

**Michigan Pregnancy & Pediatric
Nutrition Surveillance**



2015 Annual Report with 2010-2015 Trends

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.

Michigan Department of Health and Human
Services

Nick Lyon, Director

Population Health Administration

Susan Moran, Director

Bureau of Family Health Services

Lynette Biery , Director

Suggested Citation

Xue W, Kodur B, Eghtedary K. *Michigan Pregnancy and Pediatric Nutrition Surveillance 2015 Annual Report with 2010–2015 Trends*. Michigan Department of Health and Human Services, WIC Division, 2017.

Acknowledgments

It is with great appreciation that we acknowledge and thank all contributors to the Michigan Pregnancy Nutrition Surveillance System (PNSS) & Michigan Pediatric Nutrition Surveillance System (PedNSS). We thank the WIC local agency coordinators, health professionals and clerical staff at each local clinic for collecting participant data that make the Michigan Nutrition Surveillance possible.

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

For additional copies of this report, please contact

Michigan Department of Health and Human Services, WIC Division
320 S. Walnut, 6th Floor
Lansing, MI 48913
MichiganWIC@michigan.gov
(517) 335-8951

This report is available at www.michigan.gov/wic



Table of Contents

INDEX OF FIGURES	2
INDEX OF TABLES	5
EXECUTIVE SUMMARY	6
INTRODUCTION	7
DEMOGRAPHIC CHARACTERISTICS	10
MATERNAL HEALTH AND BEHAVIOR INDICATORS	15-32
Prenatal Care Enrollment	15
WIC Enrollment	18
Maternal Pre-Pregnancy Body Mass Index	21
Maternal Weight Gain	23
Maternal Anemia	26
Maternal Smoking	29
Maternal Drinking	32
PEDIATRIC HEALTH INDICATORS	33-62
Infant Low Birthweight	33
Infant High Birthweight	39
Breastfeeding Initiation & Duration	41
Anemia	48
Undernutrition	51-54
Short Stature	51
Underweight	54
Obesity and Overweight	56
HEALTH PROGRESS REVIEW	63-64
RECOMMENDATIONS	65
REFERENCES	66-71
APPENDIX A: LOCAL AGENCY TREND TABLES	A1-A7



Index of Figures

Figure 1: Trend in race/ethnicity of women participating in WIC, MI-PNSS 2010-2015	12
Figure 2: Trend in race/ethnicity in the WIC population younger than 5 years of age, MI-PedNSS 2010-2015	12
Figure 3: Distribution by maternal age, MI-PNSS 2015	14
Figure 4: Years of education attained by women enrolled in Michigan WIC, MI-PNSS 2015	14
Figure 5: Trend of prevalence of prenatal care by trimester of entry among women enrolled in WIC, MI PNSS 2010-2015	15
Figure 6: Prevalence of trimester of prenatal care enrollment by race/ethnicity and by age among women enrolled in WIC, MI-PNSS 2015	16
Figure 7: Prevalence of 1 st trimester entry into prenatal care by local agency, MI-PNSS 2015	17
Figure 8: Trend of trimester of WIC enrollment prevalence among women enrolled in WIC, MI-PNSS 2010-2015	19
Figure 9: Prevalence of trimester of WIC enrollment by maternal race/ethnicity and by age among women enrolled in WIC, MI-PNSS 2015	19
Figure 10: Prevalence of 1 st trimester enrollment in WIC by local agency, MI-PNSS 2015	20
Figure 11: Trend of maternal pre-pregnancy BMI prevalence among women enrolled in WIC, MI-PNSS 2010-2015	21
Figure 12: Prevalence of maternal BMI by race/ethnicity and by age among women enrolled in WIC, MI-PNSS 2015	22
Figure 13: Trend of pregnancy weight gain prevalence among women enrolled in WIC, MI-PNSS 2010-2015	23
Figure 14: Prevalence of pregnancy weight gain by race/ethnicity and by age among women enrolled in WIC, MI-PNSS 2015	24
Figure 15: Prevalence of less than ideal pregnancy weight gain by local agency, MI-PNSS 2015	25
Figure 16: Trend of maternal anemia prevalence among women enrolled in WIC, MI-PNSS 2010-2015	26
Figure 17: Prevalence of anemia by trimester by race/ethnicity and by age among women enrolled in WIC, MI-PNSS 2015	27
Figure 18: Prevalence of maternal 3 rd trimester anemia by local agency, MI-PNSS, 2015	28
Figure 19: Trend of maternal smoking prevalence (before and during pregnancy) among women enrolled in WIC, MI-PNSS 2015	29
Figure 20: Prevalence of maternal smoking prevalence (before and during pregnancy) by race/ethnicity and by age among women enrolled in WIC, MI-PNSS 2015	30
Figure 21: Prevalence of smoking during the last trimester by local agency, MI-PNSS 2015	31
Figure 22: Trend of maternal drinking prevalence (before and during pregnancy) among women enrolled in WIC, MI-PNSS 2010-2015	32



MI-PNSS & PedNSS Report 2010-2015

Figure 23: Trend of low birthweight incidence by race/ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2010-2015	33
Figure 24: Incidence of low birthweight among infants born to mothers enrolled in WIC 2015 by maternal age and by maternal race/ethnicity, MI-PNSS 2015	34
Figure 25: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal trimester of entry into WIC, MI-PNSS 2015	34
Figure 26: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal prenatal BMI and smoking, MI-PNSS 2015	35
Figure 27: Incidence of low birthweight among Michigan infants born to mothers enrolled in MI WIC by maternal prenatal BMI and maternal smoking, MI-PNSS 2015	35
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 2015	36
Figure 29: Incidence of infant low birthweight by local agency, MI-PNSS 2015	38
Figure 30: Trend of high birthweight incidence by race/ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2010-2015	39
Figure 31: Incidence of high birthweight by maternal age group and race/ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2015	39
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 2015	40
Figure 33: Trend of breastfeeding initiation prevalence by race/ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2010-2015	41
Figure 34: Trend of breastfed (to 6 months of age) prevalence by race/ethnicity among infants enrolled in WIC, MI-PedNSS 2010-2015	42
Figure 35: Prevalence of breastfeeding duration among infants enrolled in WIC and born to mothers enrolled in WIC that initiated breastfeeding, MI-PNSS/PedNSS 2015	42
Figure 36: Prevalence of being breastfed (ever or to 6 months of age) by maternal race/ethnicity and by age among infants enrolled in WIC, MI-PedNSS/PNSS 2015	43
Figure 37: Prevalence of breastfed (ever) by local agency, MI-PNSS 2015	46
Figure 38: Prevalence of breastfed to 6 months by local agency, MI-PedNSS/PNSS 2015	47
Figure 39: Trend of pediatric anemia prevalence among children <5 years enrolled in WIC, MI-PedNSS 2010-2015	48
Figure 40: Trend of pediatric anemia prevalence among children <5 years enrolled in WIC by race/ethnicity, MI-PedNSS 2010-2015	48
Figure 41: Prevalence of pediatric anemia by maternal race/ethnicity and trimester of WIC enrollment among children <5 years enrolled in WIC, MI-PNSS 2010-2015/PedNSS 2015	49
Figure 42: Prevalence of pediatric anemia by local agency among children <5 years enrolled in WIC, MI-PedNSS 2015	50
Figure 43: Trend of short stature prevalence by race/ethnicity among children <2 years enrolled in WIC, MI-PedNSS 2010-2015	52
Figure 44: Prevalence of short stature among children <5 years enrolled in WIC by race/ethnicity and age group, MI-PedNSS 2010-2015	52



MI-PNSS & PedNSS Report 2010-2015

Figure 45: Trend of underweight prevalence by age group among children <5 years enrolled in WIC, MI-PedNSS 2010-2015	54
Figure 46: Prevalence of underweight by race/ethnicity and age group among children <5 years enrolled in WIC, MI-PedNSS 2015	54
Figure 47: Prevalence of underweight among children < 5 years of age enrolled in WIC by maternal age group, MI-PNSS 2010-2015/PedNSS 2015	55
Figure 48: Trend of obesity prevalence by race/ethnicity among children 2 to 5 years enrolled in WIC, MI-PedNSS 2010-2015	56
Figure 49: Trend of overweight prevalence by race/ethnicity among children 2 to 5 years enrolled in WIC, MI-PedNSS 2010-2015	57
Figure 50: Prevalence of obese and overweight among children ages 2 to 5 years enrolled in WIC by race/ethnicity, MI-PedNSS 2015	57
Figure 51: Prevalence of obesity and overweight by maternal prenatal BMI or maternal gestational weight gain among 2-5 years old children born to mothers enrolled in WIC, MI-PNSS 2010-2013/PedNSS 2015	58
Figure 52: Prevalence of overweight among children ages 2 to 5 years by local agency, MI-PedNSS 2015	61
Figure 53: Prevalence of obesity among children ages 2 to 5 years by local agency, MI-PedNSS 2015	62
Figure 54: Changes in maternal, infant and child health status , MI-PNSS/PedNSS 2010-2015	63



MI-PNSS & PedNSS Report 2010-2015

Index of Tables

Table 1: Distribution of women, infants & children enrolled in Michigan’s WIC program during 2015, by local agency, MI-PedNSS 2015 & MI-PNSS 2015	11
Table 2: Race and ethnicity distribution of WIC participants for selected urban and rural agencies, MI-PNSS/ PedNSS 2015	13
Table 3: Prevalence of 1 st trimester prenatal care enrollment among women enrolled in WIC by local agency, MI-PNSS 2015	16
Table 4: Prevalence of 1 st trimester WIC enrollment among women enrolled in WIC by local agency, MI-PNSS 2015	18
Table 5: Weight classification based on pre-pregnancy BMI (IOM, 1990)	21
Table 6: Weight classification based on pre-pregnancy BMI (IOM, 2009)	21
Table 7: Maternal weight gain categories based on the 2009 IOM recommendations (IOM, 2009)	23
Table 8: Incidence of low birthweight among infants enrolled in WIC by local agency, MI-PNSS 2015	37
Table 9: Adjusted Odds ratio estimates for low birthweight by maternal factors MI-PNSS 2015	37
Table 10: Incidence of high birthweight among infants born to mothers enrolled in WIC by local agency , MI-PNSS 2015	40
Table 11: Prevalence of breastfeeding initiation and breastfed to 6 months among infants whose mothers enrolled in Michigan WIC by selected maternal characteristics, MI-PedNSS/PNSS 2015	44
Table 12: Prevalence of ever breastfed among infants enrolled in WIC by local agency, MI-PNSS 2015	45
Table 13: Prevalence of breastfed to 6 months among infants enrolled in WIC by local agency, MI-PNSS/ PedNSS 2015	45
Table 14: Prevalence of anemia among children <5 years enrolled in WIC, by local agency, MI-PedNSS 2015	49
Table 15: Prevalence of short stature among children <5 years enrolled in WIC, by local agency, MI-PedNSS 2015	53
Table 16: Adjusted odds ratios for short stature among children <2 years by child and maternal effects, MI-PNSS 2013-2015/PedNSS 2015	53
Table 17: Prevalence of underweight among children <5 years enrolled in WIC, by local agency, MI-PedNSS 2015	55
Table 18: Prevalence of overweight and obese among children ages 2 to 5 enrolled in MI WIC by selected maternal and infant characteristics, MI-PNSS 2010-2013/PedNSS 2015	58
Table 19: Adjusted odds ratios for child BMI >85th percentile and >95th percentile among children ages 2 to 5 years by infant, child & maternal effects, MI-PNSS 2010-2013/PedNSS 2015	59
Table 20: Prevalence of obesity among children 2 to 5 years enrolled in WIC by local agency, MI-PedNSS 2015	60
Table 21: Prevalence of overweight among children 2 to 5 years enrolled in WIC by local agency, MI-PedNSS 2015	60



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 2015 was merged with maternal data from 2010-2015, creating a database of information that was used to analyze key maternal and pediatric health indicators. This report summarizes data from 2015 and highlights trends from 2010 through 2015.

- There were 229,691 children under the age of 5 years participating in WIC during 2015; of these, 55.7% were under the age of 2 years old.
- Michigan's live births went from 114,717 in 2010 to 113,204 in 2015, a 1.6% decrease (MDHHS, 2015) and maternal WIC enrollment decreased by 8.2%. Out of 63,091 total women enrolled in WIC in 2015, 4,198 (6.7%) women were prenatal and 12,851 (20.4%) were postpartum, 46,042 (73.0%) women were enrolled in WIC during their pregnancy and returned to WIC for postpartum visit.
- Enrollment of women during their 1st trimester decreased by 9.3% from 2010 (37.6%) to 2015 (34.1%).
- Ideal prenatal weight gain was 31.0% in 2010 and 29.8% in 2015, a 3.9% decrease.
- The incidence of low birthweight among infants enrolled in WIC increased by 14.1% from 8.5% in 2010 to 9.7% in 2015. Low birthweight disproportionately affects Black, Non-Hispanic infants (13.8%) compared to White, Non-Hispanic infants (8.0%).
- The prevalence of breastfeeding initiation in 2015 was 65.1%, an increase of 8.9% from 2010 (59.8%).
- The prevalence of breastfeeding to 6 months was 18.9% in 2010 among WIC participants compared to 18.4% in 2015, a slight decrease.
- Among infants enrolled in WIC and born to mothers enrolled in WIC that initiated breastfeeding, 28.6% were breastfed to six months and 16.6% were breastfed for one year.
- The prevalence of obesity among children ages 2 to 5 years decreased by 4.4% from 13.5% in 2010 to 12.9% in 2015.
- From 2010 to 2015, the prevalence of anemia among all children 5 years and younger increased by 14.7% from 15% in 2010 to 17.2% in 2015. In 2015, the prevalence of anemia was significantly higher among Black, Non-Hispanic children (28.6%).



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 implications 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 socioeconomic status are disproportionately affected by low birthweight. For example, in Michigan, 13.2% of Black, non-Hispanics infants were born with low birthweight compared to 7.1% of White, Non-Hispanic infants in 2013 (MDHHS, 2013). 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, and several are putting on an excessive amount of weight throughout 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 was 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). 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 partook 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

Qualification criteria that should be met to participate in WIC are to be:

- ◆ a pregnant woman or postpartum woman, infant, or child under the age of 5;
- ◆ a resident of Michigan;
- ◆ at or below 185% of the Poverty Income Guideline or participate in another state-

administered program that utilizes the same income guidelines;

- ◆ classified by a health professional as “nutritionally at risk”.

In 2013-2014, 54% of babies born in Michigan enrolled in WIC (MDHHS, 2015). In fiscal year 2015, there was an average of 8 million (8,023,742) WIC participants in the United States and 244,829 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 48 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



MI-PNSS & PedNSS Report 2010-2015

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, behavioral, and health are recorded and verified by a health professional at the 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 '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 additionally used in 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 the state, or participant lack of recall. The analysis could be skewed if these limitations differ from the participants who remain in the program.



Demographic Characteristics

Linkage Methods

A SAS database was created for each year of data: 2010–2015 for PedNSS and 2010-2015 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 (2015) was sorted and linked to PNSS by using Child ID (Infant ID). The merged dataset included only data from children whose mother enrolled in WIC. Each unique Child ID in PedNSS would link to one record of maternal data in PNSS.
- ◆ PedNSS 2015 was linked to PNSS 2010-2015 if the analysis focused on all children younger than 5 years old.
- ◆ PedNSS 2015 was linked to PNSS 2010-2013 if 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 analysis was for children younger than 2 years old, then PedNSS 2015 were linked to PNSS 2013-2015 and analysis was restricted to those that were younger than 24 months.

In 2015, there were 229,691 infants and children up to 5 years of age and 62,875 pregnant and postpartum women enrolled in Michigan’s 48 local WIC agencies. There was a decrease in women enrollees from 2010 to 2015 with a more significant decrease in children enrollees. Over half (55.8%) of the children enrolled in WIC were under the age of 2 years. Of the mothers enrolled in 2015, 63.9% of them were between the ages of 20 to 29 years. The largest proportion of Michigan WIC clients (12.1%) 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 2010 to 2015 Michigan’s crude birth rate declined by 1.3%. In addition, the population live below poverty line decreased from 15.7% in 2010 to 14.8% in 2015 (a 5.7%) decline. These factors could at least partially explain the reason maternal WIC enrollment decreased by 8.2% as trends in birth and poverty generally shape participation in WIC (Carlson, Neuberger, & Rosenbaum, 2015).



MI-PNSS & PedNSS Report 2010-2015

Table 1: Distribution of women, infants, and children enrolled in Michigan's WIC program during 2015 by local agency, MI-PNSS & PedNSS 2015

Agency	Frequency	%	Agency	Frequency	%
Barry-Eaton DHD	3426	1.2	Jackson County HD	5871	2.0
Bay County HD	3171	1.1	Kalamazoo County HD	3552	1.2
Benzie-Leelanau DHD	812	0.3	Kalamazoo Family Health Center	4525	1.6
Berrien County HD	5039	1.7	Kent County HD	16714	5.7
Branch-Hillsdale-St. Joseph Community Health Agency	6306	2.2	Keweenaw Bay Indian Community	300	0.1
Calhoun County HD	5700	2.0	Lapeer County HD	2307	0.8
Central MI District HD	6050	2.1	Livingston County HD	2290	0.8
Chippewa County HD	1378	0.5	Luce-Mackinac-Alger-Schoolcraft DHD	944	0.3
Community Action Agency	2826	1.0	Macomb County HD	12049	4.1
Delta & Menominee	1866	0.6	Marquette County HD	1553	0.5
Detroit DHWP	35417	12.1	Mid-MI Community Action Agency	2219	0.8
Detroit Urban League	16143	5.5	Mid-Michigan DHD	4559	1.6
Dickinson-Iron DHD	1173	0.4	Monroe County HD	3736	1.3
District Health Dept. #10	9768	3.3	Muskegon County HD	7816	2.7
District Health Dept. #2	2099	0.7	Health Department of Northwest MI	3128	1.1
District Health Dept. #4	2094	0.7	Oakland County HD	18152	6.2
Downriver Community Services	3749	1.3	Saginaw County Dept. of Pub Health	5188	1.8
Genesee County HD	14379	4.9	Sanilac County HD	1119	0.4
Grand Traverse County HD	2433	0.8	Shiawassee County HD	2360	0.8
Health Delivery, Inc.	2777	1.0	St. Clair County	4182	1.4
Huron County HD	919	0.3	Tuscola County HD	1833	0.6
Ingham County HD	8359	2.9	Washtenaw County HD	6670	2.3
InterCare Community Health Network	15612	5.3	Wayne County HD	26140	8.9
Ionia County HD	2071	0.7	Western Upper Peninsula HD	1792	0.6
			Total	292,566	

¹ Recording period is January 1st through December 31st

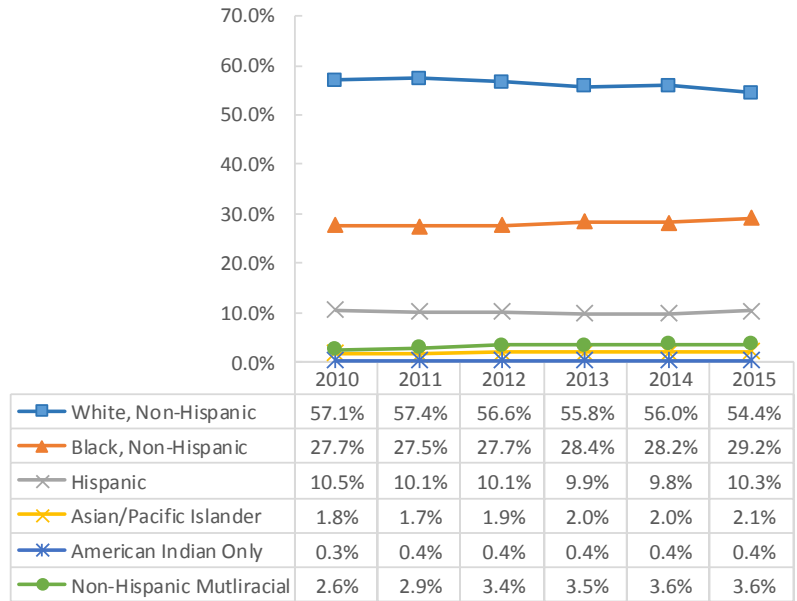
² Excludes Records with unknown data and errors



Race and Ethnicity

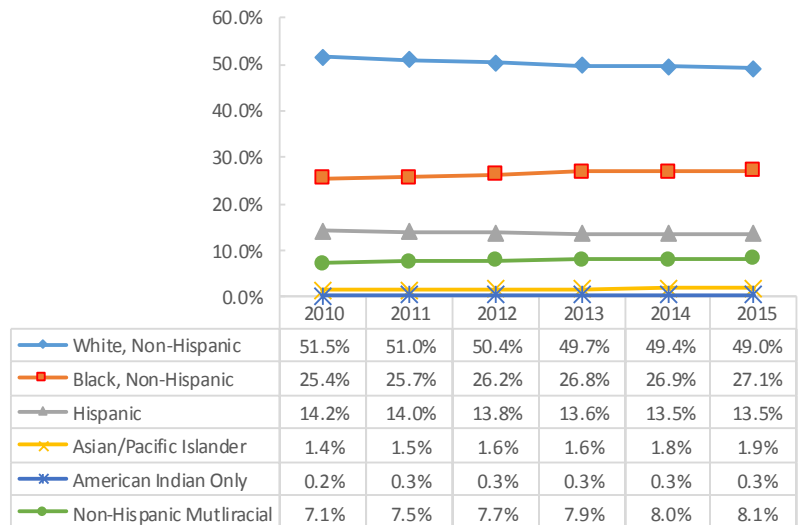
WIC participants self-identify their race and ethnicity (Figure 1). The distribution of race/ethnicity among women in 2015 is as follows: White, Non-Hispanic (54.4%), Black, Non-Hispanic (29.2%), Hispanic (10.3%), Asian/Pacific Islander (2.1%), American Indian Only (0.4%) and Multiracial, Non-Hispanic (3.6%). The proportion of White, Non-Hispanic women enrolled in WIC decreased 4.7% from 2010 through 2015, while the proportion of Black, Non-Hispanic women and Non-Hispanic Multiracial increased by 5.4% and 38.5% respectively.

Figure 1: Race/Ethnicity of women participating in WIC, MI-PNSS 2010–2015¹⁻²



In 2015, less than half (49.0%) of the children under 5 years of age were White, Non-Hispanic (Figure 2). The proportion of Multiracial, Non-Hispanic increased from 7.1% in 2010 to 8.1% in 2015, a 14.1% increase. There was also an increase in Black, Non-Hispanic children from 25.4% in 2010 to 27.1% in 2015.

Figure 2: Trend in race/ethnicity in the WIC population younger than 5 years of age, MI-PedNSS 2010-2015¹⁻²



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



MI-PNSS & PedNSS Report 2010-2015

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 2015, the highest proportion of Black, Non-Hispanic participants (74.2%) were seen at The Detroit Department of Health and Wellness Promotion. Health Delivery System Inc. (87.6%) and the Detroit Urban League (86.3%) serve a predominately non-White population, while Kent County (33.6%) and InterCare Community Health Network (30.8%) enrolled the highest proportion of Hispanics.

More about WIC

- ◆ Approximately \$6.17 billion was spent through WIC in FY 2015 (4.18 billion in food and 1.92 billion in administration) on food and other services for an average of 8.02 million participants (USDA, 2015).
- ◆ In FY 2015, Michigan ranked 9th nationally with 244,829 WIC participants. (USDA, 2015)

Table 2: Race and ethnicity distribution of WIC participants for selected urban and rural agencies, MI-PNSS & PedNSS 2015

Urban WIC Agency by Race/Ethnicity												
Agency	White, Non-Hispanic		Black, Non-Hispanic		Hispanic		Asian/Pacific		American Indian		Non-Hispanic	
	N	%	N	%	N	%	N	%	N	%	N	%
Detroit Dept. Health & Wellness Promotion	2619	7.4%	26263	74.2%	5139	14.5%	582	1.6%	19	0.1%	754	2.1%
Wayne County HD	14872	57.0%	7295	28.0%	1360	5.2%	1060	4.1%	24	0.1%	1458	5.6%
Kent County HD	5616	33.6%	3712	22.2%	5605	33.6%	326	2.0%	17	0.1%	1418	8.5%
Genesee County HD	6331	44.1%	5365	37.4%	931	6.5%	57	0.4%	7	0.1%	1650	11.5%
Oakland County HD	8297	45.7%	5727	31.6%	2500	13.8%	407	2.2%	13	0.1%	1192	6.6%
Rural WIC Agency by Race/ Ethnicity												
Agency	White, Non-Hispanic		Black, Non-Hispanic		Hispanic		Asian/Pacific		American Indian		Non-Hispanic	
	N	%	N	%	N	%	N	%	N	%	N	%
InterCare Comm Health Network	9109	59.0%	574	3.7%	4753	30.8%	181	1.2%	16	0.1%	809	5.2%
District Health Dept. #10	7736	79.5%	147	1.5%	1304	13.4%	8	0.1%	12	0.1%	523	5.4%
Branch-Hillsdale-St. Joseph Community Health Agency	4856	77.3%	136	2.2%	927	14.8%	8	0.1%	1	0.0%	352	5.6%
Central MI District HD	5298	87.7%	90	1.5%	220	3.6%	42	0.7%	37	0.6%	354	5.9%
Health Department of Northwest MI	2776	88.8%	20	0.6%	92	2.9%	25	0.8%	86	2.8%	125	4.0%

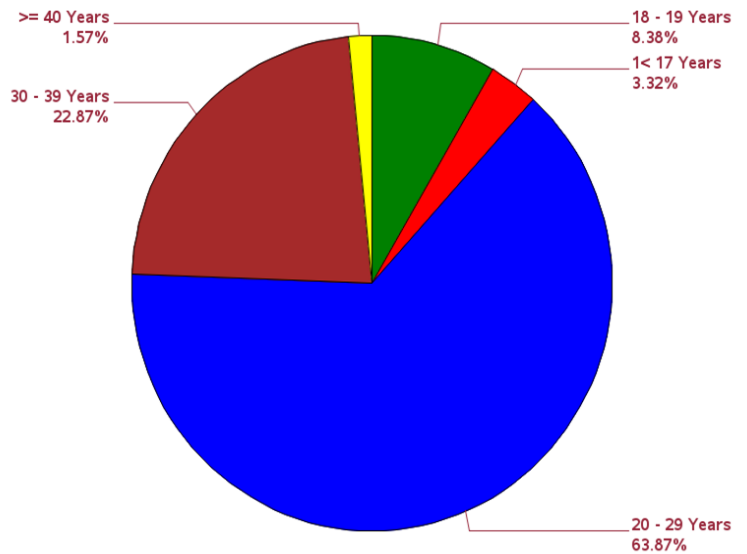


Maternal Age

The majority (63.9%) of the women enrolled in 2015 were between 20 to 29 years of age, followed by women 30 to 39 years old (22.9%). 8.4% of the mothers were 18-19 years of age and 3.3% had not reached adulthood. 1.6% of the women enrolled were over 40 years of age (Figure 3).

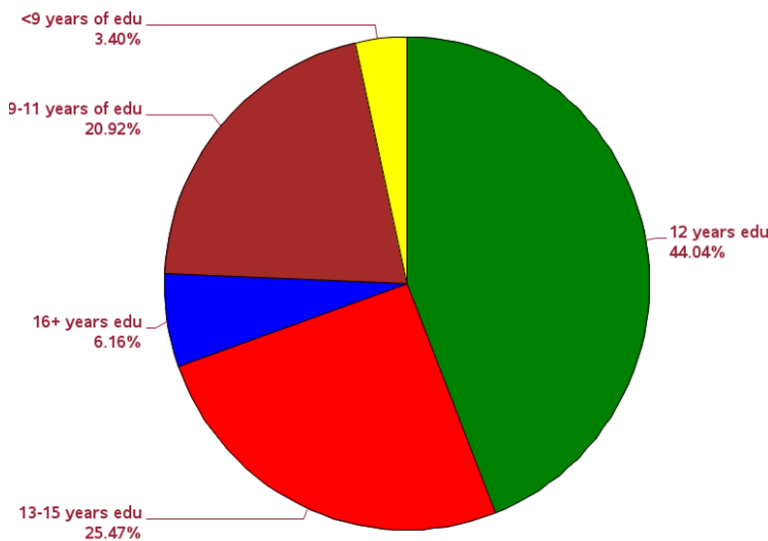
There is a clear pattern of increasing maternal age in WIC mothers over years. From 2010 to 2015, adolescent mothers decreased by 44% from 5.88% to 3.3%, while older mothers (over 30 years) increased from 20.7% to 24.5%.

Figure 3: Distribution by maternal age, MI-PNSS 2015¹⁻²



Maternal Education

Figure 4: Years of education attained by women enrolled in Michigan WIC, MI-PNSS 2015¹⁻²



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

From 2010 to 2015, the percentage of enrollees with education less than high school decreased from 27.7% to 24.3% while women with high school education increased from 42.9% to 44%. In addition, enrollees who had at least some college education increased from 23.5% to 25.5% and women with advanced degrees increased from 6.0% to 6.2%.

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



Maternal Health and Behavior Indicators

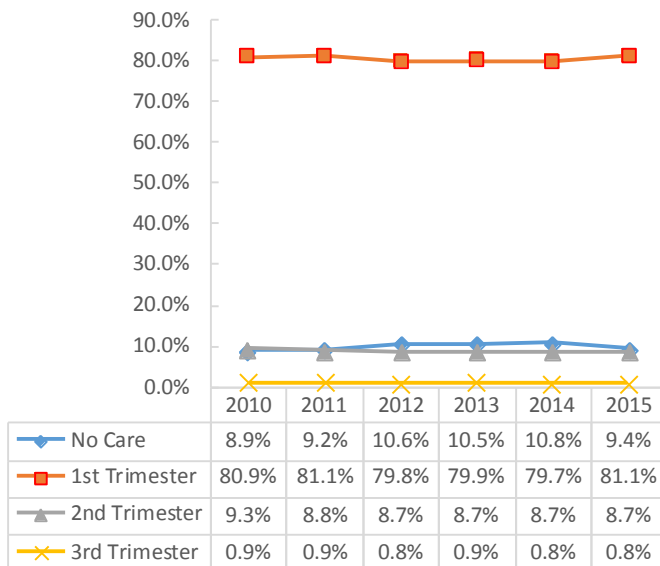
Prenatal Care Enrollment

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.).

Although women can enter into prenatal care at various times during their pregnancy, doing so within the 1st trimester is ideal. In 2015, 72.3% of the live births to Michigan mothers received prenatal care in their first trimester (MDHHS, 2015). At WIC enrollment, 81.1% of Michigan mothers entered prenatal care during their 1st trimester of pregnancy, slightly lower than 81.8% of women enrolled in MWR states and Hawaii (PNSS) in 2015 during that time (Figure 5). The Healthy People 2020 goal for women to enroll in prenatal care during their first trimester is 77.9% (USHHS, 2010).

Figure 5: Trend of prevalence of prenatal care by trimester of entry among women enrolled in WIC*, MI-PNSS 2010-2015¹⁻²



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

Please note that, as recorded in PNSS, prenatal care refers to self-reported or 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.



MI-PNSS & PedNSS Report 2010-2015

Generally, the rate of WIC mothers entering prenatal care in their first trimester expanded with age. In 2015, young WIC mothers (<15) were at the greatest risk of not receiving prenatal care (20.0%) and less likely to enroll in the first trimester (52.5%). Asian/Pacific Islander participants had the highest proportion (84.0%) of women entering prenatal care in the first trimester followed by White, Non-Hispanic participants (82.6%) (Figure 6). 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).

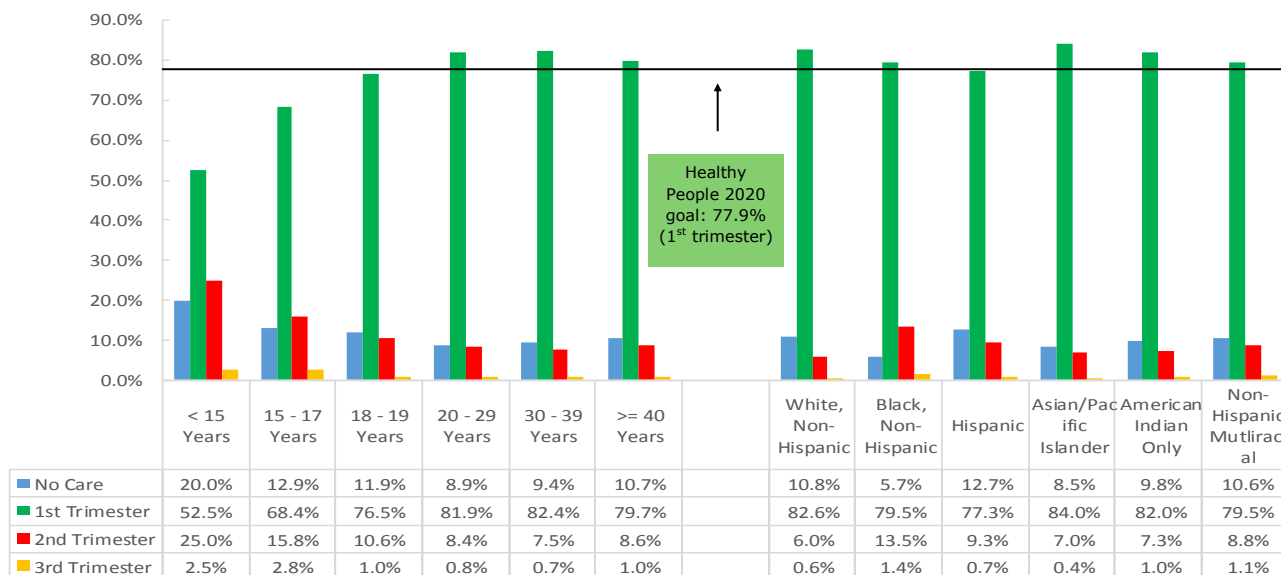
Early enrollment into prenatal care also varied by agency, as seen in Table 3. In 2015, the Keweenaw Bay Indian Community

reported the highest proportion of first trimester prenatal care enrollment (94.0%) followed by Livingston County HD with 91.7%. Conversely, the Benzie-Leelanau District Health Department reported the lowest prevalence of 1st trimester prenatal care enrollment with 61.4%.

Table 3: Prevalence of 1st trimester prenatal care enrollment among women enrolled in WIC by local agency, MI-PNSS 2015¹⁻²

Highest Prevalence of 1st trimester PNC	
Agency	%
Keweenaw Bay Indian Tribe	94.0
Livingston County HD	91.7
Barry-Eaton DHD	90.9
Macomb County HD	88.7
Wayne County HD	88.6
Lowest Prevalence of 1st trimester PNC	
Agency	%
St. Clair County	65.1
Tuscola County HD	64.9
Saginaw County Dept. of Pub Hlth	62.9
Grand Traverse County HD	62.2
Benzie-Leelanau DHD	61.4

Figure 6: Prevalence of trimester of prenatal care enrollment by race/ethnicity or age among women enrolled in WIC*, MI-PNSS 2015¹⁻²

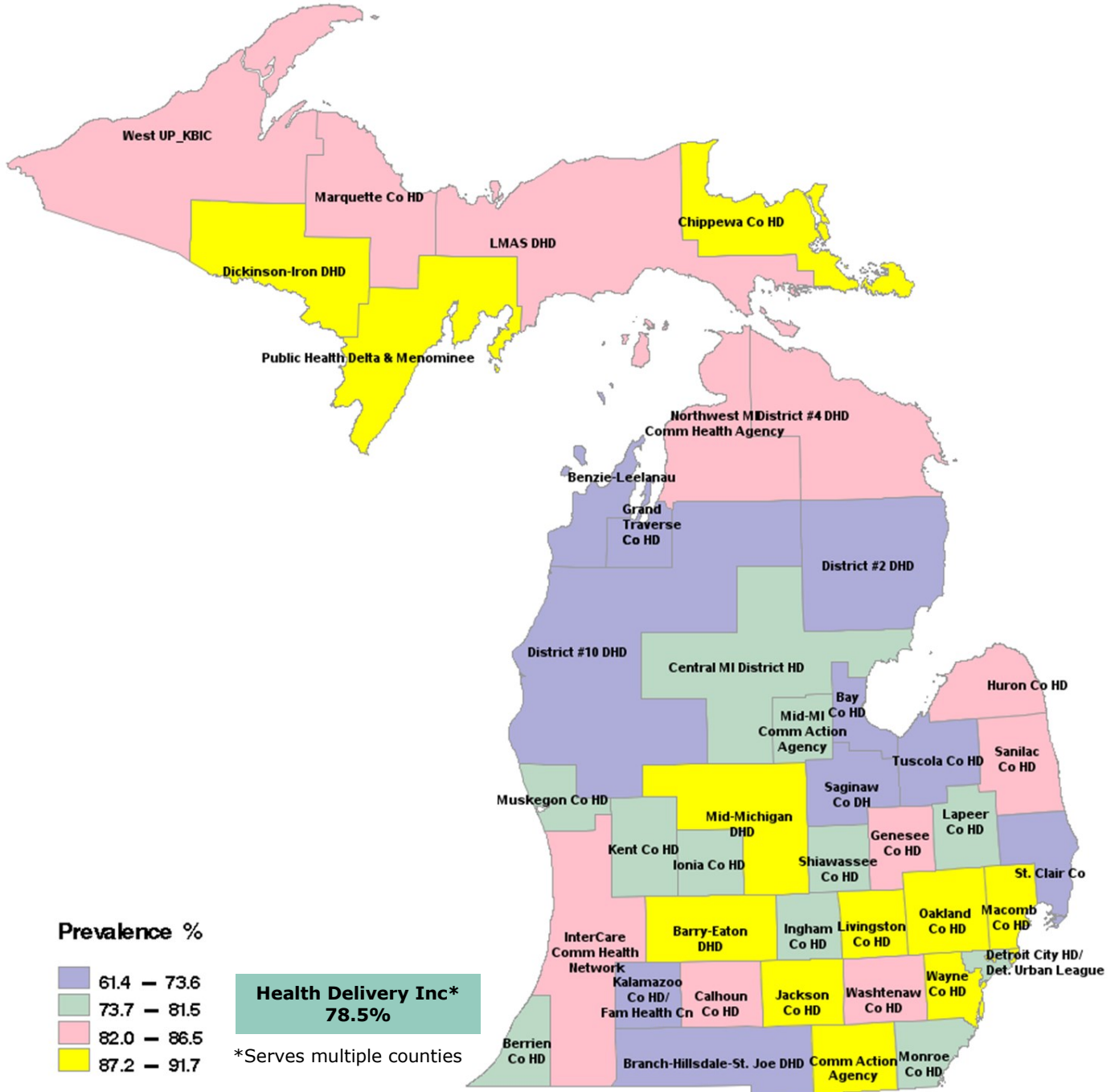


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors * No Care = No prenatal care at time of WIC enrollment



MI-PNSS & PedNSS Report 2010-2015

Figure 7: Prevalence of 1st trimester entry into prenatal care by local agency, MI-PNSS 2015





MI-PNSS & PedNSS Report 2010-2015

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 2015, approximately 64.1% of Michigan WIC mothers enrolled during their first or second trimester compared to 50.4% of mothers enrolled in MWR states and Hawaii (PNSS). The proportion of first trimester enrollment into WIC decreased from 37.6% in 2010 to 34.1% in 2015, a 9.3% 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 (33.7%), however, the majority (94.2%) joined before giving birth. Hispanic women had the highest prevalence (40.5%) of first trimester enrollment. On the contrary, 25.0% 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 started January 2014. One objective was to increase first trimester entry into the WIC

program to 42.0% by December 2018. Twenty-one agencies exceeded this goal in 2015. Keweenaw Bay Indian Tribe had the highest prevalence of first trimester enrollment (58.2%), while Downriver Community Services had the lowest (24.8%) (Table 4).

MICHIGAN WIC FIVE YEAR PLAN	
Increase 1 st trimester entry into WIC to 42.0% in 2018.	
21 Local Agencies exceeded this goal	
◆	Keweenaw Bay Indian Tribe had highest prevalence of 1st trimester WIC enrollment (58.2%) followed by Luce-Mackinac-Alger-Schoolcraft District Health Department at (57.1%) (Table 4).

Table 4: Prevalence of 1st trimester WIC enrollment among women enrolled in WIC by local agency, MI-PNSS 2015¹⁻²

Highest Prevalence of 1st trimester Entry	
Agency	%
Keweenaw Bay Indian Tribe	58.2
Luce-Mackinac-Alger-Schoolcraft DHD	57.1
Chippewa County HD	51.1
Benzie-Leelanau DHD	50.6
Bay County HD	49.5
Lowest Prevalence of 1st trimester Entry	
Agency	%
Wayne County HD	25.9
Detroit Urban League	25.8
Oakland County HD	25.7
Detroit DHWP	25.7
Downriver Community Serv.	24.8

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



MI-PNSS & PedNSS Report 2010-2015

Figure 8: Trend of trimester of WIC enrollment prevalence among women enrolled in WIC, MI-PNSS 2010-2015¹⁻²

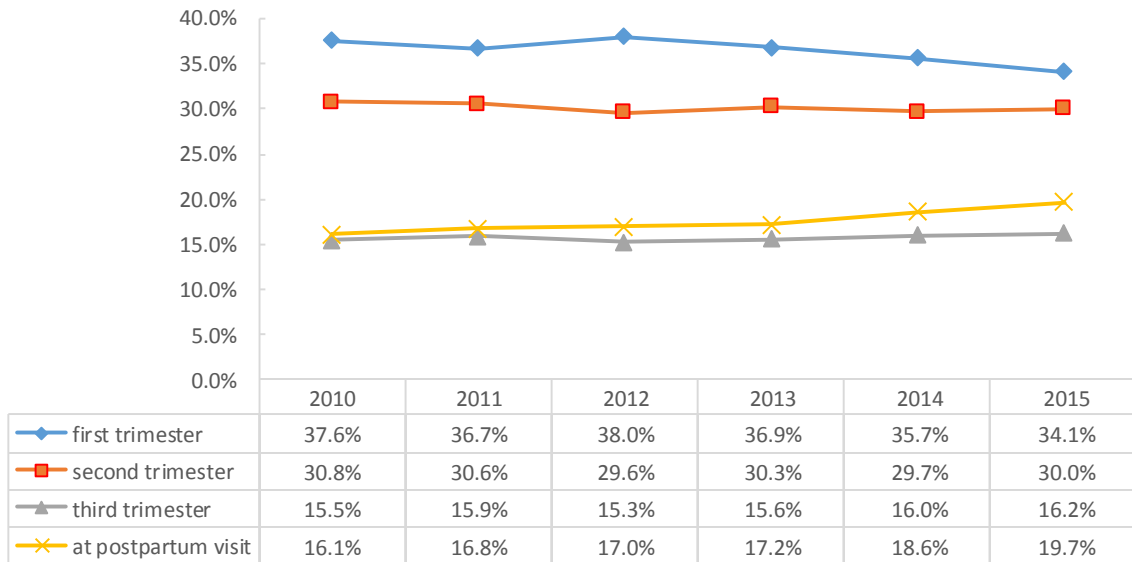
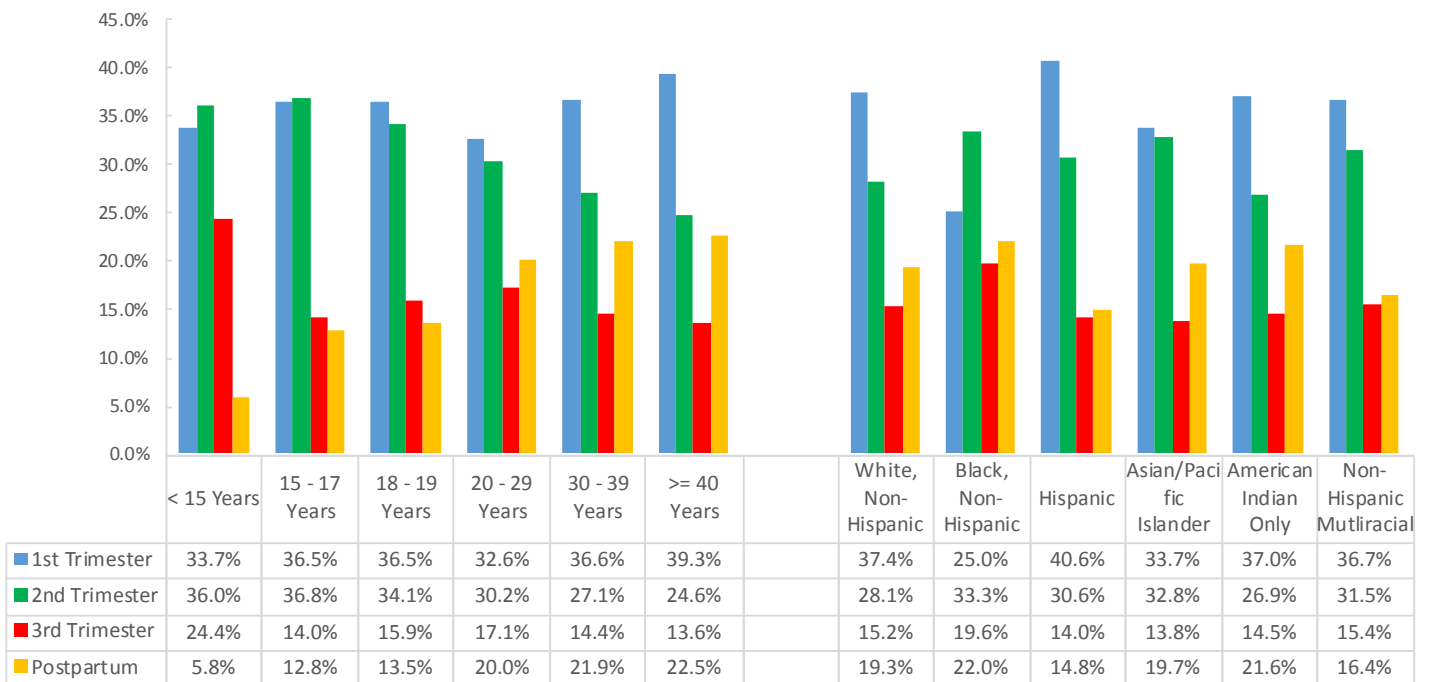


Figure 9: Prevalence of trimester of WIC enrollment by maternal age or race/ethnicity among women enrolled in WIC, MI-PNSS 2015¹⁻²

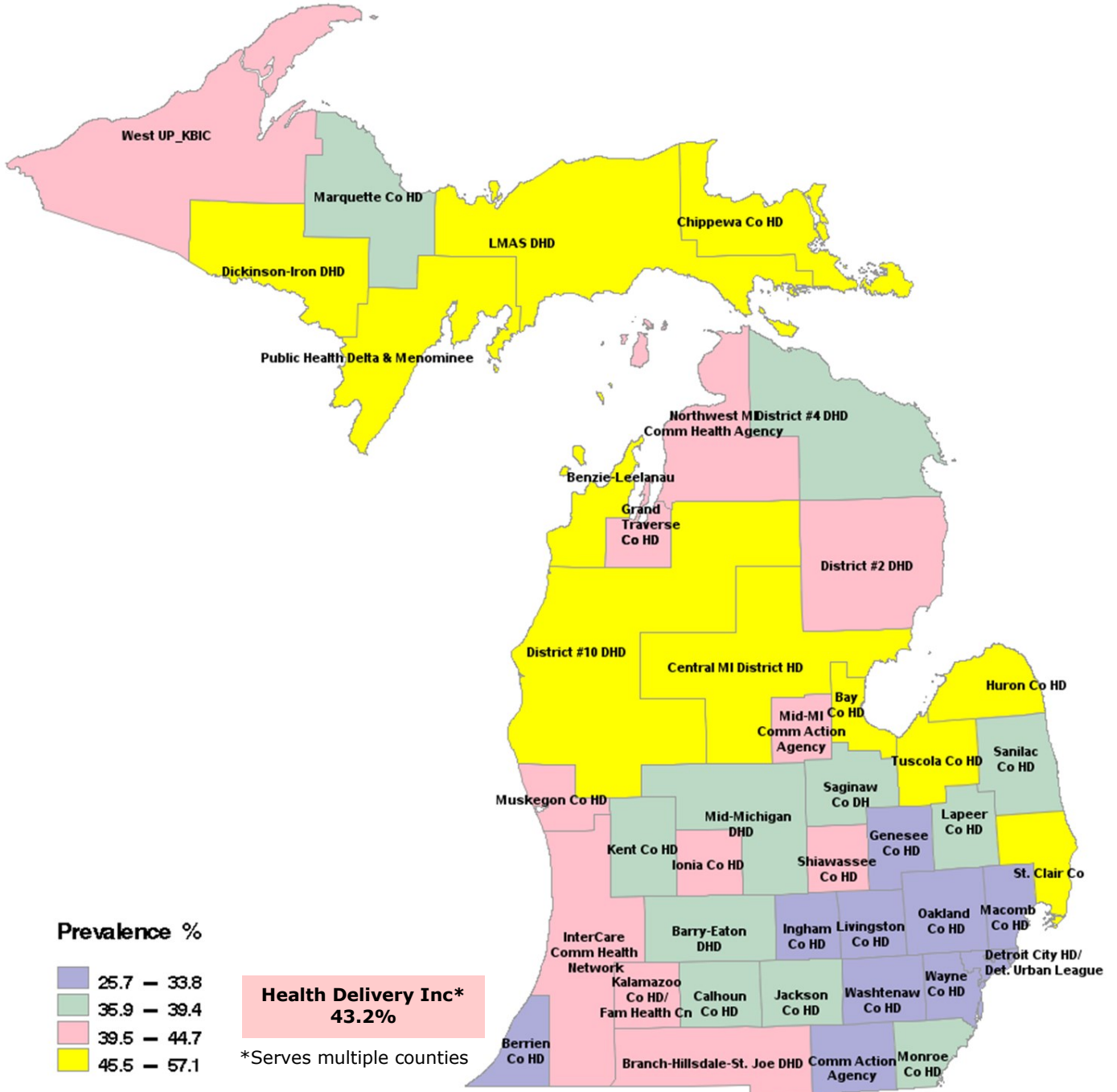


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors



MI-PNSS & PedNSS Report 2010-2015

Figure 10: Prevalence of 1st trimester enrollment in WIC by local agency, MI-PNSS 2015





MI-PNSS & PedNSS Report 2010-2015

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).

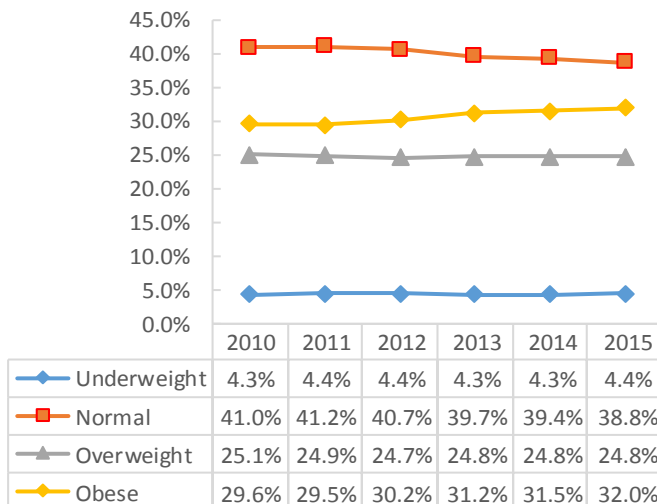
Table 5: Weight classification based on pre-pregnancy BMI (IOM 1990)

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

Figure 11: Trend of maternal pre-pregnancy BMI prevalence among women enrolled in WIC, MI-PNSS 2010-2015¹⁻³



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

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 (56.8%) (Figure 11) were overweight or obese in 2015 which was slightly lower than the prevalence of women enrolled in MWR states and Hawaii (57.9%) (PNSS).



MI-PNSS & PedNSS Report 2010-2015

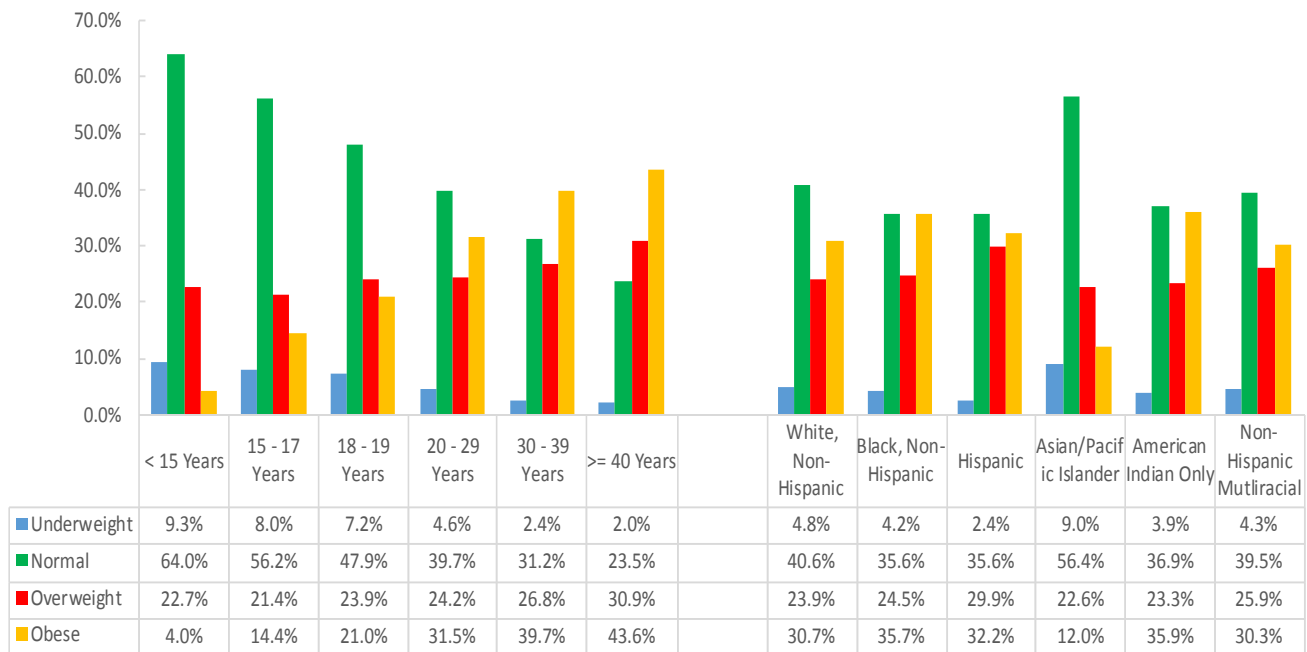
Nearly one-third of the women enrolled in Michigan’s WIC program in 2015 were classified as obese, while the prevalence of obesity increased by 8.1% from 29.6% in 2010 to 32.0% in 2015. Only 38.8% of the women were normal weight prior to pregnancy, a decrease of 5.4% from 2010.

The prevalence of prenatal BMI differed by age and race/ethnicity (Figure 12). Older women were more apt to be obese; 39.7% of 30 – 39 year olds and 43.6% of women 40 years old and older were obese. The highest prevalence of obesity was found among American Indians (35.9%) followed by Black, Non-Hispanic

(35.7%), while the lowest prevalence of obesity was among Asian/Pacific Islander women (12.0%).

In 2015, the highest prevalence of pre-pregnancy underweight was reported by Keweenaw Bay Indian Tribe, Jackson County Health Department and Sanilac County Health Department at 7.6%, 6.2% and 6.2% respectively. On the contrary, Health Delivery, Inc (65.2%) and Benzie-Leelanau District Health Department (62.3%) had the highest percentage of pre-pregnancy overweight or obese women.

Figure 12: Prevalence of maternal pre-pregnancy BMI by race/ethnicity or age among women enrolled in WIC, MI-PNSS 2015¹⁻³



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



MI-PNSS & PedNSS Report 2010-2015

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

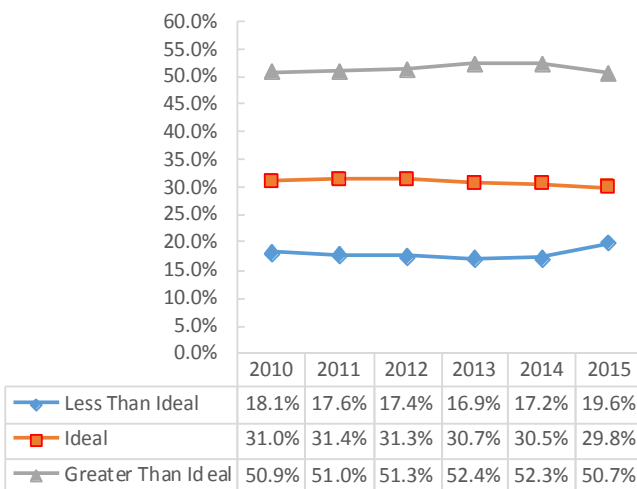
Table 7: Maternal weight gain categories based on the 2009 IOM recommendations (IOM, 2009)

Weight	Pre-pregnancy BMI	Total Weight Gain (lbs)	Rates of Weight Gain 2 nd and 3 rd 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)

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 a 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.

From 2010 to 2015, the prevalence of gestational weight gain among women enrolled in Michigan WIC changed very little (Figure 13). There was a slight increase in women who gained less than the ideal weight during their pregnancy, while the women gained ideal weight decreased slightly from 31% in 2010 to 29.8% in 2015.

Figure 13: Trend of pregnancy weight gain prevalence among women enrolled in WIC, MI-PNSS 2010-2015¹⁻³



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



MI-PNSS & PedNSS Report 2010-2015

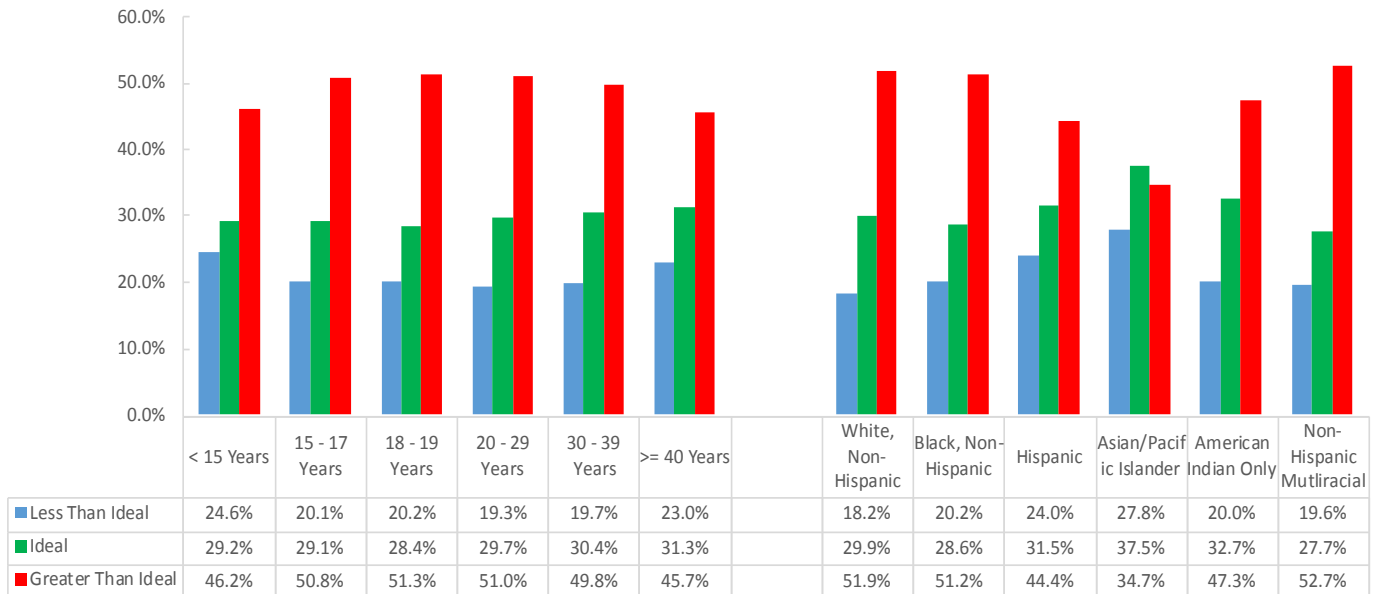
In 2015, a good portion of women (70.2%) gained either less than ideal or greater than ideal weight during their pregnancy. Less than 30% of women gained ideal weight during their pregnancy.

Asian/Pacific Islander women (27.8%) and mothers less than 15 years old (24.6%) gained less than the recommended amount of gestational weight compared to other age and racial/ethnic groups (Figure 14). White, Non-Hispanic women (51.9%) and mothers between the ages of 15 to 30 years old had

the highest prevalence of weight gain above the 2009 IOM recommendations.

In 2015, Livingston County Department of Public Health reported the lowest (14.7%) prevalence of inadequate weight gain whereas Keweenaw Bay Indian Tribe reported the highest (28.9%) (Figure 15). Conversely, the highest prevalence of excessive weight gain (56.3%) was reported by Livingston County Department of Public Health.

Figure 14: Prevalence of pregnancy weight gain by race/ethnicity or age among women enrolled in WIC, MI-PNSS 2015¹⁻³

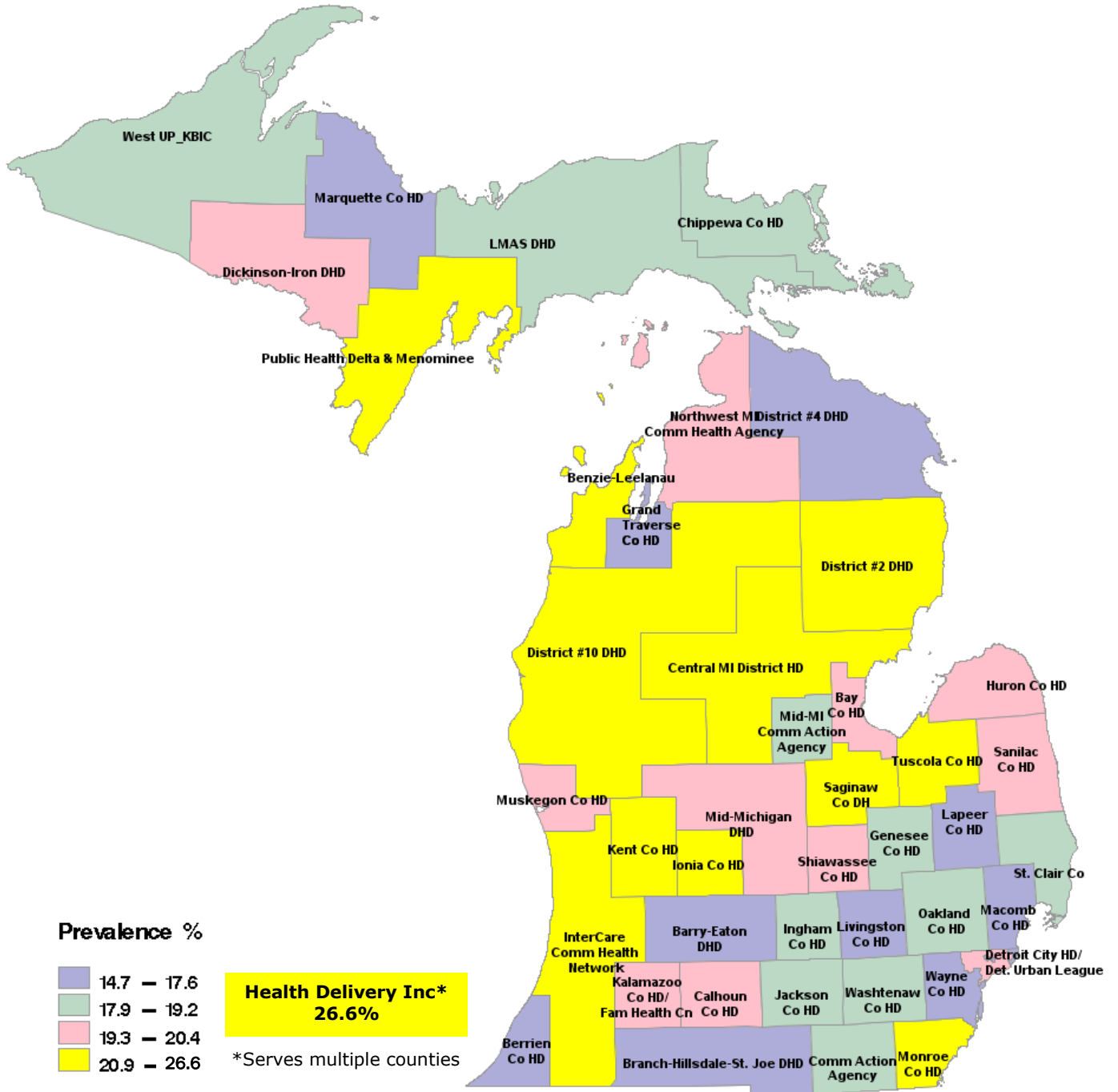


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors ³Based on 2009 IOM report "Weight Gain During Pregnancy: Reexamining the Guidelines".



MI-PNSS & PedNSS Report 2010-2015

Figure 15: Prevalence of less than ideal pregnancy weight gain by local agency, MI-PNSS 2015



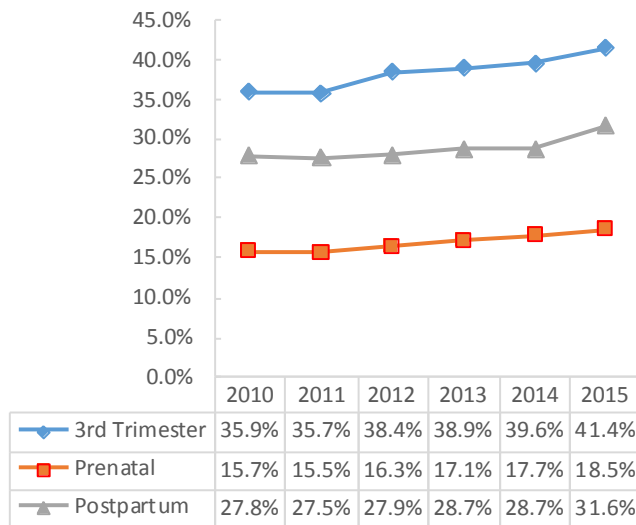


Maternal Anemia

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 infant during the first year of life is associated with maternal iron deficiency anemia, as well as low birthweight (Health, 2005).

Figure 16: Trend of maternal anemia prevalence among women enrolled in WIC, MI-PNSS 2010-2015¹⁻³



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

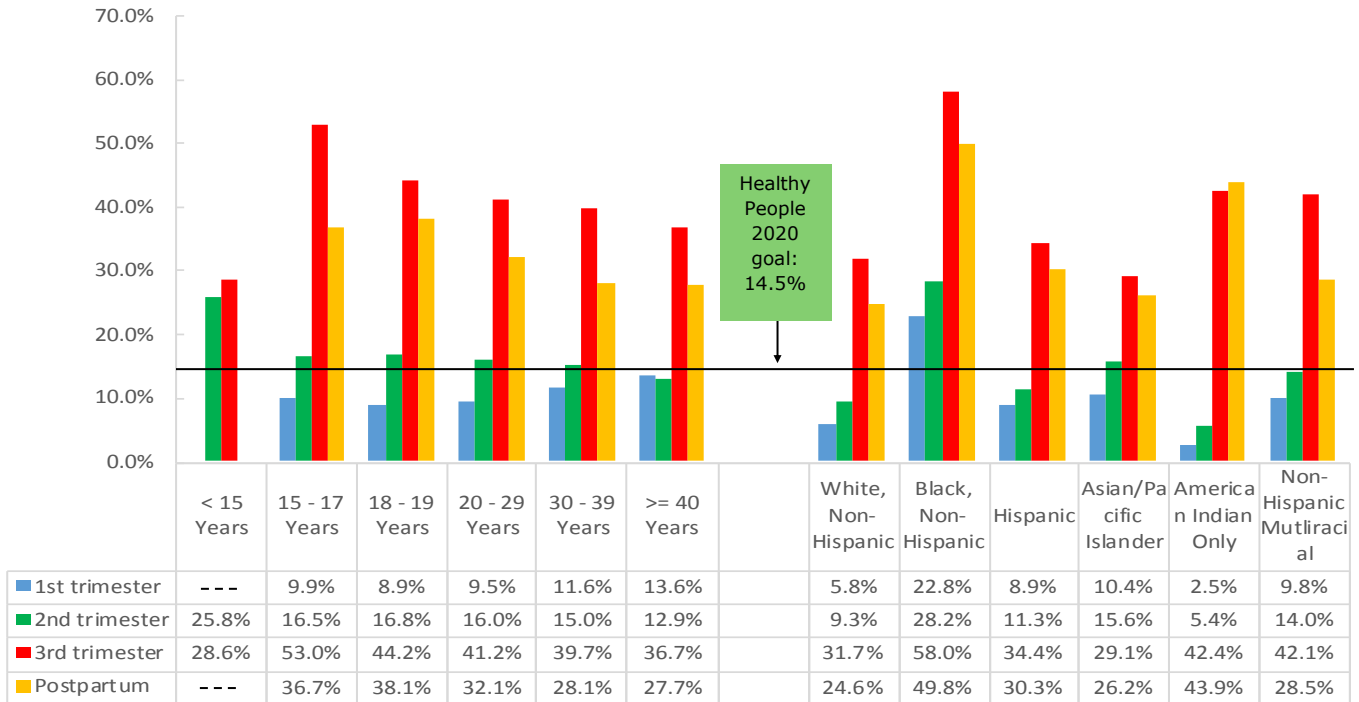
When a woman enrolls in WIC, her hemoglobin level or hematocrit is measured. To determine if she is anemic, trimester and age-specific cut-offs are used. These measurements reflect the health status of the women at the time of enrollment.

Among Michigan WIC enrollees, the prevalence of anemia during the third trimester was 41.4%, a 15.3% increase from 2010 (Figure 16). In 2015, the prevalence of third trimester anemia among states in the Mid-West region and Hawaii was 23.0% (PNSS). The prevalence of anemia in 2015 among Michigan mothers



MI-PNSS & PedNSS Report 2010-2015

Figure 17: Prevalence of anemia by trimester by race/ethnicity or age among women enrolled in WIC, MI-PNSS 2015¹⁻²



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

was lower for women who enrolled prior to giving birth (18.5%).

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 2015, over half of all Black, Non-Hispanic women (58.0%) who enrolled during their 3rd trimester were anemic (highest among race/ethnic categories).

Among the age groups, the prevalence of anemia during the third trimester decreased with maternal age with the exception of

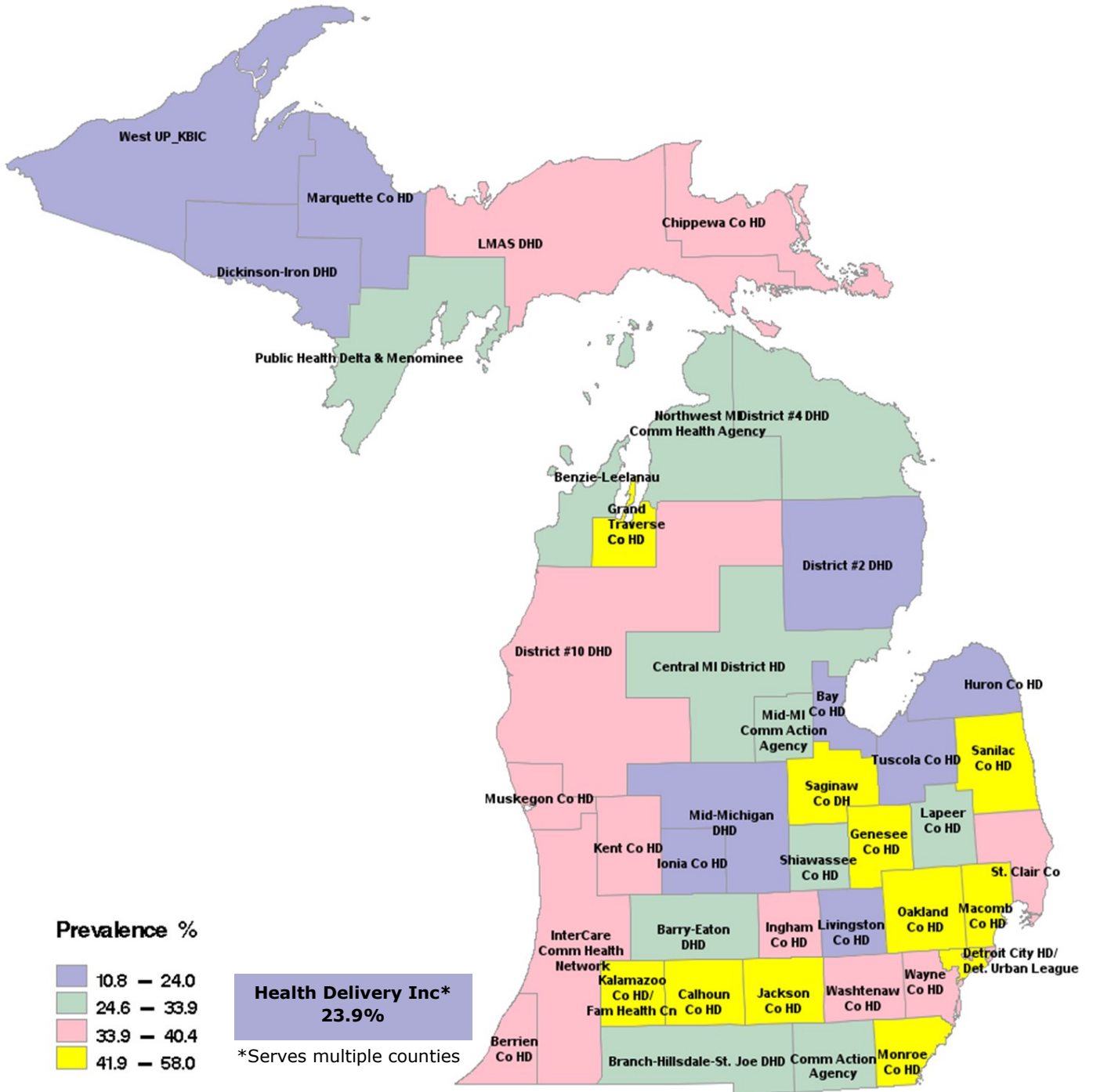
mothers less than 15 years old - the estimated prevalence from this group may not be reliable due to the small sample. The estimated third trimester anemia prevalence decreased from 53% among women between the ages of 15 to 17 years old to 36.7% among mothers over 40 years old.

The prevalence of anemia during the third trimester varied by agencies as well (Figure 18). The Detroit Urban League reported the highest prevalence of third trimester anemia (59.2%) and Mid-Michigan District Health Department reported the lowest (10.8%).



MI-PNSS & PedNSS Report 2010-2015

Figure 18: Prevalence of 3rd trimester anemia by local agency, MI-PNSS 2015





Maternal Smoking

Adverse developmental outcomes such as infant mortality, preterm birth and low birthweight are commonly associated with maternal smoking during pregnancy. In 2014, out of 95% of all births in the United States, roughly one in ten women smoked three months prior to pregnancy and approximately 8.4% of mothers smoked at any time during pregnancy (Curtin & Mathews, 2016). 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.

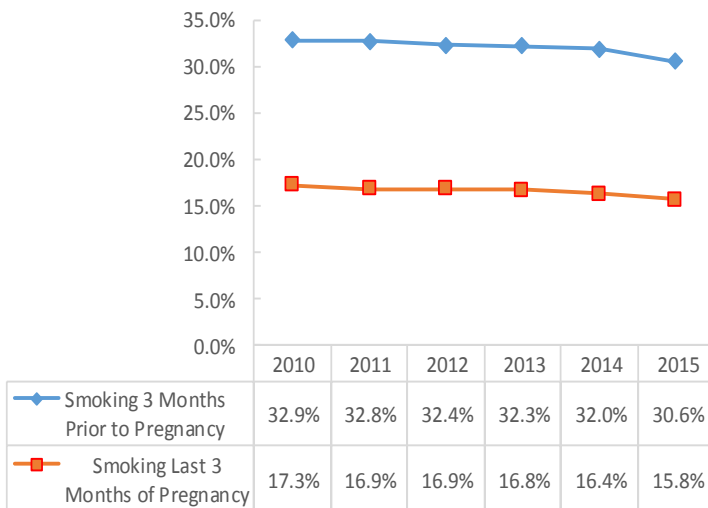
The Healthy People 2020 objective is to increase the rate of abstinence from smoking during pregnancy to 98.6% (USHHS, 2010). To this end, the Michigan WIC program warns women of the detrimental effects associated with smoking, encourages abstinence for healthy fetal development, and provides information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

HEALTHY PEOPLE 2020 OBJECTIVE

Increase the rate of abstinence of 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 7.0% from 2010 to 2015.
- ◆ Over one third of women (39.6%) 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 2010¹⁻²



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 7.0% from 2010 to 2015 (Figure 19). Nearly one in every six women (15.8%) smoked during the last three months of pregnancy; an 8.7%

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



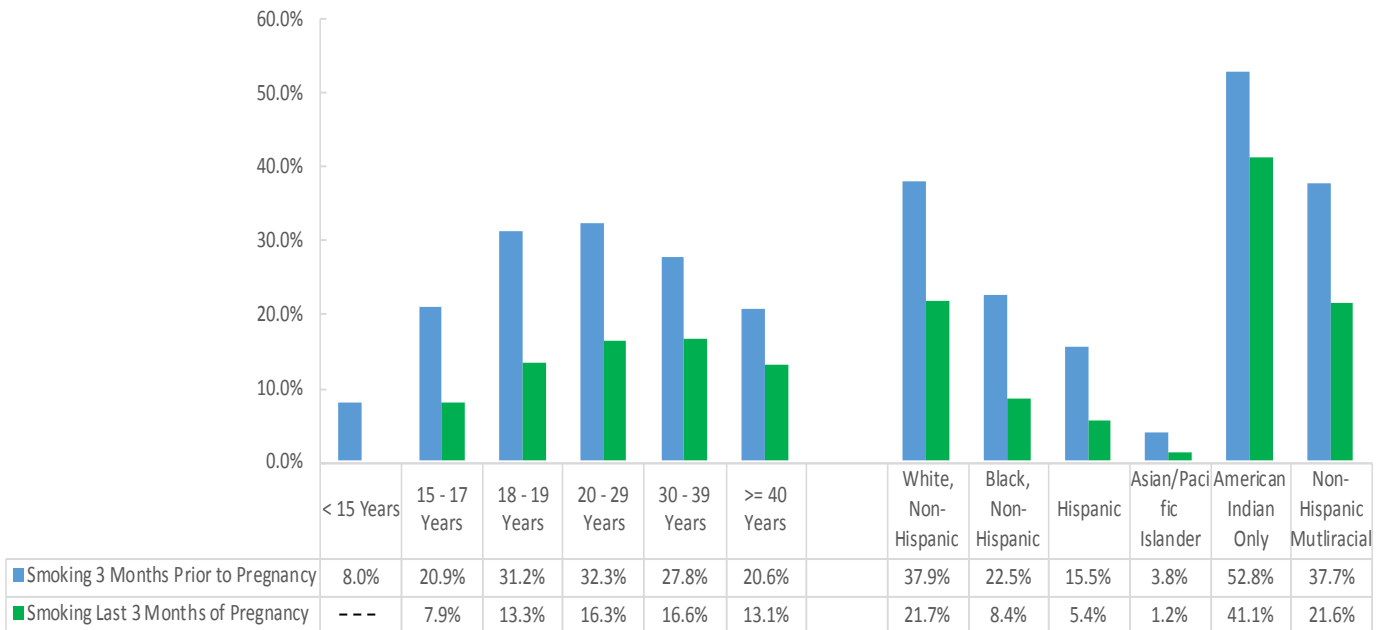
MI-PNSS & PedNSS Report 2010-2015

decrease from 2010. Among Michigan WIC enrollees, 30.6% of women smoked during the three months prior to pregnancy compared to 30.4% of women enrolled in MWR states and Hawaii (PNSS). Over one third of women (39.6%) 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 (1.2%), while American Indian women (41.1%) 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). The Detroit Department of Health and Wellness Promotion reported the lowest prevalence of smoking during the last three months (8.1%), and the highest prevalence of quitting smoking (58.6%). Close to half of the women (49.5%) enrolled at the District Health Department #2 reported smoking three months prior to pregnancy. Chippewa County Health Department had the highest prevalence of smoking during the last trimester (37.3%). 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 or age MI-PNSS 2015¹⁻²

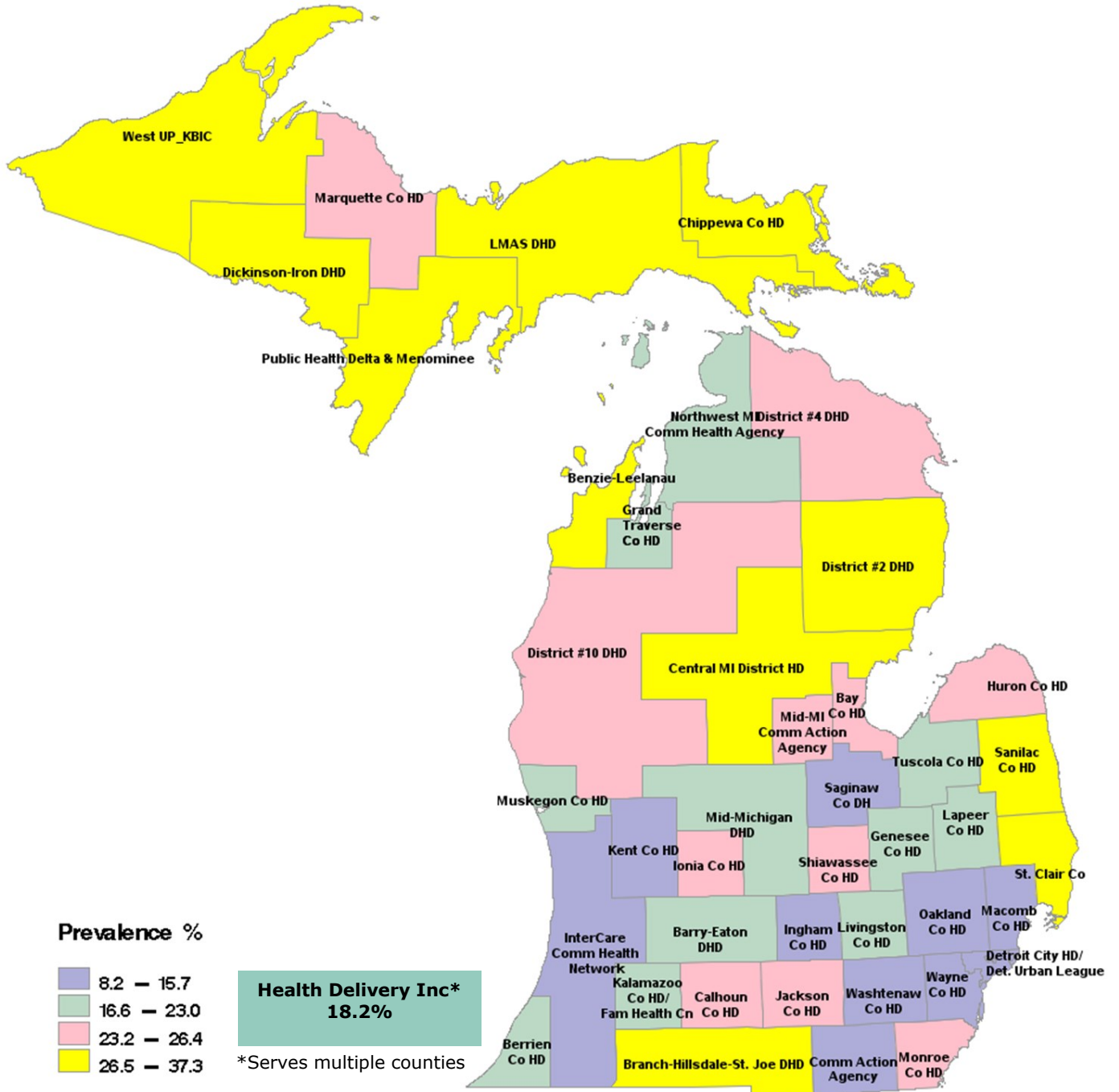


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors ³ --- Data insufficient for analysis



MI-PNSS & PedNSS Report 2010-2015

Figure 21: Prevalence of smoking during the last trimester by local agency, MI-PNSS 2015





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.

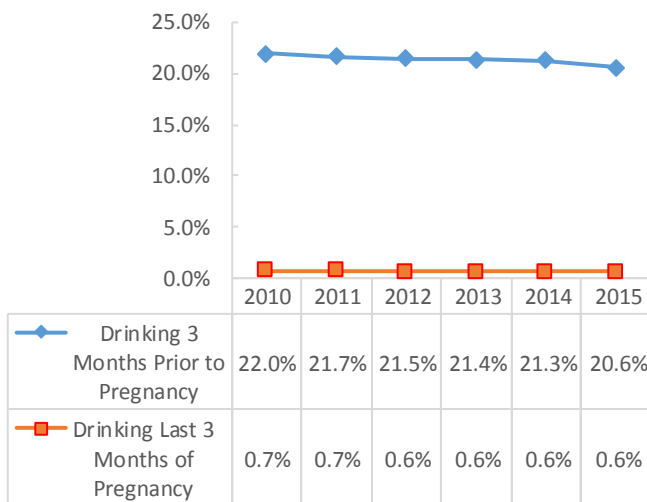
Low birthweight, abnormal facial features, learning disabilities, vision or hearing problems, among others are all clinical signs and behaviors characterized by FASD (CDC, 2015). There is also an increased risk of miscarriage associated with alcohol consumption during the first three months of pregnancy (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 2015, 20.6% of women enrolled in WIC reported drinking prior to pregnancy, a slight decrease from 22% in 2010. 0.6% of women reported drinking during their last trimester of pregnancy (Figure 22).

The prevalence of drinking prior to pregnancy was lowest among teens less than 15 years of age (3.4%) when compared to women ages 20-29 (23.1%). Black, Non-Hispanic women had the highest reported prevalence of alcohol consumption 3 months prior to pregnancy (22.5%); Asian/Pacific Islander had the lowest (4.2%).

Figure 22: Trend of maternal drinking prevalence (before and during pregnancy) among women enrolled in WIC, MI-PNSS 2010-2015¹⁻²



¹Recording period is January 1st through December 31st

²Excludes 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

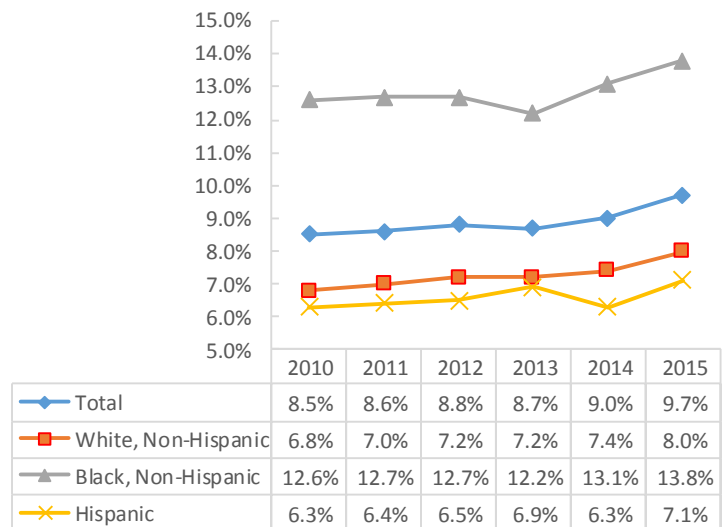
**HEALTHY PEOPLE 2020
OBJECTIVE**

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%

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 2015, the incidence of low birthweight in Michigan PNSS population was 9.7%, higher than the MWR states and Hawaii at 6.1% (PNSS report 2014). The overall incidence of low birthweight among Michigan PNSS has increased 14.1% from 2010 to 2015 (Figure 23). The trend is consistently observed from different race/ethnic groups. Racial disparities persist as in 2007-2014 MI PNSS and PedNSS report. Among Black, Non-Hispanics, the rate remains excessively high at 13.8%, compared to 7.1% of Hispanic infants and 8.0% of White, non-Hispanic infants.

Figure 23: Trend in low birthweight incidence by race among infants born to mothers enrolled in WIC, MI PNSS 2010-2015¹⁻⁴

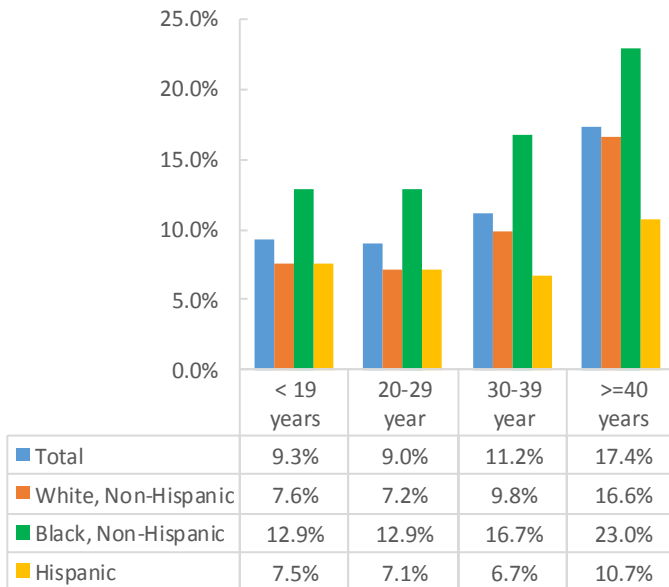


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing ³Analyses based on one record per child. ⁴Low birthweight (lbw) < 2,500 grams regardless of gestational age



MI-PNSS & PedNSS Report 2010-2015

Figure 24: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal age and by maternal race/ethnicity, MI-PNSS 2015¹⁻⁴

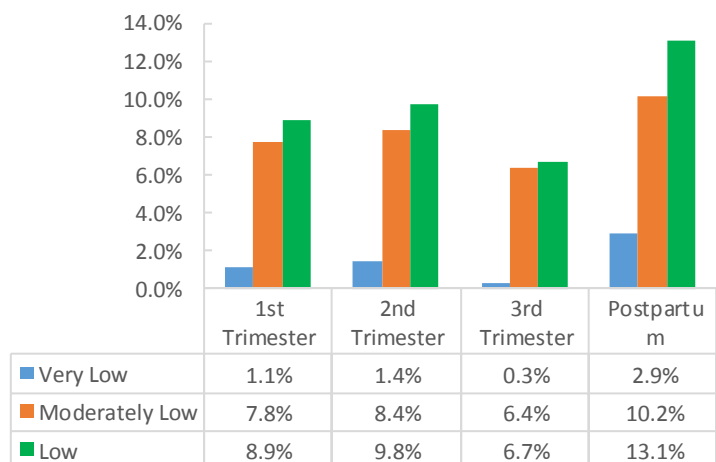


Analysis of low birthweight by selected maternal characteristics are presented in Figures 26–29 and Table 9. Overall, low birthweight incidence is highest among infants born to mothers older than 40 years and lowest among women ages 20–29 years (Figure 24).

There are obvious disparities between maternal race/ethnic and age groups. The highest incidence of low birthweight was reported by Black, Non-Hispanic women. (23.0%) over the age of 40 years. The lowest incidence (6.7%) was among Hispanic women ages 30–39 years.

Infant low birthweight incidence was lower among women who enrolled in WIC during their 3rd trimester (6.7%) compared to women enrolled at other times (Figure 25). This finding is consistent with the 2008–2014 PNSS and PedNSS trend report. This might be because women that enrolled later tend to have lower risk (medical, anthropometric, or biochemical).

Figure 25: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal trimester of entry into WIC, MI-PNSS 2015¹⁻⁴



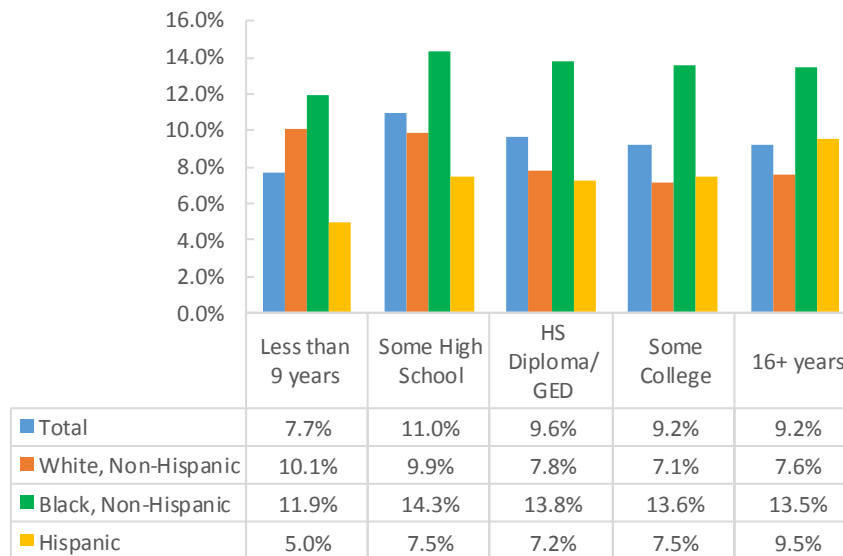
¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors ³Analyses based on one record per child.

⁴Low birthweight (lbw) < 2,500 grams, moderately low birthweight (mlbw) <2,500 g and >1,500g, very low birthweight <1,500- regardless of gestational age



MI-PNSS & PedNSS Report 2010-2015

Figure 26: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal education and by maternal race/ethnicity, MI-PNSS 2015¹⁻⁴

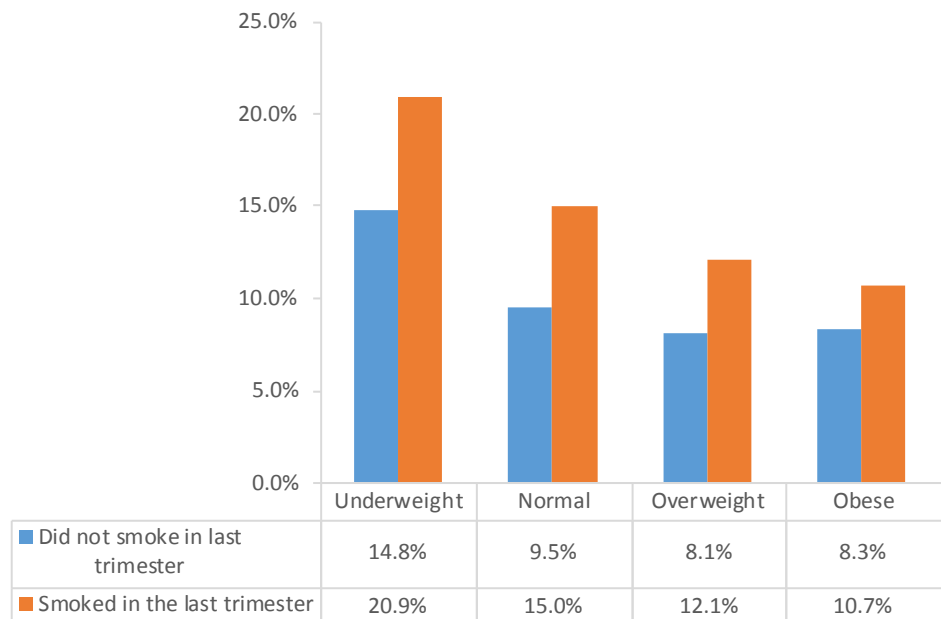


Among Non-Hispanic Whites, the risk of low birthweight was the highest among mothers who had less education (less than 9 years or some high school education) while for Hispanic mothers, those had the highest education (over 16 years of education) are at the greatest risk of delivering low birthweight infants (Figure 26).

One in every five infants born to mothers who smoked in the last trimester and were underweight pre-pregnancy had low birthweight (20.9%).

As shown in Figure 28, low maternal prenatal BMI and maternal smoking in the last trimester are both risk factors of infant low birthweight.

Figure 27: Incidence of low birthweight among infants born to mothers enrolled in WIC by maternal prenatal BMI and smoking, MI-PNSS 2015¹⁻⁴



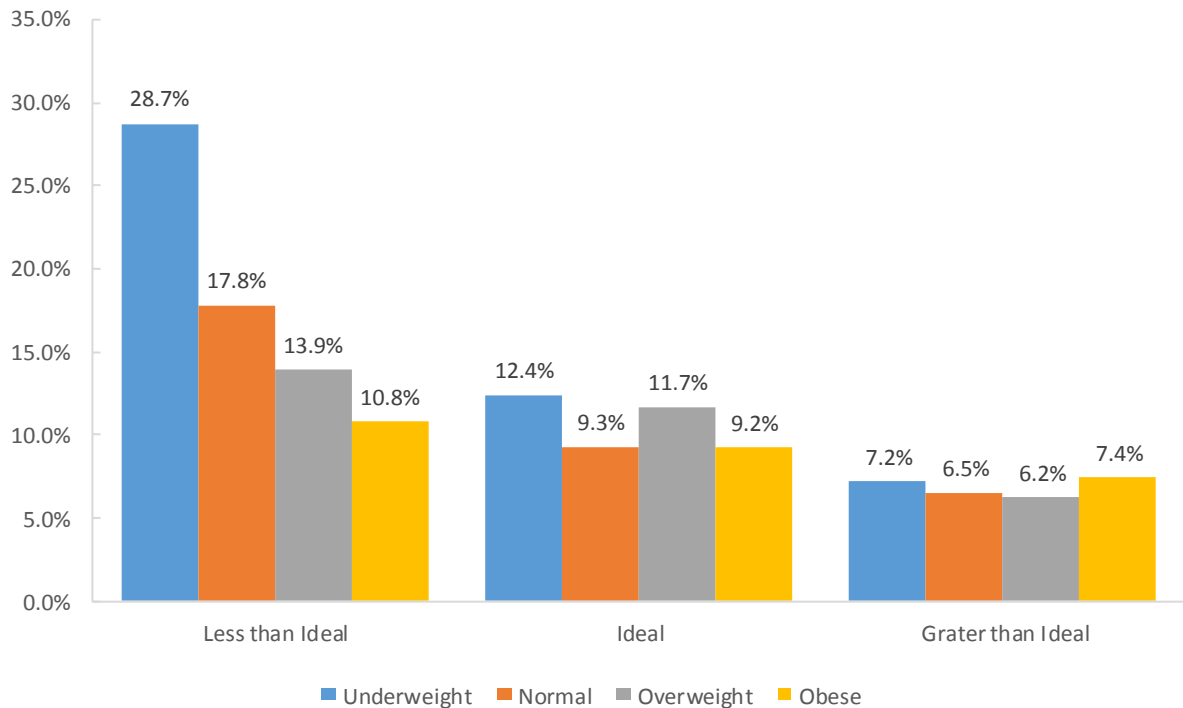
¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing

³ Analyses based on one record per child. ⁴Low birthweight (lbw) <2,500 grams



MI-PNSS & PedNSS Report 2010-2015

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 2015¹⁻⁴



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

³ Analyses based on one record per child. ⁴Low 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 outcome.



MI-PNSS & PedNSS Report 2010-2015

The incidence of low birthweight varied by agencies. The highest incidence was found among infants born to mothers enrolled at the Detroit Department of Health and Wellness Program at 13.3% while lowest incidence was from infants enrolled at Chippewa County Health Department at 4.5% (Table 8). Some agencies achieved the Healthy People 2020 objective but further efforts are needed to lower rates throughout Michigan.

Table 9: Adjusted odds ratio estimates for low birthweight by maternal factors, MI-PNSS 2015¹

Effect	Point Estimate	95% Confidence Limits
Maternal age: 30 - 39 years vs 20 - 29 years	1.32	1.217 1.432
Maternal age: >= 40 years vs 20 - 29 years	2.013	1.58 2.566
Maternal race: Black, Non-Hispanic vs White, Non-Hispanic	2.01	1.865 2.166
Maternal education: Less than vs Greater than High School	1.004	0.909 1.108
Maternal education: High School vs Greater than High School	1.003	0.926 1.086
WIC second trimester enrollment vs first trimester	0.988	0.905 1.078
WIC third trimester enrollment vs first trimester	0.645	0.575 0.724
WIC postpartum enrollment vs first trimester	1.389	1.27 1.519
Smoking vs no smoking during last trimester	1.766	1.619 1.925
Pregnancy weight gain more than ideal vs Ideal	0.673	0.62 0.73
Pregnancy weight gain less than ideal vs Ideal	1.665	1.528 1.814
Maternal prenatal BMI underweight vs normal	1.507	1.313 1.729
Maternal prenatal BMI obese vs normal	0.848	0.78 0.923

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

Table 8: Incidence of low birthweight among Michigan infants born to mothers enrolled in MI WIC by local agency, MI-PNSS 2015¹

Lowest Incidence of Low Birthweight	
Agency	%
Chippewa County HD	4.5
Huron County HD	5.7
Western Upper Peninsula HD	5.7
Ionia County HD	6.1
Grand Traverse County HD	6.3
Highest Incidence of Low Birthweight	
Agency	%
Oakland County HD	10.5
Muskegon County HD	11.1
Genesee County HD	11.6
Detroit Urban League	12.3
Detroit DHWP	13.3
MI-PNSS 2015	

¹ LBW < 2,500 grams regardless of gestational age

Maternal factors that increased the odds of low birthweight infants (Table 9)

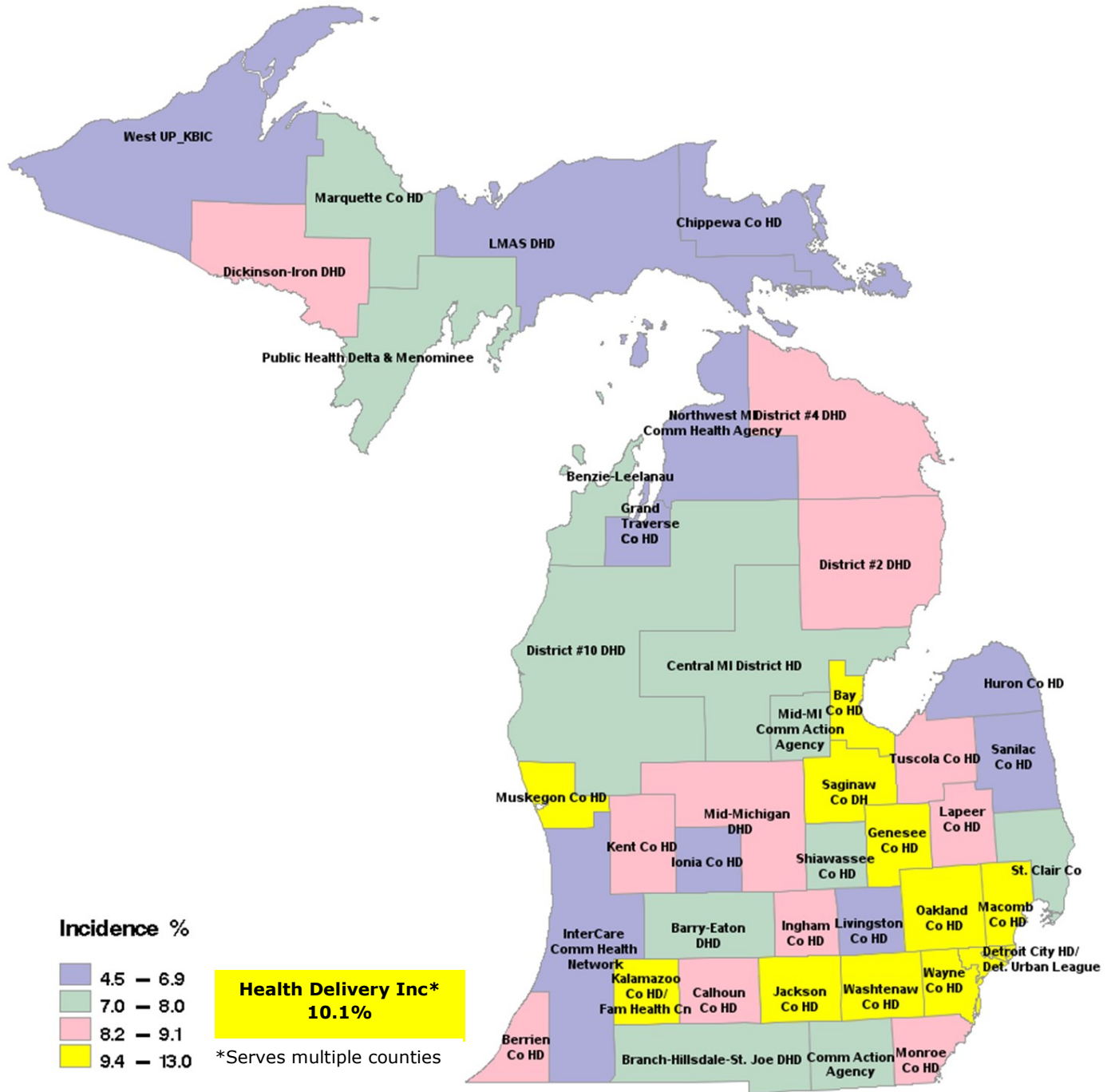
After adjusting for other characteristics

- Maternal ages 30-39 and 40 years and older - increased odds by 1.32 and 2.01 times that of a 20-29 year old woman, respectively.
- Black, Non-Hispanic women – more than doubled the odds of White, Non-Hispanic women
- WIC enrollment during postpartum - increased odds by 1.39 times that of women enrolled during the 1st trimester
- Underweight prenatal BMI - 1.5 times more likely to have LBW infant than that of normal weight women
- Pregnancy weight gain less than ideal - increased odds by 1.67 times that of ideal weight gain during pregnancy
- Maternal smoking during the last trimester - increased odds by 1.77 times that of non-smoking mothers



MI-PNSS & PedNSS Report 2010-2015

Figure 29: Incidence of infant low birthweight by local agency, MI-PNSS 2015

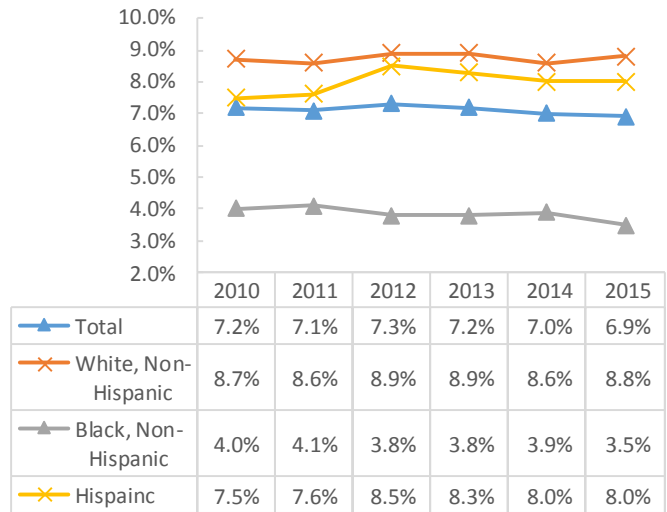




Infant High Birthweight

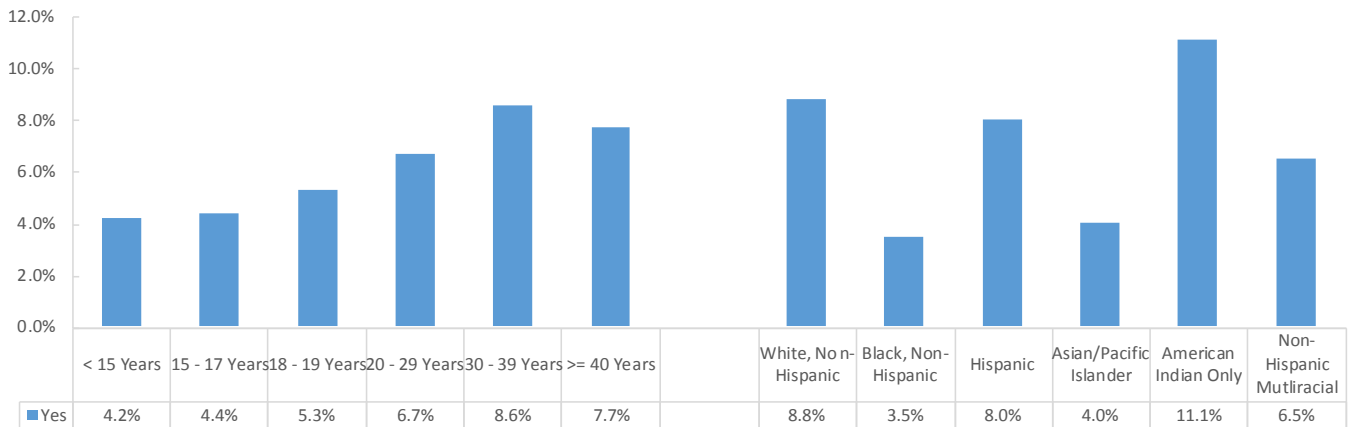
High birthweight (weighing more than 4,000 grams at birth) is associated with difficult labor and delivery. It increases the risk of shoulder dystocia, skeletal fractures, and brachial plexus injury (Siggelkow, Boehm et.al, 2008a, Melendez, Bhatia, Callis, Woolf, & Yoong, 2009). There are two main reasons why babies are large for gestational age. It might be due to an underlying medical problem (e.g. mother had 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 2015 was 6.9%, a 4.2% decline from 2010 (Figure 30). The incidence of high birthweight varies by maternal race/ethnicity and age

Figure 30: Trend high birthweight incidence by race/ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2015¹⁻⁴



group (Figure 31). The high birthweight incidence was lowest among Black, Non-Hispanic infants (3.5%), which was a 12.5% decline from 2010. The highest incidence was found among American Indian infants (11.1%). There is also a trend of high birthweight incidence increasing with maternal age.

Figure 31: Incidence of high birthweight by maternal age group and race/ethnicity, MI-PNSS 2015¹⁻⁴

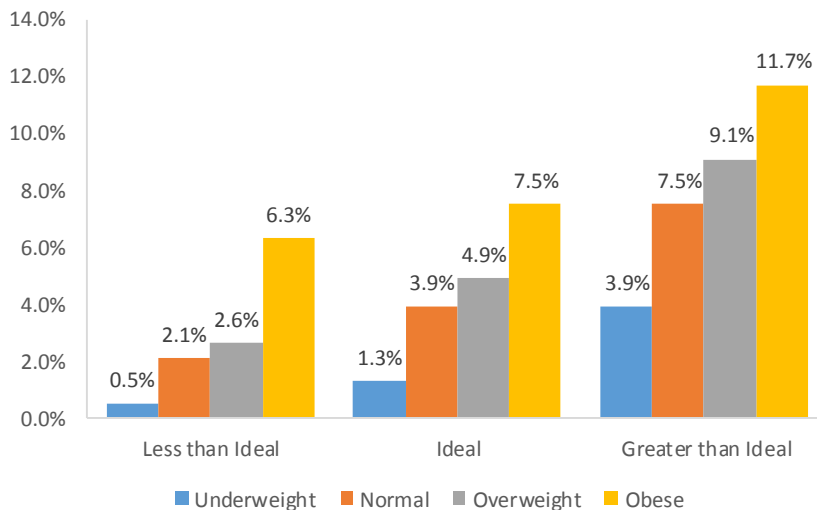


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing ³Analyses based on one record per child, born during the reporting period ⁴High birthweight >4,000 grams regardless of gestational age Note: Data is not sufficient for <15 years group,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



MI-PNSS & PedNSS Report 2010-2015

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 2015¹⁻⁶



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 (Figure 32).

High birthweight incidence was especially high among women who were overweight/obese and gained more than the recommended weight during their pregnancies.

Table 10: Incidence of high birthweight among Michigan infants born to mothers enrolled in WIC by local agency, MI-PNSS 2015⁶

As shown in Table 10, among local WIC agencies, the Detroit Department of Health Wellness and Promotion reported the lowest incidence of high birthweight (4.0%), while the Keweenaw Bay Indian Tribe reported the highest (18.8%).

Highest Incidence of High Birthweight	
Agency	%
Keweenaw Bay Indian Tribe	18.8
Huron County HD	12.0
Mid-MI Community Action Agency	11.8
Marquette County HD	11.2
Health Department of Northwest MI	10.9
Lowest Incidence of High Birthweight	
Agency	%
Genesee County HD	5.2
Health Delivery, Inc	5.1
Tuscola County HD	4.3
Detroit Urban League	4.2
Detroit DHWP	4.0

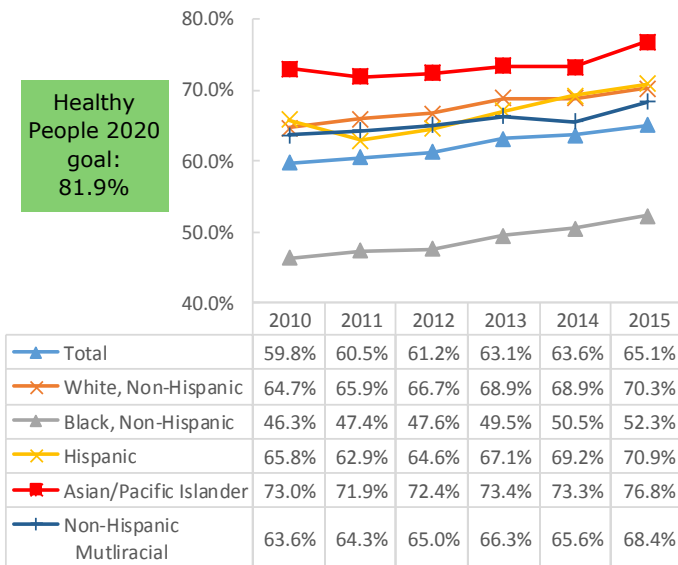
MI-PNSS 2015

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors ³Analyses based on one record per child, born during the reporting period ⁴Based on 1990 IOM report, "Nutrition During Pregnancy" ⁵Based 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 moms and children. Breastfeeding reduces 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

Figure 33: Trend of breastfeeding initiation prevalence by maternal race and ethnicity among infants born to mothers enrolled in WIC, MI-PNSS 2010- 2015¹⁻²



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

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;

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.

Armstrong, Reilly, & Child Health Information Team, 2002) while other studies reported no protective effects. Despite the lack of consensus, other benefits of breastfeeding have been established and it is essential that Michigan WIC program continues to promote breastfeeding. In addition, 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.

In 2015, the prevalence of infants ever breastfed among women enrolled in Michigan was 65.1%. Although the prevalence of breastfeeding has not reached the Healthy People 2020 recommended 81.9%, prevalence has continued to increase. For instance, the prevalence of breastfeeding initiation among Black, Non-Hispanic women increased by 13.0% from 2010 to 2015, while the overall prevalence increased by 8.9% (Figure 33).



MI-PNSS & PedNSS Report 2010-2015

Among infants enrolled in WIC during 2015, the prevalence of breastfeeding to 6 months was 18.4% (a 2.6% decrease from 2010). The prevalence increased over years in Non-Hispanic Whites but decreased in Non-Hispanic Blacks and Hispanic groups (Figure 34).

Among infants who were enrolled in 2015 and born to a mother who was enrolled in WIC, the prevalence of breastfeeding for at least 6 months was 28.6% and 16.6% of infants were breastfed to 12 months. Half of WIC women who initiated breastfeeding stopped breastfeeding after two months (Figure 35).

Figure 34: Trend of breastfeeding for 6 months by race and ethnicity among infants enrolled in WIC, MI-PedNSS 2010-2015¹⁻³

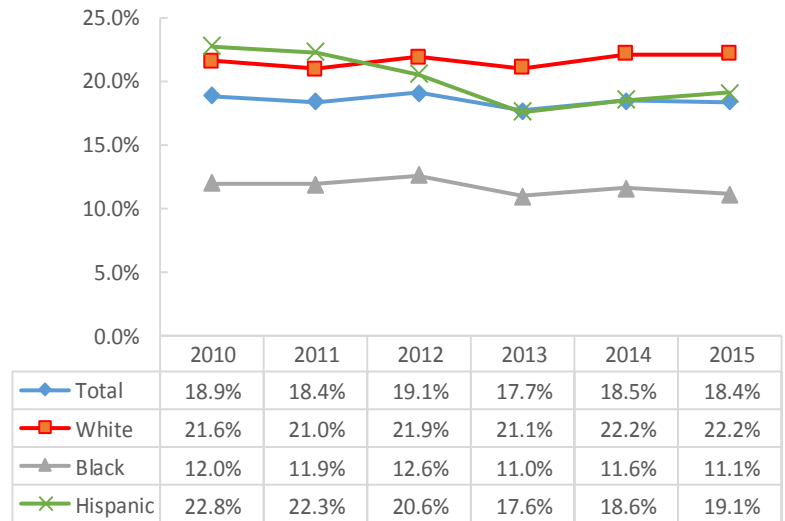
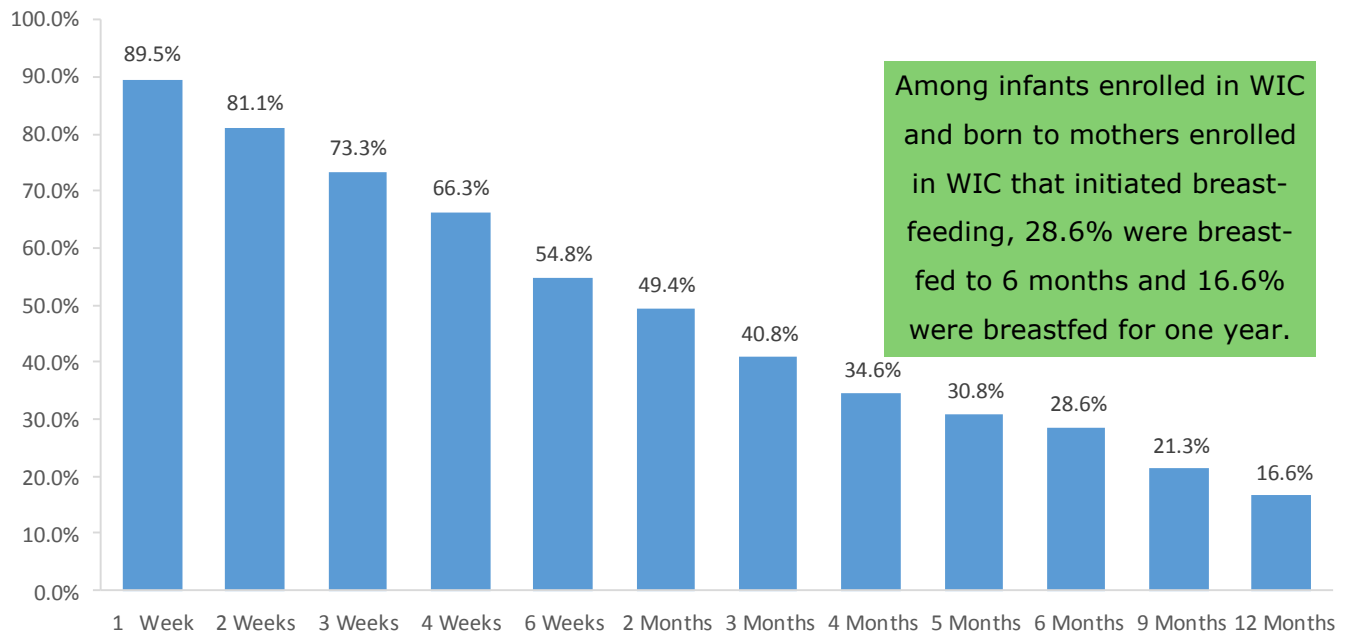


Figure 35: Prevalence of breastfeeding duration among infants enrolled in WIC and born to mothers enrolled in WIC that initiated breastfeeding, MI-PNSS/PedNSS 2015¹⁻³



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

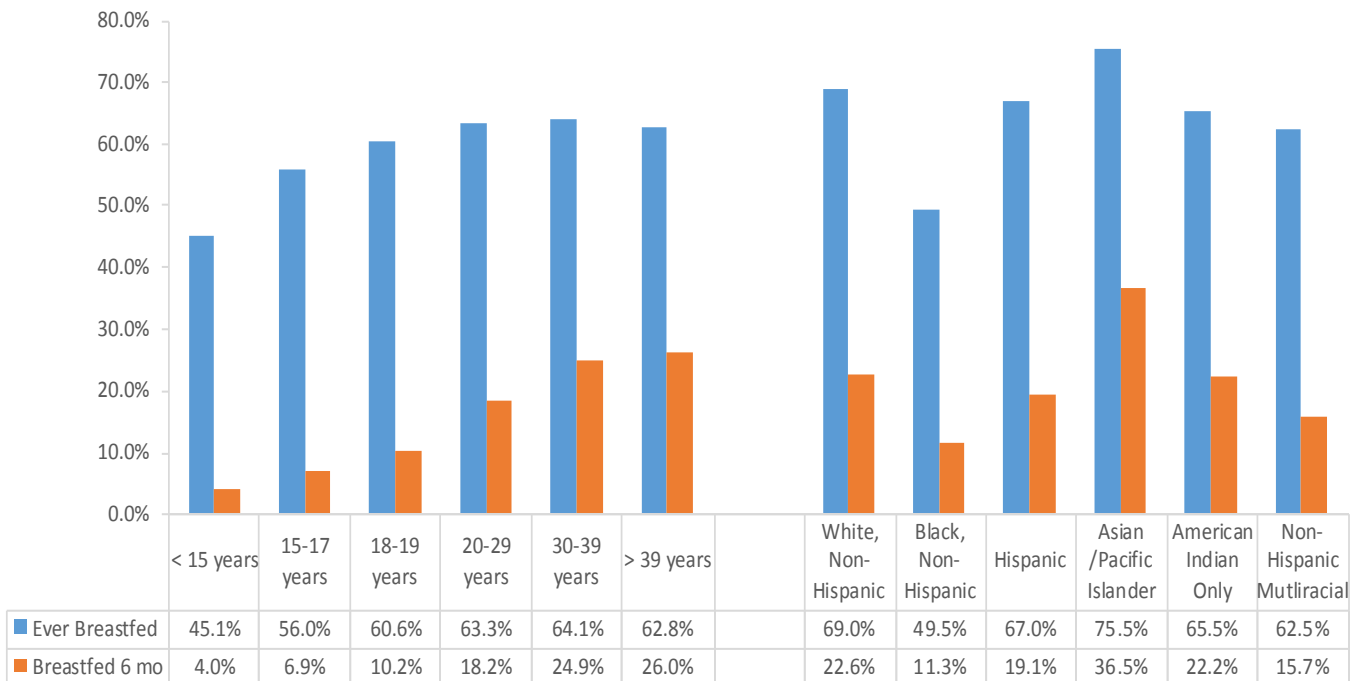


MI-PNSS & PedNSS Report 2010-2015

Both breastfeeding initiation and duration varied by maternal age and race/ethnicity (Figure 36). In general, middle-aged mothers have a higher prevalence of ever breastfeeding. Women 20-39 years old had the highest prevalence of ever breastfeeding compared to the lowest prevalence of 45.1% 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 (26.0%).

Breastfeeding was most prevalent among Asian/Pacific Islander (75.5%), followed by White, Non-Hispanic women (69.0%) and Hispanic (67.0%). Black, Non-Hispanic women had the lowest prevalence of breastfeeding (49.5%). Asian/Pacific Islander (36.5%) women had the highest prevalence of breastfeeding to 6 months, the lowest prevalence was reported by Black, Non-Hispanic women (11.3%).

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 2015¹⁻³



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



MI-PNSS & PedNSS Report 2010-2015

The prevalence of breastfeeding initiation and breastfeeding to 6 months by selected maternal characteristics is summarized in Table 11. Breastfeeding initiation rates 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 breastfed to 6 months compared to women who gained greater than the ideal amount or gained the ideal amount (Table 11).

Although 52.9% of women who smoked during their last trimester initiated breastfeeding, only 8.1% breastfed their infants to 6 months. Finally, more than half (51.6%) of women with anemia during pregnancy initiated breastfeeding, while only 12.2% breastfed to 6 months.

Table 11: Prevalence of breastfeeding initiation and breastfed to 6 months among infants whose mothers enrolled in Michigan WIC in 2015 by selected maternal characteristics, MI-PNSS/PedNSS 2015¹⁻³

	Ever Breastfed	Breastfed 6 months
Maternal Education		
<9 years	58.5%	19.4%
9-11 years	50.4%	9.0%
12 years	61.2%	15.4%
13-15 years	72.6%	25.0%
16+ years	83.0%	43.6%
Maternal Weight Gain		
Less than Ideal	58.9%	16.4%
Ideal	62.5%	19.7%
Greater than Ideal	63.3%	18.0%
Smoking 3rd Trimester		
No	64.8%	20.6%
Yes	52.9%	8.1%
Maternal Prenatal BMI		
Underweight	57.9%	15.4%
Normal	62.5%	19.2%
Overweight	62.6%	17.6%
Obese	61.0%	16.0%
Anemia 3rd Trimester		
No	62.5%	18.0%
Yes	51.6%	12.2%
MI-PNSS/PedNSS 2015		

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



MI-PNSS & PedNSS Report 2010-2015

Five agencies exceeded the Healthy People 2020 objective (81.9%) for breastfeeding initiation (Table 12 and Figure 37). The Benzie-Leelanau District Health Department reported 86.5% of women initiated breastfeeding. Contrarily, the lowest prevalence of breastfeeding initiation was reported by the Detroit Urban League at 46.5%.

The Benzie-Leelanau District Health Department reported the highest prevalence (36.7%) for 6 months duration of

Table 13: Prevalence of breastfeeding to 6 months by local agency among infants enrolled in WIC 2015 and born to mothers enrolled in WIC that initiated breastfeeding, MI-PNSS/PedNSS 2015¹⁻³

Highest Prevalence of Breastfeeding to 6 months	
Agency	%
Benzie-Leelanau DHD	36.7
Grand Traverse County HD	35.6
Western Upper Peninsula HD	34.9
Washtenaw County HD	33.1
Marquette County HD	32.2
Lowest Prevalence of Breastfeeding to 6 months	
Agency	%
Genesee County HD	13.5
Saginaw County Dept. of Pub Hlth	12.9
Detroit DHWP	10.7
Detroit Urban League	10.3
Health Delivery, Inc	9.9
MI-PNSS/PedNSS 2015	

Table 12: Prevalence of ever breastfed among infants born to mothers enrolled in WIC 2015 by local agency, MI-PNSS 2015¹⁻³

Highest Prevalence of Breastfeeding Initiation	
Agency	%
Benzie-Leelanau DHD	86.5
Grand Traverse County HD	84.4
Mid-Michigan DHD	82.6
Ionia County HD	82.4
Washtenaw County HD	82.0
Lowest Prevalence of Breastfeeding Initiation	
Agency	%
Monroe County HD	60.6
Macomb County HD	58.4
Wayne County HD	57.4
Detroit DHWP	47.3
Detroit Urban League	46.5
MI-PNSS 2015	

breastfeeding (Table 13 and Figure 38). In contrast, Health Delivery, Inc reported the lowest prevalence of breastfeeding for 6 months (9.9%).

Data for breastfeeding initiation was gathered from infants born to mothers who enrolled in WIC during 2015 (PNSS).

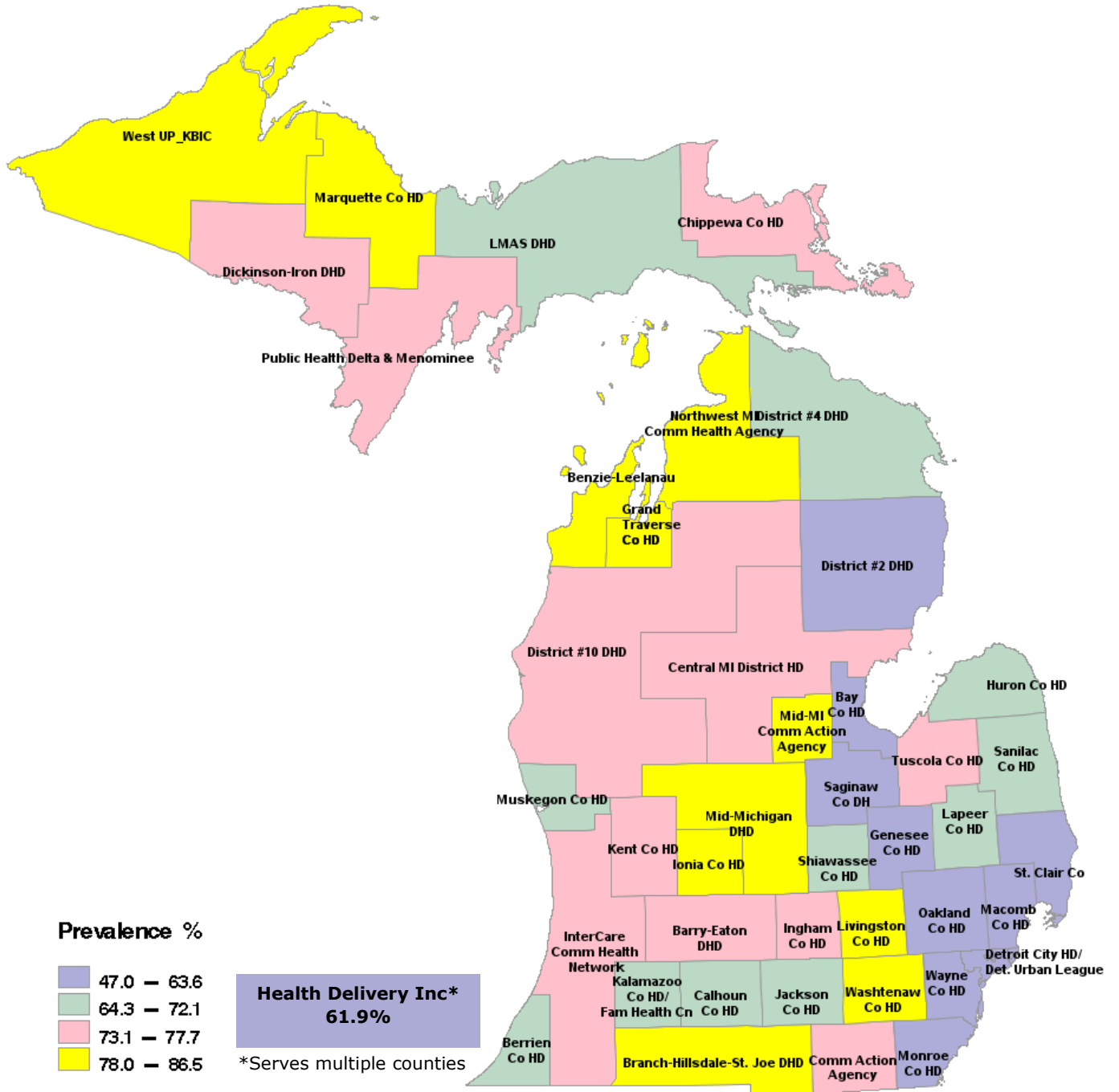
Data for 6 months duration was gathered from infants with breastfeeding data in PedNSS 2015 and whose mothers were enrolled in WIC that initiated breastfeeding.

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



MI-PNSS & PedNSS Report 2010-2015

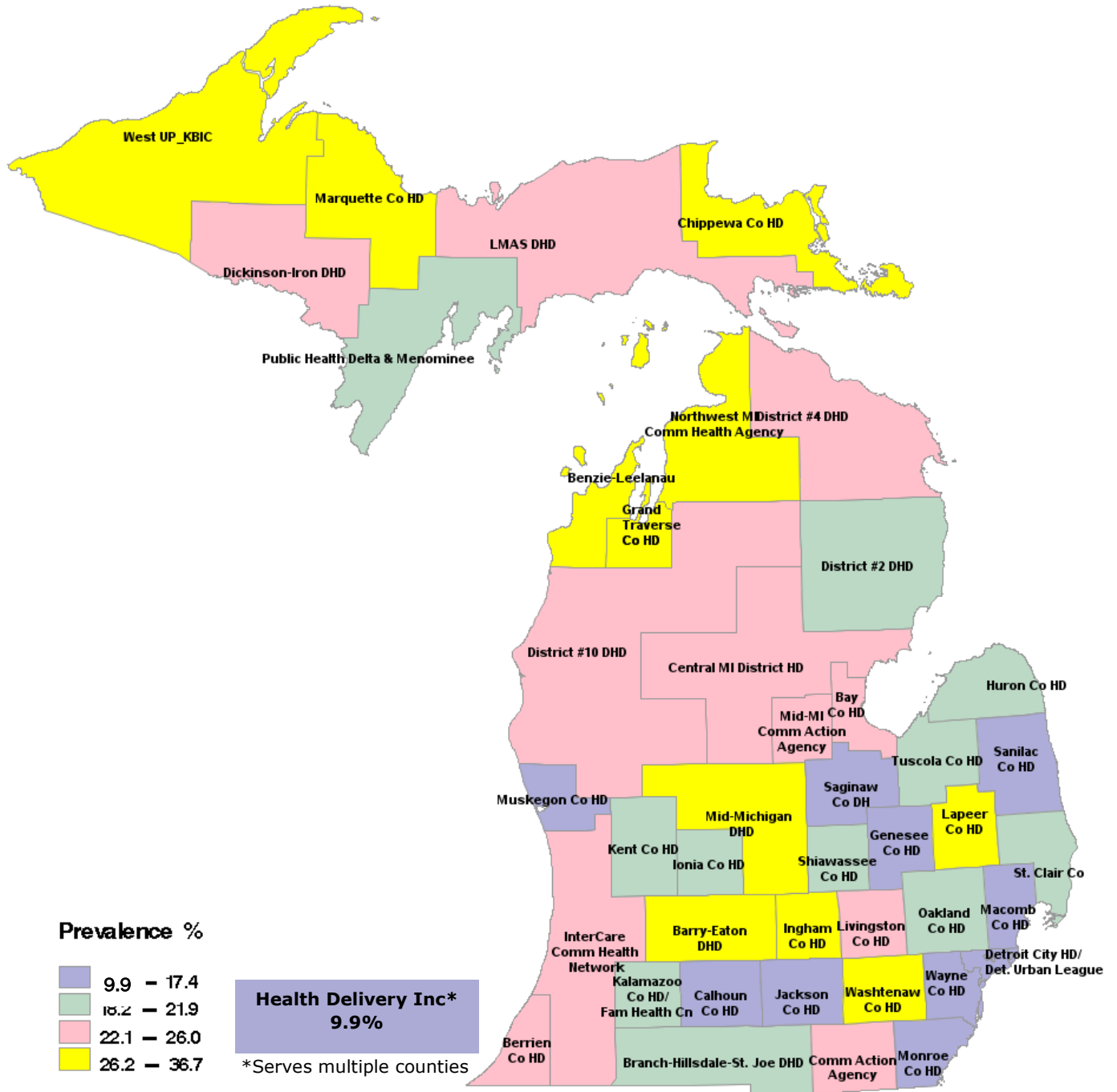
Figure 37: Prevalence of breastfed (ever) by local agency, MI-PNSS 2015





MI-PNSS & PedNSS Report 2010-2015

Figure 38: Prevalence of breastfed to 6 months by local agency, MI-PNSS/ PedNSS 2015





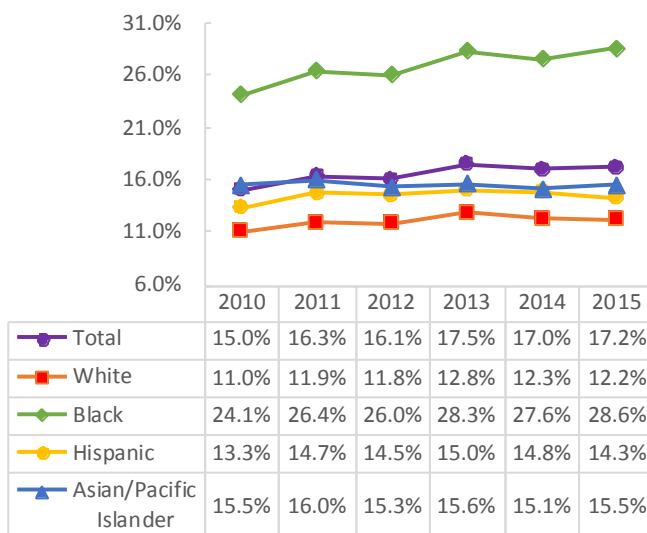
MI-PNSS & PedNSS Report 2010-2015

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 B₁₂, B₆, 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).

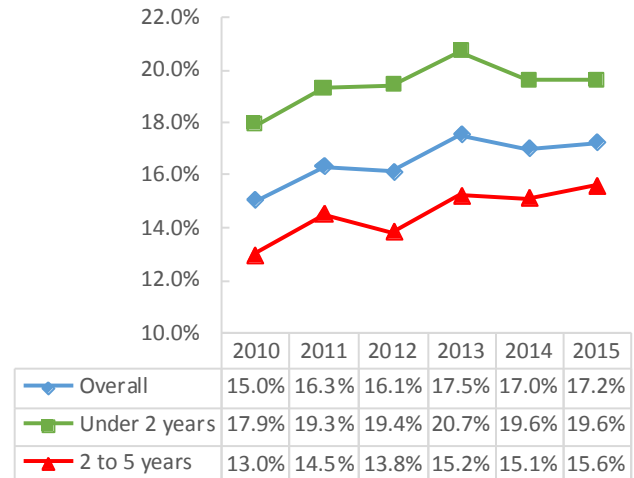
Infants and children enrolled in WIC are not tested specifically for iron deficiency but either

Figure 40: Trend of pediatric anemia prevalence by race/ethnicity among children <5 years enrolled in WIC, MI-PedNSS 2010-2015¹⁻⁴



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

Figure 39: Trend of pediatric anemia prevalence among children <5 years enrolled in WIC, MI-PedNSS 2010-2015¹⁻⁴



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%.

From 2010 to 2015, the prevalence of anemia among all children 5 years and younger increased by 14.7%. The overall prevalence of anemia in children in 2015 was 17.2%. It was especially high among children under 2 years of age (19.6%) (Figure 39).

The prevalence of anemia among Black, Non-Hispanic children was significantly higher than other race/ethnicity groups. In 2015, the prevalence of Black, Non-Hispanic (28.6%) was more than double that of White, Non-Hispanic children (12.2%) (Figure 40).

MI-PNSS & PedNSS Report 2010-2015

Black, Non-Hispanic children born to mothers enrolled in WIC during their 1st trimester had the lowest prevalence of anemia. Among Hispanics and White, Non-Hispanic, anemia levels were slightly lower in children whose mother enrolled at an earlier time (Figure 41). This finding was consistent across different race/ethnicity groups.

Because of racial disparities in anemia prevalence, agencies with a higher proportion of Black, Non-Hispanic

Figure 41: Prevalence of pediatric anemia by maternal race/ethnicity and trimester of WIC enrollment among children <5 years enrolled in WIC, MI-PNSS 2010-2015/PedNSS 2015¹⁻⁴

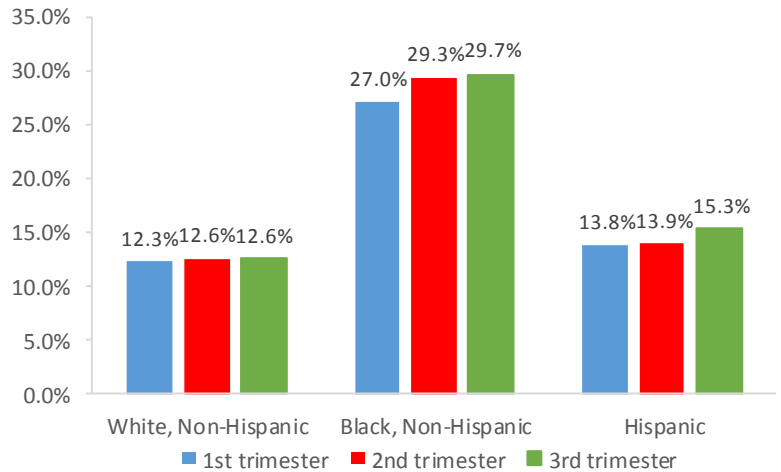


Table 14: Prevalence of anemia among children <5 years enrolled in WIC by local agency, MI-PedNSS 2015¹⁻⁴

Highest Prevalence of Anemia - Children 5 years or younger	
Agency	%
Detroit Urban League	35.4
Detroit DHWP	25.8
Kalamazoo Family Health Center	25.1
Genesee County HD	23.6
Calhoun County HD	22.9
Lowest Prevalence of Anemia - Children 5 years or younger	
Agency	%
Livingston County HD	6.3
Branch-Hillsdale-St. Joe DHD	6.1
Health Delivery, Inc	4.1
Mid-Michigan DHD	3.9
Delta & Menominee	2.6

MI - PedNSS 2015

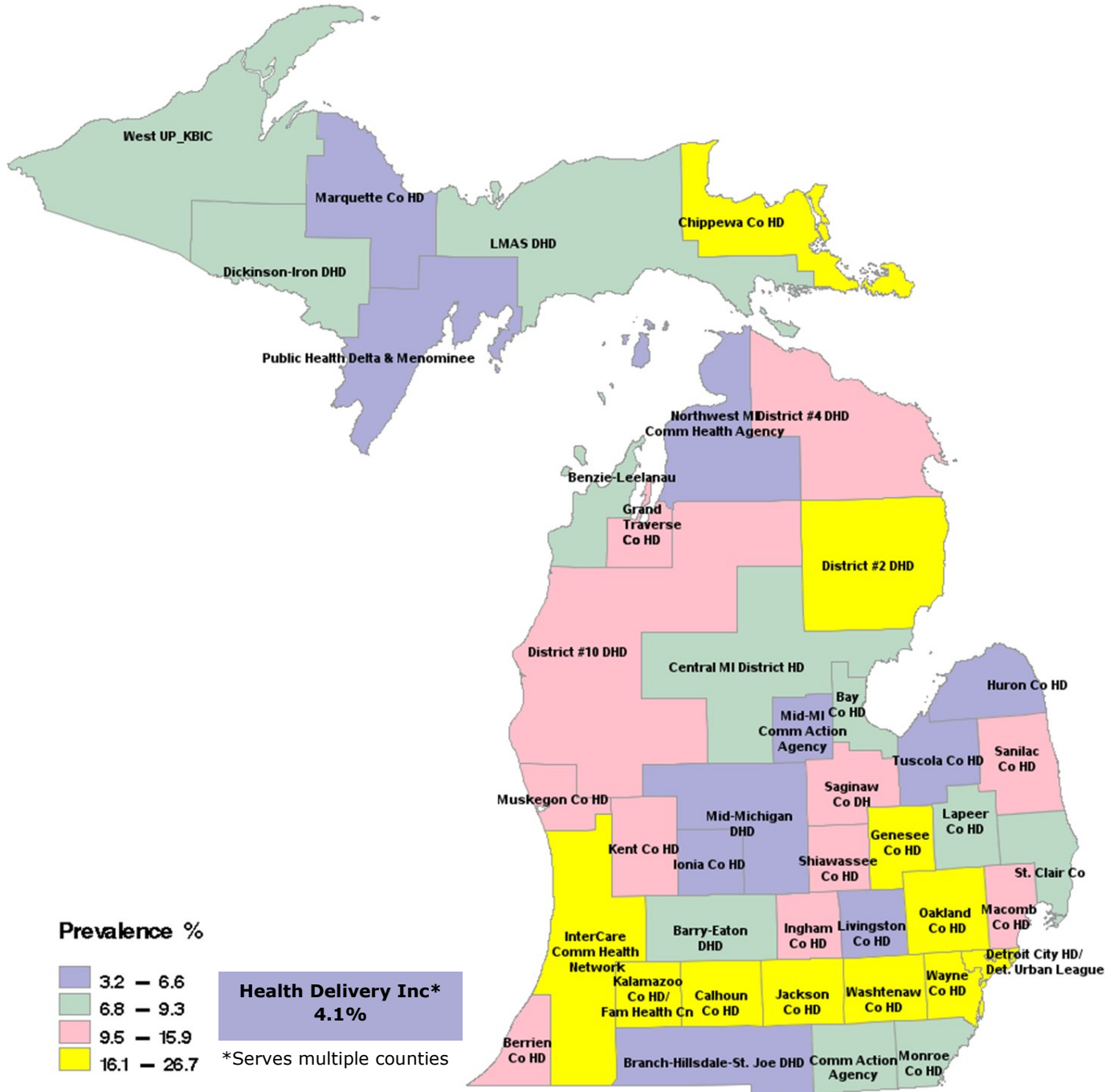
children tended to have a higher prevalence of anemia (Table 14 and Figure 42). More than one-third (35.4%) of the children enrolled at the Detroit Urban League were anemic, where 72.1% of children are Black, Non-Hispanic. Although the proportion of Black, Non-Hispanic children enrolled at the Calhoun County Health Department is lower (19.7%), the anemia prevalence was the 5th highest in the state (22.9%). Conversely, Health Delivery, Inc. serves a WIC cohort with more than half Black, Non-Hispanic (52.3%) and the anemia prevalence was one of the lowest in the state (4.1%).

Furthermore, agencies with the lowest prevalence of anemia enrolled less than 1% of Black, Non-Hispanic children. Public Health Delta and Menominee Counties reported the lowest prevalence of anemia among children (2.6%).

¹Recording period is January 1st through December 31st. ²Excludes 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.

MI-PNSS & PedNSS Report 2010-2015

Figure 42: Prevalence of pediatric anemia by local agency, MI-PedNSS 2015





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 (Fishman et al., 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 2010	
GOAL	
Decrease the prevalence of short stature among low income children under 5 years of age to 5.0%	
Four local agencies achieved this goal in 2015:	
•	Luce-Mackinac-Alger-Schoolcraft DHD (3.5%)
•	Grand Traverse County HD (4.1%)
•	Ionia County HD (4.4%)
•	InterCare Comm Health Network (4.9%)

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 is 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 \leq 2.3rd percentile based on 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.



MI-PNSS & PedNSS Report 2010-2015

From 2010 to 2015, the prevalence of short stature among children less than 2 years of age in the Michigan WIC population increased from 8.2% to 9.3% (Figure 43). Prevalence of short stature remains consistently higher among Black, non-Hispanic children.

The prevalence of short stature only decreased among Asian/Pacific Islanders (10.3%).

Figure 43: Trend of short stature prevalence by race/ethnicity among the children <2 years enrolled in WIC, MI-PedNSS 2010-2015¹⁻⁴

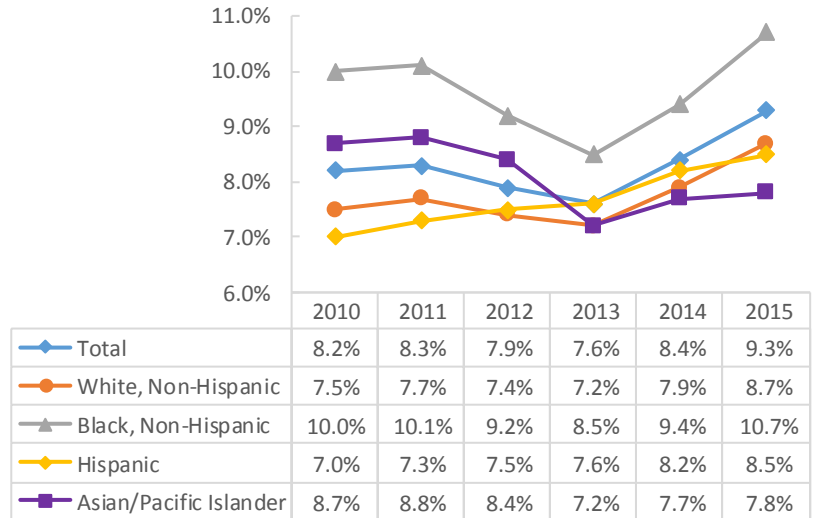
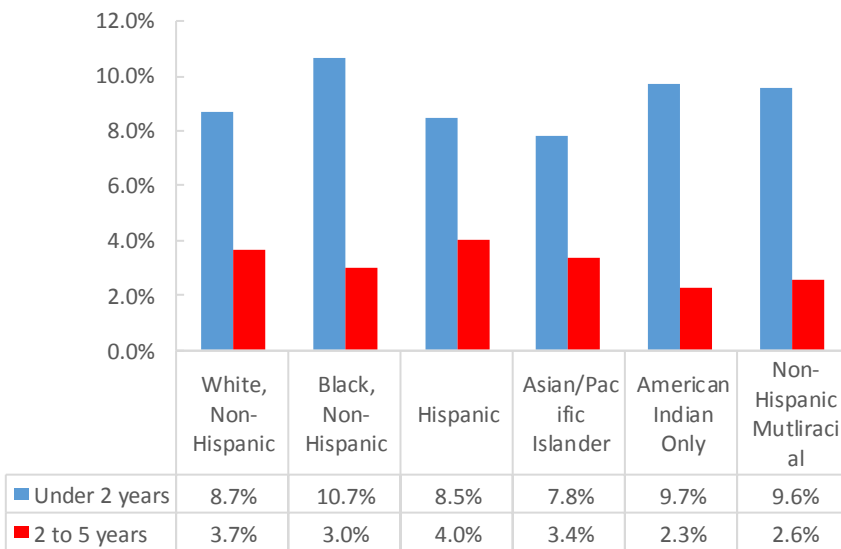


Figure 44: Prevalence of short stature among children <5 years enrolled in WIC by race/ethnicity and age group, MI-PedNSS 2015¹⁻⁴



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.

Many children enrolled in 2015 with short stature were born with low birthweight (44%).

¹Recording period is January 1st through December 31st ²Excludes records with unknown data & errors ³Analyses based on one record per child. ⁴For 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.

MI-PNSS & PedNSS Report 2010-2015

Table 15: Prevalence of short stature among children <5 years enrolled in WIC by local agency, MI-PedNSS 2015¹⁻⁴

Highest Prevalence of Underweight	
Agency	%
Genesee County HD	9.5
Marquette County HD	8.3
Mid-MI Community Action Agency	8.0
Dickinson-Iron DHD	7.9
Oakland County HD	7.9
Agency	%
Benzie-Leelanau DHD	5.3
Shiawassee County HD	5.3
InterCare Comm Health Network	4.9
Ionia County HD	4.3
Grand Traverse County HD	4.1
Luce-Mackinac-Alger-Schoolcraft DHD	3.5
MI-PedNSS 2015	

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, low maternal weight gain, maternal enrollment in WIC after the 1st trimester and children of Black, Non-Hispanic women (Table 16).

The prevalence of short stature varied by local WIC agency and ranged from 3.5% reported by the Luce-Mackinac-Alger-Schoolcraft District Health Department to 9.5% at the Genesee Health Department. (Table 15).

After accounting for race and other factors, women who enroll in WIC during their 1st trimester have lower odds of having a short stature child than women who enroll later.

Table 16: Adjusted Odds ratios for short stature among children <2 years of age by child and maternal effects, MI-PNSS 2013-2015/PedNSS 2015¹⁻⁴

Effect	OR Estimate	95% Confidence Limits	
WIC enrollment: 2nd trimester vs. 1st trimester	1.08	1.01	1.15
WIC enrollment: 3rd trimester vs. 1st trimester	1.09	1.00	1.18
Maternal gestational weight gain: Greater than ideal vs. ideal	0.84	0.79	0.90
Maternal gestational weight gain: Less than ideal vs. ideal	1.18	1.09	1.28
White, Non-Hispanic vs Black, Non-Hispanic	1.04	0.97	1.12
Hispanic vs Black, Non-Hispanic	1.14	1.03	1.26
Asian/Pacific Islander vs Black, Non-Hispanic	0.73	0.55	0.96
American Indian Only vs Black, Non-Hispanic	1.10	0.68	1.78
Non-Hispanic Multiracial vs Black, Non-Hispanic	1.06	0.95	1.19
Smoking at prenatal visit vs non-smoker	1.42	1.32	1.52
High birthweight vs normal birthweight	0.14	0.10	0.19
Low birthweight vs normal birthweight	9.82	9.17	10.52
Very low birthweight vs normal birthweight	32.29	26.47	39.37
MI-PNSS 2013-2015/PedNSS 2015			

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency ³ Analyses based on one record per child. ⁴For 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 ≤ 2.3 percentile based on 2006 WHO growth chart. For children 2 to 5 years of age, underweight is defined as weight-for-height $< 5^{\text{th}}$ percentile based on 2000 CDC growth chart.

The 2015 overall prevalence for Michigan (2.9%) 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 2.9%

Figure 45: Trend of underweight prevalence by age group among children <5 years of age enrolled in WIC, MI-PedNSS 2010-2015¹⁻⁴

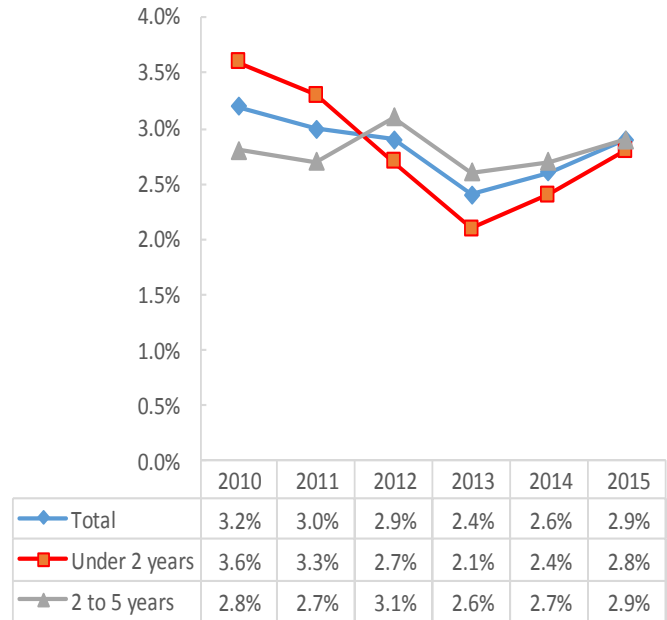
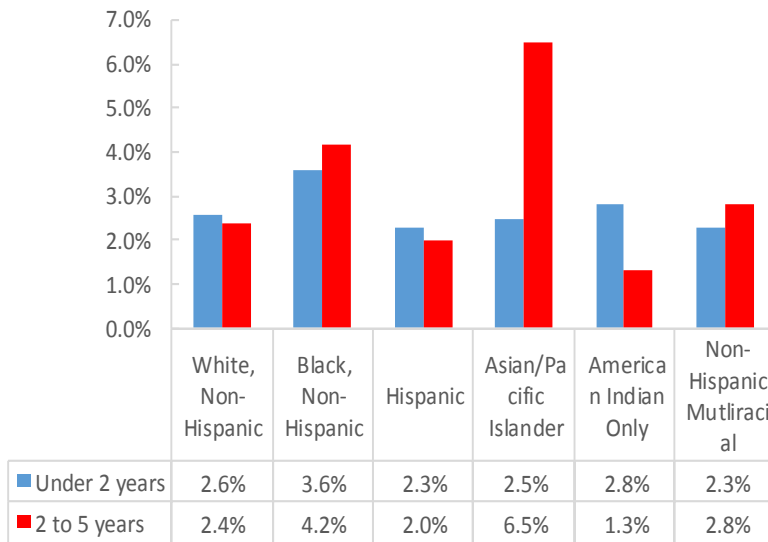


Figure 46: Prevalence of underweight by race/ethnicity and age group among children <5 years enrolled in WIC, MI-PedNSS 2015¹⁻⁴



(Figure 45). Overall, the prevalence of underweight among children in WIC declined from 3.2% in 2010 to 2.9% in 2015. The trend is mainly driven by children younger than 2 years of age.

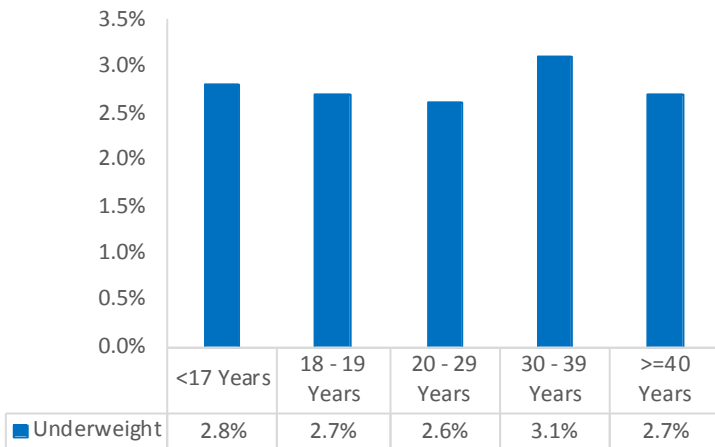
The prevalence of underweight among children of both age groups varied by race/ethnicity (Figure 46). Among children under 2 years old, Black, Non-Hispanic children had the highest prevalence (3.6%). Among children 2-5 years old, the prevalence was highest among Asian/Pacific Islander children at 6.5% followed by Black, Non-Hispanic children (4.2%).

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



MI-PNSS & PedNSS Report 2010-2015

Figure 47: Prevalence of underweight among children <5 years of age enrolled in WIC by maternal age group MI-PNSS 2010-2015/ PedNSS 2015¹⁻⁴



As shown in Figure 47, the prevalence of underweight among children 2 to 5 years of age was lower for those mothers aged 20-29 years (2.6%). The prevalence was highest for mothers 30 - 39 years old (3.1%).

Table 17: Prevalence of underweight among children <5 years of age enrolled in WIC by local agency, MI-PedNSS 2015¹⁻⁴

Livingston County HD and Sanilac County HD reported the lowest prevalence of underweight at 1.0%. Grand Traverse County HD and Benzie-Leelanau DHD reported the highest prevalence of underweight at 6.4% (Table 17).

Highest Prevalence of Underweight	
Agency	%
Benzie-Leelanau DHD	6.4
Grand Traverse County HD	6.4
Detroit Urban League	5.2
Ionia County HD	4.9
Berrien County HD	4.8
Agency	%
District Health Dept. #10	1.7
Macomb County HD	1.7
Dickinson-Iron DHD	1.3
Mid-MI Community Action Agency	1.3
Livingston County HD	1.0
Sanilac County HD	1.0

Highlight

The reported prevalence of underweight was less than or equal to 5% for nearly all agencies in Michigan during 2015.

Detroit Urban League, Grand Traverse County Health Department and Benzie-Leelanau District Health Department all exceed 5% in 2015.

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. ³ Analyses based on one record per child. ⁴Based 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

**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.

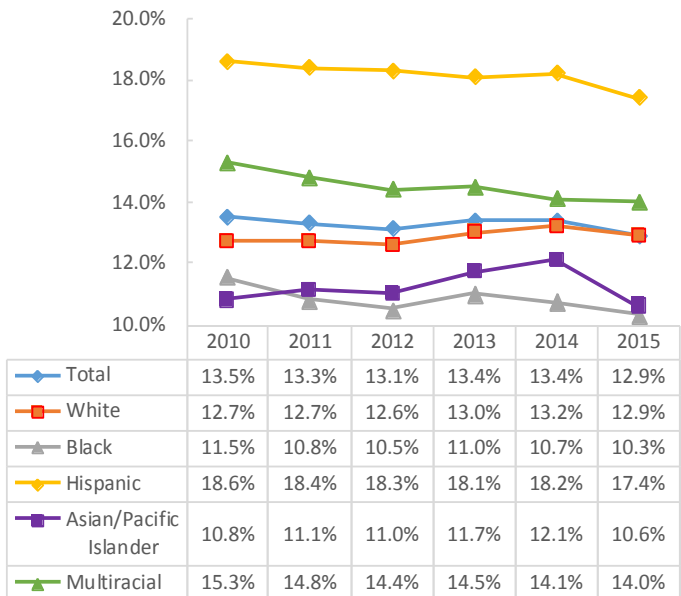
- In 2015, 24 local agencies have reached the 13.5% goal.

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.

Figure 48: Trend of obesity prevalence by race/ethnicity among children ages 2 to 5 years enrolled in WIC, MI-PedNSS 2010-2015¹⁻⁴



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



MI-PNSS & PedNSS Report 2010-2015

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

Figure 49: Trend of overweight prevalence by race/ethnicity among children 2 to 5 years enrolled in WIC, MI-PedNSS 2010-2015¹⁻⁴

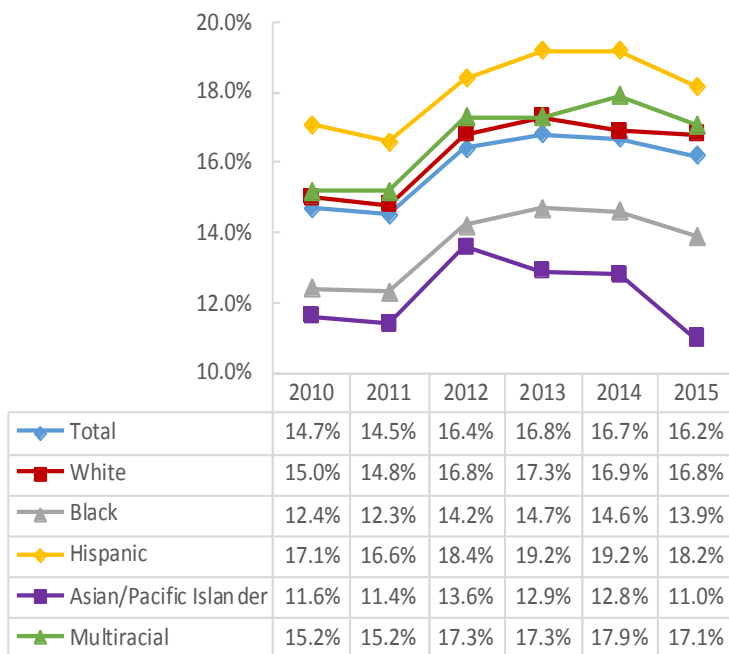
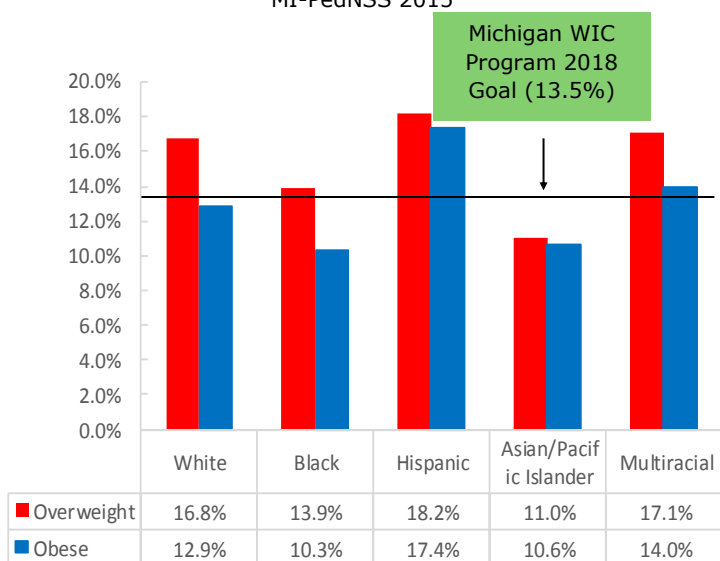


Figure 50: Prevalence of obesity and overweight among children ages 2 to 5 years enrolled in WIC by race/ethnicity, MI-PedNSS 2015¹⁻⁴



variation, thus a prevalence of obesity greater than 5% indicates that there is a higher than usual proportion of children who are obese. In 2015, the overall prevalence of obesity among children ages 2 to 5 years enrolled in Michigan WIC was 12.9%. Although higher than the 5% expected level, the increasing trend found in the 2003-2007 report has leveled off and the prevalence in 2015 (12.9%) is even lower than that in 2010 at 13.5% (Figure 48). The prevalence was consistently higher among Hispanic children while lower among Black, Non-Hispanic and Asian children.

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



MI-PNSS & PedNSS Report 2010-2015

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

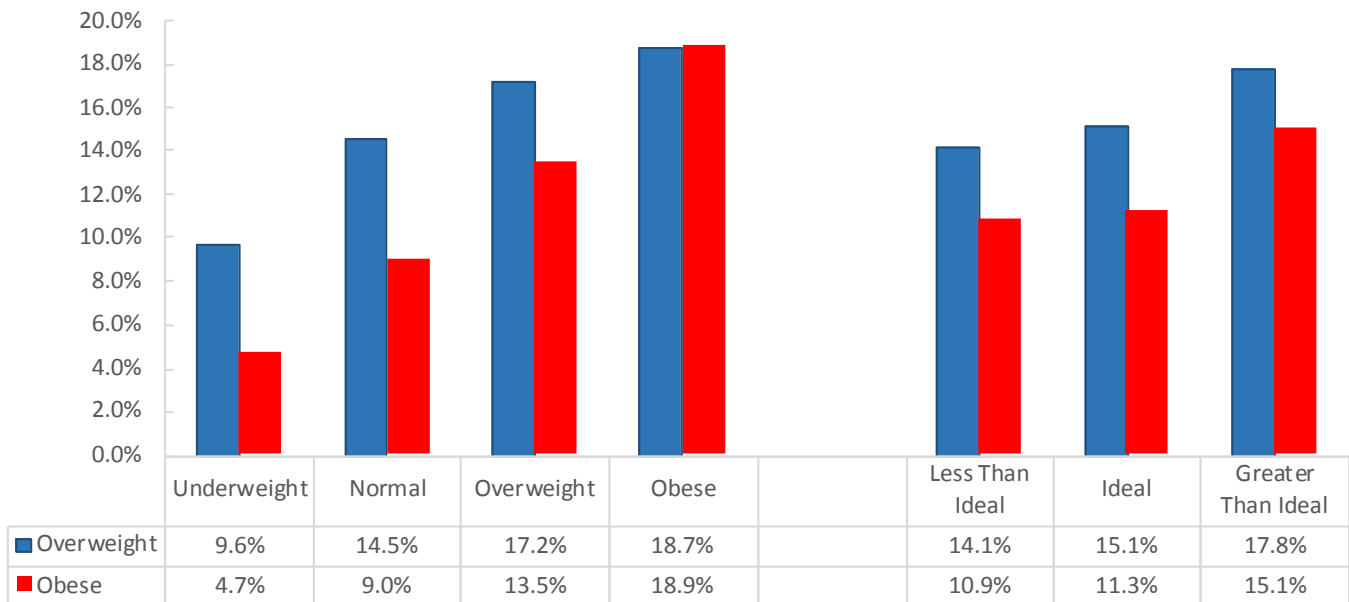
Analysis of pediatric overweight and obesity by selected maternal and infant characteristics yielded results outlined in Table 18 and Figure 51.

The association was tested by using chi-square statistics. Never breastfed, maternal smoking during the last trimester put the child at higher risk of becoming overweight and obese. Being female, 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 MI WIC by selected maternal and infant characteristics, MI-PNSS 2010-2013/ PedNSS 2015¹⁻⁶

	Over-weight %	Obese %
Maternal Education		
<12 yrs	16.8%	13.5%
12 yrs	16.9%	14.6%
>12 yrs	16.1%	12.2%
Gender		
Male	16.8%	13.8%
Female	16.5%	13.1%
Breastfeeding ever		
No	16.9%	14.6%
Yes	16.5%	12.7%
Smoking 3rd trimester		
No	16.2%	12.8%
Yes	19.0%	16.6%
Full term low birthweight		
No	16.9%	13.7%
Yes	9.3%	7.1%

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 2010-2013/PedNSS 2015¹⁻⁵



¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. ³Analyses based on one record per child. ⁴Gestation weight gain is defined based on 1990 IOM report "Nutrition during pregnancy" ⁵Based 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 percentile), 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 the child's BMI increases. For example, the adjusted odds ratio for the effect of obese maternal prenatal BMI on a child having a BMI 85th percentile or greater is 1.48 (compared to a child whose mother had a BMI categorized as normal). The effect of maternal obesity increases to 2.51 for children whose BMI is in the 95th 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 prenatal 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 2010-2013/PedNSS 2015

Odds Ratio Estimates Effect	>85th			>95th		
	AOR	95% Confidence Limits		AOR	95% Confidence Limits	
Ever breastfed	0.91	0.87	0.96	0.84	0.80	0.89
Maternal education: HS vs >HS	1.03	0.97	1.09	1.09	1.02	1.16
Maternal education: <HS vs >HS	1.10	1.03	1.17	1.21	1.12	1.30
Maternal smoking at prenatal visit	1.36	1.29	1.45	1.62	1.52	1.72
Maternal weight gain: >Ideal vs Ideal	1.16	1.10	1.22	1.19	1.12	1.26
Maternal weight gain: <Ideal vs Ideal	0.97	0.90	1.04	0.97	0.89	1.05
Maternal Prenatal Underweight vs Normal	0.64	0.55	0.74	0.50	0.40	0.61
Maternal Prenatal Overweight vs Normal	1.22	1.14	1.29	1.60	1.50	1.72
Maternal Prenatal Obese vs Normal	1.48	1.40	1.57	2.51	2.35	2.67
Child: Male vs Female	1.00	0.95	1.05	1.05	0.99	1.10
Black, Non-Hispanic vs White, Non-Hispanic	0.80	0.75	0.85	0.77	0.72	0.82
Hispanic vs White, Non-Hispanic	1.13	1.05	1.21	1.48	1.37	1.59
Asian/Pacific Islander vs White, Non-Hispanic	0.78	0.61	1.00	1.28	0.99	1.63
American Indian Only vs White, Non-Hispanic	1.37	0.97	1.95	1.57	1.08	2.26
Non-Hispanic Multiracial vs White, Non-Hispanic	1.01	0.93	1.10	0.97	0.88	1.07
Infant Very Low Birthweight vs Normal	0.41	0.30	0.57	0.40	0.28	0.58
Infant Low Birthweight vs Normal	0.64	0.57	0.71	0.59	0.52	0.67
Infant High Birthweight vs Normal	1.64	1.51	1.78	2.11	1.94	2.30

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



MI-PNSS & PedNSS Report 2010-2015

Prevalence of obesity and overweight varied by local agency (Figures 52 & 53; Tables 20 & 21). Both highest prevalence of overweight and obesity were reported by Keweenaw Bay Indian Community (28.1% and 25.6% respectively). The lowest prevalence of overweight and obesity among children was reported by the Luce-Mackinac-Alger-Schoolcraft District Health Department (12.4% and 8.9%).

Table 20: Prevalence of overweight among children 2 to 5 years of age enrolled in WIC by local agency, MI-PedNSS 2015¹⁻⁴

Highest Prevalence of Overweight	
Agency	%
Keweenaw Bay Indian Tribe	28.1
Health Delivery, Inc	20.1
Sanilac County HD	20.1
Northwest MI Comm Health Agency	19.7
Community Action Agency	19.7
Agency	%
Wayne County HD	14.7
Detroit Urban League	14.2
Detroit DHWP	14.1
Macomb County HD	13.8
Luce-Mackinac-Alger-Schoolcraft DHD	12.4
MI-PedNSS 2015	

Table 21: Prevalence of obesity among children 2 to 5 years of age enrolled in WIC by local agency, MI-PedNSS 2015¹⁻⁴

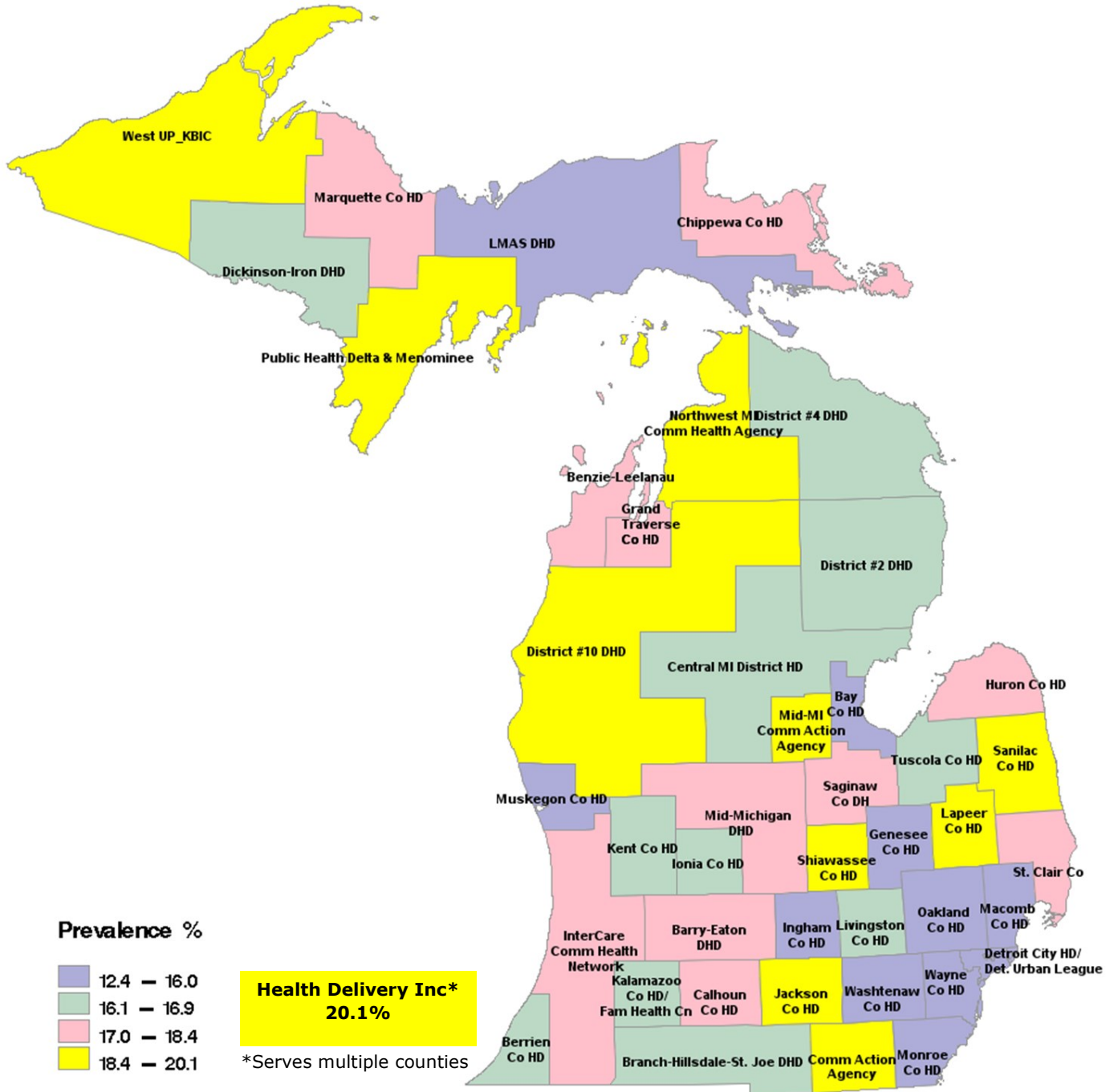
Highest Prevalence of Obesity	
Agency	%
Keweenaw Bay Indian Tribe	25.6
Mid-MI Community Action Agency	16.1
Marquette County HD	15.9
Ionia County HD	15.5
Calhoun County HD	15.4
Agency	%
Sanilac County HD	11.6
Oakland County HD	11.5
Wayne County HD	11.0
Western Upper Peninsula HD	10.1
Luce-Mackinac-Alger-Schoolcraft DHD	8.9
MI-PedNSS 2015	

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. ³Analyses based on one record per child. ⁴Based 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.



MI-PNSS & PedNSS Report 2010-2015

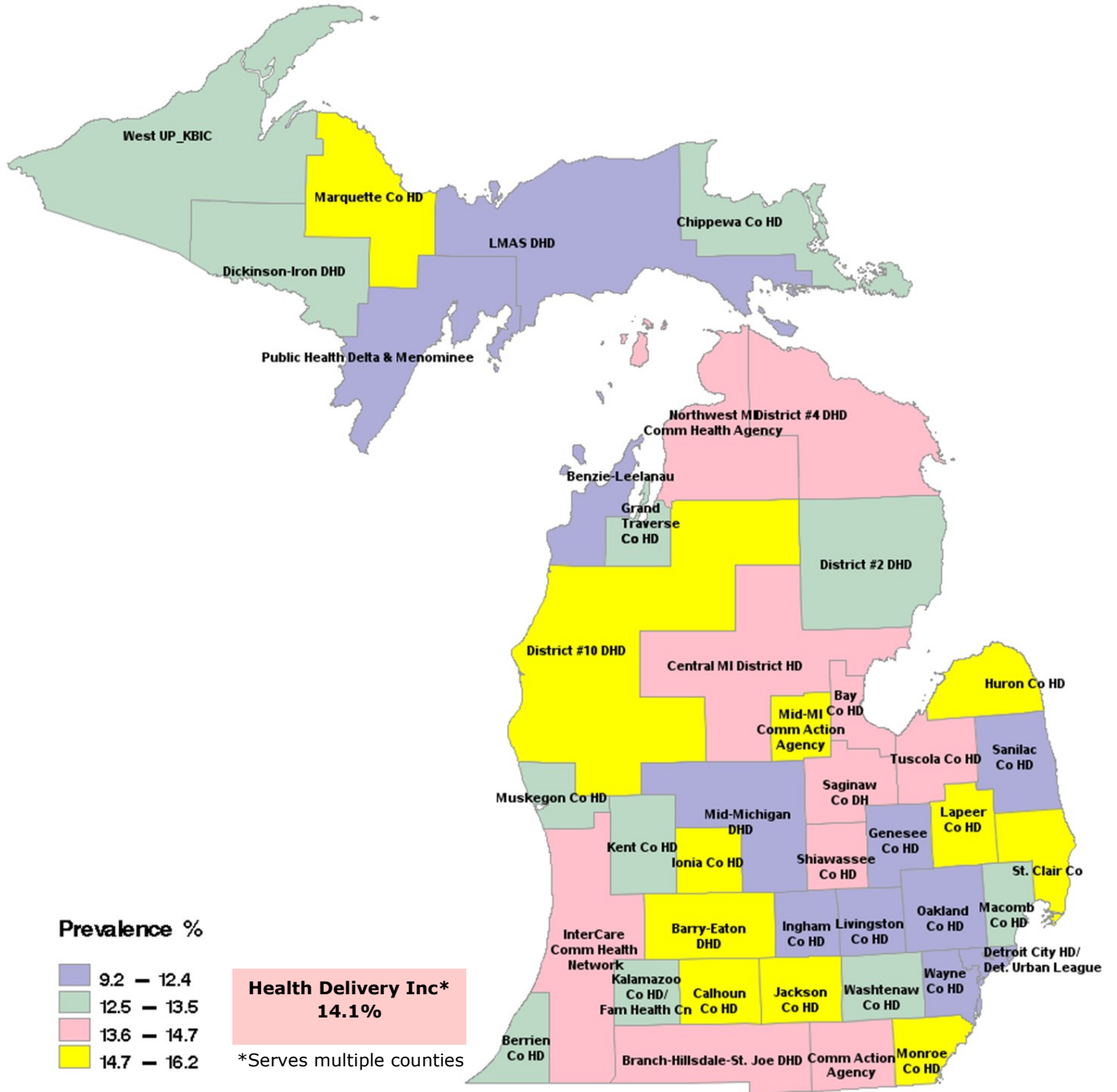
Figure 52: Prevalence of overweight among children ages 2 to 5 years by local agency, MI-PedNSS 2015





MI-PNSS & PedNSS Report 2010-2015

Figure 53: Prevalence of obesity among children ages 2 to 5 years by local agency, MI-PedNSS 2015



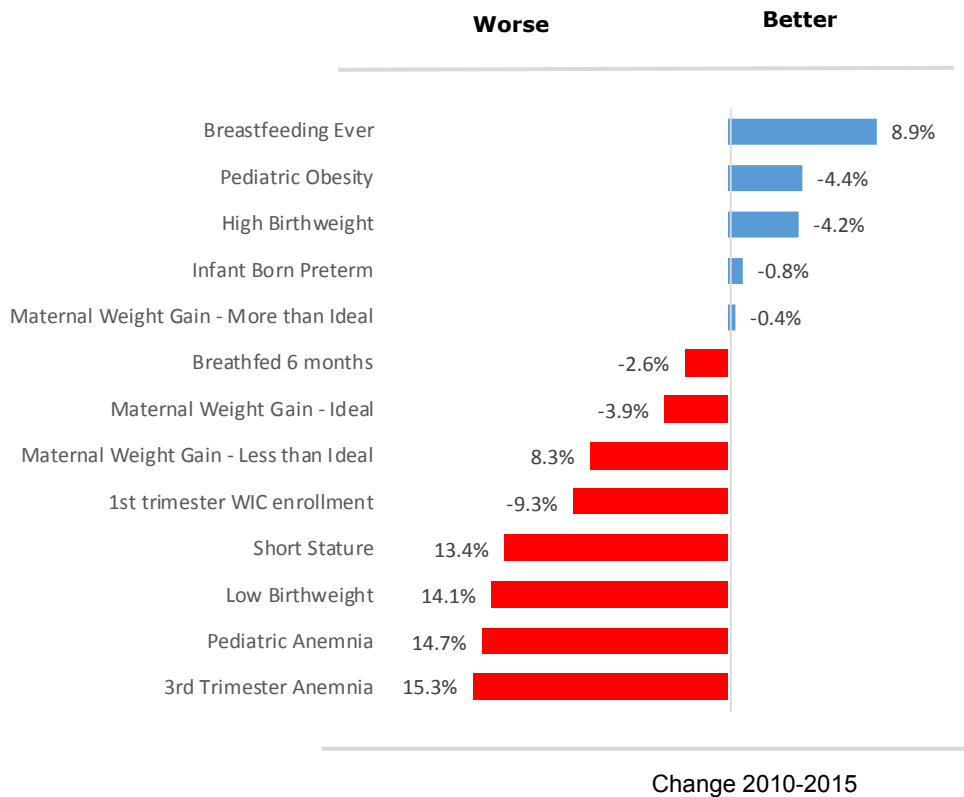


Health Progress Review

Both maternal and child health indicators were observed among the Michigan WIC population from 2010 to 2015. Changes in key indicators over this period are summarized below.

Improvements were seen in several health indicators. Breastfeeding initiation increased by 8.9%, pediatric obesity decreased by 4.4%, high birthweight declined by 4.2%, and the rate of preterm birth decreased by 0.8%.

Figure 54: Changes in maternal, infant and child health status, MI-PNSS/PedNSS 2010-2015





Health Progress Review

Despite this progress, several other health indicators worsened from 2010 to 2015, and the trends are concerning. For example, WIC first trimester enrollment decreased by 9.3% during this period. There are a number of factors that can impact early enrollment in WIC. For example, population living below the poverty line decreased from 15.7% in 2010 to 14.8% in 2015. In addition, lack of child care for older children and conflict with school or work schedules can have larger impact on timely enrollment into WIC due to the fact that there is a clear pattern of increasing maternal age and higher maternal education in WIC mothers over these years.

Maternal 3rd trimester anemia increased by 15.3%, while anemia among children increased by 14.7%. This increasing trend is consistent with the existing literature on anemia in children and reproductive aged women in the general population. The cause of this increase, however, remains unclear and warrants additional research on iron deficiency and health disparities.

From 2010 to 2015, low birthweight incidence among Michigan WIC mothers increased by 14.1%. 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 WIC moms had the largest increase in low birth weight infants (17.6%), while the percentage of low birth weight infants among white women in Michigan's general population remained constant from 2010 to 2015. Further investigation is needed to understand this contrast.



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 especially at 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 race/ethnicity 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 women up to 2 years to cover interpregnancy and postpartum to increase breastfeeding.



References

- ACCESS, A. F. (2006). Maternal Anemia: A Preventable Killer. Retrieved February 2016, from <https://www.k4health.org/sites/default/files/Maternal-Anemia-A-Preventable-Killer.pdf>
- American Academy of Pediatrics. (2009). Prevention and treatment of childhood obesity and overweight: About childhood obesity. Retrieved 10/20, 2009, from <http://www.aap.org/obesity/about.html>
- Armstrong, J., Reilly, J. J., & Child Health Information Team. (2002). Breastfeeding and lowering the risk of childhood obesity. *Lancet (London, England)*, 359(9322), 2003–2004. [https://doi.org/10.1016/S0140-6736\(02\)08837-2](https://doi.org/10.1016/S0140-6736(02)08837-2)
- Awatef, M., Olfa, G., Imed, H., Kacem, M., Imen, C., Rim, C., Slim, B. A. (2010). Breastfeeding reduces breast cancer risk: a case-control study in Tunisia. *Cancer Causes & Control: CCC*, 21(3), 393–397. <http://doi.org/10.1007/s10552-009-9471-3>
- Baker, J. L., Olsen, L. W., & Sorensen, T. I. (2014). Childhood body-mass index and the risk of coronary heart disease in adulthood. *New England Journal of Medicine*, 357(23), 2329-2337.
- Barclay, L. (2014, September 10). New International Standards for Fetal Growth, Newborn Size. Retrieved December 2015, from MedScape: <http://www.medscape.com/viewarticle/831432>
- Barker, D. J. (2004). The developmental origins of adult disease. *Journal of the American College of Nutrition*, 23(6 Suppl), 588S-595S.
- Barker, D. J., Winter, P. D., Osmond, C., Margetts, B., & Simmonds, S. J. (1989). Weight in infancy and death from ischemic heart disease. *Lancet*, 2(8663), 577-580.
- Basu, A. M., & Stephenson, R. (2005). Low levels of maternal education and the proximate determinants of childhood mortality: a little learning is not a dangerous thing. *Social Science & Medicine (1982)*, 60(9), 2011–2023. <https://doi.org/10.1016/j.socscimed.2004.08.057>
- Buss, C., Entringer, S., Swanson, J. M., & Wadhwa, P. D. (2012, April 25). Cerebrum: The Role of Stress in Brain Development. (B. Glovin, Ed.) Retrieved January 2016, from The Dana Foundation: http://www.dana.org/Cerebrum/2012/The_Role_of_Stress_in_Brain_Development__The_Gestational_Environment%E2%80%99s_Long-Term_Effects_on_the_Brain/
- Carlson, S., & Neuberger, Z. (2015, May 4). WIC Works: Addressing the Nutrition and Health Needs of Low-Income Families for 40 Years. Retrieved January 2016, from Center on Budget and Policy Priorities: <http://www.cbpp.org/research/food-assistance/wic-works-addressing-the->



MI-PNSS & PedNSS Report 2010-2015

nutrition-and-health-needs-of-low-income-families

- Carlson, S., Neuberger, Z., & Rosenbaum, D. (2015, August 3). WIC Participation and Costs Are Stable. Retrieved December 2015, from Center on Budget and Policy Priorities: <http://www.cbpp.org/research/food-assistance/wic-participation-and-costs-are-stable>
- Carter, R. C., Jacobson, J. L., Burden, M. J., Armony-Sivan, R., Dodge, N. C., Angelilli, M. L., Jacobson, S. W. (2010). Iron deficiency anemia and cognitive function in infancy. *Pediatrics*, 126(2), e427-434. <http://doi.org/10.1542/peds.2009-2097>
- CDC. (2011, March). PNSS Health Indicators. Retrieved January 2016 , from CDC's Pediatric and Pregnancy Surveillance System: http://www.cdc.gov/pednss/what_is/pnss_health_indicators.htm
- CDC. (2012, August). Pediatric and Pregnancy Nutrition Surveillance System. Retrieved January 2016, from Center for Disease Control and Prevention: <http://www.cdc.gov/pednss/>
- CDC. (2015, April). Fetal Alcohol Spectrum Disorders (FASDs). Retrieved February 2016, from Center for Disease Control and Prevention: <http://www.cdc.gov/ncbddd/fasd/facts.html>
- Chihara, I., Hayes, D. K., Chock, L. R., Fuddy, L. J., Rosenberg, D. L., & Handler, A. S. (2014). Relationship Between Gestational Weight Gain and Birthweight. *Maternal Child Health Journal*, 18, 1123-1131. Retrieved January 2016, from <http://link.springer.com/article/10.1007%2Fs10995-013-1342-6>
- Curtin, S. C., & Mathews, T. (2016). Smoking Prevalence and Cessation Before and During Pregnancy: Data From Birth Certificate, 2014. *National Vital Statistics Report*, 65(1), 14. Retrieved February 2016, from <http://www.cdc.gov/nchs/products/nvsr.htm>
- Deputy, N. P., Sharma, A. J., & Kim, S. Y. (2015, November 6). Gestational Weight Gain — United States, 2012 and 2013. *Morbidity and Mortality Weekly Report (MMWR)*, 64(43), 1215-1220. Retrieved February 2016, from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6443a3.htm>
- Euser, A. M., Finken, M. J., Keijzer-Veen, M. G., Hille, E. T., Wit, J. M., Dekker, F. W., et al. (2005). Associations between prenatal and infancy weight gain and BMI, fat mass, and fat distribution in young adulthood: A prospective cohort study in males and females born very preterm. *American Journal of Clinical Nutrition*, 81(2), 480-487.
- Fishman, S. M., Caulfield, L. E., de Onis, M., Blössner, M., Hyder, A. A., & Mullany, L. (2004). Chapter 2: Childhood & maternal underweight In M. Ezzati, A. D. Lopez, A. Rodgers & C. J. L. Murray (Eds.), *Comparative quantification of health risks- global and regional burden of disease attributable to selected major risk factors* (pp. 39). Geneva, Switzerland: World



MI-PNSS & PedNSS Report 2010-2015

Health Organization.

- FRAC. (2015). Food, Research & Action Center. Retrieved January 2016, from WIC (Women, Infants and Children): <http://frac.org/federal-foodnutrition-programs/wic/>
- Gluckman PD, Hanson MA, Cooper C, Thornburg KL. Effect of in utero and early-life conditions on adult health and disease. *N Engl J Med.* 2008;359:61–73. doi: 10.1056/NEJMra0708473.
- Grummer-Strawn, L. M., Mei, Z., & Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. (2004). Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. *Pediatrics*, 113(2), e81-86.
- Gunderson, E. P., Hedderson, M. M., Chiang, V., Crites, Y., Walton, D., Azevedo, R. A., Selby, J. V. (2012). Lactation intensity and postpartum maternal glucose tolerance and insulin resistance in women with recent GDM: the SWIFT cohort. *Diabetes Care*, 35(1), 50–56. <http://doi.org/10.2337/dc11-1409>
- Haas, J. D., Murdoch, S., Rivera, J., & Martorell, R. (1996). Early nutrition and later physical work capacity. *Nutrition Reviews*, 54(2 Pt 2), S41–48.
- Hales, C. N., & Ozanne, S. E. (2003). The dangerous road of catch-up growth. *Journal of Physiology*, 547(Pt 1), 5-10.
- Health. (2005, September 5). Anemia or an Iron Deficiency During Pregnancy and Childbirth. Retrieved February 2016, from Health: How Stuff Works: <http://health.howstuffworks.com/pregnancy-and-parenting/pregnancy/complications/10008-anemia-or-an-iron-deficiency-during-pregnancy.htm>
- HHS. (2014). Child Health USA 2014. Retrieved December 2015, from U.S. Department of Health and Human Services: <http://mchb.hrsa.gov/chusa14/health-status-behaviors/infants/smoking-before-during-pregnancy.html>
- HRSA. (n.d.). Prenatal - First Trimester Care Access. Retrieved January 2016, from Health Resources and Services Administration: <http://www.hrsa.gov/quality/toolbox/measures/prenatalfirsttrimester/>
- HRSA. (n.d.). Prenatal Services. Retrieved January 2016, from Health Resources and Services Administration: <http://mchb.hrsa.gov/programs/womeninfants/prenatal.html>
- Horta, B. L., Victora, C. G., Menezes, A. M., & Barros, F. C. (1997). Environmental tobacco smoke and breastfeeding duration. *American Journal of Epidemiology*, 146(2), 128-133.



MI-PNSS & PedNSS Report 2010-2015

- Institute of Medicine. (1990). Nutrition during pregnancy: Part I: Weight gain. Washington DC: National Academies Press.
- Institute of Medicine. (2006). Preterm birth: Causes, consequences and prevention. Washington DC: National Academies Press.
- IOM. (1988). Chapter 1, Who Obtains Insufficient Prenatal Care? In L.o. Care, & S. Brown (Ed.), Prenatal Care: Reaching Mothers, Reaching Infants. National Academies Press. Retrieved January 2016, from <http://www.ncbi.nlm.nih.gov/books/NBK217693/>
- IOM. (2009). Weight Gain During Pregnancy: Reexamining the Guidelines. Washington, DC: The National Academies Press. Retrieved January 2016, from <http://www.nap.edu/read/12584/chapter/1>
- Kotch, J. B. (2012). Maternal and Child Health (3rd ed.). Jones & Bartlett Publishers. Retrieved December 2015, from https://books.google.com/books/about/Maternal_and_Child_Health.html?id=Flu2AgAAQBAJ
- Kramer, M. S., Morin, I., Yang, H., Platt, R. W., Usher, R., McNamara, H., et al. (2002). Why are babies getting bigger? Temporal trends in fetal growth and its determinants. *Journal of Pediatrics*, 141(4), 538-542.
- Martin, R. M., Holly, J. M. P., Smith, G. D., Ness, A. R., Emmett, P., Rogers, I., ALSPAC Study Team. (2005). Could associations between breastfeeding and insulin-like growth factors underlie associations of breastfeeding with adult chronic disease? The Avon Longitudinal Study of Parents and Children. *Clinical Endocrinology*, 62(6), 728-737. <http://doi.org/10.1111/j.1365-2265.2005.02287.x>
- MDHHS. (2015). Natality, Pregnancy & Abortion Statistics. Retrieved January 2016, from Division for Vital Records & Health Statistics, Michigan Department of Health and Human Services: <http://www.mdch.state.mi.us/pha/osr/Index.asp?Id=2>
- MDHHS. (2014, September). Michigan Resident Birth, Death, Marriage, Divorce and Fetal Death Files. Retrieved January 2016, from Michigan Department of Health and Human Services, Division for Vital Records & Health Statistics: <http://www.mdch.state.mi.us/pha/osr/natality/tab4.1.asp>
- MDHHS. (2015). An Average Day in the Michigan WIC Program combined from Vital Records and MDHHS. Retrieved January 2016, from Michigan Department of Health and Human Services, Division for Maternal and Child Health: http://www.michigan.gov/documents/mdch/An_Average_day_in_WIC_2014_468936_7.pdf



MI-PNSS & PedNSS Report 2010-2015

- Nohr, E. A., Vaeth, M., Baker, J. L., Sorensen, T., Olsen, J., & Rasmussen, K. M. (2008, June). Combined associations of prepregnancy body mass index and gestational weight gain with the outcome of pregnancy. *American Society for Clinical Nutrition*, 87(6), 1750-1759. Retrieved January 2016, from <http://ajcn.nutrition.org/content/87/6/1750.full>
- Nykjaer, C., Alwan, N. A., Greenwood, D. C., Simpson, N. A., Hay, A. W., White, K. L., & Cade, J. E. (2014, March). Maternal alcohol intake prior to and during pregnancy and risk of adverse birth outcomes: evidence from a British cohort. *Journal of Epidemiology and Community Health*. Retrieved February 2016, from <http://jech.bmj.com/content/early/2014/02/11/jech-2013-202934.full>
- Oliveira, V., & Frazao, E. (2015, January). *The WIC Program: Background, Trends, and Economic Issues, 2015 Edition*. Retrieved January 2016, from United States Department of Agriculture, Economic Research Service: <http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib134.aspx>
- Recommendations to prevent and control iron deficiency in the United States. Centers for disease control and prevention. (1998). *Morbidity & Mortality Weekly Report .Recommendations & Reports*, 47(RR-3), 1-29.
- SAMHSA. (2007). *Curriculum for Addictions Professionals: Level 1*. Retrieved February 2016, from SAMHSA Fetal Alcohol Spectrum Disorders Center for Excellence: <http://fasdcenter.samhsa.gov/educationTraining/courses/CapCurriculum/index.aspx>
- Schack-Nielsen, L., & Michaelsen, K. F. (2014). Advances in our understanding of the biology of human milk and its effects on the offspring. *Journal of Nutrition*, 137(2), 503S-510S.
- Shafir, T., Angulo-Barroso, R., Jing, Y., Angelilli, M. L., Jacobson, S. W., & Lozoff, B. (2008). Iron deficiency and infant motor development. *Early Human Development*, 84(7), 479-485. <http://doi.org/10.1016/j.earlhumdev.2007.12.009>
- Siggelkow, W., Boehm, D., Skala, C., Grosslercher, M., Schmidt, M., & Koelbl, H. (2008). The influence of macrosomia on the duration of labor, the mode of delivery and intrapartum complications. *Archives of Gynecology & Obstetrics*, 278(6), 547-553.
- Soures, J. D., Silveira, D. S., & Rosa, C. Q. (2014, October). Factors associated with lack of prenatal care in a large municipality. *Rev Saude Publica*, 977-984. Retrieved January 2016, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4285828/>
- Stettler, N. (2014). Nature and strength of epidemiological evidence for origins of childhood and adulthood obesity in the first year of life. *International Journal of Obesity*, 31(7), 1035-1043.
- Stettler, N., Zemel, B. S., Kumanyika, S., & Stallings, V. A. (2002). Infant weight gain and childhood



MI-PNSS & PedNSS Report 2010-2015

- overweight status in a multicenter, cohort study. *Pediatrics*, 109(2), 194-199.
- Taylor, C. R., Alexander, G. R., & Hepworth, J. T. (2005). Clustering of U.S. women receiving no prenatal care: Differences in pregnancy outcomes and implications for targeting interventions. *Maternal & Child Health Journal*, 9(2), 125-133.
- Thompson, R. A., & Davis, E. P. (2014, March). Prenatal Foundations: Fetal Programming of Health and Development. *Zero to Three*, 34(4), 6-11. Retrieved January 2016, from <http://www.du.edu/neurodevelopment/media/documents/daviszerotothree.pdf>
- Tigas, S., Sunehag, A., & Haymond, M. W. (2002). Metabolic adaptation to feeding and fasting during lactation in humans. *The Journal of Clinical Endocrinology and Metabolism*, 87(1), 302-307. <http://doi.org/10.1210/jcem.87.1.8178>
- U.S. Department of Health and Human Services. (2000). *Healthy people 2010. With understanding and improving health and objectives for improving health* (2nd ed.). Washington DC: U.S. Government Printing Office.
- USDA. (2017, April). WIC Program. From United States Department of Agriculture (USDA) Food and Nutrition Service (FNS): <https://www.fns.usda.gov/sites/default/files/pd/26wifypart.pdf>
- USHHS. (2010). 2020 Topics and Objectives. Retrieved January 2016, from [HealthyPeople.gov](http://www.healthypeople.gov): <http://www.healthypeople.gov/2020/topics-objectives>
- Van Dijk, C. E., & Innis, S. M. (2009). Growth-curve standards and the assessment of early excess weight gain in infancy. *Pediatrics*, 123(1), 102-108.
- van Geel, M., Vedder, P., & Tanilon, J. (2014). Are overweight and obese youths more often bullied by their peers? A meta-analysis on the relation between weight status and bullying. *International Journal of Obesity*, 38(10), 1263-1267. <https://doi.org/10.1038/ijo.2014.117>
- Vinturache, A., Moledina, N., McDonald, S., Slater, D., & Tough, S. (2014, December 20). Pre-pregnancy Body Mass Index (BMI) and delivery outcomes in a Canadian population. *BMC Pregnancy Childbirth*, 14(422). Retrieved January 2016, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4300169/>
- Vohr, B. R., Wright, L. L., Dusick, A. M., Mele, L., Verter, J., Steichen, J. J., ... Kaplan, M. D. (2000). Neurodevelopmental and functional outcomes of extremely low birth weight infants in the National Institute of Child Health and Human Development Neonatal Research Network, 1993-1994. *Pediatrics*, 105(6), 1216-1226.
- World Health Organization (WHO) Expert Committee on Physical Status. (1996). *Physical Status: The use and interpretation of anthropometry*. Geneva: WH



Appendix A: Map of Local Agencies and Agency Trend Tables



MI-PNSS & PedNSS Report 2010-2015

Geographic area of local WIC agencies, MI 2015



Table A-1. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2013

	PNSS N	PedNSS N	Total N ^a	Race/Ethnicity ^a				1st Trimester WIC Enrollment ^b	Weight Gain ^b		Low Birthweight ^b		
				White	Black	Hispanics	Multiracial		<Ideal	>Ideal	Total	White	Black
Michigan	67,200	253,815	321,015	51.0%	27.2%	12.9%	6.9%	36.9%	16.9%	52.4%	8.7%	7.1%	12.2%
Barry-Eaton DHD	740	2,886	3,626	86.6%	2.3%	6.0%	4.5%	37.8%	13.4%	53.9%	5.7%	5.6%	*
Bay County HD	658	2,728	3,386	72.4%	2.4%	14.7%	10.3%	51.7%	19.9%	46.8%	6.9%	5.9%	*
Benzie-Leelanau DHD	164	685	849	68.1%	1.2%	19.6%	7.9%	44.4%	16.3%	57.0%	8.5%	8.7%	*
Berrien County HD	1,178	4,333	5,511	44.8%	39.8%	7.1%	7.2%	29.7%	16.8%	51.9%	8.1%	6.0%	10.8%
Branch-Hillsdale-St. Joseph Community Health Agency	1,454	5,456	6,910	77.9%	1.5%	14.7%	5.7%	45.5%	14.5%	55.2%	7.8%	7.6%	*
Calhoun	1,211	4,737	5,948	52.4%	20.6%	10.1%	11.8%	44.3%	16.0%	52.9%	7.9%	7.5%	9.5%
Central MI District HD	1,234	5,023	6,257	88.5%	1.4%	3.7%	5.6%	50.1%	18.3%	53.5%	6.3%	6.0%	*
Chippewa County HD	295	1,175	1,470	52.7%	0.4%	3.0%	28.0%	54.2%	17.0%	53.6%	4.1%	4.3%	*
Community Action Agency	660	2,190	2,850	69.1%	1.3%	22.8%	6.8%	37.3%	21.0%	50.1%	8.0%	7.8%	*
Delta-Menominee	391	1,500	1,891	87.9%	0.2%	3.8%	7.2%	48.4%	15.3%	54.6%	7.1%	7.2%	*
Detroit City	8,330	31,029	39,359	8.0%	74.0%	14.4%	2.1%	29.6%	17.8%	55.1%	11.3%	7.4%	12.5%
Detroit Urban League	3,322	13,189	16,511	17.8%	67.1%	11.1%	2.8%	29.6%	18.2%	51.3%	11.4%	6.0%	13.2%
Dickinson-Iron DHD	278	1,033	1,311	89.7%	0.2%	2.3%	7.4%	53.3%	19.1%	50.0%	13.5%	12.9%	*
District Health Department #10	2,028	8,341	10,369	79.9%	1.3%	13.2%	5.4%	48.2%	16.9%	55.0%	7.4%	7.7%	*
District Health Department #2	449	1,722	2,171	90.5%	0.3%	3.5%	5.4%	42.5%	16.2%	48.0%	5.0%	5.2%	*
District Health Department #4	427	1,672	2,099	88.4%	0.3%	2.2%	8.4%	46.3%	17.3%	56.5%	5.8%	5.8%	*
Downriver Community Services	821	3,096	3,917	69.1%	8.9%	11.8%	8.3%	28.4%	12.1%	57.5%	7.3%	7.2%	9.7%
Genesee County HD	3,303	11,381	14,684	44.4%	38.1%	6.6%	10.6%	25.7%	15.6%	54.6%	10.6%	8.1%	13.9%
Grand Traverse County HD	626	2,126	2,752	85.7%	0.7%	6.2%	6.2%	45.4%	12.5%	50.4%	7.1%	6.9%	*
Health Delivery, Inc.	533	2,367	2,900	11.4%	53.9%	30.2%	4.0%	52.4%	27.8%	41.6%	11.8%	8.6%	13.8%
Huron	196	859	1,055	90.4%	0.3%	6.0%	3.0%	44.6%	17.6%	48.0%	5.9%	6.1%	*
Ingham County HD	2,012	7,378	9,390	38.6%	25.0%	18.8%	11.9%	31.5%	13.7%	54.0%	8.0%	7.9%	10.6%
InterCare Comm. Health Network	3,460	13,763	17,223	60.1%	3.5%	30.2%	4.9%	45.8%	20.1%	48.0%	7.0%	7.4%	10.8%
Ionia County HD	467	1,773	2,240	85.4%	0.3%	9.9%	4.2%	43.9%	14.5%	48.6%	5.4%	5.1%	*
Jackson County HD	1,250	4,926	6,176	65.2%	12.8%	8.3%	13.2%	42.2%	15.2%	52.9%	6.4%	6.1%	6.5%
Kalamazoo County HD	889	3,036	3,925	59.7%	16.9%	10.7%	11.2%	41.3%	15.5%	55.3%	8.0%	5.8%	13.7%
Kalamazoo Family Health Center	934	3,795	4,729	32.0%	42.2%	13.4%	11.3%	50.5%	21.0%	48.9%	7.3%	7.6%	9.0%
Kent	4,858	19,692	24,550	35.3%	21.4%	31.1%	8.8%	40.7%	21.4%	47.7%	8.8%	8.3%	11.7%
Keweenaw Bay Indian Community	54	266	320	4.1%	*	3.8%	9.1%	51.9%	17.1%	58.5%	2.2%	0.0%	0.0%
Lapeer County HD	486	1,932	2,418	85.5%	0.5%	7.4%	6.3%	42.6%	11.5%	56.4%	6.4%	5.1%	*
Livingston County HD	526	2,029	2,555	89.3%	0.5%	5.1%	4.0%	28.2%	14.1%	55.6%	6.5%	6.3%	*
LMAS	204	912	1,116	69.7%	0.3%	1.6%	24.0%	59.5%	16.3%	53.0%	4.6%	4.8%	*
Macomb County HD	3,334	10,944	14,278	57.0%	25.6%	3.5%	8.6%	30.1%	15.5%	52.3%	9.6%	7.6%	13.8%
Marquette County HD	333	1,262	1,595	83.0%	0.4%	3.2%	12.9%	43.8%	15.3%	47.0%	6.5%	6.1%	*
Mid-Michigan Comm.	456	1,929	2,385	89.7%	1.1%	3.4%	4.7%	46.7%	18.4%	49.3%	6.1%	6.2%	*
Mid-Michigan DHD	989	3,896	4,885	84.6%	0.5%	10.8%	3.8%	43.9%	16.8%	53.1%	6.0%	6.1%	*
Monroe County HD	853	3,268	4,121	81.0%	4.4%	7.7%	6.7%	46.1%	17.3%	52.2%	6.6%	6.3%	*
Muskegon County HD	1,723	6,820	8,543	52.9%	24.9%	11.6%	10.1%	49.9%	18.5%	52.1%	10.4%	8.0%	14.1%
Health Department of Northwest MI	702	2,903	3,605	87.1%	0.4%	3.2%	7.5%	47.0%	19.6%	48.7%	7.0%	7.4%	*
Oakland	4,191	15,081	19,272	47.7%	31.2%	12.8%	6.1%	25.4%	15.7%	52.9%	9.3%	7.5%	12.7%
Saginaw County Depart PH	1,181	4,578	5,759	46.6%	27.8%	17.4%	7.9%	47.6%	19.2%	51.6%	7.9%	7.7%	9.2%
Sanilac County HD	261	951	1,212	89.1%	0.4%	7.6%	2.7%	47.6%	16.9%	46.2%	11.7%	12.6%	*
Shiawassee County HD	514	1,966	2,480	86.9%	0.4%	6.5%	5.9%	50.1%	13.0%	52.1%	6.6%	7.0%	*
St Clair County HD	1,005	3,636	4,641	75.0%	5.1%	7.6%	12.0%	47.6%	15.8%	53.6%	6.9%	6.7%	*
Tuscola County HD	369	1,528	1,897	87.3%	0.6%	7.2%	4.8%	46.8%	14.8%	53.2%	5.0%	5.0%	*
Washtenaw County HD	1,478	5,577	7,055	34.9%	36.8%	11.6%	12.1%	32.3%	14.4%	51.4%	9.4%	8.4%	11.9%
Wayne	6,024	20,952	26,976	58.5%	26.7%	5.2%	5.9%	28.4%	15.9%	51.8%	8.0%	7.2%	9.5%
Western Upper Peninsula HD	349	1,494	1,843	88.2%	0.4%	2.7%	6.7%	45.6%	15.8%	51.4%	5.0%	5.5%	*

^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-1. (continued) Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2013

	Breastfeeding ^c		Overweight ^{d,e}				Obese ^{d,e}				Anemia < 5yrs ^d
	Initiation ^b	6 months duration ^d	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	63.1%	17.7%	16.9%	17.3%	14.6%	19.2%	13.5%	13.2%	11.1%	18.3%	17.5%
Barry-Eaton DHD	78.4%	22.1%	18.8%	18.4%	*	17.9%	13.5%	13.0%	*	20.9%	5.3%
Bay County HD	58.2%	14.1%	17.7%	17.4%	*	17.4%	15.4%	14.1%	*	18.5%	7.5%
Benzie-Leelanau DHD	81.4%	31.9%	17.6%	17.2%	*	15.9%	13.8%	10.2%	*	20.6%	10.1%
Berrien County HD	57.5%	14.1%	17.6%	17.0%	16.4%	19.3%	11.8%	11.8%	11.9%	14.8%	12.7%
Branch-Hillsdale-St. Joseph Community Health Agency	79.2%	22.0%	18.8%	18.7%	*	21.6%	14.4%	14.4%	*	14.5%	6.2%
Calhoun	67.1%	13.6%	17.4%	17.8%	15.5%	20.4%	15.4%	15.6%	15.0%	19.0%	16.7%
Central MI District HD	76.8%	19.9%	18.0%	17.9%	*	15.9%	15.0%	14.3%	*	23.9%	9.3%
Chippewa County HD	69.9%	24.1%	15.3%	14.8%	*	*	14.3%	10.7%	*	*	13.8%
Community Action Agency	70.6%	18.8%	18.2%	17.2%	*	20.2%	17.5%	16.6%	*	19.7%	10.1%
Delta-Menominee	70.4%	15.1%	17.9%	16.9%	*	*	13.8%	13.4%	*	*	2.7%
Detroit City	45.9%	11.2%	15.6%	16.4%	14.2%	20.8%	12.7%	13.6%	10.8%	19.8%	25.4%
Detroit Urban League	41.9%	7.7%	15.0%	17.4%	13.6%	19.3%	12.7%	14.0%	10.5%	19.1%	33.7%
Dickinson-Iron DHD	76.9%	20.1%	18.3%	17.2%	*	*	12.6%	11.6%	*	*	6.1%
District Health Department #10	77.2%	22.0%	19.2%	18.6%	*	22.6%	14.8%	13.2%	*	20.7%	14.8%
District Health Department #2	72.6%	18.8%	20.1%	19.6%	*	*	14.9%	14.4%	*	*	14.7%
District Health Department #4	61.1%	16.1%	16.7%	16.1%	*	*	19.1%	18.7%	*	*	11.4%
Downriver Community Services	64.7%	23.8%	19.1%	18.6%	19.5%	19.8%	15.9%	14.5%	13.3%	27.2%	13.1%
Genesee County HD	56.5%	13.7%	16.4%	16.8%	15.7%	16.0%	13.1%	14.2%	10.9%	16.7%	19.3%
Grand Traverse County HD	85.6%	28.4%	19.0%	17.8%	*	24.1%	11.3%	11.7%	*	9.3%	15.1%
Health Delivery, Inc.	57.9%	7.1%	20.3%	16.2%	19.2%	24.4%	14.6%	14.1%	10.7%	22.1%	11.1%
Huron	72.8%	16.1%	17.1%	17.2%	*	*	17.1%	17.5%	*	*	7.2%
Ingham County HD	76.7%	22.6%	15.6%	17.8%	10.9%	17.3%	13.2%	11.2%	14.0%	16.9%	11.9%
InterCare Comm. Health Network	76.7%	23.6%	16.9%	16.7%	12.0%	18.3%	13.6%	11.1%	7.5%	18.2%	26.4%
Ionia County HD	72.7%	21.0%	16.4%	16.4%	*	14.1%	13.9%	13.7%	*	20.5%	7.9%
Jackson County HD	66.6%	16.5%	18.5%	18.3%	18.4%	20.2%	14.3%	14.2%	10.6%	19.7%	24.7%
Kalamazoo County HD	71.7%	25.4%	18.7%	19.0%	20.1%	19.2%	12.7%	11.1%	6.5%	19.2%	29.1%
Kalamazoo Family Health Center	65.6%	20.6%	15.8%	15.8%	15.2%	17.0%	14.0%	12.3%	13.9%	19.1%	29.2%
Kent	70.1%	20.2%	16.7%	15.9%	14.1%	19.5%	13.3%	10.4%	11.4%	17.7%	11.5%
Keweenaw Bay Indian Community	74.0%	16.7%	26.9%	0.0%	*	*	29.6%	50.0%	*	*	28.1%
Lapeer County HD	70.6%	19.8%	19.3%	19.9%	*	11.3%	14.2%	13.4%	*	27.4%	14.4%
Livingston County HD	76.6%	18.8%	16.7%	16.9%	*	*	15.5%	15.6%	*	*	6.8%
LMAS	71.3%	18.5%	16.2%	16.6%	*	*	9.7%	10.1%	*	*	9.5%
Macomb County HD	55.9%	13.6%	15.9%	17.1%	13.6%	14.3%	13.8%	14.4%	10.8%	17.7%	22.0%
Marquette County HD	77.5%	25.9%	18.8%	19.2%	*	*	13.0%	10.9%	*	*	6.7%
Mid-Michigan Comm.	79.8%	23.8%	17.9%	17.8%	*	*	13.1%	12.7%	*	*	9.5%
Mid-Michigan DHD	79.1%	24.6%	18.5%	18.8%	*	19.7%	15.0%	14.2%	*	20.7%	4.9%
Monroe County HD	66.0%	18.3%	16.8%	16.5%	14.8%	18.1%	13.5%	13.0%	9.3%	16.4%	7.5%
Muskegon County HD	59.5%	14.2%	16.6%	16.8%	15.3%	19.9%	12.1%	11.5%	11.0%	16.9%	17.7%
Health Department of Northwest MI	79.0%	23.3%	18.1%	17.5%	*	*	13.3%	12.2%	*	*	10.7%
Oakland	58.0%	18.5%	15.3%	15.7%	13.9%	17.5%	11.4%	11.5%	8.1%	16.5%	16.5%
Saginaw County Depart PH	68.7%	15.0%	14.8%	15.9%	12.8%	16.6%	14.9%	16.0%	14.7%	15.1%	15.5%
Sanilac County HD	68.7%	15.5%	21.2%	21.6%	*	*	13.8%	13.1%	*	*	5.9%
Shiawassee County HD	76.3%	25.7%	18.5%	17.8%	*	26.0%	15.6%	15.4%	*	20.0%	11.2%
St Clair County HD	59.5%	13.3%	17.7%	16.3%	23.9%	21.0%	14.5%	13.7%	12.7%	12.9%	8.8%
Tuscola County HD	67.1%	16.5%	18.4%	17.6%	*	*	12.6%	12.6%	*	*	7.4%
Washtenaw County HD	79.5%	30.9%	17.5%	18.5%	16.2%	20.5%	13.7%	14.1%	11.8%	19.5%	21.1%
Wayne	56.8%	17.4%	16.4%	16.3%	15.9%	18.7%	13.7%	13.5%	11.4%	18.2%	17.0%
Western Upper Peninsula HD	79.7%	31.3%	18.9%	19.2%	*	*	9.8%	9.5%	*	*	8.0%

PNSS Data. ^c Analysis limited to children < 2 years of age. ^d PedNSS data. ^e 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 2014

	PNSS N	PedNSS N	Total N ^a	Race/Ethnicity ^a				1st Trimester WIC Enrollment ^b	Weight Gain ^b		Low Birthweight ^b		
				White	Black	Hispanics	Multiracial		<Ideal	>Ideal	Total	White	Black
Michigan	65,861	249,940	315,801	50.8%	27.2%	12.7%	7.1%	35.7%	17.2%	52.3%	9.1%	7.4%	13.1%
Barry-Eaton DHD	717	2,807	3,524	86.4%	2.3%	6.3%	4.7%	37.4%	15.1%	53.6%	6.3%	5.7%	*
Bay County HD	644	2,607	3,251	73.0%	3.1%	13.5%	10.1%	48.9%	17.6%	53.3%	7.6%	8.1%	*
Benzie-Leelanau DHD	162	692	854	71.3%	0.4%	18.6%	7.7%	45.9%	21.7%	47.3%	4.2%	4.2%	*
Berrien County HD	1,156	4,263	5,419	45.9%	38.3%	7.5%	7.2%	33.5%	15.0%	56.0%	9.0%	6.7%	13.4%
Branch-Hillsdale-St. Joseph Community Health Agency	1,364	5,252	6,616	77.2%	2.1%	14.7%	5.9%	44.7%	15.9%	52.9%	6.5%	6.3%	*
Calhoun	1,192	4,631	5,823	52.9%	19.8%	9.2%	12.4%	38.7%	15.2%	50.6%	9.2%	8.4%	13.5%
Central MI District HD	1,309	4,949	6,258	88.3%	1.3%	4.1%	5.4%	48.8%	17.6%	53.7%	7.6%	7.4%	*
Chippewa County HD	303	1,166	1,469	49.8%	0.7%	3.1%	29.0%	57.8%	17.3%	51.3%	3.1%	2.5%	*
Community Action Agency	617	2,214	2,831	65.3%	1.8%	25.4%	7.4%	31.1%	19.3%	45.9%	7.5%	7.4%	*
Delta-Menominee	425	1,480	1,905	86.6%	0.1%	3.6%	9.3%	49.5%	11.7%	57.7%	6.5%	6.3%	*
Detroit City	8,057	29,954	38,011	8.0%	74.2%	13.9%	2.0%	28.4%	18.7%	52.7%	12.2%	7.9%	13.5%
Detroit Urban League	3,248	13,057	16,305	15.3%	70.5%	10.0%	2.9%	26.4%	18.4%	51.3%	11.2%	6.8%	12.9%
Dickinson-Iron DHD	256	1,049	1,305	90.4%	0.3%	1.8%	7.1%	45.8%	17.7%	54.2%	4.8%	4.6%	*
District Health Department #10	2,050	8,213	10,263	79.7%	1.3%	13.2%	5.5%	47.7%	15.4%	55.3%	6.5%	5.9%	*
District Health Department #2	447	1,761	2,208	91.0%	0.1%	3.5%	5.2%	47.5%	17.0%	55.3%	5.6%	6.0%	*
District Health Department #4	432	1,717	2,149	89.2%	0.3%	2.2%	7.8%	41.9%	14.2%	52.8%	7.5%	7.3%	*
Downriver Community Services	826	3,005	3,831	69.3%	8.6%	12.2%	7.9%	27.2%	14.8%	52.7%	7.9%	7.2%	12.7%
Genesee County HD	3,234	11,445	14,679	43.9%	37.5%	6.7%	11.6%	26.9%	16.2%	53.0%	11.7%	10.8%	13.8%
Grand Traverse County HD	567	2,001	2,568	86.4%	0.9%	5.1%	6.5%	49.5%	15.7%	54.0%	7.6%	6.7%	20.0%
Health Delivery, Inc.	540	2,301	2,841	11.9%	52.4%	29.9%	5.0%	47.5%	27.1%	41.0%	11.0%	10.5%	12.9%
Huron	170	779	949	89.9%	0.4%	6.5%	3.0%	48.2%	13.9%	54.0%	5.8%	4.8%	*
Ingham County HD	2,084	7,419	9,503	38.4%	24.4%	18.8%	12.3%	32.3%	14.9%	55.3%	8.3%	7.5%	12.6%
InterCare Comm. Health Network	3,279	13,410	16,689	60.1%	3.6%	30.1%	5.0%	42.9%	18.4%	47.7%	6.3%	6.9%	4.5%
Ionia County HD	458	1,739	2,197	84.8%	0.3%	10.4%	4.5%	38.8%	18.8%	51.0%	6.3%	6.4%	*
Jackson County HD	1,248	4,907	6,155	64.4%	13.6%	8.0%	13.6%	41.5%	16.2%	51.1%	7.4%	7.1%	10.2%
Kalamazoo County HD	855	2,991	3,846	58.2%	17.8%	10.9%	11.7%	38.9%	14.9%	54.8%	9.6%	8.1%	12.8%
Kalamazoo Family Health Center	929	3,736	4,665	33.5%	40.7%	13.6%	11.2%	47.7%	18.6%	52.9%	9.8%	6.9%	14.1%
Kent	4,778	18,987	23,765	34.7%	21.9%	30.6%	8.9%	35.8%	22.1%	47.9%	9.4%	8.7%	14.5%
Keweenaw Bay Indian Community	53	269	322	4.0%	*	4.7%	9.0%	53.8%	34.1%	46.3%	2.3%	16.7%	*
Lapeer County HD	513	1,953	2,466	86.7%	0.5%	7.3%	5.3%	44.0%	15.3%	49.9%	5.6%	4.7%	*
Livingston County HD	535	1,901	2,436	89.3%	0.6%	4.7%	4.2%	29.6%	12.8%	54.8%	6.2%	6.3%	*
LMAS	180	870	1,050	71.4%	0.5%	0.9%	22.0%	59.1%	19.0%	50.3%	10.1%	8.8%	*
Macomb County HD	3,249	11,089	14,338	58.1%	24.8%	3.1%	8.5%	31.0%	16.2%	53.9%	8.6%	7.8%	10.9%
Marquette County HD	357	1,223	1,580	82.4%	0.2%	3.4%	13.2%	45.8%	17.9%	50.0%	5.3%	4.5%	*
Mid-Michigan Comm.	416	1,863	2,279	91.0%	1.0%	3.2%	4.0%	44.1%	22.9%	48.3%	11.7%	11.5%	*
Mid-Michigan DHD	882	3,824	4,706	83.3%	0.3%	12.3%	3.8%	37.2%	14.9%	56.4%	6.5%	6.6%	*
Monroe County HD	793	3,133	3,926	80.3%	4.6%	7.5%	7.3%	39.6%	16.1%	52.5%	6.2%	6.0%	11.8%
Muskegon County HD	1,673	6,724	8,397	53.0%	24.1%	11.7%	10.8%	49.8%	19.0%	50.8%	10.5%	9.1%	15.1%
Health Department of Northwest MI	708	2,950	3,658	87.7%	0.7%	2.9%	5.4%	49.1%	18.8%	52.2%	6.2%	6.0%	*
Oakland	4,097	14,994	19,091	47.1%	31.3%	12.7%	6.5%	25.2%	17.2%	53.7%	9.9%	7.6%	13.5%
Saginaw County Depart PH	1,153	4,368	5,521	46.4%	25.8%	19.3%	8.2%	45.6%	16.0%	49.1%	9.3%	8.9%	12.0%
Sanilac County HD	249	918	1,167	89.4%	0.3%	7.5%	2.6%	46.2%	20.4%	45.5%	8.1%	8.3%	
Shiawassee County HD	490	1,947	2,437	86.7%	0.2%	6.7%	6.4%	47.3%	17.9%	52.6%	7.5%	7.7%	
St Clair County HD	981	3,584	4,565	74.2%	5.0%	8.6%	12.0%	48.6%	14.1%	56.5%	6.5%	6.0%	*
Tuscola County HD	382	1,547	1,929	87.5%	0.5%	7.5%	4.4%	44.4%	16.1%	54.0%	8.6%	9.1%	*
Washtenaw County HD	1,472	5,591	7,063	33.7%	37.0%	11.9%	12.5%	35.3%	16.4%	51.2%	9.6%	7.3%	12.9%
Wayne	6,000	21,232	27,232	58.3%	26.6%	5.5%	5.9%	27.3%	15.9%	53.0%	9.1%	7.4%	11.6%
Western Upper Peninsula HD	331	1,428	1,759	88.3%	0.4%	2.4%	6.7%	44.0%	15.3%	48.5%	4.9%	5.1%	*

^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 2014

	Breastfeeding ^c		Overweight ^{d,e}				Obese ^{d,e}				Anemia < 5yrs ^d
	Initiation ^b	6 months duration ^d	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	63.6%	18.5%	16.7%	17.0%	14.6%	19.1%	13.6%	13.4%	10.7%	18.4%	17.0%
Barry-Eaton DHD	80.2%	22.3%	18.9%	17.6%	*	23.9%	12.8%	13.1%	*	15.5%	8.5%
Bay County HD	63.3%	15.6%	17.6%	16.7%	*	16.7%	15.0%	14.3%	*	17.9%	8.6%
Benzie-Leelanau DHD	86.0%	30.6%	14.8%	16.8%	*	12.9%	14.8%	13.7%	*	17.7%	7.9%
Berrien County HD	61.8%	16.7%	15.7%	17.0%	14.2%	13.8%	12.1%	14.6%	10.1%	14.6%	11.3%
Branch-Hillsdale-St. Joseph Community Health Agency	79.8%	25.3%	18.0%	18.1%	*	18.5%	15.3%	14.8%	*	17.1%	5.2%
Calhoun	67.3%	13.4%	18.7%	18.8%	16.3%	21.9%	15.7%	15.5%	14.4%	18.4%	16.3%
Central MI District HD	74.9%	21.2%	18.0%	18.5%	*	14.0%	15.1%	14.2%	*	20.4%	8.6%
Chippewa County HD	63.8%	29.4%	17.3%	14.8%	*	*	12.5%	11.2%	*	*	13.3%
Community Action Agency	75.0%	17.5%	16.9%	15.3%	*	20.5%	18.1%	16.9%	*	20.5%	11.7%
Delta-Menominee	74.6%	19.2%	16.2%	16.2%	*	*	14.9%	14.7%	*	*	2.8%
Detroit City	46.1%	12.3%	15.1%	15.0%	14.1%	19.5%	12.3%	12.1%	10.6%	19.0%	23.8%
Detroit Urban League	43.9%	10.0%	14.3%	14.1%	13.1%	21.3%	12.8%	15.7%	11.2%	18.6%	33.2%
Dickinson-Iron DHD	69.4%	29.8%	17.3%	17.3%	*	*	13.5%	12.8%	*	*	6.5%
District Health Department #10	77.0%	23.1%	19.6%	18.3%	*	25.3%	16.1%	14.9%	*	22.5%	13.4%
District Health Department #2	68.2%	17.9%	18.6%	17.8%	*	*	14.4%	14.5%	*	*	14.4%
District Health Department #4	63.7%	21.1%	18.1%	18.9%	*	*	16.4%	16.1%	*	*	15.6%
Downriver Community Services	67.1%	23.4%	18.7%	17.8%	13.6%	21.2%	15.3%	14.3%	17.5%	20.5%	14.1%
Genesee County HD	56.1%	14.1%	16.3%	16.2%	15.7%	16.2%	12.8%	13.9%	10.8%	16.8%	20.8%
Grand Traverse County HD	85.7%	31.7%	16.9%	15.8%	*	*	13.5%	13.5%	*	*	16.3%
Health Delivery, Inc.	59.7%	10.9%	19.0%	17.0%	15.4%	25.9%	15.1%	8.5%	13.6%	20.4%	6.9%
Huron	72.0%	23.6%	15.4%	16.1%	*	*	20.5%	20.8%	*	*	5.6%
Ingham County HD	77.7%	25.7%	16.5%	17.7%	14.4%	19.0%	12.5%	10.1%	12.0%	17.4%	11.5%
InterCare Comm. Health Network	76.4%	25.2%	17.7%	17.8%	17.2%	18.0%	14.5%	11.8%	7.2%	20.4%	24.4%
Ionia County HD	79.8%	18.6%	17.0%	17.2%	*	16.7%	14.6%	13.1%	*	22.2%	8.1%
Jackson County HD	70.7%	16.5%	21.2%	21.3%	18.8%	21.1%	14.7%	14.9%	10.8%	20.1%	18.0%
Kalamazoo County HD	72.2%	23.5%	16.7%	16.3%	15.7%	22.2%	13.7%	14.0%	9.6%	16.0%	26.2%
Kalamazoo Family Health Center	63.9%	18.8%	17.0%	16.2%	16.5%	18.9%	13.2%	13.2%	12.1%	16.0%	26.2%
Kent	71.8%	20.3%	16.4%	16.2%	14.6%	18.3%	13.5%	10.9%	11.0%	18.0%	11.0%
Keweenaw Bay Indian Community	62.8%	22.0%	23.4%	0.0%	*	*	29.0%	40.0%	*	*	23.0%
Lapeer County HD	71.0%	23.1%	20.1%	20.1%	*	19.6%	13.6%	12.3%	*	30.4%	9.9%
Livingston County HD	79.9%	22.6%	17.8%	18.1%	*	*	11.8%	11.3%	*	*	6.0%
LMAS	72.8%	21.7%	19.5%	18.6%	*	*	9.9%	9.1%	*	*	11.9%
Macomb County HD	57.2%	14.8%	16.0%	15.9%	15.3%	20.4%	13.7%	14.3%	10.9%	20.4%	19.8%
Marquette County HD	80.7%	27.1%	19.6%	17.4%	*	*	12.2%	12.2%	*	*	7.9%
Mid-Michigan Comm.	78.7%	27.5%	17.7%	17.0%	*	*	15.2%	14.9%	*	*	9.3%
Mid-Michigan DHD	82.0%	26.1%	19.0%	19.7%	*	16.3%	14.0%	13.4%	*	17.3%	4.0%
Monroe County HD	62.5%	13.8%	16.0%	15.5%	17.5%	15.6%	13.6%	13.3%	7.9%	19.8%	7.3%
Muskegon County HD	62.8%	15.5%	15.8%	16.1%	14.6%	17.1%	12.9%	13.0%	10.3%	16.8%	16.6%
Health Department of Northwest MI	77.4%	29.1%	18.9%	18.8%	*	*	14.3%	12.9%	*	*	7.4%
Oakland	60.6%	19.3%	15.5%	16.1%	13.6%	17.6%	12.0%	11.7%	9.5%	17.4%	15.4%
Saginaw County Depart PH	67.0%	13.3%	17.2%	18.7%	15.5%	17.4%	14.5%	15.4%	12.1%	16.8%	18.3%
Sanilac County HD	61.6%	16.8%	21.9%	20.5%	*	*	16.6%	16.6%	*	*	7.7%
Shiawassee County HD	72.1%	22.0%	18.6%	18.0%	*	20.4%	12.0%	12.0%	*	14.8%	13.2%
St Clair County HD	60.8%	12.9%	16.4%	16.3%	12.0%	18.9%	16.2%	14.9%	20.0%	18.9%	8.1%
Tuscola County HD	73.2%	19.1%	17.2%	16.5%	*	14.8%	13.5%	13.8%	*	13.0%	4.8%
Washtenaw County HD	80.7%	29.9%	17.6%	18.2%	17.3%	17.1%	15.9%	16.7%	13.6%	22.9%	16.4%
Wayne	53.2%	17.3%	15.2%	14.8%	14.9%	20.9%	12.0%	12.9%	9.1%	11.5%	22.8%
Western Upper Peninsula HD	76.3%	30.1%	14.9%	15.3%	*	*	10.1%	8.2%	*	*	10.6%

^b PNSS Data. ^c Analysis limited to children < 2 years of age. ^d PedNSS data. ^e 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 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. Joseph Community Health Agency	1262	5044	6306	77.3%	2.2%	14.8%	5.6%	42.6%	17.5%	51.3%	7.9%	8.4%	20.0%
Calhoun	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%	*
Downriver Community Services	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	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	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 Indian Community	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%
Health Department of Northwest MI	681	2447	3128	88.7%	0.6%	2.9%	4.0%	43.6%	19.3%	50.0%	6.9%	6.7%	*
Oakland	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	6263	19877	26140	57.0%	28.0%	5.2%	5.6%	25.9%	17.3%	52.1%	9.5%	7.5%	12.7%
Western Upper Peninsula 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-3 (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. Joseph Community Health Agency	79.6%	20.1%	16.6%	17.3%	10.3%	16.1%	14.1%	13.4%	15.4%	16.6%	6.1%
Calhoun	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 Services	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	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	74.2%	18.6%	16.3%	14.3%	14.4%	19.2%	13.0%	10.2%	9.7%	17.2%	11.9%
Keweenaw Bay Indian Community	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%
Health Department of Northwest MI	78.3%	30.8%	19.7%	20.1%	25.0%	12.2%	14.4%	12.7%	16.7%	24.4%	7.7%
Oakland	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	57.4%	15.9%	14.7%	14.7%	14.2%	18.0%	11.0%	11.3%	9.1%	12.0%	17.3%
Western Upper Peninsula HD	78.8%	33.3%	17.4%	*	35.7%	24.1%	9.4%	*	14.3%	15.5%	7.4%

^b PNSS Data. ^c Analysis limited to children < 2 years of age. ^d PedNSS data. ^e 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.