRR due to statistical imprecision and will appear as white regions on the map.[35] All rates in our analysis have been adjusted to remove the differences that might be due to the different age and sex composition of local populations. For a complete description and methods, please see the CHRT website at **www.CHRT.org**.

[34] Methods for identify procedures and service use are based on either the Agency for Healthcare Research and Quality's (AHRQ's) prevention quality indicators, or the Dartmouth Atlas of Care. Selection of codes was based on review of the literature and/or consultation with clinical experts. "ambulatory care sensitive conditions" refer to hospitalizations, such as asthma, pneumonia, chronic pulmonary obstructive disease, and congestive heart failure.

[35] All suppressed data were included in the overall Michigan totals and did not affect the state averages.

CHRT

CENTER FOR HEALTHCARE
RESEARCH & TRANSFORMATION

**Center for Healthcare Research & Transformation**

2929 Plymouth Road, Suite 245  Ann Arbor, MI  48105-3206

Phone: 734-998-7555  chrt-info@umich.edu  www.chrt.org