WOMEN, INFANTS & CHILDREN

2018

Michigan Pregnancy & Pediatric Nutrition Surveillance

2017 Annual Report with 2011-2017 Trends

MDHHS
Michigan Department of Health & Human Services
RICK SNYDER, GOVERNOR | NICK LYON, DIRECTOR

Michigan Department of Health and Human Services
WIC Program

Mission Statement

The mission of the Michigan WIC program is to improve the health outcomes and quality of life for eligible women, infants, and children by providing nutritious food, nutrition education, breastfeeding promotion, and support and referrals to health and other services.

To this end:

- Delivery of services and supports are to be provided in a caring, respectful, efficient, and cost effective manner.
- Delivery of services shall be provided in a culturally competent and confidential manner.
- The WIC Program shall assure the broadest possible access to services, supports, and food.

Suggested Citation

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The authors also would like to thank Ms. Constance Renee Godinez who assisted in editing the report and providing valuable comments.

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Executive Summary

This report summarizes program data from the Michigan Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) which provides nutritional support and counseling to a large proportion of Michigan's most vulnerable residents. The Michigan Pregnancy Nutritional Surveillance System and the Pediatric Nutritional Surveillance System were used to compile this report. Pediatric data from 2017 was merged with maternal data from 2012-2017, creating a database of information that was used to analyze key maternal and pediatric health indicators. This report summarizes data from 2017 and highlights trends from 2011 through 2017.

- There were 208,288 children under the age of five years participating in WIC during 2017; of these, 49.0% were under the age of 2 years old.
- Michigan's live births went from 114,159 in 2011 to 113,374 in 2016, a 0.7% decrease (MDHHS, 2016). The population living below the poverty line decreased from 17.5% in 2011 to 14.2% in 2017, a 18.9% decline. Maternal WIC enrollment decreased by 11.9%. Out of 57,634 total women enrolled in WIC in 2017, 3,391 (5.9%) women were prenatal and 13,672 (23.7%) were postpartum. Additionally, 40,571 (70.4%) women were enrolled in WIC during their pregnancy and returned to WIC for a postpartum visit.
- Enrollment of women during their 1st trimester decreased by 16.6% from 2011 (36.7%) to 2017 (30.6%).
- Ideal prenatal weight gain was 31.4% in 2011 and 29.0% in 2017, a 7.6% decrease.
- The incidence of low birthweight among infants enrolled in WIC increased by 18.6% from 8.6% in 2011 to 10.2% in 2017. Low birthweight disproportionately affects Black, Non-Hispanic infants (14.1%) compared to White, Non-Hispanic infants (8.4%).
- The prevalence of breastfeeding initiation in 2017 was 66.7%, an increase of 10.2% from 2011 (60.5%).
- The prevalence of breastfeeding to 6 months was 18.4% in 2011 among WIC participants compared to 28.8% in 2017, a 56.5% increase.
- Among infants enrolled in WIC and born to mothers enrolled in WIC that initiated breastfeeding, 43.8% were breastfed to six months and 18.5% were breastfed for one year.
- The prevalence of obesity among children ages 2 to 5 years decreased slightly from 13.3% in 2011 to 13.2% in 2017.
- From 2011 to 2017, the prevalence of anemia among all children 5 years and younger increased by 39.9%. Additionally in 2017, the prevalence of anemia was significantly higher among children under 2 years of age (26.5%) and among Black, Non-Hispanic children (34.8%).

Introduction

A vital public health goal across the nation is to enhance the prosperity of mothers, infants, and children. An infant's well-being is associated with their mother's health from the time of her birth, and the lifetime impacts of childbearing are affected by the amount of health care and self-care that mothers receive (Kotch, 2012). Numerous studies have demonstrated that the effects of traumas that occur during fetal development can span across one's entire lifetime. A vast amount of neurological changes happen during the fetal period, therefore experiences during this time can significantly impact development (Thompson & Davis, 2014). Neurotoxin exposures such as lead, alcohol, and pesticides that occur during the delicate periods of early fetal development can lead to lasting deficits in brain function and structure (Buss, Entringer, Swanson, & Wadhwa, 2012). The improvement of birth outcomes and in turn reduction of infant morbidity and mortality translates to the improvement of maternal health during pregnancy. However, certain maternal behaviors have been proven to be detrimental to birth outcomes. For example, there is an association between maternal smoking and infant birthweight, reduced fertility and ectopic pregnancy. Evidence also suggests that maternal smoking is associated with an increased rate of premature birth, low birthweight, and that these infants are at a greater risk of death from sudden infant death syndrome (SIDS) (HHS, 2014). An important, universally recognized predictor of infant mortality and morbidity is birthweight. In 2012, among babies born worldwide, approximately 15% had low birthweight (<2500 g). Infants with low birthweight are at an increased risk of childhood morbidity and mortality, as well as increased risk for cardiovascular disease and diabetes in adulthood (Barclay, 2014). Minority populations and those of lower socio-economic status are disproportionately affected by low birthweight. For example, in Michigan, 14.5% of Black, non-Hispanic infants were born with low birthweight compared to 7.0% of White, Non-Hispanic infants in 2016 (National Vital Statistics Reports, Vol 67, 2018). Adverse birth outcomes have also been linked to poor maternal nutrition. A variety of adult diseases, such as chronic kidney disease, hypertension, and diabetes can increase as a result of the functional and structural changes produced by fetal undernutrition (Kotch, 2012). Additionally, a more noteworthy rate of women are entering pregnancy overweight or obese, or are putting on an excessive amount of weight during pregnancy (IOM, 2009).

About WIC

The Supplemental Nutrition Program for Women Infants and Children (WIC) was established as a permanent program by Congress in 1974. It was generated in response to the acknowledgment that poverty and hunger are prevalent and that pregnant women, new mothers, infants, and children are at an increased risk if they suffer from insufficient nutrition (FRAC, 2015). WIC is under the jurisdiction of the U.S. Department of Agriculture's (USDA) Food and Nutrition Service (FNS) Agency. WIC provides early nutrition and health care intervention at entry point for an extensive amount of newborns and children. Over a quarter of pregnant and postpartum women and children under 5 years of age, as well as over half of all infants in the United States participate in the program (Oliveira & Frazao, 2015).

Highlight

The goal of WIC is to "safeguard the health of low-income women, infants and children up to age 5 who are at nutritional risk" - USDA

Criteria to participate in WIC are:

- a pregnant or postpartum woman, infant, or child under the age of five;
- a resident of Michigan;
- at or below 185% of the Poverty Income Guideline or participation in another state-administered program that utilizes the same income guidelines;
- classified by a health professional as "nutritionally at risk".

In 2016-2017, 52.9% of babies born in Michigan enrolled in WIC (MDHHS, 2017). In fiscal year 2017, there was an average of 7 million (7,286,161) WIC participants in the United States and 224,106 in Michigan (USDA, 2017). The state WIC organization is housed inside of the Bureau of Family Health Services in the Michigan Department of Health and Human Services (MDHHS). There is a statewide network of forty-eight WIC agencies who perform program efforts and data collection. In response to the need for services, these agencies are distributed throughout Michigan.

PNSS and PedNSS

Program-based surveillance systems, namely, the Pregnancy Nutrition Surveillance System (PNSS) and the Pediatric Nutrition Surveillance System (PedNSS), help to monitor infant mortality, poor birth outcomes, nutritional status of pregnant and postpartum women, and newborns and children that are disadvantaged by low-income and enrolled in maternal and child health programs that are federally funded. Descriptions of maternal and child health trends, prevalence of health, and nutrition and behavioral indicators can be provided by the data from the surveillance

systems (CDC, 2012). Women, infants, and children currently enrolled in WIC provide the data that is collected in PNSS and PedNSS. Self-reported information such as demographics, behavior, and health are recorded and verified by a health professional at local WIC agencies. In addition, breastfeeding practices, clinical nutritional indicators, and anthropomorphic measurements are recorded.

A fundamental WIC program planning and evaluation data source was lost when the Centers for Disease Control and Prevention (CDC) stopped generating PNSS and PedNSS reports. 2011 was the last year that the CDC generated the PNSS & PedNSS reports nationally. In 2012, the Michigan Pregnancy & Pediatric Nutrition Surveillance Systems was implemented by including states in the Mid-West Region (MWR States) (Michigan, Illinois, Indiana, Ohio, Minnesota, Wisconsin) and Hawaii. States were requested to submit their PNSS & PedNSS extracts from 2010 – 2012 during the first phase and reports similar to CDC were generated. Prevalence in the 'National' column of the reports since 2012, includes the states that submitted their data extracts for processing. The MI-PNSS & PedNSS are a replica of the CDC PNSS & PedNSS system. The data is utilized for strategic planning, execution of program needs, and monitoring WIC program effectiveness. The information is also used in the evaluation of various Block grants, Maternal and Child Health, and public health programs.

Please note that a higher occurrence of adverse outcomes may be expected when interpreting the surveillance data, as it is important to remember that the mission of WIC is to serve women, infants, and children who are among the most vulnerable populations.

Data from PNSS and PedNSS has several limitations that include loss to follow-up due to changes in participants' qualifications, relocation out of state, or participants lack of recall. The analysis could be skewed if these limitations differ from the participants who remain in the program.

Linkage Methods

A SAS database was created for each year of data: 2011–2017 for PedNSS and 2011-2017 for PNSS. Depending on the outcome to be studied, several different merged datasets were created and used.

- To study the association of child outcomes (i.e. BMI, stature) and maternal characteristics, PedNSS (2017) was sorted and linked to PNSS by using Child ID (Infant ID). The merged dataset included only data from children whose mothers enrolled in WIC. Each unique Child ID in PedNSS links to one record of maternal data in PNSS.
- PedNSS 2017 was linked to PNSS 2011-2017 if the analysis focused on all children younger than 5 years old.
- PedNSS 2017 was linked to PNSS 2012-2015 if the analysis focused on children 2 to 5 years old, analysis was restricted to children equal to or greater than 24 months, and equal to or less than 60 months.
- If the analysis was for children younger than 2 years old, then PedNSS 2017 were linked to PNSS 2015-2017 and analysis was restricted to those that were younger than 24 months.

Demographic Characteristics

In 2017, there were 208,253 infants and children up to five years of age and 57,634 pregnant and postpartum women enrolled in Michigan's 48 local WIC agencies. There was a decrease in women enrollees from 2011 to 2017 with a more significant decrease in child enrollees. Close to half (49.0%) of the children enrolled in WIC were under the age of two years. Of the mothers enrolled in 2017, 63.1% of them were between the ages of 20 to 29 years. The largest proportion of Michigan WIC clients (11.0%) were served by the Detroit Department of Health and Wellness Promotion, while the fewest (0.1%) were enrolled at the Keweenaw Bay Indian Community (Table 1).

Highlight

From 2011 to 2016 Michigan's crude birth rate declined by 0.9%. In addition, the population living below the poverty line decreased from 17.5% in 2011 to 14.2% in 2016, a 18.9% decline. These factors may explain the decrease in WIC enrollment, as trends in birth and poverty generally shape participation in WIC (Carlson, Neuberger, & Rosenbaum, 2015).

Table 1: Distribution of women, infants, and children enrolled in Michigan's WIC program during 2017 by local agency, MI-PNSS & PedNSS 2017

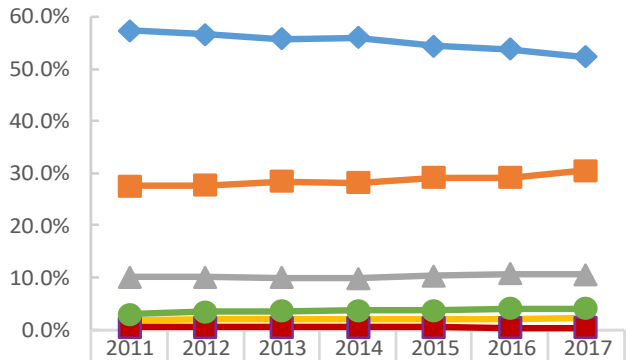
Agency	Frequency	%	Agency	Frequency	%
Barry-Eaton DHD	2,852	1.1%	Jackson County HD	5,100	1.9%
Bay County HD	2,923	1.1%	Kalamazoo County HD	4,621	1.7%
Benzie-Leelanau DHD	671	0.3%	Kalamazoo Family Health Center	2,794	1.1%
Berrien County HD	4,238	1.6%	Kent County HD	18,886	7.1%
Branch-Hillsdale-St. Joe DHD	5,256	2.0%	Keweenaw Bay Indian Tribe	292	0.1%
Calhoun County HD	4,991	1.9%	Lapeer County HD	1,937	0.7%
Central MI District HD	5,366	2.0%	Livingston County HD	1,873	0.7%
Chippewa County HD	1,161	0.4%	Luce-Mackinac-Alger-Schoolcraft DHD	869	0.3%
Community Action Agency	2,284	0.9%	Macomb County HD	12,632	4.8%
Delta & Menominee	1,555	0.6%	Marquette County HD	1,250	0.5%
Detroit DHWP	29,128	11.0%	Mid-MI Community Action Agency	2,007	0.8%
Detroit Urban League	16,316	6.1%	Mid-Michigan DHD	3,829	1.4%
Dickinson-Iron DHD	1,084	0.4%	Monroe County HD	3,126	1.2%
District Health Dept. #10	8,493	3.2%	Muskegon County HD	6,855	2.6%
District Health Dept. #2	1,976	0.7%	Northwest MI Comm Health Agency	3,114	1.2%
District Health Dept. #4	1,924	0.7%	Oakland County HD	16,135	6.1%
Downriver Community Serv.	3,188	1.2%	Saginaw County Dept. of Pub Hlth	4,403	1.7%
Genesee County HD	13,100	4.9%	Sanilac County HD	1,075	0.4%
Grand Traverse County HD	2,026	0.8%	Shiawassee County HD	1,976	0.7%
Health Delivery, Inc	2,662	1.0%	St. Clair County	3,706	1.4%
Huron County HD	848	0.3%	Tuscola County HD	1,633	0.6%
Ingham County HD	8,079	3.0%	Washtenaw County HD	5,560	2.1%
InterCare Comm Health Network	13,073	4.9%	Wayne County HD	25,742	9.7%
Ionia County HD	1,819	0.7%	Western Upper Penin DHD	1,459	0.6%
				Total 265,887	

[1] Recording period is January 1st through December 31st [2] Excludes Records with unknown data and errors

Race and Ethnicity

WIC participants self-identify their race and ethnicity (Figure 1). The distribution of race/ethnicity among women in 2017 is as follows: White, Non-Hispanic (52.3%), Black, Non-Hispanic (30.5%), Hispanic (10.5%), Asian/ Pacific Islander (2.3%), American Indian Only (0.3%), and Multiracial, Non-Hispanic (4.0%). The proportion of White, Non-Hispanic women enrolled in WIC decreased 8.9% from 2011 through 2017, while the proportion of Black, Non-Hispanic women and Hispanic women increased by 10.9% and 3.9%, respectively.

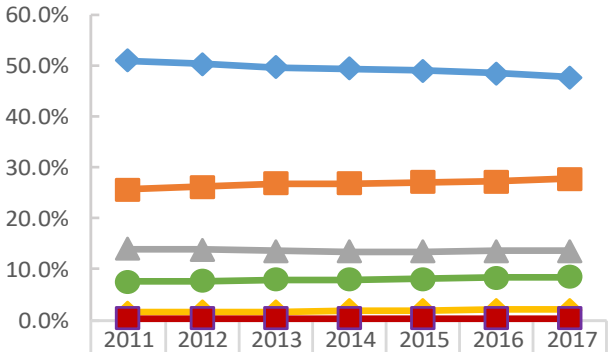
Figure 1: Race/Ethnicity of women participating in WIC, MI-PNSS 2011-2017[1-2]



	2011	2012	2013	2014	2015	2016	2017
White, Non-Hispanic	57.4%	56.6%	55.8%	56.0%	54.4%	53.8%	52.3%
Black, Non-Hispanic	27.5%	27.7%	28.4%	28.2%	29.2%	29.1%	30.5%
Hispanic	10.1%	10.1%	9.9%	9.8%	10.3%	10.7%	10.5%
Asian/Pacific Islander	1.7%	1.9%	2.0%	2.0%	2.1%	2.1%	2.3%
American Indian Only	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.3%
Non-Hispanic Mutliracial	2.9%	3.4%	3.5%	3.6%	3.6%	4.0%	4.0%

In 2017, less than half (47.7%) of children under 5 years of age were White, Non-Hispanic (Figure 2). The proportion of Multiracial, Non-Hispanic increased from 7.5% in 2011 to 8.5% in 2017, a 13.3% increase. There was also a 8.2% increase in Non-Hispanic Black children from 2011 to 2017.

Figure 2: Trend in race/ethnicity in the WIC population younger than five years of age, MI-PedNSS 2011-2017[1-2]



	2011	2012	2013	2014	2015	2016	2017
White, Non-Hispanic	51.0%	50.4%	49.7%	49.4%	49.0%	48.5%	47.7%
Black, Non-Hispanic	25.7%	26.2%	26.8%	26.9%	27.1%	27.2%	27.8%
Hispanic	14.0%	13.8%	13.6%	13.5%	13.5%	13.6%	13.6%
Asian/Pacific Islander	1.5%	1.6%	1.7%	1.9%	1.9%	2.0%	2.1%
American Indian Only	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Non-Hispanic Mutliracial	7.5%	7.7%	7.9%	8.0%	8.1%	8.3%	8.5%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors

Despite the fact that the racial/ethnic distribution fluctuates by agency, White, Non-Hispanic enrollees tend to shape the larger part of participants in most agencies. The distribution of race and ethnicity for selected urban and rural agencies are listed in Table 2.

In 2017, the highest proportion of Black, Non-Hispanic participants (76.4%) were seen at The Detroit Urban League. Health Delivery System Inc. (88.6%) and the Detroit Department of Health and Wellness Promotion (91.9%) serve a predominately non-White population, while Kent County (32%) and InterCare Community Health Network (30.3%) enrolled the highest proportion of Hispanics.

More about WIC

- Approximately $5.64 billion was spent through WIC in FY 2017 (3.61 billon in food and 1.97 billion in administration) on food and other services for an average of 7.3 million participants (USDA, 2017).
- In FY 2017, Michigan ranked 10th nationally with 224,106 WIC participants (USDA, 2017).

Table 2: Race and ethnicity distribution of WIC participants for selected urban and rural agencies, MI-PNSS & PedNSS 2017

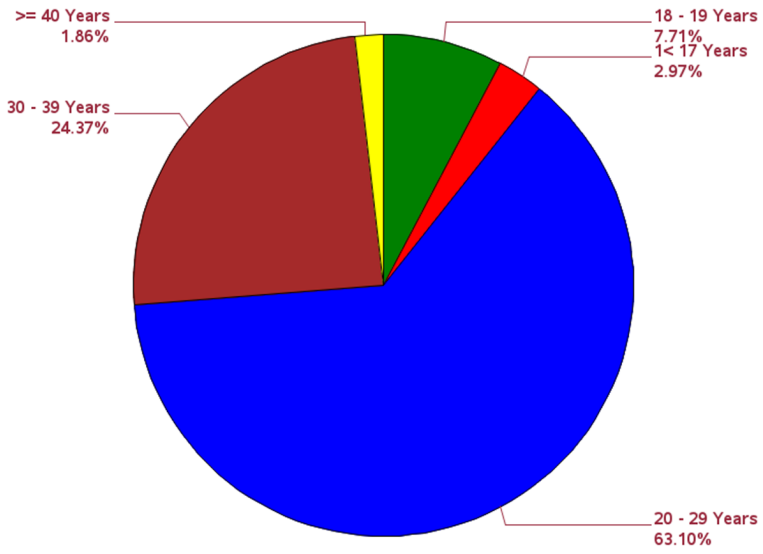
Urban WIC Agency by Race/Ethnicity												
Agency	White, Non-Hispanic		Black, Non-Hispanic		Hispanic		Asian/Pacific		American Indian		Non-Hispanic, Multiracial	
	N	%	N	%	N	%	N	%	N	%	N	%
Detroit Dept. Health & Wellness Promotion	2346	8.1%	21038	72.3%	4670	16.1%	428	1.5%	16	0.1%	596	2.0%
Wayne County HD	14278	55.6%	7110	27.7%	1492	5.8%	1269	4.9%	21	0.1%	1521	5.9%
Kent County HD	5902	31.3%	4402	23.3%	6029	32.0%	904	4.8%	25	0.1%	1600	8.5%
Genesee County HD	5531	42.3%	5108	39.0%	868	6.6%	44	0.3%	6	0.0%	1526	11.7%
Oakland County HD	6930	43.0%	5257	32.6%	2358	14.6%	391	2.4%	13	0.1%	1166	7.2%
Rural WIC Agency by Race/ Ethnicity												
Agency	White, Non-Hispanic		Black, Non-Hispanic		Hispanic		Asian/Pacific		American Indian		Non-Hispanic, Multiracial	
	N	%	N	%	N	%	N	%	N	%	N	%
InterCare Comm Health Network	7617	58.7%	487	3.8%	3934	30.3%	138	1.1%	14	0.1%	789	6.1%
District Health Dept. #10	6713	79.2%	125	1.5%	1094	12.9%	14	0.2%	22	0.3%	507	6.0%
Branch-Hillsdale-St. Joe DHD	4044	77.1%	100	1.9%	785	15.0%	6	0.1%	0	0.0%	309	5.9%
Central MI District HD	4627	86.3%	80	1.5%	248	4.6%	42	0.8%	42	0.8%	320	6.0%
Northwest MI Comm Health Agency	2774	89.1%	16	0.5%	83	2.7%	23	0.7%	46	1.5%	172	5.5%

Maternal Age

The majority (63.1%) of women enrolled in 2017 were between 20 to 29 years of age, followed by women 30 to 39 years old (24.4%). 7.7% of the mothers were 18-19 years of age and 3.0% had not reached adulthood. 1.86% of the women enrolled were over 40 years of age (Figure 3).

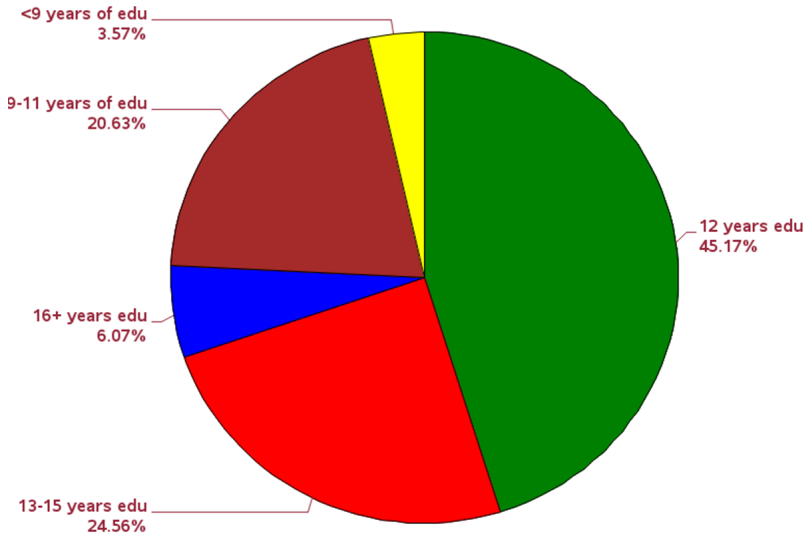
There is a clear pattern of increasing maternal age in WIC mothers over the years. From 2011 to 2017, adolescent mothers decreased from 5.1% to 3.0%, while older mothers (over 30 years) increased from 21.5% to 26.2%.

Figure 3: Distribution of maternal age, MI-PNSS 2017[1-2]



Maternal Education

Figure 4: Years of education attained by women enrolled in Michigan WIC, MI-PNSS 2017[1-2]



[1] Recording period is January 1st through December 31st [2] Excludes records with unknown data and errors

The distribution of maternal education among women enrolled changed over time with a trend toward higher education among women enrolled.

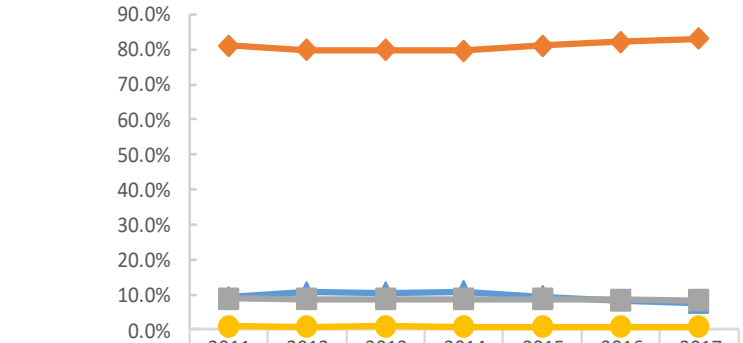
From 2011 to 2017, the percentage of enrollees with education less than high school decreased from 25.9% to 24.2% while women with high school education increased from 43.7% to 45.2%. In addition, enrollees who had at least some college education increased slightly from 24.4% to 24.6% and women with advanced degrees remained the same at 6.1%.

Maternal Health and Behavior Indicators

Prenatal Care Enrollment

Early and consistent prenatal care is emphasized by many studies as a beneficial strategy to enhance the well-being and birth outcomes of at-risk women. Prenatal care aims to promote maternal and fetal health, monitor risk factors, and treat complications early (Soures, Silveira, & Rosa, 2014). Each year approximately one million women in the United States do not receive sufficient prenatal care during their pregnancy (HRSA, n.d.). Infants born to mothers who did not receive prenatal care are three times more likely to be born at low birthweight. In addition, infant mortality is five times greater for infants born to mothers who received no prenatal care when compared to those who did in their first trimester (HRSA, n.d.).

Figure 5: Trend of prevalence of prenatal care by trimester of entry among women enrolled in WIC*, MI-PNSS 2011-2017[1-2]



	2011	2012	2013	2014	2015	2016	2017
No Care	9.2%	10.6%	10.5%	10.8%	9.4%	8.4%	7.7%
1st Trimester	81.1%	79.8%	79.9%	79.7%	81.1%	82.2%	83.1%
2nd Trimester	8.8%	8.7%	8.7%	8.7%	8.7%	8.6%	8.3%
3rd Trimester	0.9%	0.8%	0.9%	0.8%	0.8%	0.7%	0.8%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors * No Care= No prenatal care at time of WIC enrollment

Although women can enter into prenatal care at various times during their pregnancy, doing so within the 1st trimester is ideal. In 2017, 83.1% of live births to Michigan mothers received prenatal care in their first trimester (MDHHS, 2017). At WIC enrollment, 83.1% of Michigan mothers entered prenatal care during their 1st trimester of pregnancy, slightly lower than 83.4% of women enrolled in MWR states and Hawaii (PNSS) from prior years (Figure 5). The Healthy People 2020 goal for women to enroll in prenatal care during their first trimester is 77.9% (USHHS, 2010).

Please note that as recorded in PNSS, prenatal care refers to self-reported, from a medical record prenatal visit to a doctor, or a certified nurse midwife. Also, the results reflect responses to prenatal care at the time of WIC enrollment. Some misclassification can occur for women who enter WIC prior to receiving prenatal care as receiving no prenatal care.

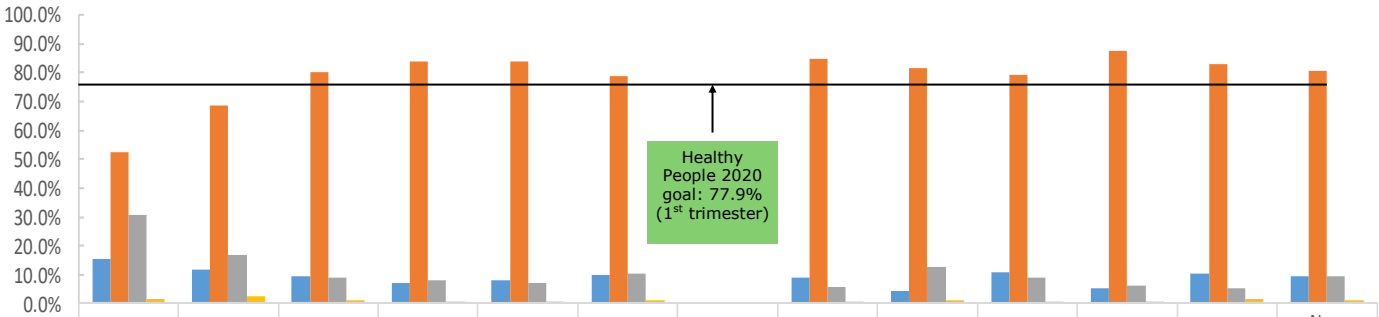
Generally, the rate of WIC mothers entering prenatal care in their first trimester expanded with age. In 2017, young WIC mothers (<15) were at the greatest risk of not receiving prenatal care (15.4%) and less likely to enroll in the first trimester (52.3%). Less than 5% of Black WIC mothers did not have prenatal care before enrolling in WIC, while 11.0% of Hispanic mothers had not had prenatal care at WIC enrollment. There is also a correlation between early enrollment in prenatal care and higher education, the higher the education level, the greater the probability of the mother receiving prenatal care (IOM, 1988, Basu & Stephenson, 2005).

Early enrollment into prenatal care also varied by agency, as seen in Table 3. In 2017, Keweenaw Bay Indian Tribe reported the highest proportion of first trimester prenatal care enrollment (96.6%) followed by Livingston County Health Department (91.9%). Conversely, the St. Clair County Health Department reported the lowest prevalence of 1st trimester prenatal care enrollment with 67.4%.

Table 3: Prevalence of 1st trimester prenatal care enrollment among women enrolled in WIC by local agency, MI-PNSS 2017 [1-2]

Highest Prevalence of 1st trimester PNC	
Agency	**%**
Keweenaw Bay Indian Tribe	96.6%
Livingston County HD	91.9%
Barry-Eaton DHD	91.2%
Washtenaw County HD	90.7%
Calhoun County HD	89.3%
Downriver Community Serv.	89.3%
Lowest Prevalence of 1st trimester PNC	
Agency	**%**
Kalamazoo Family Health Center	74.0%
Grand Traverse County HD	73.7%
Berrien County HD	73.3%
Bay County HD	72.8%
St. Clair County	67.4%
	MI-PNSS 2017

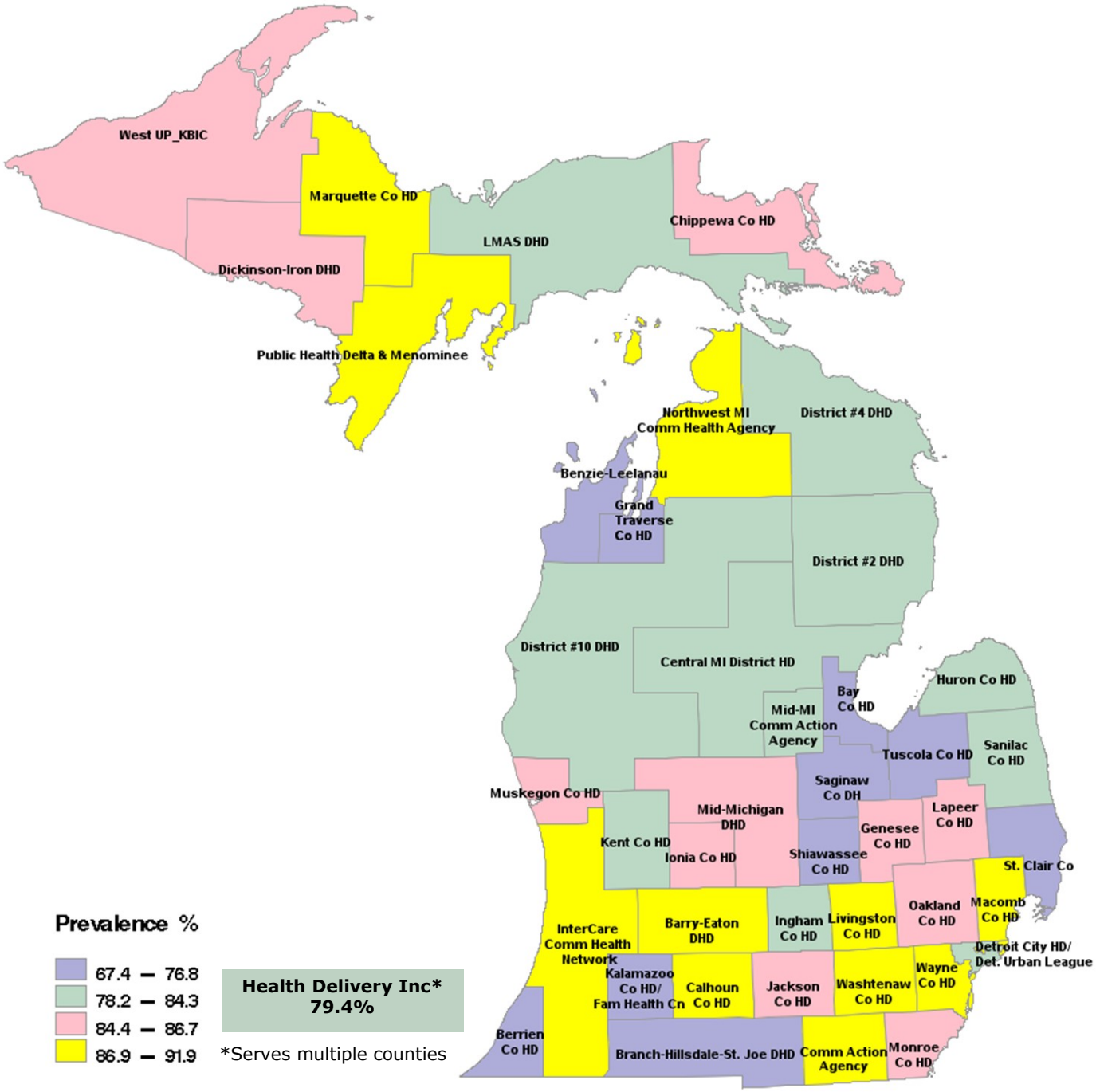
Figure 6: Prevalence of trimester of prenatal care enrollment by race/ethnicity or age among women enrolled in WIC*, MI-PNSS 2017[1-2]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
No Care	15.4%	11.9%	9.4%	7.1%	8.2%	9.8%		9.1%	4.4%	11.0%	5.3%	10.3%	9.3%
1st Trimester	52.3%	68.7%	80.3%	84.0%	83.9%	78.8%		84.7%	81.6%	79.4%	87.7%	82.8%	80.5%
2nd Trimester	30.8%	17.0%	9.2%	8.2%	7.1%	10.2%		5.7%	12.7%	8.9%	6.2%	5.2%	9.3%
3rd Trimester	1.5%	2.4%	1.1%	0.7%	0.7%	1.2%		0.50%	1.30%	0.70%	0.80%	1.70%	1.00%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors *No Care = No prenatal care at time of WIC enrollment

Figure 7: Prevalence of 1st trimester entry into prenatal care by local agency, MI-PNSS 2017



WIC Enrollment

The evidence of WIC effectiveness has been studied for many years. Research has shown that prenatal WIC participation helps improve birth outcomes. Higher birthweights, fewer premature births, and longer gestations, especially for at-risk women, are just a few of the benefits associated with participation in WIC during pregnancy (Carlson & Neuberger, 2015). In 2017, approximately 60.0% of Michigan WIC mothers enrolled during their first or second trimester compared to 61.5% of mothers enrolled in MWR states and Hawaii (PNSS). The proportion of first trimester WIC enrollment decreased from 36.7% in 2011 to 30.6% in 2017, a 16.6% decrease (Figure 8, next page).

Trimester of WIC enrollment by maternal age and race/ethnicity among women is depicted in Figure 9. Young mothers (<15 years) were less likely to enter WIC during their first trimester (26.5%), however, the majority (91.2%) joined before giving birth. Conversely, higher percentages of mothers over 40 years old enrolled in WIC during the first trimester, but less than 40% of mothers over 40 years old enrolled in WIC later in pregnancy. American Indian and Hispanic women had the highest prevalence (39.1% and 36.7% respectively) of first trimester enrollment. On the contrary, 21.8% of Black, Non-Hispanic women enrolled during their first trimester.

Michigan's WIC program established a five-year plan for six health outcome indicators that began in January 2014. One objective was to increase first trimester entry into the WIC program to 42.0% by December 2018. Ten agencies exceeded this goal in 2017. Kalamazoo Family Health Center had the highest prevalence of first trimester enrollment (54.9%), while Livingston County Health Department had the lowest (22.1%) (Table 4).

MICHIGAN WIC FIVE YEAR PLAN

Increase 1st trimester entry into WIC to 42.0% in 2018.

10 Local Agencies exceeded this goal

- Kalamazoo Family Health Center had highest prevalence of 1st trimester WIC enrollment (54.9%) followed by Luce-Mackinac-Alger-Schoolcraft DHD at(53.9%) (Table 4).

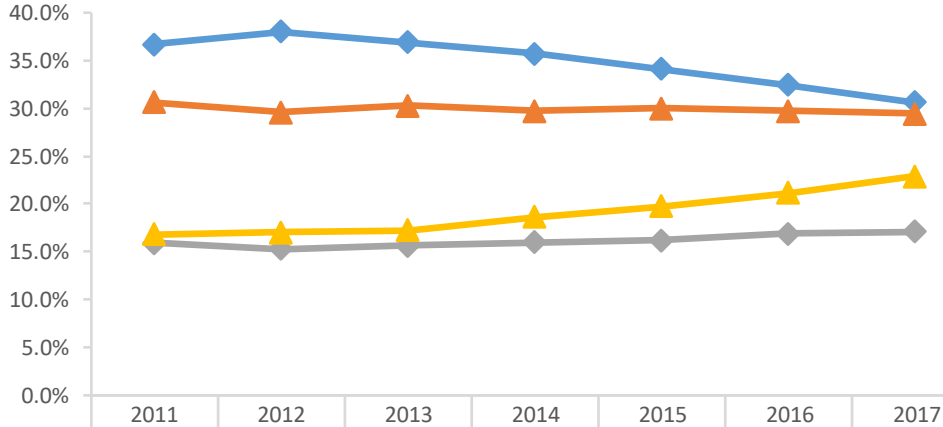
- 39.1% of American Indian and 36.7% of Hispanic women entered WIC during their 1st trimester (Figure 9).

Table 4: Prevalence of 1st trimester WIC enrollment among women enrolled in WIC by local agency, MI-PNSS 2017[1-2]

Highest Prevalence of 1st trimester Entry	
Agency	%
Kalamazoo Family Health Center	54.9%
Luce-Mackinac-Alger-Schoolcraft DHD	53.9%
Chippewa County HD	52.6%
Keweenaw Bay Indian Tribe	49.2%
Dickinson-Iron DHD	46.3%
Lowest Prevalence of 1st trimester Entry	
Agency	%
Downriver Community Serv.	24.5%
Genesee County HD	24.1%
Wayne County HD	23.1%
Detroit Urban League	23.1%
Livingston County HD	22.1%
	MI-PNSS 2017

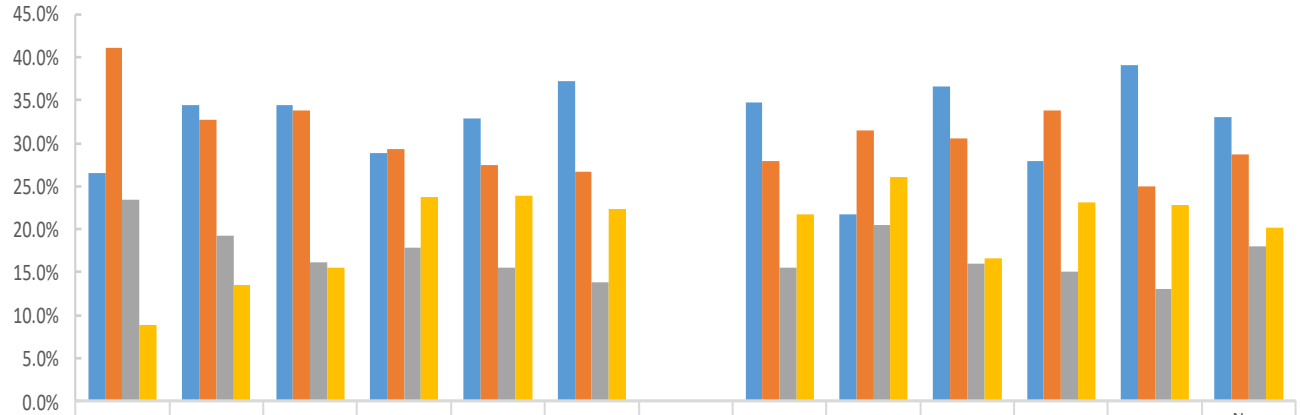
[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors

Figure 8: Trend of trimester of WIC enrollment prevalence among women enrolled in WIC, MI-PNSS 2011-2017[1-2]



	2011	2012	2013	2014	2015	2016	2017
first trimester	36.7%	38.0%	36.9%	35.7%	34.1%	32.4%	30.6%
second trimester	30.6%	29.6%	30.3%	29.7%	30.0%	29.7%	29.4%
third trimester	15.9%	15.3%	15.6%	16.0%	16.2%	16.9%	17.1%
at postpartum visit	16.8%	17.0%	17.2%	18.6%	19.7%	21.1%	22.9%

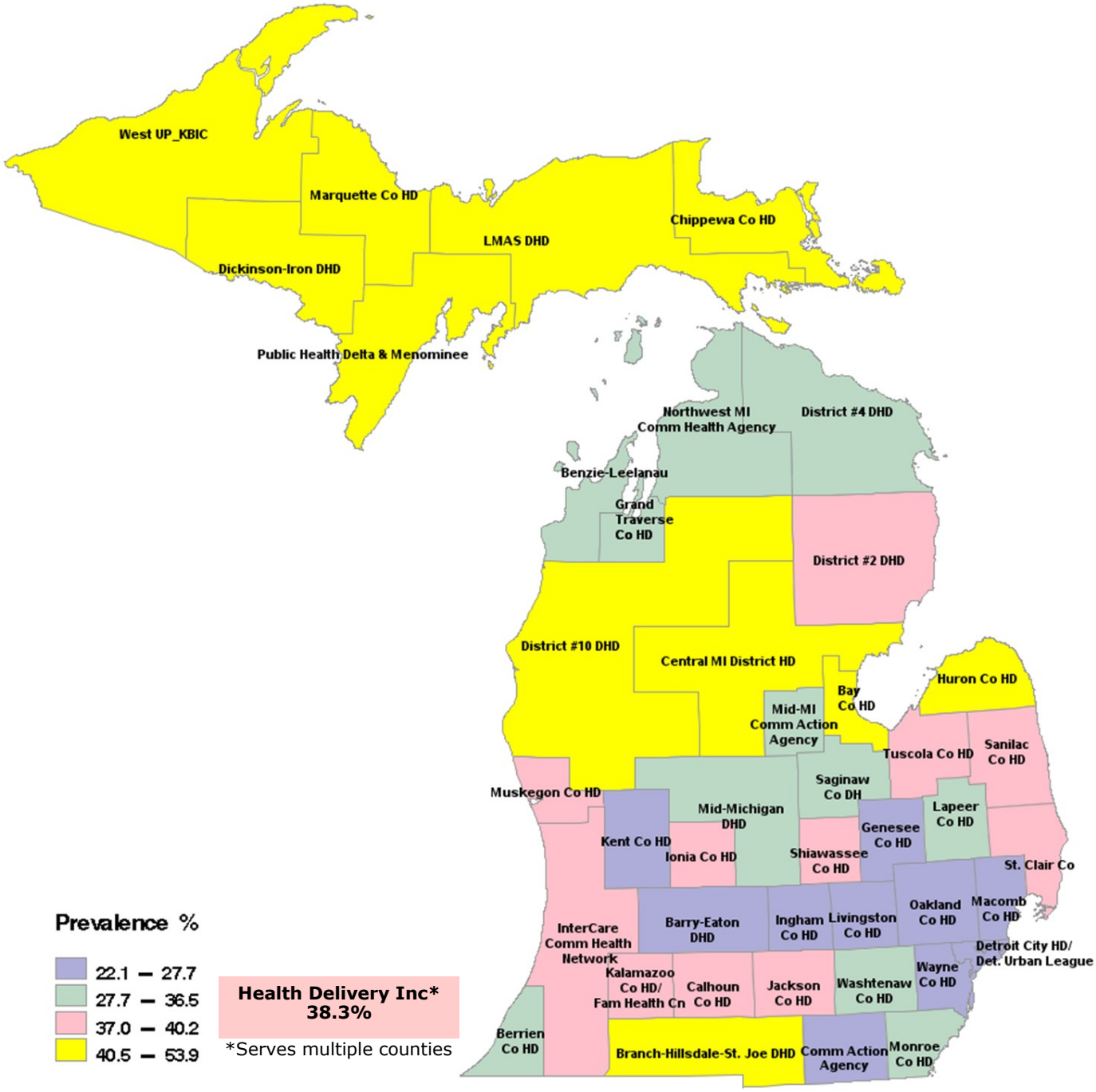
Figure 9: Prevalence of trimester of WIC enrollment by maternal age and race/ethnicity among women enrolled in WIC, MI-PNSS 2017[1-2]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
first trimester	26.5%	34.5%	34.4%	28.9%	32.9%	37.2%		34.7%	21.8%	36.7%	28.0%	39.1%	33.0%
second trimester	41.2%	32.8%	33.9%	29.4%	27.5%	26.7%		28.0%	31.5%	30.6%	33.9%	25.0%	28.7%
third trimester	23.5%	19.2%	16.2%	17.8%	15.6%	13.8%		15.6%	20.5%	16.0%	15.0%	13.0%	18.1%
at postpartum visit	8.8%	13.5%	15.5%	23.8%	23.9%	22.3%		21.8%	26.1%	16.7%	23.1%	22.9%	20.2%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors

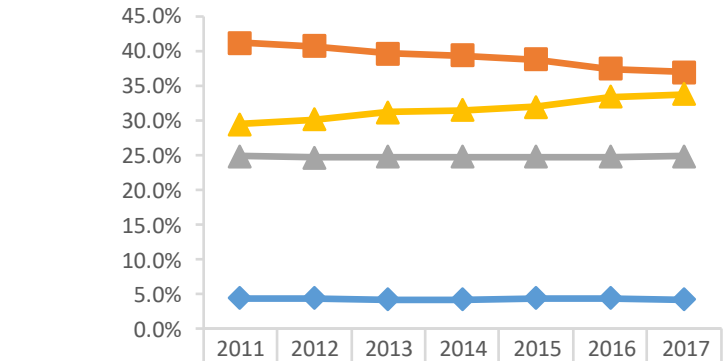
Figure 10: Prevalence of 1st trimester enrollment in WIC by local agency, MI-PNSS 2017



Maternal Pre–Pregnancy Body Mass Index

The prevalence of overweight and obese women of reproductive age has dramatically increased and has become a major public health concern (Vinturache, Moledina, McDonald, Slater, & Tough, 2014). Fetal and maternal complications such as gestational diabetes, still-birth, fetal growth abnormalities, and complicated labor have been associated with high pre-pregnancy BMI. On the contrary, low pre-pregnancy BMI is associated with a higher risk of a pre-term birth (Nohr, et al., 2008).

Figure 11: Trend of maternal pre-pregnancy BMI prevalence among women enrolled in WIC, MI-PNSS 2011-2017[1-3]



	2011	2012	2013	2014	2015	2016	2017
Underweight	4.4%	4.4%	4.3%	4.3%	4.4%	4.4%	4.3%
Normal	41.2%	40.7%	39.7%	39.4%	38.8%	37.5%	37.0%
Overweight	24.9%	24.7%	24.8%	24.8%	24.8%	24.8%	24.9%
Obese	29.5%	30.2%	31.2%	31.5%	32.0%	33.4%	33.8%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Based on 1990 IOM report, "Nutrition During Pregnancy" and 2009 IOM report "Weight Gain During Pregnancy: Reexamining the Guidelines"

Table 5: Weight classification based on pre-pregnancy BMI (IOM 1990)

Pre-pregnancy weight	BMI
Underweight	<19.8
Normal weight	19.8 – 26.0
Overweight	>26.0 – 29.0
Obese	>29.0

Table 6: New Recommendations for Weight classification based on pre-pregnancy BMI (IOM 2009)

Pre-pregnancy weight	BMI
Underweight	<18.5
Normal weight	18.5 – 24.9
Overweight	>25.0 – 29.9
Obese (includes all classes)	≥30.0

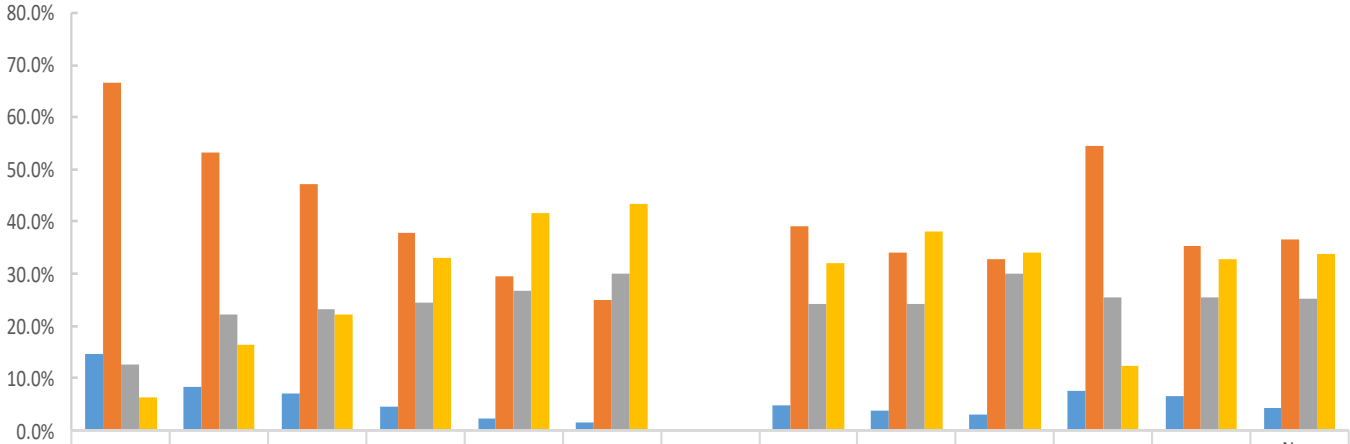
The weight for height measurement taken before pregnancy is pre-pregnancy body mass index. Women were classified as underweight, normal weight, overweight or obese based on the new guidelines released in 2009 by the Institute of Medicine (IOM). Based on the new guidelines, over half of Michigan mothers enrolled in WIC (58.7%;Figure 11) were overweight or obese in 2017 which was slightly higher than the prevalence of women enrolled in MWR states and Hawaii (58.3%;PNSS).

More than one out of three women enrolled in Michigan's WIC program in 2017 were classified as obese, while the prevalence of obesity increased by 14.6% from 29.5% in 2011 to 33.8% in 2017. Only 37.0% of the women were normal weight prior to pregnancy, a decrease of 10.2% from 2011.

The prevalence of prenatal BMI differed by age and race/ethnicity (Figure 12). Older women were more apt to be obese; 41.6% of 30 – 39 year olds and 43.4% of women 40 years old and older were obese. The highest prevalence of obesity was found among Black, Non-Hispanic women (38.0%) followed by Hispanic women (34.1%), while the lowest prevalence of obesity was among Asian/Pacific Islander women (12.4%).

In 2017, the highest prevalence of pre-pregnancy underweight was reported by Shiawassee County Health Department and Jackson County Health Department at 6.1% and 6.5%, respectively. On the contrary, Sanilac County HD (64.5%) and Health Delivery, Inc. (65.6%) had the highest percentage of pre-pregnancy overweight or obese women.

Figure 12: Prevalence of maternal pre-pregnancy BMI by race/ethnicity and age among women enrolled in WIC, MI-PNSS 2017[1-3]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
Underweight	14.6%	8.3%	7.1%	4.6%	2.2%	1.6%		4.7%	3.7%	3.0%	7.6%	6.5%	4.4%
Normal	66.7%	53.3%	47.2%	37.9%	29.5%	25.0%		39.0%	34.0%	32.8%	54.4%	35.3%	36.6%
Overweight	12.5%	22.1%	23.3%	24.5%	26.7%	29.9%		24.2%	24.3%	30.1%	25.6%	25.5%	25.2%
Obese	6.3%	16.4%	22.3%	33.0%	41.6%	43.4%		32.1%	38.0%	34.1%	12.4%	32.7%	33.8%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Based on 2009 IOM report "Weight Gain During Pregnancy: Reexamining the Guidelines".

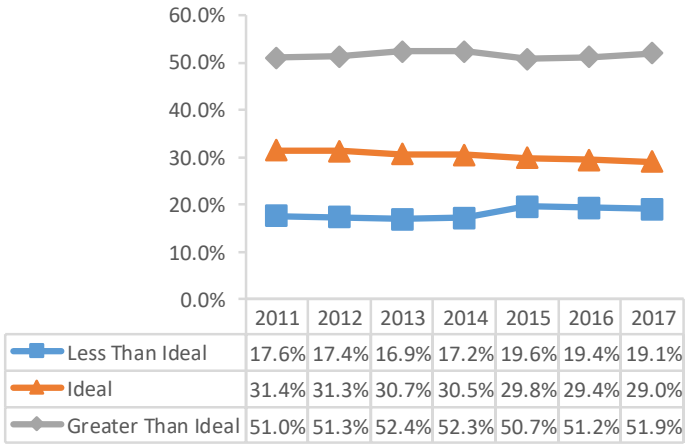
Maternal Weight Gain

Maternal weight gain is considered to be an important determinant of infant mortality and morbidity and is based on pre-pregnancy weight status (CDC, 2011). A potentially modifiable risk factor such as gestational weight gain can help prevent adverse consequences for the mother and the child, as well as help to achieve an ideal birthweight (Chihara, et al., 2014). The Institute of Medicine (IOM) has recommendations in place for ideal maternal weight gain as there are health risks associated with weight gain exceeding the recommendations. Macrosomia, future maternal obesity, postpartum weight retention, and possible future childhood obesity are all risk factors for excessive gestational weight gain. On the contrary, inadequate gestational weight gain is associated with an increased risk of low birthweight (Deputy, Sharma, & Kim, 2015). When discussing maternal weight gain it is equally important to discuss pre-pregnancy BMI because some women classified as overweight or obese tend to gain less during pregnancy.

Table 7: Maternal weight gain categories based on the 2009 IOM recommendations (IOM, 2009)

Weight	Pre-pregnancy BMI	Total Weight Gain (lbs)	Rates of Weight Gain 2nd and 3rd Trimester (lbs/week)
Under-weight	<18.5	28 – 40	1 (1 – 1.3)
Normal weight	18.5 – 24.9	25 – 35	1 (0.8 – 1)
Over-weight	>25.0 – 29.9	15 – 25	0.6 (0.5 – 0.7)
Obese (includes all classes)	≥30.0	11 - 20	0.5 (0.4 – 0.6)

Figure 13: Trend of pregnancy weight gain prevalence among women enrolled in WIC, MI-PNSS 2011-2017[1-3]



	2011	2012	2013	2014	2015	2016	2017
Less Than Ideal	17.6%	17.4%	16.9%	17.2%	19.6%	19.4%	19.1%
Ideal	31.4%	31.3%	30.7%	30.5%	29.8%	29.4%	29.0%
Greater Than Ideal	51.0%	51.3%	52.4%	52.3%	50.7%	51.2%	51.9%

[1] Recording Period January 1st through December 31st [2] Excluded records with un-known data or errors[3]Based on 1990 IOM report "Nutrition during pregnancy" and 2009 IOM report "Weight Gain During Pregnancy: Reexamining the Guidelines".

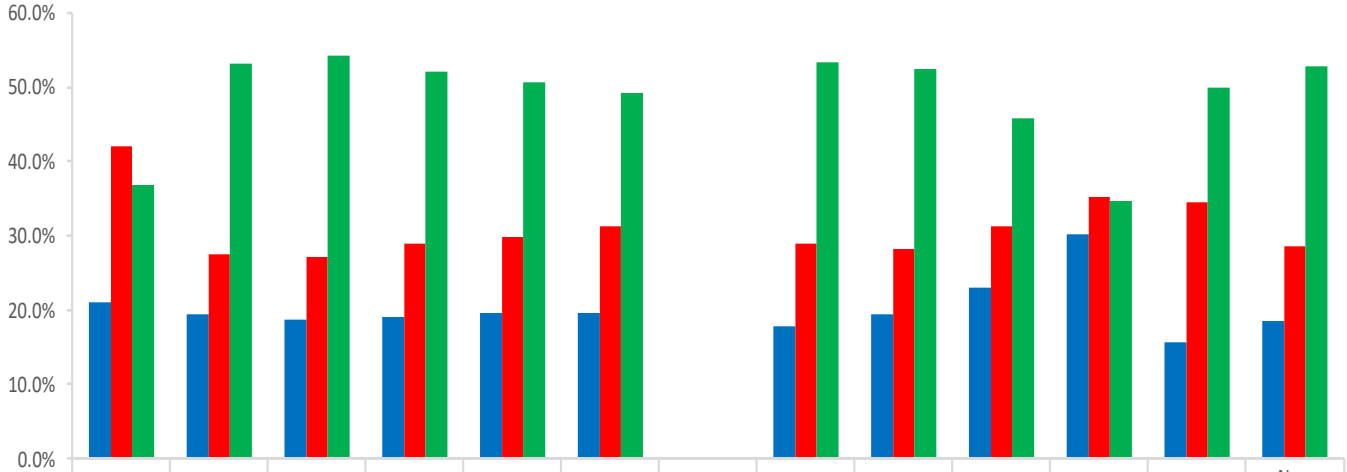
From 2011 to 2017, the prevalence of less than ideal gestational weight gain among women enrolled in Michigan WIC increased from 17.6% to 19.1% while the prevalence of gaining ideal weight decreased from 31.4% to 29.0% (Figure 13). There was a slight increase in women who gained more than ideal weight during their pregnancy, 51.0% in 2011 and 51.9% in 2017.

In 2017, a good portion of women (71.0%) gained either less than ideal or greater than ideal weight during their pregnancy. Women who gained ideal weight during pregnancy reached the lowest point since 2011.

More than half of White, Non-Hispanic mothers (53.3%), and Black Non-Hispanic mothers (52.4%) gained greater than ideal weight during pregnancy, while less than one third of the White, Black, and Hispanic mothers gained ideal weight that is in the range recommended by 2009 IOM. Over one half of the mothers 18 – 40 years old are more likely to gain greater than ideal weight during pregnancy.

In 2017, Dickinson-Iron Health Department reported the lowest (6.3%) prevalence of inadequate weight gain whereas Kent County Health Department reported the highest (25.4%) (Figure 15). Conversely, the highest prevalence of excessive weight gain (58.9%) was reported by Luce-Mackinac-Alger-Schoolcraft.

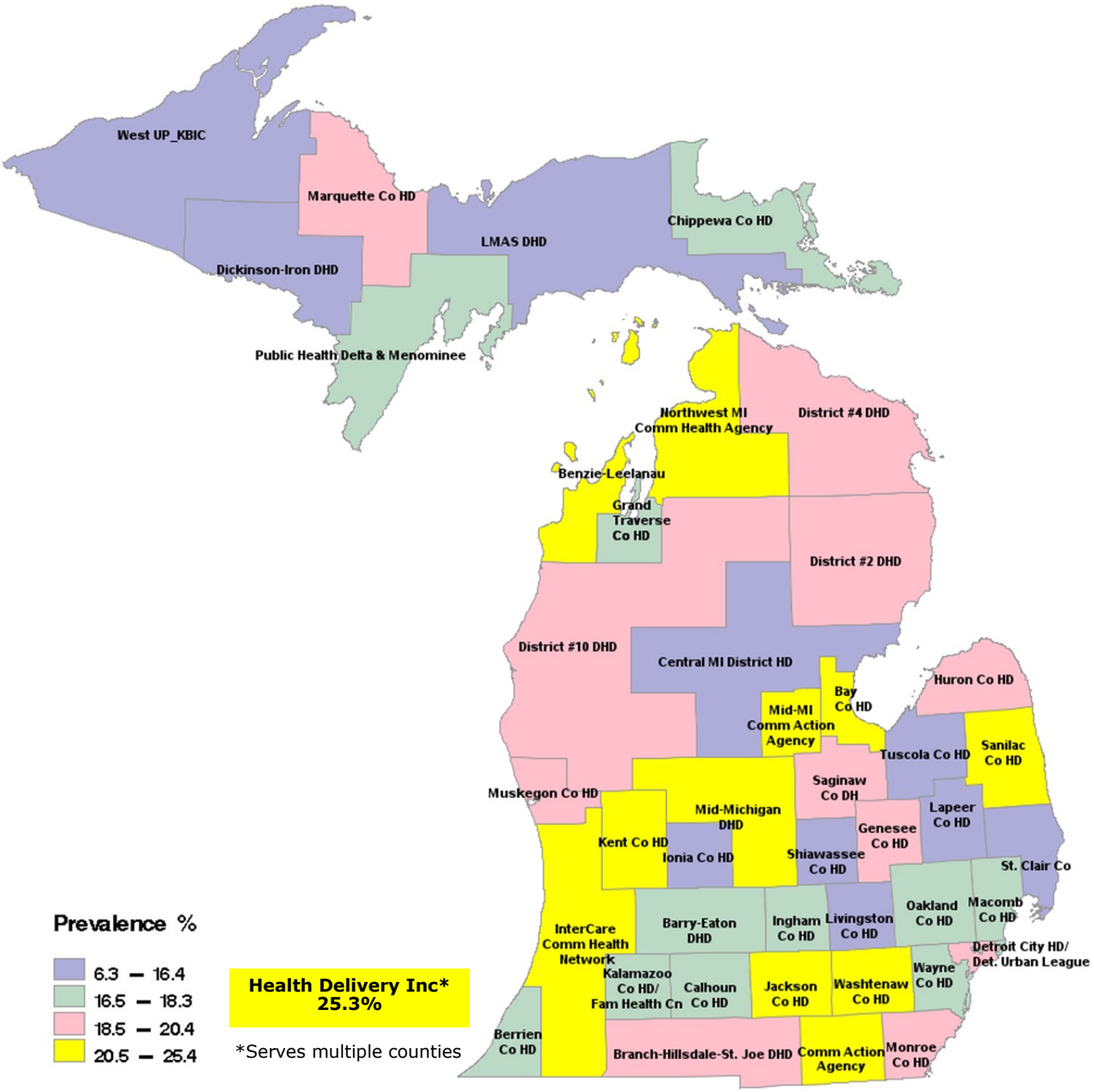
Figure 14: Prevalence of pregnancy weight gain by race/ethnicity and age among women enrolled in WIC, MI-PNSS 2017[1-3]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
Less Than Ideal	21.1%	19.4%	18.6%	19.0%	19.5%	19.5%		17.8%	19.4%	23.0%	30.2%	15.6%	18.5%
Ideal	42.1%	27.5%	27.1%	28.9%	29.9%	31.3%		28.9%	28.2%	31.2%	35.2%	34.4%	28.6%
Greater Than Ideal	36.8%	53.1%	54.3%	52.1%	50.7%	49.2%		53.3%	52.4%	45.8%	34.6%	50.0%	52.9%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Based on 2009 IOM report "Weight Gain During Pregnancy: Reexamining the Guidelines".

Figure 15: Prevalence of less than ideal pregnancy weight gain by local agency, MI-PNSS 2017



Maternal Anemia

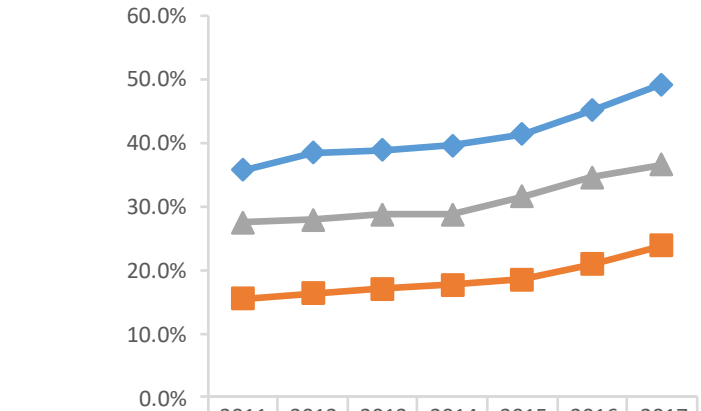
Across the nation, mothers and infants with anemia and iron deficiency remain at epidemic levels. The prevalence of anemia, defined as a decreased level of hemoglobin in the blood, is highest among pregnant women, infants, and young children (ACCESS, 2006). Anemia during pregnancy is most commonly caused by iron deficiency (95% of the cases). Adequate intake of iron is important during pregnancy.

During the first and second trimester, there is an increase in the mother's blood volume, as well as the manufacturing of blood cells by the infant, that in turn require sufficient iron levels or puts the mother at risk for anemia (Health, 2005). Many studies have shown that there is a higher prevalence of anemia that occurs during the third trimester of pregnancy. At the same time, an increased incidence of anemia in the infants during the first year of life is associated with maternal iron deficiency anemia, as well as low birthweight (Health, 2005).

When a woman enrolls in WIC, her hemoglobin level or hematocrit is measured. To determine if she is anemic, trimester and age-specific cut-offs are used. These measurements reflect the health status of women at the time of enrollment.

Among Michigan WIC enrollees, the prevalence of anemia during the third trimester was 49.2%, a 37.8% increase from 2011 (Figure 16). In 2017, the prevalence of third trimester anemia among states participated in the PNSS was 32.1% (PNSS). The prevalence of anemia in 2017 among Michigan mothers was lower for women who enrolled prior to giving birth (23.8%).

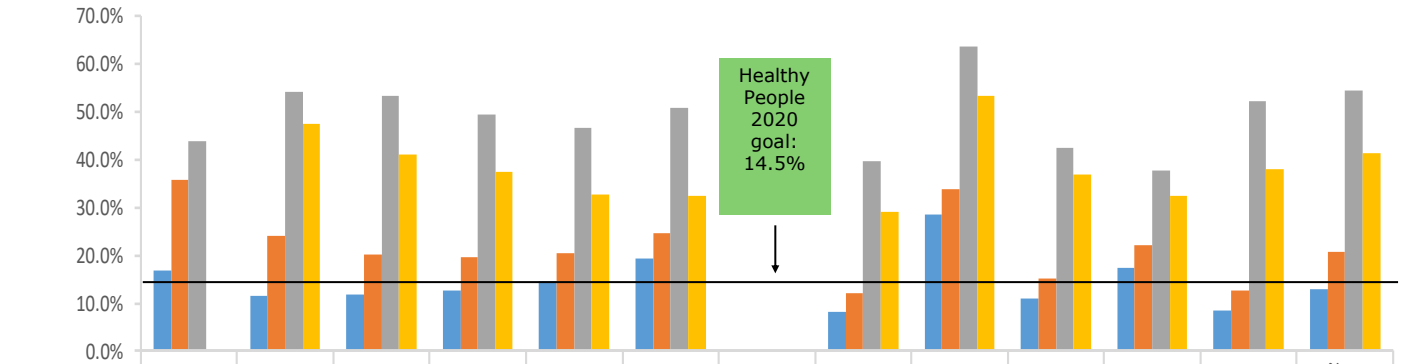
Figure 16: Trend of maternal anemia prevalence among women enrolled in WIC, MI-PNSS 2011-2017[1-3]



	2011	2012	2013	2014	2015	2016	2017
3rd Trimester	35.7%	38.4%	38.9%	39.6%	41.4%	45.1%	49.2%
Prenatal	15.5%	16.3%	17.1%	17.7%	18.5%	20.9%	23.8%
Postpartum	27.5%	27.9%	28.7%	28.7%	31.6%	34.6%	36.6%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Based on 1998 CDC MMWR, "Recommendations to Prevent and Control Iron Deficiency in the United States", altitude adjusted.

Figure 17: Prevalence of anemia by trimester by race/ethnicity and age among women enrolled in WIC, MI-PNSS 2017[1-2]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
1st Trimester	16.7%	11.5%	11.9%	12.8%	14.6%	19.4%		8.2%	28.5%	11.1%	17.3%	8.6%	12.9%
2nd Trimester	35.7%	24.0%	20.2%	19.5%	20.5%	24.5%		12.0%	33.9%	15.1%	22.2%	12.8%	20.8%
3rd Trimester	43.8%	54.2%	53.4%	49.3%	46.5%	50.7%		39.7%	63.6%	42.4%	37.6%	52.2%	54.3%
Postpartum	---	47.5%	41.1%	37.4%	32.8%	32.5%		29.0%	53.4%	37.0%	32.5%	38.1%	41.4%

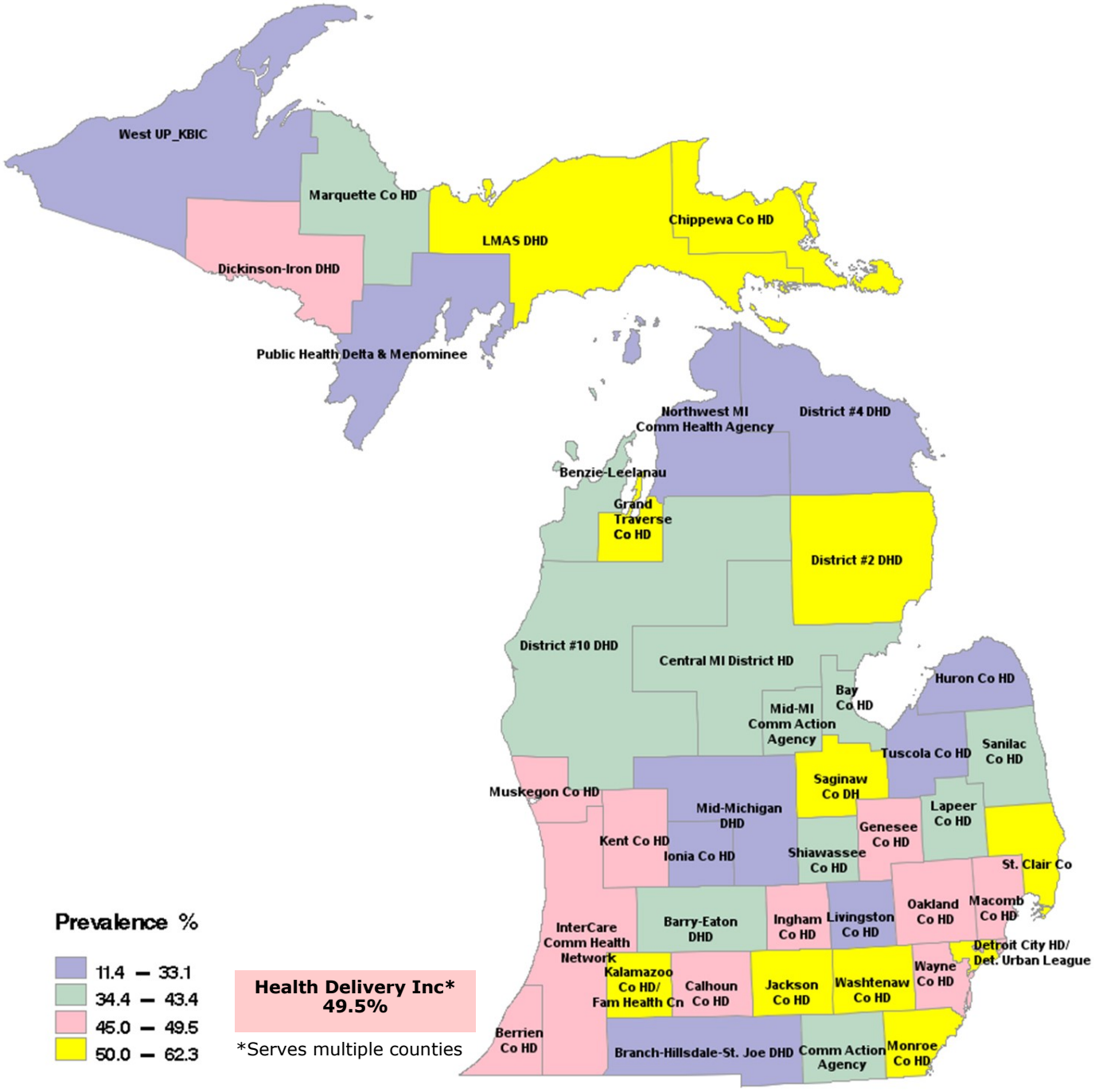
[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]--- Data insufficient for analysis

The prevalence of anemia during the third trimester exceeds the Healthy People 2020 goal of 14.5% for all age groups, as well as racial/ethnic groups (Figure 17). In 2017, over half of all Black, Non-Hispanic women (63.6%) who enrolled during their 3rd trimester were anemic (highest among race/ethnic categories).

The prevalence of anemia during the third trimester decreased with maternal age among mothers 15-40 years old. The estimated third trimester anemia prevalence was higher among women between the ages of 15 to 17 years old and ages 18 to 19 years old (54.2% and 53.4%, respectively). The prevalence was lower among mothers 30—39 years old (46.5%) and mothers younger than 15 years old (43.8%).

The prevalence of anemia during the third trimester varied by agencies as well (Figure 18). Keweenaw Bay Indian Tribe reported the highest prevalence of third trimester anemia (80.0%) followed by Detroit Urban League (71.1%) and the Delta & Menominee reported the lowest (11.4%).

Figure 18: Prevalence of 3rd trimester anemia by local agency, MI-PNSS 2017



Maternal Smoking

Adverse developmental outcomes such as infant mortality, preterm birth, and low birthweight are commonly associated with maternal smoking during pregnancy. In 2016, 9.4% of women who gave birth smoked three months prior to pregnancy (NVSS 2018), and approximately 7.2% of mothers smoked at any time during pregnancy (CDC 2018). In addition, research has shown that there is also an indirect association between maternal smoking and the likelihood of partaking in other high-risk behaviors which ultimately lead to poor birth outcomes.

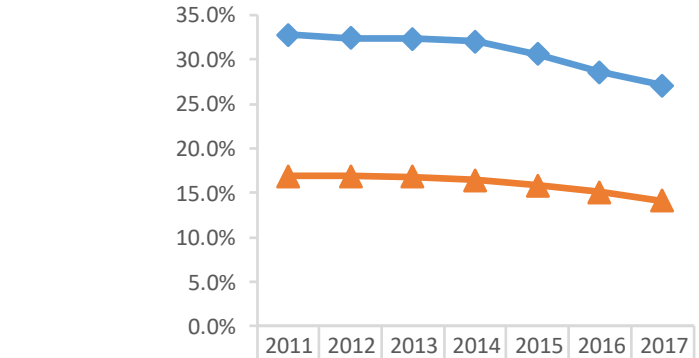
The Healthy People 2020 objective is to increase the rate of abstinence from smoking during pregnancy to 98.6% (USHHS, 2010). To this end, the Michigan WIC program warns women of the detrimental effects associated with smoking, encourages abstinence for healthy fetal development and provides information and referrals for smoking cessation classes.

Healthy People 2020 Objective

Increase the rate of abstinence from smoking during pregnancy to 98.6% (USHHS, 2010)

- The prevalence of smoking three months prior to pregnancy among women enrolled in the Michigan WIC program declined by 17.4% from 2011 to 2017.
- Over one third of women (39.3%) enrolled in WIC reported that they quit smoking by first prenatal visit and stayed off cigarettes.

Figure 19: Trend of maternal smoking prevalence (before and during pregnancy) among women enrolled in WIC, MI-PNSS 2011-2017[1-2]



	2011	2012	2013	2014	2015	2016	2017
Smoking 3 months prior to pregnancy	32.8%	32.4%	32.3%	32.0%	30.6%	28.6%	27.1%
Smoking last 3 months of pregnancy	16.9%	16.9%	16.8%	16.4%	15.8%	15.1%	14.1%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors

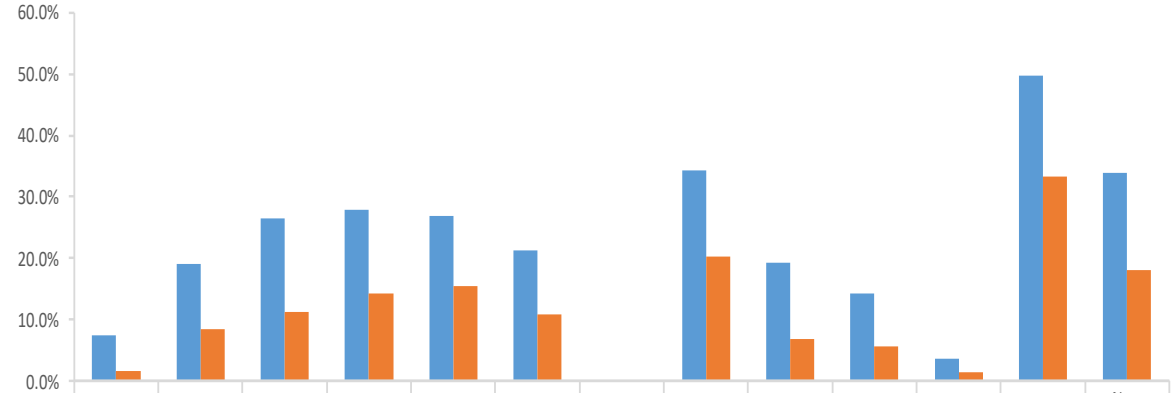
Cigarette smoking is self-reported in PNSS and may be underreported and subject to recall bias. To be classified as a smoker, a woman must report smoking an average of one or more cigarettes per day. The prevalence of smoking three months prior to pregnancy among women enrolled in the Michigan WIC program declined by 17.4% from 2011 to 2017 (Figure 19). About one in every seven women (14.1%) smoked during the last three months of pregnancy; a 16.6% decrease from 2011. Among Michigan WIC enrollees, 27.1% of women smoked during the three months prior to pregnancy compared to 29.5% of women enrolled in

MWR states and Hawaii (PNSS). 44.1% of women enrolled in WIC reported that they quit smoking by the first prenatal visit and remained abstinent from cigarettes.

Among racial/ethnic groups, Asian/Pacific Islander women reported the lowest prevalence of smoking during their third trimester (1.4%), while American Indian women (33.3%) reported the highest prevalence (Figure 20). There was less variation in the prevalence of third trimester smoking by age group.

The prevalence of maternal smoking did vary by agency (Figure 21). Detroit Department of Health and Wellness Promotion reported the lowest prevalence of smoking during the last three months (5.7%), and the highest prevalence of quitting smoking (57.4%). Close to half of the women (49.5%) enrolled at District Health Dept. #2, District Health Dept. #4, Luce-Mackinac-Alger-Schoolcraft DHD, and Keweenaw Bay Indian Tribe reported smoking three months prior to pregnancy. The Luce-Mackinac-Alger-Schoolcraft DHD had the highest prevalence of smoking during the last trimester (35.3%). Differences in maternal smoking prevalence among the agencies may likely be due to the difference in racial/ethnic distribution of the agencies as smoking rates differ by race/ethnicity.

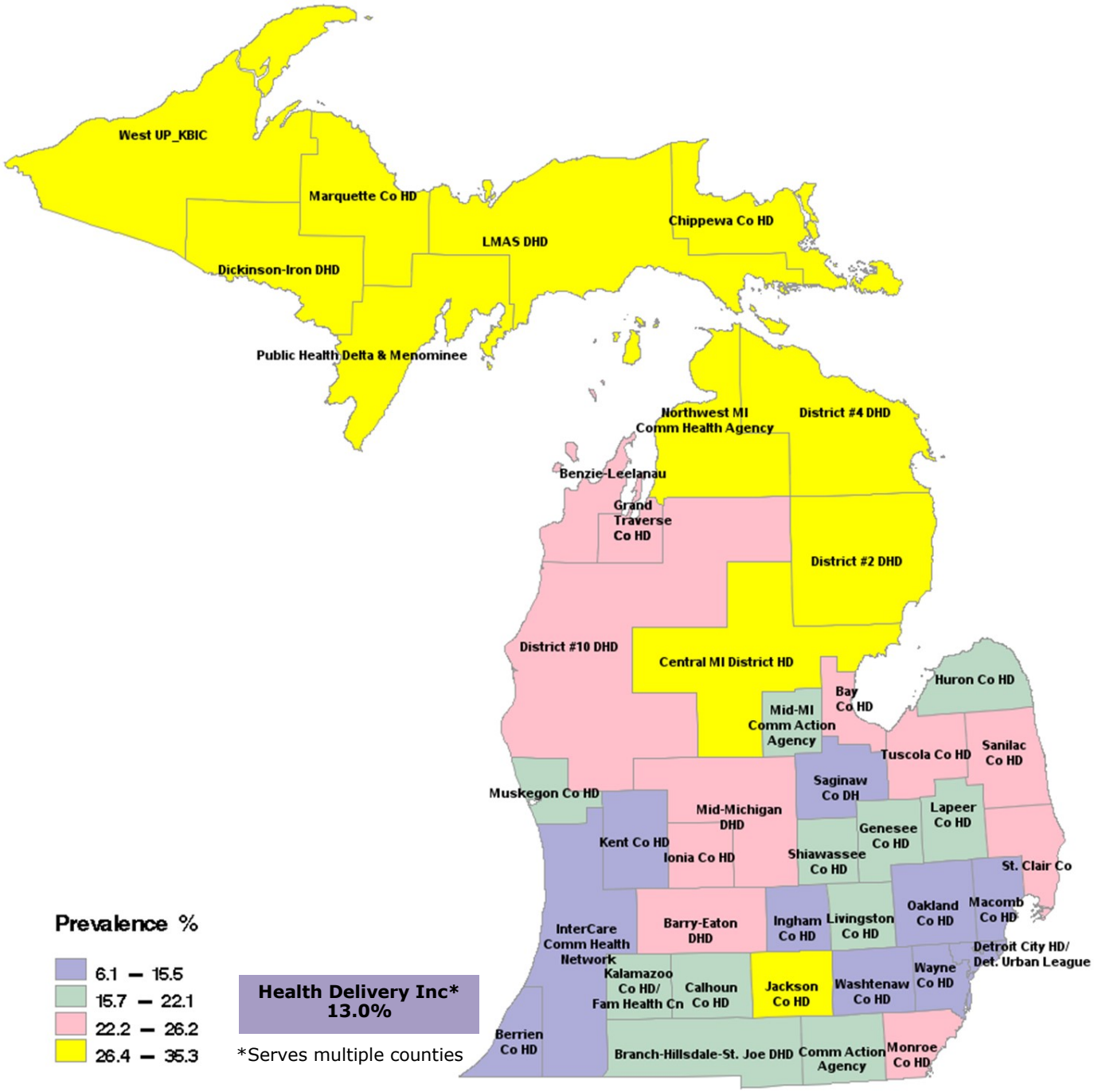
Figure 20: Prevalence of smoking (3 months prior to pregnancy and during the last 3 months of pregnancy) among women enrolled in WIC by race/ethnicity and age MI-PNSS 2017[1-2]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
Smoking 3 Months Prior to Pregnancy	7.4%	19.0%	26.4%	27.9%	26.8%	21.2%		34.3%	19.3%	14.2%	3.6%	49.7%	34.0%
Smoking Last 3 Months of Pregnancy	1.5%	8.5%	11.2%	14.3%	15.5%	10.8%		20.2%	6.9%	5.7%	1.4%	33.3%	18.1%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors

Figure 21: Prevalence of smoking during the last trimester by local agency, MI-PNSS 2017



Maternal Drinking

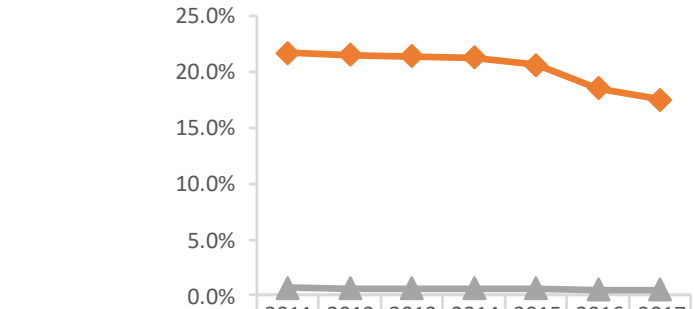
There is a large amount of evidence surrounding the detrimental effects of maternal drinking during pregnancy. While there is no known safe amount of alcohol to drink, the CDC recommends that women should not drink if they are pregnant or planning to become pregnant (CDC, 2015). Alcohol can easily cross the placenta and enter the bloodstream of the fetus when a woman consumes alcohol during pregnancy. Because the fetus cannot break down alcohol the way an adult can, the fetal blood level remains high for a longer period of time (SAMHSA, 2014). Fetal alcohol spectrum disorders (FASD) are caused by maternal consumption of alcohol. Low birthweight, abnormal facial features, learning disabilities, vision or hearing problems, among others are all clinical signs and behaviors characterized by FASD (CDC, 2015). There is also an increased risk of miscarriage associated with alcohol consumption during the first three months of pregnancy (Nykjaer, et al., 2014).

During WIC enrollment, women are asked on average how many drinks per week they consumed three months prior to pregnancy and during the last three months of pregnancy. Because the data is self-reported, it is subject to recall bias and underreporting.

In 2017, 17.5% of women enrolled in WIC reported drinking prior to pregnancy, while 0.5% reported drinking during their last trimester of pregnancy (Figure 22). Both rates have decreased from 2011 to 2017.

The prevalence of drinking prior to pregnancy was lowest among teens less than 15 years of age (2.9%) when compared to women ages 20-29 (19.5%). Non-Hispanic multiracial women and Native American women had the highest reported prevalence of alcohol consumption 3 months prior to pregnancy (22.5% and 25.3%, respectively); Asian/ Pacific Islander had the lowest (3.5%).

Figure 22: Trend of maternal drinking prevalence (before and during pregnancy) among women enrolled in WIC, MI-PNSS 2011-2017[1-2]



	2011	2012	2013	2014	2015	2016	2017
Drinking 3 months prior to pregnancy	21.7%	21.5%	21.4%	21.3%	20.6%	18.5%	17.5%
Drinking last 3 months of pregnancy	0.7%	0.6%	0.6%	0.6%	0.6%	0.5%	0.5%

[1]Recording period is January 1st through December 31st
[2]Excludes records with unknown data and errors

Pediatric Health Indicators

Infant Low Birthweight

Low birthweight is defined as birthweight less than 2,500 grams (5 pounds and 8 ounces) regardless of gestational age. It is a well-established risk factor for neonatal and post-neonatal mortality and morbidity. A large body of evidence has shown that infants born with low birthweight present a higher risk of a variety of health problems including neurodevelopmental disabilities and respiratory disorders. In addition, infants with low birthweight who gain excessive weight during infancy and early childhood have a greater risk of developing metabolic syndromes such as obesity, hypertension, and diabetes which is associated with an increased risk of cardiovascular disease (Gluckman, 2008, Casey, 2008;Euser et al., 2005; Barker, 2004; Hales & Ozanne, 2003; Vohr et al., 2000). Healthy People 2020 established a target incidence of 7.8% for low birthweight, a goal yet to be attained in the Michigan or National PNSS population.

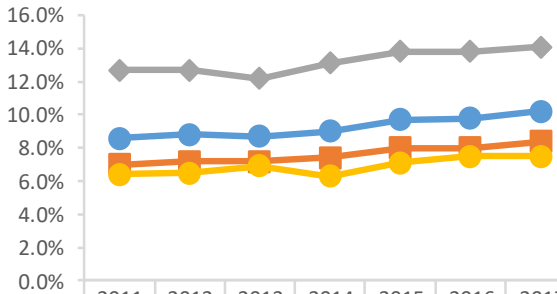
Birthweight is reported in both PNSS and PedNSS; PNSS reports infant demographics for infants whose mother enrolled in WIC, while PedNSS includes infants enrolled in WIC whose mother may or may not have enrolled in WIC. For this section, we report PNSS data only. In 2017, the incidence of low birthweight in Michigan PNSS population was 10.2%, higher than the MWR states and Hawaii at 9.7% (prior year). The overall incidence of low birthweight among Michigan PNSS has increased 18.6% from 2011 to 2017 (Figure 23). The trend is consistently observed from different race/ethnic groups, and racial disparities persist as seen in the 2010-2016 MI PNSS and PedNSS report. Among Black, Non-Hispanics, the rate remains excessively high at 14.1%, compared to 8.4% of White, non-Hispanic infants and 7.5% of Hispanic infants.

Healthy People 2020 Objective

Reduce the incidence of low birthweight (<2,500 grams) to 7.8%

Reduce the incidence of very low birthweight (<1,500 grams) to 1.4%

Figure 23: Trend in low birthweight incidence by race/ethnicity among infants born to mothers enrolled in WIC, MI PNSS 2011-2017[1-4]



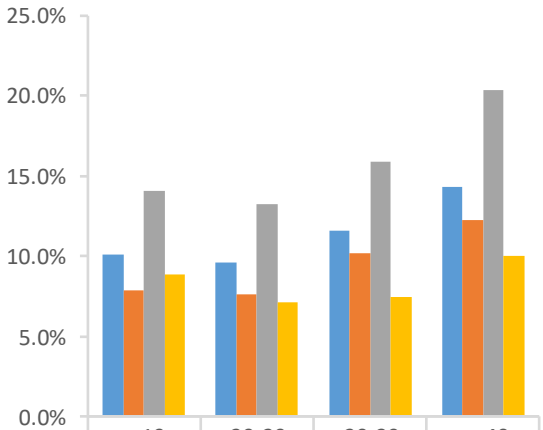
	2011	2012	2013	2014	2015	2016	2017
Total	8.6%	8.8%	8.7%	9.0%	9.7%	9.8%	10.2%
White, Non-Hispanic	7.0%	7.2%	7.2%	7.4%	8.0%	8.0%	8.4%
Black, Non-Hispanic	12.7%	12.7%	12.2%	13.1%	13.8%	13.8%	14.1%
Hispanic	6.4%	6.5%	6.9%	6.3%	7.1%	7.5%	7.5%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors frequency missing [3] Analyses based on one record per child. [4]Low birthweight (lbw) < 2,500 grams regardless of gestational age

Analysis of low birthweight by selected maternal characteristics are presented in Figures 26–29 and Table 9. Overall, low birthweight incidence is highest among infants born to mothers older than 40 years and lowest among women ages 20-29 years (Figure 24).

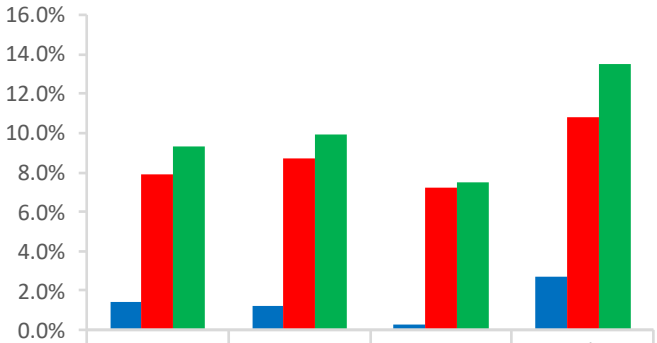
There are obvious disparities between maternal race/ethnic and age groups. The highest incidence of low birthweight was reported by Black, Non-Hispanic women. (20.4%) over the age of 40 years. The lowest incidence (7.1%) was among Hispanic women ages 20-29 years.

Figure 24: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal age and by maternal race/ethnicity, MI-PNSS 2017[1-4]



	< 19 years	20-29 year	30-39 year	>=40 years
Total	10.1%	9.6%	11.6%	14.3%
White, Non-Hispanic	7.9%	7.6%	10.2%	12.3%
Black, Non-Hispanic	14.1%	13.3%	15.9%	20.4%
Hispanic	8.9%	7.1%	7.5%	10.0%

Figure 25: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal trimester of entry into WIC, MI-PNSS 2017[1-4]

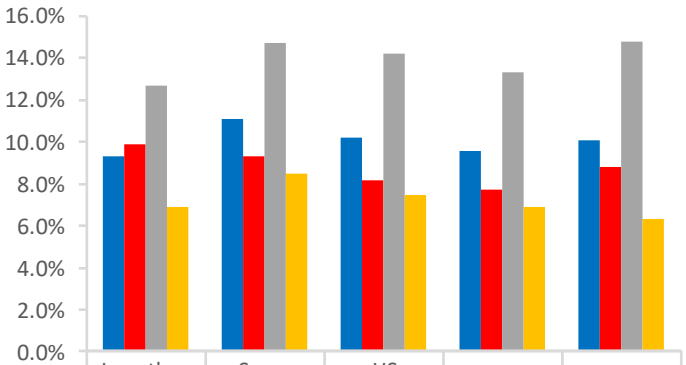


	first trimester	second trimester	third trimester	at postpartum visit
Very Low (<1500 grams)	1.4%	1.2%	0.3%	2.7%
Moderately Low (>1500 to <2500 grams)	7.9%	8.7%	7.2%	10.8%
Low (< 2500 grams)	9.3%	9.9%	7.5%	13.5%

Infant low birthweight incidence was lower among women who enrolled in WIC during their 3rd trimester (7.5%) compared to women enrolled at other times (Figure 25). This finding is consistent with the 2015 and 2016 PNSS and PedNSS trend reports. This may be because women that enrolled later tend to have lower risk (medical, anthropometric, or biochemical).

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child. [4]Low birthweight (lbw) <2,500 grams (g), moderately low birthweight (mlbw)<2,500g and >1,500g, very low birthweight <1,500g- regardless of gestational age

Figure 26: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal education and by maternal race/ethnicity, MI-PNSS 2017[1-4]



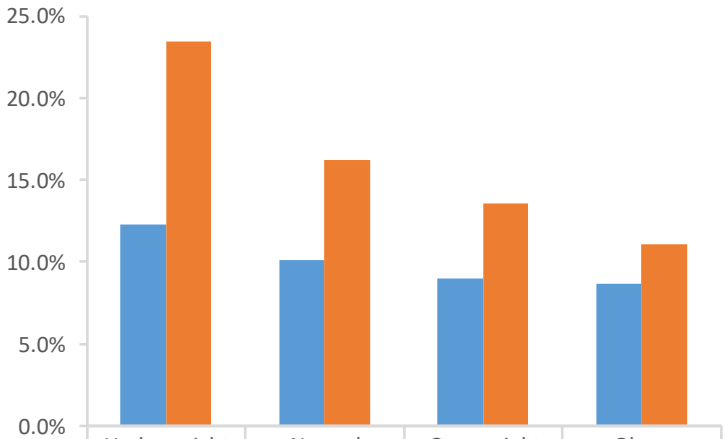
	Less than High School	Some High School	HS Diploma/ GED	Some College	16+ years
Total	9.3%	11.1%	10.2%	9.6%	10.1%
White, Non-Hispanic	9.9%	9.3%	8.2%	7.7%	8.8%
Black, Non-Hispanic	12.7%	14.7%	14.2%	13.3%	14.8%
Hispanic	6.9%	8.5%	7.5%	6.9%	6.3%

Black, Non-Hispanic mothers have the highest prevalence of delivering low birth weight infants across all maternal education level groups. Among all racial/ ethnic groups, mothers with some college had the lowest prevalence of delivering low birthweight infants (Figure 26).

Figure 27: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal prenatal BMI and smoking, MI-PNSS 2017[4]

Close to one in four infants born to mothers who smoked in their last trimester and were underweight pre-pregnancy, had low birthweight (23.5%).

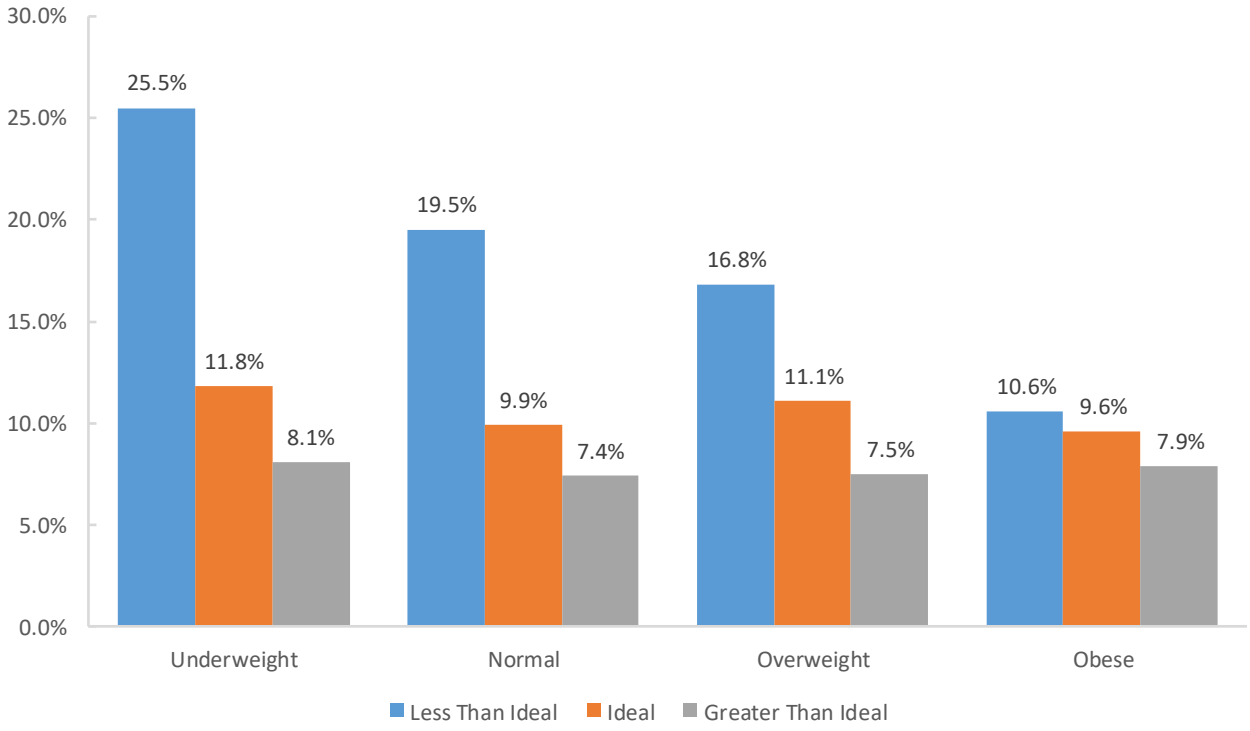
These findings support maternal smoking in the last trimester and low maternal prenatal BMI as risk factors for infant low birthweight.



	Underweight	Normal	Overweight	Obese
Did not smoke	12.3%	10.1%	9.0%	8.7%
Smoked	23.5%	16.2%	13.6%	11.1%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child. [4]Low birthweight (lbw) <2,500 grams

Figure 28: Incidence of low birthweight among Michigan infants born to mothers enrolled in MI WIC by maternal prenatal BMI and maternal weight gain, MI-PNSS 2017[1-4]



[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors frequency missing
[3] Analyses based on one record per child. [4]Low birthweight (lbw) <2,500 grams

In Figure 28, low birthweight was stratified by both maternal prenatal BMI and maternal weight gain during pregnancy. Low birthweight incidence was especially high among women who were underweight and gained less than the recommended weight during their pregnancies.

Both maternal prenatal weight and gestational weight gain can have significant effects on the outcome of an infant's birthweight. There is also a potential interaction effect between maternal prenatal weight and gestational weight gain on an infant's birthweight.

The incidence of low birthweight varied by agencies. The highest incidence was found among infants born to mothers enrolled at the Detroit Urban League at 13.2% while lowest incidence was reported by Western Upper Peninsula DHD at 5.4% (Table 8). Some agencies achieved the Healthy People 2020 objective but further efforts are needed to lower rates throughout Michigan.

Table 8: Incidence of low birthweight among Michigan infants born to mothers enrolled in MI WIC by local agency, MI-PNSS 2017[1]

Highest Incidence of Low Birthweight	
Agency	**%**
Detroit Urban League	13.2%
Saginaw County Dept. of Pub Hlth	12.7%
Detroit DHWP	12.5%
Oakland County HD	12.0%
Genesee County HD	11.9%
Lowest Incidence of Low Birthweight	
Agency	**%**
Downriver Community Serv.	6.7%
Mid-MI Community Action Agency	6.0%
Luce-Mackinac-Alger-Schoolcraft DHD	5.9%
Keweenaw Bay Indian Tribe	5.5%
Western Upper Penin DHD	5.4%
MI-PNSS 2017	

[1] LBW < 2,500 grams regardless of gestational age

Table 9: Adjusted Odds ratio estimates for Low Birthweight by maternal factors, MI-PNSS 2017[1]

Effect	Point Estimate	95% Confidence Limits	
Maternal age: 30 - 39 years vs 20 - 29 years	1.34	1.22	1.47
Maternal age: >= 40 years vs 20 - 29 years	2.01	1.54	2.62
Maternal race: Black, Non-Hispanic vs White, Non-Hispanic	1.93	1.77	2.10
WIC third trimester enrollment vs first trimester	0.73	0.64	0.84
WIC postpartum enrollment vs first trimester	1.33	1.20	1.47
Smoking vs no smoking during last trimester	1.69	1.51	1.88
Pregnancy weight gain more than ideal vs Ideal	0.75	0.68	0.82
Pregnancy weight gain less than ideal vs Ideal	1.76	1.59	1.95
Maternal prenatal BMI underweight vs normal	1.29	1.09	1.53
Maternal prenatal BMI obese vs normal	0.80	0.73	0.89

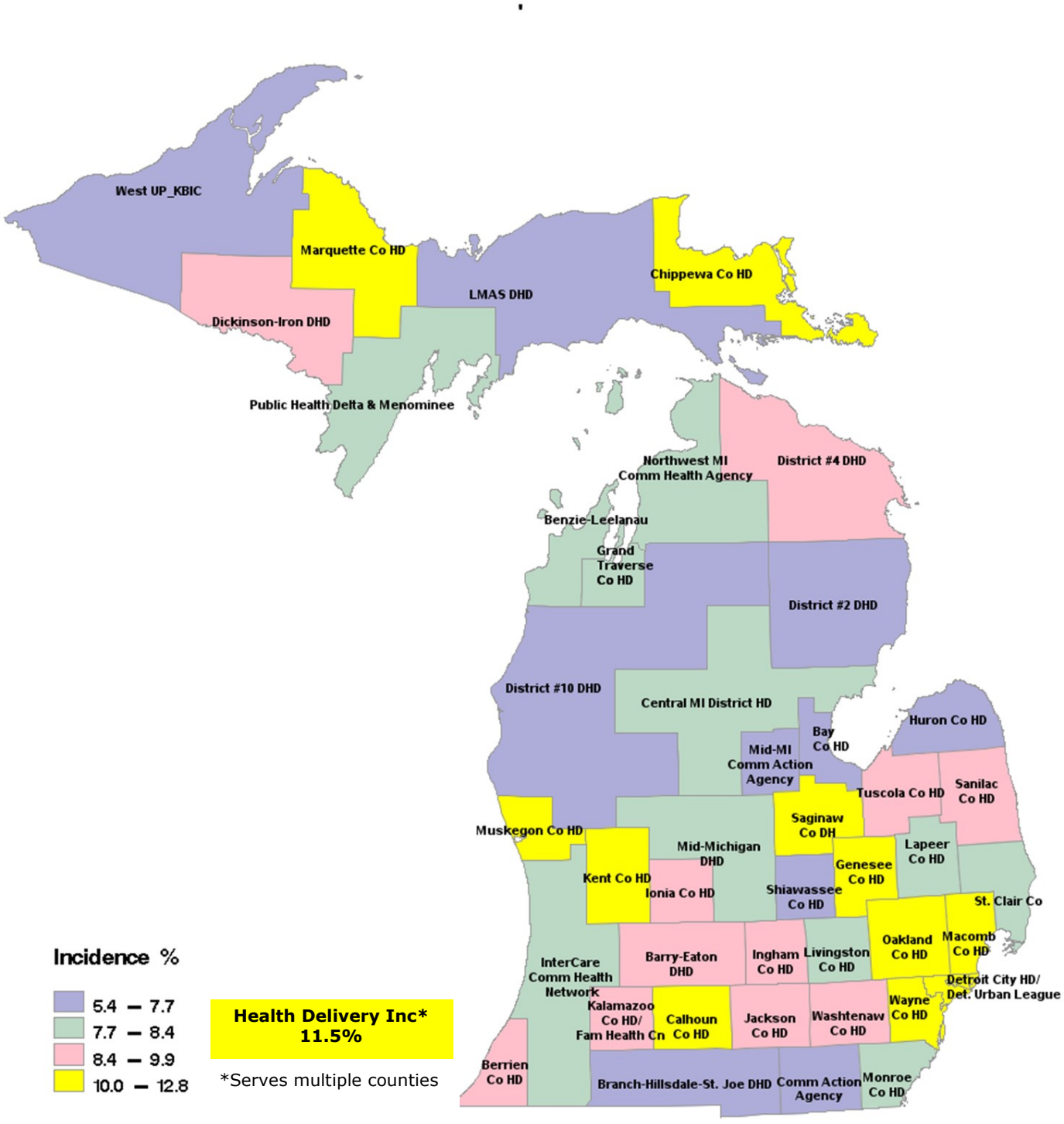
Multinomial regression of low birthweight vs. normal birthweight infant. Model includes: Maternal age, Maternal race & ethnicity, Maternal education, Maternal pre-pregnancy weight, Pregnancy weight gain, PNC enrollment, WIC Enrollment and Smoking during the last trimester

Maternal Factors that increased the odds of a low birthweight infant (Table 9)

After adjusting for other characteristics

- Maternal ages 30-39 and 40 years or older - increased odds by 1.34 times and 2.01 times than that of a 20-29 year old woman, respectively
- Black, Non-Hispanic women – nearly doubled the odds of White, Non-Hispanic women
- WIC enrollment during postpartum - increased odds by 1.33 times that of women enrolled during the 1st trimester
- Underweight prenatal BMI - 1.29 times more likely to have LBW infant than that of normal weight women
- Pregnancy weight gain less than ideal - increased odds by 1.76 times that of ideal weight gain during pregnancy
- Maternal smoking during the last trimester - increased odds by 1.7 times that of non-smoking mothers

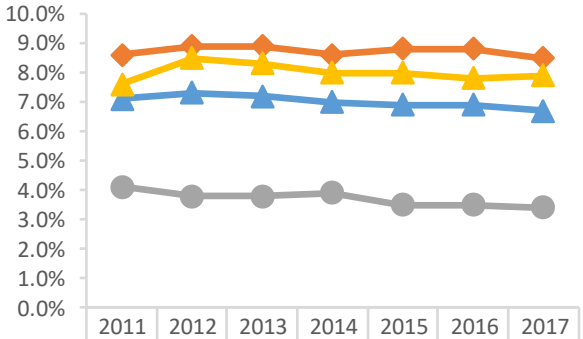
Figure 29: Incidence of infant low birthweight by local agency, MI-PNSS 2017



Infant High Birthweight

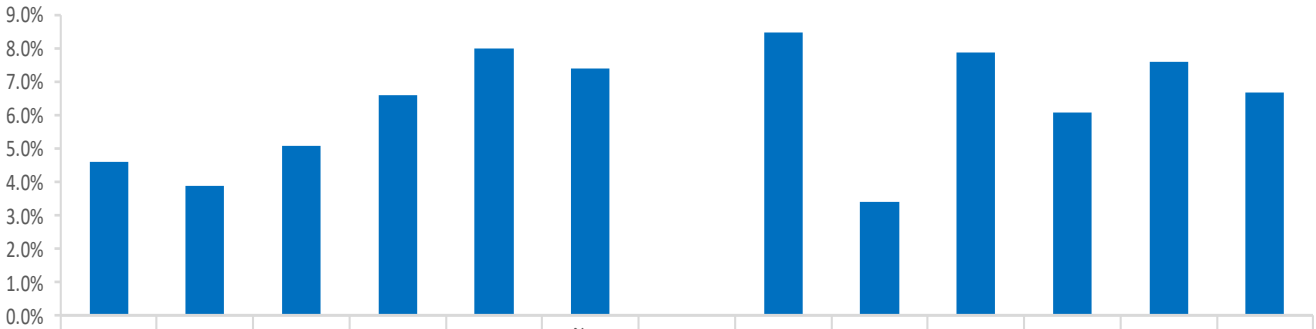
High birthweight (weighing more than 4,000 grams at birth) is associated with difficult labor and delivery. It increases the risk of shoulder dystocia, skeletal fractures, and brachial plexus injury (Siggelkow, Boehm et.al, 2008a, Melendez, Bhatia, Callis, Woolf, & Yoong, 2009). There are two main reasons why babies are large for gestational age: underlying maternal medical problems (e.g. gestational diabetes) or family genetics. Overweight mothers, excessive maternal weight gain during pregnancy, gestational diabetes, or insulin-dependent diabetes mellitus are risk factors for having high birthweight babies (Kramer et al., 2002). The incidence of high birthweight among infants enrolled in WIC in 2017 was 6.7%, a 5.6% decline from 2011 (Figure 30). The incidence of high birthweight varies by maternal race/ethnicity and age group (Figure 31). The high birthweight incidence was lowest among Black, Non-Hispanic infants (3.4%), which was a 17.1% decline from 2011. The highest incidence was found among American Indian infants (12.1%).

Figure 30: Trend of high birthweight incidence by race/ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2017[1-4]



	2011	2012	2013	2014	2015	2016	2017
Total	7.1%	7.3%	7.2%	7.0%	6.9%	6.9%	6.7%
White, Non-Hispanic	8.6%	8.9%	8.9%	8.6%	8.8%	8.8%	8.5%
Black, Non-Hispanic	4.1%	3.8%	3.8%	3.9%	3.5%	3.5%	3.4%
Hispanic	7.6%	8.5%	8.3%	8.0%	8.0%	7.8%	7.9%

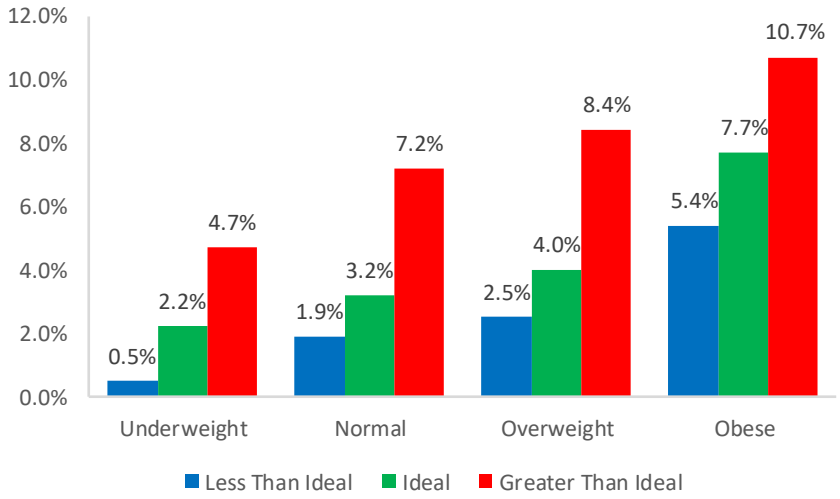
Figure 31: Incidence of high birthweight by maternal age group and race/ethnicity, MI-PNSS 2017[1-4]



	White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Multiracial		< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years
High Birthweight	4.6%	3.9%	5.1%	6.6%	8.0%	7.4%		8.5%	3.4%	7.9%	6.1%	7.6%	6.7%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and error frequency missing [3]Analyses based on one record per child, born during the reporting period [4]High birthweight >4,000 grams regardless of gestational age Note: Data is not sufficient for <15 years group, no estimate is provided.

Figure 32: Incidence of high birthweight by maternal prenatal BMI and maternal gestational weight gain among infants born to mothers enrolled in WIC, MI-PNSS 2017[1-6]



Both prenatal BMI and weight gain during pregnancy were associated with the risk of high birthweight. Women who were overweight or obese had a higher incidence of infant high birthweight, especially among those who gained more than the recommended weight during their pregnancies (Figure 32).

As shown in Table 10, among local WIC agencies, the Detroit Urban League reported the lowest incidence of high birthweight (4.0%), while the Luce-Mackinac-Alger-Schoolcraft DHD reported the highest (14.1%).

Table 10: Incidence of high birthweight among Michigan infants born to mothers enrolled in WIC by local agency, MI-PNSS 2017[6]

Highest Incidence of High Birthweight	
Agency	**%**
Luce-Mackinac-Alger-Schoolcraft DHD	14.1%
Keweenaw Bay Indian Tribe	12.7%
Benzie-Leelanau DHD	12.3%
Chippewa County HD	11.7%
Tuscola County HD	11.0%
Lowest Incidence of High Birthweight	
Agency	**%**
Genesee County HD	4.8%
Health Delivery, Inc	4.8%
Macomb County HD	4.7%
Detroit DHWP	4.5%
Detroit Urban League	4.0%
MI-PNSS	**2017**

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child, born during the reporting period [4] Based on 1990 IOM report, "Nutrition During Pregnancy" [5]Based on 2009 IOM report "Weight Gain During Pregnancy: Reexamining the Guidelines".

Breastfeeding Initiation and Duration

It is well documented that breastfeeding conveys significant benefits to both mothers and children. Breastfeeding reduces the risk of cancer, metabolic profiles, and benefits moms psychologically (Gunderson et al., 2012; Tigas, Sunehag, & Haymond, 2002). Breastfeeding also benefits children both short and long term in areas such as infectious diseases, inflammatory diseases, neurological development, and cancer prevention (Schack-Nielsen & Michaelsen, 2007;Martin RM 2005). Since the 2003-2007 PNSS and PedNSS report, more literature has been published on breastfeeding and childhood obesity, but the association remains inconclusive. More evidence has been cumulating which suggest a modest protective effect of breastfeeding on childhood obesity (Stettler, 2007; Horta, Victora, Menezes, & Barros, 1997; Grummer-Strawn, Mei, & Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System, 2004; Armstrong, Reilly, & Child Health Information Team, 2002) while other studies reported no protective effects. Despite the lack of consensus concerning breastfeeding and obesity, other benefits have been established and it is essential that the Michigan WIC program continues to promote breastfeeding. In doing so, the Michigan WIC program's five year plan established goals to increase the prevalence of breastfeeding initiation to 67% and breastfeeding for 6 months to 20.5% by the year 2018.

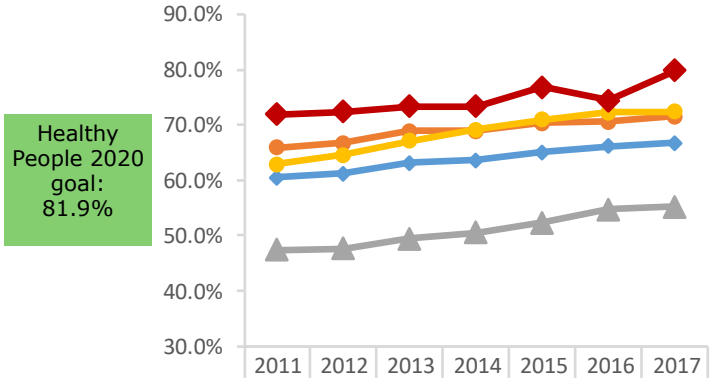
Healthy People 2020 Objective

Increase the prevalence of breastfeeding initiation to 81.9%

Healthy People 2020 target for mothers breastfeeding to 6 months is 60.6% and 34.1% to 12 months.

In 2017, the prevalence of infants ever breastfed among women enrolled in Michigan WIC was 66.7%. Although the prevalence of breastfeeding has not reached the Healthy People 2020 recommendation of 81.9%, prevalence has continued to increase. For instance, the prevalence of breastfeeding initiation among Black, Non-Hispanic women increased by 16.5% from 2011 to 2017, while the overall prevalence increased by 10.2% (Figure 33).

Figure 33: Trend of breastfeeding initiation prevalence by maternal race and ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2011- 2017[1-2]



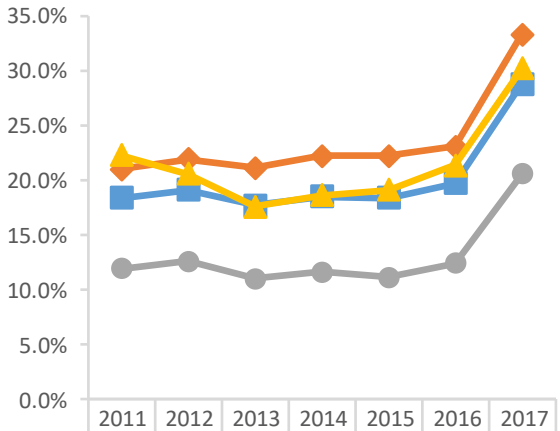
	2011	2012	2013	2014	2015	2016	2017
Total	60.5%	61.2%	63.1%	63.6%	65.1%	66.2%	66.7%
White, Non-Hispanic	65.9%	66.7%	68.9%	68.9%	70.3%	70.6%	71.5%
Black, Non-Hispanic	47.4%	47.6%	49.5%	50.5%	52.3%	54.7%	55.2%
Hispanic	62.9%	64.6%	67.1%	69.2%	70.9%	72.3%	72.4%
Asian/Pacific Islander	71.9%	72.4%	73.4%	73.3%	76.8%	74.5%	79.8%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors

Among infants enrolled in WIC during 2017, the prevalence of breastfeeding to 6 months was 28.8% (a 56.5% increase from 2011). The prevalence increased in Non-Hispanic White, Non-Hispanic Black and Hispanic infants (Figure 34).

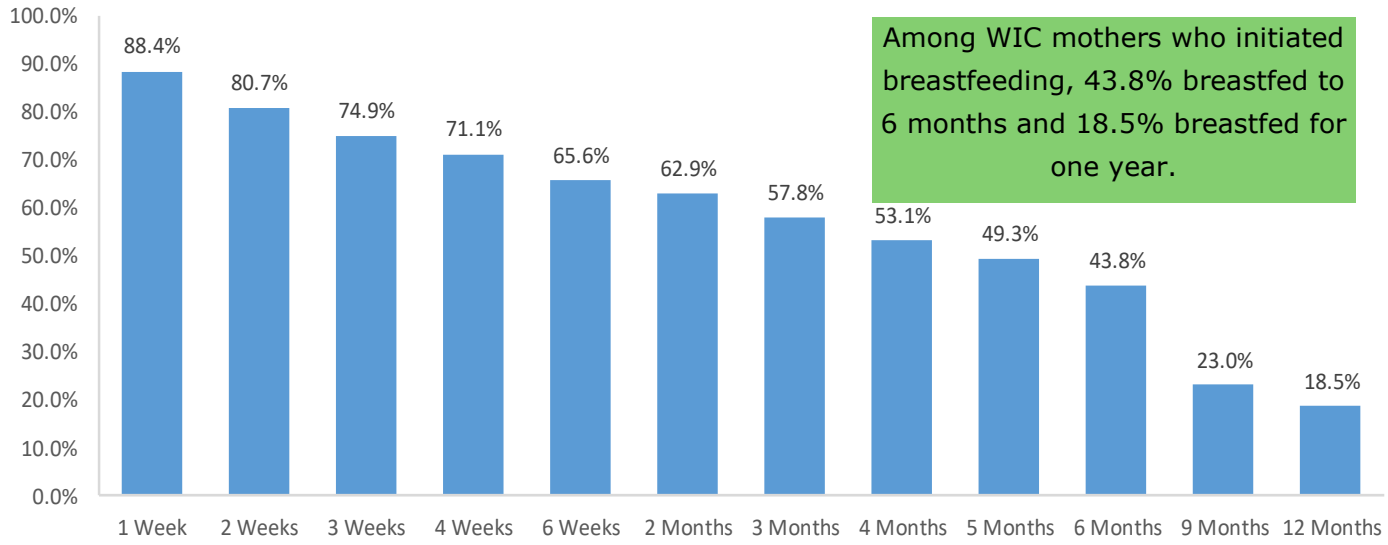
Among infants who were enrolled in 2017 and born to a mother who was enrolled in WIC, the prevalence of breastfeeding for at least 6 months was 43.8%, and 18.5% of infants were breastfed to 12 months. Half of WIC women who initiated breastfeeding stopped breastfeeding after four months (Figure 35).

Figure 34: Trend of breastfeeding for 6 months by race and ethnicity among infants enrolled in WIC, MI-PedNSS 2011-2017[1-3]



	2011	2012	2013	2014	2015	2016	2017
Total	18.4%	19.1%	17.7%	18.5%	18.4%	19.7%	28.8%
White, Non-Hispanic	21.0%	21.9%	21.1%	22.2%	22.2%	23.1%	33.3%
Black, Non-Hispanic	11.9%	12.6%	11.0%	11.6%	11.1%	12.4%	20.6%
Hispanic	22.3%	20.6%	17.6%	18.6%	19.1%	21.4%	30.2%

Figure 35: Prevalence of breastfeeding duration among infants enrolled in WIC and born to mothers enrolled in WIC that initiated breastfeeding, MI-PNSS/PedNSS 2017[1-3]

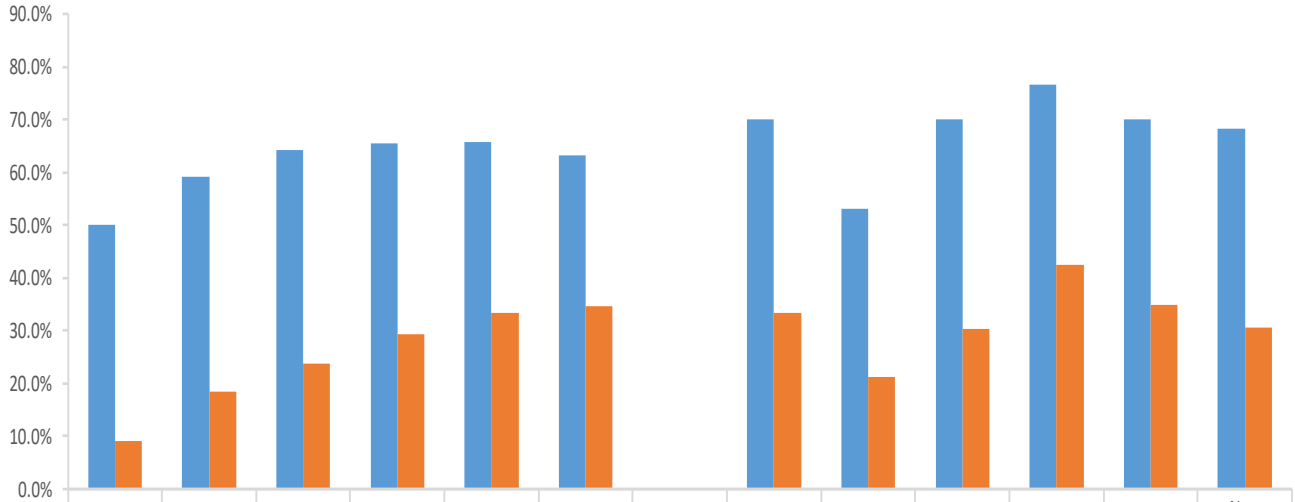


[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child.

Both breastfeeding initiation and duration varied by maternal age and race/ethnicity (Figure 36). In general, adolescent mothers have a lower prevalence of ever breastfeeding. Women 20-39 years old had the highest prevalence of ever breastfeeding compared to the lowest prevalence of 50.0% among mothers younger than 15 years of age. Prevalence of breastfeeding to 6 months increases with maternal age, the highest rate was found among moms older than 39 years (34.5%).

Breastfeeding was most prevalent among Asian/Pacific Islander (76.5%), followed by Hispanic women (70.0%), White, Non-Hispanic women (69.9%), and American Indian women (69.9%). Black, Non-Hispanic women had the lowest prevalence of breastfeeding (53.1%). Additionally, Asian/Pacific Islander (42.5%) women had the highest prevalence of breastfeeding to 6 months,while the lowest prevalence was reported by Black, Non-Hispanic women (21.2%).

Figure 36: Prevalence of being breastfed (ever or to 6 months of age) by maternal race/ethnicity and by age among infants born to mothers enrolled in WIC, MI-PNSS/PedNSS 2017[1-3]



	< 15 Years	15 - 17 Years	18 - 19 Years	20 - 29 Years	30 - 39 Years	>= 40 Years		White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Mutliracial
Ever Breastfed	50.0%	59.2%	64.3%	65.4%	65.7%	63.2%		69.9%	53.1%	70.0%	76.5%	69.9%	68.2%
Breastfed 6 Months	8.9%	18.3%	23.8%	29.3%	33.2%	34.5%		33.4%	21.2%	30.3%	42.5%	34.9%	30.4%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child

The prevalence of breastfeeding initiation and breastfeeding to 6 months by selected maternal characteristics is summarized in Table 11. Breastfeeding initiation rate and duration tended to be higher among women with at least 12 years of education with the lowest rates reported by mothers with some high school education. Women who were either underweight or obese prior to their pregnancies had a lower prevalence of ever breastfeeding or breastfeeding to 6 months compared to normal weight or overweight women. Women that gained less than the ideal amount of weight during pregnancy had a lower prevalence of initiation and breastfeed to 6 months compared to women who gained greater than the ideal amount or gained the ideal amount (Table 11).

Although 56.0% of women who smoked during their last trimester initiated breastfeeding, 23.2% of women who smoked during the last trimester breastfed their infants to 6 months. Finally, more than half (55.6%) of women with anemia during pregnancy initiated breastfeeding, while only 17.9% breastfed to 6 months.

Table 11: Prevalence of breastfeeding initiation and breastfed to 6 months among infants whose mothers enrolled in Michigan WIC in 2017 by selected maternal characteristics, MI-PNSS/PedNSS 2017[1-3]

	Ever Breastfed	Breastfed 6 months
Maternal Education		
Less than High School	60.1%	30.9%
Some High School	53.4%	19.4%
HS Diploma/GED	63.4%	26.6%
Some College	74.2%	36.8%
16+ years	82.8%	52.1%
Maternal Weight Gain		
Less Than Ideal	61.5%	27.0%
Ideal	64.6%	29.3%
Greater Than Ideal	65.7%	30.7%
Smoking 3rd Trimester		
No	65.3%	29.6%
Yes	56.0%	23.2%
Maternal Prenatal BMI		
Underweight	61.7%	27.1%
Normal	65.2%	31.0%
Overweight	65.2%	31.0%
Obese	63.6%	27.7%
Anemia 3rd Trimester		
No	66.7%	31.5%
Yes	55.6%	17.9%
		MI-PNSS/PedNSS 2017

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child

Five agencies exceeded the Healthy People 2020 objective (81.9%) for breastfeeding initiation (Table 12 and Figure 37). The Grand Traverse County Health Department reported 86.5% of women initiated breastfeeding. Contrarily, the lowest prevalence of breastfeeding initiation was reported by the Detroit Department of Health and Wellness Promotion at 49.3%.

The Grand Traverse County Health Department reported the highest prevalence (52.2%) for 6 months duration of breastfeeding (Table 13 and Figure 38). In contrast, the Health Delivery, Inc reported the lowest prevalence of breastfeeding for 6 months (18.9%).

Data for breastfeeding initiation was gathered from infants born to mothers who enrolled in WIC during 2017 (PNSS).

Data for 6 months duration was gathered from infants with breastfeeding data in PedNSS 2017 and whose mothers were enrolled in WIC that initiated breastfeeding.

Table 12: Prevalence of ever breastfed among infants born to mothers enrolled in WIC 2017 by local agency, MI-PNSS 2017[1-3]

Highest Prevalence of Breastfeeding Initiation	
Agency	**%**
Grand Traverse County HD	86.5%
Mid-Michigan DHD	84.8%
Branch-Hillsdale-St. Joe DHD	82.6%
Barry-Eaton DHD	82.5%
Western Upper Penin DHD	82.4%
Lowest Prevalence of Breastfeeding Initiation	
Agency	**%**
Health Delivery, Inc	60.2%
Macomb County HD	58.4%
Genesee County HD	57.8%
Detroit Urban League	49.8%
Detroit DHWP	49.3%
MI-PNSS/PedNSS 2017	

Table 13: Prevalence of breastfeeding to 6 months by local agency among infants enrolled in WIC 2017 and born to mothers enrolled in WIC that initiated breastfeeding, MI-PNSS/PedNSS 2017[1-3]

Highest Prevalence of Breastfeeding to 6 Months	
Agency	**%**
Grand Traverse County HD	52.2%
Dickinson-Iron DHD	47.9%
Western Upper Penin DHD	46.1%
Northwest MI CHA	44.3%
Marquette County HD	44.0%
Lowest Prevalence of Breastfeeding to 6 Months	
Agency	**%**
Genesee County HD	23.4%
Macomb County HD	23.1%
Detroit DHWP	20.9%
Detroit Urban League	19.8%
Health Delivery, Inc	18.9%
MI-PNSS/PedNSS 2017	

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors. [3]Analyses based on one record per child.

Figure 37: Prevalence of breastfed (ever) by local agency, MI-PNSS 2017

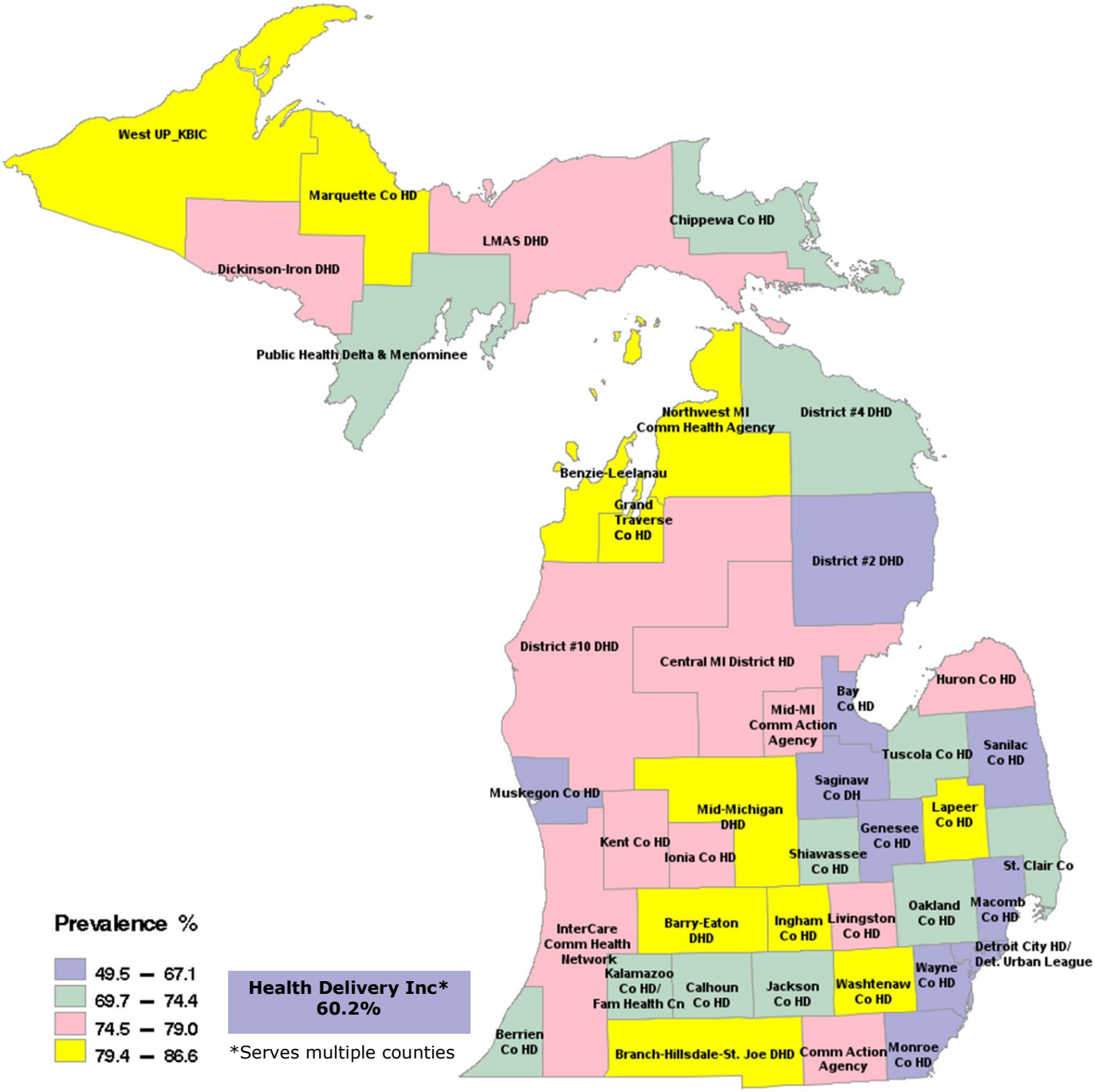
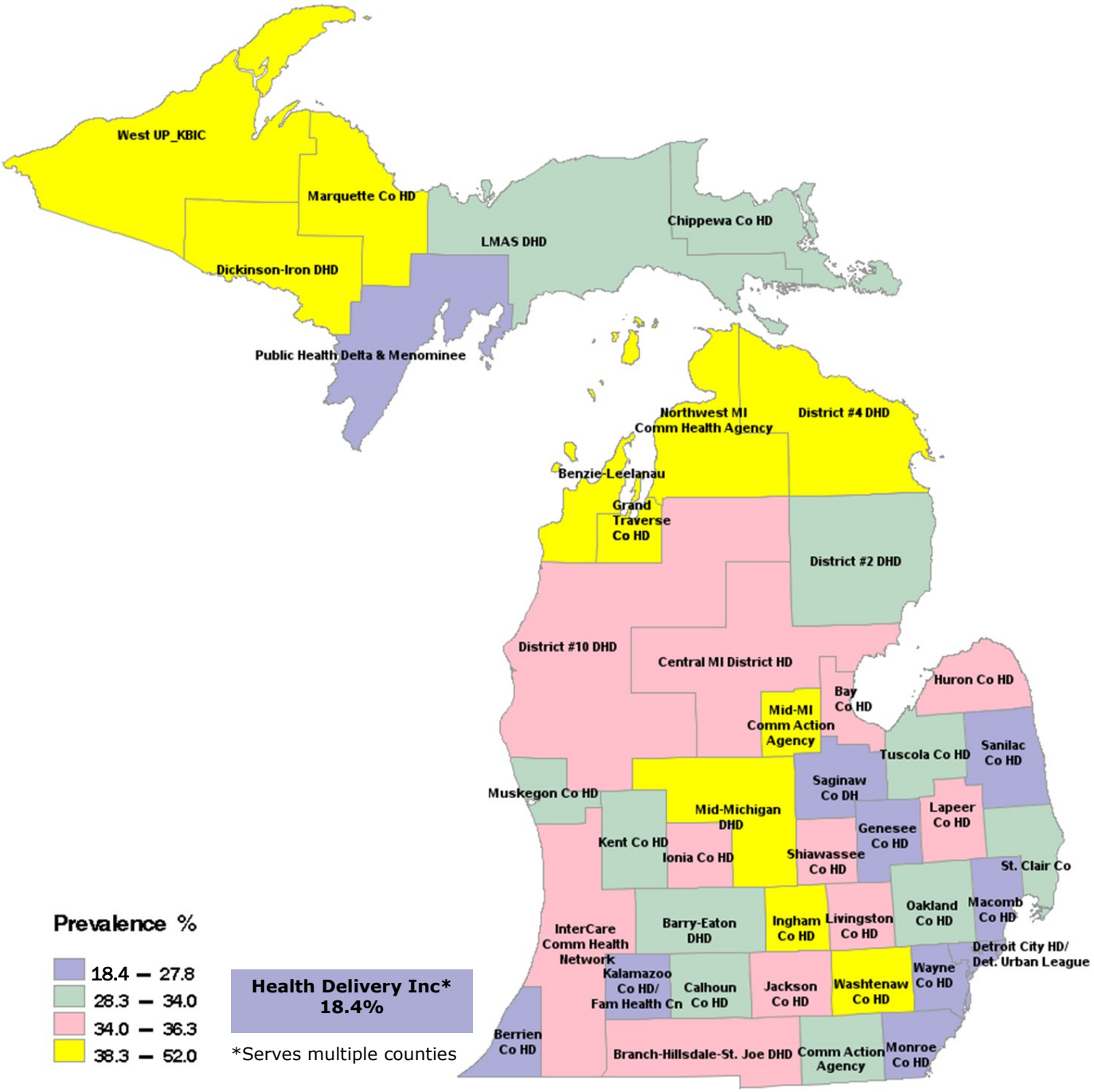


Figure 38: Prevalence of breastfed to 6 months by local agency, MI-PNSS/ PedNSS 2017

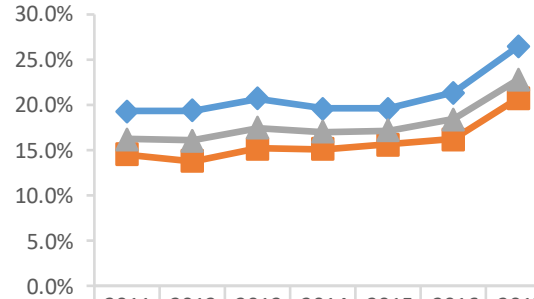


Anemia

Anemia is a condition marked by a deficiency of red blood cells or of hemoglobin in the blood. It may be related to nutritional deficiencies of vitamins B_{12}, B_6, C, folate, copper, or iron and other conditions such as thalassemia, sickle cell disease, bone marrow suppression, or lead poisoning. In children, anemia is associated with poverty, malnutrition, malabsorption, and inadequate dietary intake thus children enrolled in WIC may be at higher risk of anemia. Previous evidence suggests iron deficiency is associated with poorer motor function in infants (Shafir et al., 2008) and poorer infant social-emotional behavior (Carter et al., 2010).

Infants and children enrolled in WIC are not tested specifically for iron deficiency but either their hematocrit (Hct) or hemoglobin (Hb) is measured and adjusted for clinic altitude. In PedNSS, children ages 6 months to 2 years are considered anemic if their Hb is less than 11.0g/dl or their Hct is less than 32.9%. Children 2 to 5 years of age are considered anemic if their Hb is less than 11.1g/dl or their Hct is less than 33.0%.

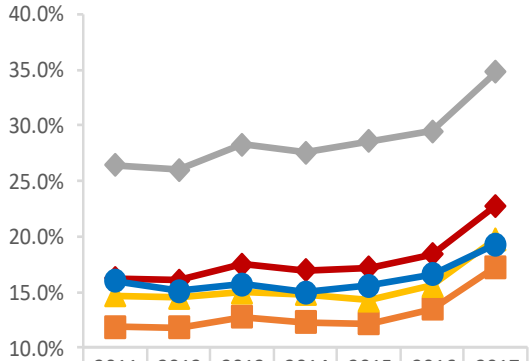
Figure 39: Trend of pediatric anemia prevalence among children <5 years enrolled in WIC, MI-PedNSS 2011-2017[1-4]



	2011	2012	2013	2014	2015	2016	2017
Under 2 years	19.3%	19.4%	20.7%	19.6%	19.6%	21.4%	26.5%
2 to 5 years	14.5%	13.8%	15.2%	15.1%	15.6%	16.2%	20.8%
Overall	16.3%	16.1%	17.5%	17.0%	17.2%	18.4%	22.8%

From 2011 to 2017, the prevalence of anemia among all children 5 years and younger increased by 39.9%. The overall prevalence of anemia in children in 2017 was 22.8.%. It was especially high among children under 2 years of age (26.5%) (Figure 39).

Figure 40: Trend of pediatric anemia prevalence by race/ethnicity among children <5 years enrolled in WIC, MI-PedNSS 2011-2017[1-4]



	2011	2012	2013	2014	2015	2016	2017
Total	16.3%	16.1%	17.5%	17.0%	17.2%	18.4%	22.8%
White, Non-Hispanic	11.9%	11.8%	12.8%	12.3%	12.2%	13.5%	17.3%
Black, Non-Hispanic	26.5%	26.0%	28.3%	27.6%	28.6%	29.5%	34.8%
Hispanic	14.7%	14.5%	15.0%	14.8%	14.3%	15.6%	19.8%
Asian/Pacific Islander	16.0%	15.1%	15.7%	15.0%	15.6%	16.6%	19.3%

The prevalence of anemia among Black, Non-Hispanic children was significantly higher than other racial/ethnic groups. In 2017, the prevalence of Black, Non-Hispanic (34.8%) was more than double that of White, Non-Hispanic children (17.3%) (Figure 40).

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child [4]Based on 1998 CDC MMWR, "Recommendations to Prevent and Control Iron Deficiency in the United States", altitude adjusted.

There is a clear disparity of pediatric anemia by race/ethnicity. Black, Non-Hispanic children had the highest prevalence of anemia, more than twice that of White, Non-Hispanic children, and Hispanic children. Among Black, Non-Hispanic children, those whose mothers enrolled at an earlier time had a lower prevalence of anemia.

Because of racial disparities in anemia prevalence, agencies with a higher proportion of Black, Non-Hispanic children tended to have a higher prevalence of anemia (Table 14 and Figure 42). More than one-third (45.3%) of the children enrolled at the Detroit Urban League were anemic, where 75.4% of children are Black, Non-Hispanic. Although the proportion of Black, Non-Hispanic children enrolled at the Intercare County Health Department is lower (3.7%), the anemia prevalence was the 5th highest in the state (29.8%). Conversely, Health Delivery, Inc. serves a WIC cohort with more than half Black, Non-Hispanic (53.9%) and the anemia prevalence was one of the lowest in the state (17.9%).

Furthermore, agencies with the lowest prevalence of anemia enrolled only 4.2% of Black, Non-Hispanic children. The Delta & Menominee Health Department reported the lowest prevalence of anemia among children (5.2%).

Figure 41: Prevalence of pediatric anemia by maternal race/ethnicity and trimester of WIC enrollment among children <5 years enrolled in WIC, MI-PNSS 2012-2017/PedNSS 2017[1-4]

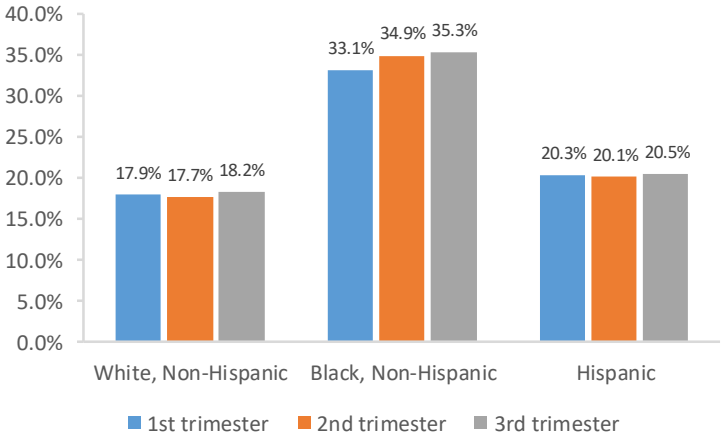
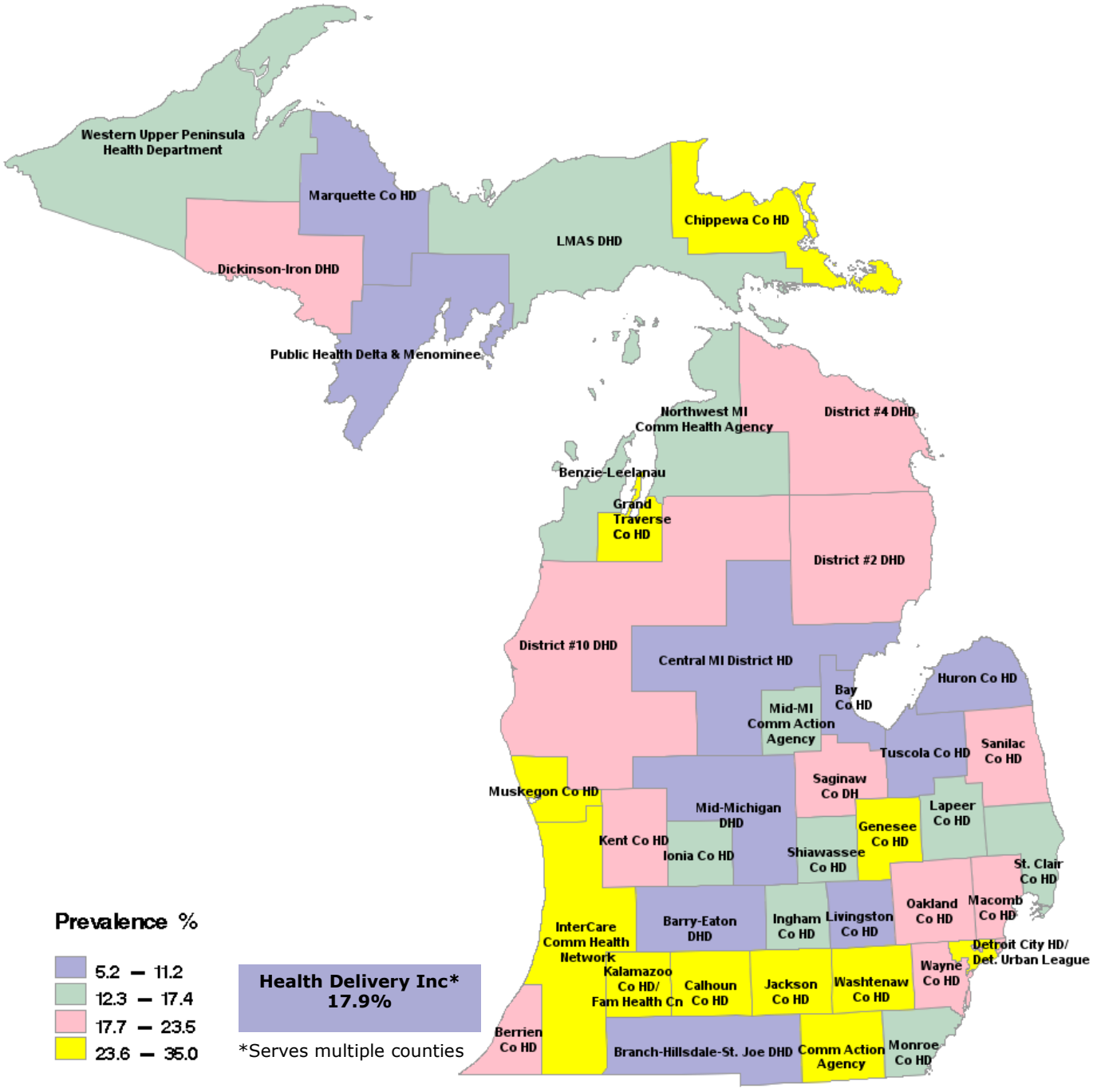


Table 14: Prevalence of anemia among children <5 years enrolled in WIC by local agency, MI-PedNSS 2017[1-4]

Highest Prevalence of Anemia - Children 5 years	
Agency	**%**
Detroit Urban League	45.3%
Kalamazoo County HD	34.1%
Keweenaw Bay Indian Tribe	32.6%
Kalamazoo Family Health Center	31.1%
Muskegon County HD	30.1%
Lowest Prevalence of Anemia - Children 5 years	
Agency	**%**
Western Upper Penin DHD	8.6%
Branch-Hillsdale-St. Joe DHD	8.4%
Marquette County HD	8.3%
Mid-Michigan DHD	5.4%
Delta & Menominee	5.2%
MI - PedNSS 2017	

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child [4] Based on 1998 CDC MMWR, "Recommendations to Prevent and Control Iron Deficiency in the United States" , altitude adjusted.

Figure 42: Prevalence of pediatric anemia by local agency, MI-PedNSS 2017



Undernutrition

Undernutrition among children has long been recognized as a major public health problem, it is a serious and growing challenge especially in low and middle income classes.

Undernutrition has been associated with increased mortality, increased susceptibility to infectious diseases, impaired cognitive development, poor school performance, and delayed physical growth and motor development (Fanjiang, Kleinman,2007, Fishman, Caulfield, de Onis, Blössner, Hyder, & Mullany, 2004, Haas, Murdoch, Rivera, & Martorell, 1996).

Infancy and early childhood are a period of intense growth, thus most vulnerable to nutrient deficiency. Improving health outcomes by improving the level of nutrition remains an imperative public health objective and is part of the Michigan WIC program's mission. Two anthropometric measures, height-for-age and weight-for-height, are used in PedNSS to assess the health status of infants and children in Michigan's WIC population. Because the WIC population is by definition 'at nutritional risk,' the expected prevalence of short stature may be higher than what would be expected among the general population. Height or length is measured and recorded for every child at their certification or recertification visit.

HEALTHY PEOPLE 2020 GOAL

Decrease the prevalence of short stature among low income children under 5 years of age to 5.0%

One local agency achieved this goal in 2017:

- Grand Traverse County HD (4.3%)

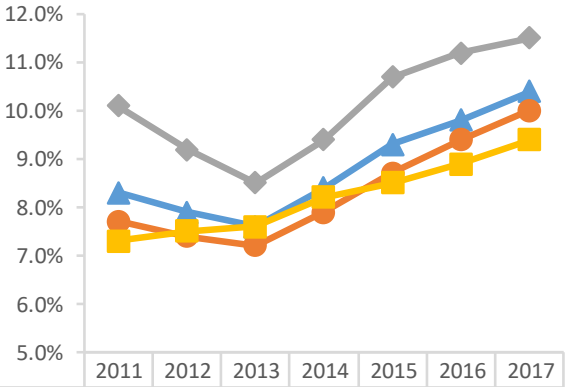
Undernutrition - Short Stature

Short stature (low length/height-for-age) may be associated with short parental stature, low birthweight, or may result from growth retardation, which in turn has been associated with chronic malnutrition and chronic illnesses (WHO, 1996). Before 2010, short stature was defined based on length-for-age for children under 2 years of age and height-for-age for children 2 years of age and older using CDC 2000 growth chart. Since 2010, for children less than 2 years, short stature is defined as length-for-age<=2.3rd percentile based on the WHO 2006 growth chart. For children 2 years and older, short stature is defined when they are less than the 5th percentile height-for-age using the 2000 CDC gender-specific growth chart.

From 2011 to 2017, the prevalence of short stature among children less than 2 years of age in the Michigan WIC population increased from 8.3% to 10.4% (Figure 43). Prevalence of short stature remains consistently higher among Black, Non-Hispanic children.

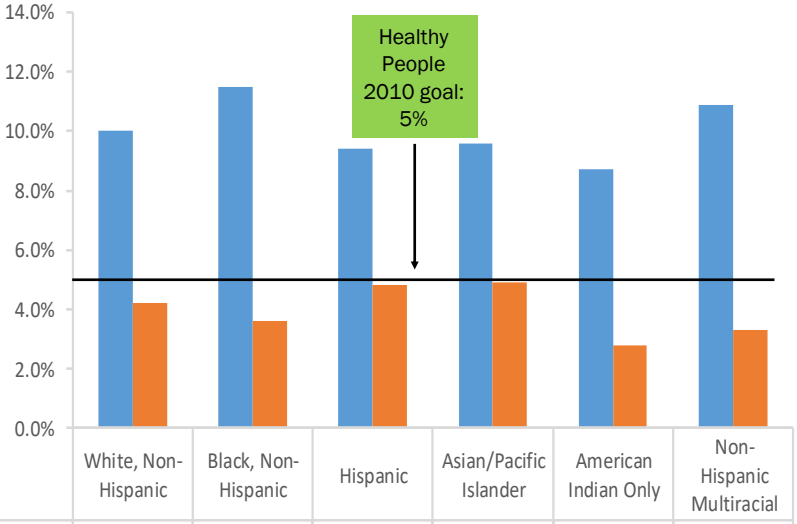
The prevalence of short stature increased across all racial/ethnic groups from 2011 to 2017.

Figure 43: Trend of short stature prevalence by race/ethnicity among children <2 years enrolled in WIC, MI-PedNSS 2011-2017[1-4]



	2011	2012	2013	2014	2015	2016	2017
Total	8.3%	7.9%	7.6%	8.4%	9.3%	9.8%	10.4%
White, Non-Hispanic	7.7%	7.4%	7.2%	7.9%	8.7%	9.4%	10.0%
Black, Non-Hispanic	10.1%	9.2%	8.5%	9.4%	10.7%	11.2%	11.5%
Hispanic	7.3%	7.5%	7.6%	8.2%	8.5%	8.9%	9.4%

Figure 44: Prevalence of short stature among children <5 years enrolled in WIC by race/ethnicity and age group, MI-PedNSS 2017[1-4]



	White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Multiracial
Under 2 years	10.0%	11.5%	9.4%	9.6%	8.7%	10.9%
2 to 5 years	4.2%	3.6%	4.8%	4.9%	2.8%	3.3%

Short stature is less prevalent among children ages 2 to 5 years than among children under 2 years of age (Figure 44). By the age of 2 years, the prevalence of short stature was below the Healthy People 2010 objective for all racial/ethnic groups.

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data & errors [3]Analyses based on one record per child [4]For children under 2 years of age; short stature is defined as length-for-age<=2.3rd percentile based on 2006 WHO growth chart percentiles. For children 2 years of age and older, short stature is defined as length-for-age<=5th percentile based on 2000 CDC growth chart percentiles for height-for-age.

Table 15: Prevalence of short stature among children <5 years enrolled in WIC by local agency, MI-PedNSS 2017[1-4]

Highest Prevalence of Underweight	
Agency	**%**
Sanilac County HD	10.5%
Marquette County HD	9.3%
Genesee County HD	8.8%
Kent County HD	8.8%
Mid-MI Community Action Agency	8.6%
Oakland County HD	8.6%
Agency	**%**
Luce-Mackinac-Alger-Schoolcraft DHD	5.7%
Delta & Menominee	5.7%
Benzie-Leelanau DHD	5.6%
Shiawassee County HD	5.6%
Ionia County HD	5.5%
Grand Traverse County HD	4.3%
MI-PedNSS 2017	

Logistic regression was performed to assess the association between short stature and child/maternal characteristics. Several factors were significantly associated with short stature including: maternal smoking at the prenatal visit, maternal weight gain, trimester of maternal enrollment in WIC, birthweight, and racial/ethnic group.

The prevalence of short stature varied by local WIC agency and ranged from 4.3% reported by the Grand Traverse County Health Department to 10.5% at the Sanilac County Health Department. (Table 15).

Maternal gestational weight gain, prenatal maternal smoking, birthweight are all associated with short stature among children less than 2 years of age.

Table 16: Adjusted Odds ratios for short stature among children <2 years of age by child and maternal effects, MI-PNSS 2015-2017/PedNSS 2017[1-4]

Effect	OR Estimate	95% Confidence Limits	
WIC enrollment: 2nd trimester vs. 1st trimester	1.043	0.959	1.135
WIC enrollment: 3rd trimester vs. 1st trimester	1.007	0.909	1.114
Maternal gestational weight gain: Greater than ideal vs. ideal	0.868	0.796	0.946
Maternal gestational weight gain: Less than ideal vs. ideal	1.122	1.013	1.242
White, Non-Hispanic vs Black, Non-Hispanic	1.05	0.963	1.145
Hispanic vs Black, Non-Hispanic	0.935	0.816	1.072
Asian/Pacific Islander vs Black, Non-Hispanic	0.815	0.6	1.108
American Indian Only vs Black, Non-Hispanic	1.109	0.538	2.284
Non-Hispanic Multiracial vs Black, Non-Hispanic	1.154	0.95	1.401
Smoking at prenatal visit vs non -smoker	1.293	1.176	1.422
High birthweight vs normal birthweight	0.171	0.119	0.246
Low birthweight vs normal birthweight	8.471	7.752	9.256
Very low birthweight vs normal birthweight	27.398	20.998	35.747
MI-PNSS 2015-2017/PedNSS 2017			

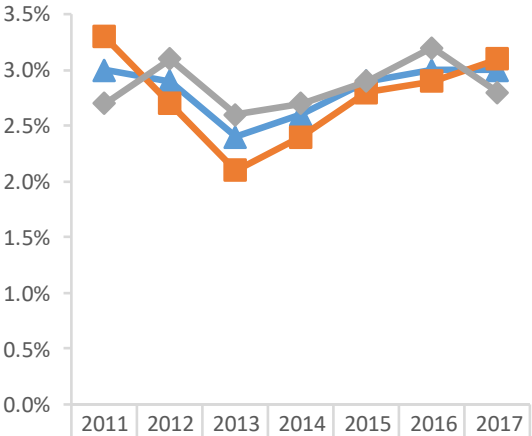
[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and error frequency [3]Analyses based on one record per child [4]For children under 2 years of age; short stature is defined as length-for-age<=2.3rd percentile based on 2006 WHO growth chart percentiles. For children 2 years of age and older, short stature is defined as length-for-age<=5th percentile based on 2000 CDC growth chart percentiles for height-for-age.

Undernutrition-Underweight

Underweight is a health indicator related to undernutrition. For children under 2 years of age, underweight is defined as weight-for-length<=2.3rd percentile based on the 2006 WHO growth chart. For children 2 to 5 years of age, underweight is defined as weight-for-height <5th percentile based on the 2000 CDC growth chart.

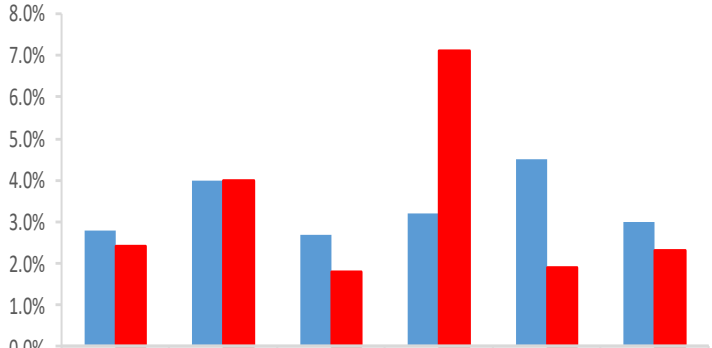
The 2017 overall prevalence for Michigan (3.0%) is lower than the expected prevalence 5%. Among children younger than 2 years of age, the prevalence is at 2.8% and among those 2 to 5 years old the prevalence is 3.1% (Figure 45). Overall, the prevalence of underweight among children in WIC declined from 3.0% in 2011 to 2.4% in 2013. Then bounced back to 3.0% in 2016 and 2017.

Figure 45: Trend of underweight prevalence by age group among children <5 years of age enrolled in WIC, MI-PedNSS 2011-2017[1-4]



	2011	2012	2013	2014	2015	2016	2017
Total	3.0%	2.9%	2.4%	2.6%	2.9%	3.0%	3.0%
Under 2 years	3.3%	2.7%	2.1%	2.4%	2.8%	2.9%	3.1%
2 to 5 years	2.7%	3.1%	2.6%	2.7%	2.9%	3.2%	2.8%

Figure 46: Prevalence of underweight by race/ethnicity and age group among children <5 years enrolled in WIC, MI-PedNSS 2017[1-4]

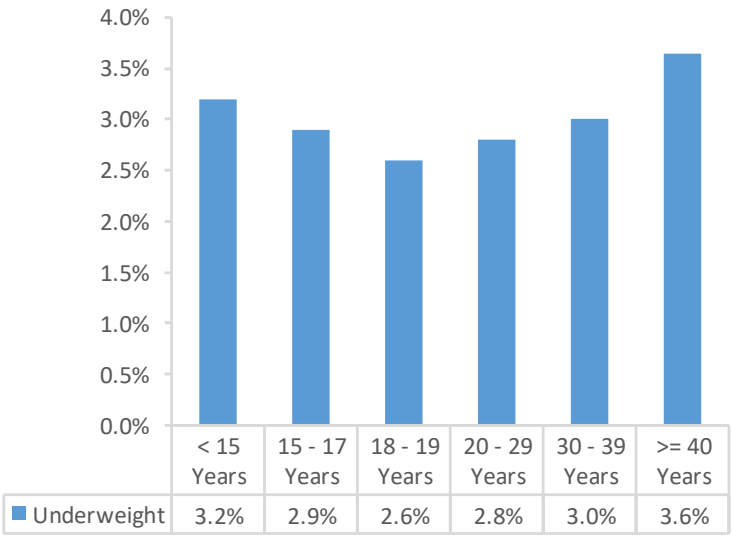


	White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	American Indian Only	Non-Hispanic Multiracial
Under 2 years	2.8%	4.0%	2.7%	3.2%	4.5%	3.0%
2 to 5 years	2.4%	4.0%	1.8%	7.1%	1.9%	2.3%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child [4]Based on 2006 WHO growth chart percentiles. For children under 2 years of age, underweight is defined as weight-for-length <=2.3rd percentile. For children 2 years of age, underweight is defined as BMI <5th percentile based on the 2000 CDC growth chart.

The prevalence of underweight among children of both age groups varied by race/ethnicity (Figure 46). Among children under 2 years old, American Indian children had the highest prevalence (4.5%) followed by Black, Non-Hispanic children (4.0%). Among children 2-5 years old, the prevalence was highest among Asian/Pacific Islander children at 7.1% followed by Black, Non-Hispanic children (4.0%).

Figure 47: Prevalence of underweight among children 2 to 5 years of age enrolled in WIC by maternal age group MI-PNSS 2012-2015/ PedNSS 2017[1-4]



As shown in Figure 47, the prevalence of underweight among children 2 to 5 years of age was highest among mothers over 40 years old (3.6%) followed by young mothers that were younger than 15 years old (3.2%). The prevalence was lowest for mothers 18—19 years old (2.6%) and 20-29 years old (2.8%).

Sanilac County Health Department reported the lowest prevalence of underweight at 0.6%. Grand Traverse County Health Department reported the highest prevalence of underweight at 5.9% followed by Detroit Urban League at 5.5% (Table 17).

Highlight

The reported prevalence of underweight was less than or equal to 5% for 46 agencies in Michigan during 2017.

Grand Traverse County Health Department and Detroit Urban League are the two agencies that exceeded 5% in 2017.

Table 17: Prevalence of underweight among children <5 years of age enrolled in WIC by local agency, MI-PedNSS 2017[1-4]

Highest Prevalence of Underweight	
Agency	%
Grand Traverse County HD	5.9%
Detroit Urban League	5.5%
Jackson County HD	4.8%
Benzie-Leelanau DHD	4.6%
Ionia County HD	4.4%
Lowest Prevalence of Underweight	
Agency	%
Bay County HD	1.5%
Branch-Hillsdale-St. Joe DHD	1.5%
Livingston County HD	1.4%
Huron County HD	1.1%
Sanilac County HD	0.6%
MI-PedNSS 2017	

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3] Analyses based on one record per child [4]Based on 2006 WHO growth chart percentiles. For children under 2 years of age, underweight is defined as weight-for-length<=2.3rd percentile. For children older than 2 years of age, underweight is defined as BMI for age <5th percentile based on 2000 CDC growth chart.

Overweight and Obesity

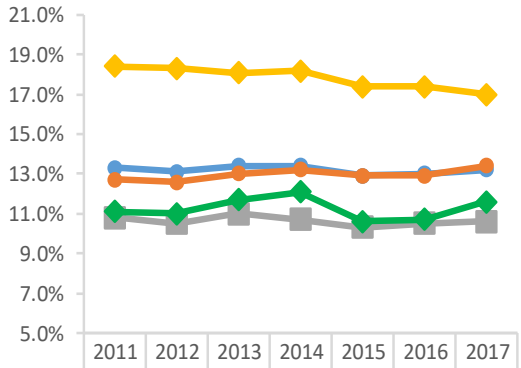
Overweight is defined as having excess body weight for a particular height from fat, muscle, bone, water, or a combination of these factors. Obesity is defined as having excess body fat. Similar to adults, obesity in children has become an epidemic in the United States and in other industrialized countries. Childhood obesity has doubled in the past 30 years. Obesity in children has been associated with a variety of adverse health effects which include increased risk of cardiovascular disease, prediabetes, bone and joint problems, asthma, sleep disorders, and skin infections. Obese children tend to have lower self-esteem and self-confidence than non-obese children and may be stigmatized, bullied, or marginalized by their peers (American Academy of Pediatrics, 2009). Research has found that obesity during childhood can lead to obesity in adulthood and have both immediate and long term effects on their health (Van Dijk & Innis, 2009). Although somewhat controversial, the concept that events in utero or early infancy can increase the risk of childhood and adult obesity has been proposed (Barker, 2004; Stettler, 2007). For example, the rate of weight-gain in infancy has been associated with childhood obesity (Stettler, Zemel, Kumanyika, & Stallings, 2002). Other factors, however, could confound this association (e.g. maternal BMI, low birthweight infants, and the concept of catch-up growth). Nevertheless, higher childhood BMI was found to be associated with increased risk of coronary heart disease in adulthood.

Michigan WIC Program Five Year Plan

Decrease the prevalence of obesity among children 2 to 5 years of age to 13.5% by December 2018.

- In 2017, 19 local agencies have reached the 13.5% goal.

Figure 48: Trend of obesity prevalence by race/ethnicity among children ages 2 to 5 years enrolled in WIC, MI-PedNSS 2011-2017[1-4]

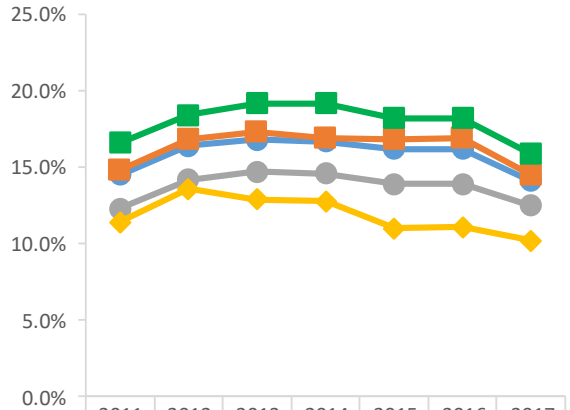


	2011	2012	2013	2014	2015	2016	2017
Total	13.3%	13.1%	13.4%	13.4%	12.9%	13.0%	13.2%
White, Non-Hispanic	12.7%	12.6%	13.0%	13.2%	12.9%	12.9%	13.4%
Black, Non-Hispanic	10.8%	10.5%	11.0%	10.7%	10.3%	10.5%	10.6%
Hispanic	18.4%	18.3%	18.1%	18.2%	17.4%	17.4%	17.0%
Asian/Pacific Islander	11.1%	11.0%	11.7%	12.1%	10.6%	10.7%	11.6%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child [4]Based on the 2000 CDC growth chart percentiles for children 2 years of age and older.

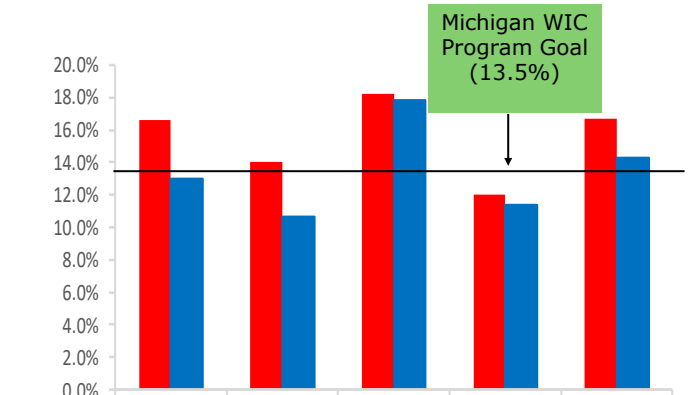
The association increased with age and was stronger for boys than for girls (Baker, Olsen, & Sorensen, 2007). Childhood obesity remains an important public health issue, one that the WIC program continues to address with improved food packages and nutritional counseling. Using the new guidelines from the American Academy of Pediatrics and the CDC gender specific BMI for age chart, a child with a BMI percentile above 95% is considered obese (previously referred to as 'overweight'). Children with a BMI percentile over 85% and less than or equal to 95% are considered overweight (previously 'risk of overweight') (American Academy of Pediatrics, 2009). By definition, 5% of children are expected to be above the 95th percentile due to normal variation. Thus a prevalence of obesity greater than 5% indicates that there is a higher than usual proportion of children who are obese. In 2017, the overall prevalence of obesity among children ages 2 to 5 years enrolled in Michigan WIC was 13.2%. Although higher than the 5% expected level, the increasing trend found in the 2003-2007 report has slowed down and the prevalence in 2017 (13.2%) is even lower than that in 2011 at 13.3% (Figure 48). The prevalence was consistently higher among Hispanic children while lower among Black, Non-Hispanic, and Asian children.

Figure 49: Trend of overweight prevalence by race/ethnicity among children 2 to 5 years enrolled in WIC, MI-PedNSS 2011-2017[1-4]



	2011	2012	2013	2014	2015	2016	2017
Total	14.5%	16.4%	16.8%	16.7%	16.2%	16.2%	14.1%
White, Non-Hispanic	14.8%	16.8%	17.3%	16.9%	16.8%	16.9%	14.5%
Black, Non-Hispanic	12.3%	14.2%	14.7%	14.6%	13.9%	13.9%	12.5%
Hispanic	16.6%	18.4%	19.2%	19.2%	18.2%	18.2%	15.9%
Asian/Pacific Islander	11.4%	13.6%	12.9%	12.8%	11.0%	11.1%	10.2%

Figure 50: Prevalence of obese and overweight among children ages 2 to 5 years enrolled in WIC by race/ethnicity, MI-PedNSS 2017[1-4]



	White, Non-Hispanic	Black, Non-Hispanic	Hispanic	Asian/Pacific Islander	Non-Hispanic Multiracial
Overweight	16.6%	14.0%	18.2%	12.0%	16.7%
Obese	13.0%	10.6%	17.8%	11.4%	14.3%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child [4]Based on 2000 CDC growth chart percentiles for children 2 years of age and older.

Bi-variate analysis was conducted to assess the association between selected maternal-child characteristics and BMI among young children enrolled in MI WIC.

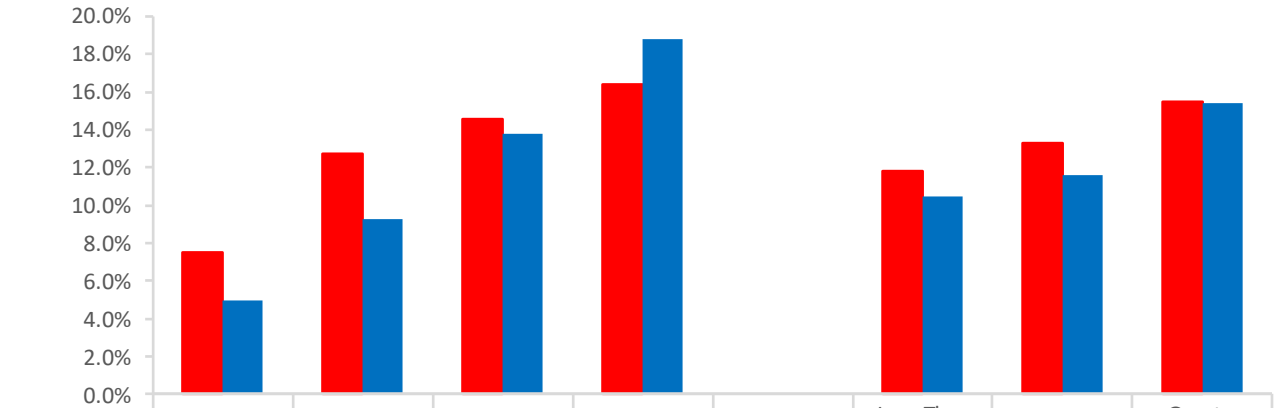
Analysis of pediatric overweight and obesity by selected maternal and infant characteristics yielded results outlined in Table 18 and Figure 51.

The association was tested by using chi-square statistics. Never breastfed and maternal smoking during the last trimester put the child at higher risk of becoming overweight and obese. Having higher maternal education and born with low birthweight (full term) reduces the risk of becoming overweight or obese during the age 2 to 5 years.

Table 18: Prevalence of overweight and obese among children ages 2 to 5 enrolled in WIC by selected maternal and infant characteristics, MI-PNSS 2012-2017/PedNSS 2017[1-6]

	Overweight %	Obese %
Maternal Education		
<12 yrs	14.3%	14.4%
12 yrs	14.2%	14.0%
>12 yrs	13.9%	12.3%
Gender		
Male	14.2%	14.0%
Female	14.1%	13.1%
Breastfeeding ever		
No	14.6%	14.7%
Yes	13.9%	13.0%
Smoking 3rd trimester		
No	13.8%	13.0%
Yes	16.2%	16.8%
Full term low birthweight		
No	14.7%	14.0%
Yes	7.9%	7.7%

Figure 51: Prevalence of obesity and overweight by maternal prenatal BMI or maternal gestational weight gain among 2-5 years old children enrolled in WIC and born to mothers enrolled in WIC, MI-PNSS 2012-2015/PedNSS 2017[1-5]



	Underweight	Normal	Overweight	Obese		Less Than Ideal	Ideal	Greater Than Ideal
Overweight	7.5%	12.7%	14.6%	16.4%		11.8%	13.3%	15.5%
Obese	5.0%	9.3%	13.8%	18.8%		10.5%	11.6%	15.4%

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child [4] Gestational weight gain is defined based on 1990 IOM report "Nutrition during pregnancy" [5]Based on 2000 CDC growth chart percentiles for weight-for-length for children 2 years of age and older

Focus on Pediatric Obesity

A Multiple logistic regression model was used to estimate the odds of a child having a BMI categorized as overweight (85th—95th percentile) or obese (>95th percentile). The model takes into account both maternal effects (maternal prenatal BMI, gestational weight gain, education level, and prenatal smoking) and child effects (race/ethnicity, gender, birthweight and ever breastfed). Analysis results are shown in Table 19. Some characteristics are positively associated with a child's BMI increases. For example, the adjusted odds ratio for the effect of obese maternal prenatal BMI on a child having a BMI in the 85th–95th percentile is 1.44 (compared to a child whose mother had a BMI categorized as normal). The effect of maternal obesity increases to 2.32 for children whose BMI is in the 95th or greater percentile. Other characteristics which were significantly associated with an increased risk of a child being overweight or obese were: Hispanic ethnicity, high birthweight (>4,000g), maternal education less than high school, maternal BMI either obese or overweight, maternal gestational weight gain greater than ideal, and prenatal smoking. In contrast, infants with low birthweight, underweight maternal BMI, and being Black were found to be protective against obesity. Furthermore, ever breastfed as an infant was mildly protective.

Table 19: Adjusted odds ratios for child BMI >85th percentile and >95th percentile by infant, child, & maternal effects among children ages 2 to 5 years, MI-PNSS 2012-2015/PedNSS 2017

Odds Ratio Estimates	85th—95th percentile			>95th percentile		
Effect	AOR	95% Confidence Limits		AOR	95% Confidence Limits	
Ever breastfed	0.87	0.83	0.92	0.83	0.78	0.87
Maternal education: HS vs >HS	1.00	0.95	1.06	1.11	1.04	1.18
Maternal education: <HS vs >HS	1.00	0.93	1.08	1.15	1.07	1.24
Maternal smoking at prenatal visit	1.37	1.28	1.46	1.57	1.47	1.68
Maternal weight gain: >Ideal vs Ideal	1.15	1.09	1.22	1.21	1.14	1.28
Maternal weight gain: <Ideal vs Ideal	0.88	0.81	0.95	0.88	0.81	0.95
Maternal Prenatal Underweight vs Normal	0.57	0.49	0.68	0.51	0.42	0.63
Maternal Prenatal Overweight vs Normal	1.14	1.07	1.22	1.50	1.40	1.61
Maternal Prenatal Obese vs Normal	1.44	1.36	1.53	2.32	2.18	2.47
Child: Male vs Female	0.99	0.94	1.04	1.07	1.01	1.12
Black, Non-Hispanic vs White, Non-Hispanic	0.79	0.74	0.84	0.73	0.69	0.78
Hispanic vs White, Non-Hispanic	1.13	1.04	1.22	1.39	1.28	1.51
Asian/Pacific Islander vs White, Non-Hispanic	0.80	0.64	1.01	1.16	0.93	1.45
American Indian Only vs White, Non-Hispanic	0.83	0.55	1.25	1.17	0.81	1.69
Non-Hispanic Multiracial vs White, Non-Hispanic	1.00	0.88	1.14	0.96	0.84	1.11
Infant Very Low Birth-weight vs Normal	0.44	0.31	0.62	0.45	0.31	0.64
Infant Low Birthweight vs Normal	0.65	0.58	0.72	0.64	0.57	0.72
Infant High Birthweight vs Normal	1.42	1.30	1.56	1.87	1.72	2.04

Model includes: maternal prenatal weight, gestational weight gain, education, and prenatal smoking and child's race/ethnicity, gender, birthweight and ever breastfed

Prevalence of obesity and overweight varied by local agency (Figures 52 & 53; Tables 20 & 21). Highest prevalence of obesity was reported by Keweenaw Bay Indian Community (27.2%) and lowest prevalence was reported by Grand Traverse at 11.3%. As to overweight, the highest prevalence was reported by Sanilac County Health Department at 19% and lowest prevalence of was reported by the Delta & Menominee at 11.2%.

Table 20: Prevalence of overweight among children 2 to 5 years of age enrolled in WIC by local agency, MI-PedNSS 2017[1-4]

Highest Prevalence of Overweight	
Agency	**%**
Sanilac County HD	19.0%
Luce-Mackinac-Alger-Schoolcraft DHD	18.1%
District Health Dept. #4	17.6%
Grand Traverse County HD	17.6%
Shiawassee County HD	17.2%
Lowest Prevalence of Overweight	
Agency	**%**
Wayne County HD	12.7%
Detroit Urban League	12.7%
Detroit DHWP	12.4%
Macomb County HD	12.3%
Delta & Menominee	11.2%
MI-PedNSS 2017	

Table 21: Prevalence of obesity among children 2 to 5 years of age enrolled in WIC by local agency, MI-PedNSS 2017[1-4]

Highest Prevalence of Obesity	
Agency	**%**
Keweenaw Bay Indian Tribe	27.2%
Sanilac County HD	21.3%
Luce-Mackinac-Alger-Schoolcraft DHD	19.5%
Benzie-Leelanau DHD	17.7%
Bay County HD	17.1%
Lowest Prevalence of Obesity	
Agency	**%**
Detroit DHWP	12.1%
Berrien County HD	12.0%
Detroit Urban League	12.0%
Wayne County HD	11.9%
Grand Traverse County HD	11.3%
MI-PedNSS 2017	

[1]Recording period is January 1st through December 31st [2]Excludes records with unknown data and errors [3]Analyses based on one record per child [4]Based on 2000 CDC growth chart percentiles. For children 2 years of age and older, overweight is defined as BMI-for-age>=85th to <95th percentile, and obesity is defined as height-for-age<5th percentile.

Figure 52: Prevalence of overweight among children ages 2 to 5 years by local agency, MI-PedNSS 2017

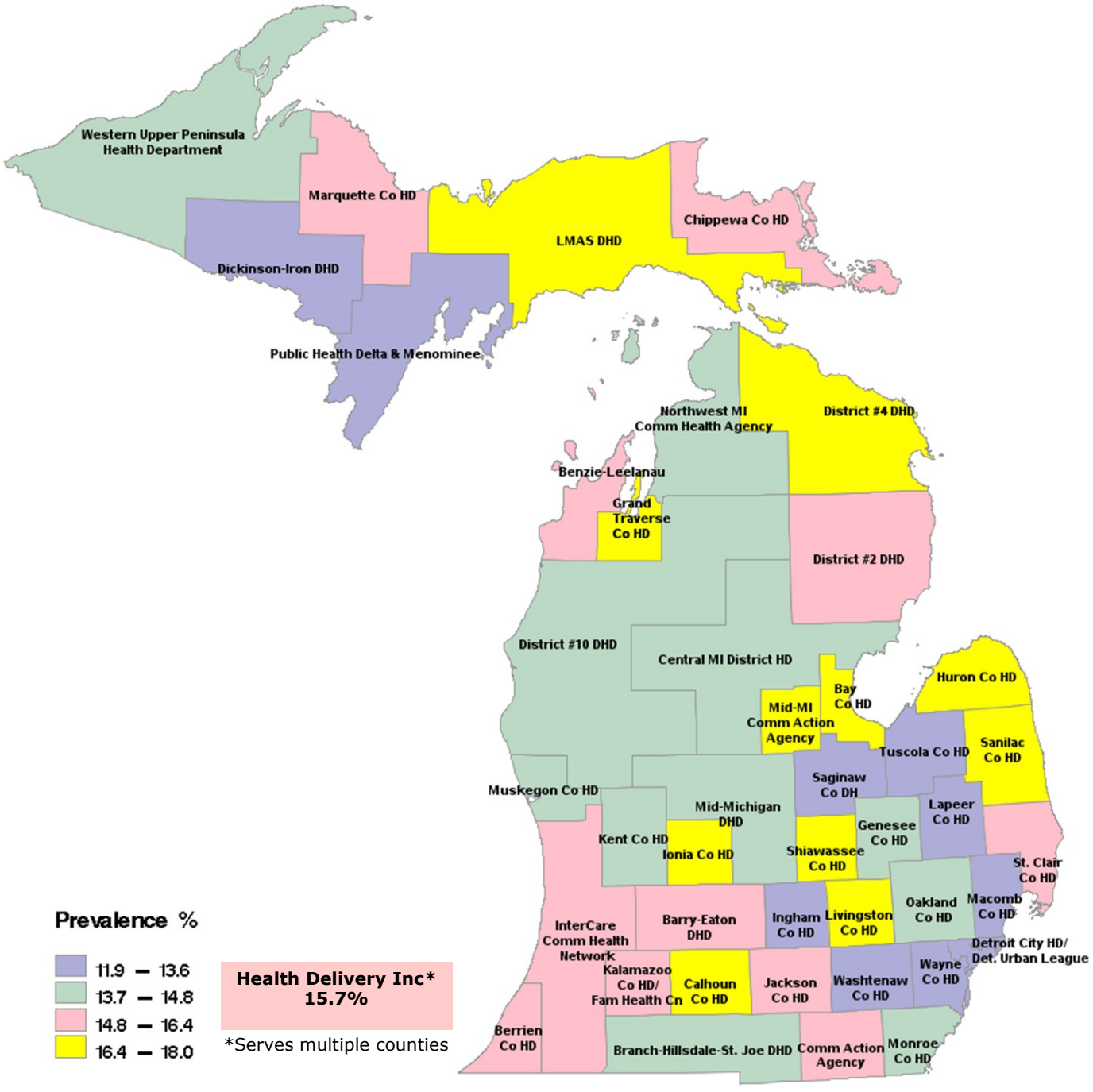
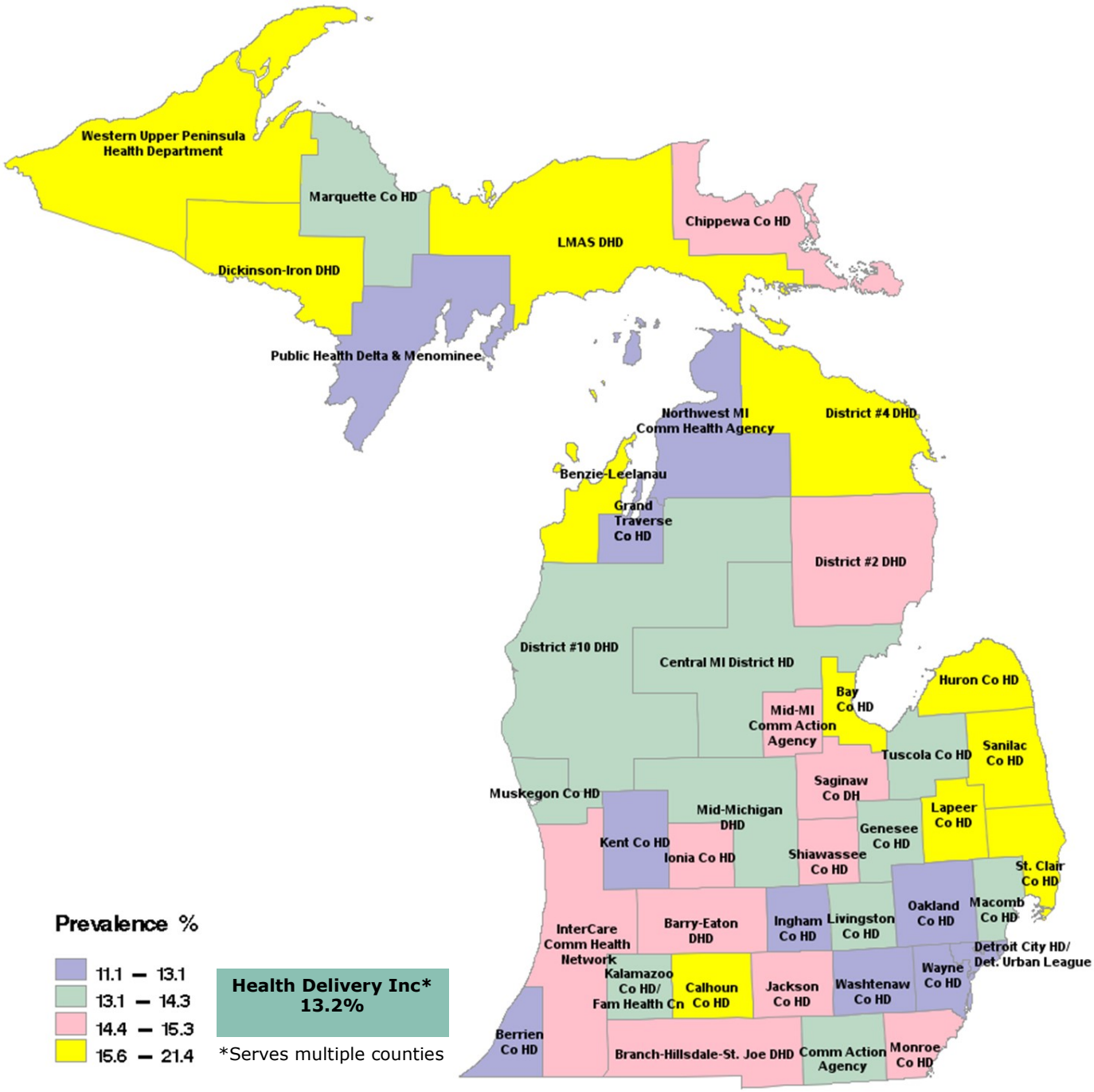


Figure 53: Prevalence of obesity among children ages 2 to 5 years by local agency, MI-PedNSS 2017

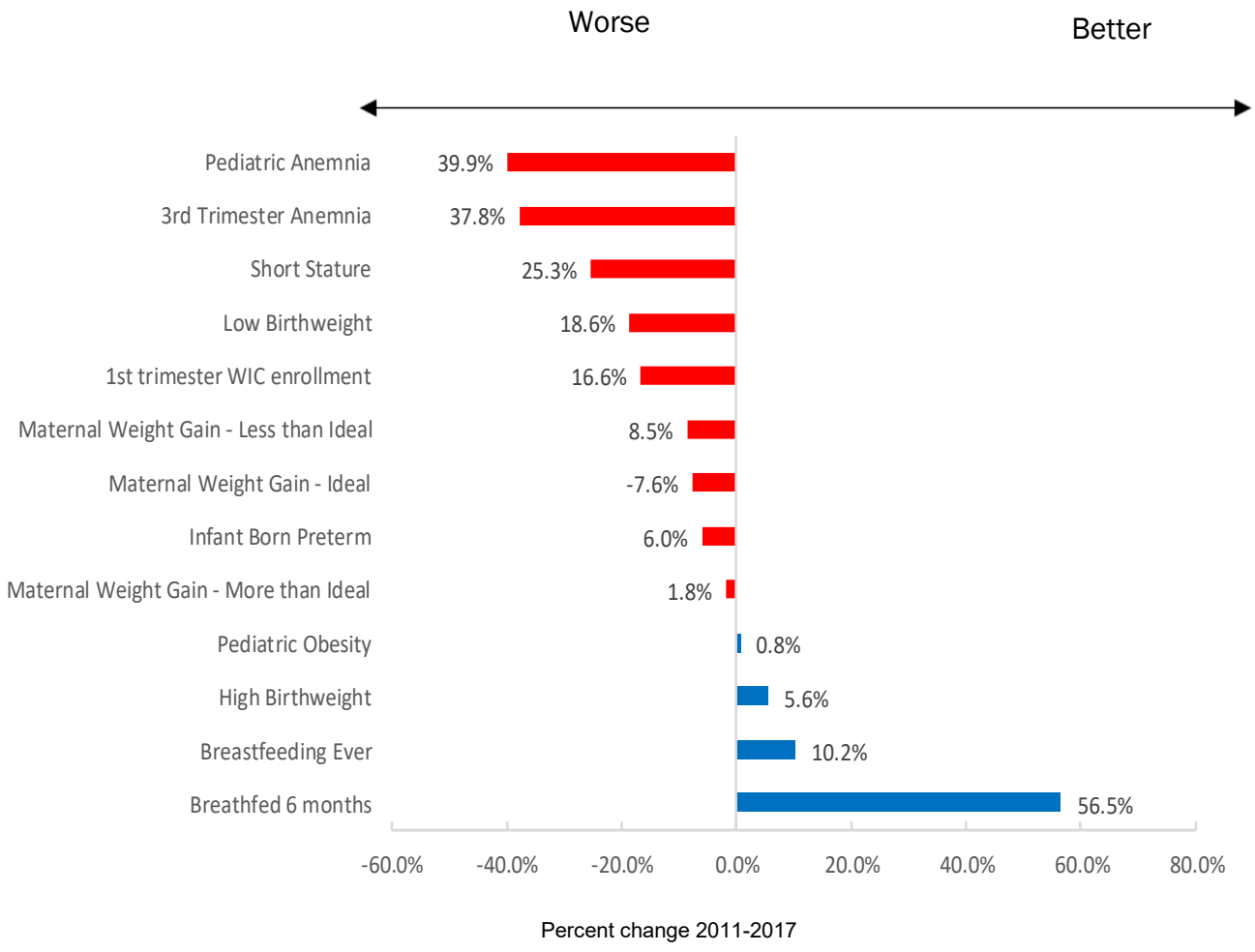


Health Progress Review

Both maternal and child health indicators were observed among the Michigan WIC population from 2011 to 2017. Changes of key indicators were summarized below over this period.

Improvements were seen in several health indicators: Breastfeeding initiation increased by 10.2% and breastfeeding to 6 months increased by 56.5%. Pediatric obesity decreased by 0.8% and high birthweight declined by 5.6%.

Figure 54: Changes in maternal, infant, and child health status, MI-PNSS/PedNSS 2011-2017



Health Progress Review (Cont'd)

Despite this progress, several other health indicators worsened from 2011 to 2017, and the trends are concerning.

From 2011 to 2017, WIC first trimester enrollment decreased by 16.6%. There are a number of factors that can impact early enrollment in WIC. For example, populations living below the poverty line decreased from 17.5% in 2011 to 14.2% in 2017. In addition, lack of child care for older children and conflict with school or work schedules can have a larger impact on timely enrollment in WIC. There is also a pattern of increasing maternal age and higher maternal education in WIC mothers over these years.

Maternal 3rd trimester anemia increased by 37.8%, while anemia among children increased by 39.9%. This trend is alarming. The increasing trend in anemia is also reporting in existing literature among children and reproductive aged women in the general population. However, the cause of this increase remains unclear and warrants additional research on iron deficiency and health disparities.

From 2011 to 2017, low birthweight incidence among Michigan WIC mothers increased by 18.6%. An increase in low birthweight was also reported nationally among Michigan women in the National Vital Statistics reports, but this increase was less dramatic. Among all races/ ethnicities, White, Non-Hispanic mothers had the largest increase in low birthweight infants (20.0%), followed by Hispanic WIC moms at (17.2%). The prevalence of low birthweight was significantly higher among Black, Non-Hispanic mothers, but the prevalence was growing at a slower pace compared to Hispanic and White, Non-Hispanic women.

Maternal & Pediatric Nutrition Recommendations

Results of the analysis of the Michigan PNSS and PedNSS data provide an important knowledge base that enhances our ability to identify needs and prioritize public health programs. Our analysis results support the following actions:

- Mothers with low prenatal BMI and those who gain less than ideal weight are at an especially high risk for delivering low birthweight babies. Programs to improve nutrition status and promote healthier behaviors during pregnancy for those moms are needed.
- Prenatal counseling should be provided about the importance of appropriate weight gain during pregnancy, the health risks of excess weight gain, and post-partum weight gain retention. This is especially important to women who are overweight or obese prior to conception.
- Black, Non-Hispanic women present a significantly lower rate of initiating breastfeeding compared to other racial/ethnic groups. Efforts should be continued to promote breastfeeding initiation. E.g. Form partnerships with hospitals and primary care providers to promote breastfeeding initiation.
- Despite the prevalence of breastfeeding for 6 months increasing overall, it was mainly driven by the increase in White, Non-Hispanic mothers. There was a slight increase in Black, Non-Hispanic mothers whereas the prevalence among Hispanic mothers decreased over the years. More effective programs are needed to promote breastfeeding duration among Black, Non-Hispanic women and Hispanic women.
- Diet is the most important way to prevent and treat iron deficiency. Increased consumption of food rich in iron in young children is needed to reduce pediatric anemia.
- Help WIC participants understand the benefits of their food packages and how to implement it in their diets.
- Coordinators should be aware and understand the physical and social determinants of health for each WIC participant. Develop and design direct programs to achieve positive changes in dietary and physical activity.
- Continue to promote the intake of fruits, vegetables, and whole grains with food packages.
- In order to compare Michigan on a national level, MI-PNSS and PedNSS needs to be expanded to all states.
- Produce data reports that provide sufficient evidence that causes a catalyst for action in developing or implementing policies.
- Extend eligibility for children to participate in WIC until their 6th birthday.
- Expand maternal enrollment to 2 years to cover interpregnancy and postpartum care and increase breastfeeding.

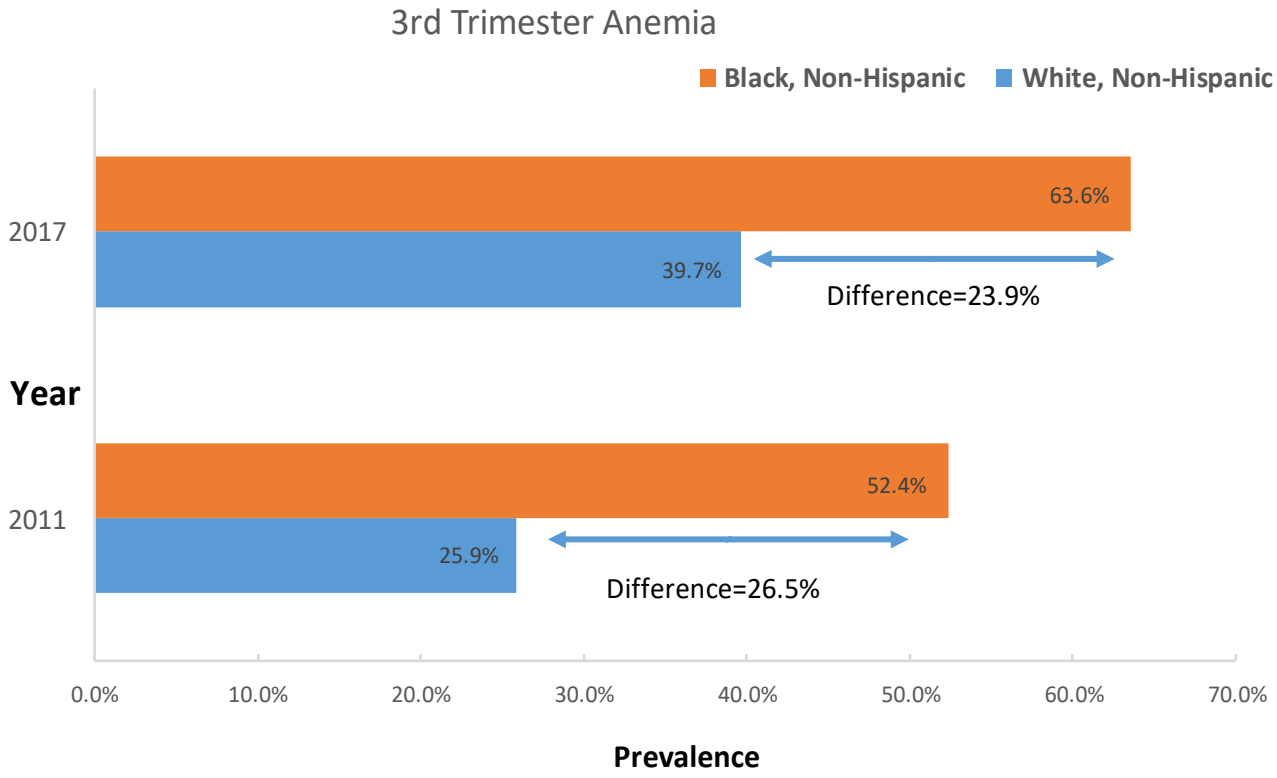
Health Disparities in Michigan WIC Population, 2011-2017

Maternal Anemia

Anemia during late pregnancy can have many complications to both mothers and newborns. Anemic mothers are at higher risk of perinatal mortality and morbidity. Babies born to anemic mothers are more likely to be born preterm and with lower birthweights which can be associated with a wide variety of health problems later in life.

There is a dramatic difference in the 3rd trimester anemia prevalence between Black, Non-Hispanic and White, Non-Hispanic mothers. In 2011, about one in four White, Non-Hispanic mothers had third trimester anemia compared to nearly one in two Black, Non-Hispanic mothers. The prevalence has increased in both groups from 2011 to 2017 while the disparities in prevalence decreased from 26.5% in 2011 to 23.9% in 2017.

Figure 55: Difference in prevalence of 3rd trimester anemia among Black and White, Non-Hispanic mothers 2011—2017

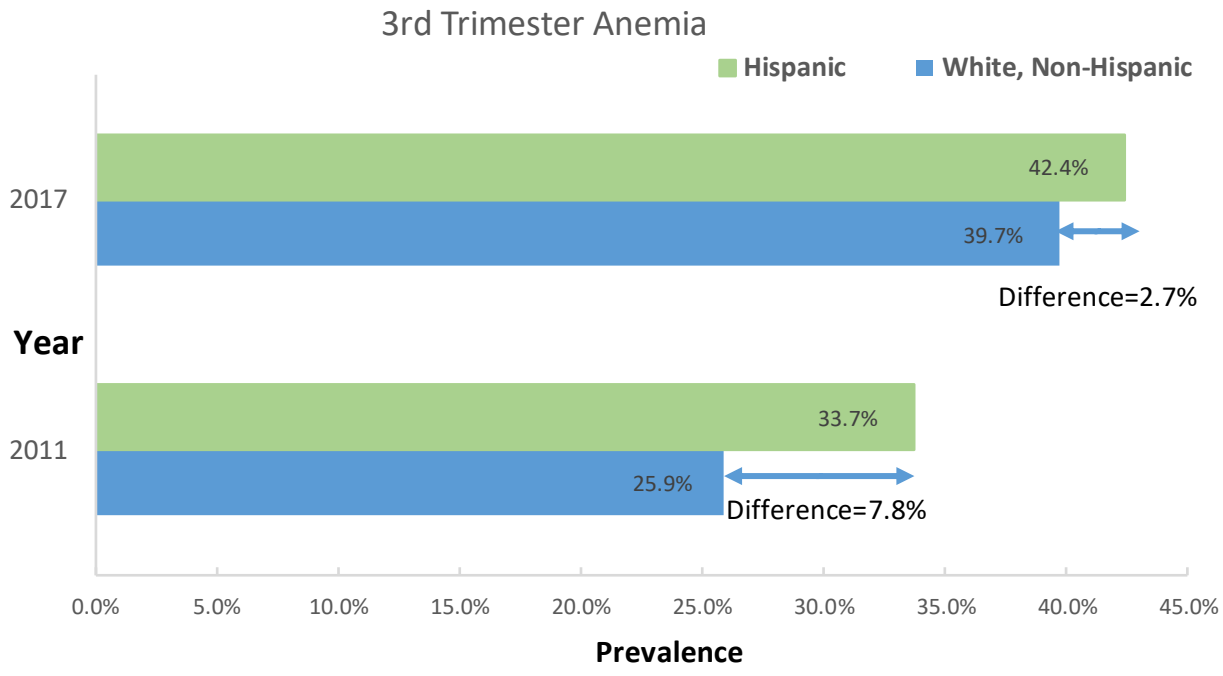


Health Disparities in Michigan WIC Population, 2011-2017

Maternal Anemia

Compared to White, Non-Hispanic mothers, the 3rd trimester anemia prevalence among Hispanic mothers is also noticeably higher. In 2011, about one in every four White, Non-Hispanic mothers vs one in three Hispanic mothers had anemia during the 3rd trimester. The 3rd trimester anemia prevalence increased among White, Non-Hispanic mothers from 25.9% in 2011 to 39.7% in 2017, during the same period the prevalence increased among Hispanic mothers from 33.7% to 42.4%. The disparity in prevalence decreased from 7.8% in 2011 to 2.7% in 2017.

Figure 56: Difference in prevalence of 3rd trimester anemia among Hispanic and White, Non-Hispanic mothers 2011-2017



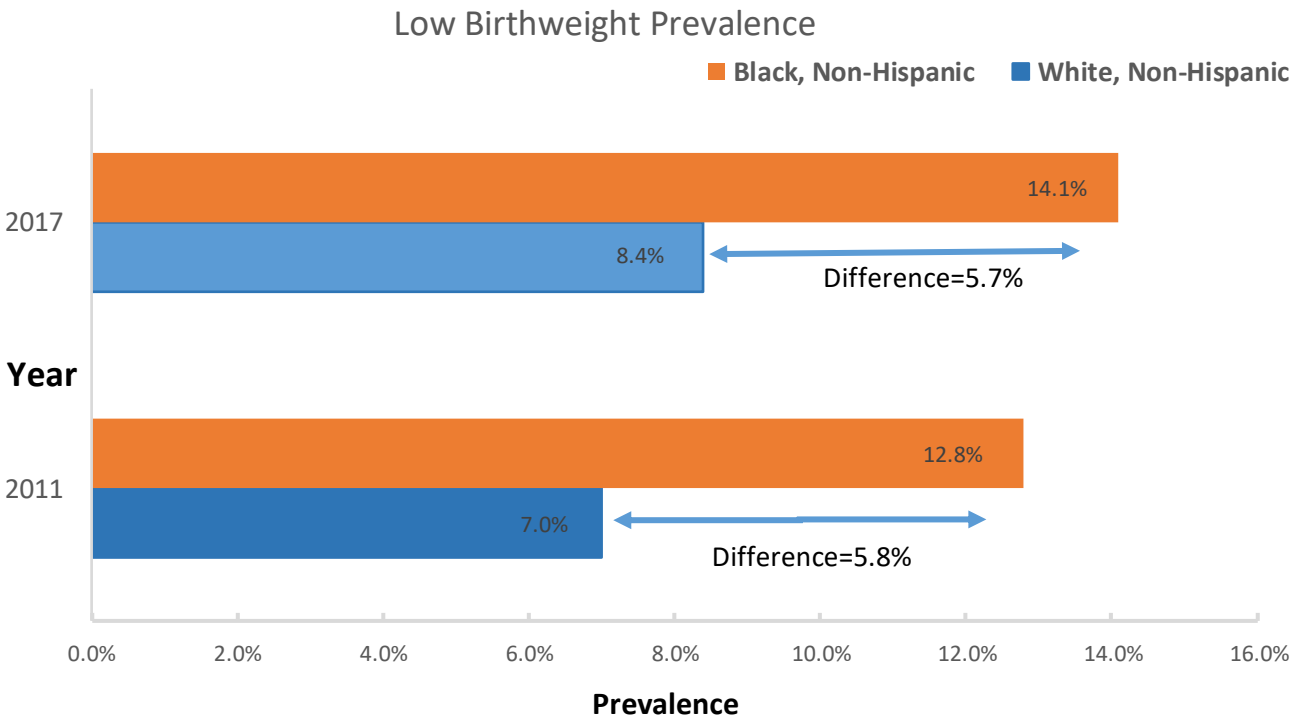
Health Disparities in Michigan WIC Population, 2011-2017

Low Birthweight

Low birthweight is an important health indicator to monitor in the WIC population. Low birthweight can lead to both short and long-term adverse health effects later in life. For example, infants with low birthweight have a higher risk of health problems such as neurodevelopmental disabilities, respiratory disorders, and metabolic syndromes.

Black, Non-Hispanic mothers have a significantly higher risk of delivering low birth weight babies than White, Non-Hispanic mothers. In 2011, 7.0% of White, Non-Hispanic mothers delivered low birth weight babies compared to 12.8% of Black, Non-Hispanic mothers. The prevalence has increased in both groups from 2011 to 2017 and the disparity in prevalence decreased slightly from 5.8% in 2011 to 5.7% in 2017.

Figure 57: Difference in prevalence of low birthweight among Black and White, Non-Hispanic mothers 2011-2017

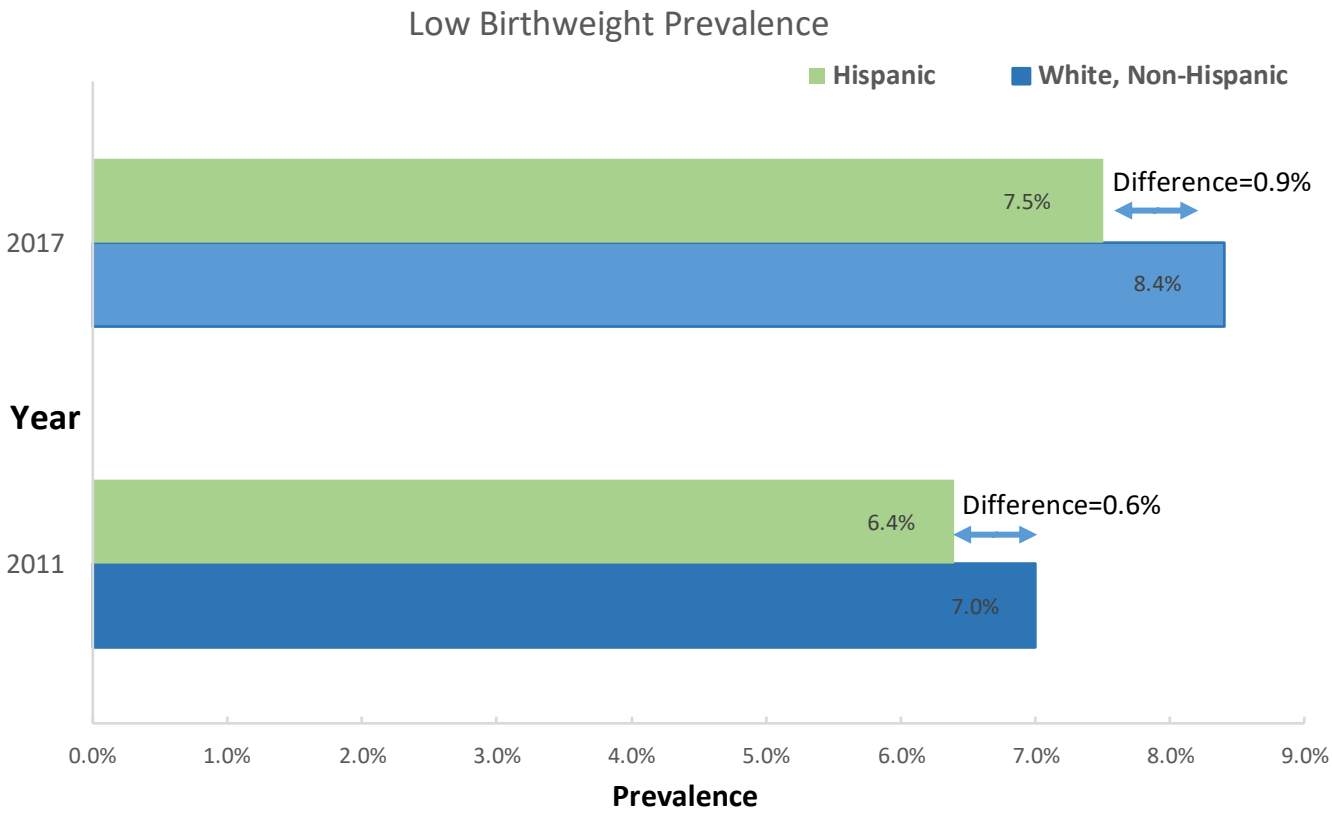


Health Disparities in Michigan WIC Population, 2011-2017

Low Birthweight

The prevalence of low birthweight is slightly lower in Hispanic mothers compared to White, Non-Hispanic mothers. In 2011, the prevalence was 6.4% vs 7.0% for Hispanic and White, Non-Hispanic mothers, respectively. By 2017, the prevalence increased to 7.5% and 8.4% for Hispanic and White, Non-Hispanic mothers, respectively.

Figure 58: Difference in prevalence of low birthweight among Hispanic and White, Non-Hispanic mothers 2011-2017



Health Disparities in Michigan WIC Population, 2011-2017

Breastfeeding Initiation

There are obvious disparities in breastfeeding initiation prevalence across racial/ethnic groups as well. Hispanic mothers have slightly higher breastfeeding initiation prevalence than White, Non-Hispanic mothers, while Black, Non-Hispanic mothers have a significantly lower initiation prevalence than Hispanic and White, Non-Hispanic mothers. The breastfeeding initiation prevalence increased from 47.4% to 55.2% from 2011 to 2017 among Black, Non-Hispanic mothers. The difference in the prevalence between White and Black, Non-Hispanic mothers decreased from 18.5% to 16.3% over the same period.

Figure 59: Difference in prevalence of breastfeeding initiation among Black and White, Non-Hispanic mothers 2011—2017

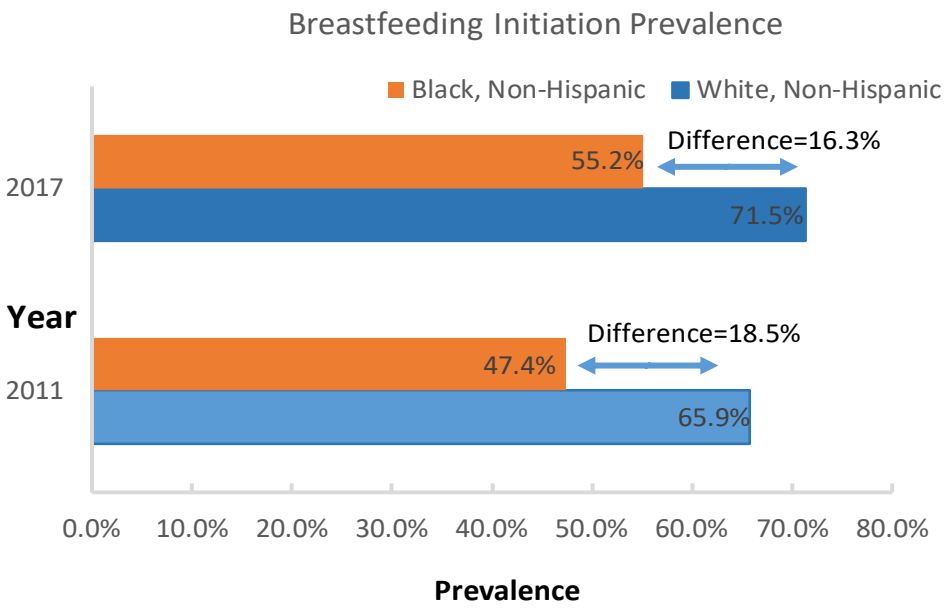
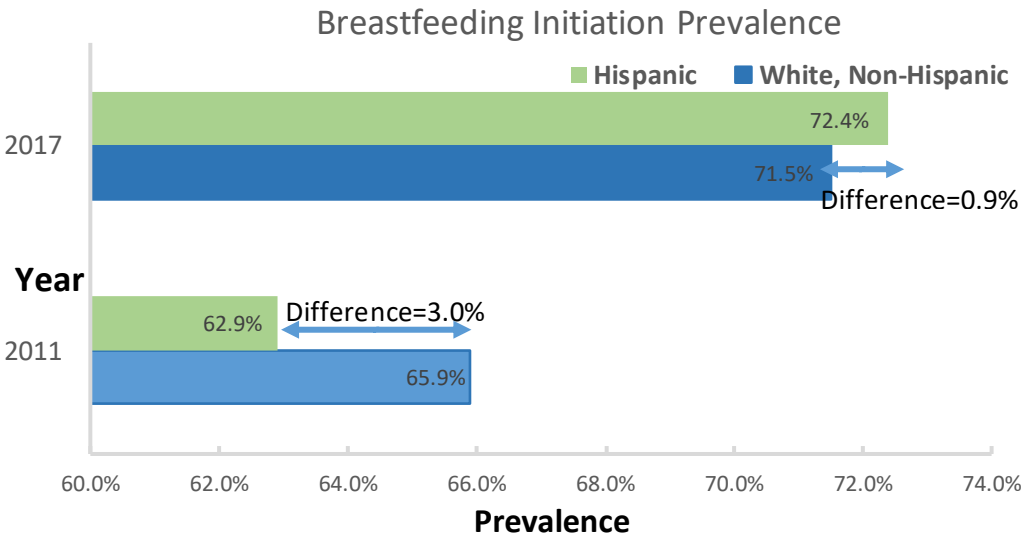


Figure 60: Difference in prevalence of breastfeeding initiation among Hispanic and White, Non-Hispanic mothers 2011—2017



Breastfeeding initiation prevalence increased quickly among Hispanic moms from 62.9% in 2011 to 72.4% in 2017. The prevalence exceeded that of White WIC moms.

Health Disparities in Michigan WIC Population, 2011-2017

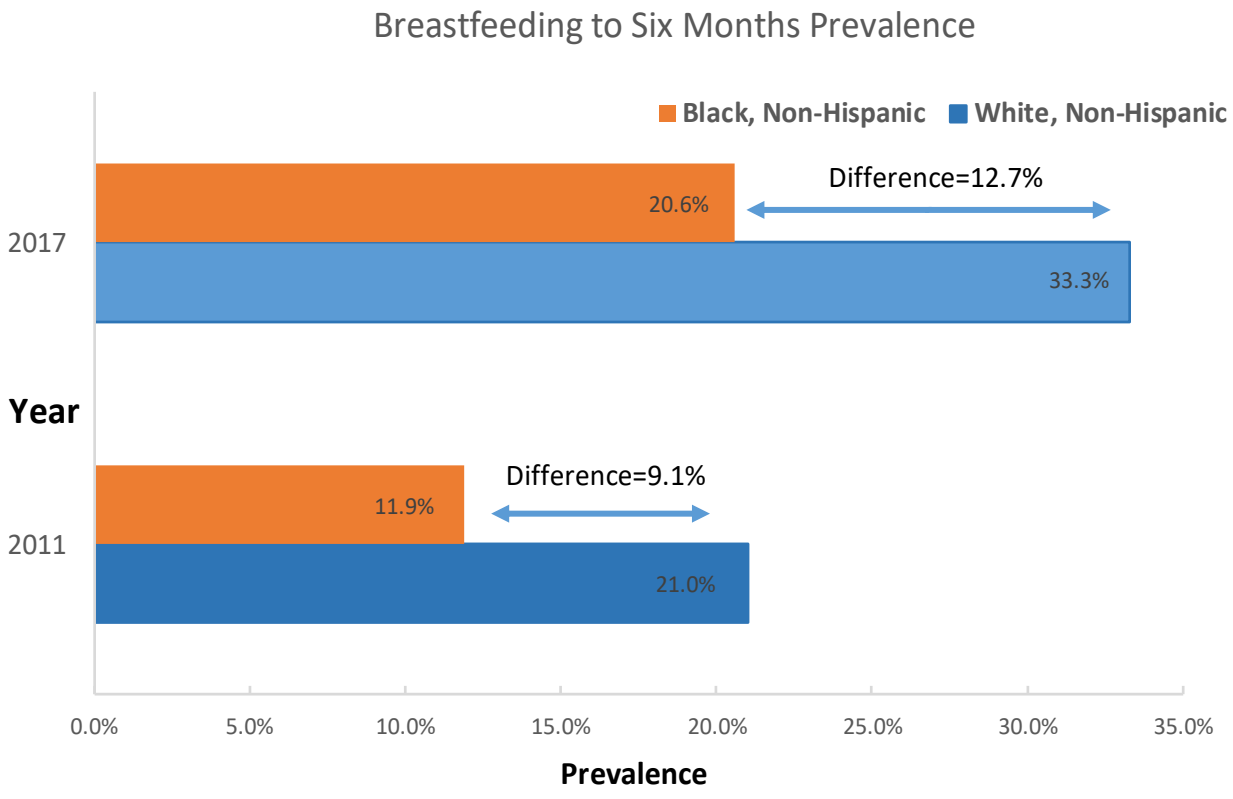
Breastfeeding to Six Months

While extensive literature demonstrates the benefits of breastfeeding, the new guidelines from the American Academy of Pediatrics recommends exclusively breastfeeding to six months.

The prevalence of breastfeeding to six months in Black, Non-Hispanic mothers is significantly lower than both Hispanic and White, Non-Hispanic mothers. As of 2017, the prevalence of breastfeeding to six months among White, Non-Hispanic mothers is still significantly higher than that of Black, Non-Hispanic mothers (33.3% vs. 20.6%).

From 2011 to 2017, the prevalence of breastfeeding to six months increased both in White and Black Non-Hispanic mothers. The disparities worsened from 9.1% in 2011 to 12.7% in 2017.

Figure 61: Difference in prevalence of breastfeeding to six months among Black and White, Non-Hispanic mothers 2011—2017

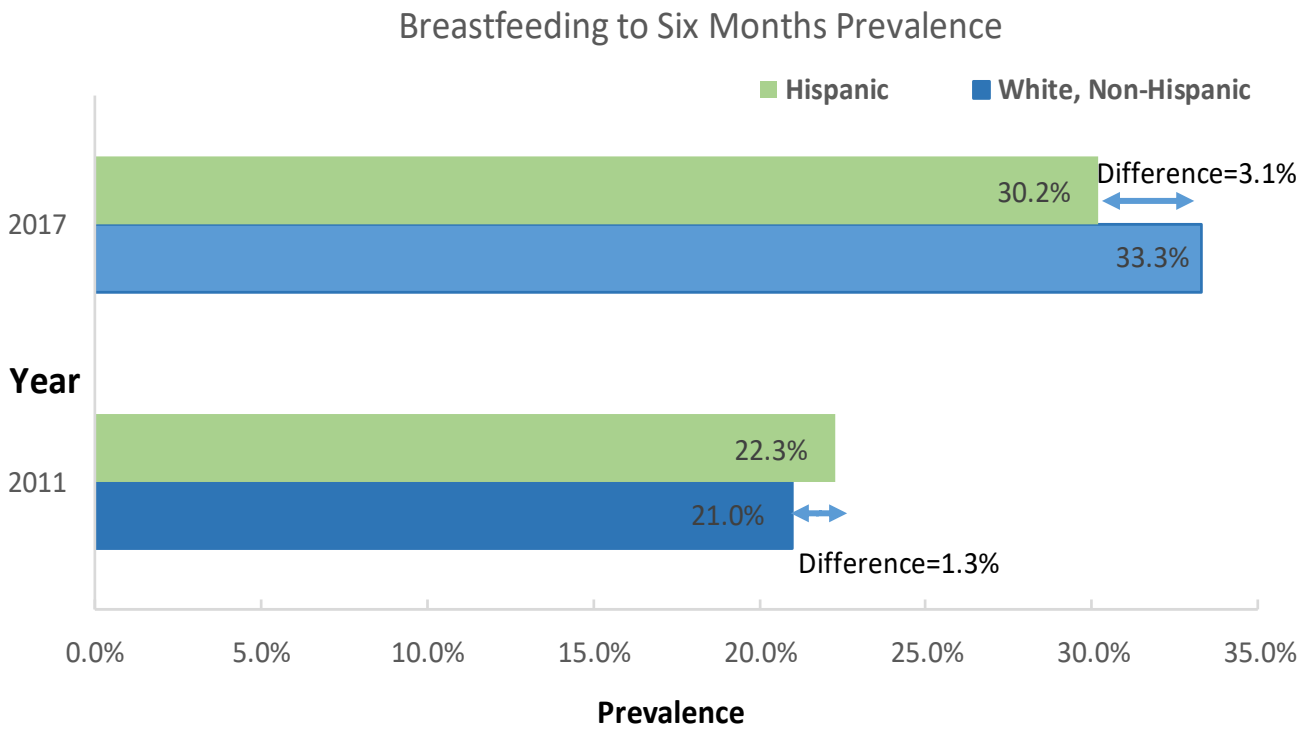


Health Disparities in Michigan WIC Population, 2011-2017

Breastfeeding to Six Months

Among Hispanic mothers, the prevalence of breastfeeding to six months increased quickly from 22.3% in 2011 to 30.2% in 2017. The prevalence among these mothers was 1.3% higher than White, Non-Hispanic mothers in 2011 but became 3.1% lower than White, Non-Hispanic mothers in 2017.

Figure 62: Difference in prevalence of breastfeeding to six months among Hispanic and White, Non-Hispanic mothers 2011—2017



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Appendix A: Map of Local Agencies and Agency Trend Tables

Geographic area of local WIC agencies, MI 2017

Table A-1. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2015

	PNSS N	PedNSS N	Total N	Race/Ethnicity				1st Trimester WIC Enrollment	Weight Gain		Low Birthweight		
				White	Black	Hispanics	Multiracial		< Ideal	> Ideal	Total	White	Black
Michigan	63091	240590	303681	151866	83491	38907	21727	34.1%	19.6%	50.7%	9.7%	8.0%	13.8%
Barry-Eaton DHD	678	2748	3426	87.5%	1.8%	6.3%	4.0%	36.3%	15.3%	56.0%	7.1%	7.5%	*
Bay County HD	605	2566	3171	73.6%	2.4%	13.4%	10.4%	49.5%	19.9%	45.5%	9.7%	9.2%	5.6%
Benzie-Leelanau DHD	173	639	812	71.9%	0.7%	15.8%	7.2%	50.6%	24.8%	51.1%	7.1%	9.4%	*
Berrien County HD	1071	3968	5039	47.7%	37.1%	7.9%	6.3%	32.6%	16.8%	54.4%	8.7%	7.2%	11.0%
Branch-Hillsdale-St. Joe DHD	1262	5044	6306	77.3%	2.2%	14.8%	5.6%	42.6%	17.5%	51.3%	7.9%	8.4%	20.0%
Calhoun County HD	1149	4551	5700	52.6%	19.4%	9.8%	12.1%	36.0%	20.4%	51.1%	8.5%	8.2%	10.7%
Central MI District HD	1216	4834	6050	87.7%	1.5%	3.6%	5.9%	46.8%	21.5%	47.2%	7.2%	7.5%	15.8%
Chippewa County HD	283	1095	1378	48.8%	0.3%	3.7%	29.0%	51.1%	17.9%	55.5%	4.5%	4.8%	*
Community Action Agency	602	2224	2826	63.7%	1.8%	25.8%	8.4%	27.8%	18.3%	49.2%	7.5%	7.1%	*
Delta-Menominee	391	1475	1866	83.3%	0.2%	3.5%	12.3%	45.6%	21.8%	44.0%	7.0%	6.9%	33.3%
Detroit City	7430	27987	35417	7.4%	74.2%	14.5%	2.1%	25.7%	20.2%	51.3%	13.3%	9.8%	14.8%
Detroit Urban League	3254	12889	16143	13.7%	72.9%	9.4%	3.1%	25.8%	19.8%	50.8%	12.3%	8.4%	13.7%
Dickinson-Iron DHD	221	952	1173	91.9%	0.1%	2.9%	4.9%	49.1%	20.0%	42.4%	8.6%	9.1%	*
District Health Department #10	1962	7806	9768	79.5%	1.5%	13.4%	5.4%	45.6%	21.2%	50.3%	7.1%	7.5%	6.7%
District Health Department #2	421	1678	2099	90.4%	0.1%	3.9%	5.4%	43.8%	22.1%	52.3%	8.2%	8.1%	*
District Health Department #4	426	1668	2094	88.6%	0.4%	2.6%	8.0%	39.1%	17.6%	50.5%	8.9%	8.7%	100.0 %
Downriver Community Serv	770	2979	3749	68.4%	9.3%	11.8%	8.6%	24.8%	16.2%	53.9%	8.3%	8.2%	9.7%
Genesee County HD	3087	11292	14379	44.1%	37.4%	6.5%	11.5%	27.7%	18.1%	53.4%	11.6%	9.7%	15.0%
Grand Traverse County HD	539	1894	2433	85.3%	1.0%	7.1%	5.6%	42.7%	15.3%	52.0%	6.3%	6.7%	*
Health Delivery, Inc.	517	2260	2777	12.4%	52.7%	29.7%	4.6%	43.2%	26.6%	42.1%	10.1%	7.3%	13.7%
Huron County HD	187	732	919	90.1%	0.2%	6.1%	3.6%	46.8%	20.1%	46.3%	5.7%	5.3%	*
Ingham County HD	1934	6425	8359	37.2%	25.5%	18.2%	12.6%	32.9%	18.6%	51.3%	9.1%	8.1%	11.8%
Intercare Comm. Health Network	3086	12526	15612	59.0%	3.7%	30.8%	5.2%	43.3%	23.9%	46.5%	6.9%	6.6%	8.0%
Ionia County HD	406	1665	2071	83.8%	0.4%	10.8%	4.7%	41.0%	21.9%	51.3%	6.1%	6.8%	*
Jackson County HD	1160	4711	5871	64.7%	13.5%	7.8%	13.6%	38.3%	19.2%	49.6%	10.4%	9.8%	15.5%
Kalamazoo County HD	794	2758	3552	56.9%	18.7%	10.7%	12.8%	34.1%	16.2%	54.4%	8.4%	7.2%	12.1%
Kalamazoo Family Health Center	886	3639	4525	34.2%	41.3%	12.2%	11.2%	44.2%	23.6%	52.0%	10.4%	10.6%	12.0%
Kent County HD	4504	12210	16714	33.6%	22.2%	33.6%	8.5%	35.9%	23.9%	46.6%	9.0%	8.1%	13.4%
Keweenaw Bay WIC Program	55	245	300	4.3%	0.0%	4.3%	8.7%	58.2%	28.9%	40.0%	6.3%	0.0%	*
Lapeer County HD	455	1852	2307	84.9%	0.9%	8.6%	5.4%	39.4%	15.0%	54.8%	8.2%	6.2%	33.3%
Livingston County HD	466	1824	2290	88.7%	0.9%	5.1%	4.1%	28.1%	14.7%	56.3%	6.4%	6.2%	33.3%
LMAS	174	770	944	70.1%	0.7%	0.5%	22.6%	57.1%	18.4%	51.0%	6.8%	8.6%	*
Macomb County HD	3149	8900	12049	50.8%	30.4%	3.6%	9.4%	28.4%	17.2%	52.3%	10.2%	8.2%	13.0%
Marquette County HD	313	1240	1553	80.3%	0.4%	3.9%	13.5%	36.9%	17.4%	49.1%	8.0%	7.2%	*
Mid-Michigan Comm.	433	1786	2219	91.3%	1.1%	3.3%	3.7%	44.2%	19.1%	52.5%	7.2%	7.2%	*
Mid-Michigan DHD	885	3674	4559	82.6%	0.3%	12.6%	4.3%	38.9%	20.4%	52.0%	8.9%	9.1%	*
Monroe County HD	779	2957	3736	78.8%	5.1%	7.6%	8.0%	38.5%	20.9%	51.1%	8.3%	7.8%	19.4%
Muskegon County HD	1566	6250	7816	52.7%	24.0%	11.9%	11.1%	44.7%	20.1%	50.1%	11.1%	9.7%	15.6%
Northwest MI Comm Health Agency	681	2447	3128	88.7%	0.6%	2.9%	4.0%	43.6%	19.3%	50.0%	6.9%	6.7%	*
Oakland County HD	3860	14292	18152	45.7%	31.6%	13.8%	6.6%	25.7%	18.7%	50.7%	10.5%	9.0%	13.8%
Saginaw County Depart PH	1115	4073	5188	44.1%	27.3%	20.6%	7.6%	39.3%	24.1%	46.5%	9.4%	8.6%	10.9%
Sanilac County HD	232	887	1119	87.7%	0.4%	8.3%	3.5%	36.6%	19.4%	48.3%	6.3%	6.4%	*
Shiawassee County HD	473	1887	2360	85.6%	0.4%	6.5%	7.3%	40.1%	20.2%	47.5%	7.6%	7.4%	33.3%
St Clair County HD	869	3313	4182	73.8%	5.6%	8.7%	11.5%	47.1%	18.5%	51.3%	7.9%	7.4%	14.3%
Tuscola County HD	333	1500	1833	88.5%	0.5%	6.9%	3.7%	45.5%	21.0%	51.1%	9.0%	8.6%	33.3%
Washtenaw County HD	1375	5295	6670	32.9%	37.1%	12.5%	12.9%	33.8%	19.0%	49.5%	10.4%	7.3%	15.1%
Wayne County HD	6263	19877	26140	57.0%	28.0%	5.2%	5.6%	25.9%	17.3%	52.1%	9.5%	7.5%	12.7%
Western UP District HD	385	1407	1792	88.2%	0.5%	2.0%	7.1%	38.4%	17.9%	50.2%	5.7%	5.9%	*

[a] PNSS & PedNSS combined data (Distribution of American Indian/Alaska Native & Asian/Pacific Islander available in Local Agency Briefs) [b] PNSS Data *Data insufficient for analysis

Table A-1 (continued) Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2015

	Breastfeeding		Overweight				Obese				Anemia < 5 yrs
	Initiation	6 months duration	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	65.1%	18.4%	16.2%	16.8%	14.0%	18.3%	12.9%	12.9%	10.3%	17.4%	17.2%
Barry-Eaton DHD	77.5%	26.1%	17.7%	18.4%	13.6%	15.1%	14.7%	14.4%	0.0%	18.6%	7.3%
Bay County HD	62.4%	21.1%	15.6%	16.0%	21.7%	16.7%	14.6%	13.5%	13.0%	13.3%	8.0%
Benzie-Leelanau DHD	86.5%	34.2%	17.3%	14.7%	0.0%	22.9%	12.2%	12.4%	0.0%	12.5%	10.3%
Berrien County HD	65.6%	22.1%	16.4%	18.4%	14.1%	18.0%	13.2%	14.7%	11.4%	16.4%	11.8%
Branch-Hillsdale-St. Joe DHD	79.6%	20.1%	16.6%	17.3%	10.3%	16.1%	14.1%	13.4%	15.4%	16.6%	6.1%
Calhoun County HD	70.4%	17.3%	17.5%	17.6%	16.9%	23.0%	15.4%	16.1%	12.7%	20.3%	22.9%
Central MI District HD	74.9%	21.1%	16.3%	16.4%	6.7%	14.6%	14.4%	14.2%	16.7%	15.7%	9.5%
Chippewa County HD	73.1%	29.3%	18.1%	14.7%	0.0%	19.0%	13.5%	13.0%	0.0%	0.0%	18.7%
Community Action Agency	77.7%	22.6%	19.7%	20.5%	13.8%	19.1%	14.5%	13.4%	20.7%	18.7%	9.4%
Delta-Menominee	74.4%	19.7%	19.2%	19.8%		17.9%	12.4%	12.5%		7.1%	2.5%
Detroit City	47.3%	10.6%	14.1%	14.9%	13.4%	16.8%	11.8%	10.9%	10.0%	18.8%	25.8%
Detroit Urban League	46.5%	10.2%	14.2%	14.9%	12.9%	21.0%	12.2%	15.8%	10.1%	21.4%	35.4%
Dickinson-Iron DHD	74.7%	22.6%	16.8%	16.5%		31.3%	12.5%	11.6%		18.8%	9.1%
District Health Department #10	77.2%	23.9%	19.4%	18.4%	22.7%	21.7%	15.3%	14.2%	13.6%	21.2%	14.9%
District Health Department #2	62.7%	18.6%	16.1%	16.3%	0.0%	13.3%	12.5%	11.5%	0.0%	33.3%	22.3%
District Health Department #4	64.8%	21.6%	16.6%	16.4%	0.0%	19.0%	13.8%	14.6%	0.0%	4.8%	12.5%
Downriver Community Serv	72.3%	20.0%	16.9%	16.0%	16.2%	19.4%	14.3%	12.2%	15.3%	24.3%	20.0%
Genesee County HD	61.2%	13.5%	15.8%	16.8%	14.4%	14.3%	11.8%	13.3%	10.1%	12.8%	23.6%
Grand Traverse County HD	84.4%	33.2%	17.4%	17.6%	16.7%	21.2%	12.8%	11.7%	0.0%	19.2%	17.1%
Health Delivery, Inc.	62.0%	10.1%	20.1%	22.3%	19.3%	21.7%	14.1%	10.7%	10.3%	21.7%	4.1%
Huron County HD	66.7%	23.4%	18.1%	18.5%	0.0%	4.8%	15.2%	14.5%	0.0%	28.6%	7.9%
Ingham County HD	76.3%	25.7%	15.3%	15.5%	13.8%	19.5%	12.1%	10.5%	10.5%	15.7%	12.0%
Intercare Comm. Health Network	77.3%	24.5%	17.7%	17.7%	13.7%	18.1%	13.9%	12.0%	12.7%	17.8%	22.3%
Ionia County HD	82.4%	21.6%	16.1%	15.2%	0.0%	23.8%	15.5%	14.7%	0.0%	20.0%	8.9%
Jackson County HD	72.1%	16.7%	19.4%	19.0%	17.3%	21.5%	14.7%	15.1%	11.3%	14.9%	20.0%
Kalamazoo County HD	71.5%	21.8%	17.3%	18.3%	15.2%	16.4%	12.7%	12.4%	10.8%	18.4%	18.0%
Kalamazoo Family Health Center	63.5%	17.2%	16.5%	15.6%	16.2%	15.7%	13.2%	13.1%	11.0%	19.3%	25.1%
Kent County HD	74.2%	18.6%	16.3%	14.3%	14.4%	19.2%	13.0%	10.2%	9.7%	17.2%	11.9%
Keweenaw Bay WIC Program	77.1%	27.3%	28.1%	50.0%		14.3%	25.6%	50.0%		57.1%	20.0%
Lapeer County HD	70.8%	27.8%	18.8%	19.1%	0.0%	21.7%	14.7%	13.5%	0.0%	23.3%	10.4%
Livingston County HD	81.0%	24.0%	16.2%	16.5%	16.7%	13.2%	11.8%	11.7%	0.0%	10.5%	6.3%
LMAS	69.6%	22.4%	12.4%	12.6%	0.0%		9.2%	9.5%	0.0%		11.1%
Macomb County HD	58.4%	16.3%	13.8%	15.1%	12.1%	13.7%	12.7%	14.4%	8.9%	24.5%	15.9%
Marquette County HD	79.0%	31.5%	17.7%	17.9%	.	23.8%	15.9%	15.1%	.	19.0%	6.9%
Mid-Michigan Comm.	77.9%	22.1%	19.2%	19.0%	33.3%	16.1%	16.2%	15.2%	22.2%	32.3%	7.0%
Mid-Michigan DHD	82.6%	25.6%	17.0%	17.3%	0.0%	16.4%	12.3%	12.1%	0.0%	12.3%	3.9%
Monroe County HD	60.6%	15.5%	15.3%	15.6%	13.6%	12.2%	14.7%	14.6%	12.3%	14.8%	10.5%
Muskegon County HD	64.2%	14.5%	16.0%	15.9%	14.6%	17.3%	12.5%	12.2%	11.7%	14.1%	17.5%
Northwest MI Comm Health Agency	78.3%	30.8%	19.7%	20.1%	25.0%	12.2%	14.4%	12.7%	16.7%	24.4%	7.7%
Oakland County HD	63.6%	18.9%	15.1%	15.6%	13.8%	16.3%	11.5%	11.9%	9.8%	13.6%	15.1%
Saginaw County Depart PH	61.2%	13.3%	17.1%	18.4%	13.5%	18.3%	14.7%	14.1%	12.2%	18.9%	16.0%
Sanilac County HD	66.9%	15.9%	20.1%	18.7%	50.0%	24.3%	11.6%	11.7%	0.0%	10.8%	13.2%
Shiawassee County HD	71.1%	21.6%	18.4%	17.1%	0.0%	32.7%	14.6%	14.2%	0.0%	16.4%	13.8%
St Clair County HD	61.5%	18.6%	18.4%	17.7%	18.0%	23.2%	14.8%	13.9%	13.5%	20.5%	7.7%
Tuscola County HD	75.7%	19.4%	16.8%	16.5%	0.0%	20.6%	13.6%	13.6%	0.0%	13.2%	7.6%
Washtenaw County HD	82.0%	32.7%	16.0%	17.1%	14.3%	16.6%	12.9%	11.7%	12.0%	19.9%	18.4%
Wayne County HD	57.4%	15.9%	14.7%	14.7%	14.2%	18.0%	11.0%	11.3%	9.1%	12.0%	17.3%
Western UP District HD	78.8%	33.3%	17.4%	*	35.7%	24.1%	9.4%	*	14.3%	15.5%	7.4%

[a] PNSS Data [b] Analysis limited to children < 2 years of age [c] PedNSS data [d] Analysis limited to children older than 24 months and up to 60 months *Data insufficient for analysis

Table A-2. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2016

	PNSS N	PedNSS N	Total N[a]	Race/Ethnicity				1st Trimester WIC Enrollment	Weight Gain		Low Birthweight		
				White	Black	Hispanics	Multiracial		<Ideal	>Ideal	Total	White	Black
Michigan	60,144	231,594	291,738	48.6%	27.2%	13.6%	8.3%	32.4%	19.4%	51.2%	9.8%	8.0%	13.9%
Barry-Eaton DHD	626	2,582	3,208	85.8%	1.9%	7.1%	4.7%	35.5%	14.0%	54.9%	10.1%	10.6%	0.0%
Bay County HD	655	2,524	3,179	70.3%	2.6%	14.9%	11.9%	46.4%	18.3%	49.0%	7.0%	6.2%	12.6%
Benzie-Leelanau DHD	161	623	784	72.3%	0.3%	15.6%	8.4%	38.0%	17.6%	50.4%	6.7%	7.4%	*
Berrien County HD	998	3,662	4,660	46.0%	37.4%	8.1%	7.7%	31.5%	17.6%	53.2%	7.5%	7.3%	8.7%
Branch-Hillsdale-St. Joseph DHD	1,206	4,806	6,012	75.9%	2.0%	15.6%	6.4%	41.5%	16.3%	55.7%	5.6%	5.8%	6.3%
Calhoun County HD	1,141	4,461	5,602	50.1%	19.3%	9.8%	14.2%	39.2%	20.0%	48.9%	8.7%	7.0%	16.9%
Central Michigan District HD	1,150	4,669	5,819	86.2%	1.7%	4.2%	6.6%	44.0%	17.8%	51.4%	7.6%	7.3%	15.4%
Chippewa County HD	229	1,028	1,257	44.1%	0.3%	3.3%	33.7%	46.2%	18.4%	42.1%	6.0%	6.4%	*
Community Action Agency	586	2,181	2,767	60.8%	1.8%	26.7%	10.6%	33.4%	25.9%	48.3%	6.0%	5.7%	*
Delta-Menominee	338	1,397	1,735	79.4%	0.4%	4.2%	15.6%	44.4%	25.2%	40.8%	10.0%	9.4%	*
Detroit City	6,384	25,884	32,268	7.6%	72.5%	15.9%	2.3%	25.3%	19.8%	51.3%	12.9%	6.7%	14.5%
Urban League	3590	13,298	16,888	12.8%	73.7%	9.1%	3.5%	23.3%	19.8%	50.6%	13.5%	6.7%	14.9%
Dickinson-Iron DHD	249	963	1,212	91.9%	0.1%	2.8%	4.8%	48.1%	13.4%	51.5%	6.8%	7.2%	*
District Health Dept #10	1,856	7,549	9,405	77.2%	1.5%	14.3%	6.7%	41.1%	20.7%	51.1%	8.2%	8.2%	14.3%
District Hd #2	425	1,729	2,154	87.0%	0.1%	5.4%	7.3%	37.7%	16.0%	52.9%	6.9%	6.8%	*
District Health Dept #4	381	1,594	1,975	87.9%	0.8%	2.9%	7.9%	41.6%	21.6%	45.2%	7.2%	7.0%	*
Downriver Community Serv	721	2,815	3,536	65.1%	9.5%	13.4%	10.4%	25.4%	17.5%	52.6%	10.1%	10.0%	11.1%
Genesee County HD	3061	11,034	14,095	42.3%	36.8%	7.4%	13.2%	27.6%	16.9%	53.3%	10.6%	7.6%	15.4%
Grand Traverse County HD	515	1,807	2,322	83.1%	0.9%	8.2%	6.7%	29.6%	17.0%	51.2%	8.6%	8.7%	25.0%
Health Delivery	554	2,246	2,800	11.3%	52.6%	30.2%	5.5%	42.3%	28.6%	43.1%	13.0%	5.1%	16.1%
Huron County HD	192	716	908	90.5%	0.1%	6.6%	2.8%	40.8%	13.7%	59.0%	6.3%	6.2%	*
Ingham County HD	1909	6781	8,690	33.0%	24.5%	20.3%	15.6%	30.1%	16.7%	54.8%	9.8%	8.0%	12.6%
Intercare Comm. Health	2,890	11,766	14,656	58.4%	3.6%	30.8%	6.1%	41.1%	23.0%	46.3%	7.8%	7.5%	15.1%
Ionia County HD	405	1,566	1,971	83.7%	0.3%	11.7%	4.3%	38.1%	14.8%	54.2%	7.5%	8.2%	*
Jackson County HD	1146	4,526	5,672	61.2%	13.3%	8.8%	16.3%	42.7%	13.3%	51.5%	8.7%	8.1%	9.0%
Kalamazoo County HD	771	2,763	3,534	52.9%	20.2%	11.2%	14.7%	36.4%	16.0%	57.5%	8.1%	7.0%	10.3%
Kalamazoo Family Health Center	930	3,722	4,652	32.3%	42.3%	12.7%	11.6%	42.2%	21.4%	52.3%	10.4%	7.9%	12.9%
Kent County HD	4161	16,821	20,982	31.2%	21.9%	33.0%	9.4%	32.6%	24.0%	46.2%	9.5%	9.3%	14.0%
Keweenaw Bay	49	235	284	4.3%	0.0%	4.3%	10.2%	35.4%	24.1%	31.0%	2.6%	16.7%	*
Lapeer County HD	425	1755	2180	80.8%	0.9%	10.3%	7.7%	34.4%	15.6%	55.6%	6.0%	5.7%	50.0%
Livingston County HD	435	1,676	2,111	86.9%	1.0%	5.9%	5.2%	25.8%	14.7%	50.9%	6.4%	6.9%	*
LMAS	172	732	904	68.0%	0.3%	0.8%	24.9%	51.8%	19.1%	47.3%	10.0%	11.6%	*
Macomb County HD	3072	10711	13,783	55.3%	26.0%	3.5%	9.3%	27.4%	19.4%	52.2%	11.6%	9.8%	13.8%
Marquette County HD	338	1,156	1,494	78.8%	0.3%	5.1%	14.2%	39.4%	18.4%	51.3%	7.9%	8.8%	*
Mid-Michigan DHD	843	3,445	4,288	81.8%	0.4%	13.0%	4.6%	40.1%	20.4%	51.6%	6.7%	6.4%	*
Mid-Michigan Comm.	397	1,684	2,081	89.3%	1.4%	4.0%	4.7%	34.3%	22.2%	48.0%	8.3%	8.7%	*
Monroe County HD	684	2,777	3,461	75.1%	6.4%	8.3%	9.7%	35.3%	22.7%	47.1%	9.0%	8.7%	15.5%
Muskegon County HD	1584	5,992	7,576	49.5%	23.8%	13.4%	13.1%	40.5%	21.2%	50.4%	9.8%	8.3%	15.5%
Northwest MI Comm Health Agency	647	2,789	3,436	88.9%	0.6%	2.9%	4.8%	39.2%	18.2%	53.4%	7.2%	7.1%	*
Oakland County HD	3593	13,713	17,306	43.4%	30.6%	15.3%	8.3%	25.3%	19.0%	51.6%	10.9%	9.1%	14.8%
Saginaw County Depart PH	997	3,847	4,844	40.6%	27.9%	22.2%	9.0%	35.2%	20.4%	51.9%	10.2%	9.2%	13.5%
Sanilac County HD	245	865	1,110	86.9%	0.5%	8.6%	4.0%	30.0%	11.4%	58.6%	6.8%	7.1%	*
Shiawassee County HD	419	1835	2,254	83.0%	0.6%	7.8%	8.4%	37.3%	19.1%	53.1%	8.9%	8.6%	*
St Clair County HD	899	3,231	4,130	69.3%	5.3%	10.0%	15.2%	41.9%	17.2%	51.6%	7.7%	7.4%	13.3%
Tuscola County HD	339	1,414	1,753	87.2%	0.2%	8.3%	4.0%	40.1%	21.6%	48.5%	6.0%	6.0%	*
Washtenaw County HD	1,298	4,964	6,262	30.9%	36.6%	12.6%	15.7%	32.8%	19.9%	46.7%	11.2%	9.7%	15.0%
Wayne County HD	6,097	21,849	27,946	55.7%	27.1%	6.1%	6.7%	25.4%	17.7%	54.5%	9.1%	8.5%	10.2%
Western UP District HD	309	1,306	1,615	88.3%	1.0%	2.3%	7.0%	39.2%	15.6%	53.3%	10.2%	9.5%	*

[a] PNSS & PedNSS combined data (Distribution of American Indian/Alaska Native & Asian/Pacific Islander available in Local Agency Briefs) [b] PNSS Data *Data insufficient for analysis

Table A-2 (continued) Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2016

	Breastfeeding		Overweight[d,e]				Obese[d,e]				Anemia < 5yrs[d]
	Initiation	6 months duration	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	66.2%	19.7%	16.2%	16.9%	13.9%	18.2%	13.0%	12.9%	10.5%	17.4%	18.4%
Barry-Eaton DHD	79.4%	22.0%	18.2%	18.8%	12.0%	17.0%	14.1%	12.9%	*	23.9%	7.6%
Bay County HD	64.4%	18.6%	19.2%	20.0%	23.3%	17.3%	16.0%	15.6%	10.0%	15.4%	7.1%
Benzie-Leelanau DHD	86.3%	33.0%	15.8%	13.6%	0.0%	19.6%	12.3%	11.9%	*	13.0%	11.0%
Berrien County HD	70.6%	21.2%	16.2%	15.9%	15.3%	16.1%	12.4%	13.8%	10.3%	16.1%	13.9%
Branch-Hillsdale-St. Joseph DHD	79.6%	22.4%	15.8%	15.7%	4.3%	18.3%	13.2%	12.4%	10.6%	15.2%	5.7%
Calhoun County HD	70.3%	19.3%	18.4%	21.6%	15.8%	17.6%	14.1%	13.7%	11.6%	21.8%	23.1%
Central Michigan District HD	73.1%	21.6%	18.5%	18.8%	16.7%	12.9%	15.0%	14.2%	16.7%	23.5%	9.6%
Chippewa County HD	70.6%	33.5%	14.9%	15.9%	50.0%	6.3%	16.1%	11.5%	*	25.0%	15.9%
Community Action Agency	72.7%	20.0%	20.0%	20.4%	15.0%	20.4%	14.1%	11.5%	25.0%	19.9%	17.8%
Delta-Menominee	69.2%	20.4%	17.9%	18.7%	33.3%	7.7%	13.0%	11.4%	33.3%	19.2%	3.5%
Detroit City	48.7%	12.7%	14.4%	15.2%	13.9%	16.6%	11.8%	9.6%	10.5%	17.7%	26.1%
Detroit Urban League	47.9%	10.7%	14.3%	18.5%	12.7%	20.1%	12.4%	14.1%	10.9%	20.1%	39.1%
Dickinson-Iron DHD	77.3%	30.5%	19.6%	19.1%	0.0%	23.5%	12.8%	11.7%	*	17.6%	14.2%
District Health Dept #10	77.3%	24.3%	17.8%	17.1%	19.6%	23.2%	15.8%	15.3%	17.4%	17.5%	16.3%
District Hd #2	67.0%	17.7%	17.9%	18.6%	50.0%	7.9%	15.4%	14.3%	*	23.7%	19.6%
District Health Dept #4	65.3%	20.8%	17.0%	17.1%	16.7%	13.0%	14.0%	13.9%	*	17.4%	13.5%
Downriver Community Serv	74.1%	20.0%	17.1%	18.4%	6.3%	19.3%	15.6%	14.1%	12.6%	25.3%	16.8%
Genesee County HD	59.4%	15.8%	15.1%	16.0%	13.7%	17.6%	11.9%	12.6%	10.8%	12.2%	19.7%
Grand Traverse County HD	86.6%	30.7%	16.0%	16.2%	22.2%	8.7%	12.2%	11.3%	11.1%	17.4%	21.1%
Health Delivery	63.9%	10.8%	18.3%	21.6%	16.9%	20.7%	14.6%	16.7%	12.0%	19.8%	7.7%
Huron County HD	71.9%	26.2%	21.2%	20.8%	0.0%	33.3%	16.2%	15.5%	*	23.8%	11.6%
Ingham County HD	78.7%	25.8%	15.7%	15.3%	15.9%	17.1%	13.4%	12.0%	11.4%	20.0%	11.5%
Intercare Comm. Health	77.5%	26.7%	18.3%	16.9%	15.8%	20.8%	13.7%	11.9%	10.3%	18.3%	21.8%
Ionia County HD	79.0%	21.6%	16.4%	14.7%	50.0%	24.4%	14.8%	14.2%	*	19.5%	8.5%
Jackson County HD	74.7%	17.1%	19.4%	19.8%	16.9%	18.0%	16.1%	15.4%	13.2%	16.3%	21.4%
Kalamazoo County HD	78.3%	22.8%	18.1%	16.9%	20.1%	18.4%	12.1%	13.3%	9.8%	13.2%	21.4%
Kalamazoo Family Health Center	63.6%	17.5%	16.5%	18.0%	14.2%	20.4%	13.1%	11.7%	10.1%	19.9%	24.6%
Kent County HD	74.5%	21.7%	15.7%	16.1%	13.1%	17.4%	11.8%	9.4%	9.7%	16.0%	14.1%
Keweenaw Bay	84.6%	34.2%	27.9%	33.3%		0.0%	26.9%	16.7%	*	40.0%	25.5%
Lapeer County HD	72.6%	23.5%	18.3%	17.9%	14.3%	16.7%	15.8%	14.3%	*	25.9%	10.4%
Livingston County HD	82.9%	25.2%	17.5%	17.8%	0.0%	21.3%	11.2%	11.0%	*	8.5%	6.9%
LMAS	72.5%	26.1%	11.4%	11.4%		0.0%	15.5%	15.0%	*	50.0%	14.3%
Macomb County HD	55.5%	15.7%	14.7%	16.4%	11.9%	13.7%	13.3%	14.5%	10.0%	17.4%	19.8%
Marquette County HD	82.3%	33.3%	17.5%	18.4%	0.0%	21.9%	15.2%	14.2%	*	21.9%	9.7%
Mid-Michigan	84.8%	27.4%	17.4%	17.4%	0.0%	18.3%	12.3%	11.8%	33.3%	14.5%	2.9%
Mid-Michigan Comm.	75.9%	28.9%	19.7%	19.9%	27.3%	21.6%	14.0%	13.6%	27.3%	18.9%	8.7%
Monroe County HD	62.7%	19.5%	16.2%	17.2%	13.8%	13.5%	14.9%	14.5%	12.5%	19.2%	13.5%
Muskegon County HD	67.8%	18.0%	16.3%	15.6%	16.1%	19.6%	13.4%	13.9%	10.6%	12.6%	21.9%
Northwest MI Comm Health Agency	80.8%	30.5%	16.2%	15.8%	23.1%	25.0%	13.6%	13.4%	15.4%	8.3%	10.9%
Oakland County HD	69.2%	23.1%	15.0%	15.7%	12.6%	16.4%	12.3%	12.1%	9.7%	16.2%	17.1%
Saginaw County Depart PH	59.0%	12.7%	17.2%	19.1%	12.2%	17.9%	14.7%	14.7%	12.6%	19.4%	17.4%
Sanilac County HD	69.2%	23.4%	11.3%	11.9%	0.0%	7.1%	7.3%	7.3%	*	7.1%	14.6%
Shiawassee County HD	74.1%	23.2%	17.8%	17.0%	0.0%	25.4%	15.9%	15.1%	*	17.5%	13.0%
St Clair County HD	66.7%	19.5%	19.8%	19.0%	34.6%	20.3%	16.0%	15.7%	9.9%	21.1%	9.0%
Tuscola County HD	74.0%	28.5%	14.9%	14.8%	0.0%	14.1%	13.7%	14.3%	*	10.9%	9.3%
Washtenaw County HD	82.9%	33.6%	16.7%	17.3%	16.4%	18.2%	12.9%	13.3%	9.1%	24.5%	18.8%
Wayne County HD	58.7%	16.7%	14.5%	14.6%	14.0%	17.2%	10.8%	11.3%	9.4%	11.0%	19.5%
Western UP District HD	81.8%	29.7%	15.9%	16.5%	0.0%	0.0%	13.0%	13.0%	*	18.2%	4.3%

[a] PNSS Data [b] Analysis limited to children < 2 years of age [c] PedNSS data [d] Analysis limited to children older than 24 months and up to 60 months *Data insufficient for analysis

Table A-3. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2017

	PNSS N	PedNSS N	Total N	Race/Ethnicity				1st Trimester WIC Enrollment	Weight Gain		Low Birthweight		
				White	Black	Hispanics	Multiracial		< Ideal	> Ideal	Total	White	Black
Michigan	57676	208288	265964	48.7%	28.4%	12.9%	7.5%	30.6%	19.1%	51.9%	10.2%	8.4%	14.1%
Barry-Eaton DHD	554	2298	2852	85.8%	2.5%	6.8%	4.5%	26.6%	17.2%	52.7%	9.9%	10.2%	6.7%
Bay County HD	612	2311	2923	72.6%	2.7%	14.3%	10.0%	43.6%	22.2%	52.0%	6.8%	6.6%	4.8%
Benzie-Leelanau DHD	141	530	671	71.7%	0.6%	15.7%	7.6%	27.7%	21.4%	58.2%	7.9%	7.8%	0.0%
Berrien County HD	935	3303	4238	45.5%	38.6%	8.3%	6.6%	31.0%	18.0%	56.4%	8.7%	6.4%	13.5%
Branch-Hillsdale-St. Joe DHD	1124	4132	5256	77.1%	1.9%	15.0%	5.9%	40.8%	19.0%	50.3%	6.9%	7.2%	15.8%
Calhoun County HD	1003	3988	4991	51.7%	19.8%	8.9%	13.0%	37.4%	18.0%	55.0%	10.6%	8.9%	16.8%
Central MI District HD	1135	4231	5366	86.3%	1.5%	4.6%	6.0%	43.2%	16.1%	57.3%	7.8%	8.0%	11.1%
Chippewa County HD	240	921	1161	48.1%	0.1%	2.8%	30.6%	52.6%	16.7%	56.7%	10.7%	7.6%	.
Community Action Agency	499	1785	2284	63.6%	1.3%	24.7%	10.3%	27.7%	23.5%	51.0%	7.2%	5.5%	33.3%
Delta-Menominee	322	1233	1555	79.0%	0.4%	4.3%	15.7%	44.9%	17.3%	53.1%	8.4%	8.2%	0.0%
Detroit City	6381	22747	29128	8.1%	72.3%	16.1%	2.0%	24.7%	19.8%	52.5%	12.5%	7.2%	14.2%
Detroit Urban League	3761	12555	16316	11.9%	76.4%	7.5%	3.4%	23.1%	18.0%	53.3%	13.2%	6.9%	14.3%
Dickinson-Iron DHD	217	867	1084	92.0%	0.2%	2.7%	4.6%	46.3%	6.3%	43.8%	8.5%	7.8%	
District Health Department #10	415	1561	1976	88.3%	0.5%	4.6%	6.6%	37.0%	19.8%	48.0%	7.0%	7.0%	33.3%
District Health Department #2	1786	6707	8493	79.2%	1.5%	12.9%	6.0%	41.7%	18.9%	53.2%	7.7%	7.9%	10.5%
District Health Department #4	430	1494	1924	88.1%	0.5%	3.5%	7.4%	36.3%	18.5%	55.0%	9.7%	9.3%	0.0%
Downriver Community Serv	672	2516	3188	65.6%	9.7%	14.0%	9.3%	24.5%	16.8%	49.9%	6.7%	5.8%	18.3%
Genesee County HD	2939	10161	13100	42.3%	39.0%	6.6%	11.7%	24.1%	18.6%	52.8%	11.9%	9.9%	14.9%
Grand Traverse County HD	503	1523	2026	82.8%	0.8%	7.9%	7.3%	32.0%	16.5%	52.8%	8.4%	7.8%	16.7%
Health Delivery, Inc.	533	2129	2662	11.4%	54.4%	28.4%	5.3%	38.3%	25.3%	42.9%	11.5%	11.3%	15.3%
Huron County HD	174	674	848	92.1%	0.1%	5.2%	2.6%	45.9%	20.4%	42.6%	7.7%	8.0%	
Ingham County HD	1831	6248	8079	35.3%	25.4%	18.9%	13.7%	27.6%	18.1%	51.6%	9.7%	8.6%	13.3%
Intercare Comm. Health Network	2662	10411	13073	58.7%	3.8%	30.3%	6.1%	38.4%	23.2%	45.7%	8.3%	8.4%	7.9%
Ionia County HD	379	1440	1819	85.8%	0.2%	9.6%	4.4%	37.4%	13.7%	54.2%	9.2%	9.3%	
Jackson County HD	1077	4023	5100	62.5%	14.3%	8.1%	14.6%	38.6%	20.8%	53.4%	8.7%	7.8%	12.0%
Kalamazoo County HD	846	3775	4621	47.7%	28.4%	11.2%	11.9%	26.2%	18.6%	52.9%	9.7%	7.3%	14.3%
Kalamazoo Family Health Center	695	2099	2794	33.1%	43.7%	12.3%	9.7%	54.9%	17.3%	53.4%	9.7%	8.1%	13.9%
Kent County HD	3970	14916	18886	31.3%	23.3%	32.0%	8.5%	27.3%	25.4%	44.5%	10.4%	10.6%	13.4%
Keweenaw Bay WIC Program	61	231	292	6.5%	0.0%	4.8%	14.4%	49.2%	9.5%	40.5%	5.5%	0.0%	
Lapeer County HD	357	1580	1937	80.8%	0.6%	9.8%	8.5%	29.6%	15.1%	55.5%	8.4%	8.9%	
Livingston County HD	370	1503	1873	86.9%	0.9%	4.9%	5.4%	22.1%	15.2%	55.7%	8.0%	7.9%	0.0%
LMAS	198	671	869	70.4%	0.6%	0.7%	23.1%	53.9%	16.4%	58.9%	5.9%	6.6%	0.0%
Macomb County HD	2917	9715	12632	53.9%	28.7%	3.1%	7.9%	26.0%	17.9%	53.5%	11.1%	9.5%	14.9%
Marquette County HD	243	1007	1250	81.7%	0.4%	4.1%	12.1%	44.0%	18.6%	45.5%	10.5%	10.3%	.
Mid-Michigan Comm.	776	3053	3829	82.8%	0.5%	12.3%	4.2%	35.1%	20.5%	51.9%	7.7%	7.5%	0.0%
Mid-Michigan DHD	407	1600	2007	90.0%	1.0%	3.6%	4.7%	33.7%	22.0%	54.2%	6.0%	5.5%	0.0%
Monroe County HD	655	2471	3126	74.9%	6.7%	8.6%	9.4%	33.1%	20.0%	51.9%	7.9%	7.1%	7.7%
Muskegon County HD	1505	5350	6855	50.1%	25.7%	12.3%	11.3%	38.5%	20.1%	49.9%	10.4%	9.0%	13.7%
Northwest MI Comm Health Agency	634	2480	3114	89.1%	0.5%	2.7%	5.5%	36.5%	24.5%	49.8%	7.9%	8.4%	0.0%
Oakland County HD	3463	12672	16135	43.0%	32.6%	14.6%	7.2%	26.2%	18.3%	52.5%	12.0%	10.3%	15.3%
Saginaw County Depart PH	1009	3394	4403	41.3%	29.4%	20.8%	8.1%	36.2%	20.3%	50.7%	12.7%	11.1%	14.7%
Sanilac County HD	230	845	1075	88.4%	0.6%	7.3%	3.6%	38.5%	22.6%	41.9%	8.8%	9.4%	0.0%
Shiawassee County HD	394	1582	1976	83.1%	0.5%	7.9%	8.4%	39.5%	16.2%	50.8%	7.4%	8.1%	0.0%
St Clair County HD	799	2907	3706	72.6%	5.0%	8.9%	13.1%	39.7%	14.6%	55.7%	8.1%	7.9%	12.5%
Tuscola County HD	331	1302	1633	87.4%	0.8%	7.6%	3.8%	40.2%	15.4%	53.3%	8.4%	9.0%	0.0%
Washtenaw County HD	1201	4359	5560	31.2%	37.6%	12.1%	15.3%	32.5%	21.6%	49.6%	9.9%	8.4%	12.1%
Wayne County HD	5928	19814	25742	55.6%	27.7%	5.8%	5.9%	23.1%	17.4%	52.9%	10.0%	8.0%	12.9%
Western UP District HD	320	1139	1459	88.8%	1.1%	2.0%	6.0%	38.8%	14.1%	51.8%	5.4%	5.4%	0.0%

[a] PNSS & PedNSS combined data (Distribution of American Indian/Alaska Native & Asian/Pacific Islander available in Local Agency Briefs) [b] PNSS Data *Data insufficient for analysis

Table A-2 (continued) Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2017

	Breastfeeding		Overweight				Obese				Anemia < 5 yrs
	Initiation	6 months duration	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	66.7%	28.8%	14.1%	14.6%	12.5%	15.9%	13.2%	13.4%	10.6%	17.0%	22.8%
Barry-Eaton DHD	82.5%	34.0%	16.4%	16.9%	12.0%	17.4%	14.4%	13.5%	0.0%	22.8%	10.5%
Bay County HD	65.1%	34.0%	16.4%	16.0%	20.7%	16.6%	16.5%	16.5%	6.9%	14.3%	11.2%
Benzie-Leelanau DHD	80.7%	41.3%	16.3%	12.5%	0.0%	25.0%	16.7%	16.5%	100.0%	15.9%	13.8%
Berrien County HD	73.2%	27.8%	15.8%	16.1%	16.3%	12.8%	11.4%	10.8%	11.3%	16.2%	17.9%
Branch-Hillsdale-St. Joe DHD	82.6%	35.6%	14.5%	14.5%	16.7%	14.4%	14.5%	13.4%	8.3%	20.1%	8.4%
Calhoun County HD	73.8%	29.1%	16.6%	17.1%	15.7%	18.0%	15.6%	15.8%	15.2%	19.0%	27.4%
Central MI District HD	77.6%	35.4%	14.7%	14.3%	13.9%	15.4%	13.5%	13.6%	8.3%	16.3%	11.1%
Chippewa County HD	69.9%	32.9%	15.8%	15.5%		0.0%	15.2%	11.4%		46.7%	24.7%
Community Action Agency	77.7%	34.0%	15.1%	15.6%	12.5%	13.8%	14.3%	11.7%	12.5%	20.9%	28.5%
Delta-Menominee	70.6%	24.1%	11.9%	12.8%	0.0%	13.0%	12.6%	11.3%	0.0%	8.7%	5.2%
Detroit City	49.3%	20.2%	12.6%	12.7%	11.8%	14.9%	11.8%	11.4%	10.2%	17.7%	29.1%
Detroit Urban League	49.8%	19.9%	12.8%	14.4%	12.1%	18.0%	11.8%	15.6%	10.2%	17.6%	45.3%
Dickinson-Iron DHD	78.4%	46.1%	13.6%	13.4%	0.0%	7.7%	16.0%	15.8%	100.0%	23.1%	19.7%
District Health Department #10	67.1%	28.3%	15.9%	14.7%	33.3%	27.8%	14.5%	14.7%	0.0%	16.7%	20.9%
District Health Department #2	78.5%	36.1%	14.7%	14.9%	12.5%	14.8%	13.9%	13.4%	12.5%	15.6%	17.9%
District Health Department #4	70.8%	38.3%	16.4%	16.4%	0.0%	22.7%	16.1%	15.8%	0.0%	22.7%	17.7%
Downriver Community Serv	71.6%	30.7%	15.0%	14.8%	12.6%	16.7%	14.8%	13.4%	11.7%	18.5%	21.5%
Genesee County HD	57.8%	22.7%	13.9%	14.1%	12.7%	15.2%	13.4%	15.2%	11.0%	15.2%	23.8%
Grand Traverse County HD	86.6%	52.0%	16.7%	16.5%	0.0%	25.6%	11.1%	10.3%	33.3%	11.6%	23.6%
Health Delivery, Inc.	60.2%	18.4%	15.7%	21.5%	15.7%	14.5%	13.2%	12.4%	10.6%	18.9%	17.9%
Huron County HD	74.5%	35.4%	16.7%	16.4%	0.0%	20.0%	17.0%	15.7%	0.0%	25.0%	10.2%
Ingham County HD	79.4%	39.0%	13.2%	12.6%	13.0%	14.9%	13.1%	13.0%	11.5%	16.9%	14.2%
Intercare Comm. Health Network	76.2%	36.3%	14.8%	13.2%	13.8%	17.9%	14.5%	12.0%	11.0%	19.2%	29.8%
Ionia County HD	79.0%	34.9%	16.7%	16.5%	50.0%	14.3%	14.6%	14.2%	0.0%	16.9%	13.1%
Jackson County HD	73.6%	34.5%	16.0%	16.1%	15.4%	17.7%	15.3%	15.3%	12.0%	17.7%	25.2%
Kalamazoo County HD	75.0%	29.9%	15.8%	15.6%	14.7%	19.8%	13.4%	13.4%	10.9%	18.4%	34.1%
Kalamazoo Family Health Center	69.0%	22.1%	15.7%	15.6%	15.5%	16.0%	14.2%	14.5%	11.5%	22.2%	31.1%
Kent County HD	75.8%	30.1%	13.9%	14.3%	12.4%	14.7%	12.4%	9.8%	11.7%	16.2%	18.0%
Keweenaw Bay WIC Program	80.0%	29.7%	14.4%	0.0%		0.0%	26.3%	0.0%		28.6%	32.6%
Lapeer County HD	79.6%	35.1%	13.1%	13.2%	0.0%	10.7%	15.7%	15.7%	30.0%	16.0%	13.0%
Livingston County HD	74.9%	35.1%	16.8%	17.3%	0.0%	8.7%	13.2%	12.7%	12.5%	15.2%	8.9%
LMAS	77.6%	31.8%	17.1%	21.0%			20.3%	19.7%			15.6%
Macomb County HD	58.4%	22.4%	12.2%	13.1%	10.5%	16.8%	13.1%	14.1%	10.5%	13.3%	22.4%
Marquette County HD	79.7%	42.1%	15.2%	15.8%	50.0%	16.7%	13.3%	12.2%	0.0%	25.0%	8.3%
Mid-Michigan Comm.	84.7%	39.2%	14.7%	14.4%	0.0%	14.9%	14.3%	13.2%	16.7%	19.0%	5.4%
Mid-Michigan DHD	74.5%	39.8%	16.9%	16.5%	30.0%	16.2%	14.7%	15.8%	0.0%	10.8%	17.1%
Monroe County HD	62.9%	24.2%	14.7%	15.9%	10.5%	11.7%	14.7%	14.5%	11.6%	15.3%	15.3%
Muskegon County HD	64.1%	28.9%	14.8%	14.9%	11.5%	19.3%	13.6%	14.9%	11.3%	12.1%	30.1%
Northwest MI Comm Health Agency	80.6%	43.7%	14.6%	14.5%	25.0%	18.4%	12.8%	12.4%	12.5%	15.8%	13.3%
Oakland County HD	70.0%	28.3%	13.8%	15.1%	11.0%	16.9%	11.8%	12.4%	9.4%	15.6%	23.5%
Saginaw County Depart PH	60.3%	23.5%	13.2%	12.2%	13.8%	14.0%	15.0%	15.8%	10.9%	19.4%	20.6%
Sanilac County HD	63.7%	26.0%	18.0%	16.9%	50.0%	28.9%	21.4%	20.9%	50.0%	21.1%	17.7%
Shiawassee County HD	74.4%	35.1%	16.5%	16.7%	0.0%	19.0%	14.7%	14.0%	16.7%	9.5%	14.9%
St Clair County HD	69.7%	32.9%	15.2%	15.4%	15.2%	15.8%	15.9%	15.4%	15.2%	18.0%	17.4%
Tuscola County HD	73.8%	34.0%	12.7%	12.6%	0.0%	14.3%	13.2%	13.8%	0.0%	11.1%	11.2%
Washtenaw County HD	79.7%	39.5%	13.4%	12.9%	13.5%	17.5%	12.1%	14.1%	9.9%	15.4%	29.0%
Wayne County HD	60.5%	24.3%	12.6%	13.1%	12.5%	13.8%	11.4%	11.1%	10.8%	11.7%	21.9%
Western UP District HD	82.3%	45.1%	13.6%	13.2%	25.0%	28.6%	15.5%	15.2%	25.0%	14.3%	8.6%

[a] PNSS Data [b] Analysis limited to children < 2 years of age [c] PedNSS data [d] Analysis limited to children older than 24 months and up to 60 months *Data insufficient for analysis

Michigan Department of Health and Human Services, WIC Division is an equal opportunity provider.