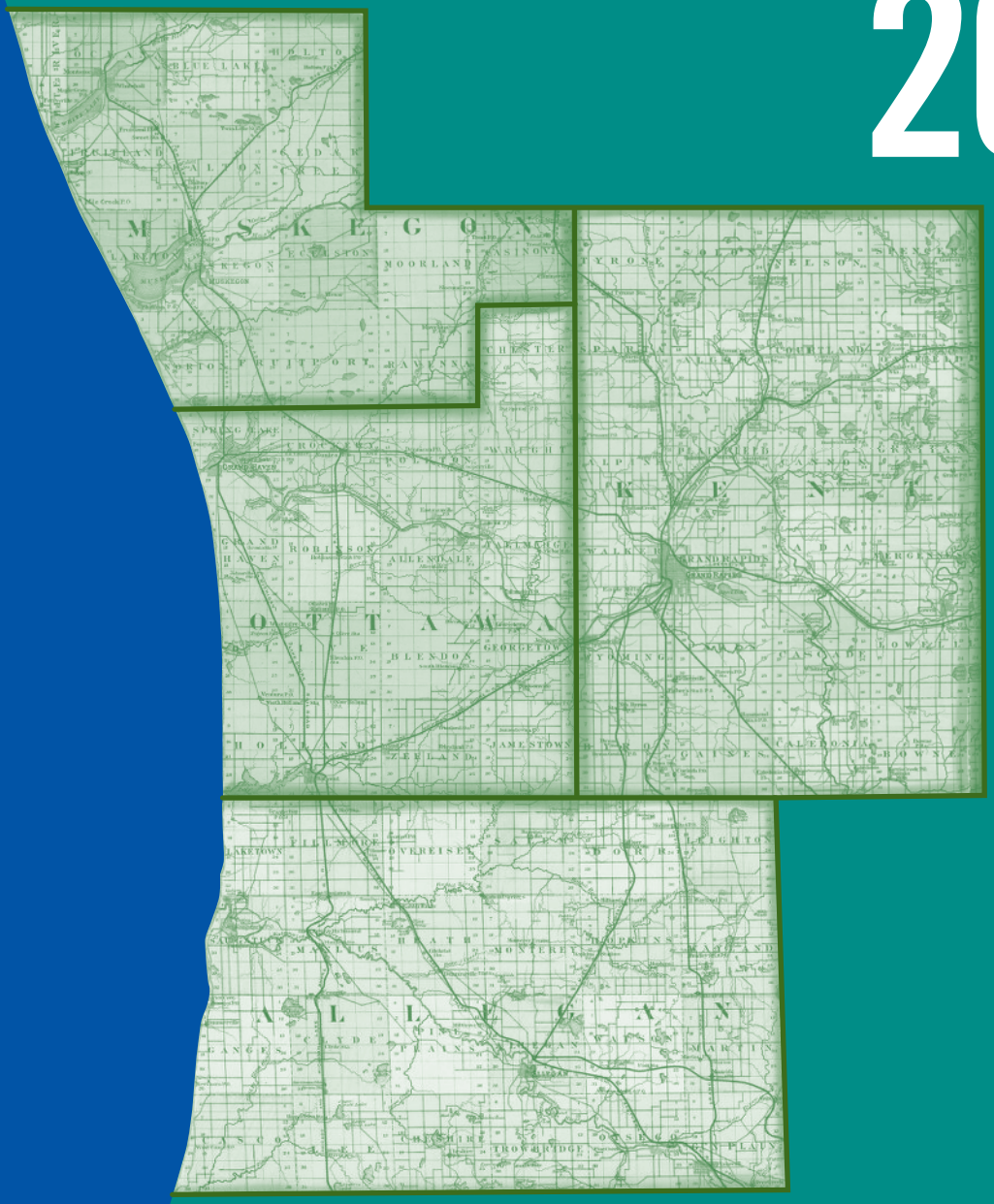
KENT COUNTY OTTAWA COUNTY MUSKEGON COUNTY ALLEGAN COUNTY

Health Check

ANALYZING TRENDS IN WEST MICHIGAN

2023



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Grand Valley State University

Health Check:
Analyzing Trends in West Michigan 2023

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GRAND VALLEY STATE UNIVERSITY
KIRKHOF COLLEGE OF NURSING

February 3, 2023

Dear Colleagues,

We are pleased to present Health Check 2023: Analyzing Trends in West Michigan. This report represents the collaborative efforts of Grand Valley State University's Kirkhof College of Nursing (KCON), Seidman College of Business, Blue Cross Blue Shield of Michigan, Blue Care Network, and Priority Health.

This is the 14th year of Health Check and its analysis of data relevant to health and health care in Kent, Ottawa, Muskegon, and Allegan (KOMA) counties. The ongoing and consistent examination of this health-related data over time continues to serve as an important tool to inform the decision-making processes and policies of the government, health care systems, education, and business.

Economic analysis uses data from our insurance provider partners, the American Hospital Association, the Centers for Disease Control and Prevention, and other sources to better understand the economic influence of health care in West Michigan. The evolution of health care trends over time in West Michigan is explored along with benchmarking with other peer communities and the Detroit area. In particular, the insurance provider data on average costs for several conditions provide unique insights into how costs are evolving in our area. Starting last year, the importance of how diverse communities interact with the health care system was added and this has been expanded upon this year.

We will continue to study and bring forward data that will help our communities address major issues in health care. We are pleased to play a role in contributing to relevant decision-making in our local and state partner organizations to ensure safe, high-quality, and cost-effective health care planning for our community.

Respectfully,

Katherine Moran

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All the data used in this project are based on primary and secondary sources. We acknowledge our data sources in each section by listing source information; these sources are not duplicated or specifically cited in text discussions to preserve readability.

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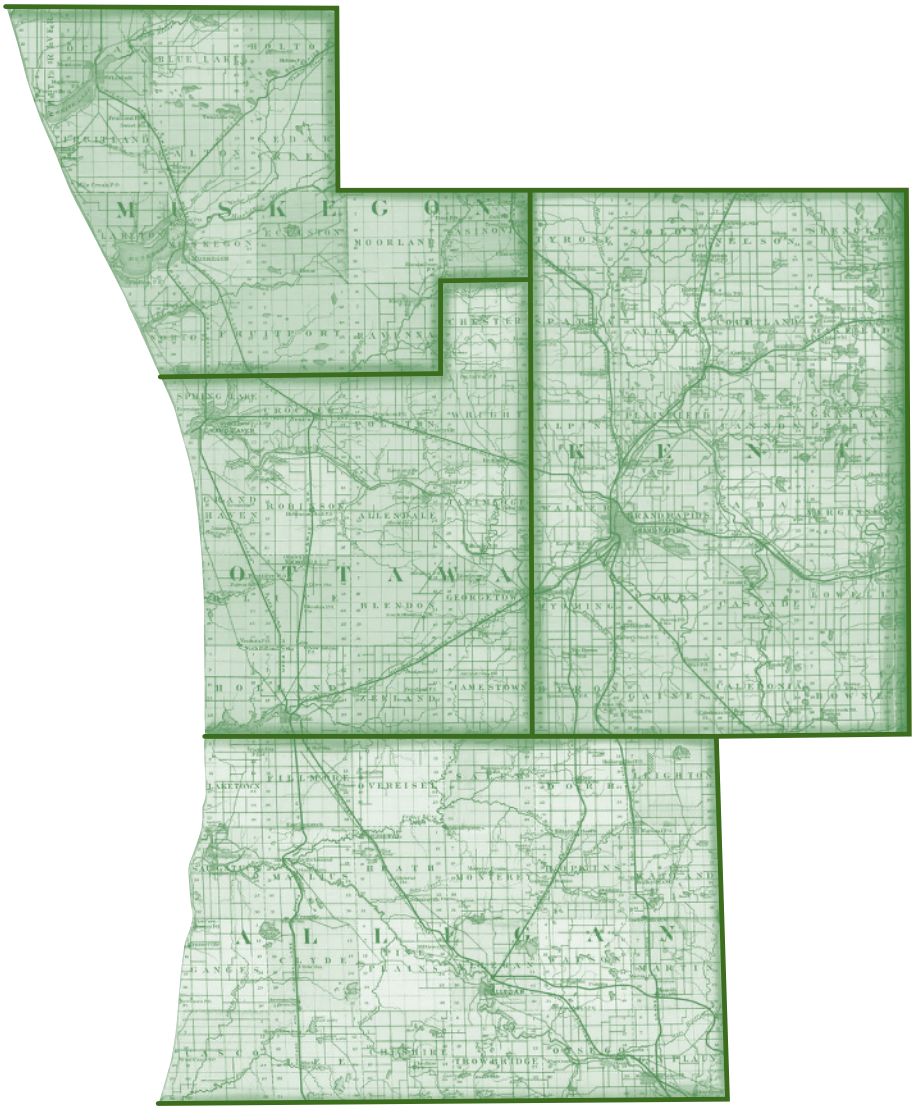
Michigan Health and Hospital Association
Michigan Bureau of Labor Market Information and Strategic Initiatives (milmi.org as part of michigan.gov)
U.S. Census Bureau
U.S. Department of Health and Human Services (ARF file 2011-2012)
United States Patent and Trademark Office
World Intellectual Property Organization



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Executive Summary

Knowledge Foundations

Education and Job Growth

This year's job growth numbers suggest that there was a rapid recovery in the U.S. economy after the global outbreak of the novel coronavirus (COVID-19). The positive economic outlook in the U.S. since 2015 was disrupted by an unprecedented public health crisis in 2020. Specifically, there was a sharp decline in job growth by about 2 percent in April 2020 when compared to the 2005 baseline in the U.S. However, in the following months, from May 2020 through June 2022, the U.S. economy experienced increases in job growth. In fact, the economy reached a new high since the pandemic, with a 14 percent job growth in June 2022.

On the other hand, the Michigan economy experienced a 23 percent drop in job growth in April 2020 from the 2005 benchmark. Because the pandemic had a more pronounced effect on Michigan's economy, ameliorating the losses in total employment is taking more effort and time, leading to a relatively slower recovery.

On a positive note, the gap in job growth between Michigan and the entire U.S. has continued to narrow from a gap of 21 percentage points in April 2020 to 16 percentage points in June 2022. Although we still do not have a complete picture about how jobs in the health care industry are changing as the pandemic progresses, though at a slower pace, we present data on job growth in 2021.

Despite the substantial impact of COVID-19 on job loss in Michigan and the slow recovery, we continue to see large gains in Grand Rapids' health care industry jobs. Specifically, based on data from the Bureau of Labor Statistics (BLS), we expect to see the highest number of annual job openings for dental assistants, home health and personal care aides, medical assistants, registered nurses (RNs), licensed practical or vocational nurses (LPNs or LVNs), and nursing aides and assistants at both the city and state levels. Different from Grand Rapids, the State of Michigan is also likely to have more job openings for dental hygienists, emergency medical technicians (EMTs) and paramedics, nurse practitioners, physical therapists, and physician assistants.

Additionally, we compared earning gains and losses for Grand Rapids to the State of Michigan and the U.S. as a whole. Since 2005, real wages for dental assistants, diagnostic medical sonographers, dietitians and nutritionists, EMTs and paramedics, medical assistants, registered nurses, physical therapists, respiratory therapists, speech-language pathologists, and surgical technologists increased nationally, but have declined in both Michigan and Grand Rapids. Between 2020 and 2021, we find that occupational therapy assistants experienced real annual earnings gains above 7 percent in Grand Rapids. We further observe a sharp decline in mean annual earnings for dental assistants, optometrists, and family medicine practitioners in Grand Rapids.

Medical Innovation

There has been an increase in medical patent activity in West Michigan since the 1990s, along with a growing number of new innovators. Patents with inventors residing in Kent County have increased from an annual average of 12.6 from 1990 to 1999 to 16.3 from 2000 to 2009, with a slight decrease to 15.9 patents from 2010 to 2021. However, behind these averages is a concerning recent development — a significant decrease in the number of medical patents since 2014, mirroring a decline seen nationally and statewide. In addition, medical patenting in the region is coming from a relatively small number of companies.

Because patented medical innovations have a great potential for creating wealth and economic growth in West Michigan, continued research and development support is vital. Fortunately, National Institute of Health funding in West Michigan has grown substantially, possibly resulting in innovations and knowledge that do not result in patents.

Health Care Trends

Demographic Changes

In this year's report, we continue to monitor trends in population demographics in West Michigan and the Detroit region and compare changes in these trends to national averages. We continue to note a shift in population density from East Michigan to West Michigan, with the Detroit region demonstrating -0.54 percent growth rate in 2021, compared to 0.27 percent growth in the Kent, Ottawa, Muskegon, and Allegan (KOMA) counties.

While the 2021 growth rate in West Michigan is below the 1.26 percent growth rate noted in 2013, population growth still surpasses the 2021 national average of 0.12 percent. We also continue to track the increase in population age, with the proportion of the population over the age of 65 continuing to increase across both the KOMA and Detroit regions. In 2021, the 65 and older population made up approximately 16 percent of the KOMA region population and 17 percent of the Detroit region population.

Health Care Overview

In this year's report, we continue to examine trends across health insurance, health care access, general health status, mental health, and health risk behaviors. We further focus on health disparities by race and gender from 2011 until 2020. A new topic that we explore this year in detail is access to specific types of preventive care (e.g., flu shots, HIV testing, and cancer screenings), particularly during COVID-19.

We first monitor trends in health insurance and health care access. Our findings in general suggest that non-white individuals are more likely to be uninsured, are more likely to have limited access to care due to costs, and less likely to have a usual source of care, particularly in the Kent, Ottawa, Muskegon, and Allegan (KOMA) counties.

There are also major disparities in accessing preventive care among males and females. Historically, males are less likely to have routine checkups compared to females. However, we observe major shifts in these trends during the first year of the pandemic.

First, we find a surge in health insurance enrollment among non-white individuals. Second, there is a major decline in the percentage of individuals reporting having no health care access due to costs in 2020. Both federal subsidies and increased public health insurance enrollment may have played an important role in reducing barriers related to costs. However, we also observe declines in access to preventive care during the COVID-19 period. This may be a worrisome development from a public health perspective since delaying care for treatable and preventable disease may contribute to excess deaths directly or indirectly related to the pandemic.

We further break down trends by specific types of preventive care. First, we find that non-white individuals and those identifying as lesbian, gay, bisexual, and transgender (LGBT) are more likely to be tested for HIV. However, there is a decline in HIV testing among these individuals during COVID-19. Second, we observe a sharp decline in breast and cervical cancer screening, prostate cancer screening, and colorectal cancer screening in KOMA. On a positive note, flu vaccination take-up appears to be increasing across races and genders in 2020.

Next, we track changes in inadequate sleeping by race and gender, which are likely to be correlated with physical and mental health problems, as well as risky health behaviors. We find that non-white individuals are more likely to report having inadequate sleep relative to white individuals. Specifically, about one in two non-white individuals experience inadequate sleep. This could potentially worsen physical and mental health. In fact, we find that non-white individuals are more likely to report fair or poor health in general.

When examining mental health problems in the Detroit and KOMA regions, we find major disparities with respect to race from 2011 to 2015. On average, 17 percent of non-white individuals reported having mental health problems, whereas the prevalence of poor mental health was around 12 percent for white individuals. However, mental health problems reached a new high during the first year of the pandemic. The percentage of white individuals with mental health problems increased from 14.3 percent in 2019 to 17 percent during the pandemic in the Detroit region, while the increase went from 11.4 percent in 2019 to 13.1 percent in KOMA. A further exploration of the trends in poor mental health days implies that the increase in mental health problems during the pandemic is more likely to be driven by females than males in both regions.

Additionally, we analyze the trends in risk factors related to alcohol consumption and smoking by race and gender. Our findings suggest that white individuals are likely to consume more alcohol than non-white individuals in West Michigan and the Detroit region. We further observe that, historically, white individuals in both regions are more likely to consume four or more drinks on a single occasion (i.e., binge drinkers) than non-white individuals.

In terms of gender composition, males are more likely to be driving the increase in alcohol consumption than females. We further note that males in KOMA have the highest percentage for binge drinking (23.4 percent) in 2020 compared to females in KOMA, as well as males and females in the Detroit region. Moreover, we observe a surge in heavy drinking among females during the first year of the pandemic. The prevalence of cigarette and e-cigarette consumption are much higher among non-white individuals in KOMA than the Detroit region since 2017. While we observe a decrease in cigarette smoking among non-white individuals from 26 percent in 2011 to 16 percent in 2020 in the Detroit region, the prevalence of smoking among non-white individuals has increased from 14.5 percent to about 24 percent in KOMA.

Quite interestingly, there is a decline in non-white individuals who report being former e-cigarette users in the Detroit region. If this is due to an increase in current e-cigarette users, this might imply a substitution from cigarettes to e-cigarettes. On the other hand, non-white individuals are more likely to be former e-cigarette users in KOMA, suggesting that a potential substitution might be in the other direction (i.e., from e-cigarettes to cigarettes) in KOMA.

Economic Analysis

Benchmarking Communities

Compared to a group of peer communities, we find that hospital admission rates in the Grand Rapids region remain relatively low (85.78 admissions per 1,000 residents in Grand Rapids vs. an average of 108.73 in the peer communities). While inpatient admissions declined in 2020 for all comparison groups, the decline was lowest in Grand Rapids (-5 percent) and greatest in Detroit (-13 percent). While outpatient visits to hospitals declined by between 8 and 18 percent for every comparison group in 2020, outpatient visits increased in Grand Rapids and Muskegon by 9 percent.

We suspect that the primary reason for the departure from the national trend relates to the early onset and severity of the Covid-19 pandemic in the Detroit region, and how this may have driven patients from outside of Grand Rapids to seek care in Western Michigan instead. Emergency department visits per 1,000 residents declined among all comparison groups in 2020 by between 14 and 22 percent, likely reflecting patients' efforts to avoid contagion in hospital settings.

The data on number of hospital personnel and compensation per worker reveals the difficulties in hospital staffing in Detroit during the first full year of the pandemic. Despite increases of between 1 and 3 percent in all comparison communities in 2020, hospital personnel per 1,000 residents declined by 5 percent in Detroit. This is despite Detroit having the highest annual compensation of $130,170 per hospital employee, compared to $80,160 in Grand Rapids, and also the largest year-over-year growth in compensation (+3 compared to -3 percent in Grand Rapids). Overall, the 2020 hospital data reveals a stark difference in the way that the two sides of the state experienced the first year of the Covid-19 pandemic.

Major Medical Conditions: Expenditure and Utilization Analysis

We used member data provided by Blue Care Network, Blue Cross Blue Shield of Michigan, and Priority Health to examine average annual expenditures and health care use for those diagnosed with at least one of the following six chronic conditions: asthma, coronary artery disease (CAD), depression, diabetes, hyperlipidemia, and low back pain.

Understanding that, from year to year, small coding changes may affect the composition of the diagnosis categories, we find mixed changes in expenditures across conditions between 2020 and 2021 in KOMA counties, but some significant declines in spending on healthy members (-3.6 percent) and members diagnosed with CAD (-8.7 percent). The largest increase was observed for those diagnosed with asthma (+7 percent).

On the other hand, spending increased in the Detroit region by between 1 and 5 percent for almost all conditions, the lone exception being CAD, which declined by 0.5 percent. We find that average annual inpatient admissions, visits to the emergency department, and the average number of prescription fills remain greater in the Detroit region than in KOMA for the chronic conditions studied here. While telehealth utilization is higher in the Detroit region than in KOMA across all conditions, it has begun to decline significantly in the Detroit region for key conditions like diabetes (-20 percent) and hyperlipidemia (-18 percent) while continuing to grow in KOMA.

Disparities

The member data from Blue Care Network, Blue Cross Blue Shield of Michigan, and Priority Health were linked with 2010 census data on population, median income, and race at the ZIP-code level. The goal of this section is to examine differences in private insurance coverage, underlying health characteristics, and the prevalence of several chronic conditions across ZIP codes with different income levels and racial concentrations. We observe patterns that are consistent with disparities by income and race in Michigan, although there are persistent differences between the east and west sides of the state, especially concerning race.

Concerning income, a disparity has emerged between High- and Low-Income ZIP codes of the KOMA region in the underlying health characteristics of the population. The average risk score among residents of the Low-Income ZIP codes of the KOMA region is 13 percent greater than that of the High-Income ZIP codes. On the other hand, the income disparity in the prevalence of diabetes declined in KOMA between 2020 and 2021. Both CAD and depression increased in prevalence among the study population in 2021 in the KOMA region, while remaining relatively steady in the Detroit region.

Concerning race, different patterns remain for many variables between the two regions. Average risk scores were relatively high in "High Share Black" ZIP codes of Detroit, but not so for the KOMA region. Asthma is more common among the residents of "High Share White" ZIP codes of Detroit, but not so in the KOMA region. Diabetes was far more prevalent in the "High Share Black" ZIP codes of Detroit than in the "High Share White" ZIP codes, while the KOMA region reveals no such pattern. Compared to 2020, the racial disparity in diabetes prevalence has increased in Detroit. A diagnosis of diabetes is 79 percent more prevalent among the members of Detroit's "High Share Black" ZIP codes, relative to the "High Share White" ZIP codes, which is up from 73 percent in 2020.

While it is difficult to determine the specific reasons behind the persistent differences in pattern between race and income quintiles, the literature points to racial segregation having an impact in the Detroit region that is not present in the KOMA region.

Knowledge Foundations

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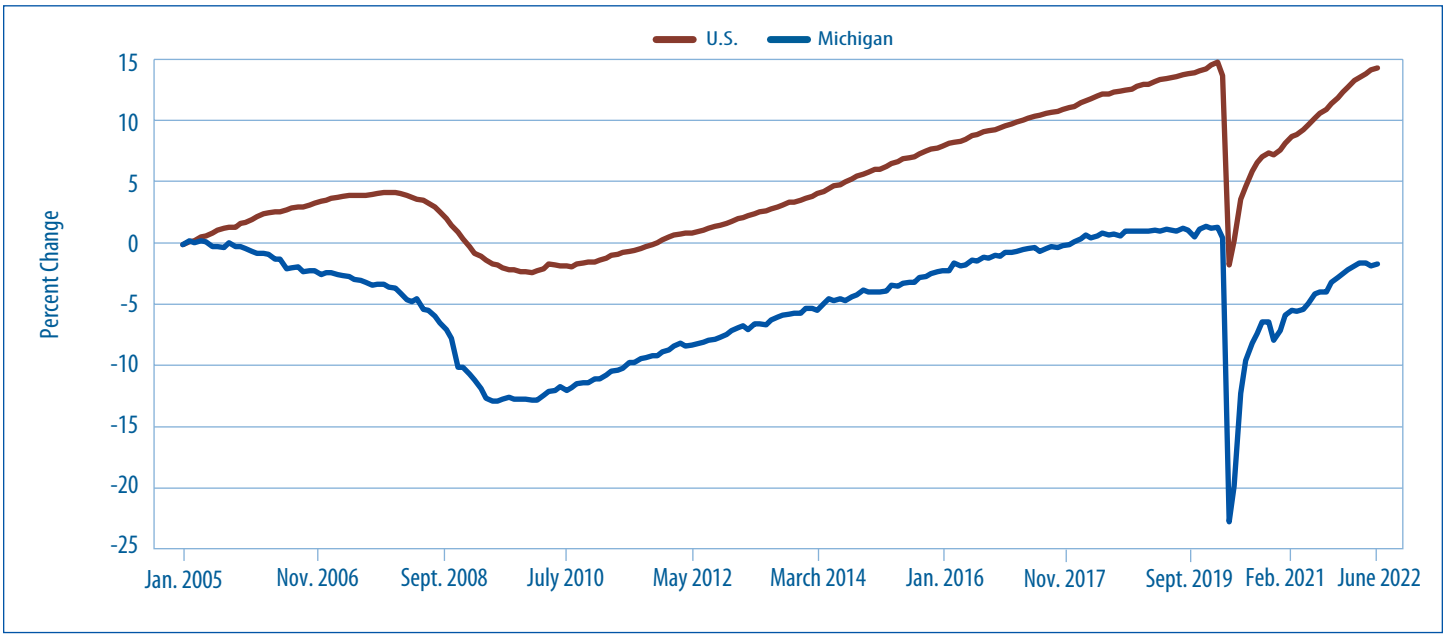
Education and Job Growth

We begin the discussion of trends in job growth by tracking changes in total employment for the U.S. and for the State of Michigan relative to January 2005. **Figure 1** plots growth in nonfarm payroll jobs from January 2005 through June 2022. After the 2008 recession, the focus was on the dramatic decline of jobs for both Michigan and the U.S. At the height of the recession, jobs fell by more than 2 percent nationally and by nearly 13 percent in Michigan from their 2005 levels. Both the State of Michigan and the U.S. began adding jobs in early 2010. By April 2014, job growth in the U.S. had recovered to its prerecession level of 4 percent and has continued to increase. However, Michigan did not recover to prerecession job levels until January 2018, meaning the state has experienced only a small net gain in payroll jobs for more than a decade. The positive economic outlook in Michigan and the U.S. for the past few years was disrupted in the first quarter of 2020 by an unprecedented outbreak of the novel coronavirus (COVID-19) in Wuhan, China, that spread rapidly around the world causing a global pandemic. The pandemic mitigation policies such as business closures, combined with a substantial negative health shock, hit a record toll on the job growth rate. In April 2020, job growth declined from a 14 percent annual rate in 2019 to about -2 percent in the U.S., while surpassing that in Michigan. Specifically, Michigan experienced a decline in nonfarm payroll jobs by about 23 percent in April 2020. Moreover, the gap between the U.S. job growth and that of Michigan further increased from 13 percentage points in 2019 to a gap of 15 percentage points in both 2020 and 2021. On a positive note, the U.S. and Michigan economies have both experienced a rapid recovery since May 2020. In fact, the U.S. economy reached a 14 percent increase in job growth in 2022, surpassing the 4.2 percent growth prior to the 2008 recession. Although there has been a remarkable surge in nonfarm payroll jobs in Michigan since May 2020, the growth rate is still far below that in the U.S. Nonetheless, it is critical to highlight that the State of Michigan was able to recover from a 23 percent decline in job growth in April 2020 to a 1.6 percent decline in June 2022.

Figure 1: Nonfarm Payroll Jobs Percent Change, January 2005 to June 2022



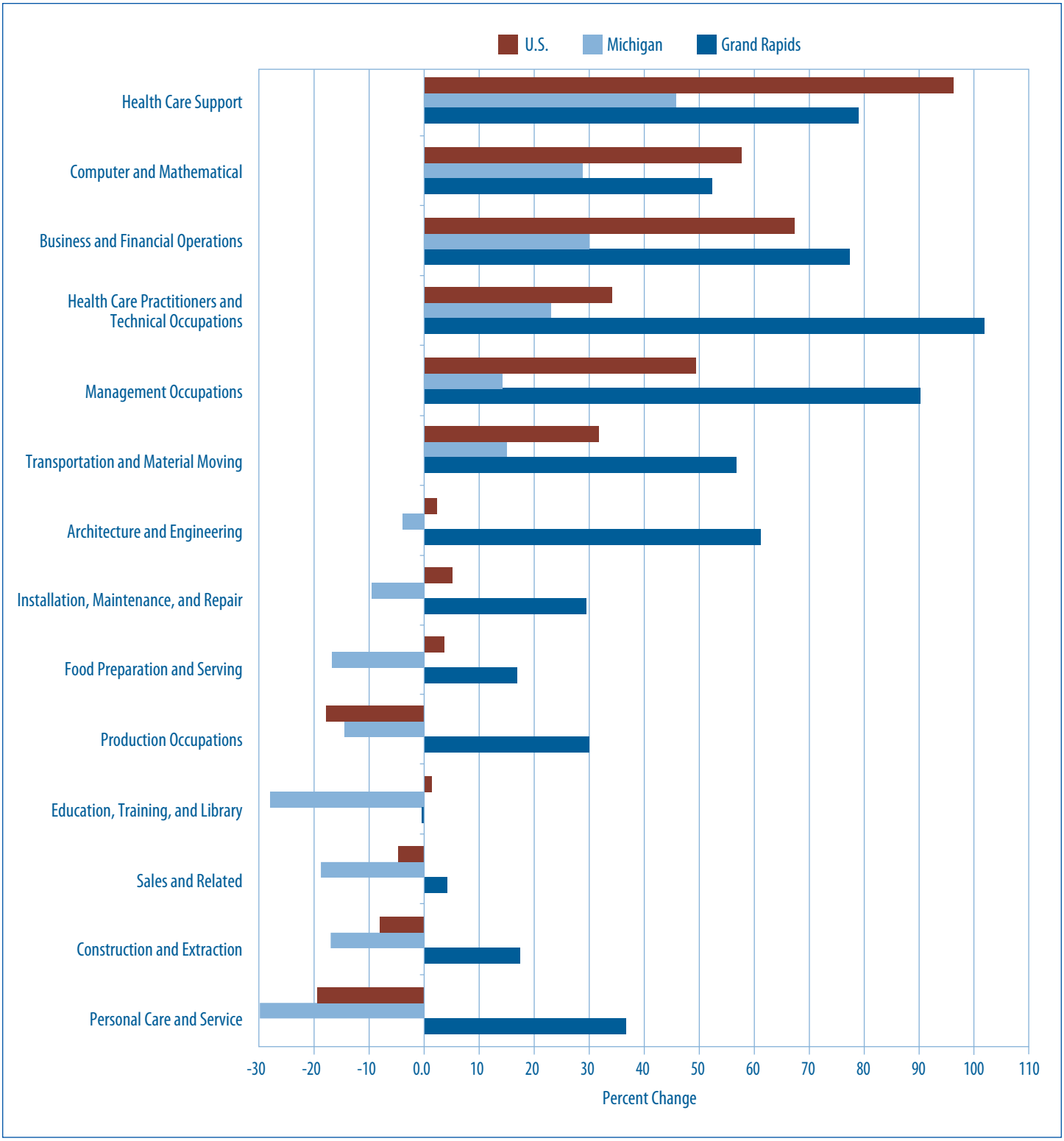
U.S. Source: http://data.bls.gov/cgi-bin/srgate
U.S. Series ID: CES0000000001

State Source: http://data.bls.gov/cgi-bin/srgate
State Series ID: SMS26000000000000001

Figure 2 provides a more detailed analysis of employment changes by examining job growth at the industry level from 2005 to 2021. We plot data for the Grand Rapids metropolitan statistical area (MSA), the State of Michigan, and the entire United States. The Grand Rapids region has experienced significant job growth (more than 50 percent) over this period in seven occupational categories: health care practitioners and technical occupations (102 percent), management occupations (90 percent), health care support (79 percent), business and financial operations (78 percent), architecture and engineering (61 percent), transportation and material moving (57 percent), as well as computer and mathematical occupations (52 percent).

Grand Rapids experienced substantial employment growth over the past decade in health care practitioners and technical occupations. Local growth in these occupations surpassed growth rates for the state and for the nation as a whole. In fact, employment for health care practitioners and technical occupations in Grand Rapids grew at nearly four times the state and triple the national rates since 2005. An important development in 2021 was the increasing trend in the growth rate of these occupations compared to those reported in 2020 (see, e.g., Health Check 2021), suggesting recovery in health care employment after the initial negative economic shock under COVID-19. Employment sectors in the U.S. that suffered the largest job losses over this period include personal care and service, production occupations, construction and extraction, as well as sales and related occupations.

Figure 2: Job Growth for Select Major Occupational Groups, 2005-2021



Source: Bureau of Labor Statistics, www.bls.gov

We observe large declines in multiple occupations in Michigan, which also suggest that the negative effect of COVID-19 was more salient in the rest of the state compared to Grand Rapids. As of May 2021, we observe relatively large declines in the growth rate of the following occupations: personal care and service (32 percent); sales and related occupations (19 percent); construction and extraction (17 percent); food preparation and serving (17 percent); installation, maintenance, and repair (10 percent); and architecture and engineering occupations (4 percent). Moreover, there is an increasing negative growth rate within education, training, and library occupations across the state as a whole, where we observe close to a 28 percent drop since 2005. In addition to the pandemic, these trends may be related to a decrease in the school-aged population, which has shown a steady decline (beyond a 13 percent drop since 2002) in Michigan, as reported in data from the Michigan Department of Education, National Center for Education Statistics. Related to the decrease in the school-aged population, reports of a smaller number of high school graduates in Michigan may impact the number of individuals seeking university-level education who supply the labor force for these in-demand occupations (Bransberger & Michelau, 2016).

Given these trends in employment, we further examine the changes in labor supply and demand conditions in the health care sector in both Grand Rapids and Michigan. To analyze this issue, we proceeded with the following steps:

1. We observed job growth for selected health care occupations since 2005.
2. We made specific predictions for employment demand in the Grand Rapids area for several selected health professions.
3. We measured changes in earnings over the past decade for these professions.

Table 1 provides historic employment levels and growth for a variety of health care occupations identified in the Bureau of Labor Statistics (BLS) data for the Grand Rapids metro area and the State of Michigan. We report growth figures since 2005 and since 2020 to illustrate long-term, as well as recent changes. In general, Grand Rapids has experienced greater job growth in the health care sector compared to the state as a whole since 2005. Growth has been especially robust in the areas of diagnostic medical sonographers, dietitians and nutritionists, registered nurses (RNs), occupational and physical therapists, occupational and physical therapy assistants, physician assistants, pediatricians, all other physicians, radiologic technologists and technicians, recreational therapists, respiratory therapists, and surgical technicians. Only a few occupations experienced job losses in Grand Rapids since 2005; those include medical transcriptionists, nuclear medicine technologists, licensed practical or licensed vocational nurses (LPNs or LVNs), and family medicine practitioners. The State of Michigan saw significant job growth among diagnostic medical sonographers, dietitians and nutritionists, medical assistants, medical records specialists, occupational therapy assistants, pharmacy technicians, physical therapists, physician assistants, pediatricians, and surgical technologists. The State of Michigan saw job losses among audiologists, dentists, dental hygienists, emergency medical technicians (EMTs) and paramedics, medical transcriptionists, nuclear medicine technologists, LPNs or LVNs, nursing aides and assistants, optometrists, obstetricians and gynecologists, family medicine practitioners, and surgeons.

If we analyze the growth rates in the health care sector since 2020, we observe a slightly different story due to the pandemic. Employment in some health care occupations is still recovering and more jobs are created for certain occupations (e.g., dentists, dental assistants, medical transcriptionists, RNs, LPNs or LVNs, opticians, family medicine practitioners, and surgeons), while job losses persist for others (e.g., nursing aides and assistants, EMTs and paramedics, cardiovascular technologists, all other physicians, radiologic technologists and technicians, and speech-language pathologists).

Table 2 presents employment projections for Michigan and the Grand Rapids metro area generated by matching data on historic and projected employment levels from the Bureau of Labor Statistics to the estimates of employment growth rates from the Michigan Department of Technology, Management, and Budget. The left-hand columns in **Table 2** display occupation-specific employment in 2021, the corresponding annualized average growth rates, and projected employment in 2030. In the next two columns, we convert the growth rates into annual job growth numbers. Replacement rate figures in the next two columns indicate the share of current employment that is expected to turn over through retirement or other forms of employment transition. Projected employment has two components: job growth (i.e., new positions) and replacement (i.e., existing positions that have been vacated). We combine these two components to estimate the average annual job openings in both Michigan and in the Grand Rapids metro area in the last two columns of **Table 2**. Occupations for which we expect to see the highest number of annual job openings include dental assistants (147 in Grand Rapids and 1,478 for the state), home health and personal care aides (1,197 in Grand Rapids and 12,750 for the state), medical assistants (295 in Grand Rapids and 3,397 for the state), licensed practical or licensed vocational nurses (108 in Grand Rapids and 907 for the state), registered nurses (921 in Grand Rapids and 6,338 for the state), and nursing aides and assistants (717 in Grand Rapids and 5,474 for the state).

Finally, **Table 3** presents inflation-adjusted growth in annual earnings for health professions in Grand Rapids, Michigan, and the U.S. Once again, data for the wage estimates came from the Bureau of Labor Statistics, and we compared changes in these estimates for the long term (from 2005 to 2021) and the shorter term (2020 to 2021). We specifically focused on fields in which real earnings have increased or decreased by more than 7 percent during the 2005 to 2020 period. In Grand Rapids, the occupations with the largest decline in real earnings include dental assistants, dental hygienists, dietitians and nutritionists, EMTs and paramedics, occupational therapists, respiratory therapists, speech-language pathologists, and surgical technologists.

Dental assistants, dental hygienists, dietitians and nutritionists, optometrists, physical therapists, and speech-language pathologists all experienced real earnings losses beyond 7 percent for the State of Michigan. There is only one occupation that experienced a large real earnings gain in the Grand Rapids region from 2005 to 2021, which is occupational therapy assistants. Family medicine practitioners and physician assistants all saw wage growth in excess of 7 percent for the state as a whole.

When we compared earnings changes in Grand Rapids to those in Michigan or the entire U.S., we found several similarities but also several interesting differences. For example, since 2005, real wages for diagnostic medical sonographers, dietitians and nutritionists, EMTs and paramedics, medical assistants, registered nurses, physical therapists, respiratory therapists, speech-language pathologists, and surgical technologists increased nationally, but have declined in both Michigan and Grand Rapids. We only observe declines in real wages for dental hygienists and optometrists in the U.S. On the other hand, the largest increase in real wages since 2005 is among family medicine practitioners and occupational therapy assistants in the U.S.

Looking at more recent changes between 2019 and 2020 in Grand Rapids, the only occupation with more than 7 percent growth in real annual earnings is occupational therapy assistants. However, the earnings growth for dental hygienists, EMTs and paramedics, LPNs or LVNs, nursing aides and assistants, occupational therapy assistants, and surgical technologists is considerably higher in Grand Rapids than in both Michigan and the U.S. at large. In the short-term, we also observe a substantial decline in earnings for optometrists and family medicine practitioners in Grand Rapids.

We emphasize that any estimates presented within this section are subject to change based on changes in the economy or changes in the regulatory environment in which health care providers and health systems operate. Furthermore, a decrease in the number of high school graduates, along with a notable decrease in the number of education jobs in the last few years, suggests that the pool of individuals entering university programs may decrease in future years. As such, policy and community efforts will be vital to retain the current skilled health care workforce, as well as encourage talented individuals to pursue degrees leading to employment within the health care sector.

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Table 1: Health Care Job Growth for Selected Occupations, 2005-2021

Occupation	Grand Rapids				
	Employment (2005)	Employment (2020)	Employment (2021)	Employment Growth (%) Since 2005	Employment Growth (%) Since 2020
Anesthesiologists	N/A	220	N/A	N/A	N/A
Audiologists	N/A	N/A	30	N/A	N/A
Cardiovascular Technologists/Technicians	N/A	400	330	N/A	-17.5
Dental Assistants	860	720	1,300	51.2	80.6
Dental Hygienists	690	780	1,090	58.0	39.7
Dentists, General	350	210	460	31.4	119.0
Diagnostic Medical Sonographers	130	400	370	184.6	-7.5
Dietitians and Nutritionists	140	310	310	121.4	0.0
EMT and Paramedics	450	N/A	790	75.6	N/A
Home Health and Personal Care Aides	N/A	6,720	7,440	N/A	10.7
Medical Assistants	1540	2,550	2,260	46.8	-11.4
Medical Records Specialists/ Medical Dosimetrists/ Health Technologists and Technicians	510	830	850	66.7	2.4
Medical Transcriptionists	290	50	100	-65.5	100.0
Nuclear Medicine Technologists	110	80	80	-27.3	0.0
Nurse Practitioners	N/A	570	720	N/A	26.3
Nurses, RN	6,310	13,940	14,120	123.8	1.3
Nurses, LPN or LVN	1,870	1,770	1,250	-33.2	-29.4
Nursing Aides and Assistants	4,950	6,910	5,580	12.7	-19.2
Occupational Therapists	230	690	720	213.0	4.3
Occupational Therapy Assistants	50	340	290	480.0	-14.7
Opticians, Dispensing	320	220	340	6.3	54.5
Optometrists	80	100	120	50.0	20.0
Pharmacists	560	920	970	73.2	5.4
Pharmacy Technicians	700	1,260	1,600	128.6	27.0
Physical Therapists	330	1,090	1,140	245.5	4.6
Physical Therapist Assistants	100	540	520	420.0	-3.7
Physician Assistants	180	720	870	383.3	20.8
Physicians, Family Medicine	270	120	170	-37.0	41.7
Physicians, Obstetricians and Gynecologists	N/A	100	100	N/A	0.0
Physicians, Pediatricians	30	130	240	700.0	84.6
Physicians, Psychiatrists	N/A	100	100	N/A	0.0
Physicians, Surgeons	100	N/A	130	30.0	N/A
Physicians, All Other	380	1,150	910	139.5	-20.9
Radiologic Technologists and Technicians	380	840	770	102.6	-8.3
Recreational Therapists	60	140	170	183.3	21.4
Respiratory Therapists	240	770	700	191.7	-9.1
Speech-language Pathologists	390	590	590	51.3	0.0
Surgical Technologists	220	780	660	200.0	-15.4

Michigan 2005: http://www.bls.gov/oes/2005/may/oes_mi.htm
Grand Rapids 2005: http://www.bls.gov/oes/2005/may/oes_24340.htm

Michigan 2020: http://www.bls.gov/oes/2020/may/oes_mi.htm
Grand Rapids 2020: http://www.bls.gov/oes/2020/may/oes_24340.htm

Michigan 2021: http://www.bls.gov/oes/2021/may/oes_mi.htm
Grand Rapids 2021: http://www.bls.gov/oes/2021/may/oes_24340.htm

	Michigan				
	Employment (2005)	Employment (2020)	Employment (2021)	Employment Growth (%) Since 2005	Employment Growth (%) Since 2020
	N/A	1,010	1,390	N/A	N/A
	690	330	350	-49.3	6.1
	1,940	2,410	2,260	16.5	-6.2
	9,650	6,900	11,150	15.5	61.6
	7,850	6,560	7,750	-1.3	18.1
	4,570	2,540	3,700	-19.0	45.7
	1,510	2,510	3,040	101.3	21.1
	1,410	2,020	2,150	52.5	6.4
	6,670	6,880	6,140	-7.9	-10.8
	N/A	68,510	79,170	N/A	15.6
	14,490	22,750	23,650	63.2	4.0
	4,820	8,090	7,430	54.1	-8.2
	3,080	1,130	1,640	-46.8	45.1
	960	610	620	-35.4	1.6
	N/A	4,880	5,830	N/A	19.5
	81,370	97,820	102,480	25.9	4.8
	17,850	12,700	10,680	-40.2	-15.9
	48,960	48,610	41,200	-15.8	-15.2
	3,510	4,400	4,610	31.3	4.8
	890	1,170	1,430	60.7	22.2
	3,550	2,670	3,840	8.2	43.8
	1,290	990	1,030	-20.2	4.0
	8,110	8,830	10,170	25.4	15.2
	8,560	13,990	15,520	81.3	10.9
	5,170	7,270	8,000	54.7	10.0
	2,550	3,100	3,550	39.2	14.5
	2,320	4,350	5,010	115.9	15.2
	3,030	2,320	1,730	-42.9	-25.4
	750	720	590	-21.3	-18.1
	370	900	1,160	213.5	28.9
	400	600	500	25.0	-16.7
	1,640	1,410	1,350	-17.7	-4.3
	10,220	13,680	11,820	15.7	-13.6
	6,020	6,630	6,300	4.7	-5.0
	700	790	860	22.9	8.9
	3,390	4,440	4,820	42.2	8.6
	3,340	3,880	3,850	15.3	-0.8
	2,610	3,970	4,130	58.2	4.0

Table 2: Need for Selected Professions in Michigan

Selected Professions	Michigan Employment (2021)[1]	Grand Rapids Employment (2021)[2]	Michigan Annual Growth Rate[3]	Grand Rapids Annual Growth Rate[4]
Dental Assistants	11150	1300	0.010	0.000
Dental Hygienists	7750	1090	0.010	0.000
Diagnostic Medical Sonographers	3040	370	0.017	0.011
Dietitians and Nutritionists	2150	310	0.008	0.006
EMT and Paramedics	6140	790	0.011	0.000
Home Health and Personal Care Aides	79170	7440	0.023	0.028
Medical Assistants	23650	2260	0.016	0.012
Nurse Practitioners	5830	720	0.042	0.019
Nurses, LPN or LVN	10680	1250	0.007	0.007
Nurses, RN	102480	14120	0.008	0.009
Nursing Aides and Assistants	41200	5580	0.007	0.010
Occupational Therapists	4610	720	0.015	0.012
Occupational Therapy Assistants	1430	290	0.032	0.018
Optometrists	1030	120	0.010	0.003
Physical Therapists	8000	1140	0.017	0.011
Physician Assistants	5010	870	0.028	0.020
Physicians, Family Medicine	1730	170	0.003	N/A
Respiratory Therapists	4820	700	0.021	0.018
Speech-language Pathologists	3850	590	0.020	0.020
Surgical Technologists	4130	660	0.007	0.005

Note: Job growth rate and annual change are based on rounded data. The 2030 projections were not available for Grand Rapids as of the writing of this study.
[1]Source: https://www.bls.gov/oes/2021/may/oes_mi.htm
[2]Source: https://www.bls.gov/oes/2021/may/oes_24340.htm
[3]Source: https://milmi.org/DataSearch/Employment-Projections-Excel-Files (Statewide Long-Term Projections 2020-2030, Occupational Projections)
[4]Source: https://milmi.org/DataSearch/Employment-Projections-Excel-Files (Michigan Regional Long-Term Employment Projections 2018-2028, West Michigan Prosperity Region Occupational Projections)

MI Annual Replacement Rate = (Replacement/Employment 2020)
GR Annual Replacement Rate = (Replacement/Employment 2018)

	Michigan Projected Employment (2030)	Grand Rapids Projected Employment (2030)	Michigan Annual Job Growth	Grand Rapids Annual Job Growth	Michigan Annual Replacement Rate	Grand Rapids Annual Replacement Rate	Average Annual Job Openings in Michigan	Average Annual Job Openings in Grand Rapids
	12344	1300	119	0	0.122	0.113	1478	147
	8573	1090	82	0	0.064	0.068	580	74
	3592	413	55	4	0.075	0.060	284	26
	2339	329	19	2	0.070	0.059	170	20
	6818	790	68	N/A	0.068	0.068	487	N/A
	99123	9806	1995	237	0.136	0.129	12750	1197
	27822	2546	417	29	0.126	0.118	3397	295
	8785	869	295	15	0.066	0.063	678	60
	11401	1340	72	9	0.078	0.079	907	108
	110621	15444	814	132	0.054	0.056	6338	921
	44364	6164	316	58	0.125	0.118	5474	717
	5351	811	74	9	0.058	0.056	343	49
	1966	347	54	6	0.146	0.117	262	39
	1142	124	11	0	0.032	0.033	44	4
	9480	1272	148	13	0.044	0.045	500	65
	6606	1061	160	19	0.063	0.064	476	75
	1790	N/A	6	N/A	0.027	N/A	53	N/A
	5920	837	110	14	0.052	0.058	361	55
	4692	719	84	13	0.065	0.058	334	47
	4432	694	30	3	0.073	0.083	332	58

Table 3: Average Annual Earnings for Select Health Care Professions

Selected Professions Color Key: Above Seven Percent Below Negative Seven Percent (-7%)	2005 Mean Annual Earnings*			2020 Mean Annual Earnings*		
	Grand Rapids	Michigan	U.S.	Grand Rapids	Michigan	U.S.
Dental Assistants	$44,884	$42,997	$41,582	$46,643	$42,371	$44,298
Dental Hygienists	$71,121	$76,823	$84,108	$65,258	$69,624	$81,717
Diagnostic Medical Sonographers	$70,011	$72,078	$76,907	$67,729	$69,122	$81,445
Dietitians and Nutritionists	$64,045	$65,030	$63,754	$61,018	$59,311	$67,164
EMT and Paramedics	$41,998	$38,738	$39,459	$34,142	$36,027	$42,267
Home Health and Personal Care Aides	$28,720	$26,611	$26,944	$28,268	$27,431	$29,378
Medical Assistants	$37,767	$36,657	$36,296	$36,529	$36,466	$38,665
Nurse Practitioners	N/A	N/A	N/A	$112,173	$114,278	$119,890
Nurses, LPN or LVN	$50,892	$52,307	$50,240	$51,208	$54,673	$52,443
Nurses, RN	$72,439	$79,349	$78,918	$73,037	$77,456	$83,769
Nursing Aides and Assistants	$31,495	$32,827	$30,802	$31,661	$33,535	$33,556
Occupational Therapists	$89,505	$76,629	$81,999	$73,016	$81,246	$91,590
Occupational Therapy Assistants	$46,813	$54,749	$55,221	$47,732	$52,621	$66,399
Optometrists	$118,322	$133,723	$132,502	$149,634	$137,489	$131,333
Physical Therapists	$87,604	$91,739	$90,670	$87,569	$91,726	$95,987
Physician Assistants	$103,990	$99,605	$98,606	$112,184	$116,267	$121,533
Physicians, Family Medicine	$219,745	$193,619	$194,757	$254,217	$223,279	$224,441
Respiratory Therapists	$77,392	$63,892	$64,198	$61,877	$63,091	$68,724
Speech-language Pathologists	$112,661	$89,671	$80,472	$78,063	$83,036	$87,151
Surgical Technologists	$49,574	$50,878	$49,837	$43,879	$48,067	$53,930

Source: https://www.bls.gov/oes/tables.htm
* 2005 and 2020 Mean Annual Earnings are inflated to 2021 dollars
NA = Not Available

	2021 Mean Annual Earnings			Percent Change in Real Annual Earnings Since 2005			Percent Change in Real Annual Earnings Since 2020		
	Grand Rapids	Michigan	U.S.	Grand Rapids	Michigan	U.S.	Grand Rapids	Michigan	U.S.
	$40,860	$39,680	$42,510	-8.97	-7.71	2.23	-12.40	-6.35	-4.04
	$66,020	$66,720	$81,360	-7.17	-13.15	-3.27	1.17	-4.17	-0.44
	$66,720	$67,530	$80,680	-4.70	-6.31	4.91	-1.49	-2.30	-0.94
	$58,980	$59,310	$65,620	-7.91	-8.80	2.93	-3.34	0.00	-2.30
	$35,927	$36,727	$41,484	-14.46	-5.19	5.13	5.23	1.94	-1.85
	$27,920	$27,490	$29,260	-2.79	3.30	8.59	-1.23	0.22	-0.40
	$35,690	$35,640	$38,190	-5.50	-2.77	5.22	-2.30	-2.27	-1.23
	$108,960	$108,770	$118,040	N/A	N/A	N/A	-2.86	-4.82	-1.54
	$52,230	$54,090	$51,850	2.63	3.41	3.21	2.00	-1.07	-1.13
	$71,970	$75,930	$82,750	-0.65	-4.31	4.86	-1.46	-1.97	-1.22
	$33,120	$33,790	$33,250	5.16	2.93	7.95	4.61	0.76	-0.91
	$73,960	$77,880	$89,470	-17.37	1.63	9.11	1.29	-4.14	-2.31
	$53,060	$54,040	$63,560	13.35	-1.29	15.10	11.16	2.70	-4.28
	$122,290	$122,140	$125,440	3.35	-8.66	-5.33	-18.27	-11.16	-4.49
	$83,080	$83,160	$92,920	-5.16	-9.35	2.48	-5.13	-9.34	-3.20
	$109,040	$111,990	$119,460	4.86	12.43	21.15	-2.80	-3.68	-1.71
	$222,800	$232,660	$235,930	1.39	20.16	21.14	-12.36	4.20	5.12
	$59,220	$61,100	$68,190	-23.48	-4.37	6.22	-4.29	-3.16	-0.78
	$74,450	$78,480	$85,820	-33.92	-12.48	6.65	-4.63	-5.49	-1.53
	$45,190	$48,050	$53,590	-8.84	-5.56	7.53	2.99	-0.04	-0.63

Medical Innovation

Medical innovations contribute to economic growth and improve the human condition. However, measuring innovations generated in a specific geographic area is challenging. One way to do so is to examine the locational aspects of medical patents. Another is to quantify the amount of spending undertaken on medical research.

Patents

A patent is the property right granted to an inventor or assignee for a new or improved product, process, or piece of equipment. Patents are used as indicators of economic growth because of the investment that goes into creating the innovations and the investment opportunities that result from these innovations.

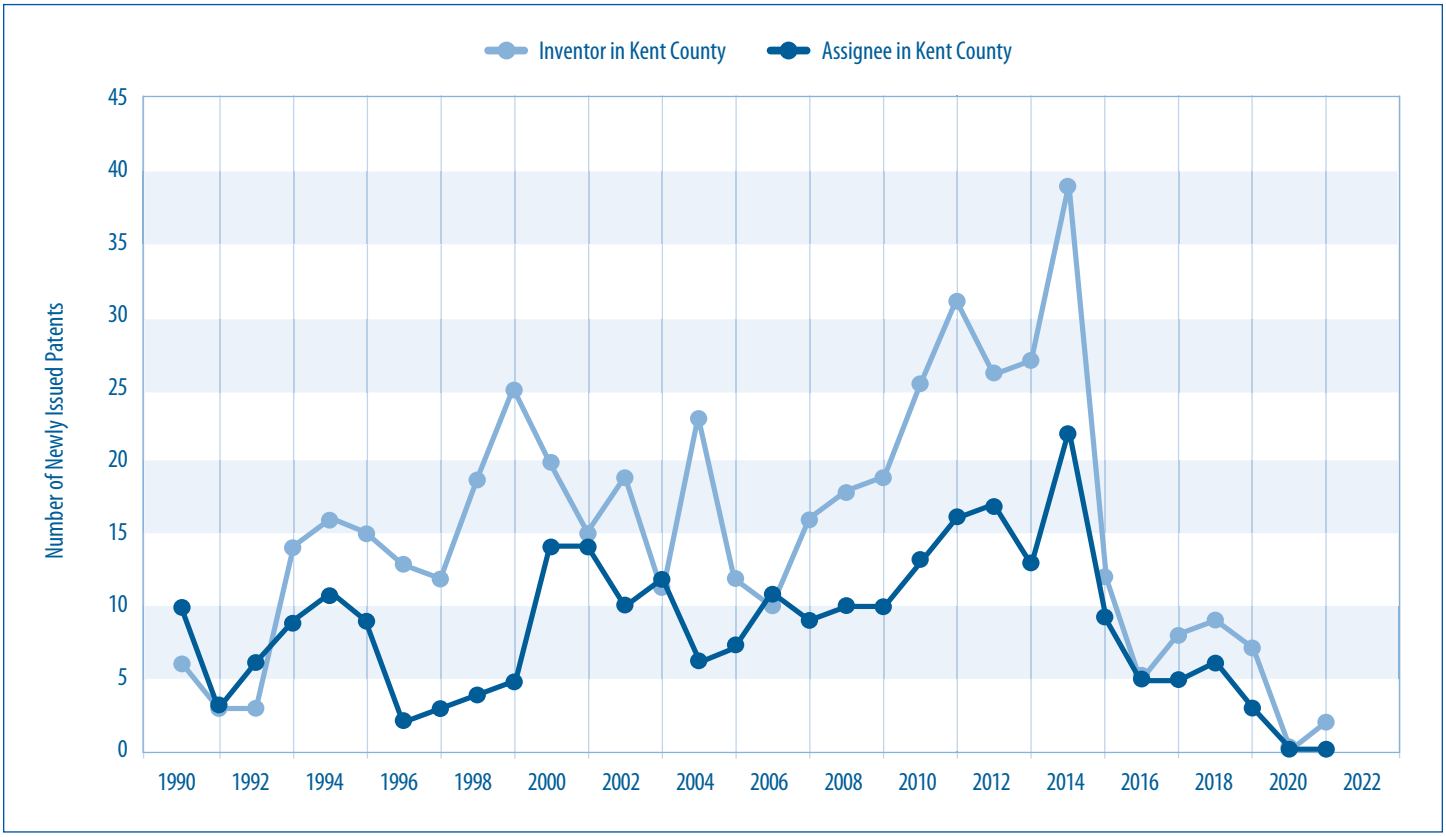
There are drawbacks to relying on patent data to measure innovative activity. Some inventors and assignees choose not to register patents for their innovations because doing so will require them to divulge details to competitors. Additionally, not all patents have a substantial impact on economic progress. Overall, patents are seen as reflecting significant contributions to society and the economy in general. The use of patents is particularly relevant in the medical field due to the large amount of spending for medical research and research and development (R&D) of innovative products.

The database of the U.S. Patent and Trademark Office (USPTO) indicates the name and location of both a patent's inventor and its assignee (owner). In some cases, the inventor owns the patent. In corporate settings, the business itself is usually the assignee while an individual researcher is the inventor. This differentiation can then result in location differences. For example, the inventor lives in Kent County, but the company that owns the patent is in China. Another example may be the inventor lives in Germany and the assignee is a company in West Michigan. To evaluate the economic significance of innovative activities, considering inventors and assignees separately is useful.

Figure 1 shows the number of new medical patents granted by the USPTO to inventors residing in Kent County, as well as patents with assignees in Kent County from the year 1990 through 2021.

For those with inventors living in Kent County, the average annual number of patents increased from 12.6 in the years 1990-1999 to 16.3 in the years 2000-2009, with a slight decreased average of 15.9 in the years 2010-2021. For those with assignees in Kent County, the average annual number of patents increased from 6.2 in the years 1990-1999 to 10.3 in the years 2000-2009 and to 9.1 patents in the years 2010-2021. Growth in medical patents owned by entities in Kent County or invented by innovators in Kent County is an indicator of economic progress, as new discoveries and improvements can result in technological advancements. Over time, such innovations could encourage greater investment and lead to additional job opportunities in the regional economy.

Figure 1: Medical Patenting in Kent County, 1990–2021

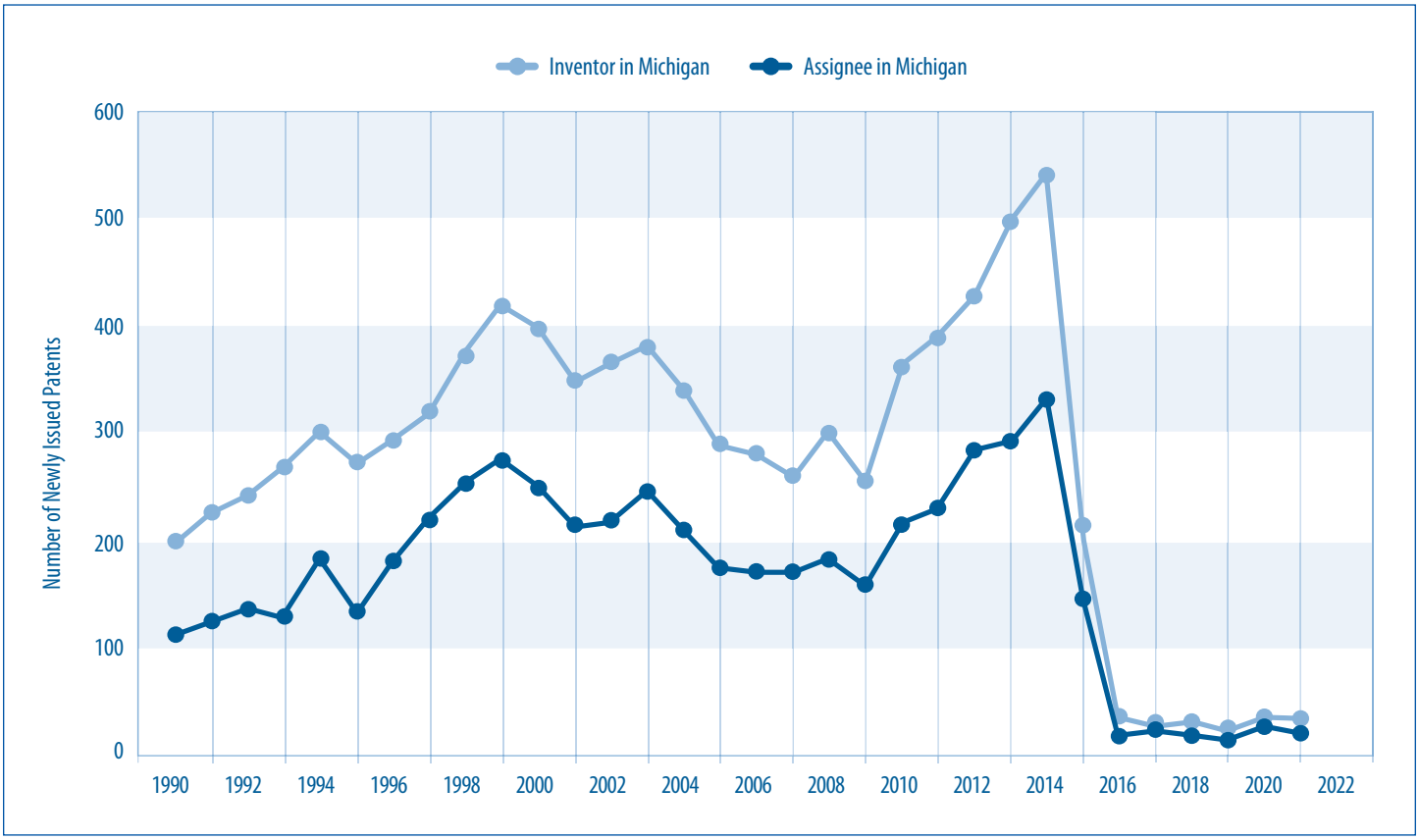


Source: United States Patent and Trademark Office, www.uspto.gov

Figure 1 clearly shows that there has been a significant decrease in patenting since 2014, with the annual number of new patents with inventors living in Kent County falling from 39 in 2014 to 2 in 2020, and the annual number of new patents with assignees located in Kent County falling from 22 to zero over the same period.

To determine if this recent change in medical patenting is specific to Kent County, we compared **Figure 1** with **Figure 2**, which shows the parallel data for the State of Michigan as a whole. The two figures have similar patterns, with generally upward trends followed by stark declines since 2014. Furthermore, rather than a regional aberration, the decline in medical patenting appears to be a national phenomenon, as can be seen in **Table 1**, which displays the percentage change in the annual number of new medical patents for Kent County, Michigan, and the entire U.S., from 2014 through 2021.

Figure 2: Medical Patenting in Michigan, 1990–2021



Source: United States Patent and Trademark Office, www.uspto.gov

Table 1: Percentage Change in Newly Issued Medical Patents by Location of Inventor and Assignee, 2014–2021

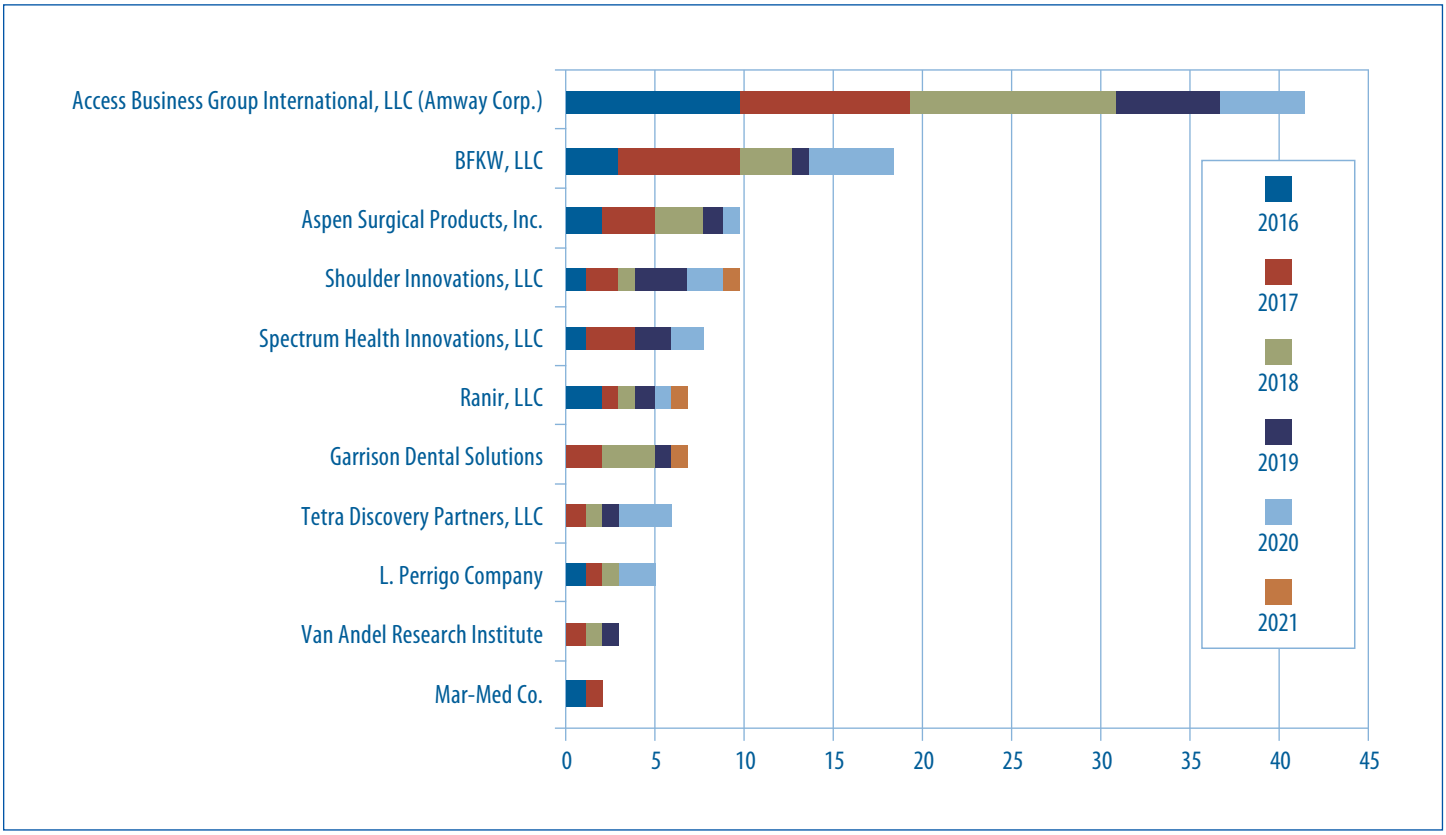
	Location of Inventor			Location of Assignee		
	Kent County	Michigan	U.S.	Kent County	Michigan	U.S.
Percent Change 2014-2021	-94	-94	-95	-100	-94	-96

Source: United States Patent and Trademark Office, www.uspto.gov

A patent obtained through the USPTO only gives property right protection in the U.S. While this protection is sufficient for some inventors and assignees, others choose to apply for patents in other countries to receive property rights elsewhere. One way to do this is through the World Intellectual Property Organization (WIPO). Filing an international patent application with the WIPO allows an inventor to then pursue patent rights in up to 193 countries simultaneously.

The number of nonduplicate medical patent applications filed by West Michigan companies at the WIPO and at the USPTO from 2016 through 2021 is shown in **Figure 3**. Since 2016, the 11 West Michigan companies shown in **Figure 3** have been granted 120 medical patents. However, most of these filings come from only four companies, which together are responsible for approximately 68 percent of the total number of filings. The year 2021 was also notable in that 73 percent of the listed companies did not apply for any medical patents.

Figure 3: Medical Patent Applications in West Michigan, KOMA Region*



*Kent, Ottawa, Muskegon, and Allegan Counties
Sources: United States Patent and Trademark Office and World Intellectual Property Organization, www.uspto.gov and www.wipo.int

The COVID-19 pandemic and resulting recession likely played a part in the decline in medical patenting in West Michigan from 2019-2021. What, though, could have caused the relatively modest volume of medical patenting in West Michigan after 2014? The patenting process involves time delays between application and approval. Increases in processing time could possibly explain the recent declines in approved medical patents. Data on patent wait times ("pendency") is not available for medical patents specifically but is available for USPTO patent applications as a whole.

Figure 4 shows the average wait times for the first action made by the USPTO on patent applications and for the entire "start to finish" time, from fiscal years 2000 through 2021. Rather than increasing in recent years, the average wait time has been decreasing since 2010 through 2021, though it is possible that this pattern does not hold for medical patents.

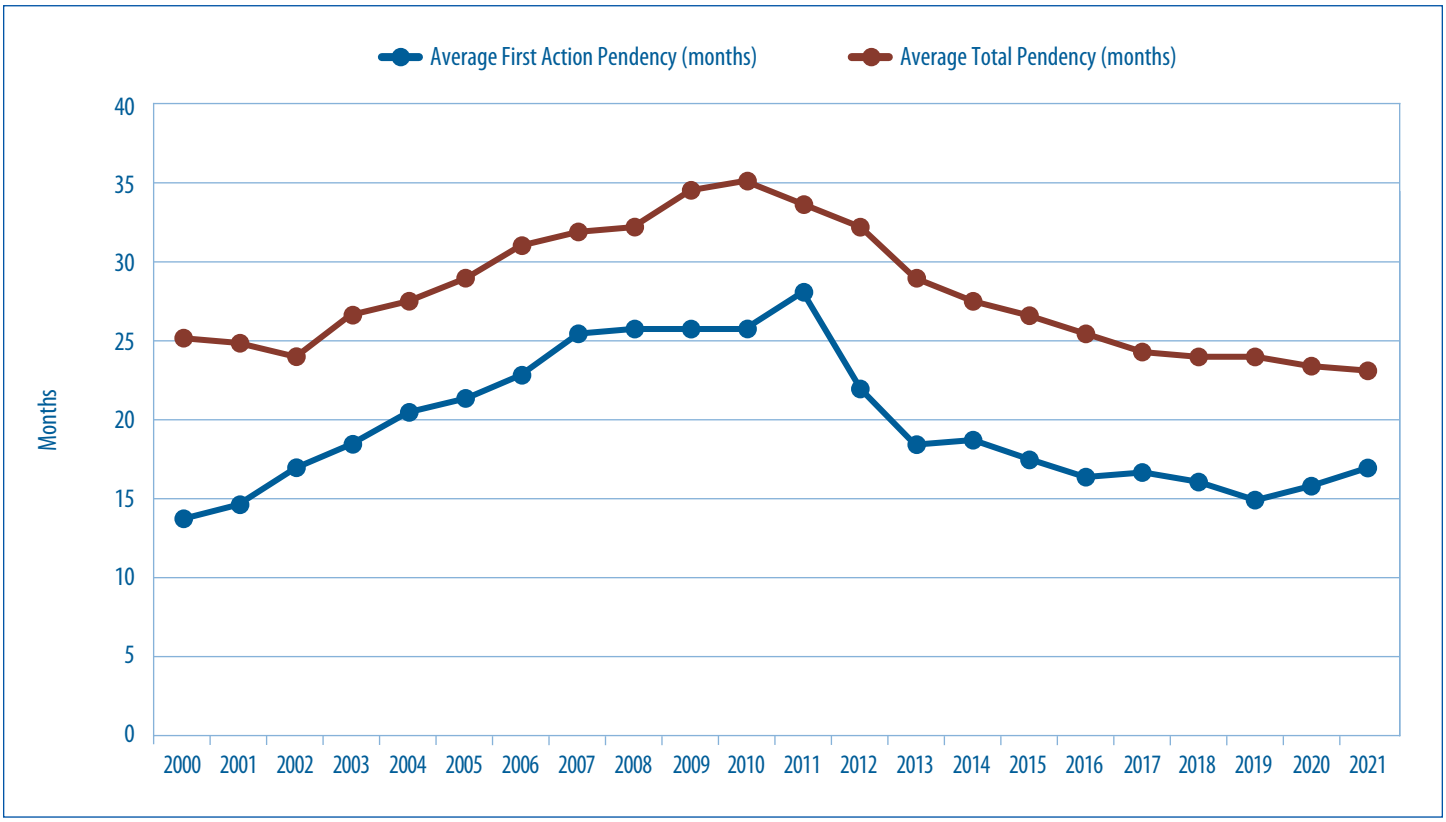
One possible explanation for the recent decrease in medical patents rests on a change in the patenting process itself and the resulting incentive structure. The Leahy-Smith America Invents Act (AIA) of 2011 switched U.S. patenting from a "first-to-invent" to a "first-to-file" system for patent applications filed on or after March 16, 2013. The act also made changes to patenting fees and the definition of "prior art" for patent reviews. Although the AIA was intended to encourage patenting, some have argued that aspects of the law might be particularly disadvantageous to small businesses and independent inventors.

There has also been a shift in global patenting, which could explain some of the decline in medical patents in the U.S. WIPO (2019) reports that the number of patent applications in the U.S. fell by 1.6 percent from 2017 through 2018, while the number of patent applications in many other locations grew by 11.6 percent in China, 7.5 percent in India, 4.7 percent at the European Patent Office, and 5.2 percent worldwide.

Recent court cases are probably another substantial reason for the decline in medical patenting. In 2012, the U.S. Supreme Court struck down medical diagnostics patents in Mayo Collaborative Services v. Prometheus Laboratories, Inc., and in 2013, it struck down patents on gene sequences in Association for Molecular Pathology v. Myriad Genetics. These rulings have likely pushed companies to keep certain medical discoveries secret rather than pursue patents for them.

Other explanations not examined here might also contribute to the patenting changes illustrated previously. Whatever the causes, the recent decreases in patenting are concerning, as patented medical innovation has the potential to become a significant driver of economic growth in West Michigan.

Figure 4: USPTO Patent Wait Times*, 2000–2021



*By fiscal year. First action pendency is the estimated time in months from filing to the date a first action is filed by the USPTO, as well as any time awaiting a reply from an applicant to submit all parts of their application. Total pendency is the estimated time in months from filing to issue or abandonment of the patent application.
Source: United States Patent and Trademark Office, www.uspto.gov

Research Spending

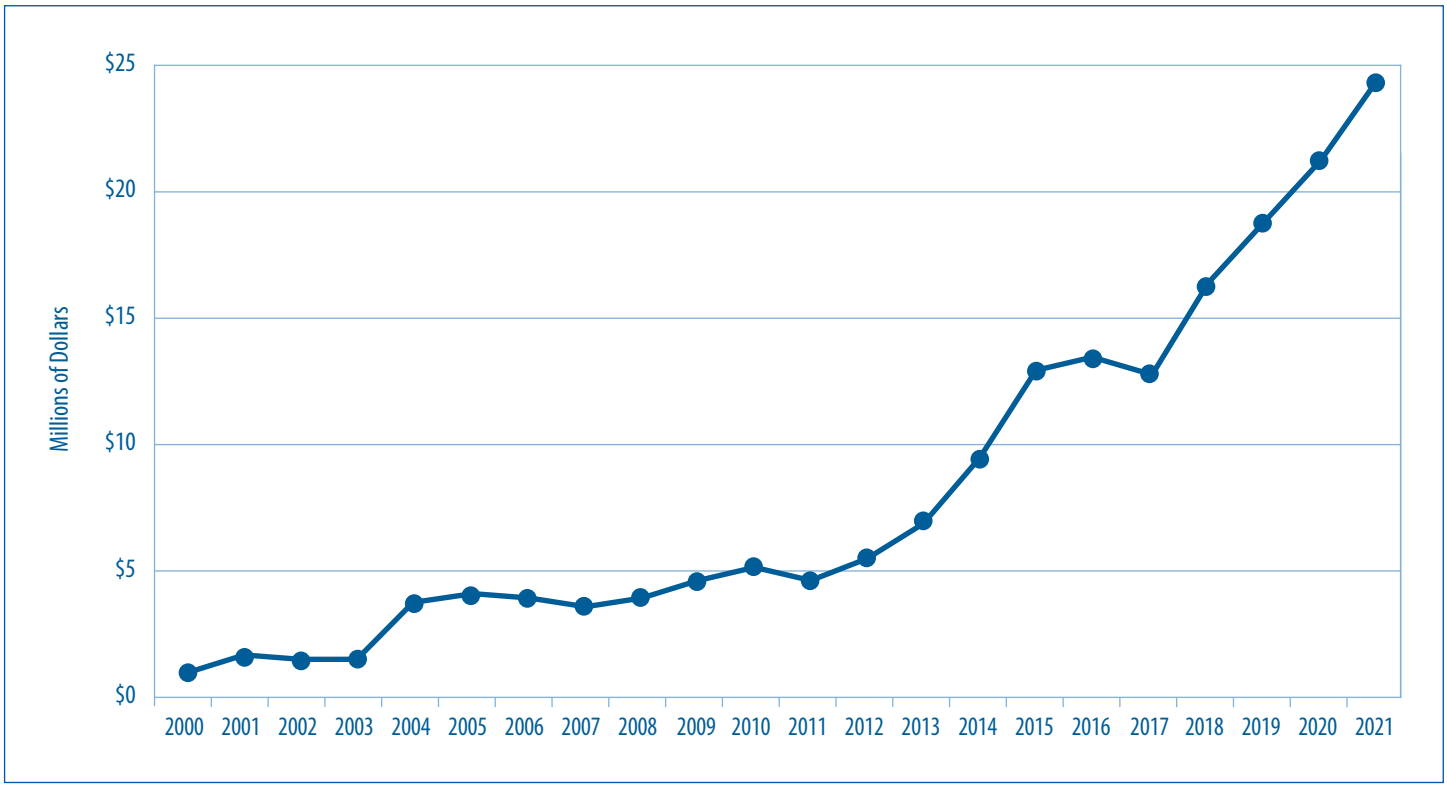
While patents are one of the outcomes of the innovation process, spending on research and development is one measure of the inputs to that process. While R&D spending by private sector companies is not always publicly available, government funding for research is. **Figure 5** shows the dollar value of National Institute of Health (NIH) funding awards to West Michigan organizations by year for 2000-2021. **Figure 6** shows those award amounts as a percentage of the NIH awards for the entire state. These figures show a significant increase in NIH research funding for West Michigan, both in dollar terms and relative to the state as a whole.

The increase in NIH funding is reassuring. Combined with the data on patenting, the funding numbers could indicate that medical innovation itself is not declining, but just that fewer medical innovations are being patented. Unfortunately, the NIH data does not imply that total spending for medical research (public and private) has a similar upward trend.

References

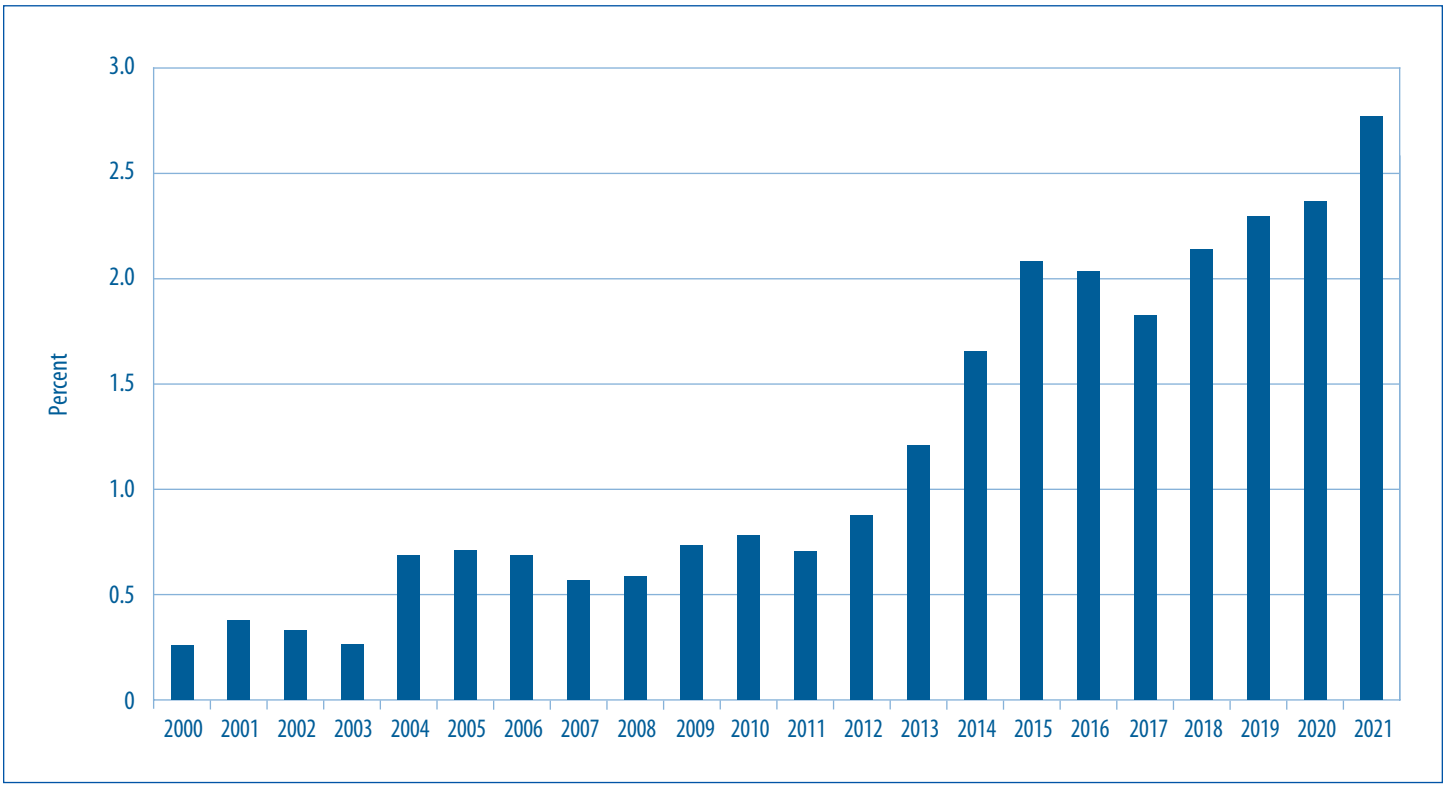
WIPO (2019). *World Intellectual Property Indicators 2019.* Geneva: World Intellectual Property Organization.

Figure 5: National Institute of Health Funding to West Michigan Organizations, 2000-2021



Source: National Institute of Health, www.nih.gov

Figure 6: National Institute of Health Funding to West Michigan Organizations as a Percentage of Total Michigan Funding, 2000–2021



Source: National Institute of Health, www.nih.gov

Health Care Trends

Grand Valley State University
www.gvsu.edu

Demographic Changes

Demographic changes have significant effects on the utilization of health care services. We continue to monitor two key trends: continued population growth on the west side of the state and an increase in the average age of the population. Because older individuals tend to have more health care needs than younger individuals, an aging population can result in increased health care utilization and, as a result, increased expenditures. Additionally, previously noted geographic shifts in population distribution from east to west can affect demand for care and resource allocation in particular regions.

Population Growth

Figure 1 displays population growth rates for Kent, Ottawa, Muskegon, and Allegan (KOMA) counties, the Detroit region (Oakland, Macomb, and Wayne counties), the entire State of Michigan, and the U.S. Throughout the 1990s, the KOMA region's population growth rate was greater than both the growth rate for the State of Michigan and the growth rate for the U.S. However, during the recession in the mid-2000s, growth rates for both the KOMA region and the Detroit region fell drastically. Though the KOMA region maintained positive population growth throughout the 2000s, except for a negative dip in 2010, the Detroit region experienced population loss beginning in the early 2000s that lasted for about a decade. The Detroit region achieved positive population growth in the early part of this decade before dipping into a negative growth rate in 2015. Although the Detroit region has experienced low, but positive, growth between 2016 and 2017 (about 0.13 percent on average), this trend has been reversed since 2018, where the decline in the population growth rate reached a low of -0.54 percent in 2021.

The KOMA region's population growth rate began increasing rapidly after 2010 and exceeded the national growth rate in 2012. Over recent years, the positive population growth in West Michigan has continued, but at a slower pace, with growth rates falling from 1.26 percent in 2013 to 0.27 percent in 2021. While the western population growth rate appears to be slowing the KOMA region population growth from 2011 through 2021, on average, continued to surpass that in the Detroit region. These findings illustrate a continued shift in population density to the western part of the state. As this trend continues, demand for health care resources and health care infrastructures could be affected. For example, while the share of total state Medicare expenditures fell for both the KOMA region and the Detroit region from 2010 to 2020, the relative decline was more than 6 percentage points larger for the Detroit region (Centers for Medicare and Medicaid Services, 2020).

In summary, we note declining population growth rates across both the KOMA and Detroit regions, across the State of Michigan as a whole, and furthermore for the U.S. at large, where the rate fell sharply from 0.73 percent in 2016 down to 0.12 percent in 2021.

Age Distribution

An important development in demographic trends in the U.S. continues to be the aging of the baby boomers, those born between 1946 and 1964. **Figures 2 through 4** depict population distributions by age for the KOMA region, the Detroit region, and the U.S. as a whole. The clear trend in all three figures is the steady aging of the population. Individuals between the ages of 45 and 64 continue to outnumber all other age groups despite being only the third largest age group in 1990. As noted previously, since 2010, the percentage of the population over the age of 65 has experienced the largest growth of any of the age categories (about 4 percentage points between 2010 and 2021) in KOMA and Detroit regions, as well as the U.S. As a result, the populations between the ages of 5 and 19, 20 and 34, and 35 and 44 all account for a smaller percentage of the total population today than they did in 1990. These trends are important for several reasons.

First, health care expenditures are closely related to age, with more than 50 percent of lifetime spending on medical care occurring after the age of 65 (Alemayehu & Warner, 2004). Due to the demographic shifts (**see Figures 2 through 4**), the Centers for Medicare and Medicaid Services (2017) project total Medicare spending to nearly double between 2015 and 2026. In Michigan, the Detroit region has a higher proportion of its population in the 45 to 64 and 65 and over age categories, which could result in higher medical expenditures. The share of the population over the age of 65 in the Detroit region grew from approximately 12 percent in 1990 to more than 17 percent in 2021. By contrast, the KOMA region has a population distribution that is slightly younger than the U.S., though the population is still aging compared to 1990. Note that increasing medical expenditures associated with an aging population are likely to occur across the entire state.

Second, **Figures 2 through 4** show the proportion of those over the age of 65 in comparison to the population between the prime working ages of 35 and 44. Since the Medicare program is primarily funded through taxes on employment, participants in the labor market effectively subsidize health insurance for the over 65 age demographics. The number of workers per Medicare beneficiary has fallen steadily since 1995. Whereas in 2000, four workers supported each Medicare enrollee, the number of workers per beneficiary is projected to fall to 2.5 by 2030 (Board of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, 2021). Moreover, the projections show that the ratio will further go down to 2.2 workers per beneficiary by 2095. Taken together, these findings suggest an increase in the cost of health insurance by 30 percent by 2095. The implications for the long-term sustainability of the Medicare Part A trust fund are grim, despite recent declines in Medicare expenditure growth rate projections. The most recent Congressional Budget Office projections of Medicare solvency suggest that the Part A trust fund will be exhausted by 2026 (Congressional Research Service, 2019).

Finally, the aging of the population has important implications for employer-sponsored health insurance premiums. As the share of the workforce over the age of 45 grows, the cost of private health insurance obtained through employment will likely continue to increase. From 2008 to 2018, average annual employer-sponsored health insurance premiums for family coverage increased 55 percent, which is more than twice as fast as the real annual wages have grown (26 percent), and three times as fast as the rate of inflation at 17 percent, over the same period (Kaiser Family Foundation, 2018).

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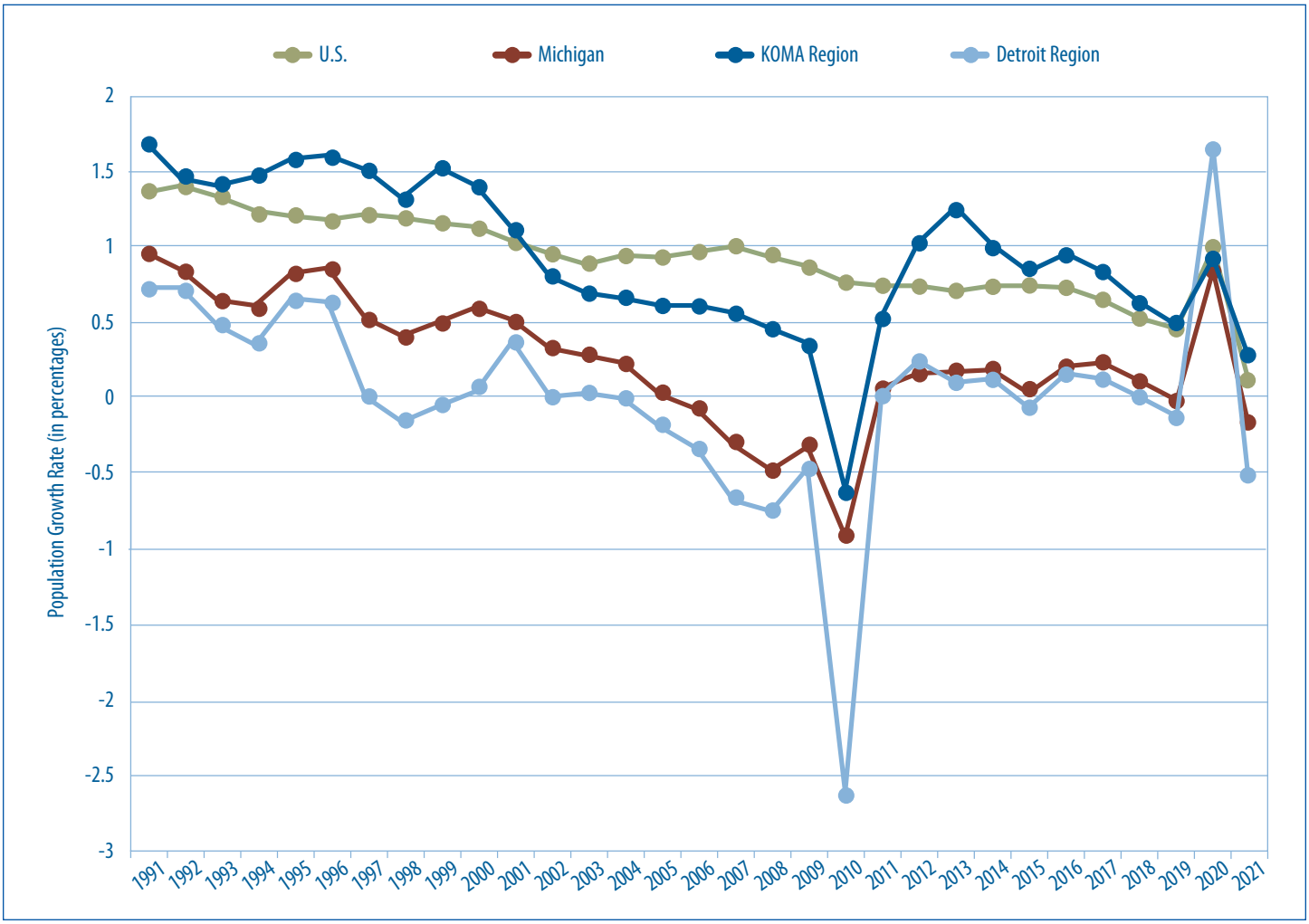
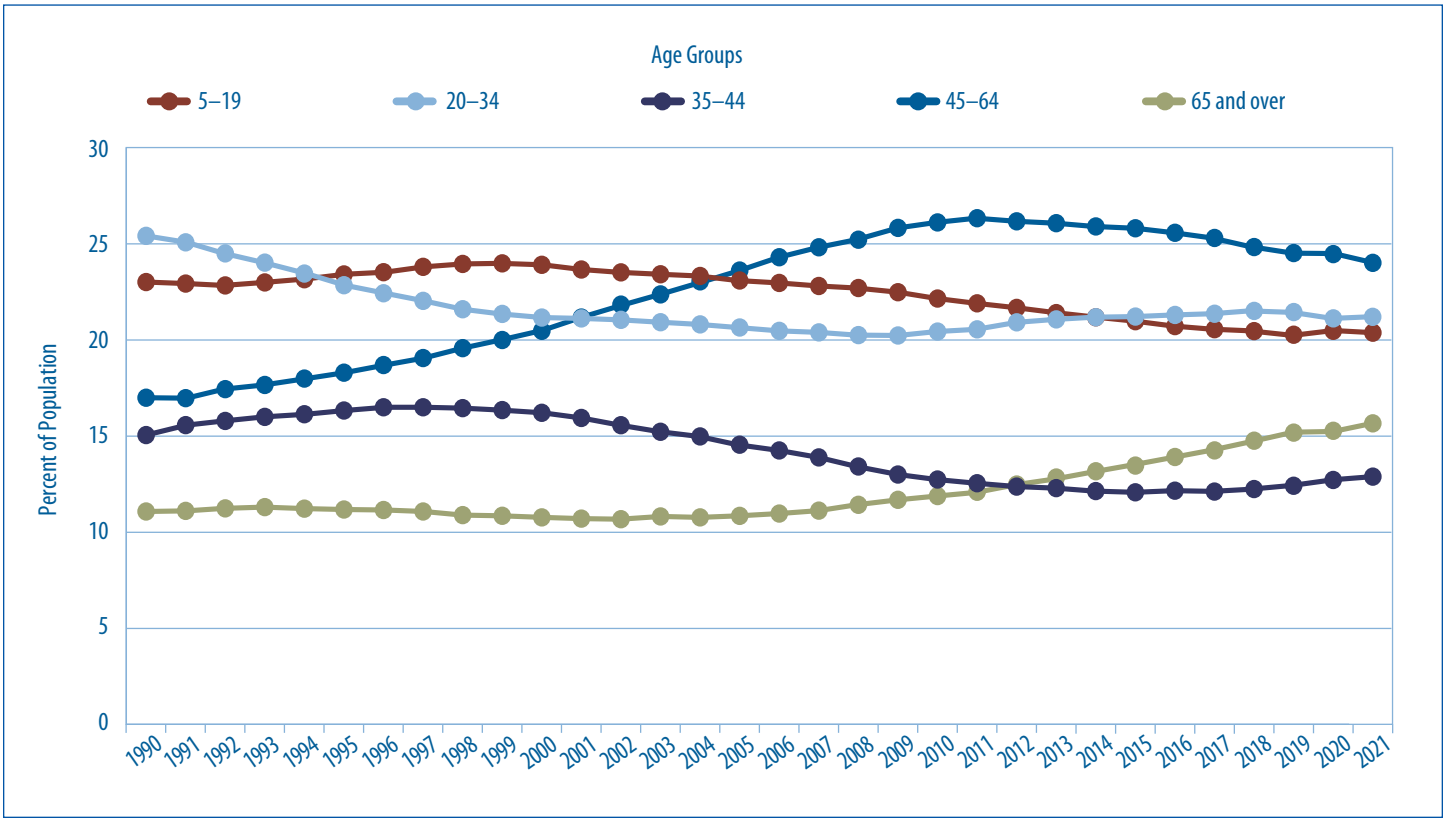
Figure 1: Annual Population Growth Rate, 1991–2021



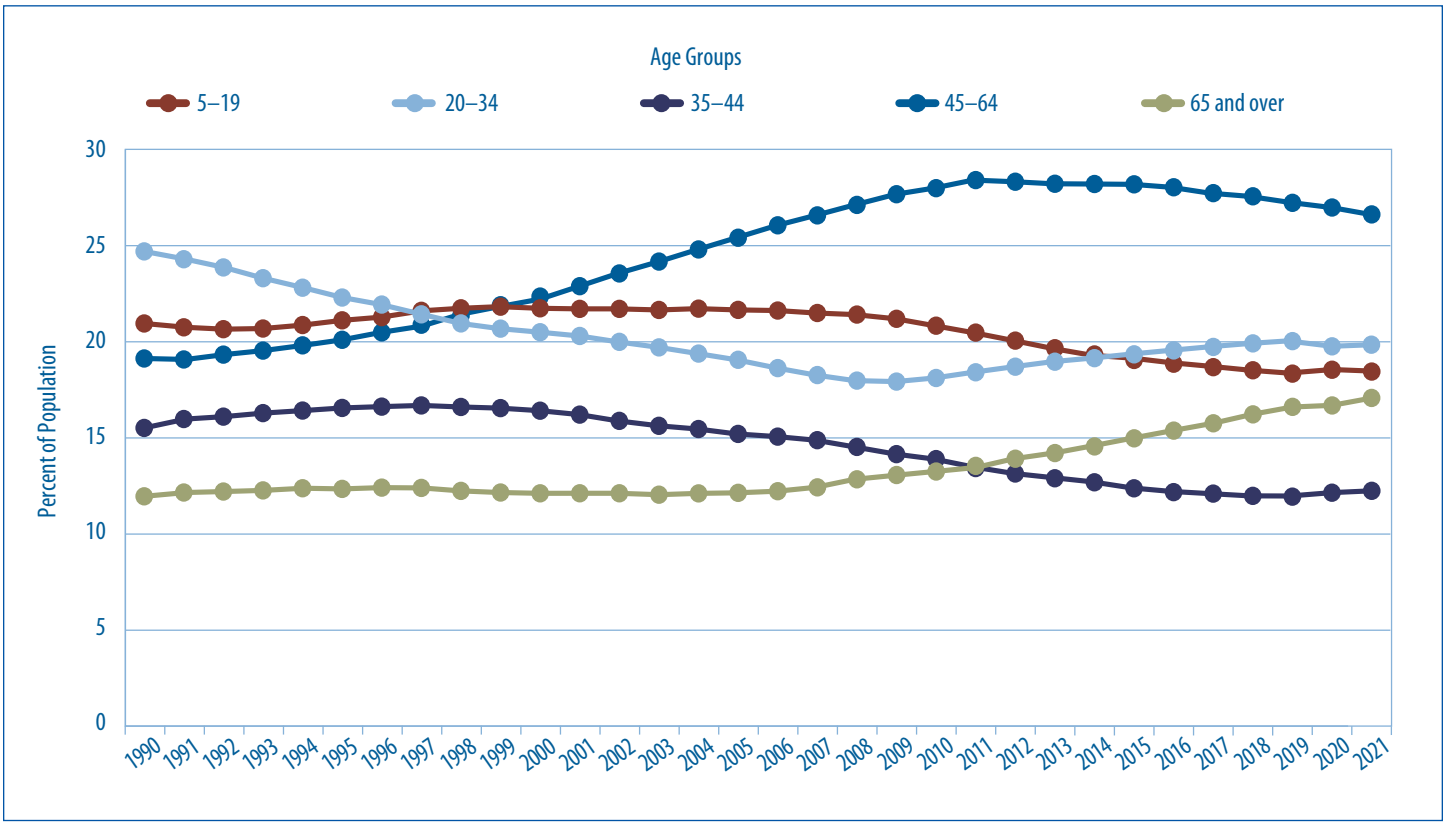
Source: U.S. Census, population and housing unit estimates
Differences compared to previous Health Check editions are due to revisions of U.S. Census Bureau data.

Figure 2: Population Distribution as a Percent of KOMA, 1990–2021



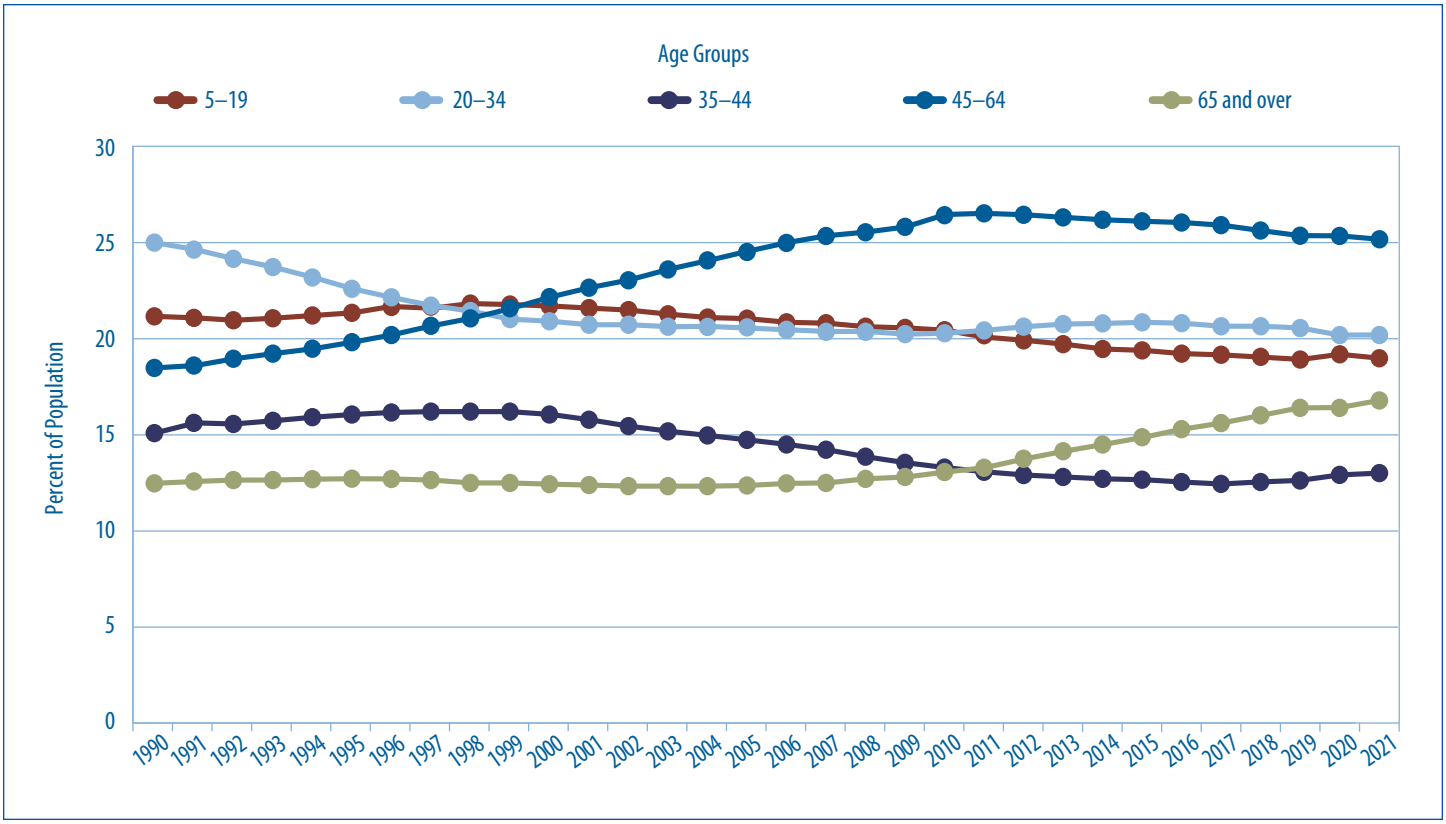
Source: U.S. Census, population and housing unit estimates

Figure 3: Population Distribution as a Percent of the Detroit Region, 1990–2021



Source: U.S. Census, population and housing unit estimates

Figure 4: Population Distribution as a Percent of Total United States, 1990–2021



Source: U.S. Census, population and housing unit estimates

Health Care Overview

In this section, we considered broad health care trends across health care access, health status, mental health, general health risk factors (e.g., alcohol consumption and smoking), vaccination behavior, HIV testing, and cancer screening. We compared the West Michigan KOMA (Kent, Ottawa, Muskegon, and Allegan) counties and the Detroit region (Macomb, Oakland, and Wayne counties). Following last year's report, we focused on health disparities in the KOMA region and the Detroit region. In doing so, we analyzed health care trends by race and gender. In additional analyses, we explored trends in HIV testing by sexual orientation (e.g., lesbian, gay, and bisexual) and gender identity (e.g., transgender). We obtained this data from the Michigan Department of Health and Human Services Behavioral Risk Factor Surveillance System (MiBRFSS).

There are a few limitations of the MiBRFSS data. First, the estimates are based on self-reported surveys. Consequently the actual incidence and prevalence rates for the factors examined using this data may differ from those reported by respondents. Second, there is a data suppression rule that restricts the disclosure of certain estimates. If the denominator of a weighted percentage has less than 50 observations and/or has a relative standard error greater than 30 percent, then these estimates are suppressed. This becomes an issue when stratifying the data by certain demographics, particularly by race, sexual orientation, and gender identity. To minimize the issue regarding race, we aggregate black non-Hispanic, other and multiracial, and Hispanic as non-white. Therefore, our analysis by race compares white individuals to non-white individuals. We must note that even in this case there are instances of missing estimates according to the suppression rule. Moreover, we were not able to explore most of the outcomes by sexual orientation and gender identity due to the data suppression rule.

Health Insurance and Access to Care

We start our analysis by exploring trends in measures involving health insurance and health care access. **Figures 1 and 2** plot the percentage of the population in the KOMA and Detroit regions that reports having no health insurance by race and gender, respectively. Uninsured rates in both regions have fallen since 2013 because of the improving economy and the increased availability of different health insurance options under the Affordable Care Act. For example, as of September 2020, more than 790,000 people enrolled in the Healthy Michigan expansion of the state's Medicaid program (MDHHS, 2020). In 2011, the first year of our data, nearly 11 percent of the white population in the KOMA region and the Detroit region were uninsured. By 2019, that figure had fallen to about 5 percent in both regions. We observe a completely different trend when we focus on the non-white population. Worth noting here is that while the trend in having no health insurance has been continuously downward for non-white populations in the Detroit region, non-white populations in the KOMA region experienced a considerable uptick in the uninsured rate in 2017. In other words, about 17 percent of non-white individuals were uninsured in KOMA in 2011, whereas about 21 percent of non-white individuals, on average, reported having no health insurance in the KOMA region between 2017 and 2019. This is a 4 percentage points increase from the 2011 level. The uninsured rate remains by far the highest when comparing other races in both the west and the east side of the state. These trends were reversed during the COVID-19 outbreak, where we observed a substantial increase in public health insurance enrollment, particularly Medicaid enrollment (Khorrami & Sommers, 2021). This is also reflected in our data. We observe a decline in the percentage of the non-white population reporting having no health insurance in 2020. We expect this declining trend to continue in the 2021 data.

When we analyze health insurance trends by gender in the KOMA region, there is an overall decline in the percentage of males and females reporting no health insurance in both West Michigan and the Detroit region. Although there was a slight uptick in the uninsured rate for males in 2019, we find a declining trend in 2020, which is consistent with the increased health insurance take-up during the pandemic.

The next six figures represent measures of health care access that we would expect to be impacted by the changes in insurance coverage observed in **Figures 1 and 2**. **Figure 3** displays estimates of the share of the white and non-white population who were unable to access health care at some point in the past 12 months due to costs. We see major disparities between non-white and white individuals, especially in West Michigan. In 2019, 21.5 percent of the non-white population reported lacking access to care because of costs in the KOMA region. Unfortunately, the 2020 estimate for non-white individuals in the KOMA region was not provided due to the data suppression rule. However, we find a decline from 12.1 percent in 2019 to 6.1 percent in 2020 among the white population who experienced access problems due to costs. These declining trends are perhaps more striking in the Detroit region. Since 2019, we find that the racial gap in the Detroit region has narrowed down substantially. Specifically, the gap in health care access due to costs between non-white and white individuals was about 6 percentage points in 2018, which then plummeted to 3.4 percentage points in 2019 and 0.4 percentage points in 2020. In **Figure 4**, we see similar declining trends for males and females in both regions, particularly for females in the Detroit region. Although the precise mechanism is ambiguous, these are positive developments considering that federal subsidies during COVID-19 may have played an effective role in alleviating disparities, at least partially, in accessing health care. An interesting avenue for future research is to disentangle the causal effect of federal fiscal responses on health care access by race and gender during the pandemic.

Figures 5 and 6 continue the examination of access to care by tracking the share of the population that reported having a usual source of care when ill. There are two notable observations. First, in **Figure 5**, we observe non-negligible disparities between non-white and white individuals in both regions, where the latter is more likely to have a usual source of care. The trends are relatively stable over time, except for non-white individuals in KOMA. Despite high volatility, non-white individuals are, on average, less likely to have a usual source of care than white individuals in KOMA. Moreover, we see a slight increase in non-white individuals having a usual source of care in 2020, slowly closing the gap with white individuals. Second, in

Figure 6, there is a noticeable disparity between females and males. Specifically, males report having a less usual source of care compared to females in both regions. For instance, while 92 percent of females reported having a usual source of care, about 83 percent of males reported having a usual source of care in the KOMA region in 2020.

Lastly, **Figures 7 and 8** plot the share of the population in West Michigan and the Detroit region with a routine checkup in the past year. Although earlier figures highlighted that health care access increased during the pandemic, these may be driven by medical conditions related to COVID-19. An important concern during the pandemic was the increase in the number of individuals delaying care for chronic conditions or avoiding preventive care due to virus exposure. In fact, Aslim et al. (2022) show that more than 30 percent of adults delayed medical care for conditions other than COVID-19 during the pandemic. Our findings in **Figures 7 and 8** are consistent with the existing literature. Although there was an increase in routine checkups until 2019, we find a sharp decline in routine checkups in 2020. This is particularly problematic as delaying care for treatable and preventable conditions may exacerbate excess mortality directly or indirectly related to the pandemic. Additionally, pairing **Figure 8** with the figures previously mentioned suggests that access problems, including access to routine checkups, are likely to be more prevalent among males than females. An important take-away is that continued stress on the importance of preventative care through an annual exam may be warranted to help promote education and monitoring of high health-risk-related behaviors.

To follow up on the discussion of delaying care and potential mitigation measures in this year's report, we follow trends in preventive care in the next section.

Preventive Care

More than one-third of individuals delayed at least one type of care during the pandemic (Gonzalez et al., 2021). A critical finding in the literature is that receiving COVID-19 vaccination reduces the concerns about spreading or contracting coronavirus, in turn, reducing the likelihood of delaying care (Aslim et al., 2022). In this section, we explore trends in measures of preventive care (e.g., flu shots, HIV testing, and cancer screenings), with a specific focus on the first year of the pandemic. Note that the estimates for cancer screening are reported only in even-numbered years.

Since the literature on COVID-19 vaccination is vast, we instead start our analysis by focusing on flu vaccination. **Figures 9 and 10** report the percentage of individuals not receiving a flu shot by race and gender, respectively. A common theme emerges in these figures. First, there is a sharp decline in the percentage of individuals not receiving flu shots (or an increase in receiving flu shots) since 2019 in **Figure 9**. Perhaps more importantly, the slope in general is steeper in 2020. Although, historically, non-white individuals in the Detroit region were less likely to receive flu shots, we observe a surge in flu vaccination uptake during the pandemic. Aslim et al. (2022) also find an increase in COVID-19 vaccination uptake among minorities and those with lower socioeconomic backgrounds following the age-specific vaccination rollout. Second, we do not find significant disparities with respect to gender in **Figure 10**. However, there is a sharp increase in flu vaccination among females since 2019, particularly in the KOMA region.

HIV testing is crucial for HIV prevention, treatment, and care. As part of routine care, the Centers for Disease Control and Prevention (CDC) recommends individuals aged 13 to 64 get tested for HIV at least once. In **Figure 11**, we explore whether individuals have ever been tested for HIV by race. We find that non-white individuals are more likely to be tested for HIV compared to white individuals in both KOMA and Detroit regions. A potentially worrisome development is that there has been a sharp decline in getting tested for HIV in 2020, particularly among non-white individuals. Next, **Figure 12** stratifies individuals based on sexual orientation (e.g., lesbian, gay, and bisexual) and gender identity (e.g., transgender). Unfortunately, we cannot provide the estimates for individuals who identify as lesbian, gay, bisexual, or transgender (LGBT) in the KOMA region due to the data suppression rule. Nonetheless, we can make comparisons using the Detroit region. On average, individuals identifying as LGBT are more likely to be tested for HIV. Similar to **Figure 11**, we observe a decline in ever being tested for HIV among individuals identifying as LGBT in 2020.

We now turn our focus to different types of cancer screening by gender in **Figures 13-16**. We first analyze trends in colorectal screening. To prevent colorectal cancer, regular screening beginning at age 45 is recommended by the CDC. **Figure 13** reports the percentage of individuals having either a sigmoidoscopy in the last five years or a colonoscopy in the last 10 years, which we define as having "appropriate" colorectal screening. Due to the lookback period in the survey question, this does not necessarily capture the changes in screening during the pandemic. Nonetheless, we find a sharp decline in both males and females screening for colorectal cancer in KOMA in 2020. Despite the decline, females, on average, are more likely to receive appropriate colorectal screening compared to males. Moreover, the percentage of individuals screening for colorectal cancer appears to be higher in KOMA than the Detroit region.

Next, we explore trends in breast and cervical cancer screening in **Figures 14 and 15**, respectively. **Figure 13** reports the percentage of women aged 40 and over having a mammogram in the past year. Existing research suggests that there has been a 58 percent decline in the volume of screening mammograms during the pandemic (Song et al., 2021). Although we observe a decline in mammograms in 2020, there has been a relatively consistent decline over time in both KOMA and Detroit regions. In terms of cervical cancer screening, we observe opposite trends in KOMA and Detroit regions since 2016. **Figure 15** displays the percentage of women aged 18 and over reporting not having a Papanicolaou smear, also called a Pap test, ever. Despite not having a longer time series, we observe a decline in not having a Pap test in the KOMA region in 2020, while there is a sharp increase in the percentage of women never getting any Pap test in the Detroit region in 2020. Although we might not be able to derive clear conclusions based on a single year, the increasing trend in the Detroit region could be problematic in terms of cervical cancer prevalence if it persists in the upcoming years.

Finally, we shift our focus to males, and we analyze trends related to prostate cancer screening. **Figure 16** shows an increasing trend in males never receiving a Prostate-Specific Antigen (PSA) test. The percentage of males not screening for prostate cancer is also higher in the KOMA region than the Detroit region.

Inadequate Sleep

Existing scholarship shows that inadequate sleep is strongly correlated with cardiovascular diseases, diabetes, respiratory disorders, as well as psychiatric disorders (Zee & Turek, 2006). Moreover, individuals, particularly teens, with shorter sleep durations are more likely to engage in risky health behaviors such as using alcohol, tobacco, or drugs (Weaver et al., 2018). For these reasons, in this year's report, we track a new outcome that measures inadequate sleep by race and gender in **Figures 17 and 18**, respectively.

Figure 17 shows major disparities between non-white and white individuals in both the KOMA and Detroit regions. Specifically, about 50 percent of non-white individuals, on average, report having inadequate sleep in both regions. On the other hand, less than 37 percent of white individuals, on average, report having inadequate sleep. We do not find similar disparities with respect to gender in **Figure 18**. Interestingly, there is a declining trend in the percentage of individuals having inadequate sleep in the first year of the pandemic. The impact of the pandemic and the corresponding mitigation policies have heterogeneous effects on sleep patterns. Yuksel et al., (2021) find that the pandemic is associated with increased sleep disturbances and that stricter lockdown polices are correlated with poorer sleep. However, the authors find a positive relationship between older age and better sleep, as well as the income level of a country and better sleep.

General Health Status and Mental Health

Figure 19 displays the percentage of white and non-white individuals reporting fair or poor health by race. Historically, non-white individuals in both the KOMA and Detroit regions were more likely to have fair or poor health compared to white individuals. Interestingly, there has been a decline in the percentage of non-white individuals reporting fair or poor health since 2018, particularly in KOMA, closing the gap with white individuals. In fact, in the first year of the pandemic, the percentage of non-white individuals in KOMA reporting fair or poor health drops to 12.1 percent from 23.7 percent in 2018. These changes might be related to increased health care access that we have shown earlier in **Figure 3**. We also see similar trends by gender in **Figure 20**. Both males and females experienced a decline in fair or poor health in 2020, though the percentage of females reporting fair or poor health remains relatively high in the Detroit region.

Figure 21 reports the percentage of white and non-white survey respondents who reported experiencing more than 14 days of poor mental health. Here, the numerator consists of the number reporting 14 days or more to the question: "Now, thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" The denominator, on the other hand, is based on the total number of respondents in a given county.

Looking at the KOMA and Detroit regions across the period of 2011-2015, we observe major disparities in mental health problems between non-white and white individuals. On average, 17 percent of non-white individuals reported having poor mental health between 2011-2015, whereas this number was around 12 percent among white individuals. After 2015, there is a stable increase in the percentage of white individuals experiencing poor mental health in the Detroit region. In fact, 17 percent of white individuals in the Detroit region reported experiencing more than 14 days of poor mental health in 2020, surpassing the percentage for white individuals (13.1 percent) in the KOMA region, as well as non-white individuals (16.3 percent) in the Detroit region. Put differently, poor mental health days peaked in 2016 among white individuals in the Detroit region and have remained high since then. On the other hand, despite having a higher fraction of non-white individuals experiencing mental health problems in the KOMA region, the gap between white and non-white individuals started closing in 2019 and remained relatively low compared to the Detroit region. Unfortunately, the estimates for non-white individuals in the KOMA region for the first year of the pandemic is not available due to the data suppression rule. Another important observation: despite individuals reporting better health in general in 2020, we observe mental health problems peaking in both regions in 2020, which is consistent with the literature (Blanchflower & Bryson, 2022). Combining the findings in this figure with **Figure 22** implies that the increase in mental health problems during the first year of the pandemic are likely driven by females in both regions.

Risk Factors

Figure 23 presents estimates of the prevalence of heavy drinking for white and non-white individuals in the KOMA and the Detroit region. Heavy drinking is defined as the proportion of adults in each region who report consuming an average of more than one alcoholic drink per day for women or more than two per day for men. Due to the data suppression rule, we do not observe the estimates for non-white individuals in the KOMA region. Therefore, we conduct our analysis using white and non-white individuals in the Detroit region, as well as white individuals in the KOMA region. The data suggest that more than seven percent of white individuals in West Michigan and the Detroit region were classified as heavy drinkers in 2020. Rates of heavy drinking have remained relatively high for white individuals compared to non-white individuals. In fact, based on the 2020 data, heavy drinking is about 4 percentage points less for non-white than white individuals in the Detroit region. The largest gap between white and non-white individuals in the Detroit region was 5.6 percentage points in 2011.

Next, **Figure 24** shows the prevalence of heavy drinking by gender. On average, we observe that the prevalence of heavy drinking is higher in KOMA than the Detroit region. In terms of gender composition, males are more likely to be heavy drinkers than females in the Detroit region. Although we do not observe clear patterns in the KOMA region, males are also more likely to be heavy drinkers. Contrarily, there are certain years (e.g., 2013-2014 and 2017-2018), where we observe an increase in the percentage of heavy drinking among females compared to males in the KOMA region. Moreover, in the first year of the pandemic, 7.3 percent of males and 7.9 percent of females were classified as heavy drinkers in West Michigan.

Figure 25 also focuses on alcohol consumption but shifts the focus from heavy drinking to binge drinking. Binge drinking is defined as consuming four or more drinks on a single occasion for women and five or more drinks on a single occasion for men. Rates of binge drinking among white individuals on both the west and east sides

of the state are similar and remained steady over the time period included in the analysis. However, similar to **Figure 6**, the white population is more likely to binge drink than the non-white population. Approximately 19 percent of white individuals in the West Michigan region reported a binge drinking episode in the past 30 days in 2020, whereas the rate for non-white individuals was at about 17.6 percent. It is critical to note that white individuals are also more likely to be binge drinking compared to non-white individuals in the Detroit region. Although there are certain years (e.g., 2014-2015 and 2017) where non-white individuals closed the gap with white individuals in the KOMA region, the persistent disparities remained intact in the Detroit region. In **Figure 26**, we also find that males had a higher percentage of binge drinking (about 24 percent) than females (about 14 percent) between 2011 and 2020. Moreover, we observe that the trends in the KOMA and the Detroit region follow each other very closely.

Figure 27 displays the estimates for the white and non-white population who are current cigarette smokers. There are two noticeable trends. There is a decreasing trend in the percentage of white and non-white smokers in the Detroit region, albeit the latter is higher in terms of levels. In 2011, 23.2 percent of white individuals and 25.8 percent of non-white individuals were current smokers in the Detroit region. The prevalence of smoking, however, plummeted to 15.7 and 16.1 percent, respectively, in 2020. The second noticeable trend is that there was a considerable increase in the percentage of non-white individuals who were current smokers in the KOMA region prior to the pandemic. In 2017, 18.9 percent of non-white individuals were current smokers in the KOMA region. However, in 2019, 29.5 percent of non-white individuals reported being current cigarette smokers in the KOMA region, which is approximately an 11-percentage point increase from the 2017 level. However, we observe a slight decline to 24.2 percent in 2020.

In terms of the gender composition of current smokers in **Figure 28**, we find relatively close trends among males and females in the KOMA and the Detroit region. However, there seems to be an increasing trend in the prevalence of male cigarette smokers in the KOMA region. Pairing this finding with **Figure 27** implies that the increase in the prevalence of smoking among non-white individuals in the KOMA region is likely to be driven by males rather than females. In 2014, the Centers for Disease Control estimated that 15.5 percent of the U.S. population currently smoked cigarettes, and cigarette smoking was responsible for 480,000 annual deaths (CDC, 2018). Treatment for illnesses related to smoking and tobacco use can be costly and resource-intensive. Reductions in the prevalence of smoking and tobacco use could lead to increased worker productivity and provide some relief for rising health care expenditures (Berman et al., 2014).

While **Figure 27** suggests a downward trend in the percentage of white and non-white individuals who are current cigarette smokers in the Detroit region, one might be concerned with whether this trend is driven by people giving up their smoking habits or simply substituting cigarettes for alternative products such as e-cigarettes. Given the decrease in the prevalence of smoking among non-white individuals in the KOMA region during the first year of the pandemic, it is interesting to explore whether these individuals substituted these alternative products for cigarettes.

Although our data do not allow us to look at these potential substitution patterns directly, **Figure 29** provides data on whether a white or a non-white person is a former e-cigarette user in the KOMA or the Detroit region. Quite interestingly, we find a decline in the percentage of former e-cigarette users among non-white individuals in the KOMA and the Detroit region, particularly in 2020. This is consistent with a potential substitution from cigarettes to e-cigarettes among non-white individuals in both regions. On the other hand, white individuals in the KOMA region and the Detroit region are relatively less likely to switch to e-cigarettes during the pandemic. **Figure 30** presents these trends by gender, which provide more insights about our findings in **Figure 29**. We find that the decrease in the percentage of non-white individuals who are former e-cigarette users in the KOMA region and the Detroit region is likely driven by males.

It is important to note that BRFSS data only cover the noninstitutionalized adult population (aged 18 or older) and cannot speak to recent trends in increased e-cigarette use among youth below the age of 18. The CDC and the FDA have recently released figures showing that 1 in 5 high school students and 1 in 20 middle school students were past month e-cigarette users, and the use of any tobacco product grew by close to 40 percent among high school students between 2017 and 2018 (CDC, 2019).

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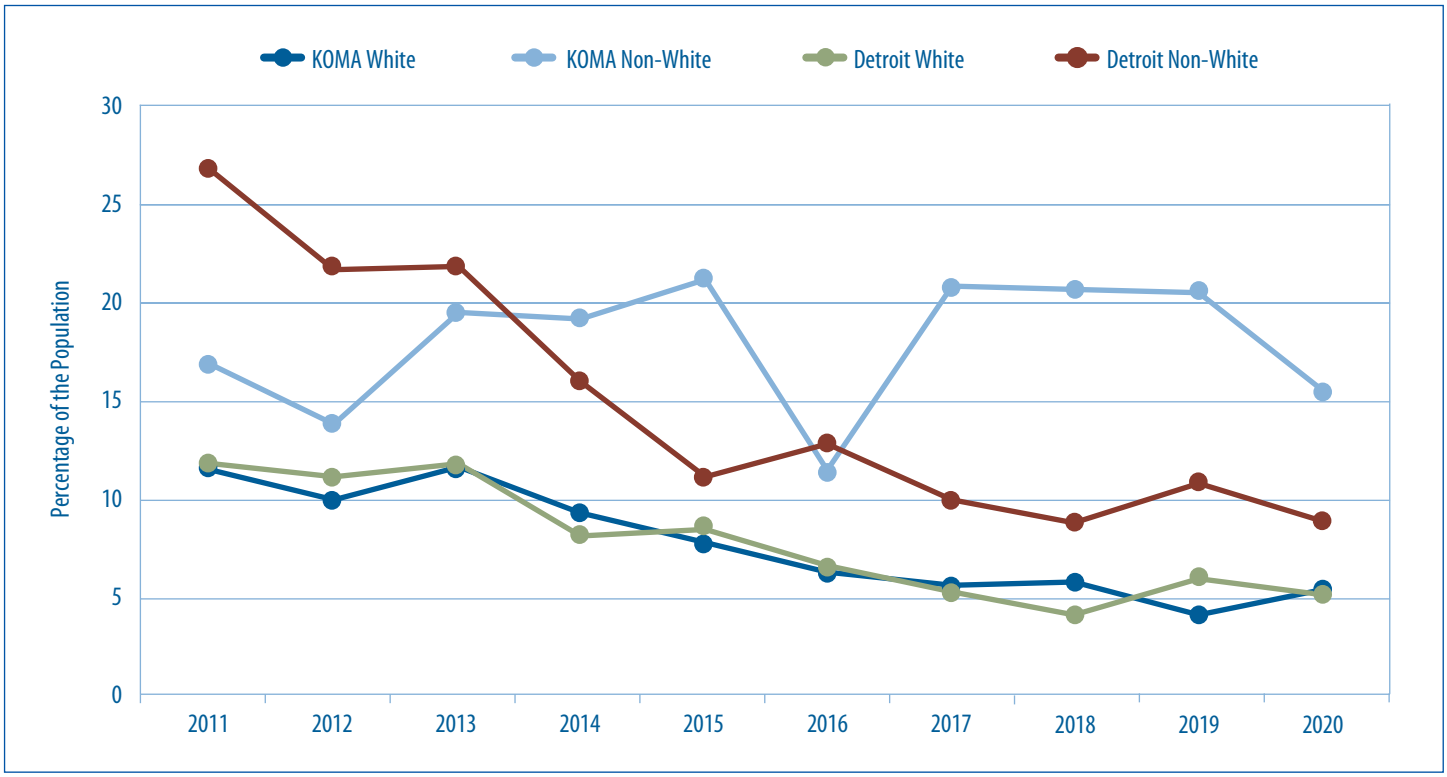
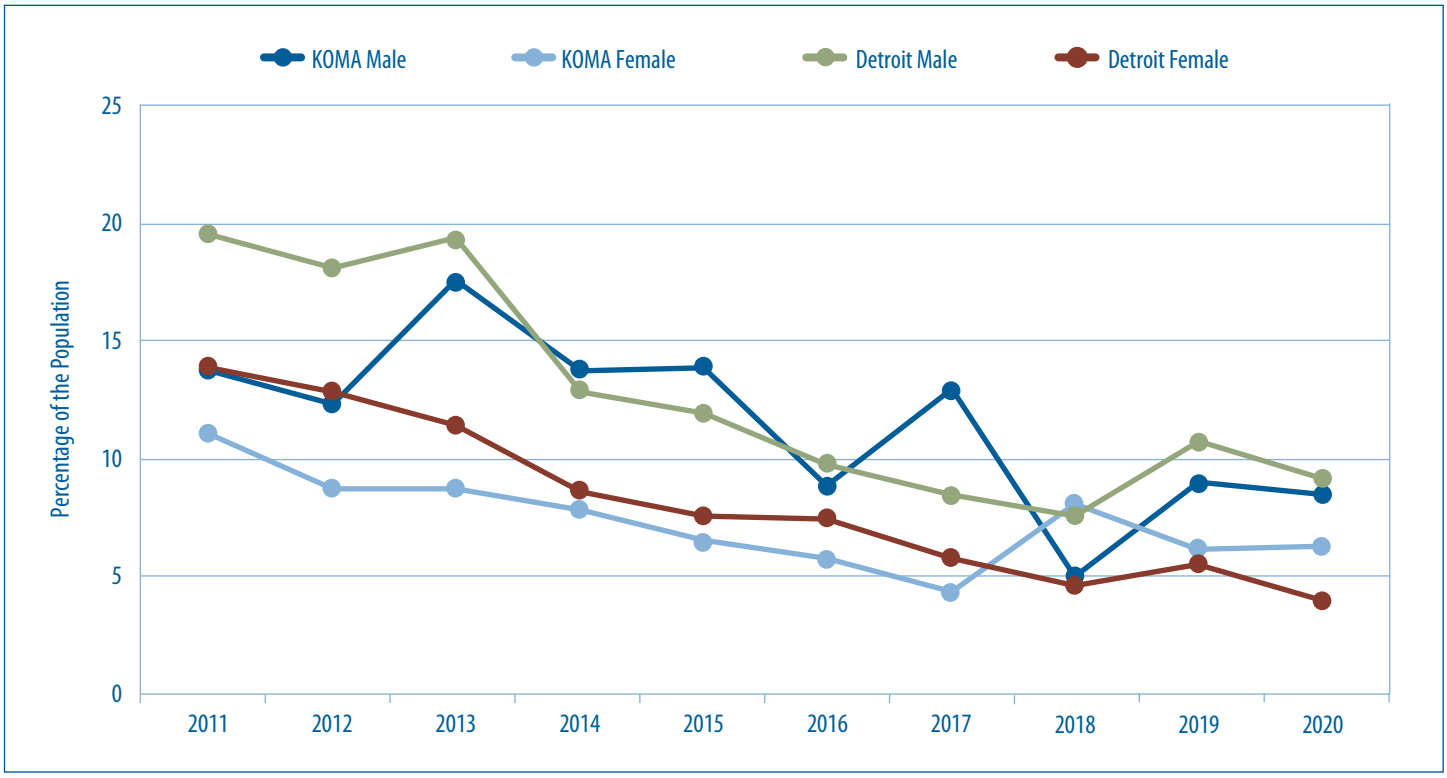
Zee, P. C., & Turek, F. W. (2006). Sleep and health: everywhere and in both directions. *Archives of Internal Medicine*, 166(16), 1686-1688.

Figure 1: No Health Insurance by Race and Region, 2011-2020



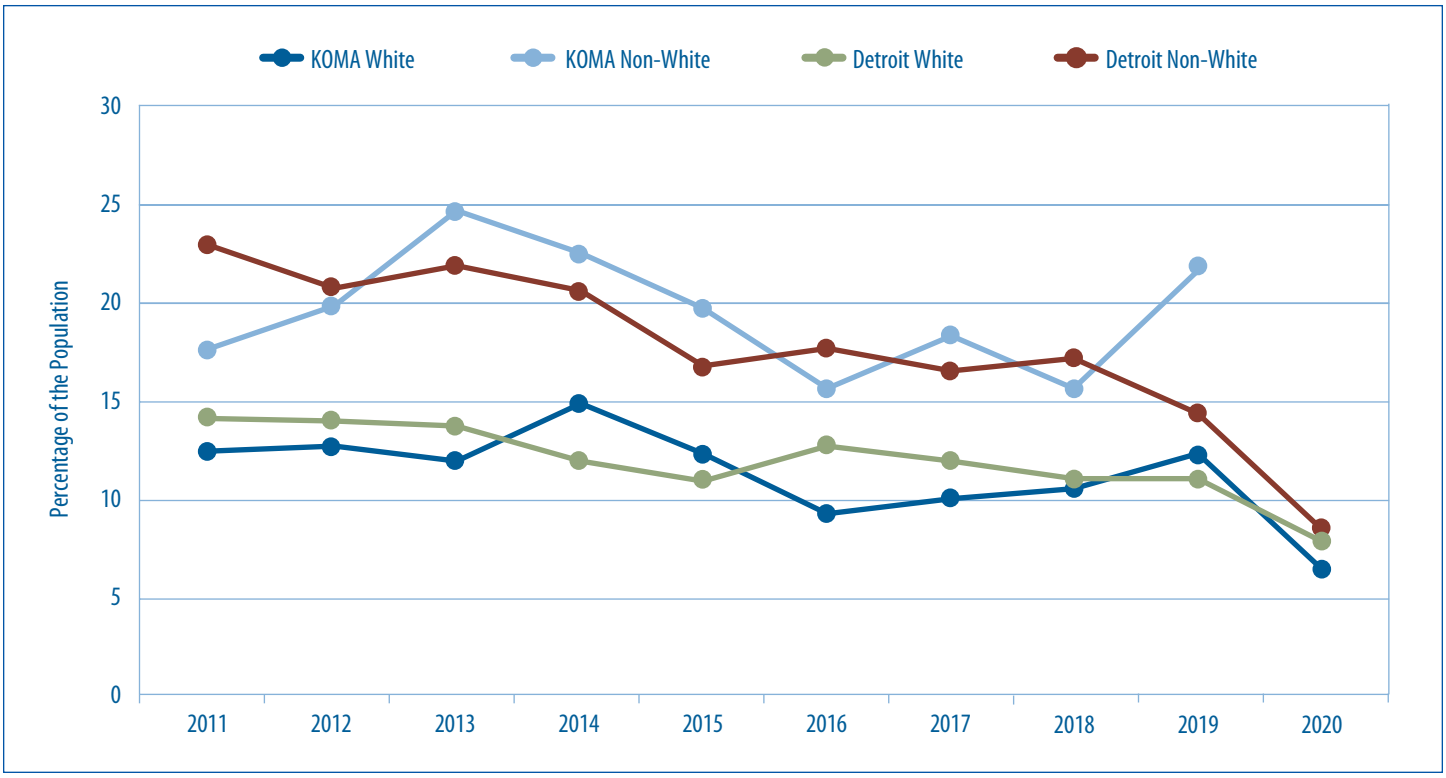
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: We impute the missing estimate for KOMA non-White in 2018 using mean substitution. KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 2: No Health Insurance by Gender, 2011-2020



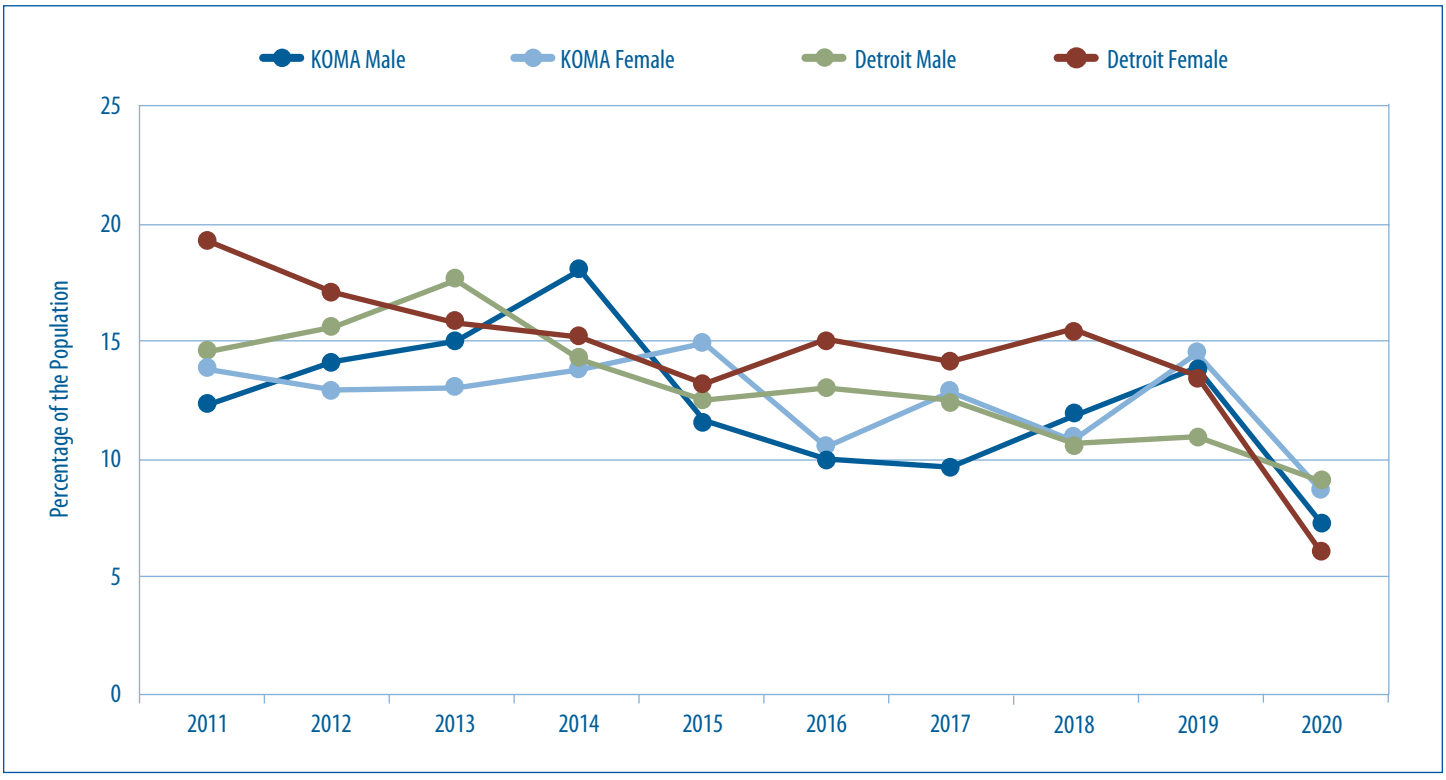
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 3: No Health Care Access Due to Cost by Race, 2011-2020



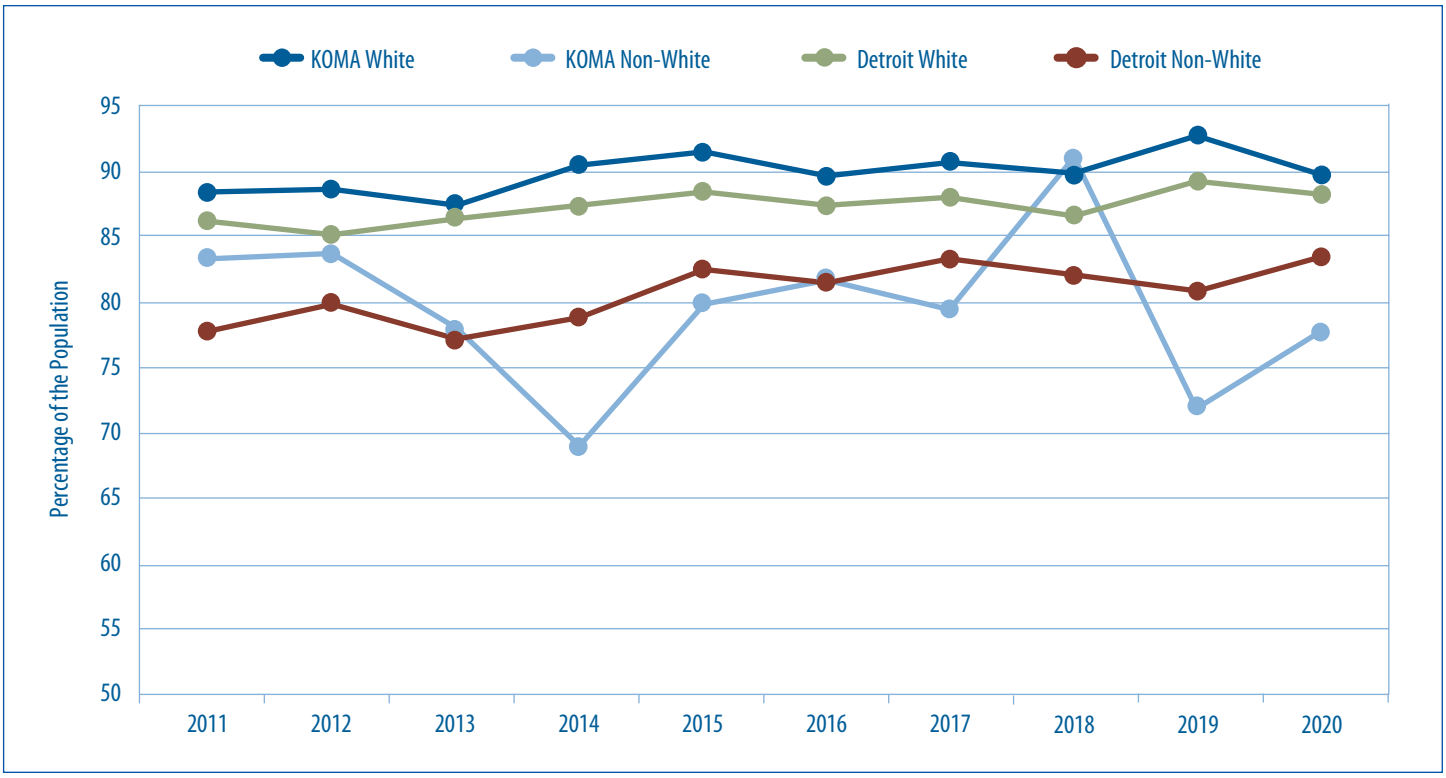
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 4: No Health Care Access Due to Cost by Gender, 2011-2020



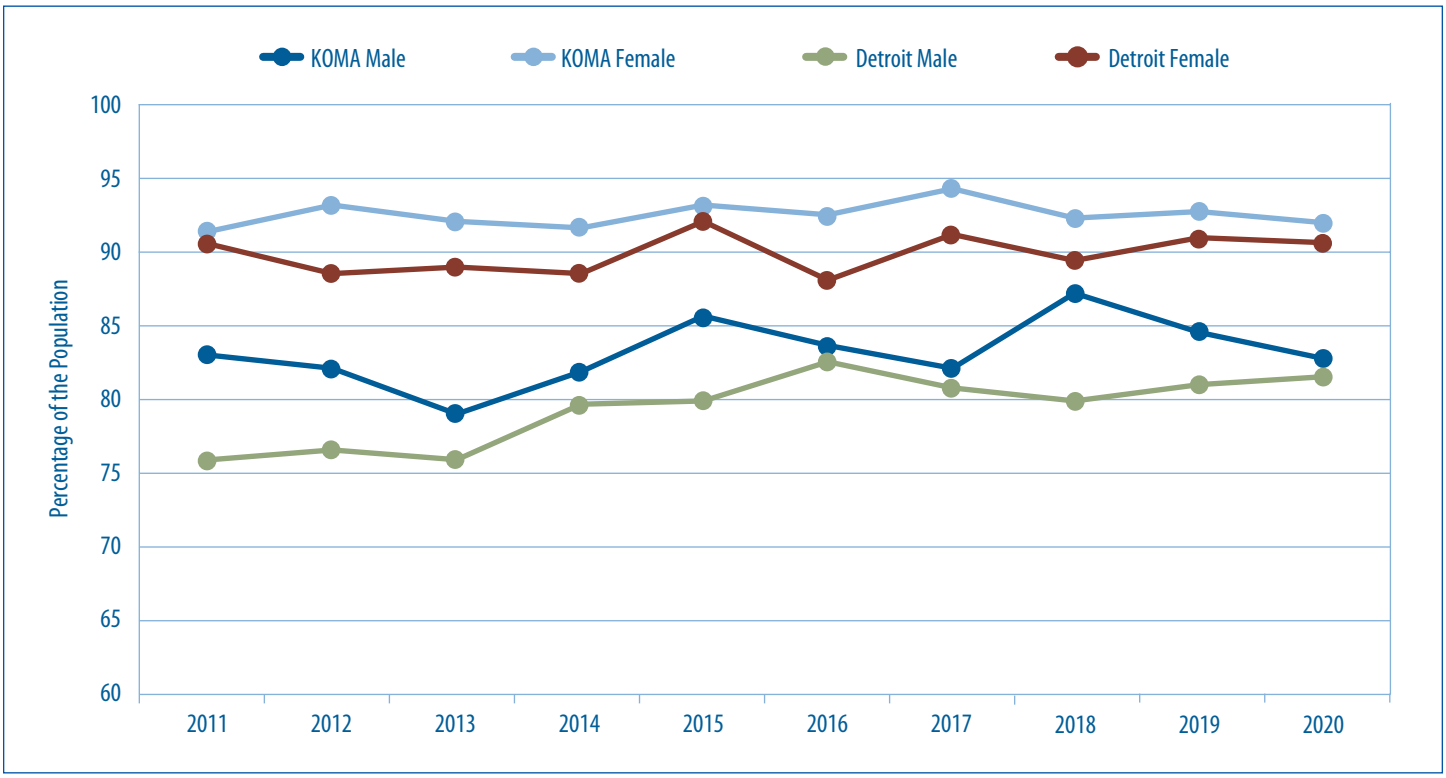
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 5: Has a Usual Source of Care by Race, 2011-2020



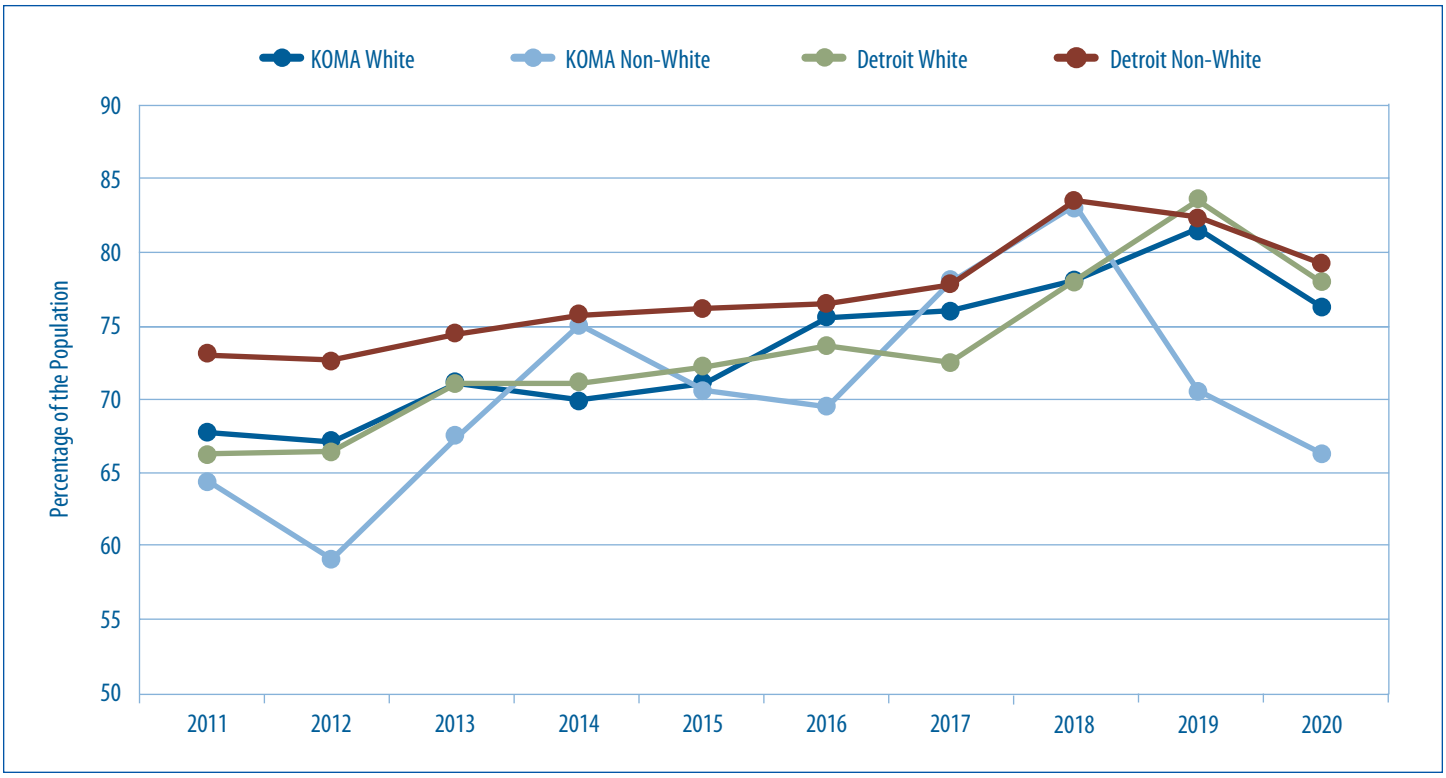
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 6: Has a Usual Source of Care by Gender, 2011-2020



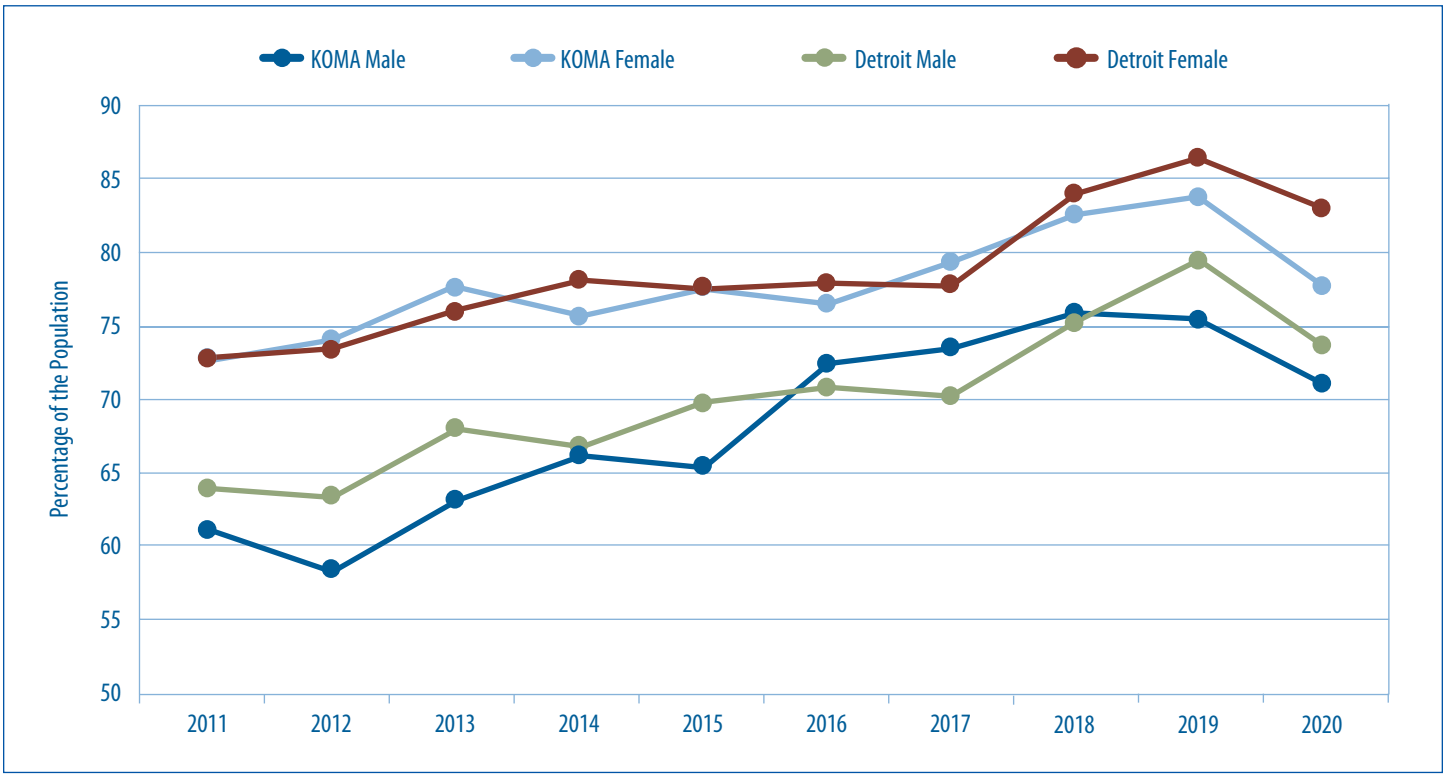
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 7: Had Routine Checkup in Past Year by Race, 2011-2020



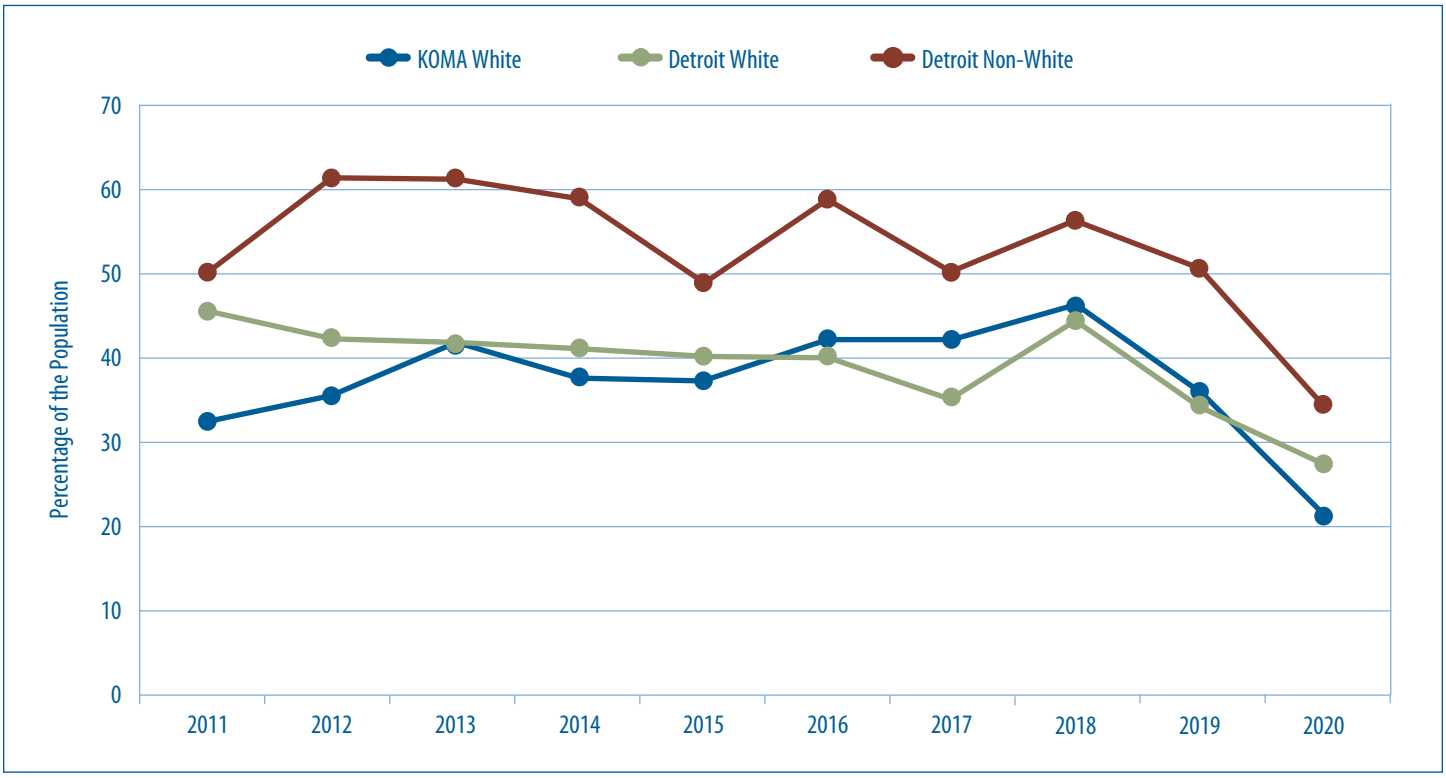
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 8: Had Routine Checkup in Past Year by Gender, 2011-2020



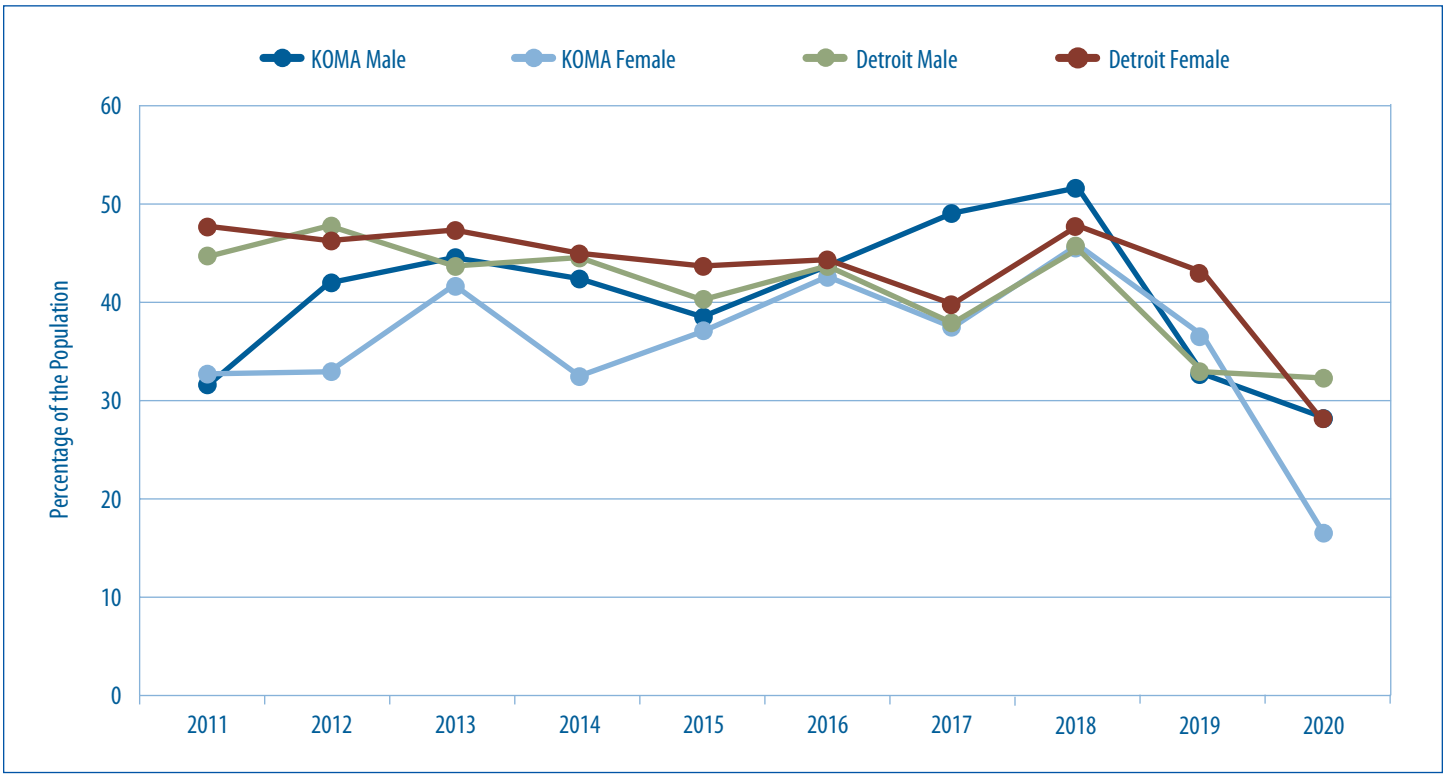
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 9: Not Had Flu Vaccine by Race, 2011-2020



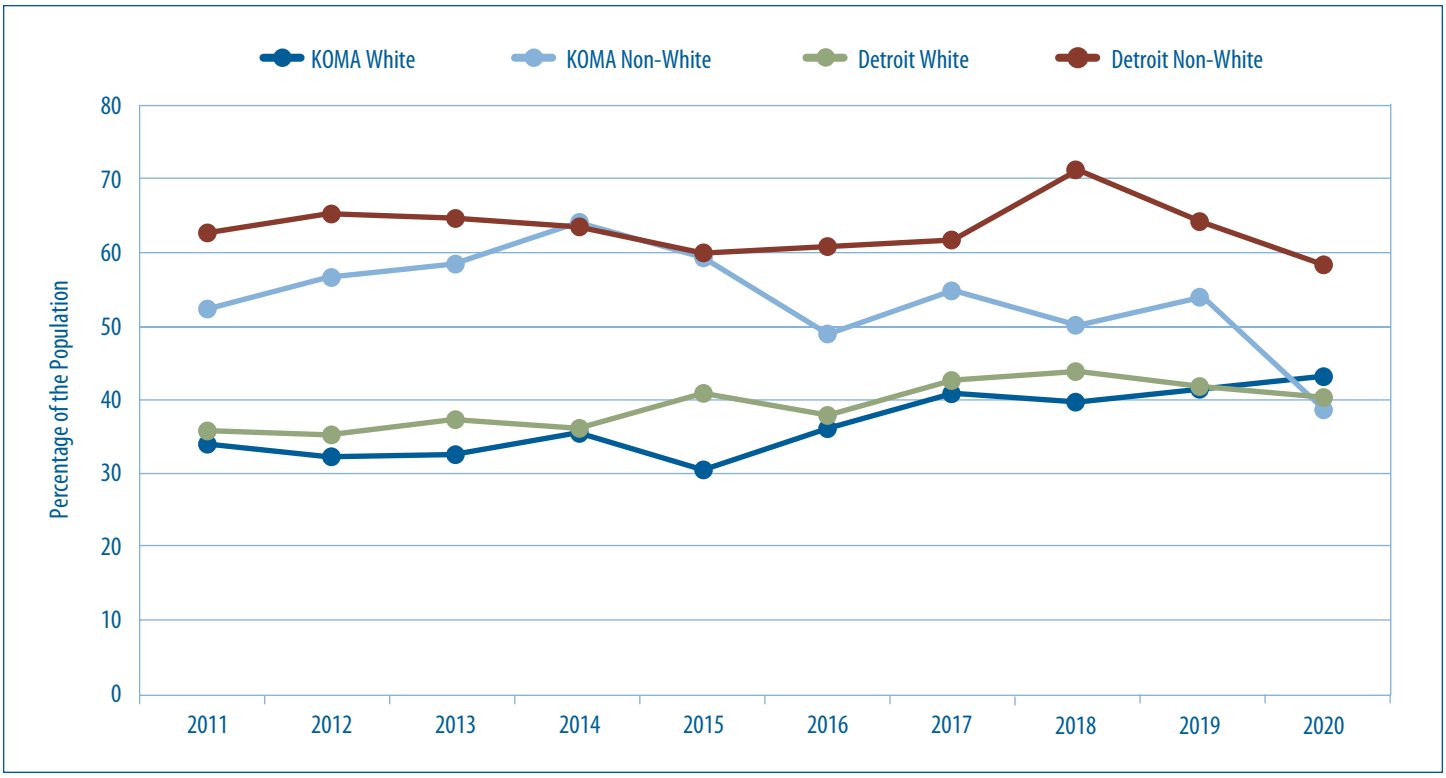
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: The estimates for KOMA non-white were not available due to the data suppression rule for Michigan BRFSS data.
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 10: Not Had Flu Vaccine by Gender, 2011-2020



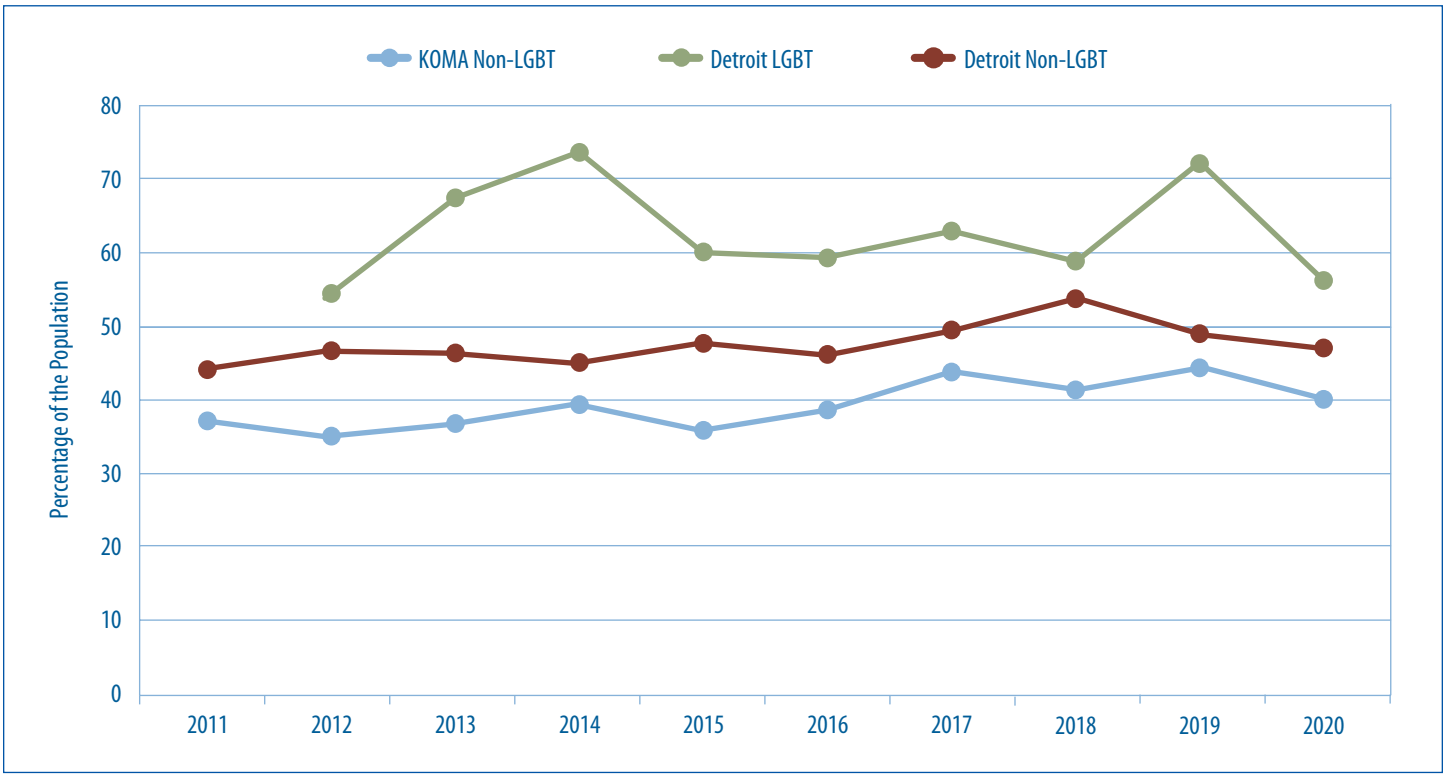
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 11: Ever Been Tested for HIV by Race, 2011-2020



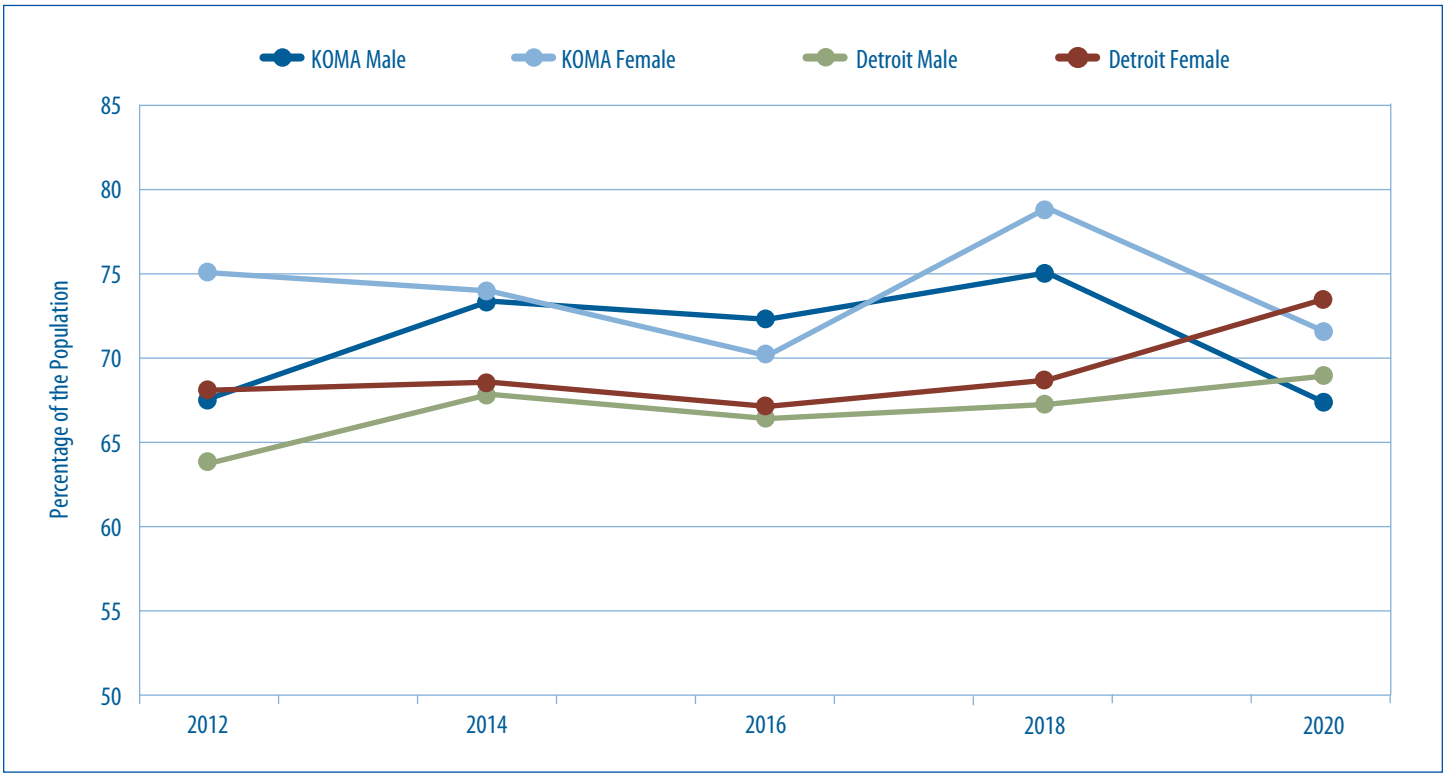
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 12: Ever Been Tested for HIV by LGBT Status, 2011-2020



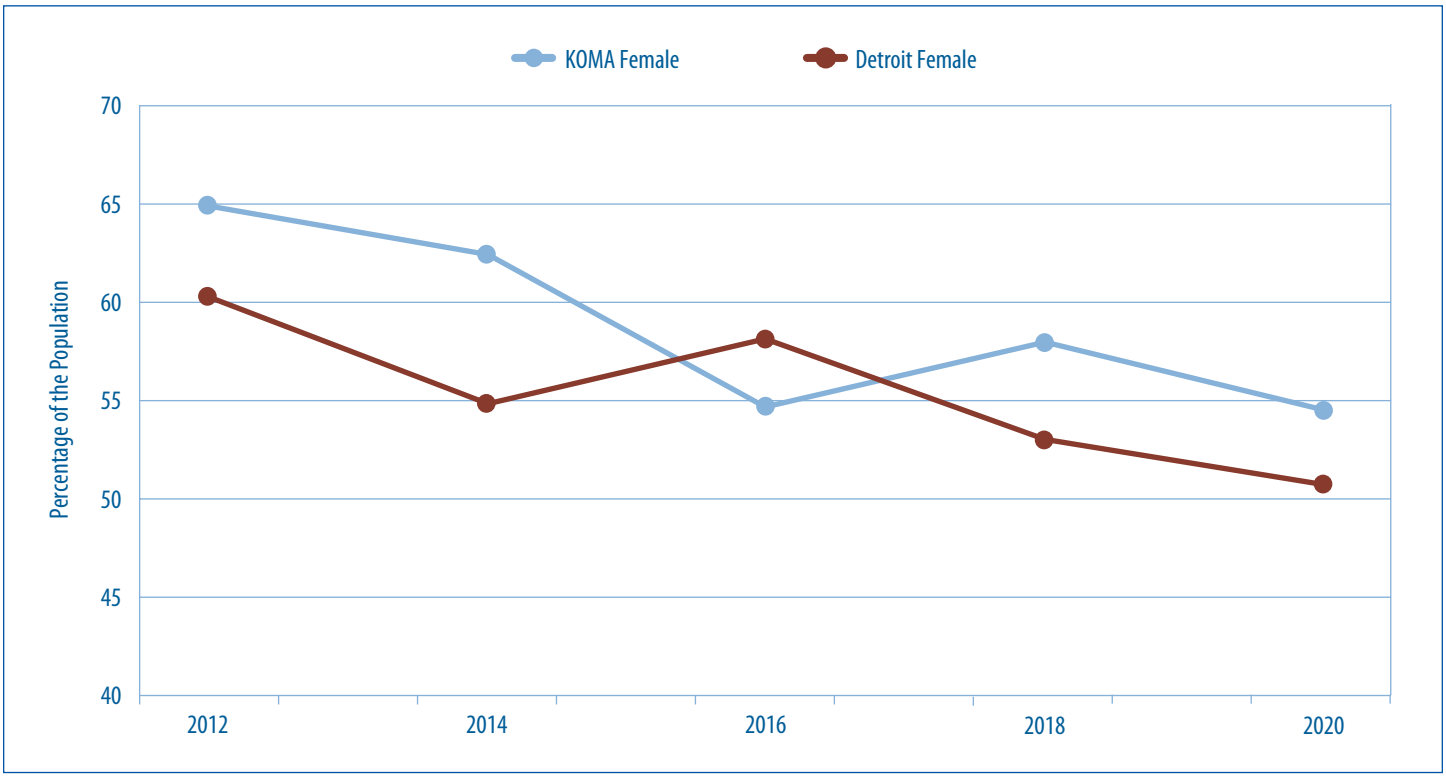
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: The estimates for KOMA LGBT were not available due to the data suppression rule for Michigan BRFSS data.

Figure 13: Had Appropriate Colorectral Screening by Gender, 2012-2020



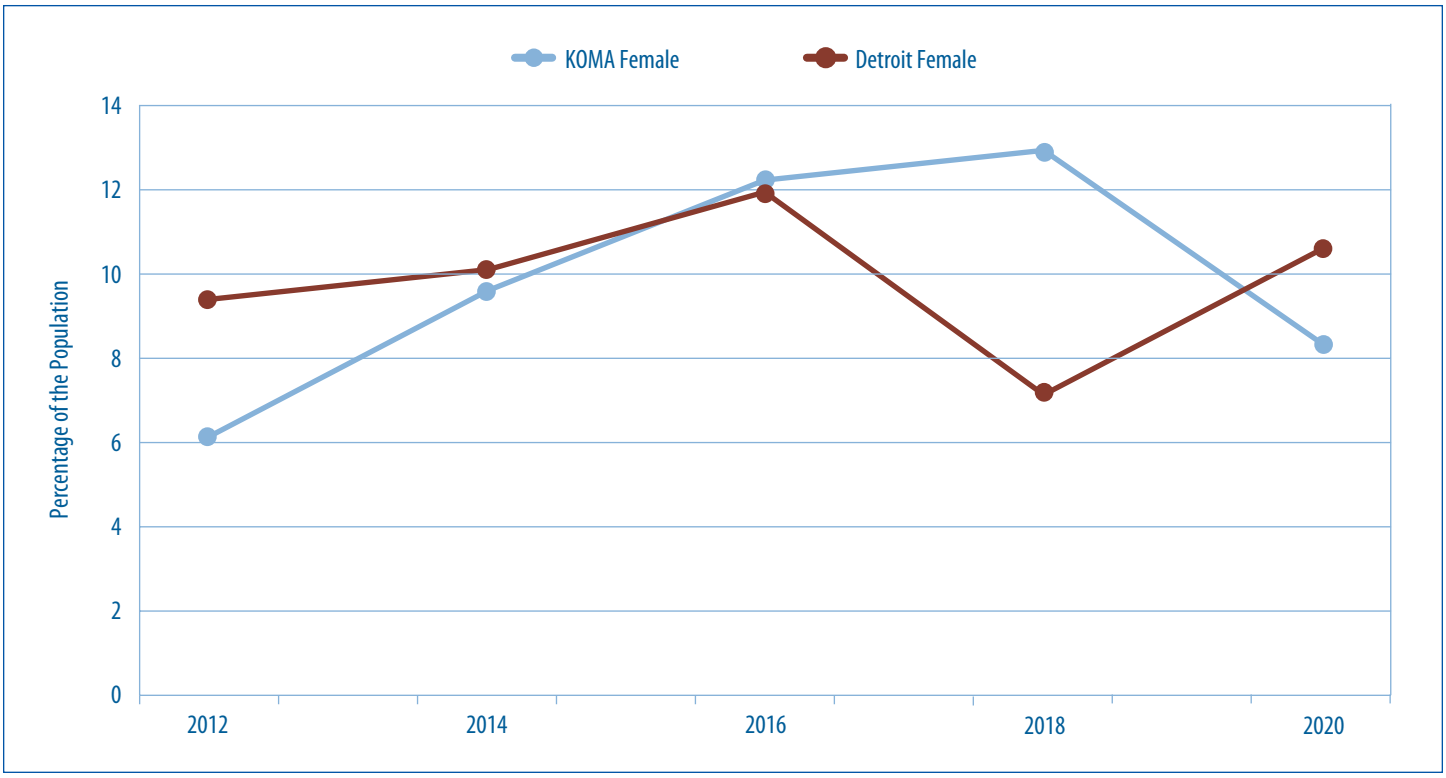
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 14: Had Mammogram in the Past Year (nonscreening included, 40+) by Gender, 2012-2020



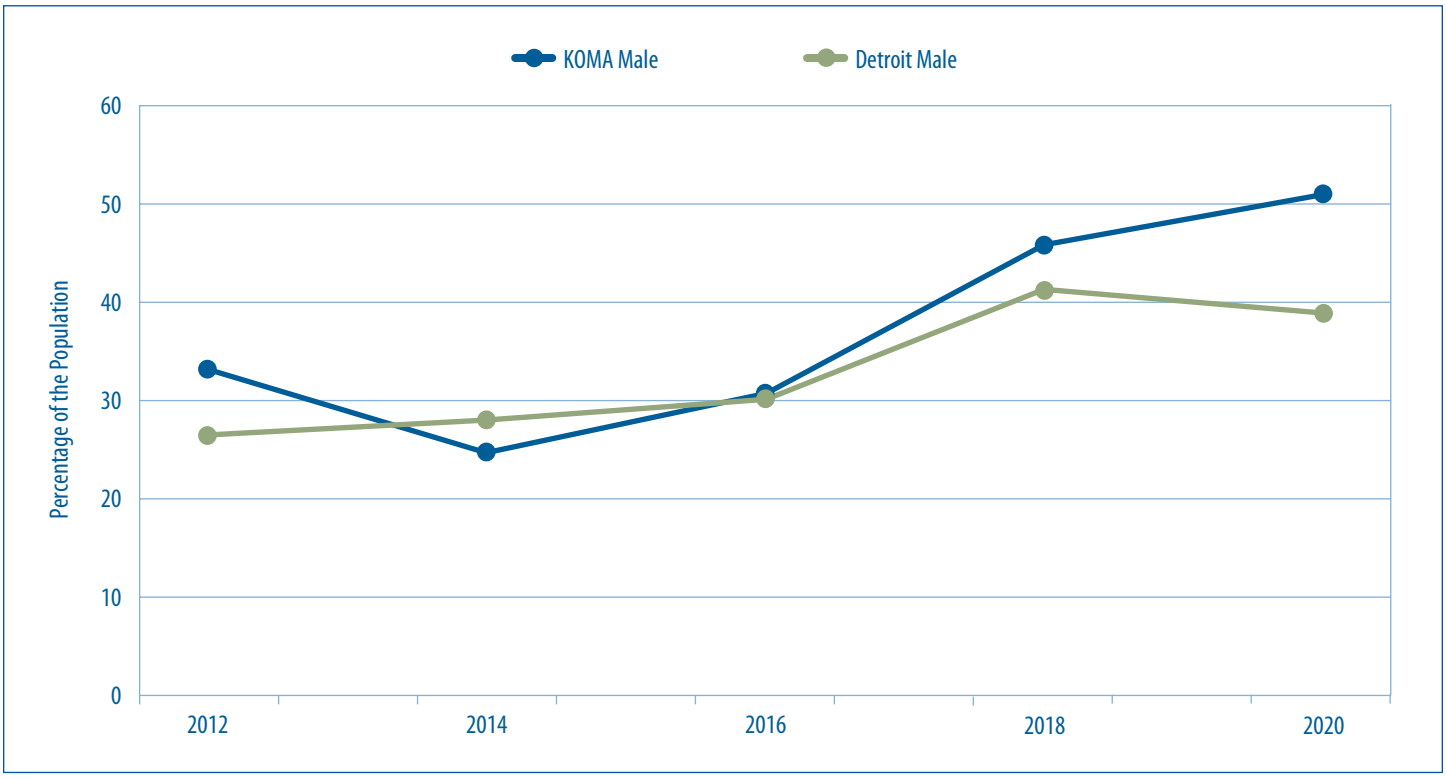
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 15: Never Had a Pap Smear/Pap Test (18+) by Gender, 2012-2020



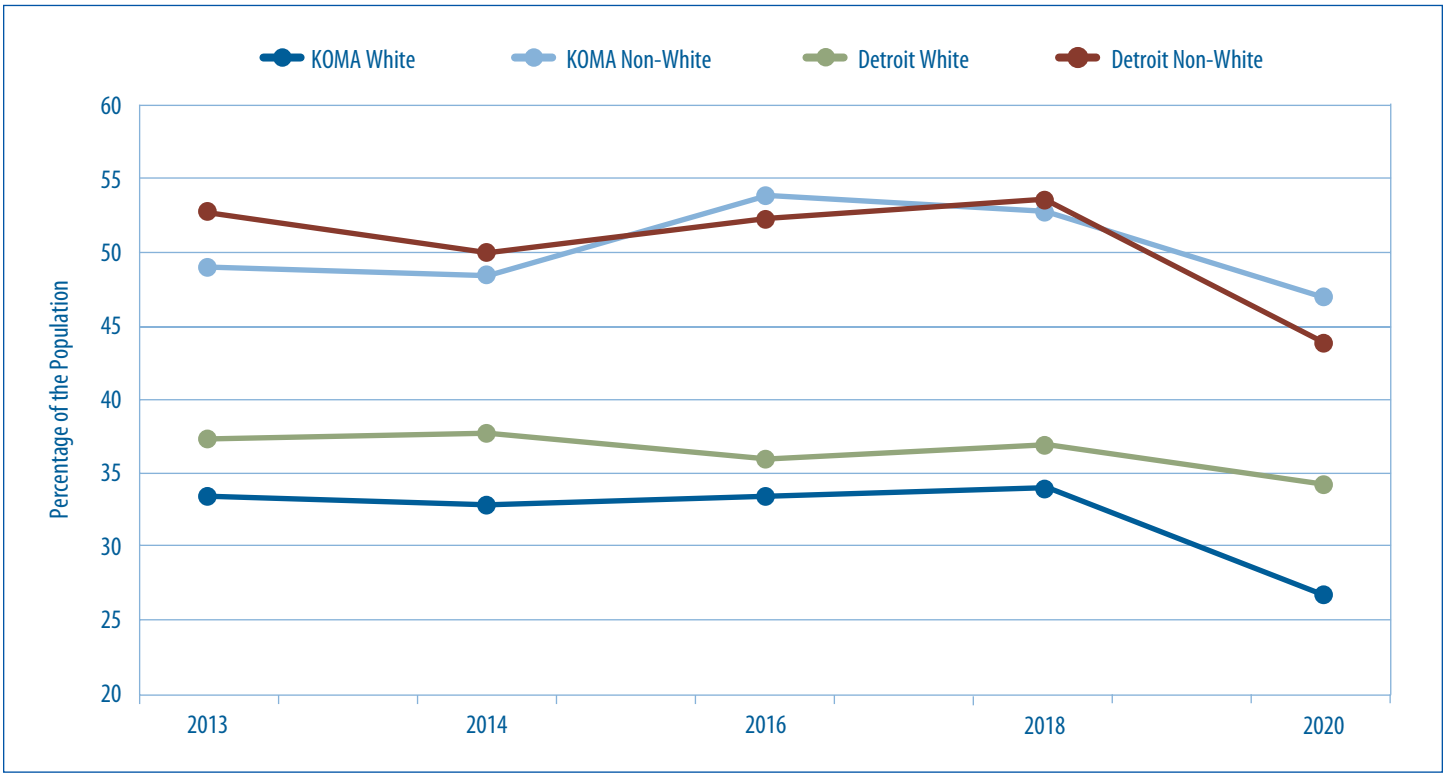
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 16: Never Had a Prostate-Specific Antigen (PSA) Test by Gender, 2012-2020



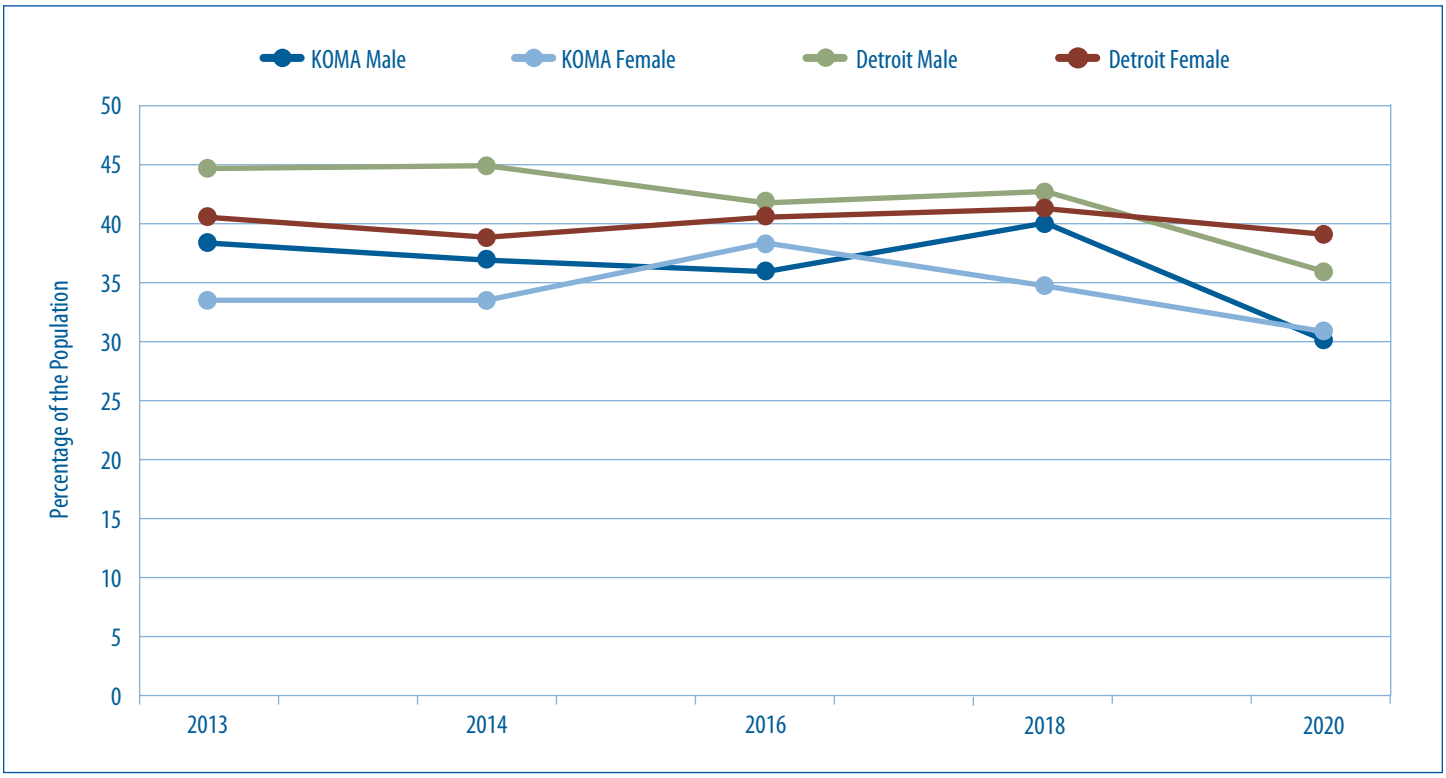
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 17: Inadequate Sleep by Race, 2011-2020



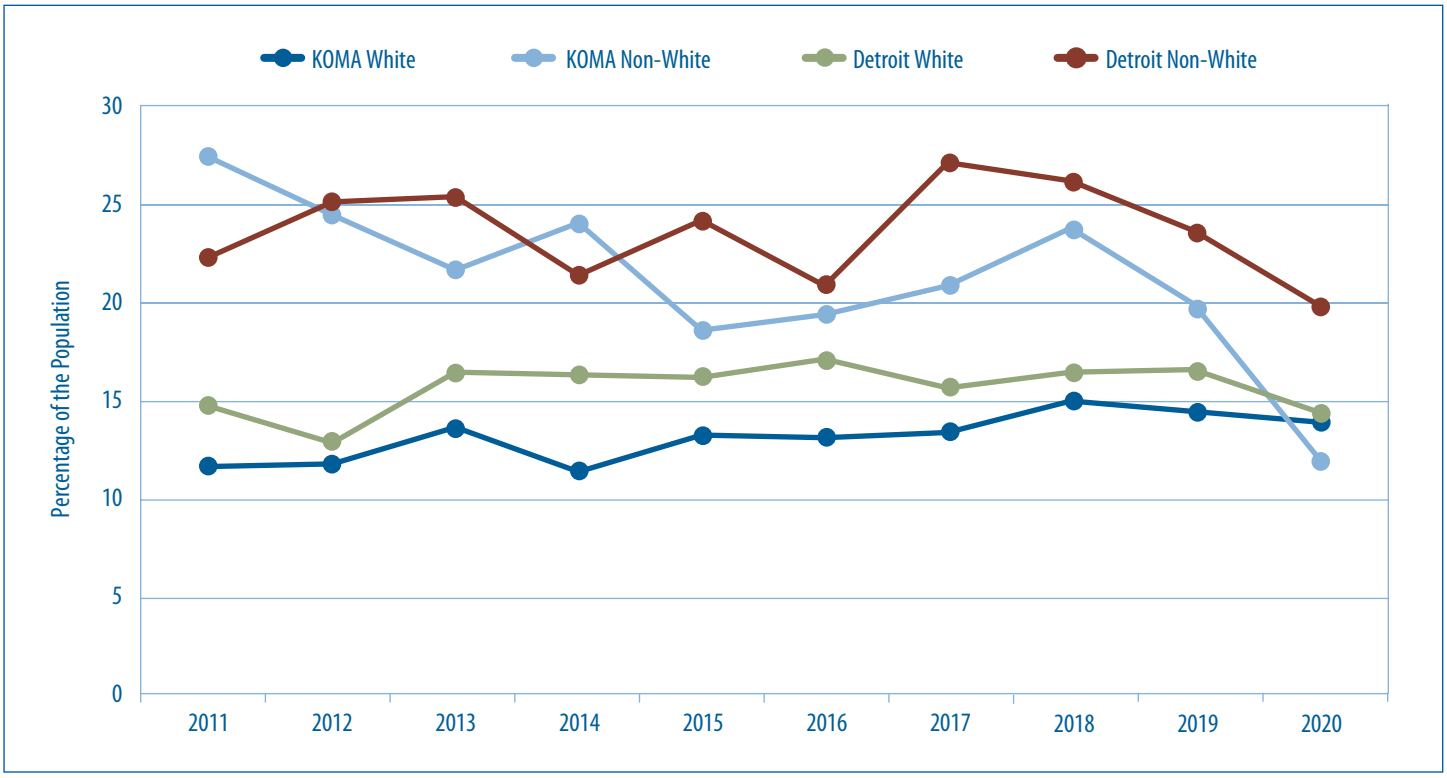
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 18: Inadequate Sleep by Gender, 2011-2020



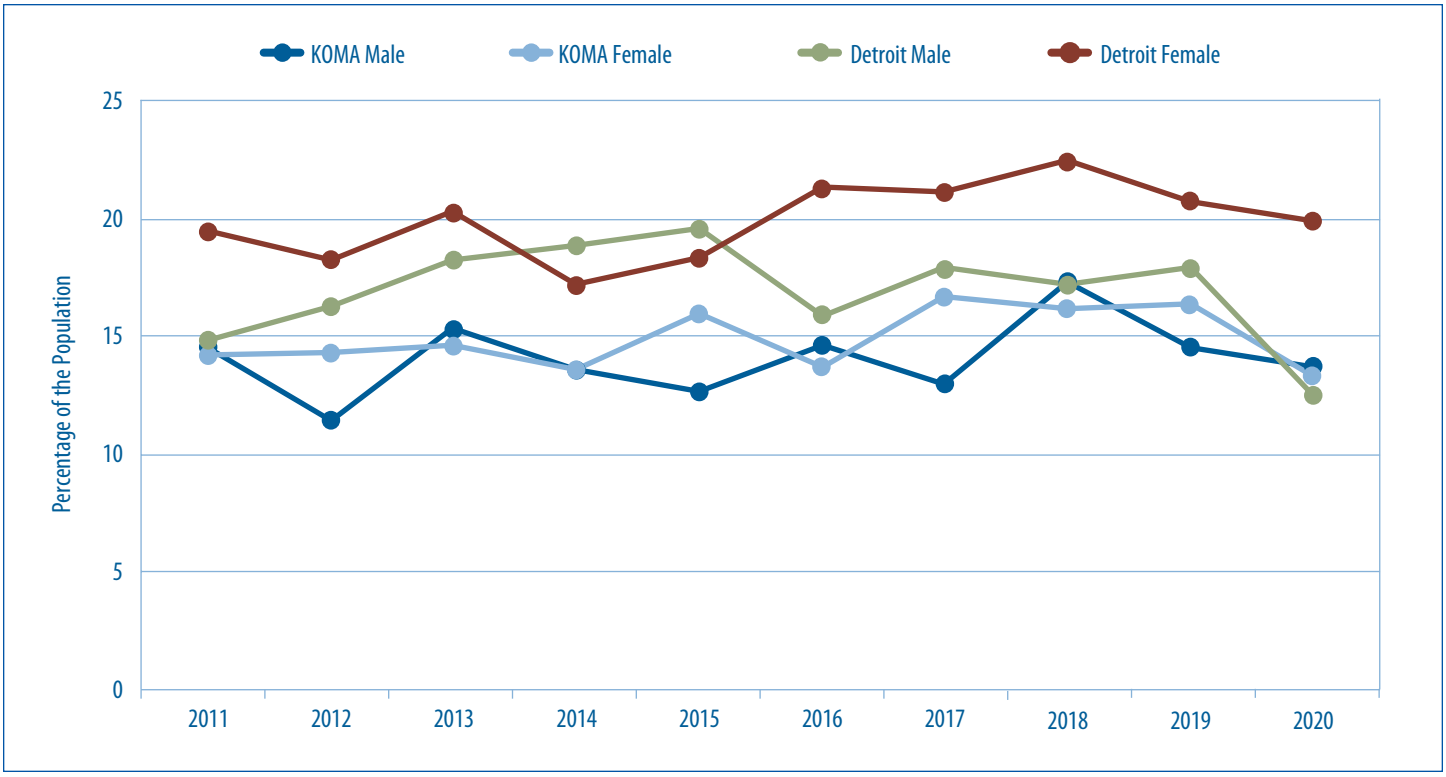
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 19: Health Status - Fair or Poor Health by Race, 2011-2020



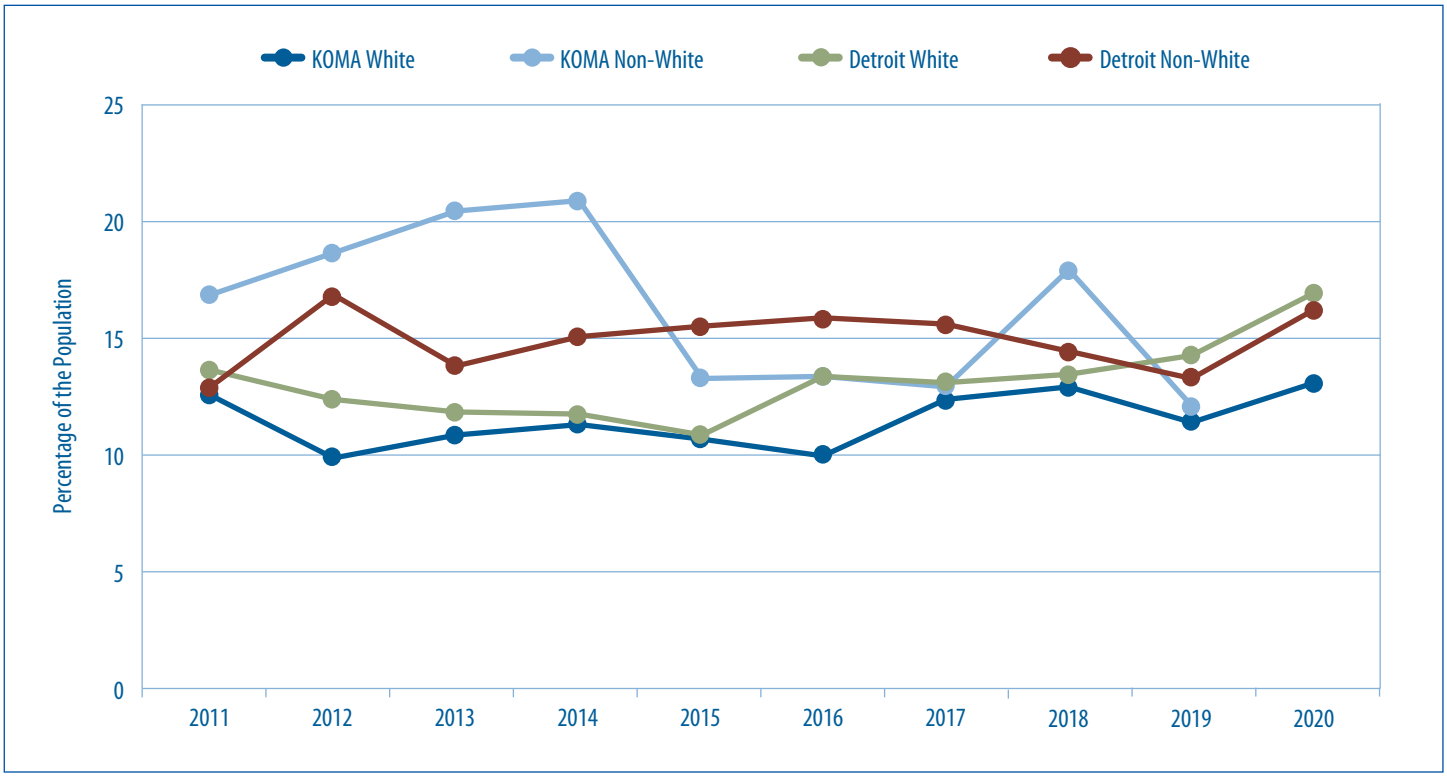
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: We impute the missing estimate for KOMA non-white in 2012 using mean substitution.

Figure 20: Health Status - Fair or Poor Health by Gender, 2011-2020



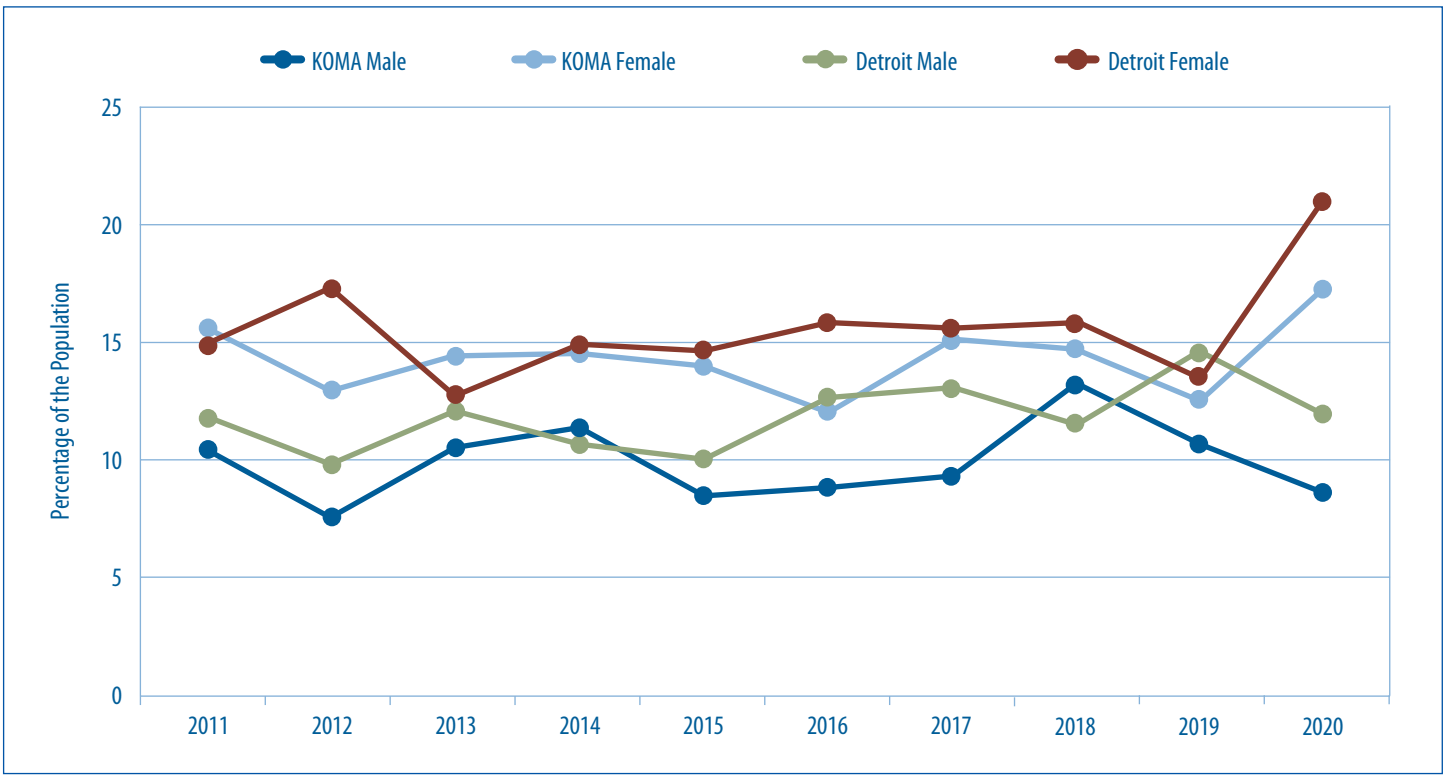
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 21: Poor Mental Health Days by Race, 2011-2020



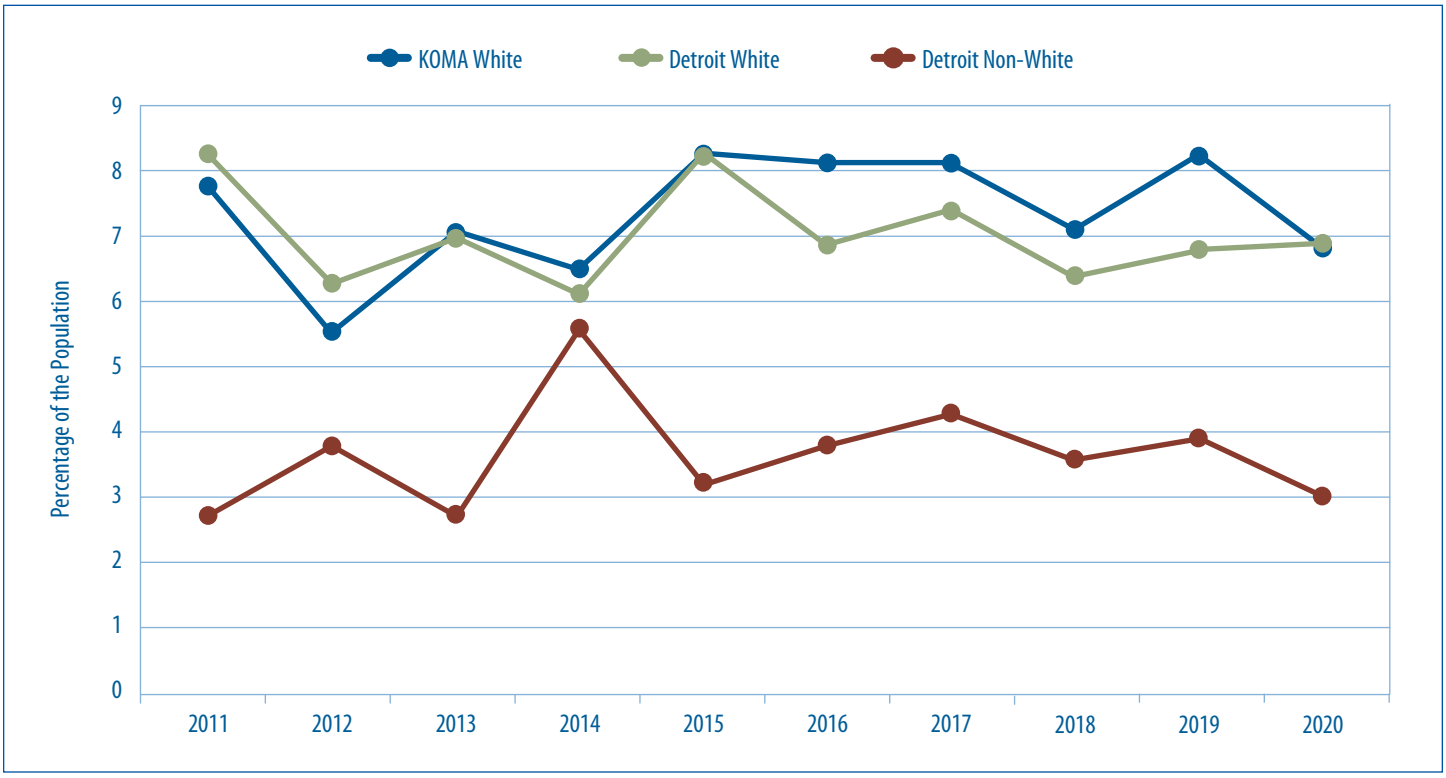
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 22: Poor Mental Health Days by Gender, 2011-2020



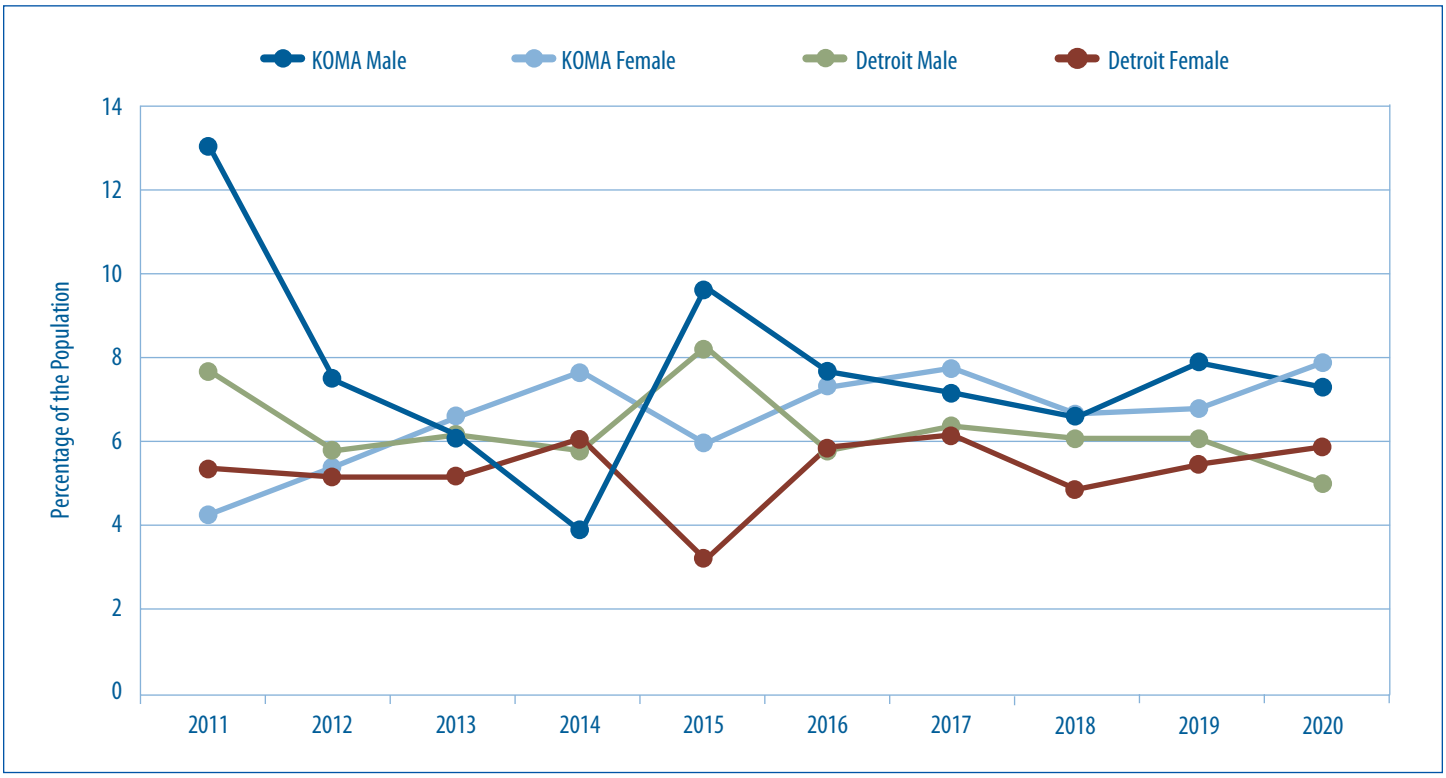
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 23: Heavy Drinking by Race, 2011-2020



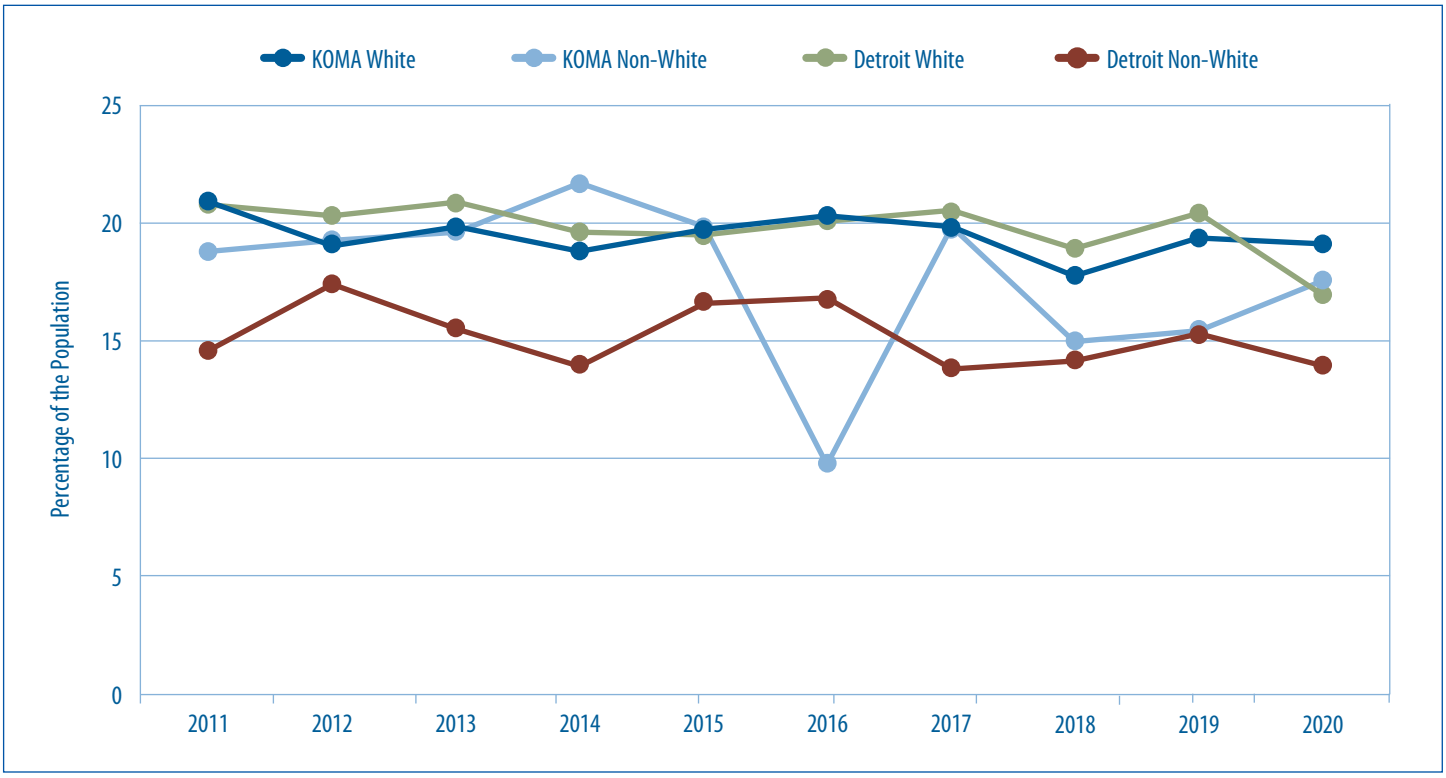
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: The estimates for KOMA non-white were not available due to the data suppression rule for Michigan BRFSS data.

Figure 24: Heavy Drinking by Gender, 2011-2020



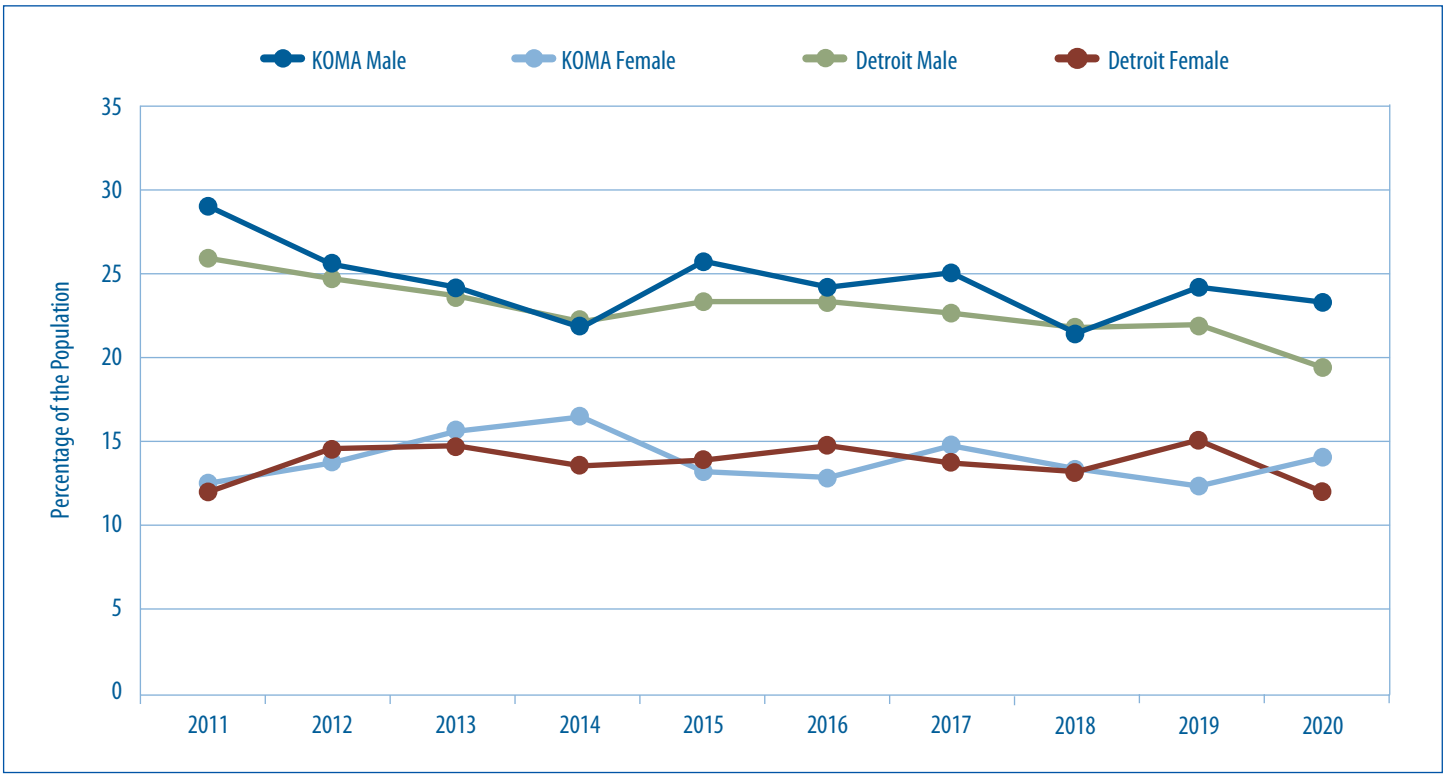
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: We impute the missing estimate for KOMA non-white in 2012 using mean substitution.

Figure 25: Binge Drinking by Race, 2011-2020



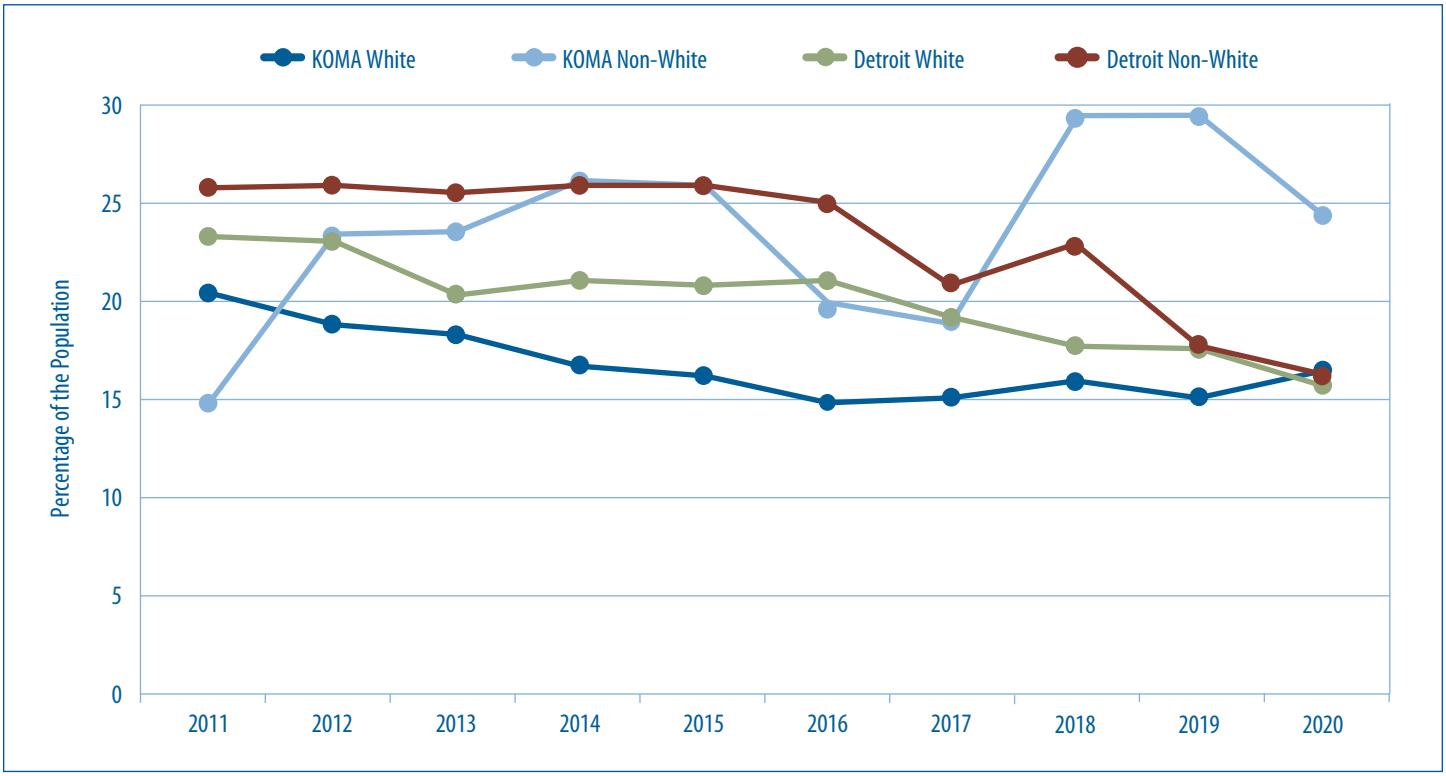
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
Note: We impute the missing estimate for KOMA non-white in 2012 using mean substitution. KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 26: Binge Drinking by Gender, 2011-2020



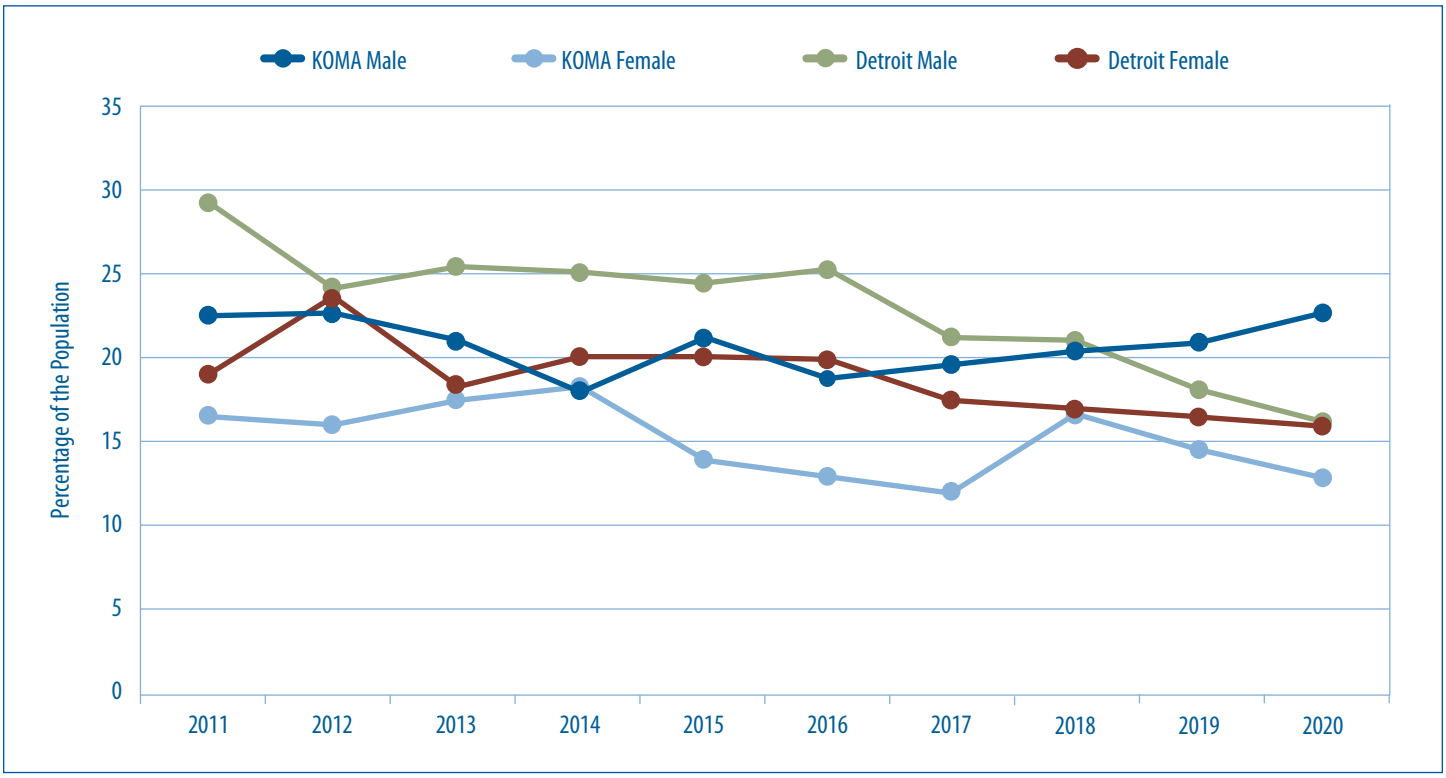
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 27: Current Cigarette Smokers by Race, 2011-2020



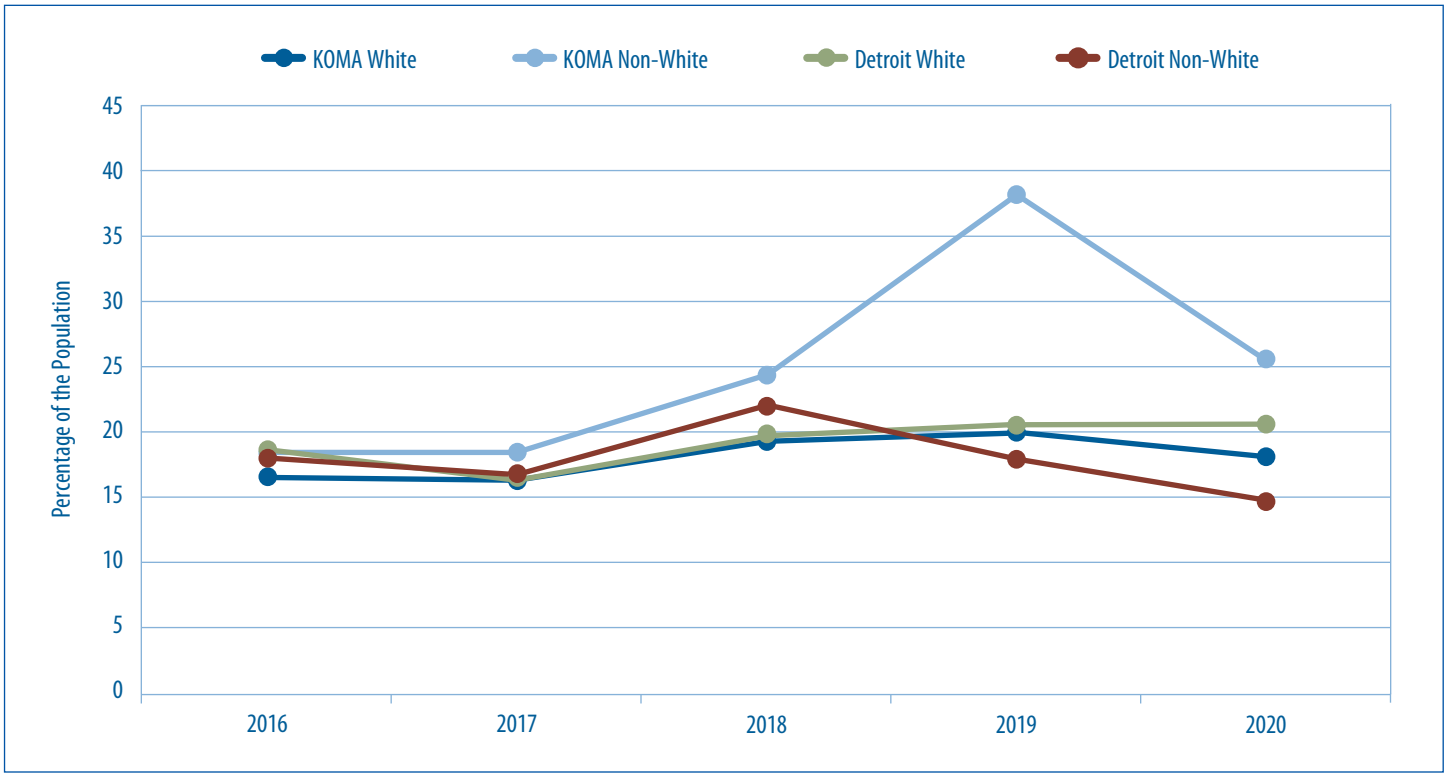
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 28: Current Cigarette Smokers by Gender, 2011-2020



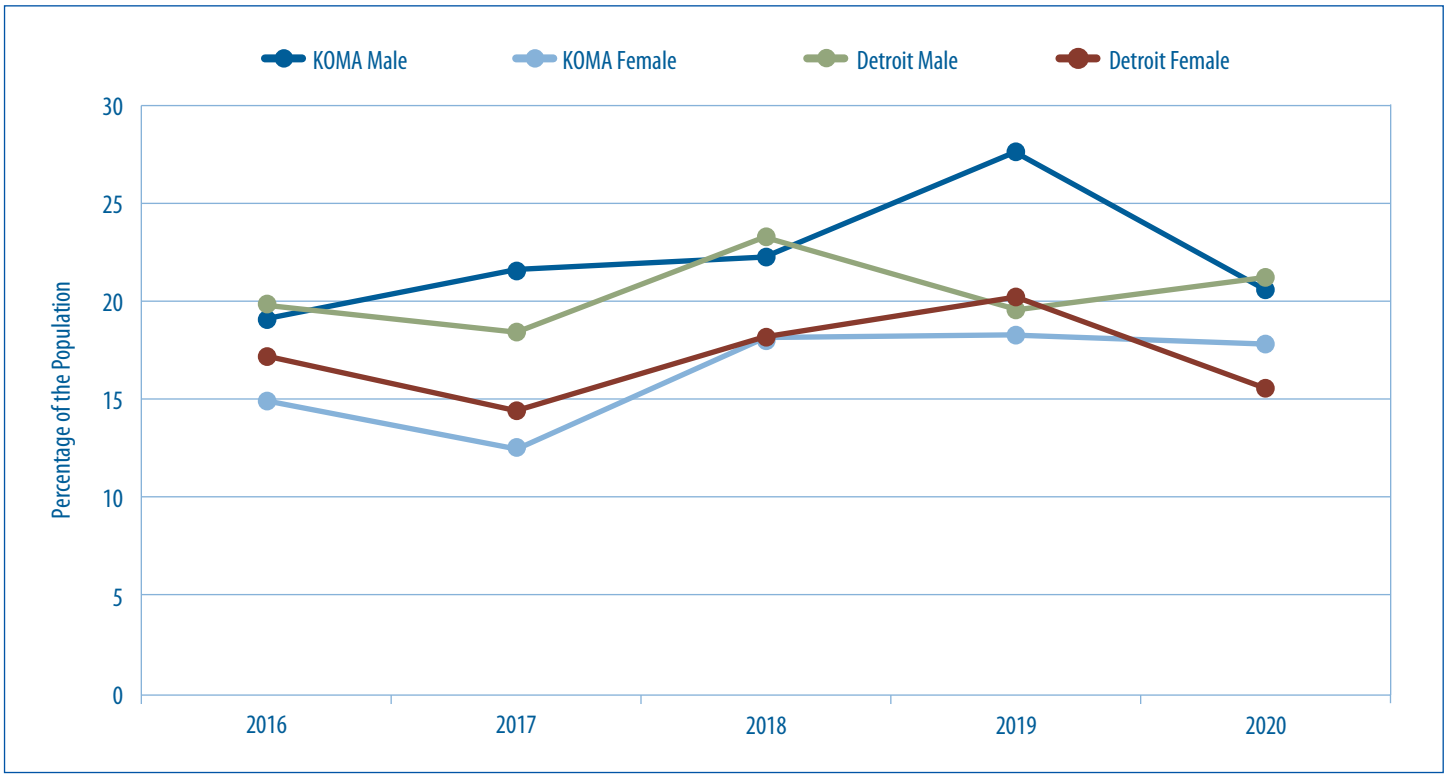
Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020

Figure 29: Former E-cigarette Use by Race, 2016-2020



Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Figure 30: Former E-cigarette Use by Gender, 2016-2020



Source: Michigan Department of Health and Human Services, Behavioral Risk Factor Surveillance System, 2020
KOMA: Kent, Ottawa, Muskegon, Allegan counties

Economic Analysis

Grand Valley State University
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Benchmarking Communities

In this section, we compare the Grand Rapids combined statistical area to a selected group of metropolitan areas to examine differences in the supply of hospital services, hospital expenses, and Medicare expenditures.[1] We compare changes in hospital utilization and expenditures for the Grand Rapids region to changes for a benchmark region calculated as the population weighted outcome average for Louisville, KY; Buffalo, NY; Rochester, NY; and Milwaukee, WI. These regions were selected as benchmark communities based on similarities to Grand Rapids in a variety of regional metrics including population density, earnings estimates, unemployment rates, and population age and race distributions. We also include data for the Detroit region and for the entire U.S.

The Supply and Utilization of Hospital Services

Figures 1-6 focus on both hospital capacity and utilization across Grand Rapids and the benchmark comparison regions. Utilization measures such as admissions, outpatient hospital visits, and emergency department visits are measured as per capita rates using the number of residents in each region as the denominator. As noted previously, a downside to the use of these per capita utilization rates is that they do not account for the inflow of patients from outside the region or the outflow of patients to other regions. As such, if individuals are traveling to a region to receive care despite living outside of that region, those individuals will contribute to the numerator in the utilization calculation, but not to the denominator. In cases where patient inflow is particularly high, utilization measures will be overstated.

Figure 1 includes data on the number of hospital beds per 1,000 residents in each region from 2005 to 2020. This measure serves as a proxy for hospital capacity. For all communities in the graph, hospital capacity has remained fairly stable over the past three years. This has solidified the relative positions of the communities observed in previous versions of this report. As it historically has, hospital capacity in Grand Rapids remains low relative the U.S. average, and well below the capacities of Detroit and the benchmark communities. Given that hospital care is expensive relative to other health services, this represents a comparative advantage for the region by way of the lower cost of care passed along to employers. While unchanging hospital capacity would suggest relatively constant levels of access and quality of care for a given population, this capacity may become strained as the population ages or becomes sicker.

Figure 2 displays the number of hospital admissions per 1,000 residents. While **Figure 1** focused on inpatient capacity, **Figure 2** provides data on inpatient utilization. As the graph shows, all comparison communities experienced a notable reduction in hospital admissions in 2020 relative to the previous year. This is likely due to the COVID-19 pandemic, which caused hospitals to delay or reschedule elective and non-critical services, and also caused patients to avoid health care facilities due to worries of contagion (Birkmeyer et al. 2020). The 13 percent decline in Detroit's admission rates was almost twice that seen in the other comparison groups and may reflect the relatively early onset and high severity of its COVID-19 outbreak (CDC 2022), as well as potential difficulties with hospital staffing visible in **Figures 6 and 7**. The percent decline in Grand Rapids (5 percent) was the lowest of the comparison groups. A potential reason for this is that the region's low rate of hospitalization over the past 15 years, and its reliance on outpatient rather than inpatient care, could have made the typical hospital admission in Grand Rapids relatively more difficult to avoid or reschedule.

Figure 3 plots per capita outpatient visits from 2005 to 2020. Most striking is that, while outpatient visits per 1,000 population in 2020 declined in Detroit (-18 percent), the benchmark communities (-12 percent), and the U.S. overall (-8 percent) relative to 2019, there was a notable increase in Grand Rapids (+9 percent). While explaining these different changes is difficult, some clues emerge when considering how the COVID-19 pandemic impacted outpatient visits across different specialties in 2020, relative to the typical non-COVID year. While specialties like pediatrics, dermatology, and cardiology experienced cumulative declines in outpatient visits in excess of 20 percent, other specialties like rheumatology, obstetrics, and gynecology saw declines of 10 percent or below (Mehrotra et al. 2021). Therefore, differences in specialty concentrations among providers, as well as in the underlying health characteristics of the population, could yield different declines in outpatient visits across regions. This alone cannot explain the rise in outpatient visits in Grand Rapids, however, as no major specialty showed a cumulative increase in outpatient visits over the course of 2020, compared to non-COVID years (Mehrotra et al. 2021). One final explanation suggested by the graph concerns the relatively large decline in outpatient visits in Detroit. Given the duration and severity of the COVID-19 outbreak in the city, and the accompanying rescheduling and avoidance of hospital care, outpatients who might have normally sought care at health care facilities in the Detroit region may have traveled to Grand Rapids instead. A sufficiently large increase in non-resident outpatients served in Grand Rapids, compared to the other regions, could have offset any reduction in outpatient services provided to the region's resident population.

Figure 4 examines an additional component of hospital utilization by plotting per capita emergency department (ED) visits for Grand Rapids and each of the comparison regions. As is clear in the graph, despite general growth in ED use over the previous 14 years, all four comparison regions experienced a sharp decline in emergency services utilization. These declines range between 14 percent for the United States and 22 percent for Detroit. These declines are consistent with findings in the literature surrounding national ED use during the COVID-19 pandemic. While emergency visits related

[1] Because the Grand Rapids metropolitan statistical area (MSA) definition has recently changed, we use the more consistent definition of the core-based statistical area. The Detroit region is defined using the smaller metropolitan division categorization. All other regions are defined using the MSA.

to infectious diseases and respiratory problems increased, those for abdominal, digestive, musculoskeletal, sprains, and superficial injuries all declined (Hartnett et al. 2020). The changes across diagnoses are important for determining how much of the decline in ED use was for problems that could be resolved efficiently in other care settings, versus foregone or delayed care that may have worsened health outcomes in the longer term.

Just as **Figure 2** showed reductions in hospitalization rates across all four comparison communities, **Figure 5** reveals changes in the average hospital lengths of stay, conditional on admission. Three of the four comparison communities experienced increases in average length of stay. This is consistent with hospitals' efforts to avoid unnecessarily admitting patients during the COVID-19 pandemic, which would likely decrease the rate of admission for less serious cases with presumably shorter expected lengths of stay. The resulting greater concentration of relatively serious cases among those admitted would thus raise the average length of stay. Grand Rapids was the only region to not experience an increase in length of stay, which is curious, but the decline is small and could be due to noise.

Finally, **Figure 6** highlights the number of hospital-based personnel per 1,000 residents in each region. These personnel counts are based on the total number of full-time equivalent (FTE) hospital employees, excluding medical and dental residents, interns, and other trainees. While there has historically been a greater number of per capita hospital workers in Detroit than in Grand Rapids, the year 2020 shows a decline in Detroit alongside increases in the other three comparison communities. Given the definition of the variable, the decline in Detroit was not due to lost work hours due to COVID-19 infections among health care workers, which would not have affected employment status. Furthermore, based on the data, the decline appears not to be the result of uncompetitive compensation (which **Figure 7** shows to be relatively high in Detroit) or large annual population growth (which was only one quarter of the growth in Grand Rapids between 2019 and 2020). A reasonable explanation for the reduction in per capita FTE hospital employees in Detroit, despite increases in the other communities, is greater burnout among health care workers in the region due to the early onset and high severity of the COVID-19 pandemic. These findings are relevant to the broad literature studying burnout among health care workers during the pandemic (Bradley and Chahar 2020, Sharifi et al. 2021, Jalili et al. 2021).

Hospital and Medical Expenditures

Figure 7 examines payroll and benefits expenses per hospital employee, which is inflation-adjusted to 2020 dollars using the consumer price index. Average compensation for hospital workers in Grand Rapids continues to be below the national average and the benchmark level and has remained fairly flat since 2005. From 2019 to 2020, average compensation increased among all comparison groups, except for Grand Rapids. Given that the percent changes for all comparison groups are low, however, this could be due to noise.

Figure 8 displays total inflation-adjusted hospital expenses per admission. It is important to recognize that **Figure 8** is measuring the expenses reported by the hospital to provide treatment for the average admission, but does not reflect patient or insurer expenditures on hospital care. While real expenses per admission have risen consistently for every comparison group over the past 15 years, there were comparable sharp increases between 2019 and 2021 for Detroit (13 percent), the benchmark communities (12 percent), and the United States overall (12 percent). The percent increase in Grand Rapids (7 percent) was relatively modest. This smaller relative increase in 2020 could be the result of differences in average length of stay (from **Figure 5**) and lower expenses in per capita health care personnel (from **Figure 7**). For the year 2020, total hospital expenses per admission in Grand Rapids remains above the U.S. average by 13 percent, or $4,660. This is a decrease from 2019, where the difference was 19 percent, or $5,830.

Figure 9 plots per capita Medicare expenditures for both Fee-for-Service (FFS) and Medicare Advantage (MA) enrollees from 2007 through 2020. These figures represent the average annual per capita government expenditure for a Medicare beneficiary in each of the comparison communities. Data on FFS Medicare enrollment and expenditures and MA enrollment were obtained through the CMS Geographic Variation Public Use File (CMS, 2020). Measures of MA expenditures were calculated using year-specific benchmark payment rates, which provide an approximate estimate of county-level MA spending. Due to the nature of the data used to construct **Figure 9**, geographic regions are defined as the primary county in the MSA (e.g. estimates for Grand Rapids are specific to Kent County). Expenditures in **Figure 9** are adjusted for regional differences in prices, population age, gender, and race. These figures include expenditures for physician and hospital care, but *exclude expenditures on prescription medications*. Additionally, in cases where treatment was received in a county outside of where the patient resides, CMS assigns expenditures to the county in which the patient lived and not the county where the treatment was performed. While sharply rising Medicare expenditures in Grand Rapids from 2016 to 2018 resulted in the region having the highest average, annual, per capita Medicare expenditure among the four comparison groups in **Figure 9**, growth was relatively slow in 2019 and 2020. As a result, this measure of Medicare expenditure is once again lower in Grand Rapids than in any of the other comparison groups.

In conclusion, the year 2020 represents several departures from the trends in hospital spending and utilization studied in previous years' versions of this report. Unlike the preceding years, the first full year of the COVID-19 pandemic generally showed reduced per capita hospital admissions and both outpatient and emergency department visits. Despite these generalized impacts across comparison groups in the study, Detroit and Grand Rapids exhibited notable differences in the changes of key variables between 2019 and 2020. Specifically, outpatient visits per capita declined sharply in Detroit while they rose in Grand Rapids. Average length of stay rose in Detroit while falling slightly in Grand Rapids. Finally, per capita hospital FTE personnel declined in Detroit while it rose in Grand Rapids. Indications are that the severe outbreak of COVID-19

in early 2020 that hit the Detroit region had a lasting impact on these measures of health care spending and utilization, above that experienced by the benchmark communities in this study, as well as the country overall. On the other hand, by various measures, Grand Rapids endured 2020 with more favorable outcomes than most of the comparison communities, though the reasons behind the differences are difficult to explain and could be due to noise. Overall, this section reveals the beginnings of the disruption to decades-long trends in health care spending and utilization in these communities caused by the COVID-19 pandemic, the full extent of which will be investigated in future versions of this report.

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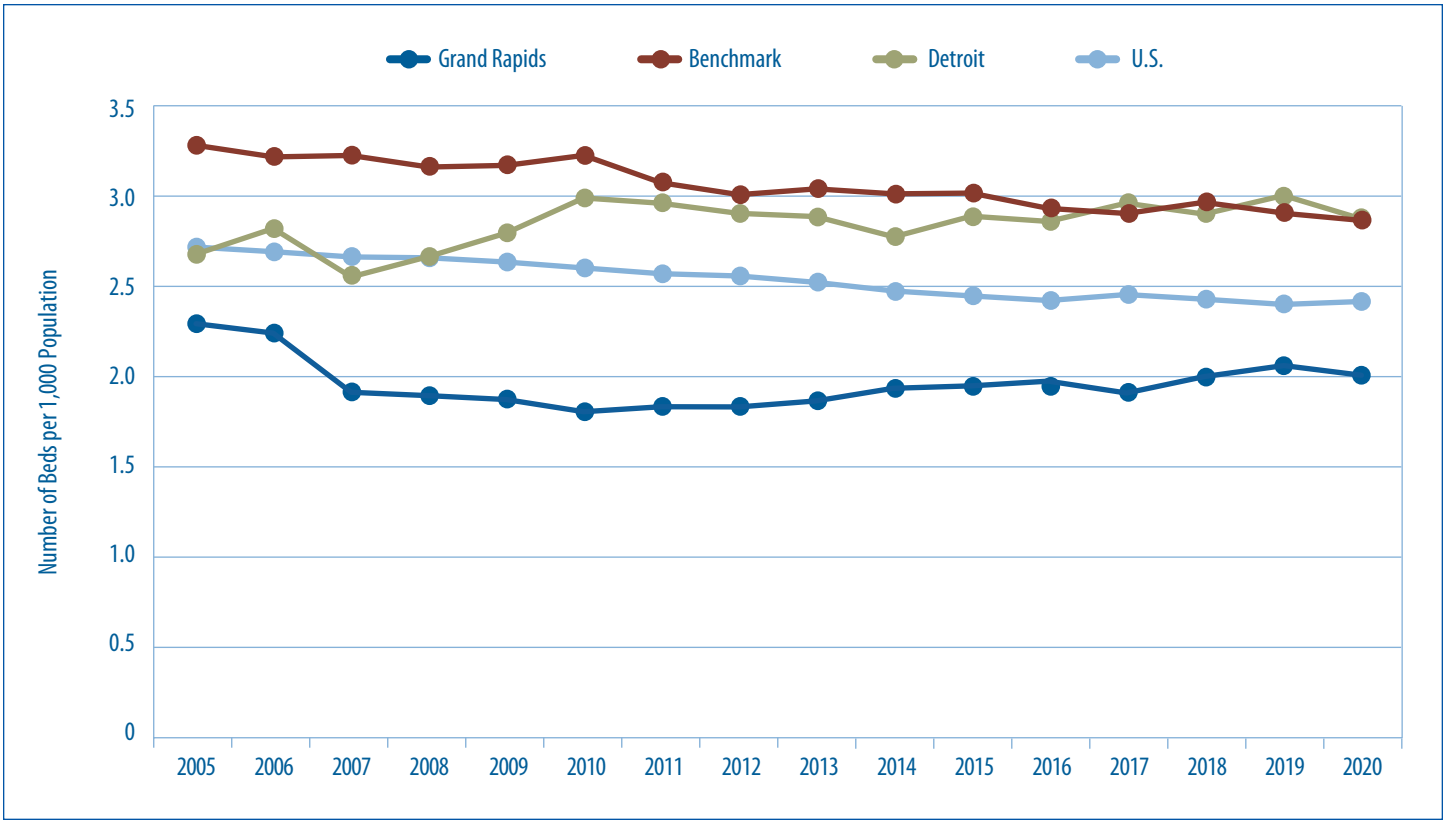
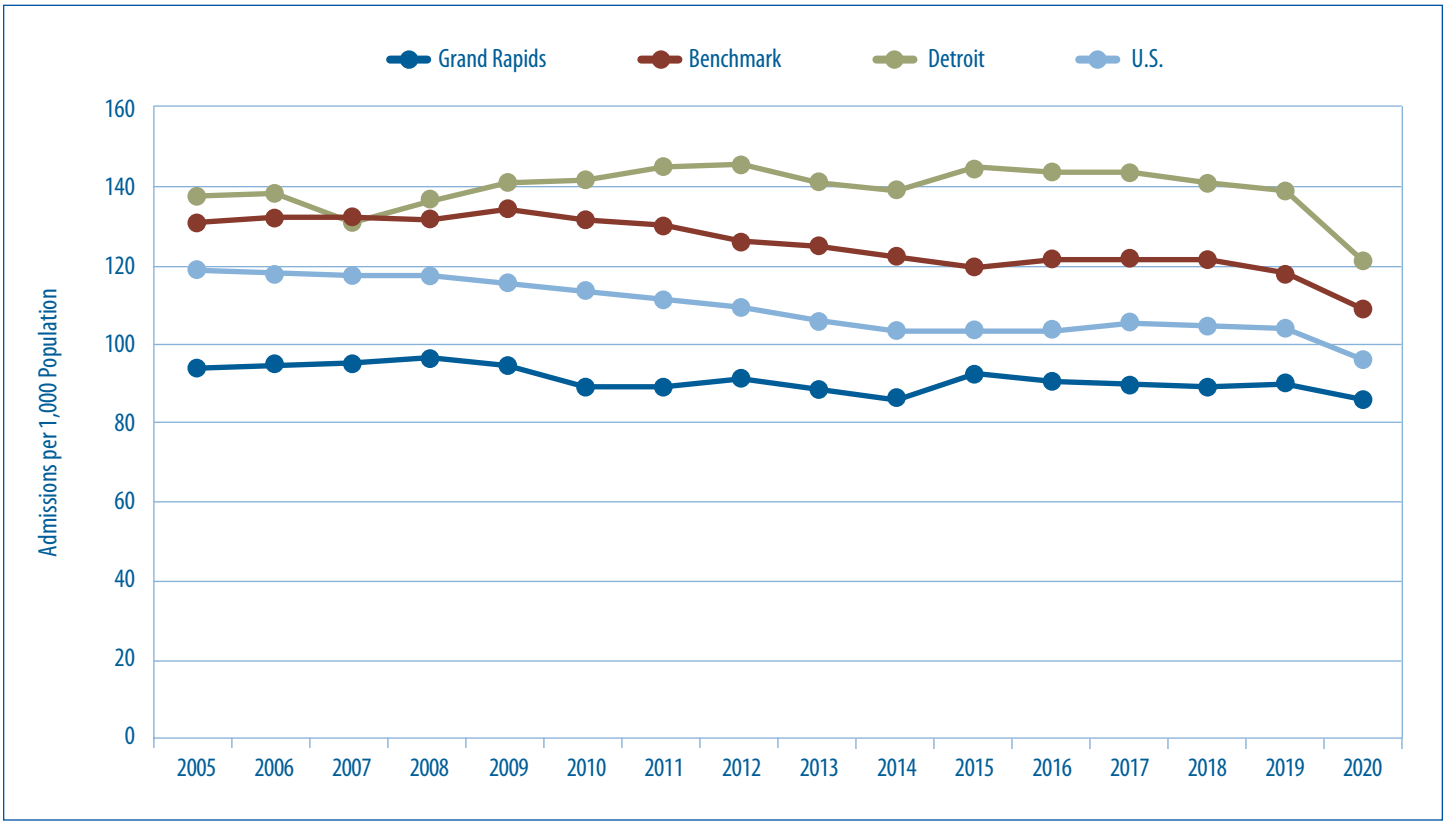
Figure 1: Hospital Beds per 1,000 Population, 2005–2020



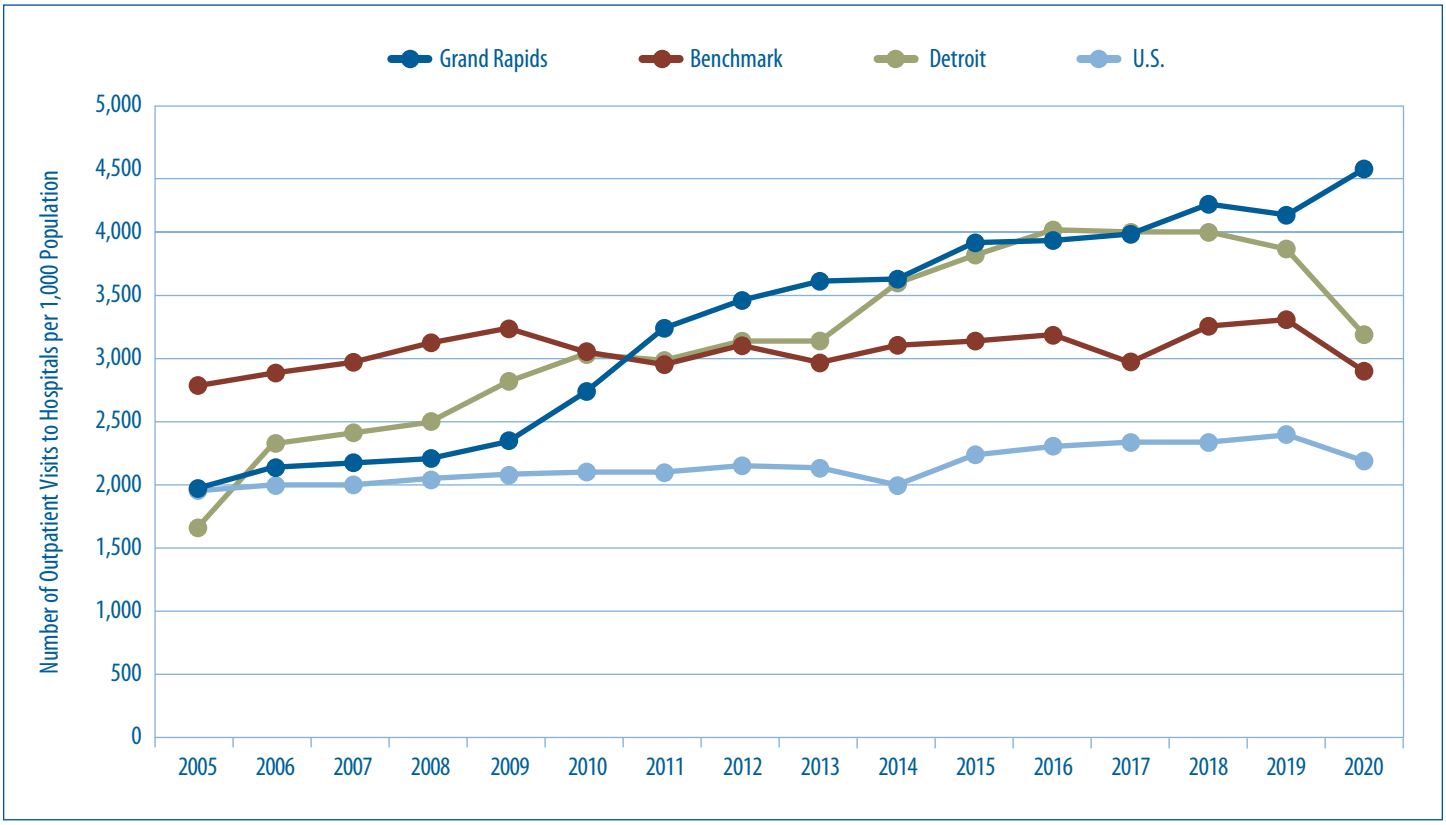
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 2: Hospital Admissions per 1,000 Population, 2005–2020



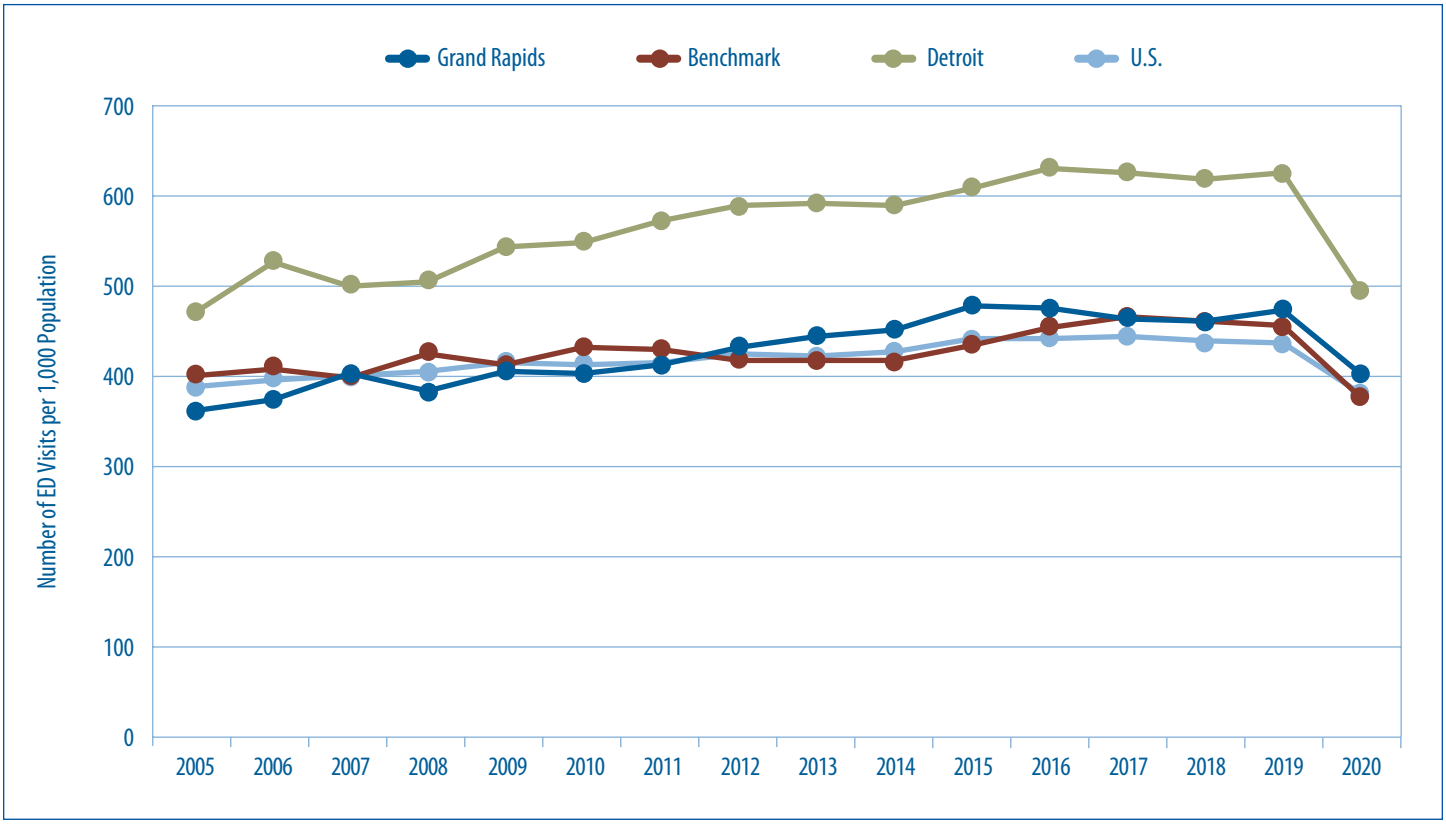
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 3: Outpatient Visits to Hospitals per 1,000 Population, 2005–2020



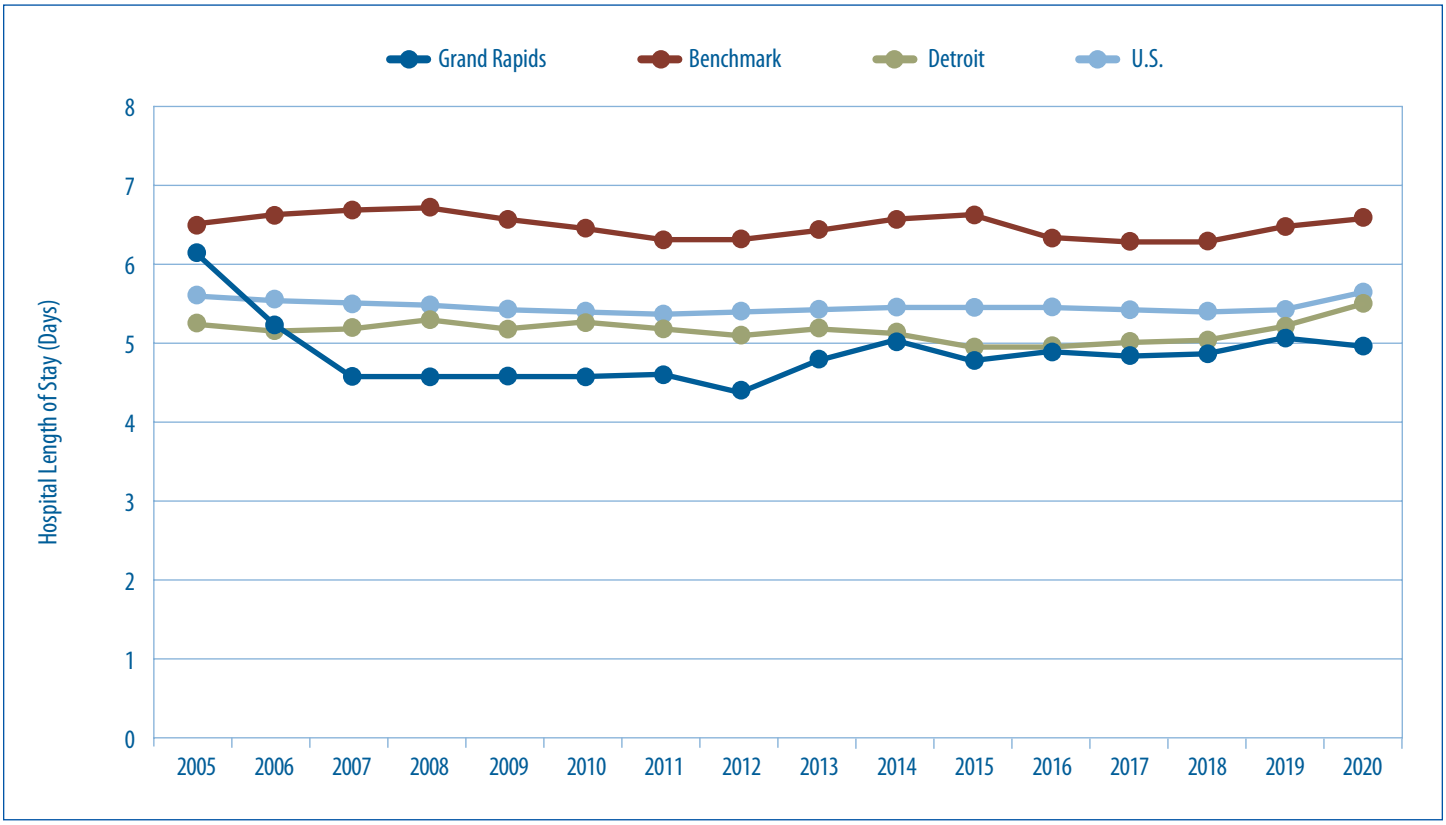
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 4: Emergency Department Visits per 1,000 Population, 2005–2020



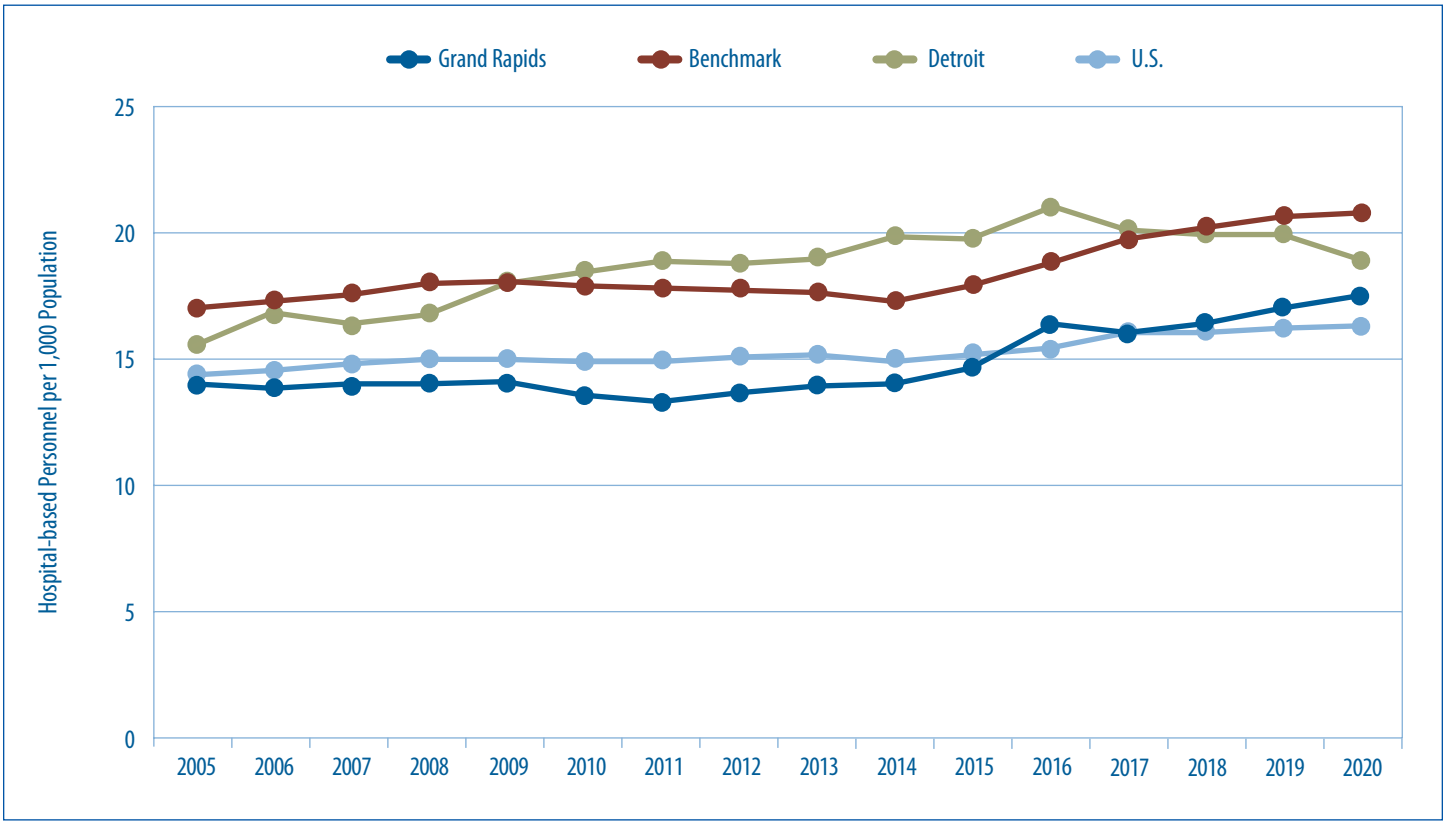
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 5: Average Hospital Length of Stay, 2005–2020



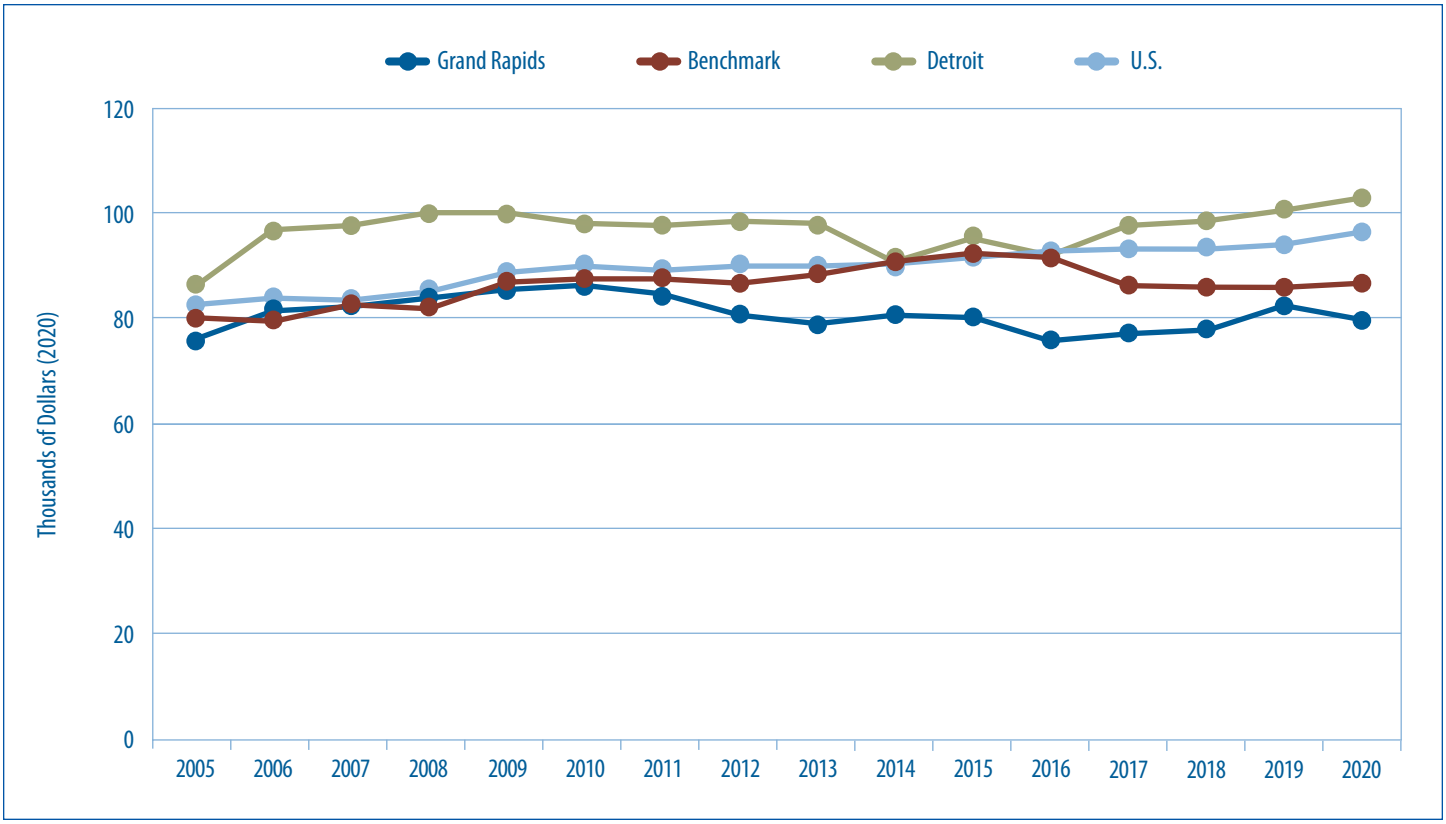
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 6: Hospital-based Personnel per 1,000 Population



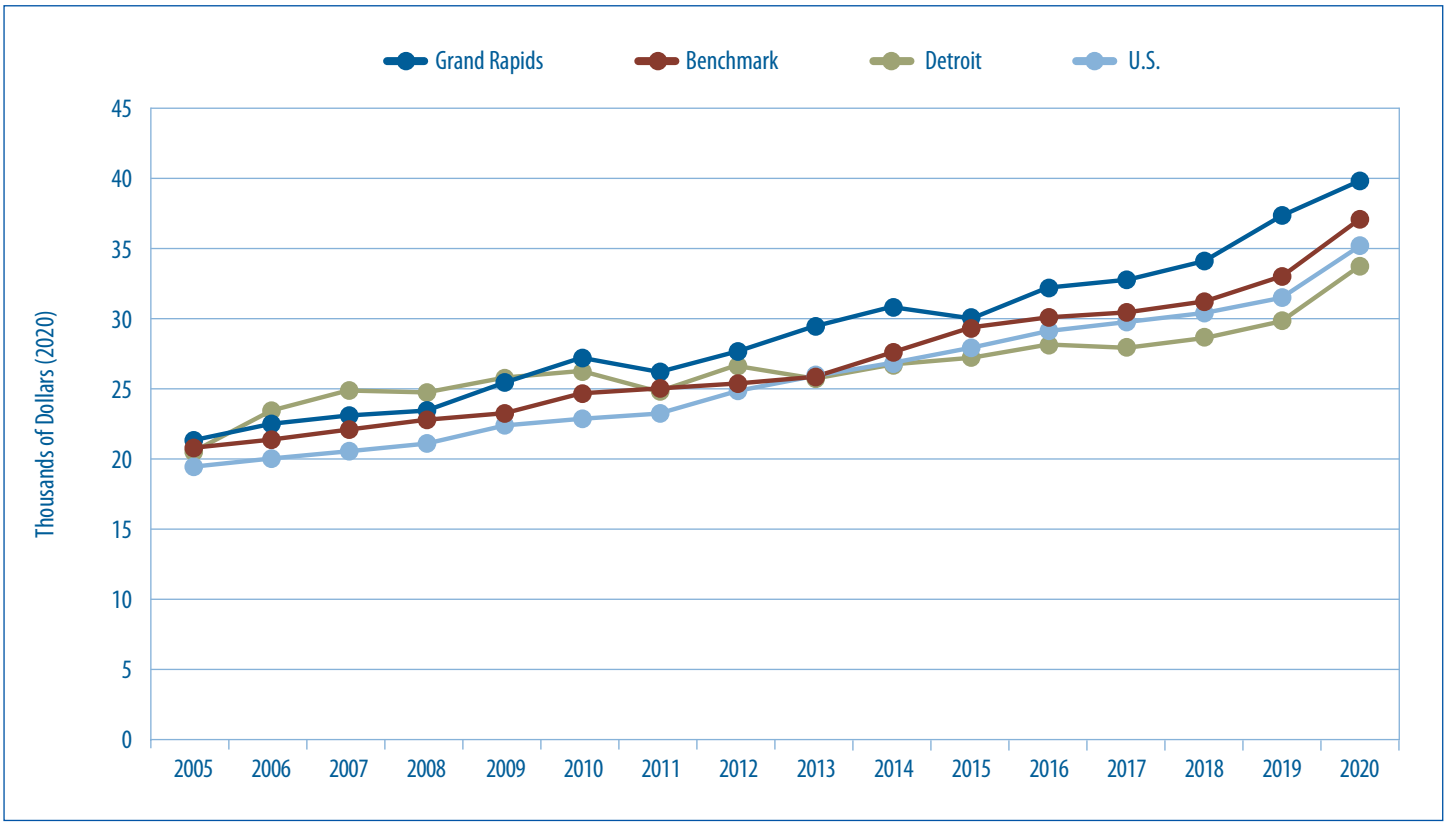
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 7: Average Payroll and Benefit Expenses per Hospital Employee, 2005–2020



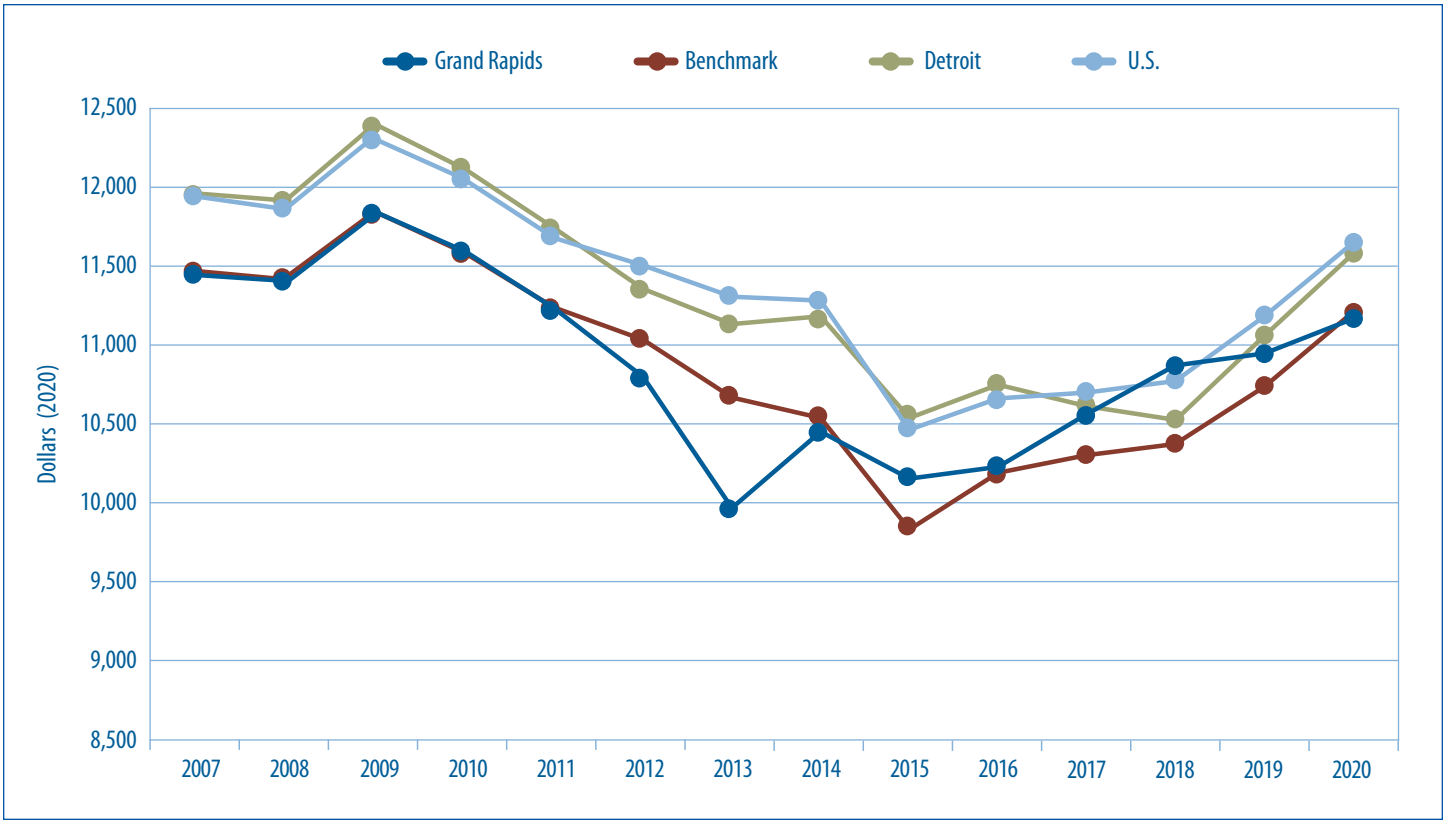
Source: American Hospital Association, AHA hospital statistics, 2020

Figure 8: Total Hospital Expenses per Admission, 2005–2020



Source: American Hospital Association, AHA hospital statistics, 2020

Figure 9: Adjusted Medicare Expenditures per Medicare Enrollee, 2007–2020



Source: American Hospital Association, AHA hospital statistics, 2020

Major Medical Conditions: Expenditure Analysis

This analysis provides general cost information about some of the most prevalent and expensive medical conditions. This section's purpose is to identify and track trends in health care expenditures for selected chronic health conditions and to examine geographic differences in the cost of care. The data presented in this section are average annual member expenditures, including prescription medication expenditures, for those enrolled in private health insurance plans administered by Blue Care Network (BCN), Blue Cross Blue Shield of Michigan (BCBSM), and Priority Health (PH) for the years 2020-2021. The following factors should be considered when interpreting analyses in this section:

- **Differences in benefit structures and enrollment.** Both BCN and PH offer primarily HMO products while BCBSM members are predominantly enrolled in PPO plans. HMOs tend to operate through selective contracting and provider referrals, utilizing networks in order to achieve cost savings. PPOs tend to have fewer restrictions on members seeking care and, therefore, usually require additional member cost-sharing in the form of higher premiums, higher coinsurance rates, or higher co-pays. Because of these differences in benefit structures, evidence suggests that HMO plans are more attractive to enrollees who are healthier, who have less complex medical needs, or who have no longstanding ties to particular providers (Ji & Liu, 2007; Nicholson et al., 2004; Tchernis et al., 2006). However, some research has failed to find a substantial difference in health status for those enrolling in HMO plans (Schaefer & Reschovsky, 2002). Furthermore, enrollment changes can alter the underlying disease burden of the payer mix resulting in changes in utilization and expenditures.
- **Disease selection.** The health status, and thus the expenditures, for members with specific conditions might vary due to differences in demographics and health behaviors. For example, patients in some counties insured by one payer may be more sick than patients in other counties who are insured by a different payer.
- **Expenditures beyond disease.** In each case, the average patient expenditure data is for services not only related to the specific disease in question, but also for other unrelated medical costs the member may have incurred during the year. Differences in expenditures or treatment intensity for these unrelated health issues can result in additional variation in average patient expenditure estimates.

Expenditure estimates from each insurer can vary considerably because of these factors. Thus, we average the data for all three insurers to arrive at a more robust estimate of member expenditures.

KOMA Region Expenditures

As we have done in previous versions of this publication, we choose to focus on six chronic conditions that are associated with high prevalence rates and high levels of resource utilization: asthma, coronary artery disease (CAD), depression, diabetes, hyperlipidemia, and low back pain. For comparison, we also include "healthy members," which we define as those between the ages of 30 and 39 who had not been diagnosed with any of the six chronic conditions previously listed and who have total annual expenditures below $450,000. **Figure 1a** provides the average annual expenditures per member for each of these conditions in Kent, Ottawa, Muskegon, and Allegan (KOMA) counties in 2020 and 2021. In most cases, we identified members in each disease category according to specifications defined by the Healthcare Effectiveness Data and Information Set (HEDIS). We excluded Medicaid and Medicare enrollees from our expenditure estimates. Finally, all expenditure estimates in **Figure 1a** are reported in 2021 dollars.

Figure 1a indicates that, after adjusting for inflation, expenditures in KOMA decreased for three of the chronic conditions from 2020 through 2021 and increased for the other three. While nominal expenditure did tend to increase across the six conditions, the high level of inflation from 2020 to 2021 was sufficient to cause real expenditures to decrease for some of the conditions. **Figure 1b** further highlights the percentage change in average member costs. Here we note that real expenditures decreased for CAD (-8.7 percent), healthy members (-3.6 percent), hyperlipidemia (-2.4 percent), and low back pain (-0.8 percent). Expenditures increased for asthma (+7 percent), depression (+5 percent), and diabetes (+0.4 percent). In dollar terms, the greatest average per-member decreases in expenditure were seen in CAD (-$3,112) and hyperlipidemia (-$387). Unfortunately, we are unable to identify the cause of these changes in spending. As 2021 comprised the second year of the COVID-19 pandemic and the rollout of COVID vaccines, two culprits remain the

[1] Analysis of expenditures in previous Health Check reports was based on total allowable expenses for members with prescription coverage. While this variable is present in this year's data for BCBSM and BCN, it is not present for PH due to a coding change. As an alternative, we used PH data from the year 2018 to estimate the share of total allowable expenses incurred among members without prescription coverage as a linear function of the share of total member months that were without prescription coverage. Only member ZIP codes from 2018 with a share of uncovered months between 0 and 1 were used for the estimation. The model fit the 2018 data well (R2 = 0.701) and the estimated coefficients were used to produce predicted shares for the 2021 data. The predicted shares were used to build total allowable expenses for members with prescription coverage for the member ZIP codes in 2021 with a share of uncovered months between 0 and 1 (25 percent of observations). For the remaining 75 percent, the share was inferred as 1 for member ZIP codes with no covered months and 0 for member ZIP codes where all months had prescription coverage.

[2] Specific definitions for each of these conditions can be found in the online Disease Population Specs Appendix accessible at https://www.gvsu.edu/vphealth/health-check-65.htm.

delay of elective hospital services and avoidance by patients fearful of contagion, at least until becoming fully vaccinated.

The medical and prescription drug components of the disease-specific expenditure figures for 2020 and 2021 are displayed in **Figure 2**. The prescription drug share of total spending for 2021 ranges from 17 percent for members with CAD to 42 percent for those diagnosed with asthma. We note that prescription drug expenditure's share of overall disease-specific expenditures rose from 25 to 26 percent in real terms across all conditions. In dollar terms, average real prescription drug expenditures increased for members diagnosed with asthma (+$588), diabetes (+$141), and depression (+$82), while it decreased for members diagnosed with low back pain (-$159), CAD (-$143), and hyperlipidemia (-$109).

Differences in Average Annual Expenditures Between KOMA and the Detroit Region

Figure 3a compares average annual per member expenditures in both the KOMA and Detroit regions. We define the Detroit region as Oakland, Macomb, and Wayne counties. **Figure 3a** indicates that 2021 expenditures for CAD, diabetes, hyperlipidemia, and healthy members are higher in the KOMA region than in the Detroit region. The percent differences vary across diagnoses, with healthy members' expenditures in KOMA being 14 percent higher than Detroit while asthma expenditures are 11 percent lower. Differences in spending for the same condition between the east and west sides of the state may result from several reasons, including higher prices for care, greater use of medical services/technologies, or geographic differences in the underlying health of the population. For this particular year, however, it is important to also factor in the different duration and severity of the COVID-19 pandemic experienced by the two regions. As Detroit was one of the first cities in the country to suffer a significant COVID-19 outbreak, the duration and severity of the city's experience with the pandemic likely increased costs to a greater degree than elsewhere.

Figure 3b plots the percentage change in expenditures for each condition from 2020 to 2021. So, while **Figure 3a** provides differences in spending levels between the two regions, **Figure 3b** presents a more dynamic look at how those spending levels changed in the past year. Unlike the KOMA region, where real expenditures decreased for some conditions between 2020 and 2021, the real expenditures for the same conditions tended to increase in the Detroit region. It is important to note that the same correction for inflation was made for both regions, indicating that nominal spending growth generally outpaced inflation in the Detroit region. This was not true for the KOMA region. The largest disparities in growth between the two regions concern expenditures for healthy members (which grew by 7.5 percent in Detroit but fell by 3.6 percent in the KOMA region) and low back pain (which grew by 7.8 percent in Detroit but fell by 0.8 percent in the KOMA region). The broad message from **Figures 3a and 3b** is that real expenditures across the chronic conditions tended to rise between 2020 and 2021 in the Detroit region and changes were more mixed in the KOMA region. This is a departure from recent trends, as real expenditure in the KOMA region had been gaining on the Detroit region from 2017 to 2020. To put the magnitude of the departure into perspective, from 2017 to 2020, nominal expenditures per CAD member went from being approximately $900 (3.5 percent) lower in the KOMA region to being $6,151 (18 percent) higher. In 2021 alone, this difference was reduced to $3,535, making expenditure on CAD members only 12 percent higher in the KOMA region. Essentially, concerning members with a CAD diagnosis, the difference in expenditures between the two regions has been cut by approximately 40 percent over the span of one year.

As was the case for the last two years, we have access to the average risk scores of 2021 members, which allows us to adjust for expenditure differences between the KOMA and Detroit regions that are due to differences in the underlying health of their residents. **Figure 3c** reports two average member expenditure measures in KOMA across all conditions. The first measure is the actual (raw) KOMA expenditures as calculated for **Figure 1a**. The second is the predicted average KOMA region expenditures for these members if the KOMA risk scores were the same (on average) as those in the Detroit region, whose expenditures are also shown in the figure. Therefore, a comparison of the middle and right bars for each diagnosis reveals expenditure differences due to factors other than the wellness of the regional member populations.

Figure 3c shows that raw expenditures in KOMA are lower than those in Detroit for members with asthma by 11.3 percent, low back pain by 6.8 percent, and depression by 2.4 percent. Raw KOMA expenditures are significantly greater than those in Detroit for healthy members (by 14.2 percent), CAD (by 12.1 percent), hyperlipidemia (by 4.2 percent) and diabetes (by 1.8 percent). As was mentioned in the discussion of **Figure 3b**, these percentage differences have generally widened or narrowed in favor of KOMA for the period 2020 to 2021. The message from this part of **Figure 3c** is that KOMA expenditures remain comparable to Detroit for most of the seven diagnoses in 2021.

The adjusted expenditures for the KOMA region in the middle columns of **Figure 3c**, however, tell a different story, as they have for the previous two years. Upon accounting for differences in the underlying health of members in the two regions, the KOMA region holds no expenditure advantages in any of the six diagnoses. Considering adjusted expenditures instead of raw, KOMA region expenditures are higher than those of Detroit by 17.7 percent for asthma, 17.5 percent for CAD, 27.5 percent for depression, 13.1 percent for diabetes, 19.6 percent for hyperlipidemia, 24.9 percent for low back pain, and 21.8 percent for healthy members. On the other hand, these percent differences have narrowed over the previous year for three of the seven diagnoses, rising for asthma, depression, diabetes, and low back pain. The adjustment reveals that the KOMA region continues to have a relatively healthy population compared to Detroit, which can largely explain the differences in raw expenditures between the regions on members with the same diagnoses. **Figure 3c** suggests that, while these members in the KOMA region do ultimately enjoy lower expenditures for three of these diagnoses, there could be additional savings from bringing prices or treatment approaches more in-line with the Detroit region. It is not clear how this would affect access to or quality of care in the KOMA region, however, so additional investigation is necessary before a recommendation can be made.

Health Services Use

Figures 4a through 4c examine regional differences in health care utilization for each of the six conditions. This is the sixth year that we have been able to include utilization data in our analysis, and this brings us closer to identifying the causes behind the documented expenditure growth.

Figure 4a displays the average number of annual inpatient visits for members in KOMA and the Detroit region in 2021. This figure is consistent with the previous three Health Check reports in showing that hospitalization rates tend to be higher on the east side of the state than the west. For example, members with diabetes experience an average of 0.14 inpatient admissions per year in KOMA, while those in Detroit average 0.24 hospital visits per year. Furthermore, these gaps have grown between 2020 and 2021. For example, while the average number of annual inpatient visits for depression were 17 percent lower in the KOMA region than in Detroit in 2020, that gap increased to 23 percent in 2021. There is a similar pattern for asthma (29 to 45 percent), CAD (12 to 26 percent), low back pain (3 to 12 percent), hyperlipidemia (17 to 27 percent), and diabetes (35 to 39 percent). This is another departure, as the gaps between regions in inpatient visits had tended to narrow over the past two years.

Figure 4b extends the utilization analysis to emergency department (ED) use. ED use was once again higher in the Detroit region than in KOMA for all six chronic conditions in 2021, compared with only five in 2020. For example, those with a low back pain diagnosis average 0.57 ED visits per year in Detroit compared to 0.40 ED visits per year in the KOMA region (indicating that we observe approximately 42 percent more ED visits per member in Detroit for lower back pain than in KOMA). The changes in these gaps across diagnoses have varied over the previous year. While those in Detroit consumed slightly less than 1 percent fewer ED visits per member with CAD than in the KOMA region in 2020, that difference was reversed in 2021. ED visits for CAD members in the KOMA region are now 5.9 percent less than in Detroit. A similar widening in gap is observed for depression (17 to 18 percent) and hyperlipidemia. On the other hand, these gaps have narrowed for low back pain (48 to 42 percent), asthma (20 to 10.5 percent), diabetes (28 to 14 percent), and hyperlipidemia (10 to 5.7 percent). Overall, while ED utilization clearly remains higher in the Detroit region than in the KOMA region, there is mixed evidence across diagnoses as to the widening or narrowing of the gaps.

Next, utilization in terms of prescription drug fills is presented in **Figure 4c**. As in the previous report, we find evidence of higher use rates in the Detroit region than in the KOMA region. For example, the average member with diabetes in the KOMA region had 64 prescription fills in 2021 compared to 76 for individuals with diabetes in the Detroit region. Assuming that each member filled a prescription 12 times throughout the year, then this would represent an average of approximately five distinct prescriptions for a person with diabetes in KOMA and a little over six distinct prescriptions in Detroit. Beyond diabetes, we note an average of 19 percent more prescription fills in Detroit than in the KOMA region for members with a depression diagnosis, and similarly 27 percent more prescription fills in Detroit for members with a low back pain diagnosis. These represent sizeable increases in gaps since 2020, which were only 18 and 20 percent, respectively.

Annual telehealth visits per member constitute the final utilization metric examined here, in **Figure 4d**. As last year's report also showed, the Detroit region has surpassed the KOMA region in the utilization of telehealth across all six chronic conditions. Interestingly, telehealth use between 2020 and 2021 fell across half of the diagnoses in Detroit, but continued to grow for most of the diagnoses in the KOMA region. These declines, which can be observed in **Figure 4e**, likely represent the gradual reopening of health care facilities to in-person treatment and visits, and thus reduced necessity of conducting patient-provider interactions virtually. Significant differences in qualitative trends were observed for telehealth use among hyperlipidemia patients (which grew by 9.7 percent in the KOMA region but declined by 18 percent in Detroit) and diabetes (which grew by 10.4 percent in the KOMA region and declined by 20 percent in Detroit). Perhaps notable is that telehealth use increased much more rapidly in Detroit than in the KOMA region over the previous two years, and so the relative growth in the KOMA region this year could represent some catching up. Just as the increase in telehealth use was more rapid in the Detroit region over the past two years, telehealth may also have greater staying power in the region over the next few years.

Comorbidities

In this section, we take a closer look at expenditures associated with diabetes and depression by examining the impact of additional diagnoses. Joint diagnoses and the presence of multiple comorbidities can lead to higher resource utilization and higher levels of spending. Importantly, we are not examining clinical linkages between these conditions, but rather only focusing on expenditure differences associated with multiple diagnoses. **Figure 5a** plots average annual member expenditures for those with only a diagnosis of diabetes, those with diagnoses of diabetes and asthma, diabetes and hypertension, diabetes and depression, and diabetes and CAD. According to **Figure 5a**, the addition of comorbidities greatly impacts the average expenditures associated with a diagnosis of diabetes. For example, expenditures in KOMA for a member diagnosed with diabetes and depression compared to a diagnosis of diabetes alone adds about $19,180 to the annual expenditure estimate, while a diagnosis of diabetes and CAD (instead of diabetes alone) adds $28,697 to the expenditure estimate. These are slightly lower, compared to previous years.

Figure 5b displays the results of a similar analysis that focuses on depression. The results are consistent with those in **Figure 5a**: the presence of multiple conditions greatly increases average annual expenditures for members with depression. For example, expenditures in Detroit for a member diagnosed with depression and CAD compared to a diagnosis of depression alone adds about $42,488 to the expenditure estimate, which is about comparable to the previous year.

Lastly, looking across **Figures 5a** and **5b** we further note that expenditures for comorbidities do not appear to be additive. That is, average expenditures for members who suffer from both diabetes and depression are higher than if we simply added the average expenditure of a member who suffers from only diabetes with the average expenditure of a member diagnosed with only depression. For KOMA in 2021, the expenditure difference adds up to $8,558 (up from $5,947 in 2020), while the same difference is slightly smaller at $8,381 in the Detroit region. Furthermore, the 2020

difference in Detroit was $10,735, so these figures reveal another apparent narrowing of the gap in expenditure between regions on members suffering from both depression and diabetes.

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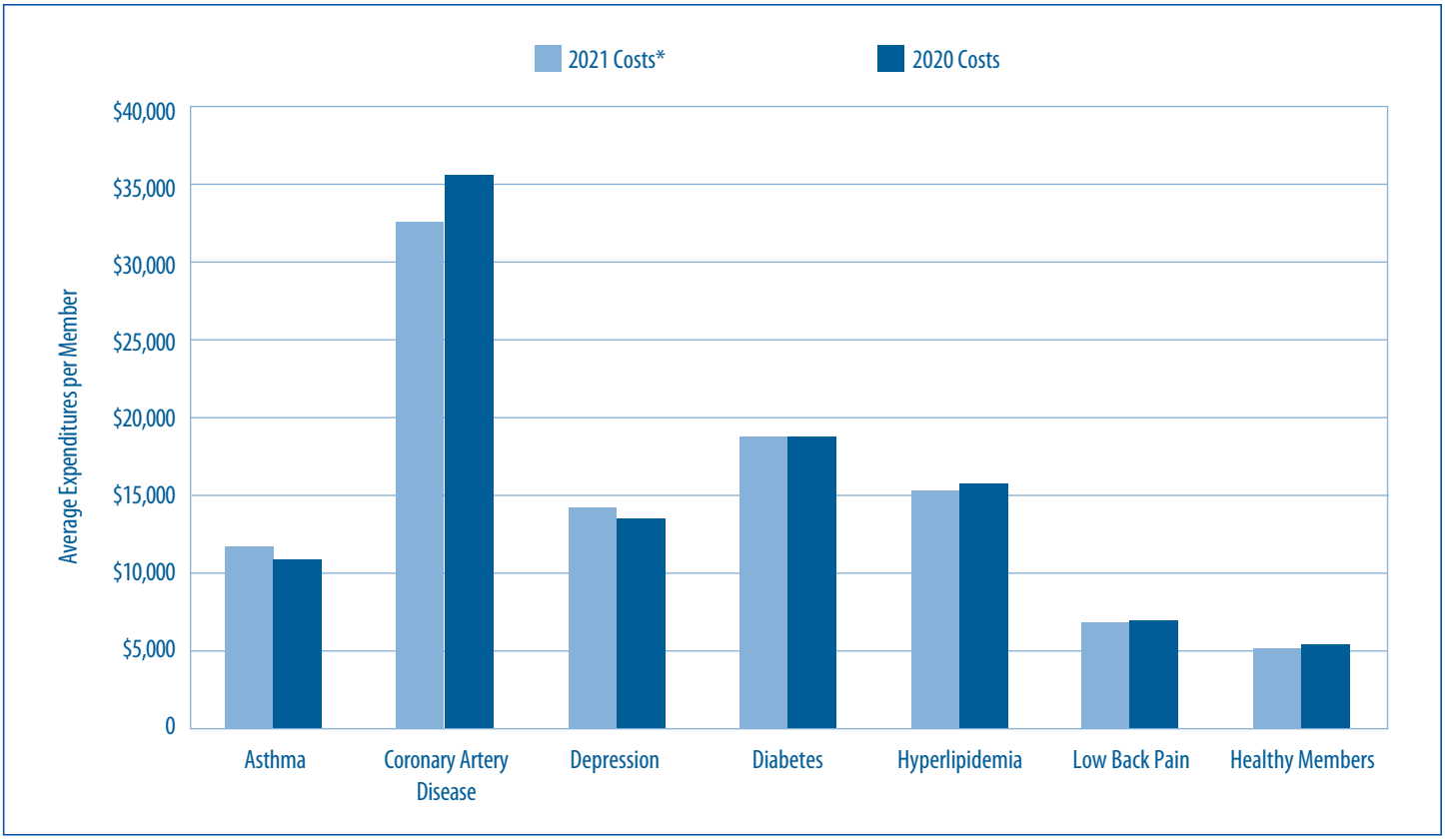
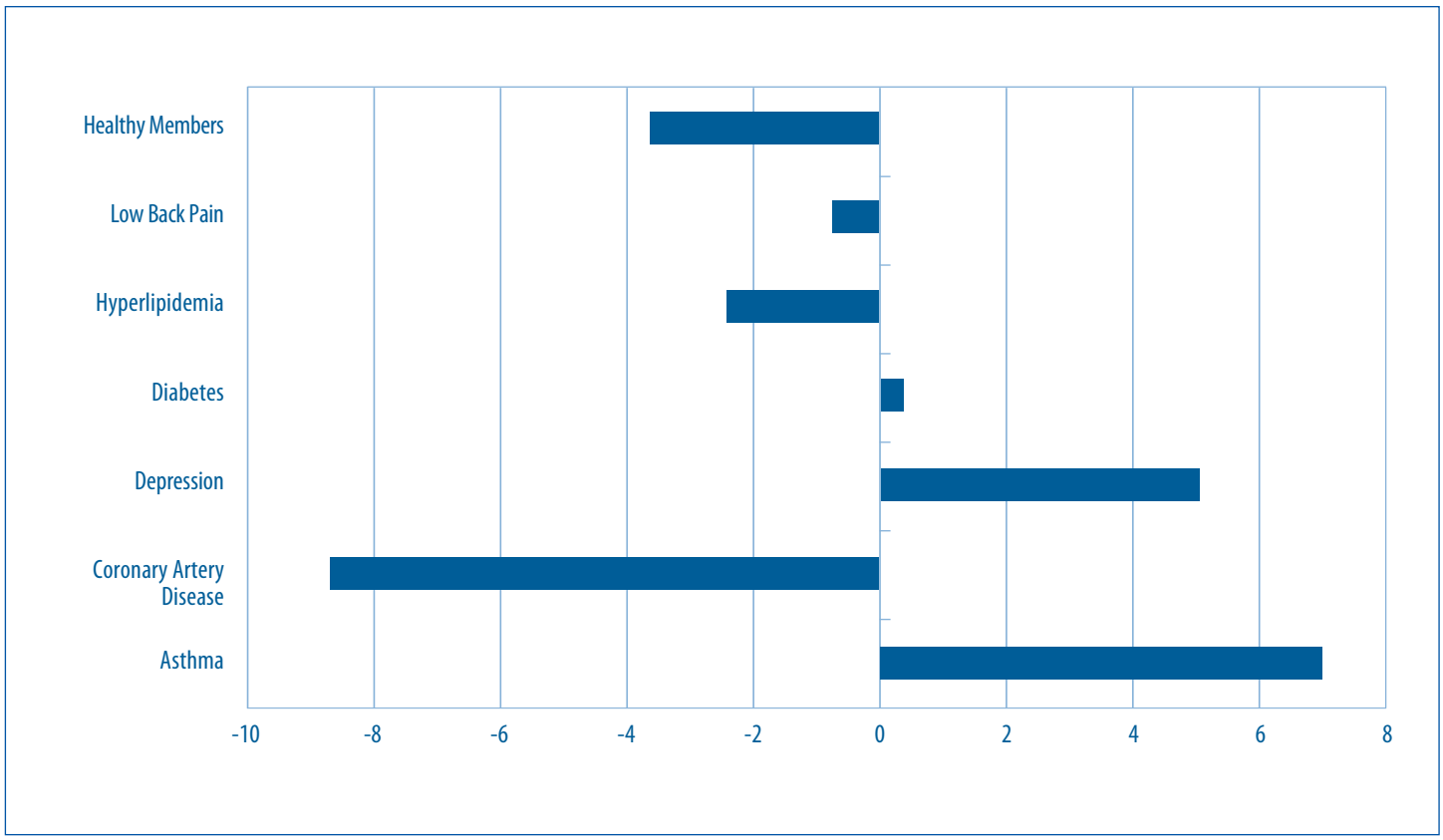
Figure 1a: Average Expenditures per Member in the KOMA Region, 2020-2021



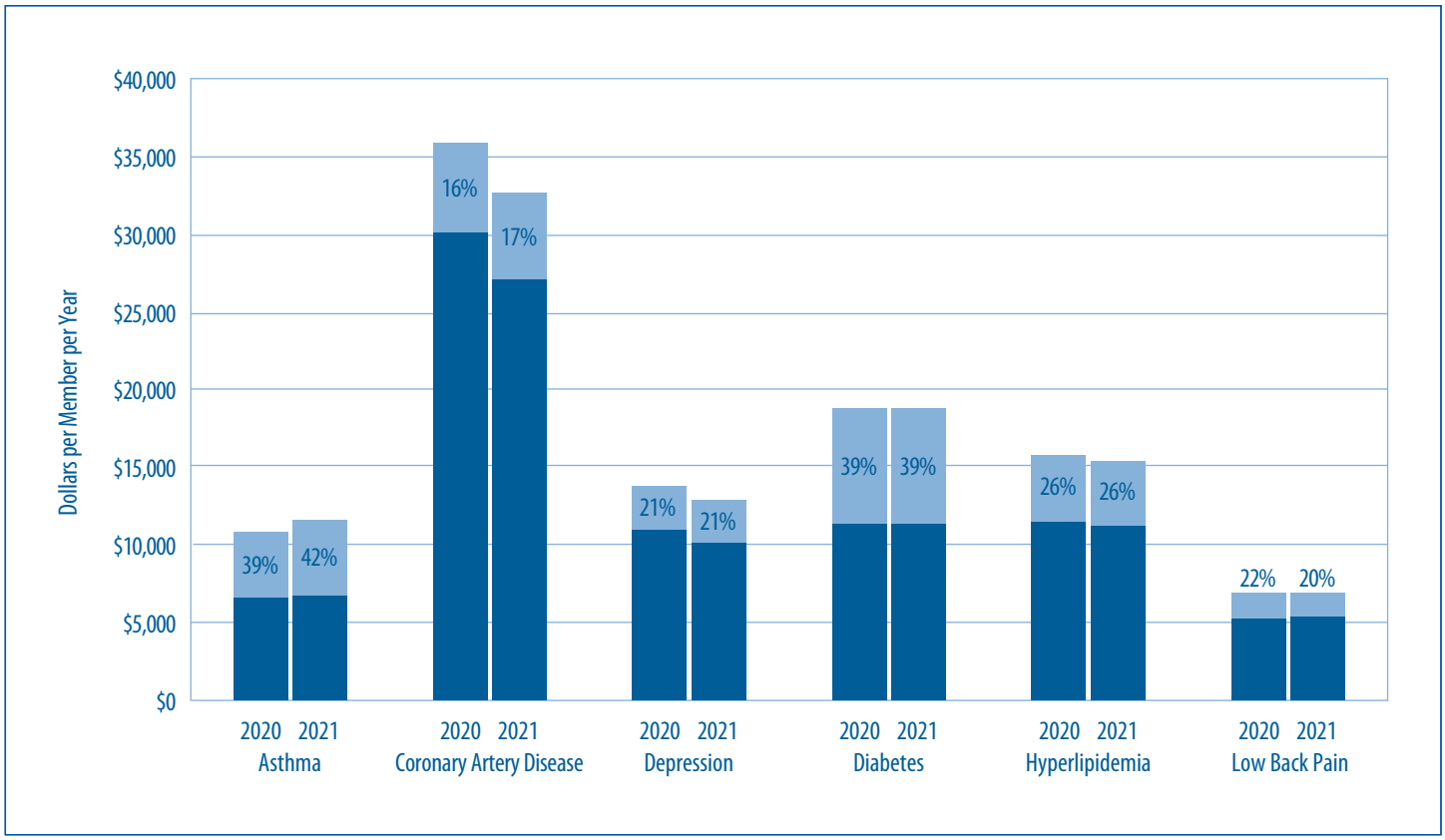
*2021 costs are unadjusted for inflation.

Figure 1b: Percentage Change in Average Member Costs in the KOMA Region, 2020-2021



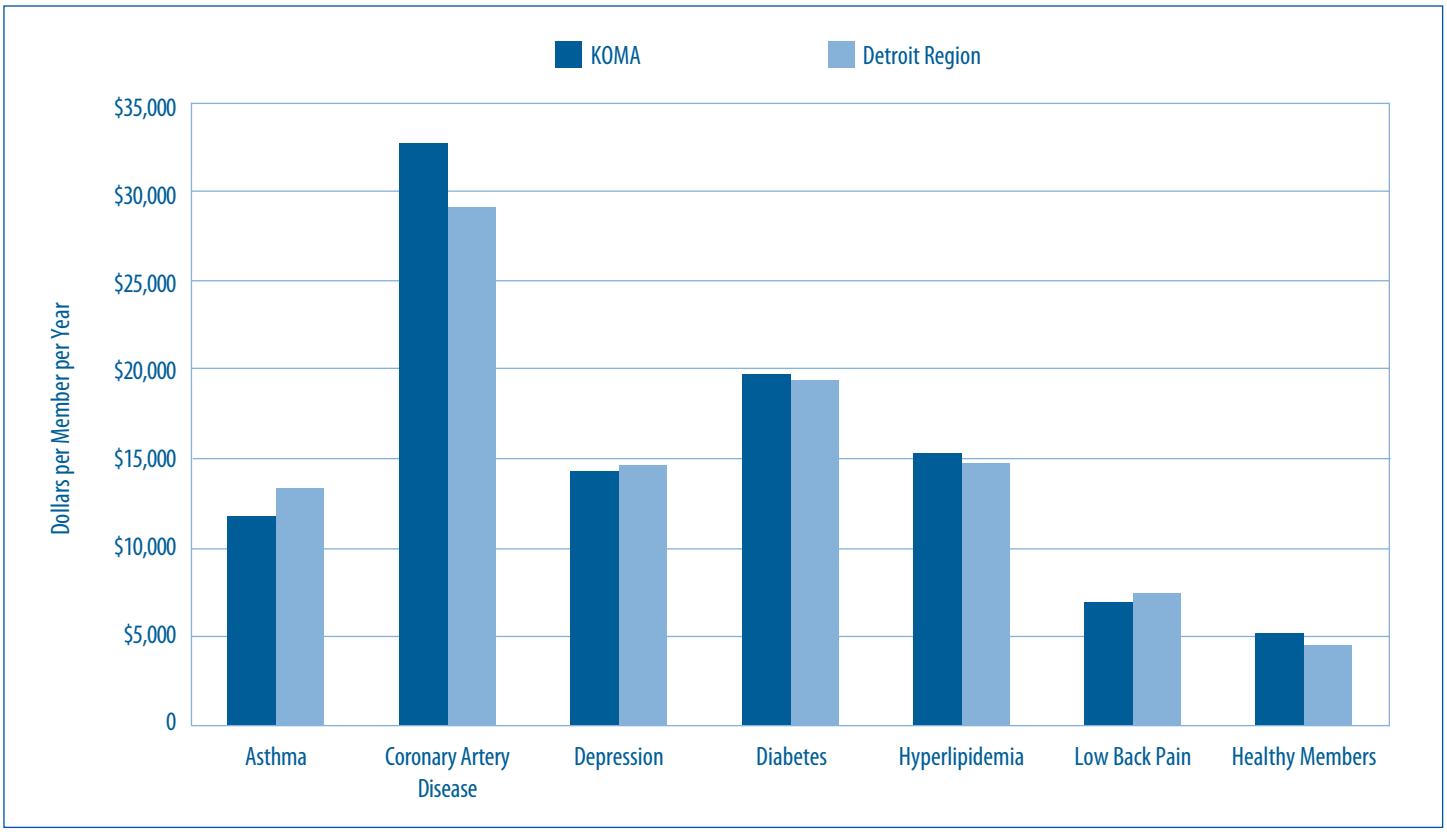
Source: BCBSM, BCN, and Priority Health member data

Figure 2: Rx Share of Average Expenditures per Member in the KOMA Region, 2020-2021



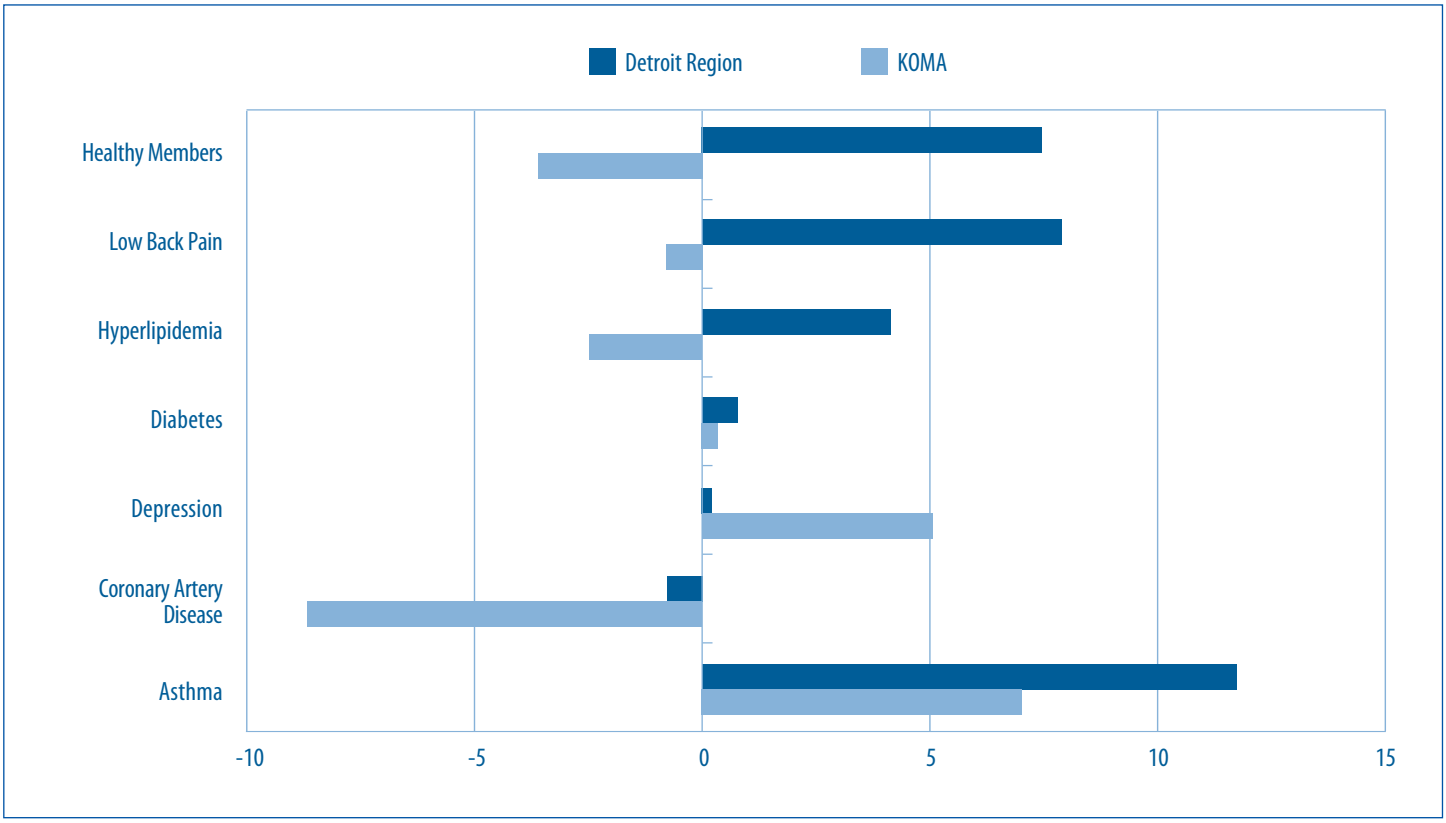
Source: BCBSM, BCN, and Priority Health member data

Figure 3a: Average Expenditures per Member, 2021



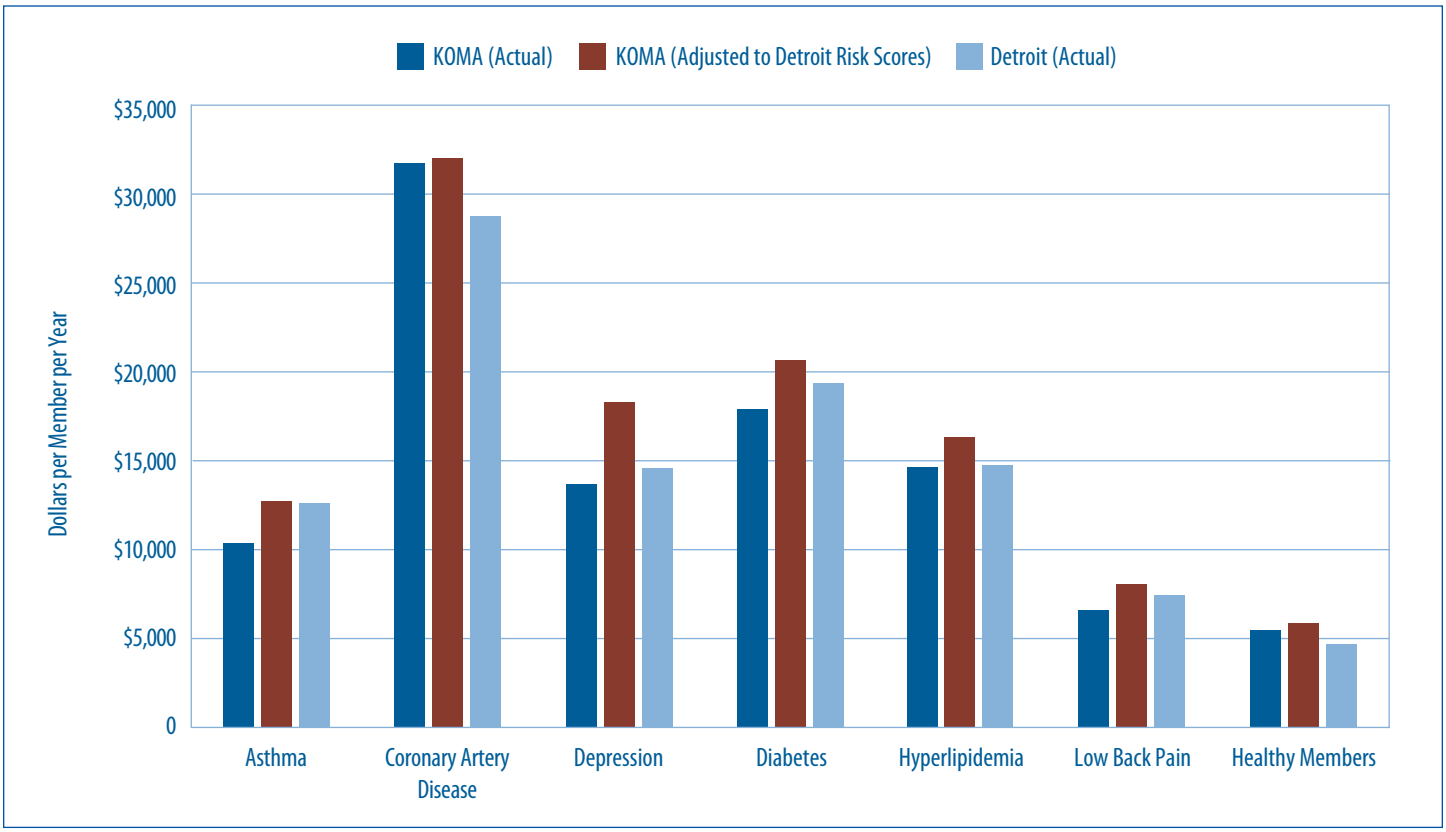
Source: BCBSM, BCN, and Priority Health member data

Figure 3b: 2020-2021 Percentage Change in Average Expenditures per Member



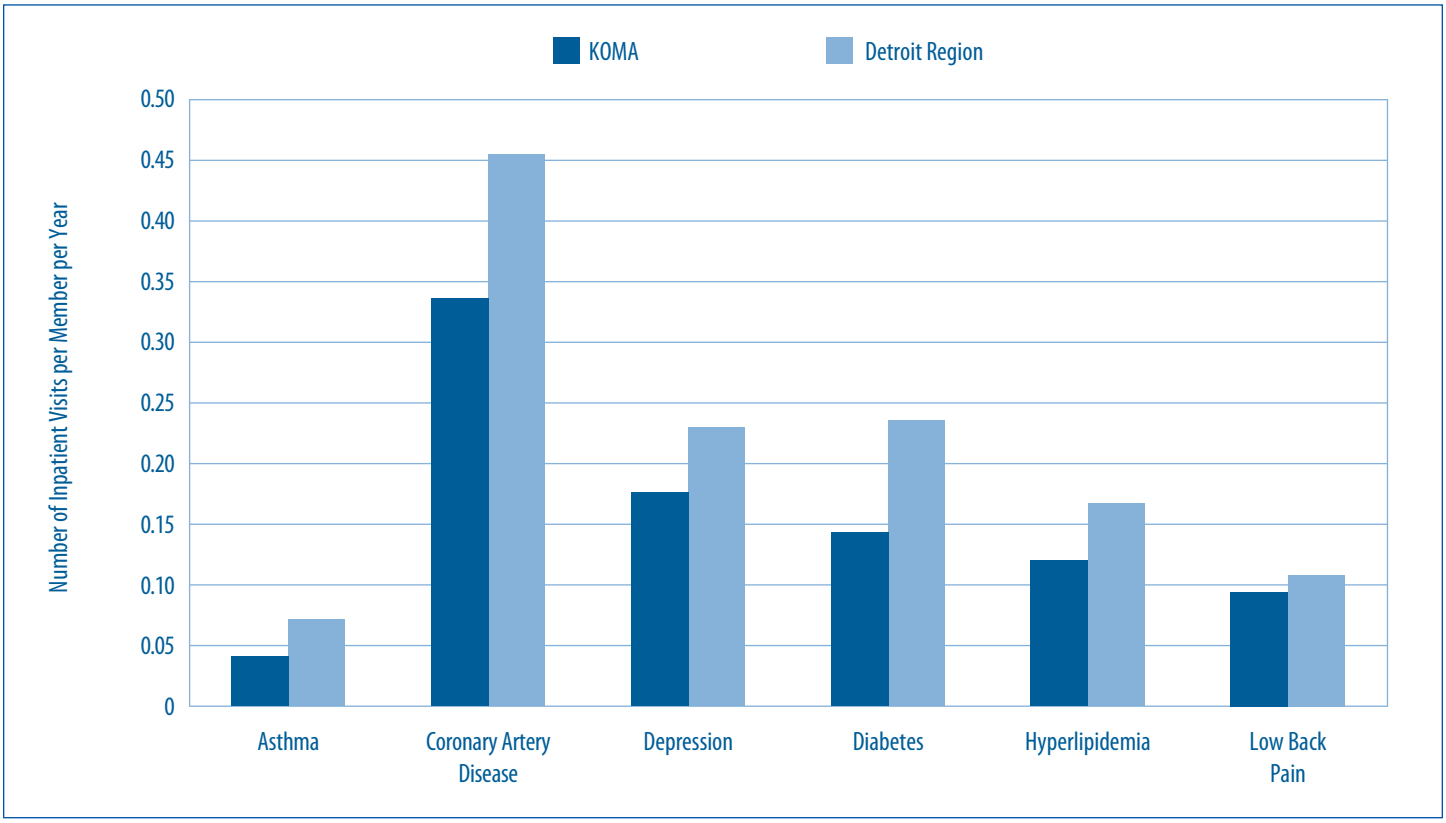
Source: BCBSM, BCN, and Priority Health member data

Figure 3c: Average Expenditures per Member with Risk-adjusted KOMA Region Values, 2021



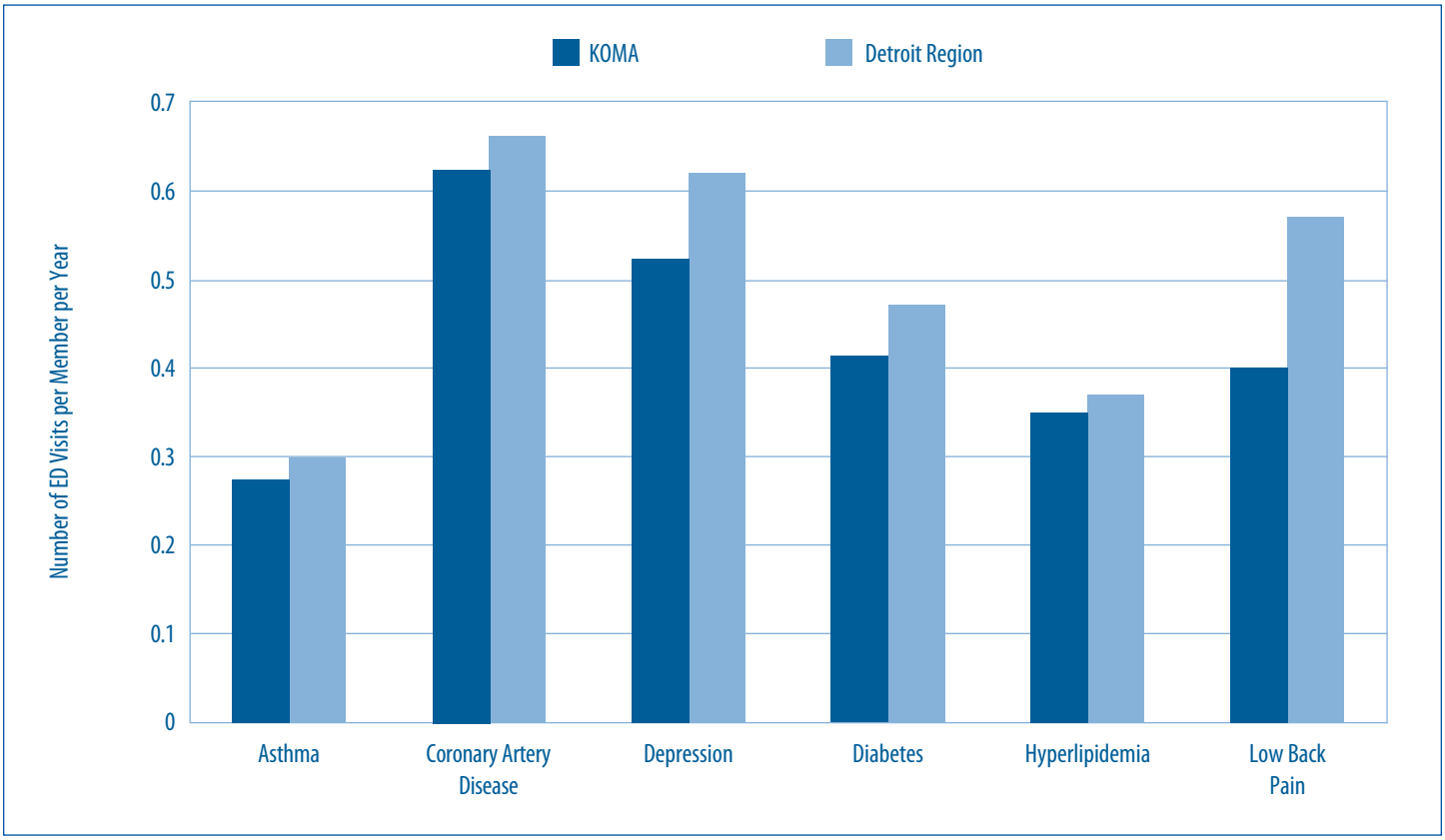
Source: BCBSM and Priority Health member data

Figure 4a: Average Annual Inpatient Visits per Member, 2021



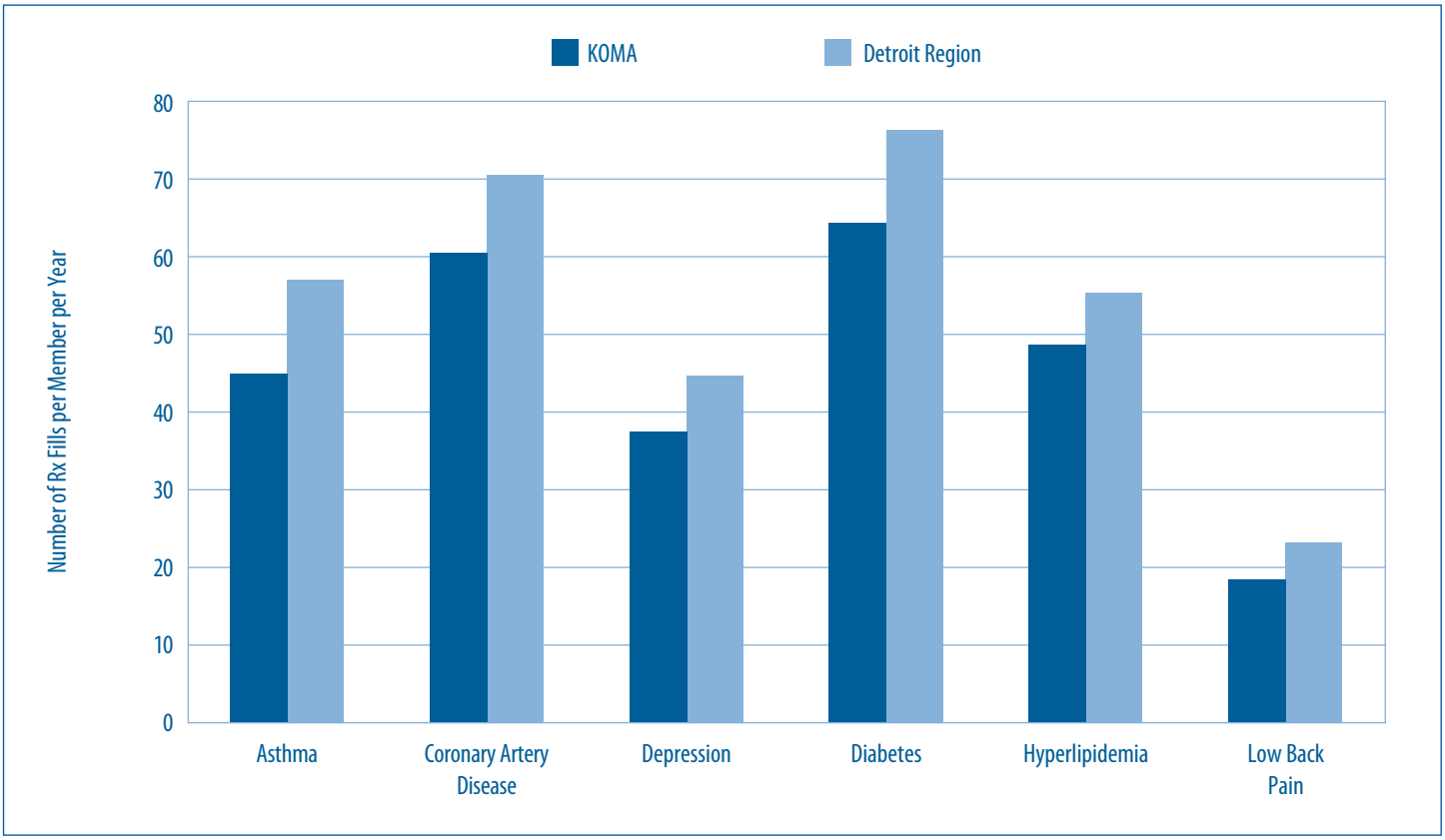
Source: BCBSM, BCN, and Priority Health member data

Figure 4b: Average Annual Emergency Department Visits per Member, 2021



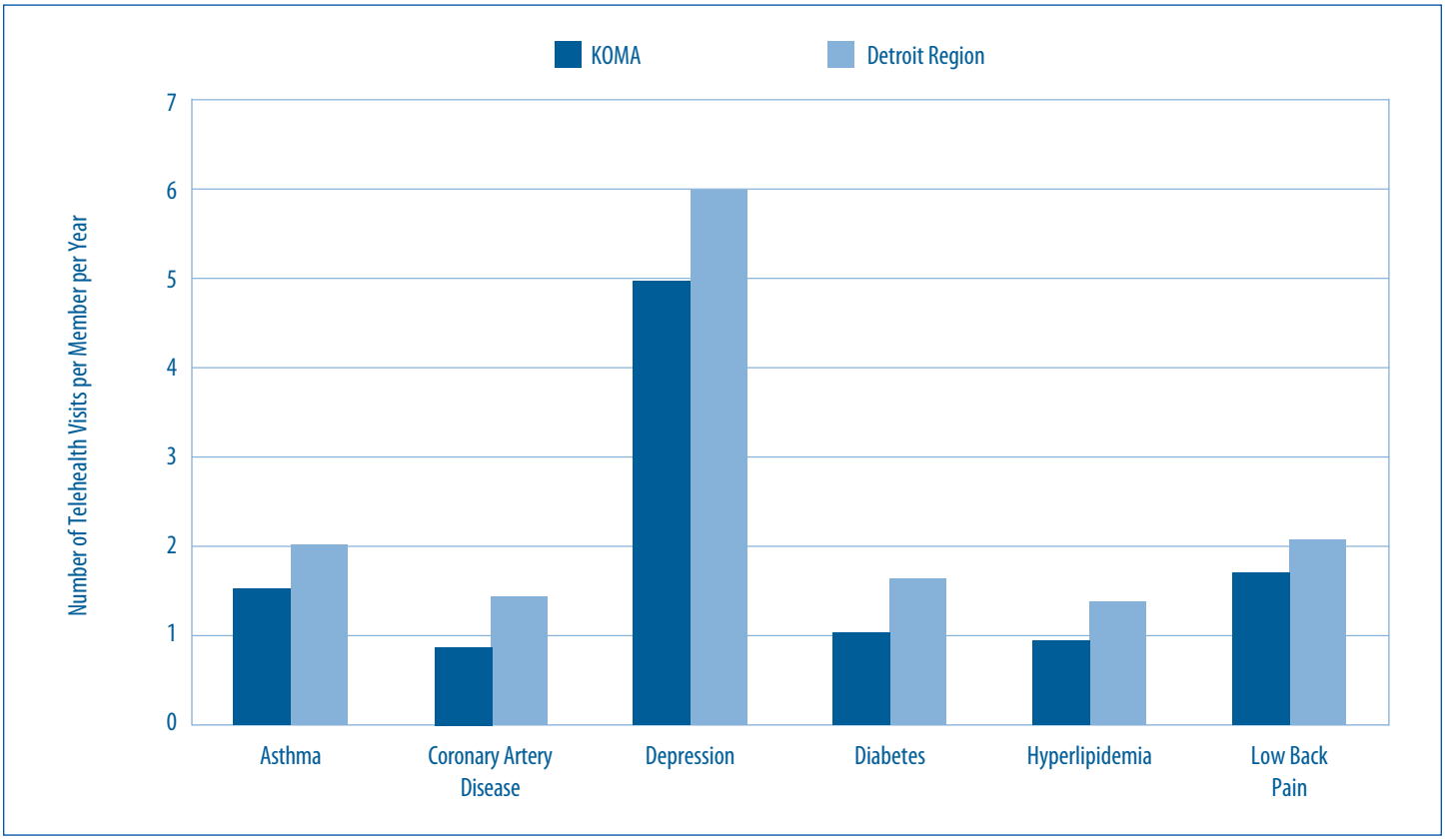
Source: BCBSM, BCN, and Priority Health member data

Figure 4c: Average Annual Prescription Fills per Member, 2021



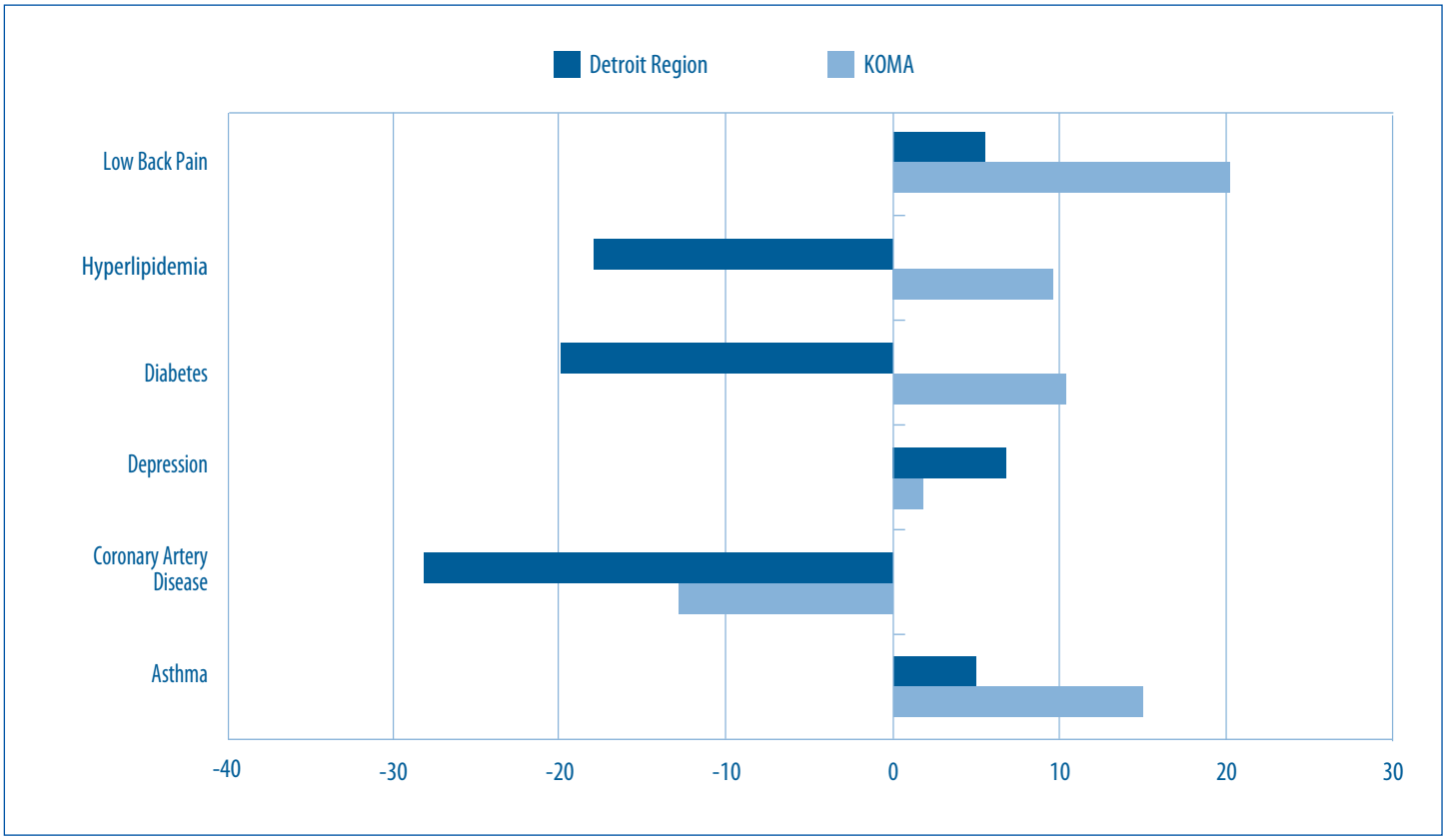
Source: BCBSM, BCN, and Priority Health member data

Figure 4d: Average Annual Telehealth Visits per Member, 2021



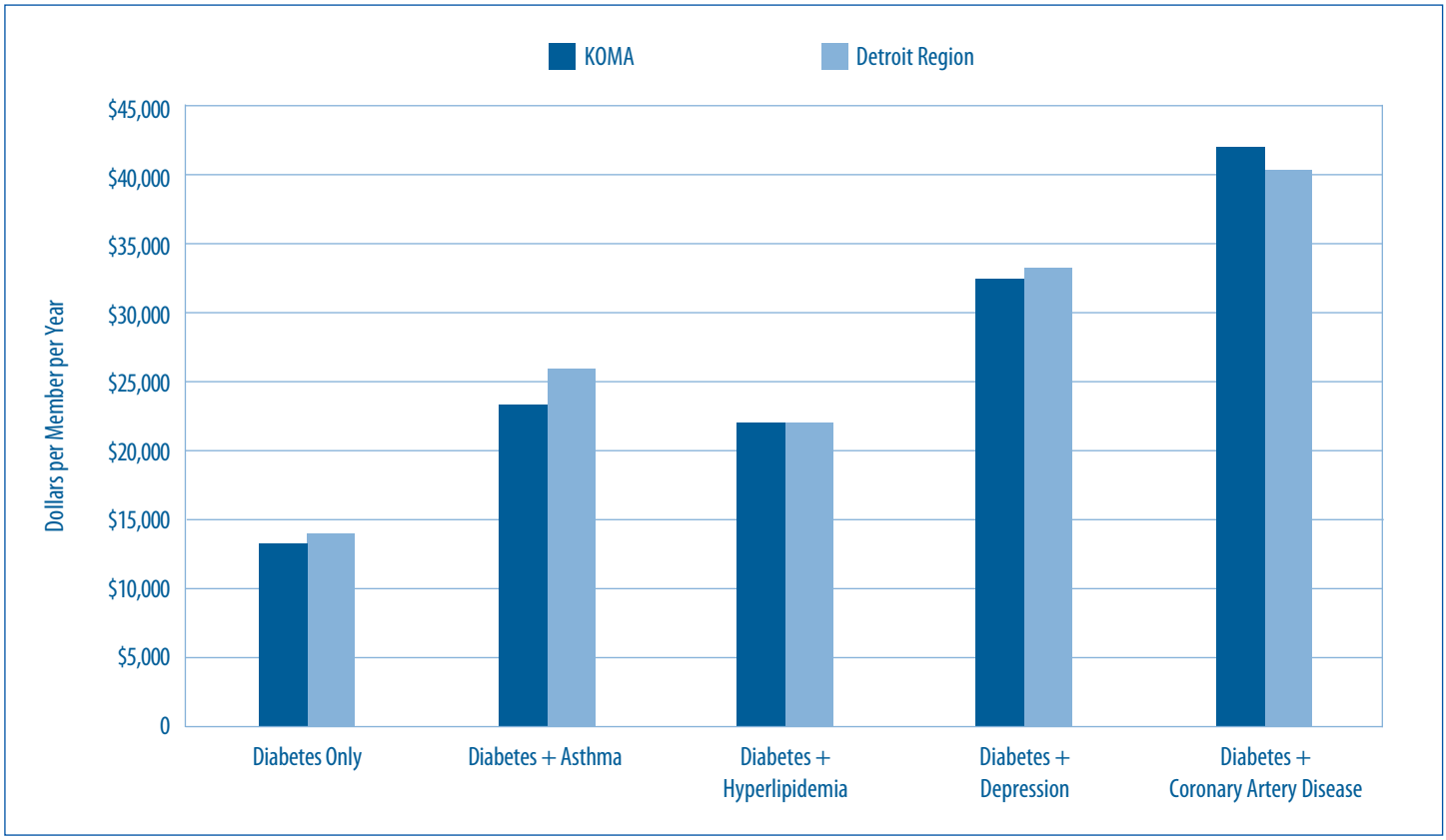
Source: BCBSM, BCN, and Priority Health member data

Figure 4e: 2020-2021 Percentage Change in Average Telehealth Visits per Member



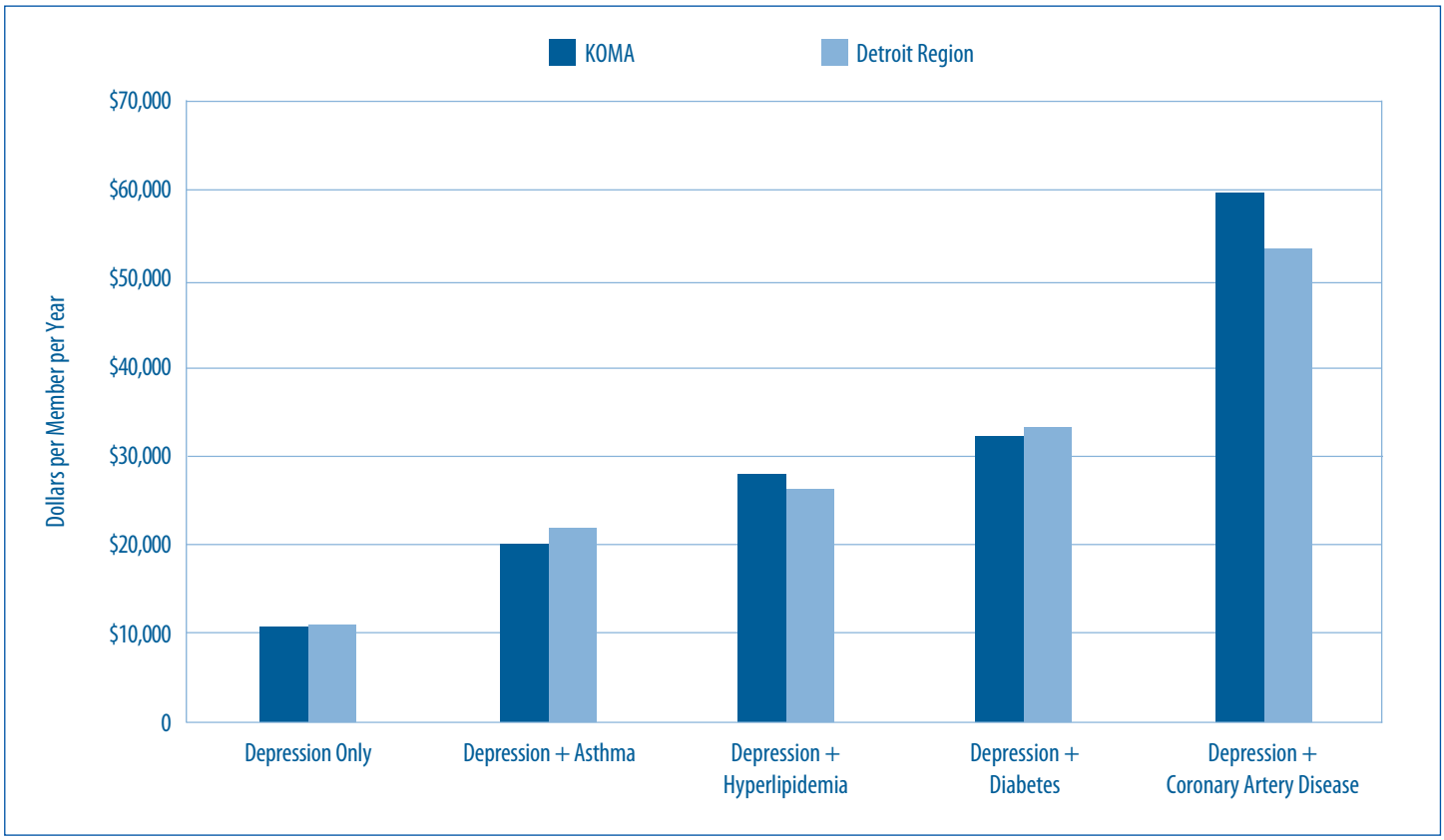
Source: BCBSM, BCN, and Priority Health member data

Figure 5a: Expenditures on Members with Diabetes and Comorbidities, 2021



Source: BCBSM, BCN, and Priority Health member data

Figure 5b: Expenditures for Members with Depression and Comorbidities, 2021



Source: BCBSM, BCN, and Priority Health member data

Disparities

What Data Is Being Used

To investigate for disparities in health outcomes across regions and groups, we use member data provided by the private health insurance plans Priority Health (PH), Blue Cross Blue Shield of Michigan (BCBSM), and Blue Care Network (BCN) at the ZIP code level. For each ZIP code, the data set records the number of member months in the presence of six different diagnoses: asthma, coronary artery disease (CAD), depression, diabetes, hyperlipidemia, and low back pain. We also examine the number of member months where the member is between the ages of 30 and 39, has none of these diagnoses, and has total annual expenditures below $450,000. These are labeled "healthy" member months. In addition to member months, the data also records the average risk score of the members in each ZIP code diagnosis group. We use this as a measure of the underlying health characteristics of the member population.

In order to categorize ZIP codes on the basis of characteristics potentially subject to health disparities, we combine the insurance plan data with 2010 census data on population, median income, and race at the ZIP code level. Median income comes from the American Community Survey, while race and population data come from the 2010 Census Demographic Profile Summary File. We then stratify the ZIP codes into population quintiles, first by income and then by race. The set of ZIP codes containing 20 percent of a given regional population with the highest weighted average income are denoted "High Income" ZIP codes, while the set with the lowest weighted average income are labeled "Low Income" ZIP codes. Similarly, the set of ZIP codes containing 20 percent of a given regional population with the highest percentage of white residents are labeled "High Share White" ZIP codes, while those with the highest percentage of black residents are labeled "High Share Black" ZIP codes. This is done separately for the KOMA and Detroit regions, and then descriptive statistics are reported for the entire region, as well as stratified quintiles. Differences in mean outcomes across quintiles is considered health disparities and any patterns with respect to income or race are investigated.

There are limitations with this approach. First, these data are 11 years older than the payer data, and it is almost certainly true that the income and racial profile of various ZIP codes have changed over the previous decade. This could influence the results, especially if gentrification occurred more rapidly in one region than the other, thus making the 2021 income or racial profile of a ZIP code much different from those in the 2010 census. This problem will hopefully be mitigated as these files are updated to the 2020 census. Second, as a simple comparison of descriptive statistics, the analysis does not control for all factors that are correlated with income or race. These include education, drug use, discrimination, opportunity, family characteristics (Iguchi et al. 2005). Therefore, readers should be cautious in interpreting any patterns or correlations as causal relationships. Third, the insurer data only covers the privately insured population and access for the nonprivately insured to public health insurance programs is different across income and race quintiles. Therefore, even controlling for race and income, the privately insured population is bound to be different from the publicly insured and uninsured populations. This means that any inferred correlations between health disparities and income or race rely on assumptions about correlations between the member and general populations of a ZIP code.

Disparities By Income

In **Table 1**, we see that KOMA has a lower median income than Detroit, but it also has a tighter income distribution. We also see the weighted Black and white shares of the populations of these sets of ZIP codes. As has already been noted in the literature, this presents difficulties in disentangling the impacts of socioeconomic status and race (Jamil et al. 2008, Meliker et al. 2009). This introduces an important caveat in the regional comparison that will be reflected again when we stratify by race: while the top income quintiles for KOMA and Detroit are not strikingly different from each other, the bottom income quintiles look very different in terms of racial distribution. So, while we will be comparing across regions those ZIP codes comprising the 20 percent of the populations with the highest weighted Black share of the population, we cannot say those quintiles have similar racial distributions

Average Risk Score

A high average risk score indicates the presence of member characteristics that are correlated with high health care spending. These risk scores are estimated by a third-party vendor, and so the characteristics that affect risk scores and the scoring method are not known. Compared to 2020, risk scores for all income groups and regions are higher by between 2 and 10 percent. Both regions show a trend of increasing average risk scores from the High Income ZIP codes to the Low Income ZIP codes, which is consistent with correlations between socioeconomic status and health-related variables found in the literature. This was only true for Detroit in 2020, meaning the disparity in risk scores by income in the KOMA region is new to this year.

Average Insured Months Per Resident

Figure 2 reports the population-weighted average number of member months in each ZIP code set, relative to the total population of the ZIP code set. This can serve as a rough measure of private insurance rates, although it is likely to be biased upward in areas where residents have multiple comorbidities. This is because an individual insured for a month while diagnosed with two different chronic conditions appears in the data as two member months.

The KOMA region has 20 percent more insured months per resident as Detroit, and is an increase compared to the previous year. This change is due to rising insured months per resident across all income categories in KOMA of between 7 percent for Low Income ZIP codes and 32 percent for High Income ZIP codes. Only the High Income ZIP codes of Detroit experienced an increase (13 percent), while those of the Low Income and region overall both declined (by 30 and 1 percent, respectively). Both KOMA and Detroit regions exhibit an increasing relationship between income quintiles and member months per capita. This is not surprising, since low-income individuals are more likely to qualify for public health insurance programs and therefore not be privately insured. This pattern of differential member months per capita across income quintiles raises the likelihood that members from low-income ZIP codes are less representative of the ZIP code population. Given the correlation between private health insurance, employment, and other socioeconomic characteristics, the disparities between members across income quintiles may underrepresent the disparities between residents.

Average Healthy Months to Total Months

Insured months where the member was between the ages of 30 and 39, had none of the six chronic conditions diagnoses, and had annual health care spending below $450,000 are coded as "healthy" member months. **Figure 3** presents the ratios of healthy months to total member months, which include both healthy months, as well as those where one of the chronic conditions was diagnosed. The healthy month ratios for the Detroit region are relatively constant across income quintiles, and at levels relatively unchanged from the previous year. The ratios weakly decline with income quintile for KOMA, which is also consistent with the previous year, but the ratios for all quintiles are down by at least 3 percent. The ratio is down by 8 percent for KOMA's High Income ZIP codes.

Average Asthma Months to Total Months

Figure 4 separately reports the average share of member months with a diagnosis of asthma for the KOMA and Detroit regions. For each region, the population-weighted average share of asthma months to total months across ZIP codes is presented, along with the weighted averages for ZIP codes in the top income quintile and those in the bottom quintile. The results show that asthma months makes up a larger share of total months in KOMA than they do in Detroit. This suggests that other chronic conditions make up a more significant share of non-healthy months for residents of the Detroit region. Both KOMA and Detroit regions show the share of asthma months increasing with income quintile, although the absolute differences are small. Only Detroit exhibited this pattern in 2020, and so the asthma disparity by income in KOMA is new to 2021.

Average CAD Months to Total Months

Unlike for asthma, **Figure 5** reveals that the share of total months with the presence of a CAD diagnosis is approximately 45 percent greater than in the KOMA region. Any relationship between CAD month ratio and income quintile is slight, though stronger in Detroit. The shares in Detroit are virtually the same as last year, while those for KOMA have increased across all income quintiles by between 22 and 26 percent. Together with the findings regarding expenditure on major medical conditions in Section 3.2, **Figure 5** suggests that the differences in CAD spending per member could be explained by economies of scale. With roughly three times the population and nearly double the share of member months with a CAD diagnosis, the much larger number of CAD patients in the Detroit region could lead to a lower average cost per CAD diagnosis, relative to the KOMA region.

Average Depression Months to Total Months

Figure 6 shows the distribution of member months with a depression diagnosis, as a share of total member months, across regions and income quintile ZIP codes. Depression member months remain more common in the KOMA region than in Detroit, consistent with the previous year. While the shares in Detroit are roughly the same as last year, those in KOMA have increased from 21 percent of total months in 2020 to 25 percent in 2021. The share of depression months increases with income quintile in the Detroit region, while the opposite is true in KOMA. Along with the previous figures, this suggests disparities in diagnoses other than asthma, CAD, and depression fall disproportionately on the members from Low Income ZIP codes in the Detroit region.

Average Diabetes Months to Total Months

In both the KOMA and Detroit regions, member months with a diabetes diagnosis are most common among the residents of Low Income ZIP codes. This pattern is revealed in **Figure 7**, where the share of member months with a diagnosis of diabetes are approximately 24 percent greater among the Low Income ZIP codes in KOMA, relative to the High Income ZIP codes. The difference is approximately 76 percent in the Detroit region. This is consistent with findings in the literature showing greater prevalence of diabetes and its associated comorbidities in groups with lower socioeconomic status (Jamil et al. 2008, Clements et al. 2020, Anderson-Carpenter and Neal 2021, Parpia et al. 2021). The wider variance in income across quintiles in the Detroit region, relative to KOMA, could explain the wider relative disparities in the share of diabetes months across quintiles. Compared to the previous year, the diabetes ratios are roughly the same across all income quintiles in Detroit, but down by between 1 and 15 percent in KOMA. The ratio of diabetes months to total months in Low Income ZIP codes of KOMA was 44 percent greater than those for High Income ZIP codes in 2020, while this has fallen to 24 percent in 2021. As a result, the income disparity in diabetes months has declined in KOMA over the past year.

Average Hyperlipidemia Months to Total Months

Figure 8 displays the share of total member months with a diagnosis of hyperlipidemia. The average hyperlipidemia share of member months is slightly higher in Detroit than in KOMA. In addition, the Detroit region shows a slight positive association between the hyperlipidemia share of member months and income quintile. This reveals a greater disparity in hyperlipidemia across High Income ZIP codes across regions, rather than across income quintiles within regions. Compared to the previous year, the share of total member months with a hyperlipidemia diagnosis has fallen across all income quintiles in ranges of between 5 and 10 percent in KOMA and 1.5 to 2 percent in Detroit.

Average Low Back Pain Months to Total Months

While the 2020 data showed no notable differences across regions in the distribution of low back pain months across income quintiles, this is not the case in 2021. As is displayed in **Figure 9**, low back pain makes up a greater share of total months in the KOMA region than it does in Detroit (5.4 versus 4.5 percent). This is a reversal from 2020, where the share was greater in Detroit (5.8 versus 5.2 percent). Much of this change is due to a 21 percent decline in the Detroit region, concentrated mostly among the High Income ZIP codes. As a result, in 2021, the share of total months with a low back pain diagnosis positively associated with income quintile in the KOMA region, while being slightly negatively correlated in Detroit.

Disparities by Race

Table 2 shows descriptive statistics where ZIP codes in the two regions are categorized by race. As was true in **Table 1**, the KOMA region has a lower weighted median income and smaller Black share of the population than is found in the Detroit region. When isolating the sets of ZIP codes in each region that make up 20 percent of the regional population and have the highest white share of the ZIP code population, which are labeled "High Share White" ZIP codes, we see that the two regions have a similar racial distribution (roughly 94 to 96 percent white and 0.5 to 2 percent Black). On the other hand, the sets of ZIP codes meeting the 20 percent regional population threshold having the highest Black share of the population ("High Share Black" ZIP codes) are quite different across regions. Even the High Share Black ZIP codes in the KOMA region tend to be majority white, having a weighted average Black share of the population equal to approximately 25 percent. The same is not true in the Detroit region, where the same classification of ZIP code has an average Black share of the population equal to roughly 91 percent. Therefore, a key difference between High Share Black ZIP codes across regions is the degree of racial segregation. Descriptions in the literature note the significance of racial segregation in determining a variety of health outcomes (Mechanic 2005, Grady and Darden 2012, Mein 2020, Gu et al. 2020, Parpia et al. 2021). Therefore, while patterns in outcome variables across quintiles in the KOMA region may illustrate different health outcomes varying with racial concentrations, the patterns in the Detroit region may reveal the additional impact of racial segregation.

Average Risk Score

The population-weighted average risk scores across regions and quintiles are presented in **Figure 10**. Compared to the previous year, average risk scores have increased between 3 and 11 percent across most quintiles. The only exception is the High Share White ZIP codes of KOMA, which are virtually unchanged. While the level of risk score is only slightly higher in the Detroit region, the two do not exhibit the same relationship between risk score and racial shares of the population. In the KOMA region, the average risk score of the High Share Black ZIP codes is about the same as that of the High Share White ZIP codes for 2021. This is not true in the Detroit region, where the High Share Black ZIP codes have an average risk score 18 percent higher than the High Share White ZIP codes, though this is down from 23 percent in the previous year. It should be noted that the opposite racial disparity was observed in KOMA in the previous year, where the High Share Black ZIP codes had an average risk score 10 percent lower than the High Share White ZIP codes. The Detroit pattern of racial disparity in risk score does closely resemble the racial disparity in income, so it is not clear whether race or income is most responsible for the risk score differences.

Average Insured Months per Resident

The racial disparities in average member months per resident displayed in **Figure 11** closely resemble the income disparities found in **Figure 2**. Once again, given the relatively low apparent rate of private insurance in the High Share Black ZIP codes in the two regions, there is a greater likelihood that the privately insured population of these ZIP codes is not representative of the ZIP code population. Notably, as private health insurance is associated with better employment and socioeconomic status, this implies that these figures may underrepresent the disparities in outcomes between High Share White and High Share Black ZIP codes. Compared to 2021, insured months per resident have increased by 20 percent in KOMA, particularly among the High Share White ZIP codes, while there has been a slight decrease in the Detroit region. This decrease is concentrated among the High Share Black ZIP codes, where insured months per resident have fallen 35 percent.

Average Healthy Months to Total Months

Figure 12 displays differences across regions and racial shares in the ratio of healthy member months to total member months. Healthy month ratios are virtually unchanged for the Detroit region, but down by 7 to 9 percent for all racial quintiles in KOMA. While the pattern across racial shares in the Detroit region is fairly weak, the same is not true for the KOMA region. The residents of High Share Black ZIP codes in the KOMA region have a 17 percent greater share of healthy months than do the residents of the region's High Share White ZIP codes, which is about the same as in 2020. This is despite the High Share Black ZIP codes having a lower weighted median income than the High Share White ZIP codes, which led to the lower relative share of healthy months shown in **Figure 3**.

Average Asthma Months to Total Months

Patterns in the share of member months with an asthma diagnosis across racially defined quintiles, shown in **Figure 13**, are the same in Detroit as those of the quintiles defined by income. The share of total months with an asthma diagnosis is 34 percent lower in the High Share Black ZIP codes of Detroit, relative to the High Share White ZIP codes, although the absolute difference is under one percentage point. For KOMA, asthma months are not particularly concentrated among High Share White or Black ZIP codes. Asthma months remain a greater share of total months in the KOMA region than in Detroit, though these shares are down between 8 and 16 percent in both regions and all quintiles compared to the previous year. As a result, member months with an asthma diagnosis have become less common in both Michigan regions.

Average CAD Months to Total Months

As with asthma, the patterns regarding regional and racial disparities in CAD found in **Figure 14** are similar to those regarding income disparities found in **Figure 5**. One exception is that there is the racial disparity in KOMA. Months with a CAD diagnosis make up a 27 percent smaller share of total months in the High Share Black ZIP codes than in the High Share White ZIP codes. This is up from 11 percent in 2020. There has been a relatively large (25 percent) increase in the CAD share of total months in KOMA between 2020 and 2021. This is particularly true among the High Share White ZIP codes, where the CAD share is up 48 percent. This shows that, while the greater disparity concerning CAD in the state is still regional, a new racial disparity has appeared in KOMA concerning CAD in 2021.

Average Depression Months to Total Months

The patterns of depression's share of total months across regions and quintiles are similar when stratifying by income and race, as can be seen when comparing **Figures 6 and 15**. The two regions exhibit the opposite relationship between racial concentration and prevalence of depression months among total months. In Detroit, the High Share Black ZIP codes have a 25 percent lower share of total months with a depression diagnosis compared to those of High Share White ZIP codes. The opposite is true in KOMA, where the share in High Share Black ZIP codes is 11 percent higher. A notable difference between the two regions is the sizeable increases for KOMA in the depression share of total months in 2021 over the previous year, which are in the order of 14 to 19 percent, depending on the racial quintile. There were increases in Detroit as well, although they are only in the 2 to 3 percent range.

Average Diabetes Months to Total Months

One of the more surprising results in this analysis is found when comparing **Figures 7 and 16**. While **Figure 7** shows the same clear relationship in both regions between the average income quintile and the share of total months with a diagnosis of diabetes, **Figure 16** reveals that the relationships are different across regions when classifying by race. The numbers for the Detroit region show that diabetes months are 79 percent more prevalent among High Share Black ZIP codes, relative to High Share White ZIP codes. This is up from 73 percent in the previous year. For the KOMA region, the share of diabetes months is actually 4 percent lower in the High Share Black ZIP codes than in the High Share White. This is down from 11 percent in the previous year. This change is mostly due to a 1.5 percentage point drop in the diabetes share of KOMA's High Share White ZIP codes. Overall, **Figures 7 and 16** indicate that income and race are reinforcing cleavages in the Detroit region, but not in the KOMA region. Furthermore, the racial disparity in diabetes months has increased slightly in the Detroit region over the previous year, while decreasing in KOMA over the same period.

Average Hyperlipidemia Months to Total Months

Figure 17 reveals patterns in the hyperlipidemia share of total months in 2021 that are virtually unchanged from 2020. In both regions, hyperlipidemia months make up a smaller share of total months among the residents of High Share Black ZIP codes than among those of High Share White ZIP codes. The differences in the KOMA and Detroit regions are 14 and 12 percent, respectively. The KOMA difference was 15 percent in 2020, showing a marginal narrowing of the racial disparity.

Average Low Back Pain Months to Total Months

Finally, **Figure 18** reveals the shares of total member months with a diagnosis of low back pain in the two regions, while also separating out the sets of ZIP codes each with high shares of white and Black residents. Separating by income in **Figure 9** shows similar patterns for the KOMA region as when separating by race in **Figure 18**. The Detroit region, on the other hand, shows a weak association between race and the share of total months with the presence of a low back pain diagnosis. The low back pain share is 8 percent greater in High Share Black ZIP codes than in High Share White ZIP codes. This was not the case in 2020, where low back pain months in High Share Black ZIP codes were 35 percent less prevalent relative to High Share White ZIP codes. This change is mostly due to declining prevalence of low back pain among the total insured months in ZIP codes with a large share of white residents.

Summary

The goal of this section is to investigate for disparities in health outcomes between the Detroit and KOMA regions according to income or race. It does this using payer data from PH, BCBSM, and BCN regarding member diagnoses and risk scores reported at the ZIP code level. In an attempt to categorize members according to income and race, we use 2010 census data at the ZIP code level to identify the ZIP codes in each region that both a) have the highest (lowest) median incomes and highest white (Black) share of ZIP code residents and b) hold a combined 20 percent of the regional population. To the extent that the characteristics of the privately insured membership from these ZIP codes are correlated with the characteristics of the ZIP code residents, this approach allows us to examine for differences in health outcomes correlated with race or income.

On the whole, when examining disparities due to income, we find patterns that are similar in the two regions. Relative to High Income ZIP codes, Low Income ZIP codes in the two regions tend to have higher average risk scores and fewer privately insured months per resident. Additionally, Low Income ZIP codes exhibit a relatively low share of months with an asthma diagnosis. The opposite was true for months with a diabetes diagnosis and also for healthy months, both of which which were more common among Low Income ZIP codes in the two regions. The two exceptions to these common patterns are for depression, which declined with income in KOMA but increased in Detroit. The opposite was true for low back pain, which increased with income in KOMA but declined in Detroit. In KOMA, compared to the previous year, the income disparities in asthma and average risk score have increased, while it has declined for diabetes.

Differences in patterns across regions remain more apparent when investigating for disparities in outcomes due to race. This is consistent with the literature, where poorer health outcomes for Black residents have been noted in Michigan and the Detroit area concerning cancer (Meliker et al. 2009), hepatitis C (Bourgi et al. 2016), tuberculosis (Noppert et al. 2017), and COVID-19 (Mein 2020, Gu et al. 2020, Anderson-Carpenter and Neal 2021, Parpia et al. 2021). In this study, we find that the average risk score was higher for High Share Black ZIP codes than for High Share White ZIP codes in Detroit, while this was not the case in KOMA. Unlike in Detroit, depression was a more common diagnosis among member months for High Share Black ZIP codes than for High Share White ZIP codes in KOMA. Diabetes months were much more common in Detroit among the High Share Black ZIP codes than among the High Share White ZIP codes. On the other hand, High Share Black and High Share White ZIP codes in KOMA showed no disparities.

Compared to the same study conducted one year previously, we find mixed results regarding changes in disparities. Concerning average risk score, the income disparity has increased in KOMA while the racial disparity has declined in Detroit. For asthma, the income disparity in KOMA has increased slightly. Depression and CAD have both become significantly more prevalent in the KOMA region, which has increased KOMA's racial disparity in CAD diagnoses. Regarding diabetes, both the income and racial disparities in KOMA have narrowed, while the racial disparity in Detroit has increased. Finally, the racial disparity for low back pain has reversed in Detroit.

The patterns observed when stratifying the two regions by income and race pose two suggestions. First, the two regions revealed similar patterns of health disparities due to income that were proportional to their underlying disparities in income. Therefore, even though there are health disparities across income quintiles in the two regions, it appears that both regions exhibit the similar underlying relationships between income and health outcomes. Second, the two regions revealed notable differences in pattern for key health outcomes when stratifying by race. This is likely not simply due to the clear differences in the underlying shares of Black and white residents in the two regional populations, which would presumably influence the magnitude of the disparities rather than the patterns. It is not unreasonable to conclude, therefore, that the relationship between race and health outcomes is different in the two regions. The privately insured membership residing in ZIP codes in Detroit with a relatively large Black population suffer worse health outcomes, especially regarding diabetes, than those from ZIP codes in the same region with a relatively large white population. The same is not true in the KOMA region.

Given the data limitations, pinning down an explanation for these findings is difficult. The most obvious candidate from the literature is racial segregation. While there is variation in the Black share of the population among ZIP codes in the KOMA region, none of the ZIP codes has a majority Black population. On the other hand, all ZIP codes included in High Share Black population for the Detroit region are majority Black. While the existing literature makes connections between racial segregation and adverse health outcomes, further research is required before determining the causes of the health disparities found here.

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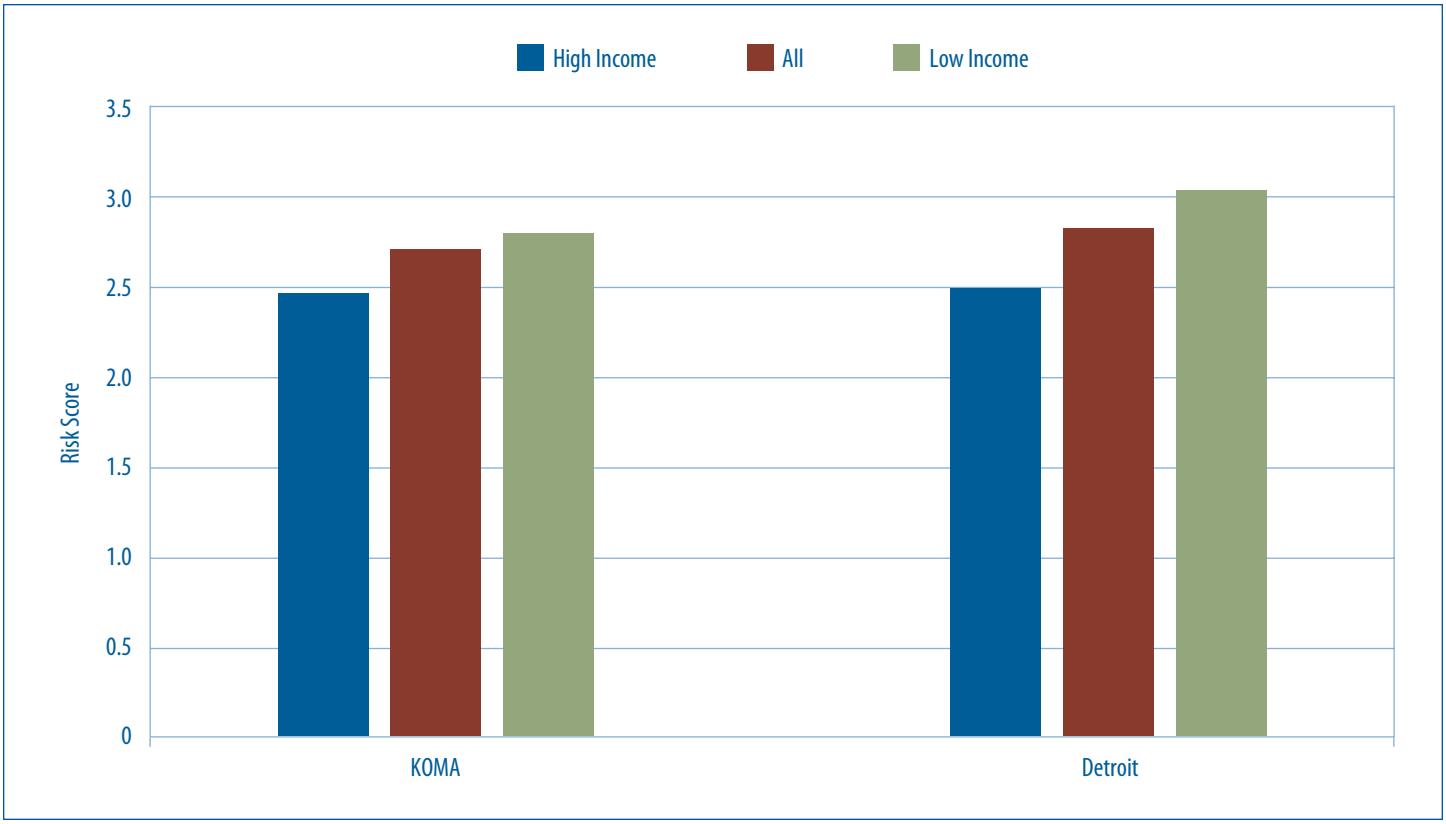
Table 1: Disparities By Income

Location	High Income ZIP Codes	All	Low Income ZIP Codes
KOMA	Avg Income: 68,099	Avg Income: 50,632	Avg Income: 34,772
	% White: 91.09	% White: 83.50	% White: 65.38
	% Black: 4.18	% Black: 7.79	% Black: 21.82
Detroit	Avg Income: 91,988	Avg Income: 55,703	Avg Income: 26,763
	% White: 85.97	% White: 63.96	% White: 19.11
	% Black: 4.96	% Black: 28.77	% Black: 72.11

Table 2: Disparities by Race

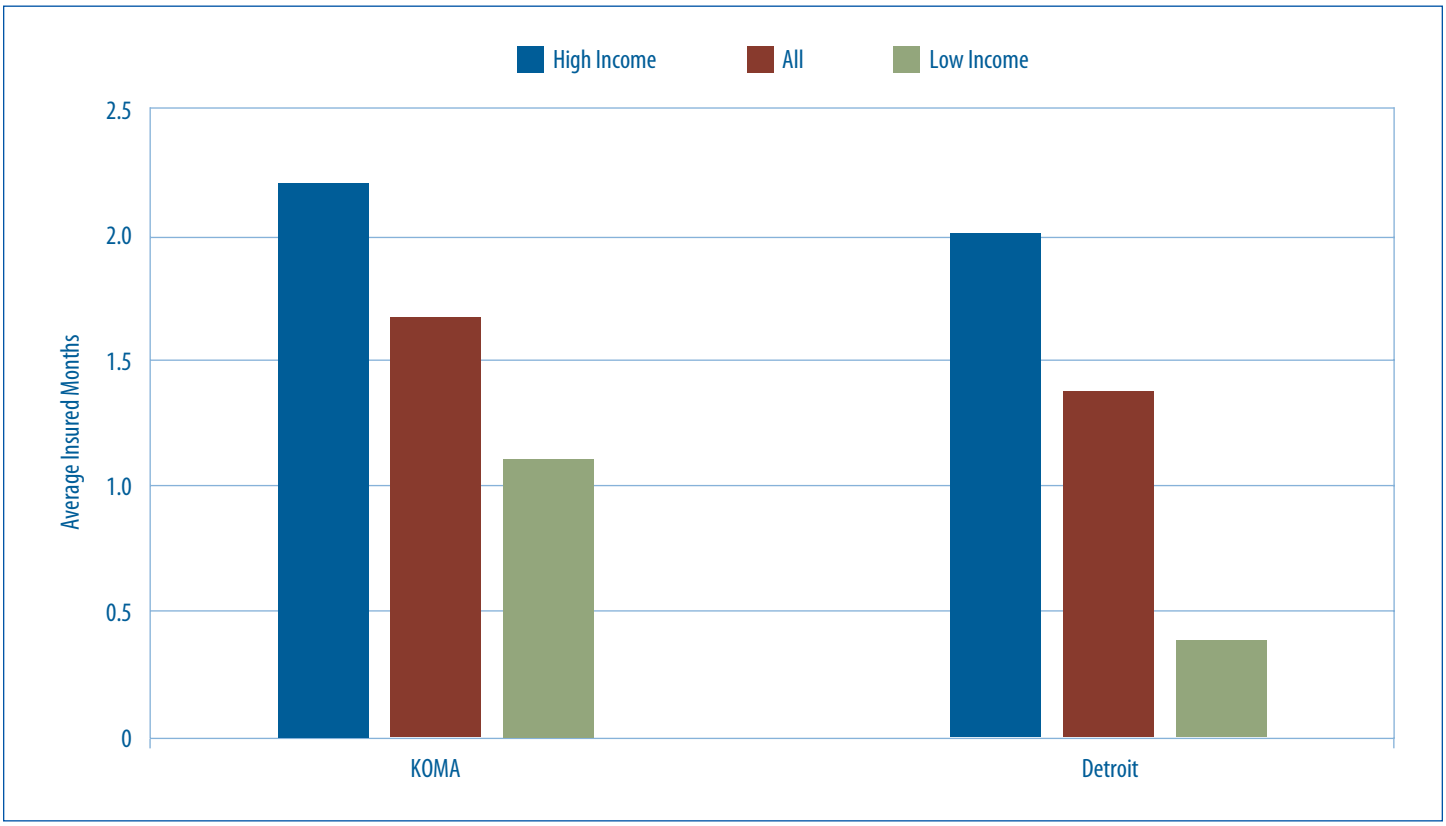
Location	High Share White ZIP Codes	All	High Share Black ZIP Codes
KOMA	Avg Income: 58,431	Avg Income: 50,632	Avg Income: 40,958
	% White: 96.14	% White: 83.50	% White: 62.05
	% Black: 0.51	% Black: 7.79	% Black: 25.42
Detroit	Avg Income: 71,649	Avg Income: 55,703	Avg Income: 30,709
	% White: 94.17	% White: 63.96	% White: 5.86
	% Black: 1.93	% Black: 28.77	% Black: 91.09

Figure 1: Average Risk Score, 2021



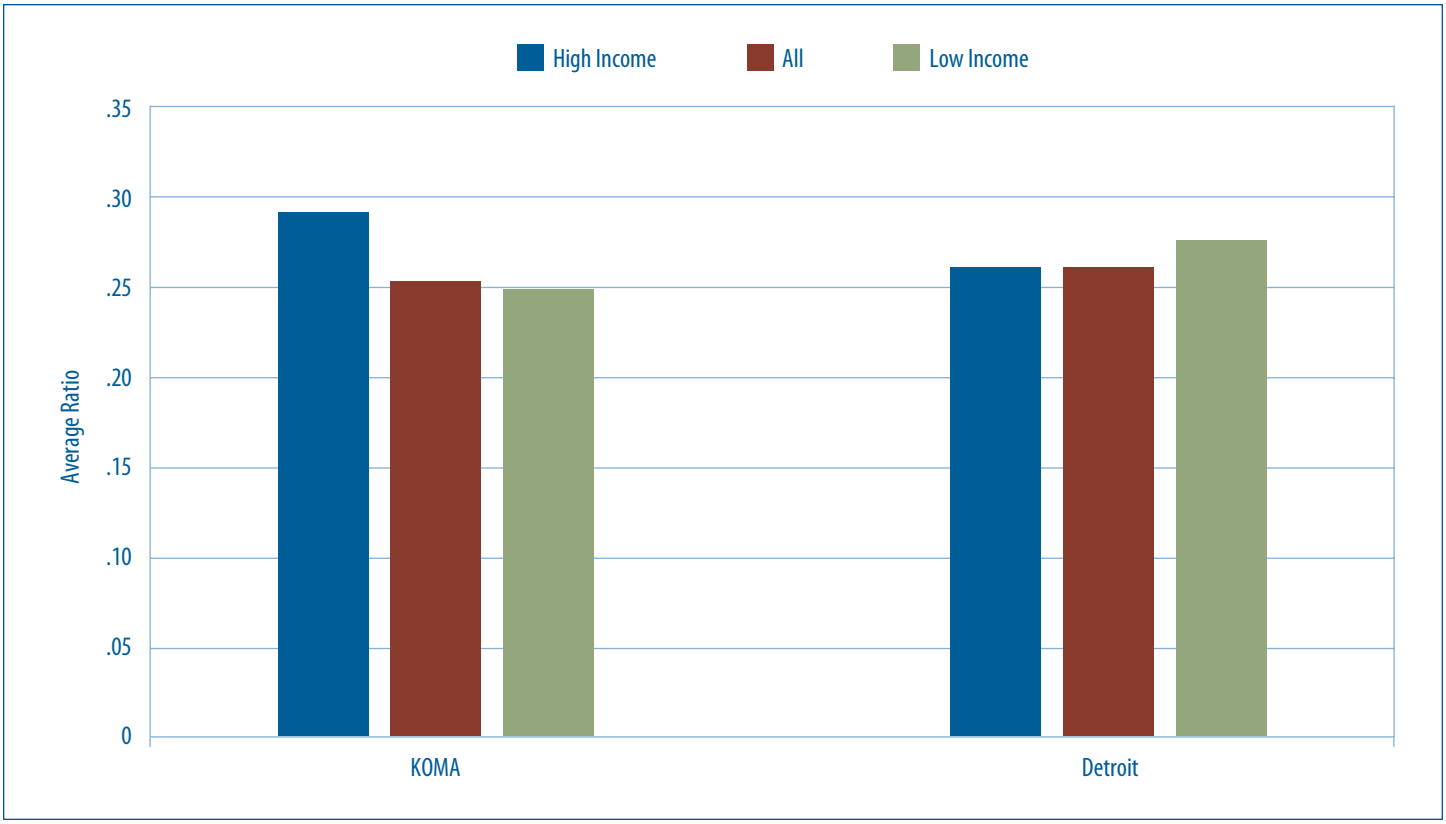
Source: BCBSM, BCN, and Priority Health member data

Figure 2: Average Insured Months per Resident, 2021



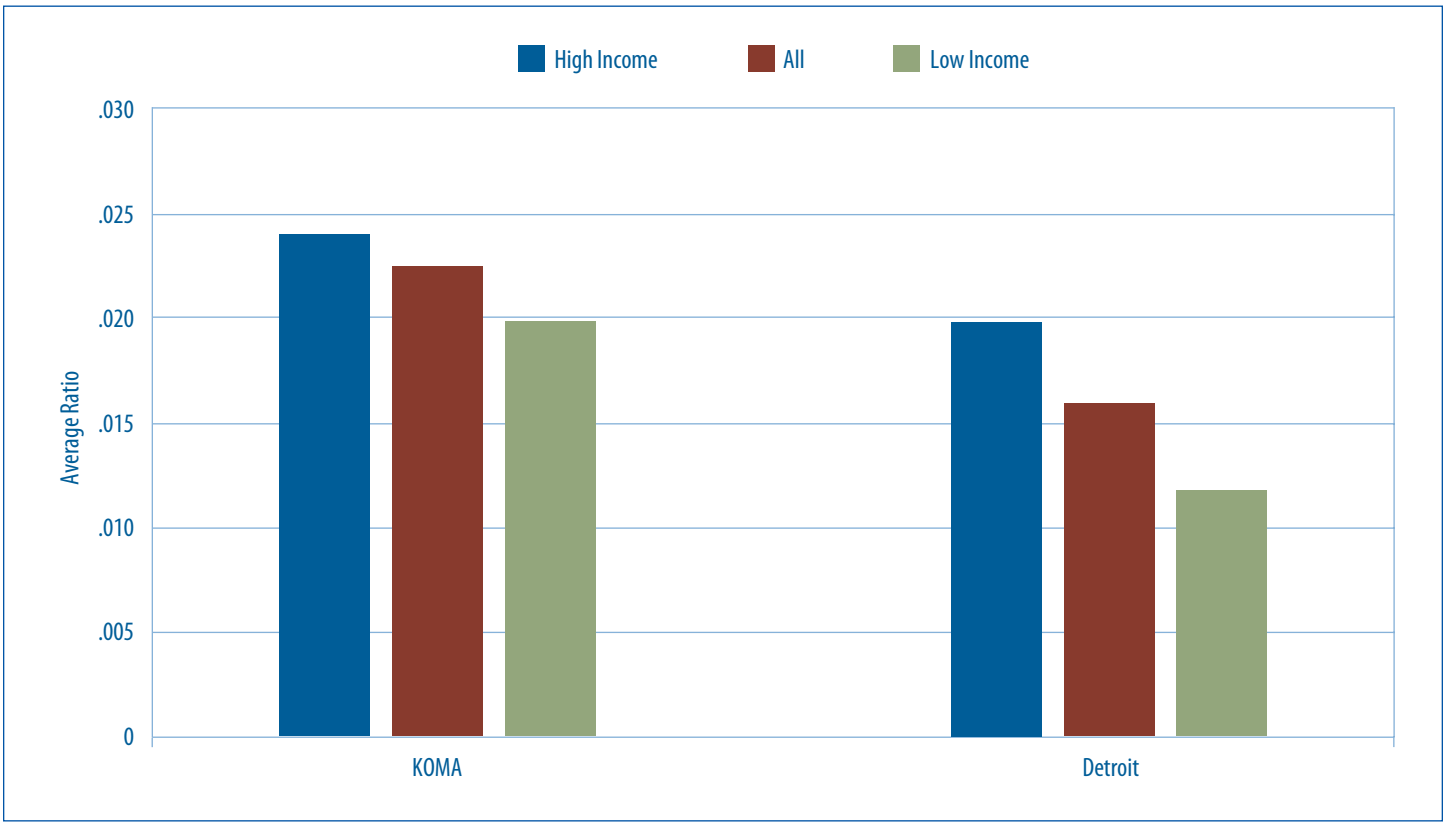
Source: BCBSM, BCN, and Priority Health member data

Figure 3: Average Ratio of Healthy Months to Total Months, 2021



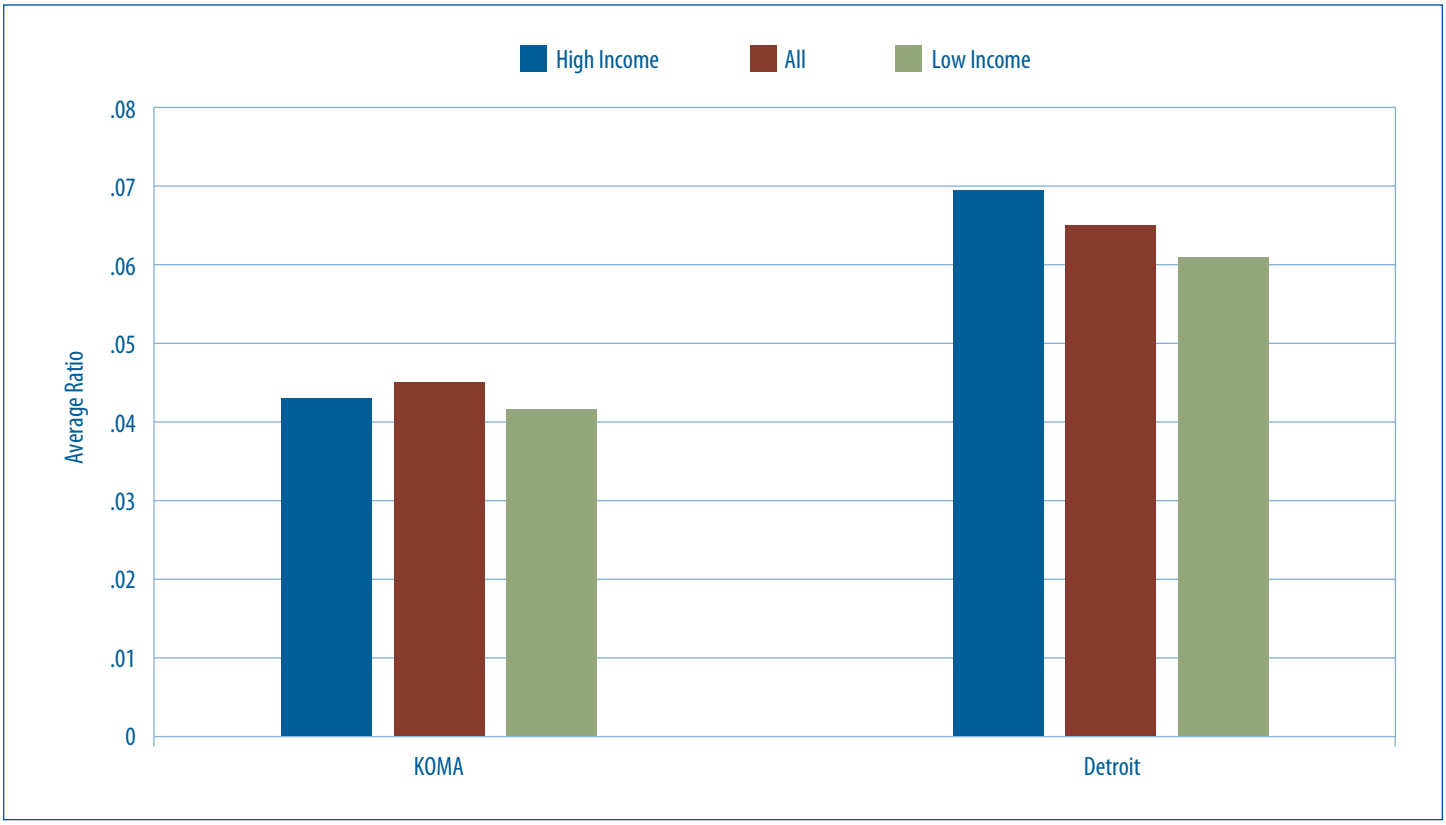
Source: BCBSM, BCN, and Priority Health member data

Figure 4: Average Ratio of Asthma Months to Total Months, 2021



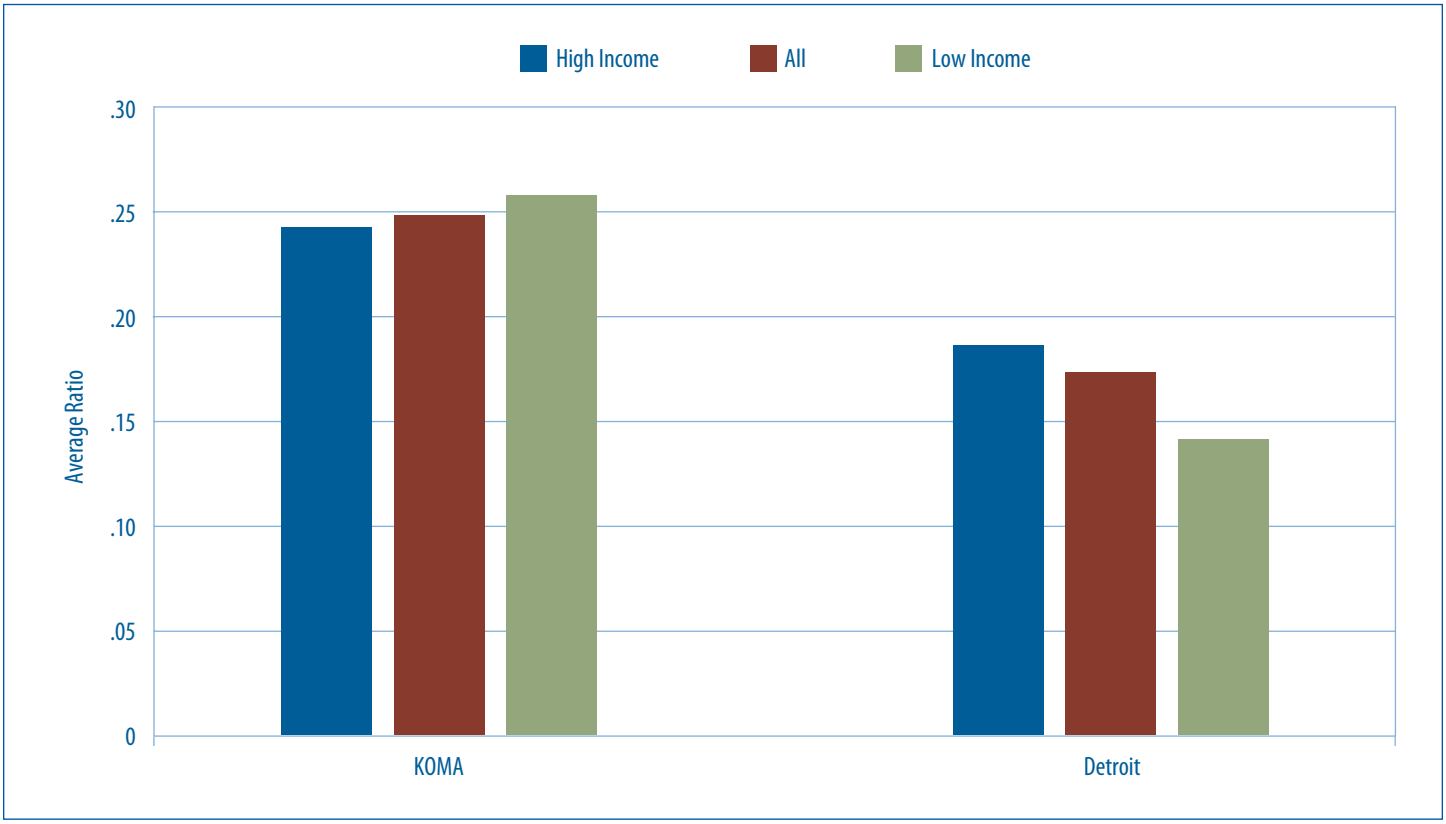
Source: BCBSM, BCN, and Priority Health member data

Figure 5: Average Ratio of CAD Months to Total Months, 2021



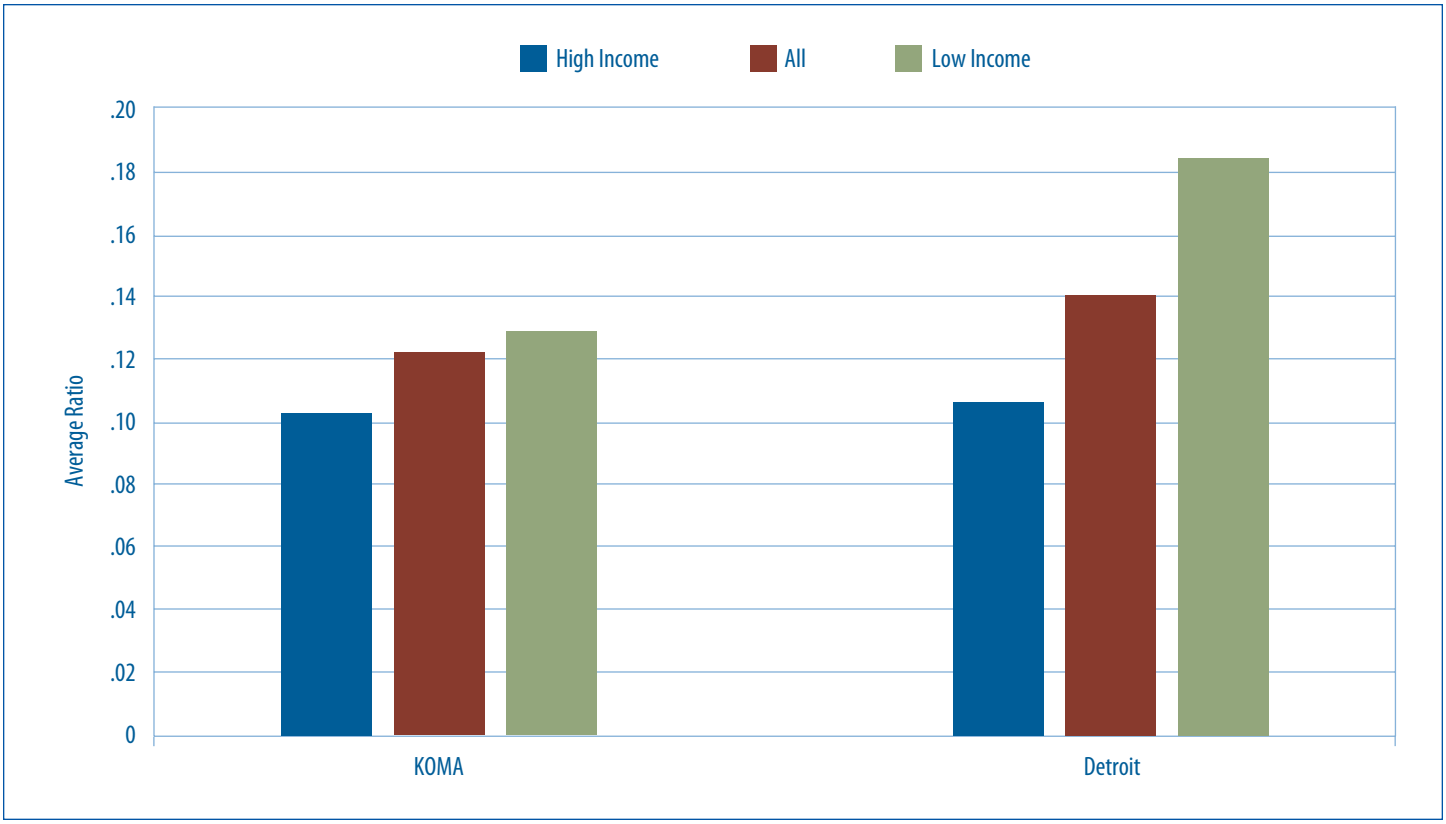
Source: BCBSM, BCN, and Priority Health member data

Figure 6: Average Ratio of Depression Months to Total Months, 2021



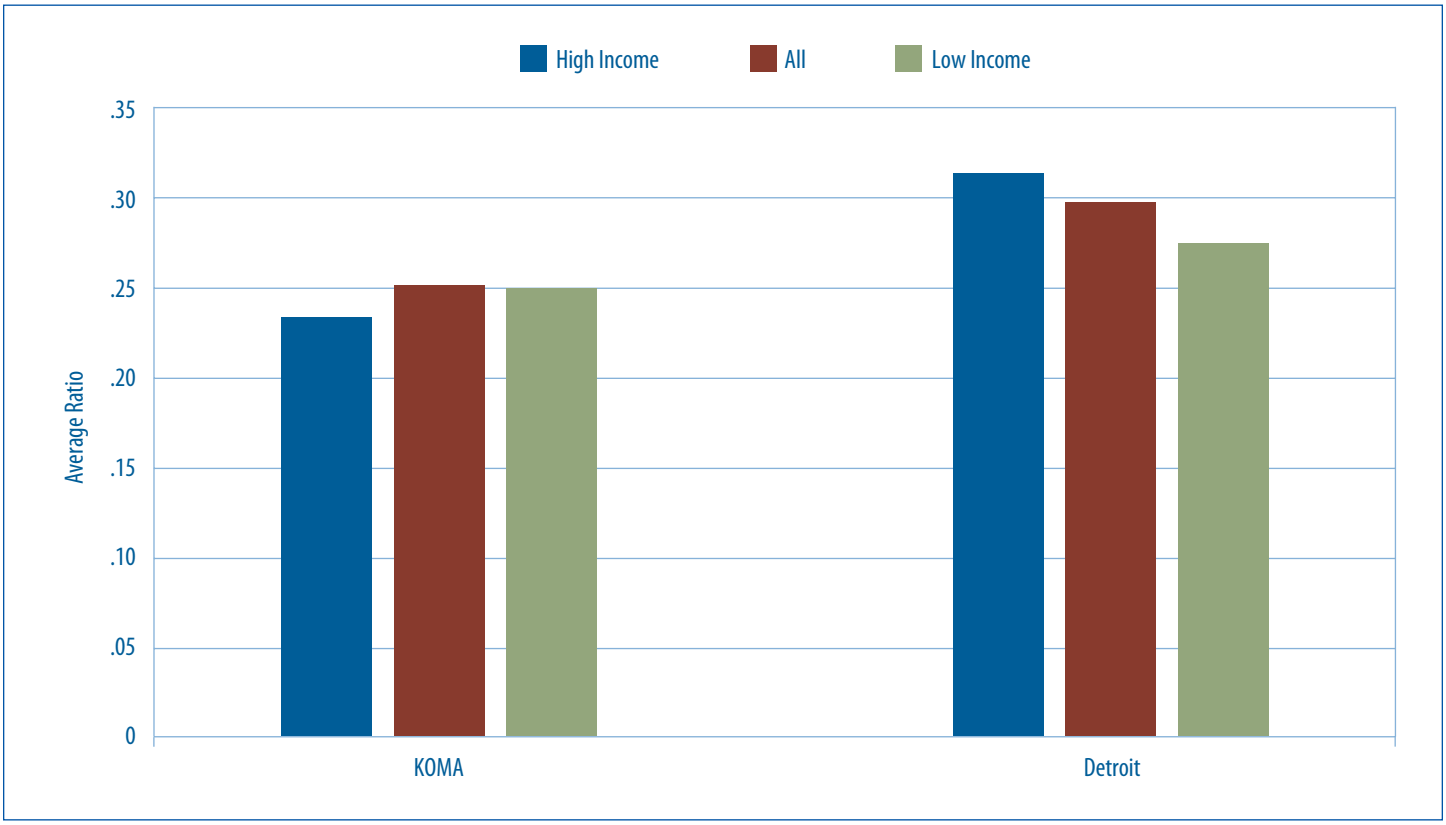
Source: BCBSM, BCN, and Priority Health member data

Figure 7: Average Ratio of Diabetes Months to Total Months, 2021



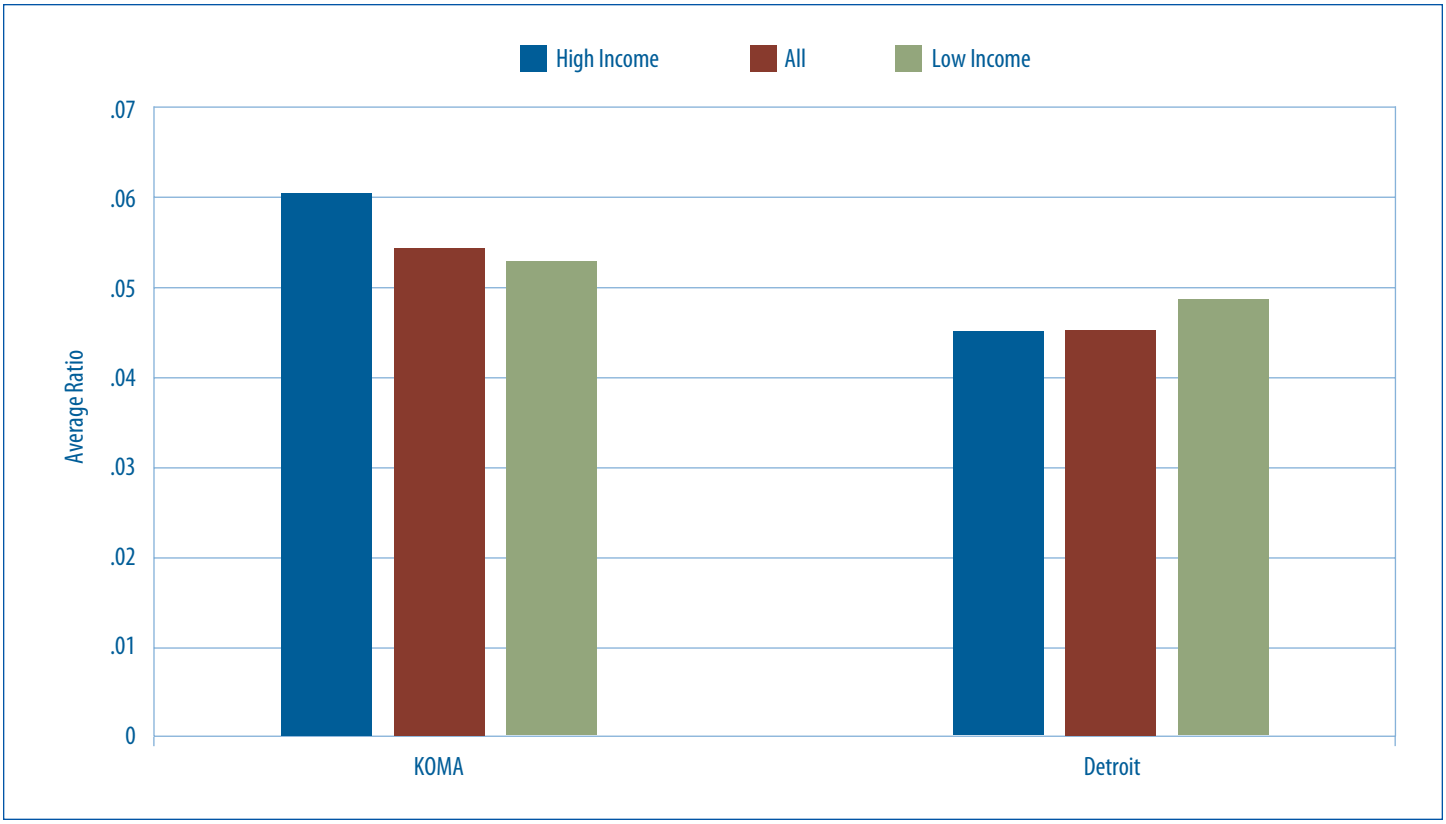
Source: BCBSM, BCN, and Priority Health member data

Figure 8: Average Ratio of Hyperlipidemia Months to Total Months, 2021



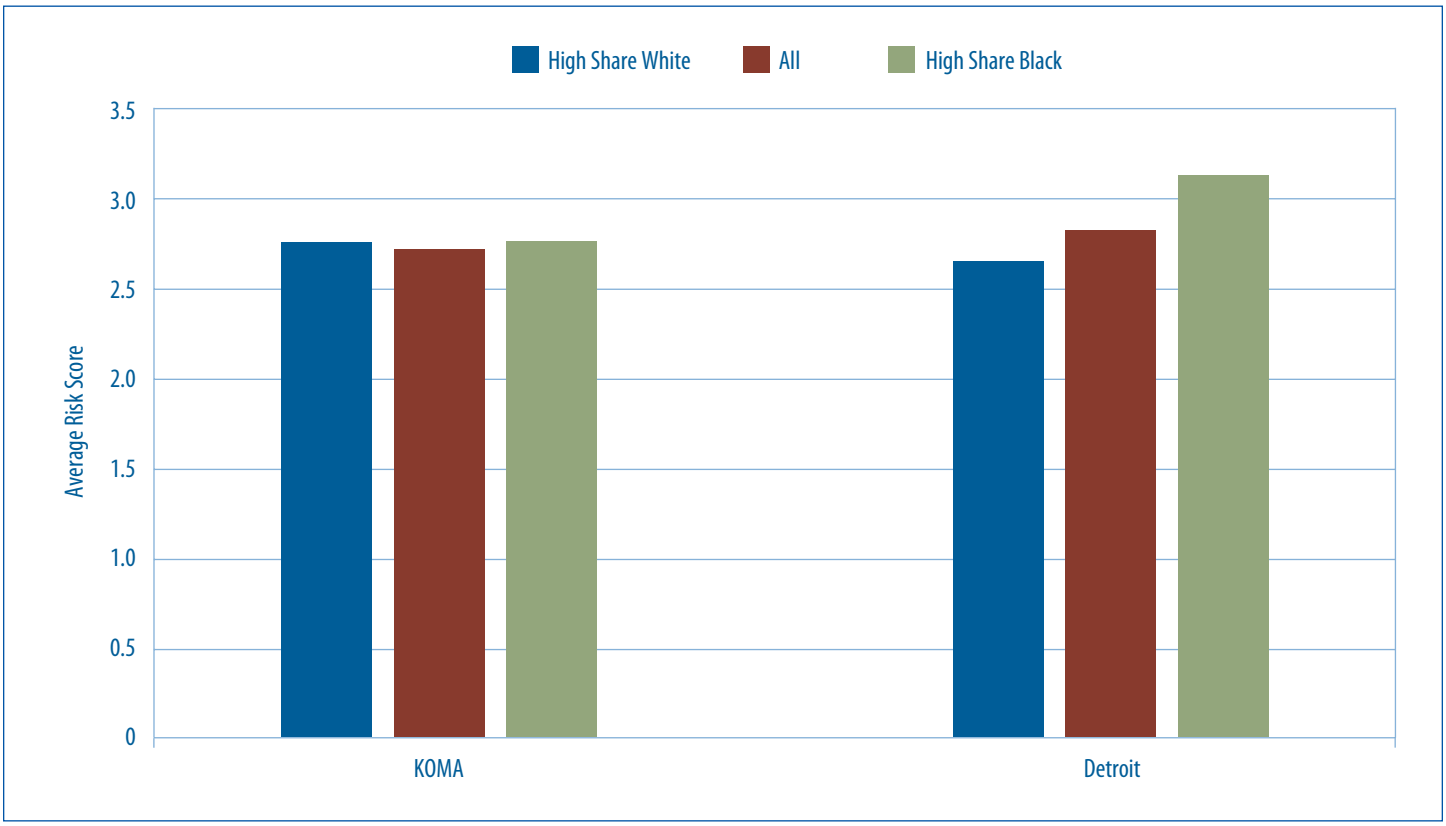
Source: BCBSM, BCN, and Priority Health member data

Figure 9: Average Ratio of Lower Back Pain Months to Total Months, 2021



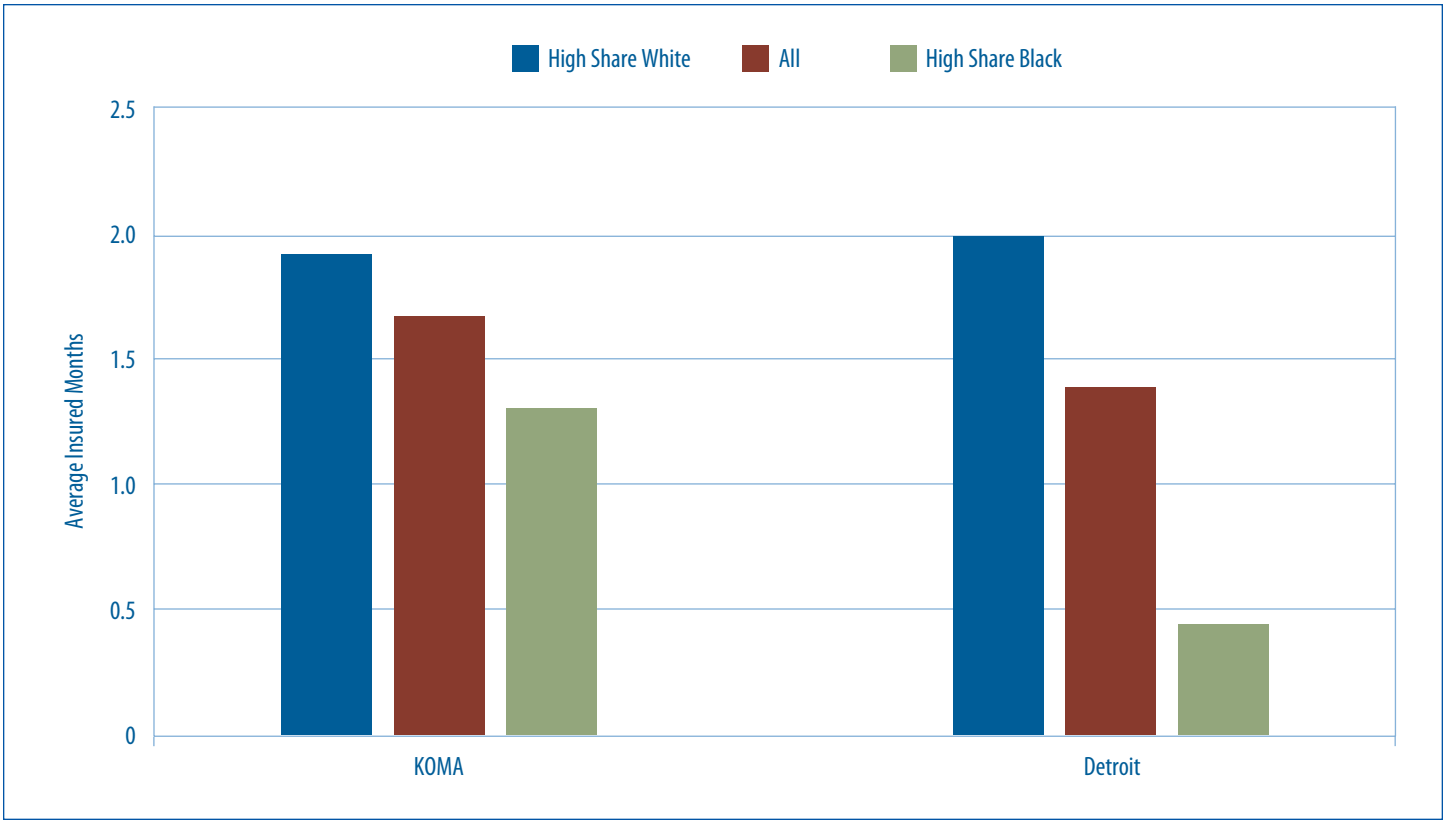
Source: BCBSM, BCN, and Priority Health member data

Figure 10: Average Risk Score, 2021



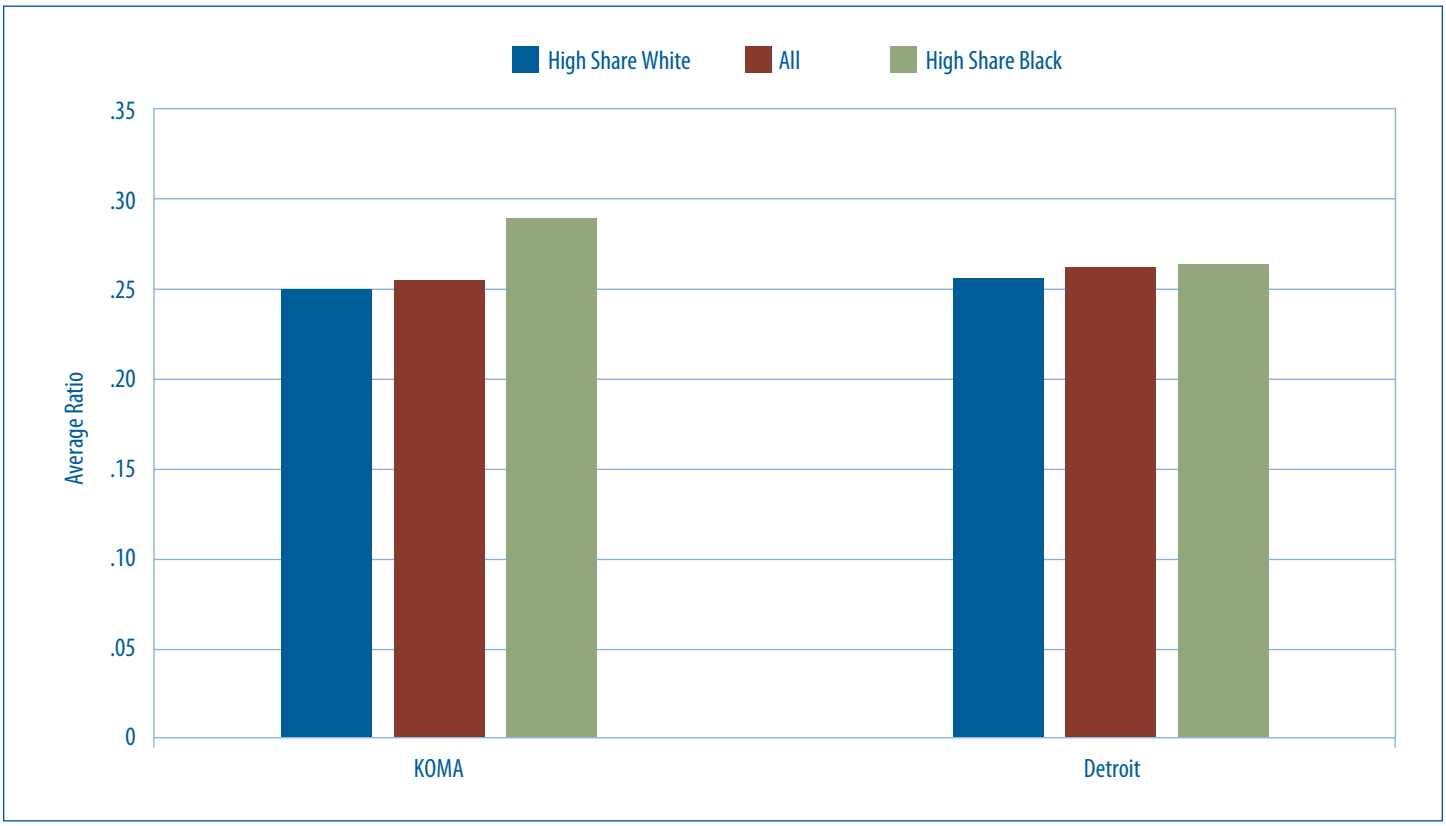
Source: BCBSM, BCN, and Priority Health member data

Figure 11: Average Insured Months per Resident, 2021



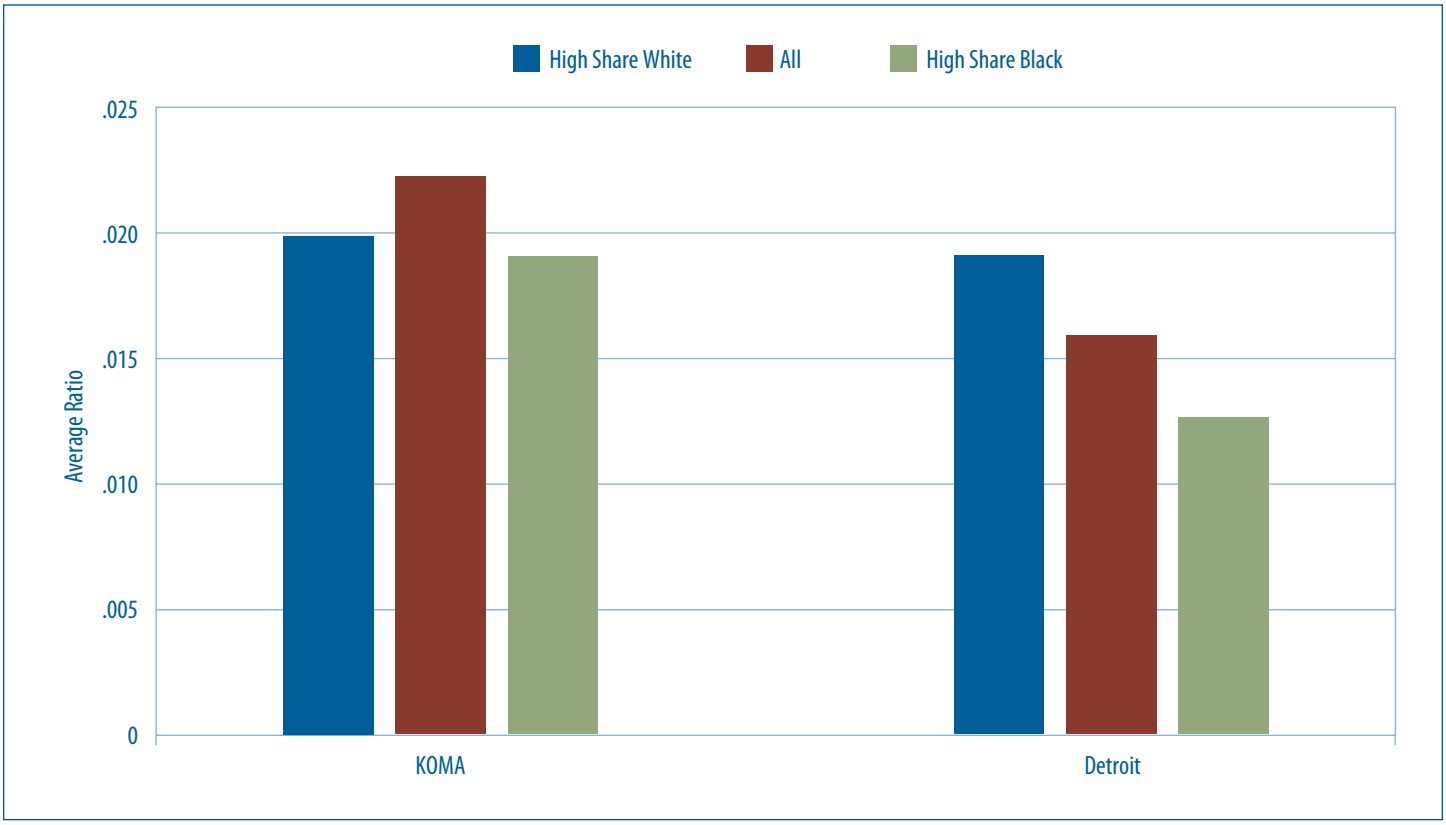
Source: BCBSM, BCN, and Priority Health member data

Figure 12: Average Ratio of Healthy Months to Total Months, 2021



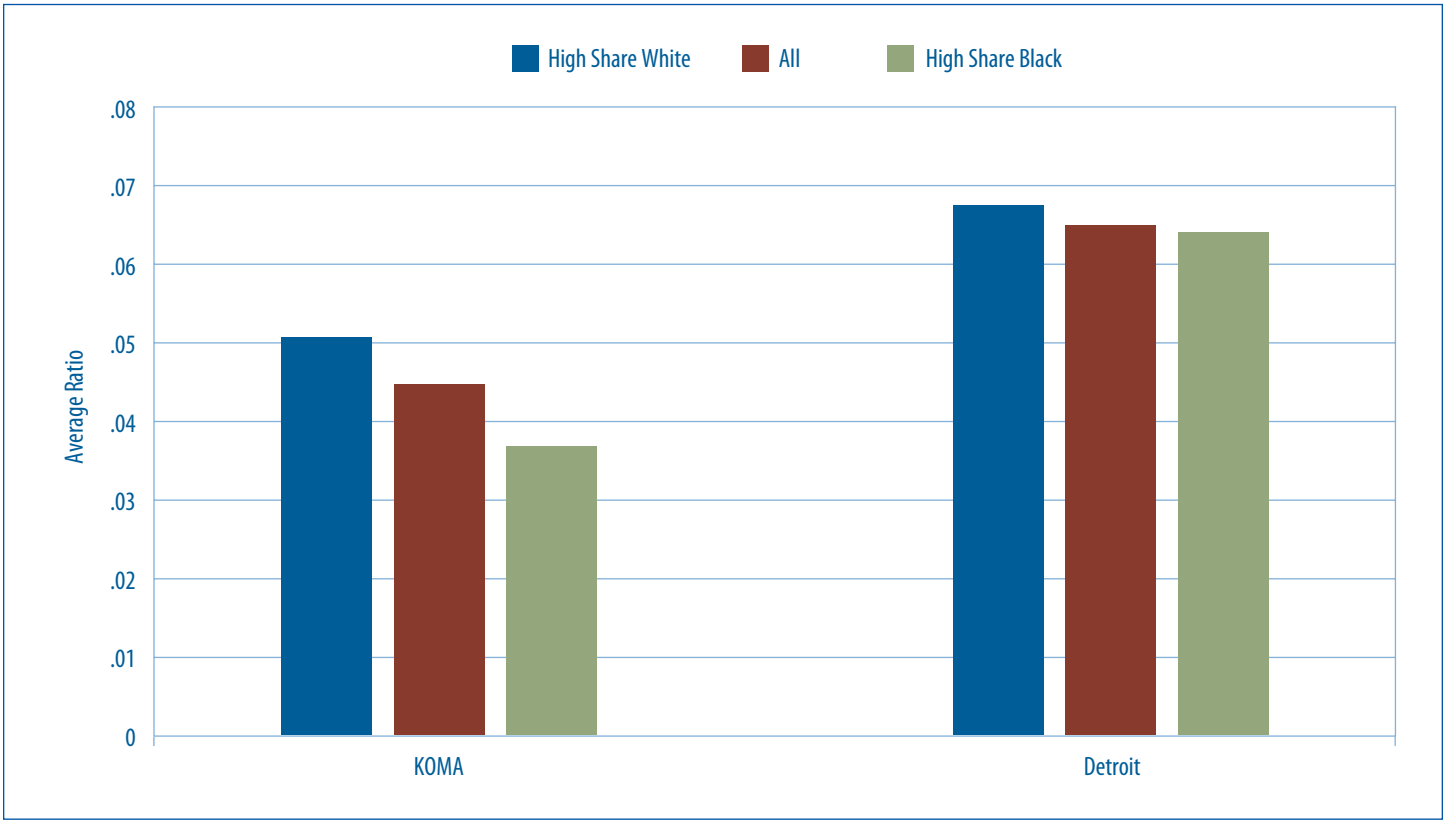
Source: BCBSM, BCN, and Priority Health member data

Figure 13: Average Ratio of Asthma Months to Total Months, 2021



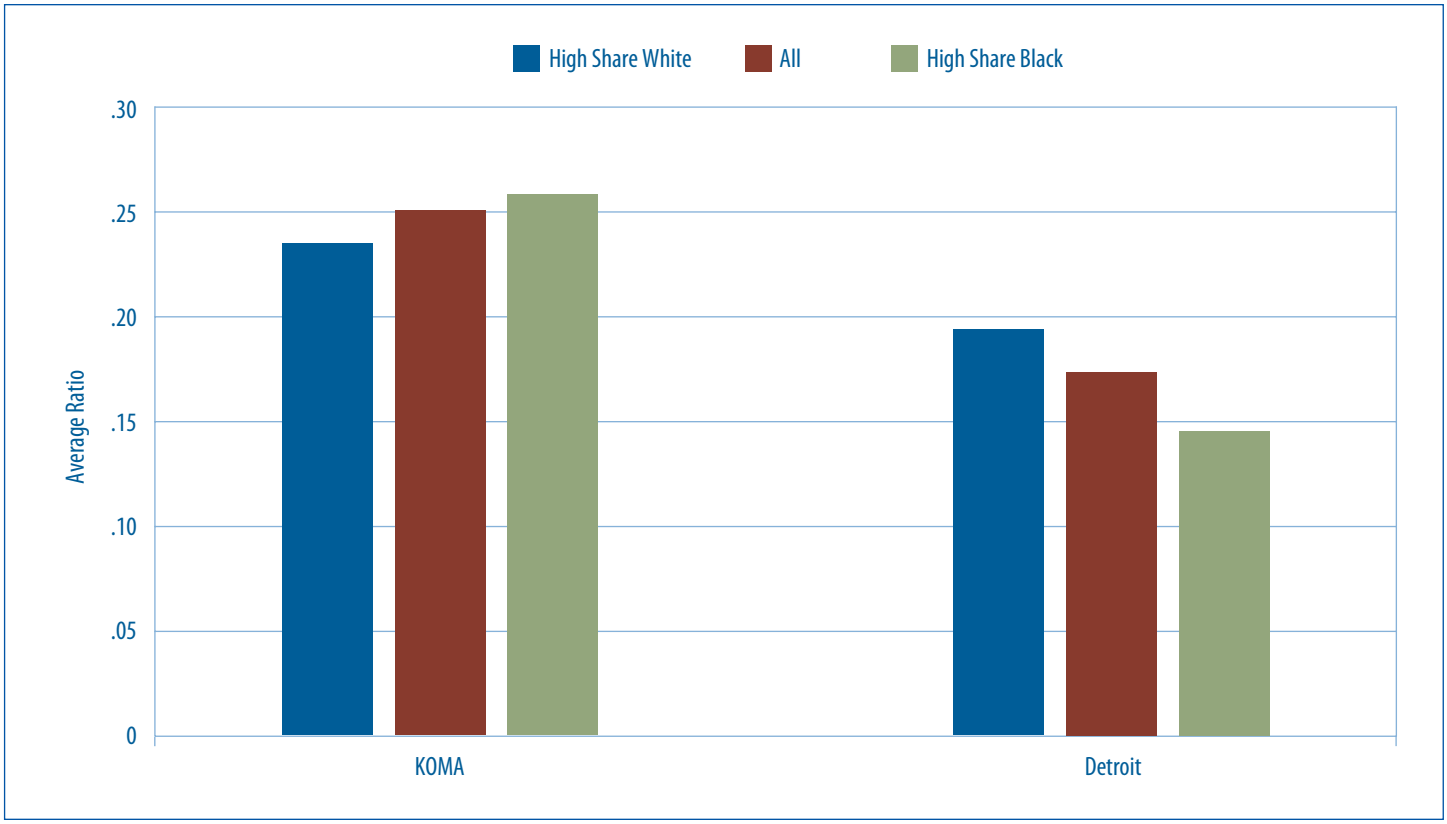
Source: BCBSM, BCN, and Priority Health member data

Figure 14: Average Ratio of CAD Months to Total Months, 2021



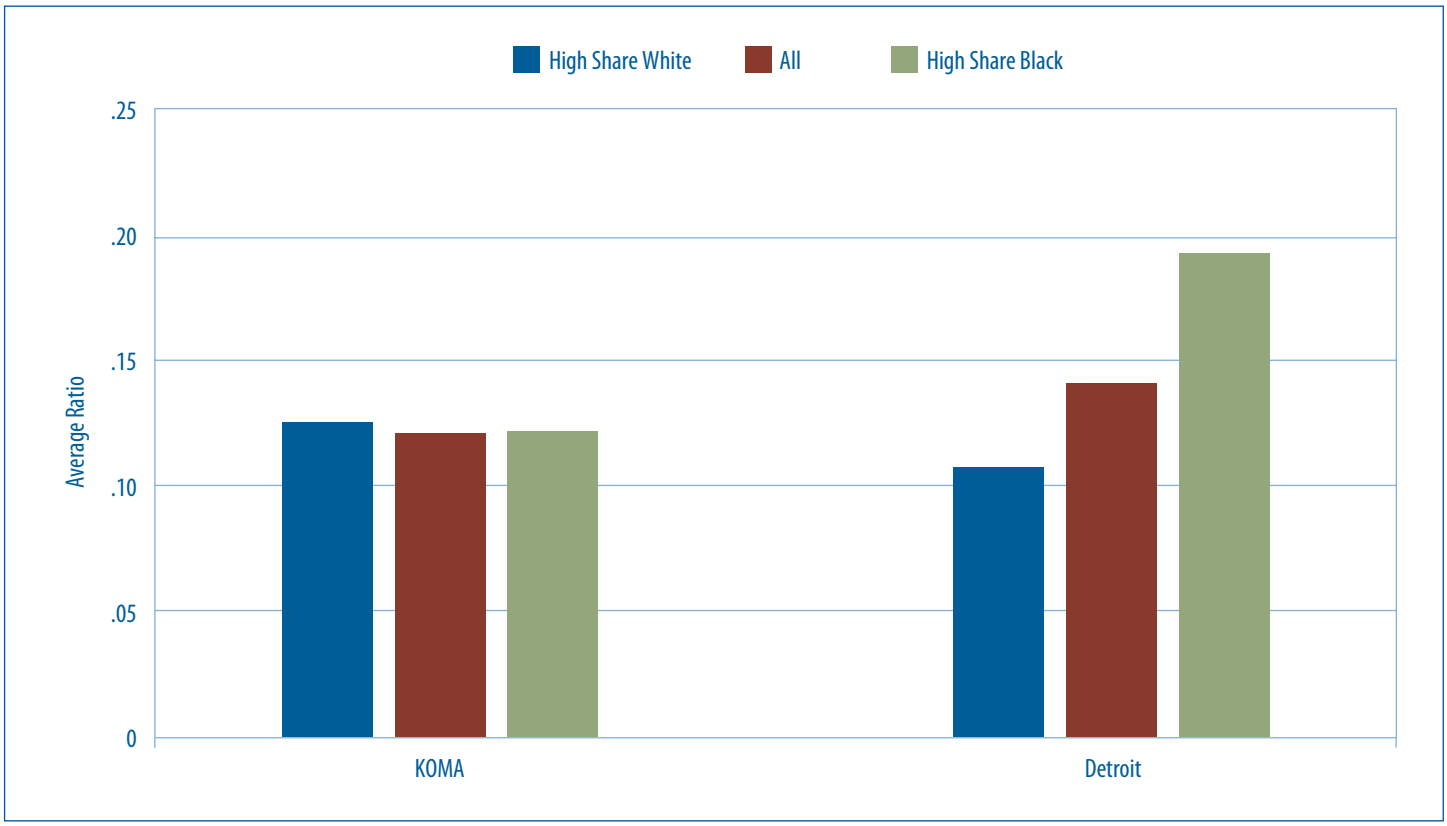
Source: BCBSM, BCN, and Priority Health member data

Figure 15: Average Ratio of Depression Months to Total Months, 2021



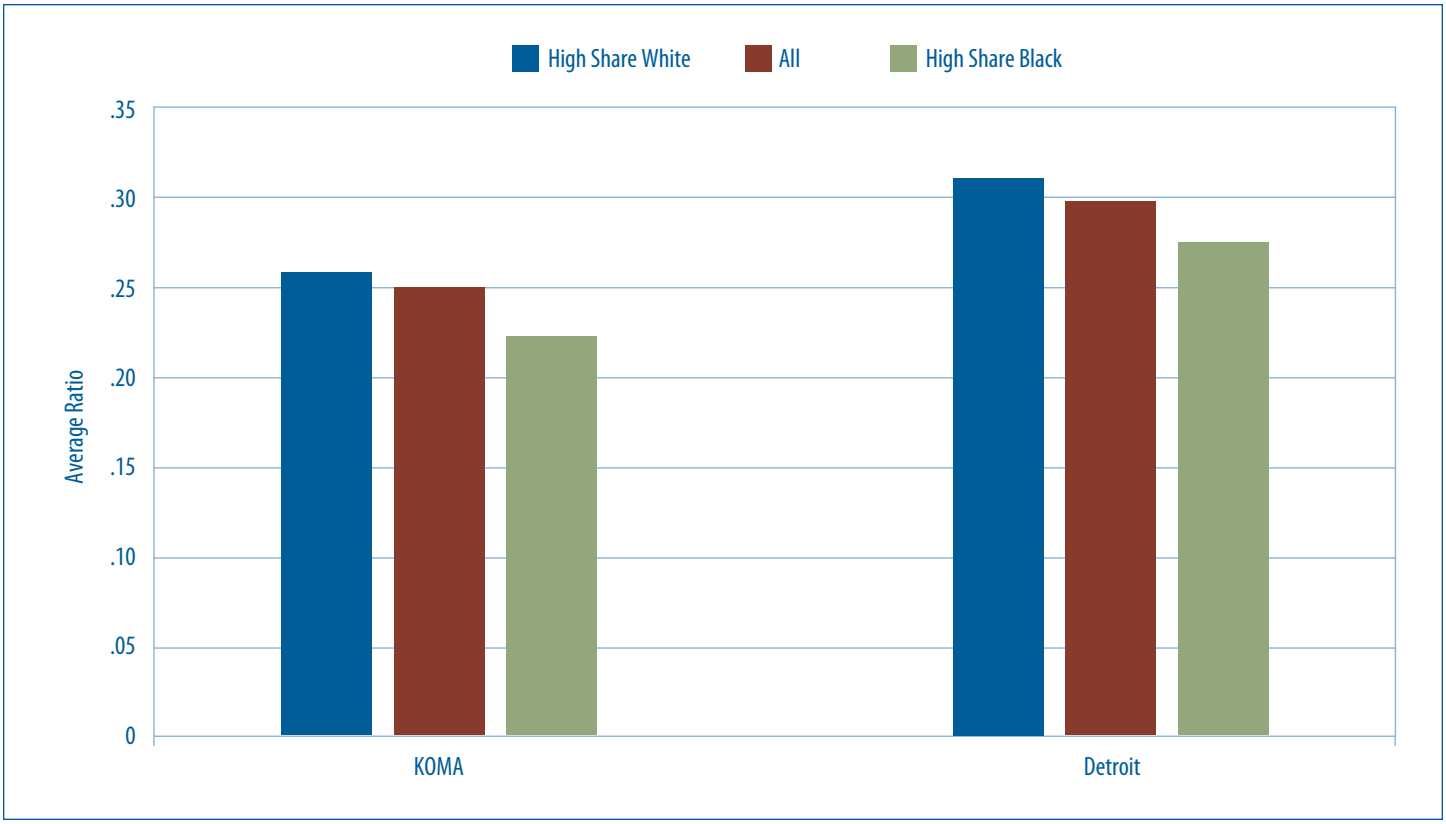
Source: BCBSM, BCN, and Priority Health member data

Figure 16: Average Ratio of Diabetes Months to Total Months, 2021



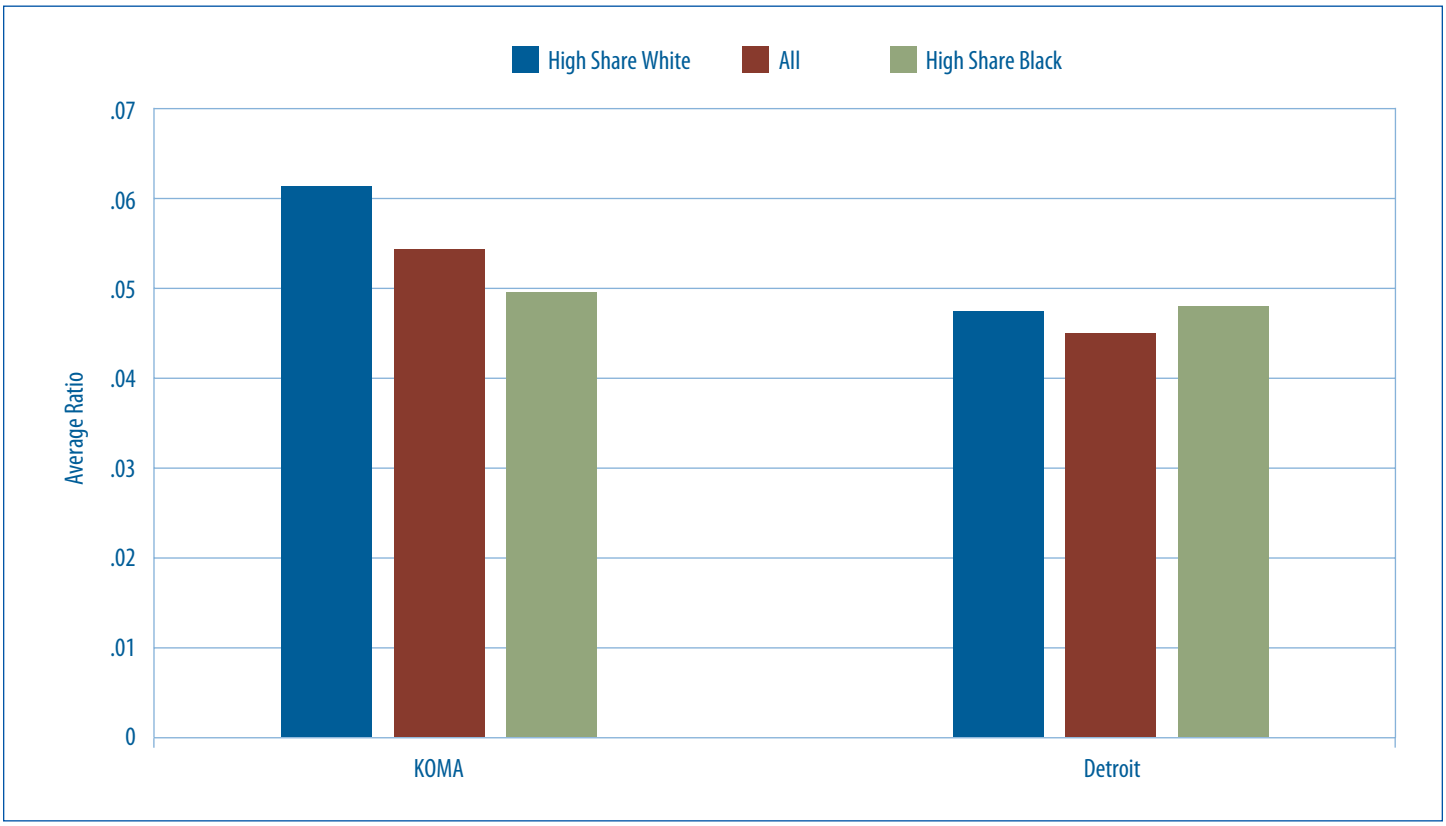
Source: BCBSM, BCN, and Priority Health member data

Figure 17: Average Ratio of Hyperlipidemia Months to Total Months, 2021



Source: BCBSM, BCN, and Priority Health member data

Figure 18: Average Ratio of Lower Back Pain Months to Total Months, 2021



Source: BCBSM, BCN, and Priority Health member data

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