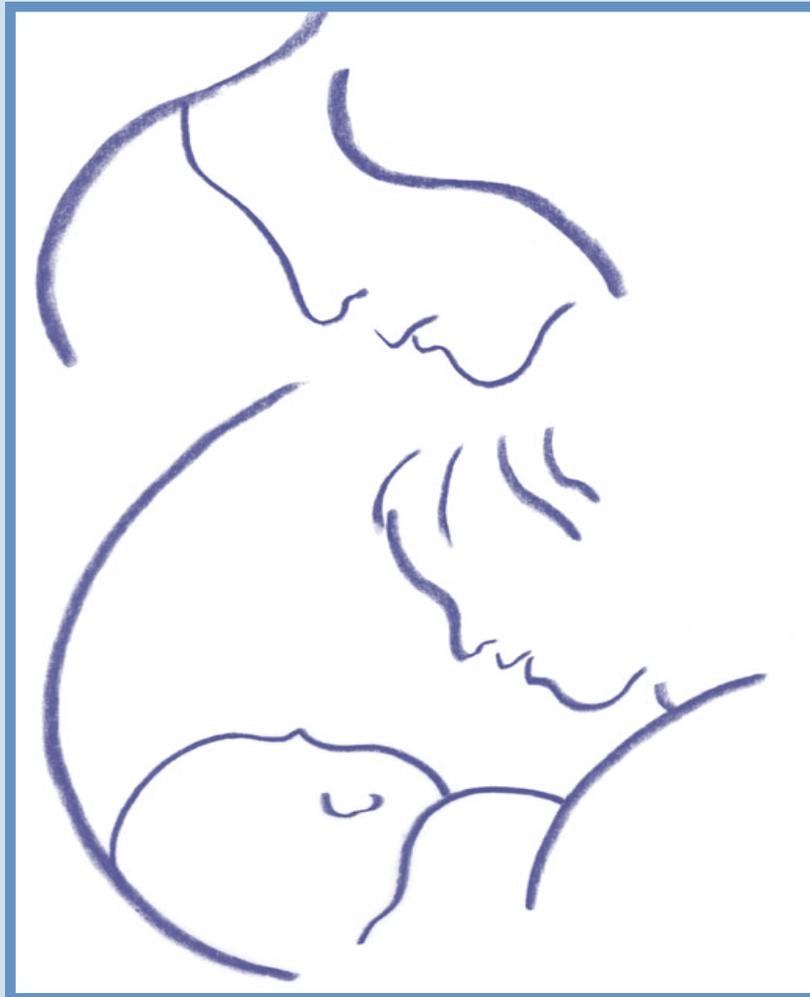




2011

Michigan Pregnancy & Pediatric Nutrition Surveillance



2007 Annual Report with Trends 2003-2007

*Michigan Department
of Community Health*



**Rick Snyder, Governor
Olga Dazzo, Director**

Michigan Department of Community Health
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 Community Health

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Women, Infants and Children (WIC) Division**

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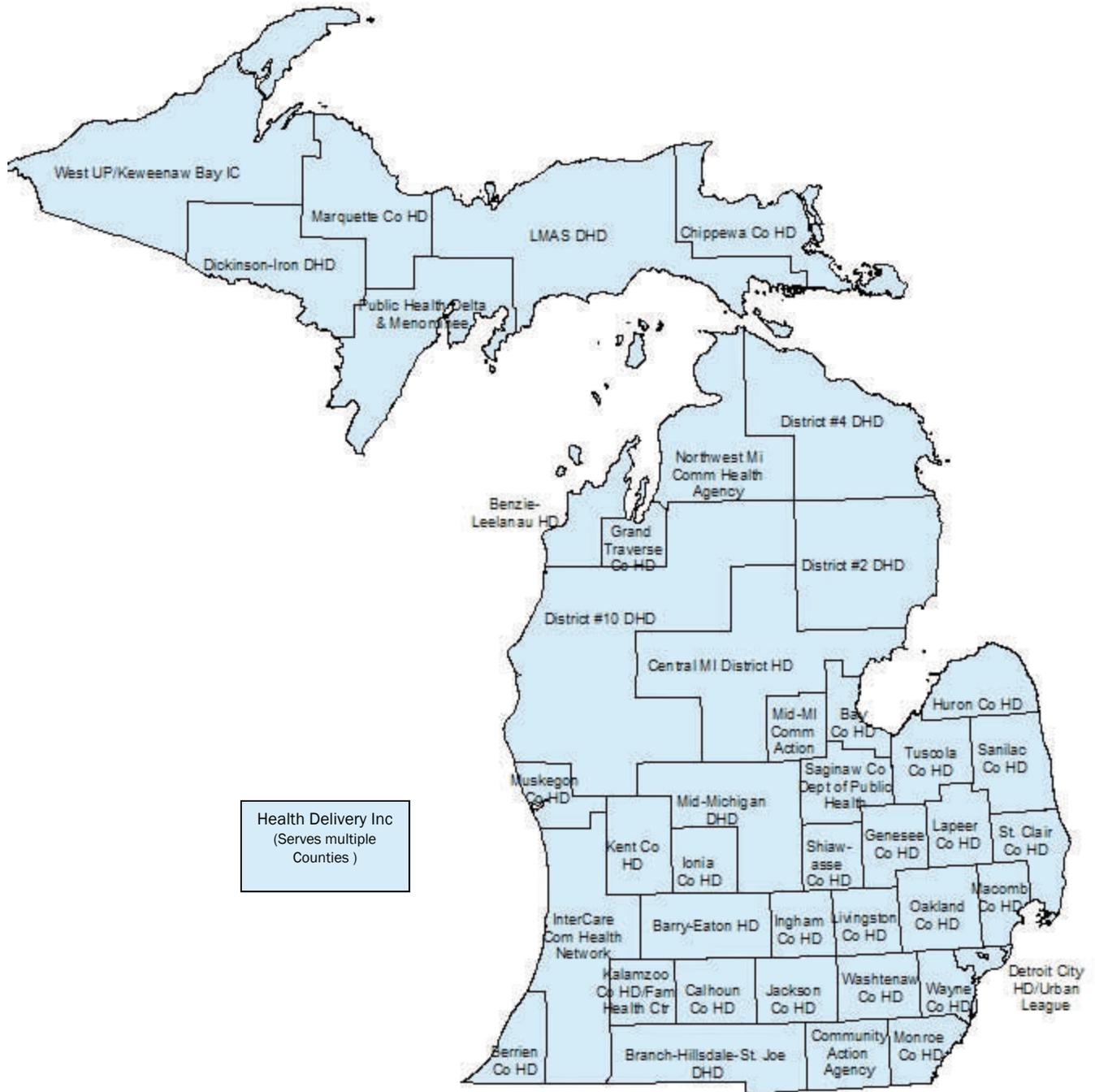
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Executive Summary

This report summarizes 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. Michigan WIC program data from years 2003 to 2007 are included in the both the Pregnancy Nutritional Surveillance System and the Pediatric Nutritional Surveillance System and were used to compile this report. Pediatric data from 2007 was merged with maternal data from 2003-2007, creating a database of information that was used to analyze key maternal and pediatric health indicators. This report summarizes year 2007 data and highlights trends from 2003 through 2007.

- There were 237,120 children under the age of five years participating in WIC during 2007; of these, 57.97% were under the age of 2 years old.
- There has been a notable increase in the proportion of Hispanic children in the program (from 6.44% in 1995 to 13.9% in 2007).
- The prevalence of obesity among children ages 2-5 years has increased by 7% since 2003 and was highest among Hispanic and Native American/Alaska Native children.
- From 2003 to 2007, Michigan's crude birth rate declined by 4.6% (MDCH, 2009), while maternal WIC enrollment increased by 10.9%.
- Enrollment of women during their 1st trimester increased slightly (1.9%) from 2003 to 2007.
- Results from statistical analysis found early WIC enrollment to be a protective factor for less than ideal maternal weight gain, low infant birthweight and pediatric short stature.
- Although measured at WIC enrollment and not an effect of WIC, the prevalence of high maternal prenatal BMI and anemia among women who enrolled during their 3rd trimester increased from 2003 to 2007.
- Both maternal smoking and drinking during pregnancy decreased among WIC enrollees.
- The overall incidence of low birthweight among infants was 7.5% in 2007, which exceeded the Healthy People 2010 objective (5%). Low birthweight disproportionately affects Black, non-Hispanic infants (10.7%) compared to White, non-Hispanic infants (6.3%).
- The prevalence of breastfeeding to 6 months increased by 1.8% overall and by 13.2% among Black, non-Hispanic women.

Figure 1: Geographic area of local WIC agencies, MI 2007



Introduction

Maternal health during the prenatal and pregnancy periods impact the health of the developing fetus (Collins, Lehnherr, Posner, & Toomey, 2009); (Barker, Winter, Osmond, Margetts, & Simmonds, 1989). Fetal development has implications across the lifespan and has been linked to the prevention and control of chronic diseases. For example, researchers found a positive correlation between intrauterine growth retardation and cardiovascular disease in adulthood (Barker, et al 1989). Although subsequent studies have been equivocal, improving maternal health during pregnancy is endorsed as a way to improve birth outcomes and reduce infant morbidity and mortality. Maternal behaviors have also been associated with negative birth outcomes. For example, smoking during pregnancy has been linked to low birth weight (Ananth & Platt, 2004), which in turn has been associated with altered glucose tolerance and high blood pressure in children, in addition to increased risk of cardiovascular disease in adulthood (Barker, 2004). Preterm and low birthweight births, along with infant mortality and neurodevelopment problems, remain significant public health problems. The costs of low birthweight and preterm births disproportionately affect those of lower socio-economic status and minority populations (Institute of Medicine, 2006). Historically, racial disparities have been evident in birth outcomes. Using low birthweight as an example, the percentage of low birthweight infants born in Michigan and nationally has been consistently higher for Black, non-Hispanics (Michigan Department of Community Health (MDCH) Vital records & Health Data Development Section, 2009). At the same time, poor maternal nutritional

status and low socioeconomic status have been associated with adverse birth outcomes.

About WIC

In recognizing that poor nutritional status is preventable, Congress created the Supplemental Nutrition Program for Women Infants and Children (WIC) in 1972. Administered by the United States Department of Agriculture (USDA), 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,2009). This is accomplished by providing federal grants to the States for supplemental foods, health care referrals and professional nutrition education targeting low-income women, infants and children. In Michigan, the WIC administration is housed within the Bureau of Family, Maternal, and Child Health in the Michigan Department of Community Health (MDCH). Program outreach and data collection are performed by the existing forty-nine WIC agencies.

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

Eligibility criteria that must be met to participate in WIC are to be:

- a pregnant or post partum woman, infant, or child under the age of five;
- 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 fiscal year 2007, there were on average 8,285,249 WIC participants in the United States and 232,206 in Michigan (USDA, 2009). Local WIC agencies are distributed throughout Michigan in response to the need for services (Figure 1, pg. 9). Maps display the prevalence of selected indicators by local WIC agency. Agency jurisdiction may encompass a single city, county, multiple counties or target a particular ethnic group; boundaries may also overlap. In some instances, agencies were 'nested' within a larger agency; wherever possible, agency jurisdiction was mapped to reflect the geographical boundary. Health Delivery Inc agency serves multiple counties and is not shown geographically. Agencies where the number of observation is five or fewer were omitted from the map.

PNSS and PedNSS

The Pregnancy Nutrition Surveillance System (PNSS) and the Pediatric Nutrition Surveillance System (PedNSS) are public health surveillance systems that describe the nutritional status of low-income pregnant, post partum or nursing women, infants and children enrolled in federally funded maternal and child health and nutrition programs. In Michigan PNSS and PedNSS, data is collected solely from women, infants and children that are currently enrolled in WIC. Self-reported demographic, behavioral, and health information is collected at the local WIC agency and verified by a nurse, registered dietitian, nutritionist, or other health professional. Anthropomorphic measurements (height, weight, and birthweight), clinical nutritional indicators status (i.e. hematology measurements), and breastfeeding practices are also collected. Data is aggregated at the state level and submitted to the Centers for Disease Control and Prevention (CDC) for analysis.

Linkage Methods

A SAS database was created for each year of data: 2000-2007 for PedNSS and 2003-2007 for PNSS. Records with duplicate WIC child IDs were removed from each year's database and the data was merged based on the child ID. Several different merged datasets were created and used depending on the outcome to be studied.

- **PedNSS 2007/PNSS 2007**—created using only 2007 data and was used primarily to analyze infant factors unique to the PedNSS such as breastfeeding duration by maternal factors only available in PNSS.
- **PedNSS 2007/PNSS 2003-2007**—sorted and linked by both maternal ID and child ID. This provided a dataset that allowed analysis of all children enrolled in WIC during 2007 by maternal and infant characteristics at the time of their mother's enrollment. Any analysis of child outcomes (i.e. BMI, stature) by maternal and infant factors used this dataset.
- **PedNSS 2003-2007/PNSS 2003-2007**—Because the size of this dataset precludes its use as a whole, only selected variables were chosen for the merge, thus limiting the analyses that could be completed at this time.

When interpreting WIC data, it is important to remember that WIC's mission is to serve women, infants and children who are among the most vulnerable populations and therefore a higher prevalence of adverse outcomes may be expected.

There are several limitations to PNSS and PedNSS data including: lack of recall by the participant, loss to follow-up due to changes in participants' eligibility or transferring out of the State. These limitations could skew the results of analysis if those that are lost to follow-up significantly differ from those who remain in the program. Lastly, missing data is inevitable in any data collection process.

Demographic Characteristics

During 2007, Michigan's 48 Local WIC agencies enrolled 64,960 pregnant and postpartum women and 237,120 infants and children up to the age of 5 years. From 2003 to 2007, the number of WIC enrollees increased (Figure 2). Considering that in 2007 125,172 live births were recorded among Michigan residents (MDCH, 2009), the ratio of live born infants born to mothers enrolled in WIC to the number of live births was nearly 1:2 (46.2%), which was a 9% increase from

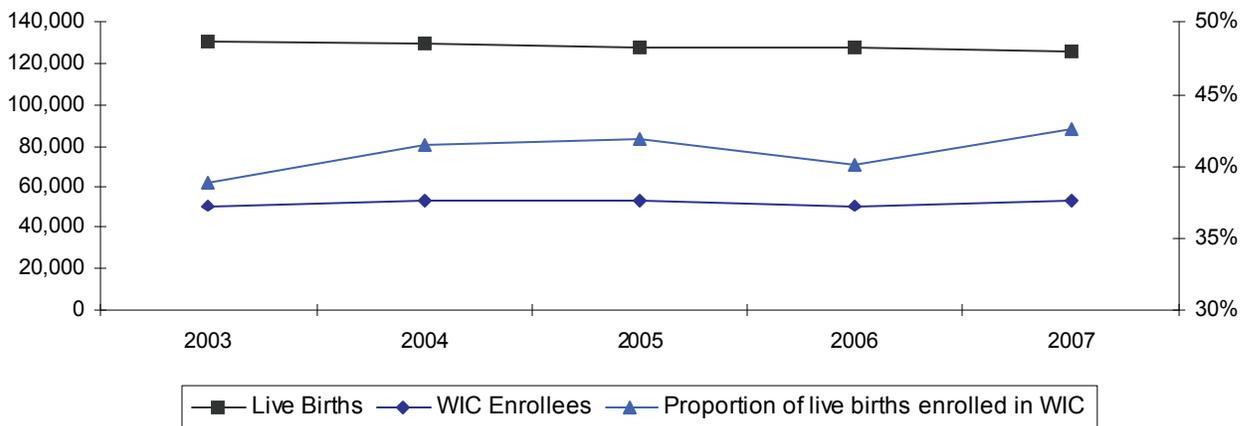
2003). A healthy out-of-state migrant effect due to Michigan's weakening economy, as well as a decline in the birthrate (4.6%), may contribute to the increase in the rate of WIC enrollment relative to the birthrate.

Of the children enrolled in WIC, over half (57.9%) were under the age of two years, with the distribution nearly even with regards to gender (50.4% males & 49.6% females). The distribution of WIC participants by local agency is outlined in Table 1. The Detroit City Health Department served the largest proportion of Michigan WIC clients (14.6%), while the Keweenaw Bay Indian Community enrolled the fewest (0.1%). In addition, the University of Michigan Pediatric Neurology Unit was the only agency to enroll only infants and children.

Highlight

From 2003 to 2007 Michigan's crude birth rate declined by 4.6% (MDCH, 2009), while maternal WIC enrollment increased by 10.9%

Figure 2 Trend in live births, WIC enrollment and WIC enrollment relative to numbers of live births, Michigan Vital Records & PNSS 2003-07



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Table 1 Distribution of women, infants and children enrolled in Michigan's WIC program during 2007 by local agency, MI PedNSS 2007 & MI PNSS 2007 1-2

Agency	N	%	Agency	N	%
Barry-Eaton DHD	3,585	1.2%	Kent County HD	24,195	8.0%
Bay County HD	3,561	1.2%	Keweenaw Bay Indian Community	332	0.1%
Benzie-Leelanau DHD	971	0.3%	Lapeer County HD	2,277	0.8%
Berrien County HD	5,072	1.7%	Livingston County HD	2,043	0.7%
Branch-Hillsdale-St. Joe DHD	6,625	2.2%	Luce-Mackinac-Alger-Schoolcraft	1,237	0.4%
Calhoun County HD	5,876	1.9%	Macomb County HD	12,132	4.0%
Central MI District HD	6,380	2.1%	Marquette County HD	1,855	0.6%
Chippewa County HD	1,363	0.5%	Mid-MI Community Action Agency	2,072	0.7%
Community Action Agency	2,768	0.9%	Mid-Michigan DHD	5,060	1.7%
Detroit City Health Department	44,122	14.6%	Monroe County HD	3,247	1.1%
Detroit Urban League	10,323	3.4%	Muskegon County HD	8,263	2.7%
Dickinson-Iron DHD	1,309	0.4%	Northwest MI Comm Health Agency	3,813	1.3%
District Health Dept. #10	10,732	3.6%	Oakland County HD	18,493	6.1%
District Health Dept. #2	2,094	0.7%	Public Health Delta & Menominee	1,924	0.6%
District Health Dept. #4	2,453	0.8%	Saginaw County Dept. of Pub Hlth	5,831	1.9%
Genesee County HD	15,050	5.0%	Sanilac County HD	1,447	0.5%
Grand Traverse County HD	2,793	0.9%	Shiawassee County HD	2,570	0.9%
Health Delivery, Inc	3,213	1.1%	St. Clair County	4,923	1.6%
Huron County HD	1,163	0.4%	Tuscola County HD	1,991	0.7%
Ingham County HD	8,190	2.7%	U of M Ped Neuro Unit *	17	0.0%
InterCare Comm Health Network	17,375	5.8%	Washtenaw County HD	6,172	2.0%
Ionia County HD	2,117	0.7%	Wayne County HD	19,108	6.3%
Jackson County HD	5,810	1.9%	Western Upper Penin DHD	2,029	0.7%
Kalamazoo County HD	4,380	1.5%			
Kalamazoo Family Health Center	3,646	1.2%	Total	302002	

MI PedNSS & PNSS 2007

¹ Recording period is January 1st through December 31st

² Excludes Records with unknown data and errors * University of Michigan Pediatric Neurology Unit agency enrolls infants and children.

Race and Ethnicity

Race and ethnicity are self-identified by WIC enrollees. The distribution of race/ethnicity among women in 2007 is as follows: White, non-Hispanic (56.8%), Black, non-Hispanic (28.2%), Hispanic (11.2%), Multiracial, non-Hispanic (2.0%), Asian/Pacific Islander (1.5%) and American Indian/Alaska Native (0.32%) (Figure 3). The proportion of Hispanic women enrolled in WIC increased 11% from 2003 through 2007, while the proportion of American Indian women decreased by 36.8%.

In 2007, more than half (52.8%) of the children under 5 years of age were White, non-Hispanic. The proportion of Hispanic children increased from 11.1% in 2003 to 13.9% in 2007 (a 25.2% increase) (Figure 4). Multiracial, non-Hispanic was added as a category in 2005, with 12.8% of the children identified as such in the first year, then dropping to 4.7% in 2006 and increasing to 4.9% in 2007. This additional category may explain some of the shift seen in the race distribution from 2004 to 2005.

Figure 3 Race/Ethnicity of women participating in WIC, MI PNSS 2007 ¹⁻²

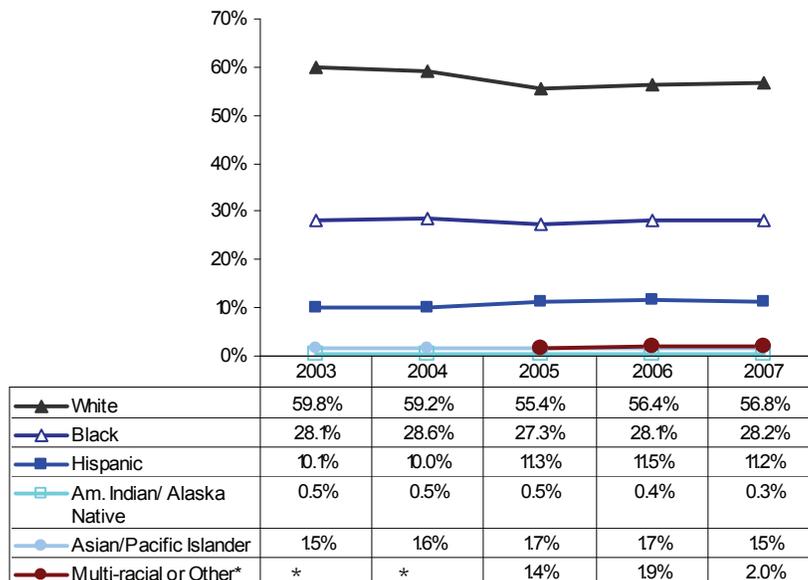
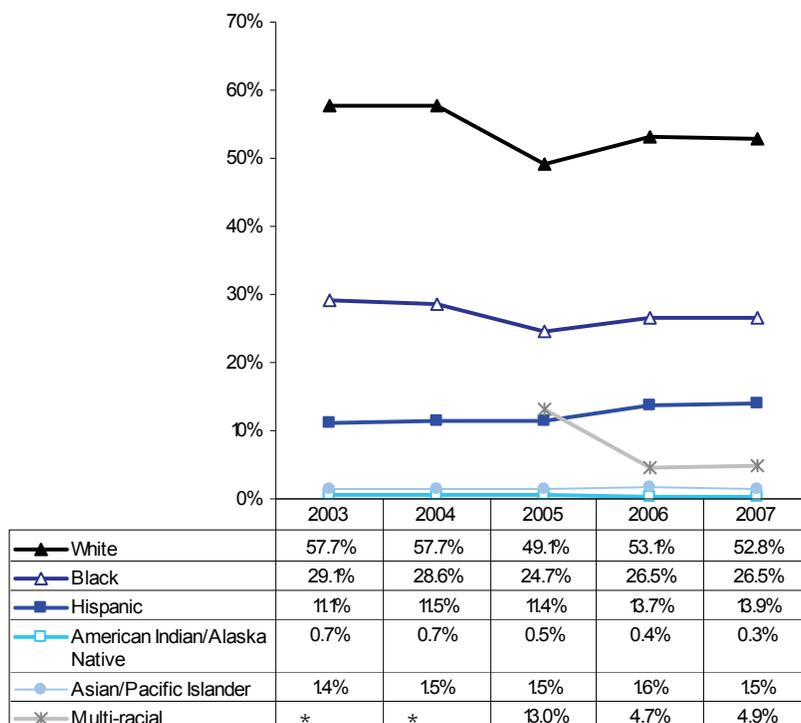


Figure 4 Trend in race/ethnicity in the WIC population younger than five years of age, 2003-2007 MI PedNSS ¹⁻²



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

* In 2005 Other race category was used in PNSS, Multiracial was added in 2006 and Other was cropped.

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Although the racial/ethnic distribution varies by agency, White, non-Hispanic women, infants and children enrollees tend to form the majority of participants in most agencies. Distribution of race and ethnicity for selected urban and rural local agencies is shown in Table 2. The Detroit Department of Health & Wellness Promotion agency has the highest proportion of Black, non-Hispanic participants (74.5%). The Detroit Urban League (87.5 % non-White) and Health Delivery System Inc (88.5% non-White) also serve a predominately non-White population, while InterCare Community Health Network enrolled the highest proportion of Hispanics (34.6%) during 2007. In contrast, many of Michigan's rural agencies see a higher proportion of White, non-Hispanic participants.

More about WIC

- The first WIC clinic in Michigan and the upper Midwest opened in 1974 at the Delta-Menominee District Health Department agency
- By 1975 there were four local agencies; today there are 49
- In FY 2007, Michigan ranked 8th with more than WIC 240,000 participants
- WIC supports local communities with more \$170 million in food purchases yearly (FY 2010)

Table 2 Race and Ethnicity distribution of WIC participants for selected urban and rural agencies, MI PNSS & PedNSS 2007

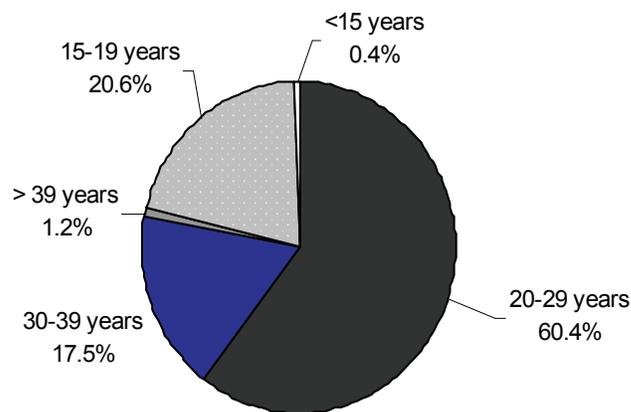
Urban WIC Agency by Race/Ethnicity												
AGENCY	White, non-Hispanic		Black, non-Hispanic		Hispanic		Asian/ Pacific Islander		American Indian/ Alaska Native		Multiracial, non-Hispanic	
	N	%	N	%	N	%	N	%	N	%	N	%
Detroit Dept. Health & Wellness Promotion	3528	8.0%	32869	74.5%	6606	15.0%	603	1.4%	30	0.1%	486	1.1%
Wayne County HD	8636	40.6%	3930	18.5%	6985	32.8%	495	2.3%	37	0.2%	1352	6.3%
Kent County HD	13197	69.1%	3557	18.6%	943	4.9%	436	2.3%	42	0.2%	790	4.1%
Genesee County HD	7871	52.3%	6475	43.0%	356	2.4%	47	0.3%	14	0.1%	287	1.9%
Oakland County HD	7586	48.5%	4738	30.3%	2414	15.4%	294	1.9%	22	0.1%	599	3.8%
Michigan	162,077	53.7%	81,040	26.8%	40,341	13.4%	4,634	1.5%	997	0.3%	12990	4.3%
Rural WIC Agency by Race/Ethnicity												
AGENCY	White, non-Hispanic		Black, non-Hispanic		Hispanic		Asian/ Pacific Islander		American Indian/ Alaska Native		Multiracial, non-Hispanic	
	N	%	N	%	N	%	N	%	N	%	N	%
InterCare (Sparta+Pullman)	9815	56.5%	574	3.3%	6014	34.6%	214	1.2%	14	0.1%	744	4.3%
District Health Department #10	7160	79.8%	109	1.2%	1216	13.6%	16	0.2%	17	0.2%	452	5.0%
Branch-Hillside-St. Joseph DHD	5314	80.2%	131	2.0%	1026	15.5%	31	0.5%	DNS	DNS	119	1.8%
Central Michigan DHD	5939	93.1%	45	0.7%	129	2.0%	23	0.4%	11	0.2%	233	3.7%
Northwest MI Community Health Agency	3485	91.4%	17	0.4%	69	1.8%	14	0.4%	47	1.2%	181	4.7%

DNS = Data not sufficient n<5

Maternal Age

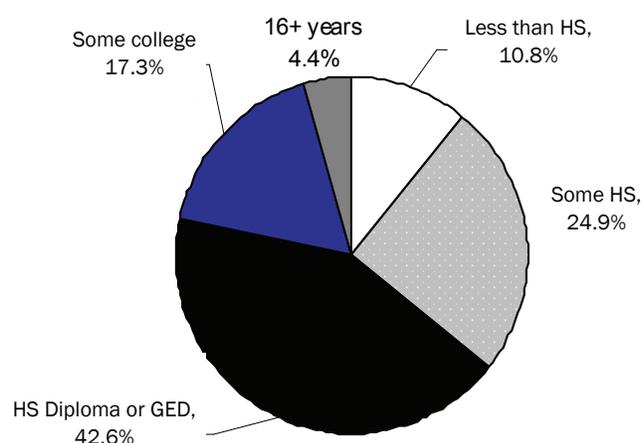
The majority of women (60.4%) enrolled in 2007 were 20–29 years of age, 20.6% were 15-19 years old, 17.5% were 30-39 years old, 1.2% were over the age of 39 years and 0.43% were under the age of 15 years old (Figure 5). Of Michigan’s live births by age group, 87.5% of live births to teens between 10-19 years were to those enrolled in WIC. Nearly half (48.5%) of 20-29 year olds who gave birth to a live infant were enrolled WIC. The prevalence decreased to 21.2% among 30-39 year olds and 18.5% to women over the age of 39 years (MDCH 2010). The prevalence decreased with age, which may show the impact of education or other available resources.

Figure 5 Distribution by maternal age, MI PNSS, 2007 ¹⁻²



Maternal Education

Figure 6 Years of education attained by women enrolled in WIC, MI 2007 PNSS



Many WIC participants (64.3%) earned at least a high school diploma or GED (Figure 6). More than one fifth (21.7%) have at least some college education and approximately one in ten had less than nine years of education at the time of their enrollment in WIC. From 2003 to 2007, the proportion of women who had at least some college education increased by 7%, while those with less than a high school diploma decreased by 7%.

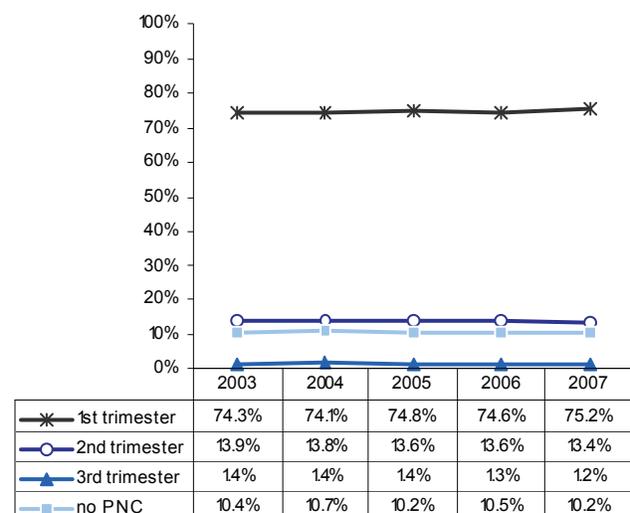
¹ Recording period is January 1st through December 31st ² Excludes records with unknown data and errors; frequency missing age = 12 frequency missing education = 110

Maternal Health and Behavior Indicators

Prenatal Care Enrollment

The benefits of prenatal care for at-risk women on birth outcomes have been scientifically recognized since the early 1900's (Alexander & Korenbrot, 1995). Inadequate prenatal care has been associated with increased risk of low birthweight, premature births, neonatal mortality, infant mortality and maternal mortality (Chen, Wen, Yang, & Walker, 2007; Taylor, Alexander, & Hepworth, 2005; Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002). In a previous study, women who smoked cigarettes or who had inadequate maternal weight gain and received medical, nutritional and educational interventions had fewer premature births than women who did not receive prenatal care or enter prenatal care during their 3rd trimester (Alexander & Korenbrot, 1995).

Figure 7 Trend of prevalence of prenatal care by trimester of entry among women enrolled in WIC*, MI PNSS, 2003-2007^{1,2}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors frequency missing: 38,851

* No PNC= No prenatal care at time of WIC enrollment

Prenatal care, as recorded in PNSS, refers to a prenatal visit to a doctor or a certified nurse midwife that is either self-reported or from the medical record. At the time of their initial WIC visit, most (75.2%) women reported they entered prenatal care during their 1st trimester of pregnancy, which is a 1.2% increase from 2003 (Figure 7), compared to 79.4% nationally (Reinold, Dalenius, Smith, Brindley, & Grummer-Strawn, 2009).

These results are not adjusted for timing into the WIC program and reflect self-reported prenatal care enrollment at the time they enroll in WIC program. Thus, women who enter WIC prior to receiving prenatal care will be misclassified as having received no prenatal care.

Among women enrolled in Michigan WIC, those that were White, non-Hispanic or 30-39 years of age were most likely to enter prenatal care during their 1st trimester (Figure 8). Teens, especially those younger than 15 years of age, were much less likely to enroll early (47.9%) and were more likely to not enroll in prenatal care at all (15.1%) when compared to women over 15 years of age. Although approximately two-thirds of Hispanic women were enrolled in WIC during their 1st trimester, nearly one in five received no prenatal care. Additionally, Black, non-Hispanics (20.8%) were more likely to receive prenatal care during their 2nd trimester and Asian/Pacific Islanders (2.1%) in their 3rd trimester.

MI PNSS & PedNSS Report 2003-2007

As seen in Table 3 and Figure 9, prevalence of early enrollment in prenatal care varied by agency. The Huron County Health Department reported the highest proportion of 1st trimester prenatal care enrollment (91.7%), followed by the District Health Department #2 (90.5%). In contrast, the Shiawassee County Health Department reported the lowest prevalence of 1st trimester prenatal care enrollment (38.1%).

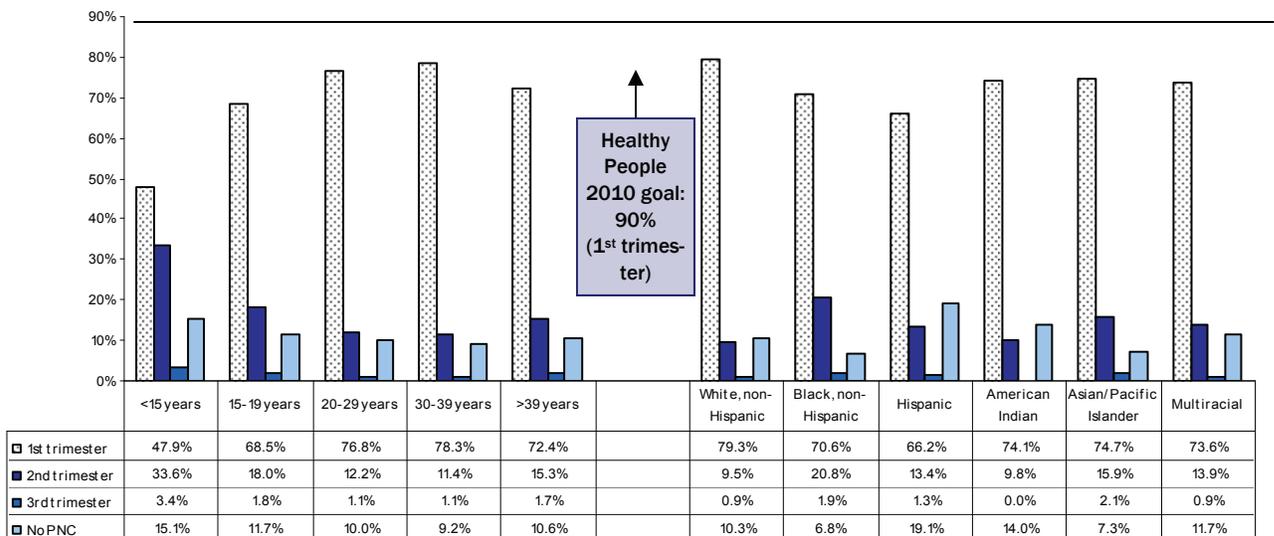
Table 3 Prevalence of 1st trimester prenatal care enrollment among women enrolled in WIC by local agency, MI PNSS 2007 ¹⁻²

Highest prevalence of 1st trimester PNC	
Agency	%
Huron County HD	91.7
District Health Dept. #2	90.5
District Health Dept. #4	89.3
Mid-MI Community Action Agency	88.2
Community Action Agency	86.1
Lowest Prevalence of 1st trimester PNC	
Agency	%
Chippewa County HD	66.7
Grand Traverse County HD	66.6
St. Clair County	66.0
Lapeer County HD	60.1
Shiawassee County HD	38.1
MI PNSS 2007	

¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors frequency missing: 8009

Figure 8. Prevalence of trimester of prenatal care enrollment by race/ethnicity or age among women enrolled in WIC*, MI PNSS 2007 ¹⁻²

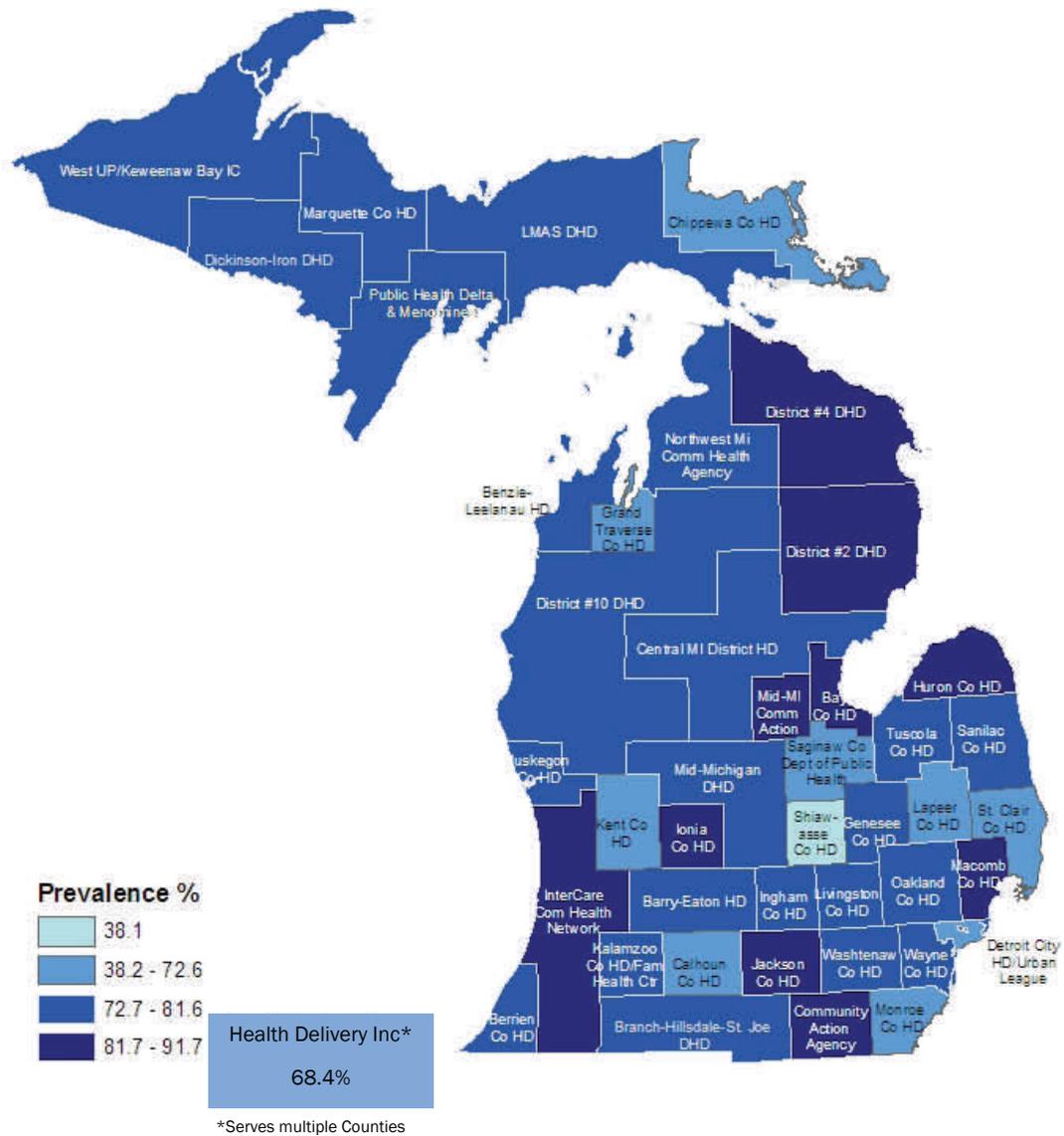


¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors; frequency missing for race/ethnicity = 8010 & for age= 8020

* No PNC= No prenatal care at time of WIC enrollment

Figure 9 Prevalence of 1st trimester entry into prenatal care by local agency, MI PNSS 2007



WIC Enrollment

Studies have shown that WIC enrollment is protective for preterm births, (Bitler & Currie, 2005a; Bitler & Currie, 2005b) low birthweight (Kowaleski-Jones & Duncan, 2002; Lazariu-Bauer, Stratton, et al, 2004) and fetal death, especially in high risk women (El-Bastawissi, Peters, et al, 2007). Furthermore, longer WIC enrollment is associated with reduced risk of low birthweight (Bitler & Currie, 2005b; Lazariu-Bauer et al., 2004) and lower rates of uterine growth retardation (Joyce, Racine, & Yunzal-Butler, 2008). In 2007, approximately 67% of Michigan women were enrolled in WIC in either their 1st or 2nd trimester (Figure 10), compared to 66.4% nationally (Reinold et al., 2009). Slightly fewer than one-third enrolled during their 1st trimester (Figure 10) (a 1.9% increase from 2003).

Pregnancy trimester of WIC enrollment by women's age and race/ethnicity are depicted in Figure 11.

Teens younger than 15 years of age were less likely to enter WIC in their 1st trimester, but the majority (90.2 %) enrolled prior to giving birth. Prevalence of 1st trimester enrollment was highest among American Indian/Alaska Native women (40.3%). In contrast, less than one quarter of Black, non-Hispanic women (21.1%) enrolled during their 1st trimester.

Michigan's WIC program established goals for selected health indicators.

One objective is to increase the proportion of 1st trimester WIC enrollment to 40% by 2008. Twenty-two local agencies met or exceeded this goal in 2007; Luce-Mackinac-Alger-Schoolcraft District Health Department had the highest prevalence of 1st trimester WIC enrollment (60.1%), while Genesee County Health Department had the lowest (21.3%) (Table 4 and Figure 12).

MIICHIGIAN WIC FIVE YEAR PLAN

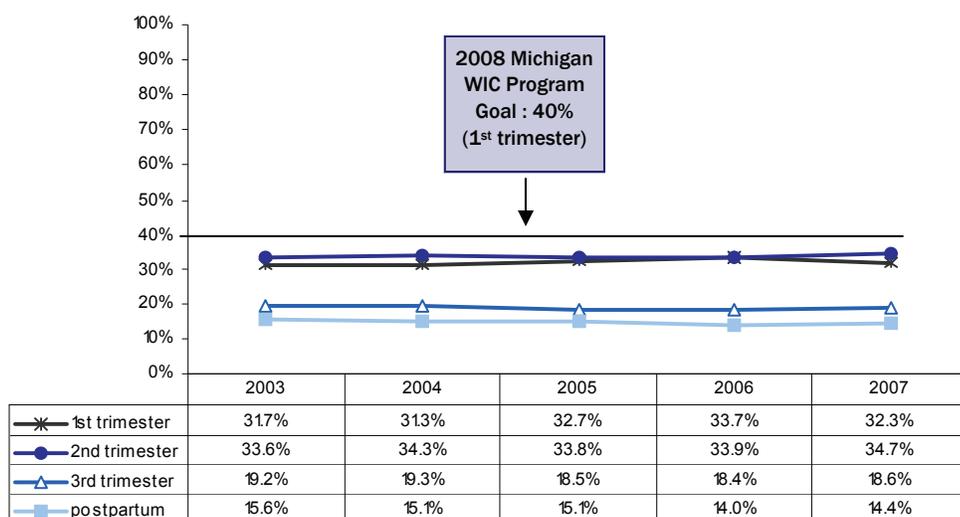
Increase 1st trimester entry into WIC to 40% in 2008

22 Local Agencies exceeded this goal

Luce-Mackinac-Alger-Schoolcraft District Health Department had the highest prevalence of 1st trimester WIC enrollment (60.1%) (Table 3).

40.3% of American Indian/Alaska Native women & 39.3% of Hispanic women entered WIC during their 1st trimester (Figure 11).

Figure 10 Trend of trimester of WIC enrollment prevalence among women enrolled in WIC, MI PNSS 2003-2007 ¹⁻²



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors = 12,127

MI PNSS & PedNSS Report 2003-2007

Table 4 Prevalence of 1st trimester WIC enrollment among women enrolled in WIC by local agency, MI PNSS 2007 ¹⁻²

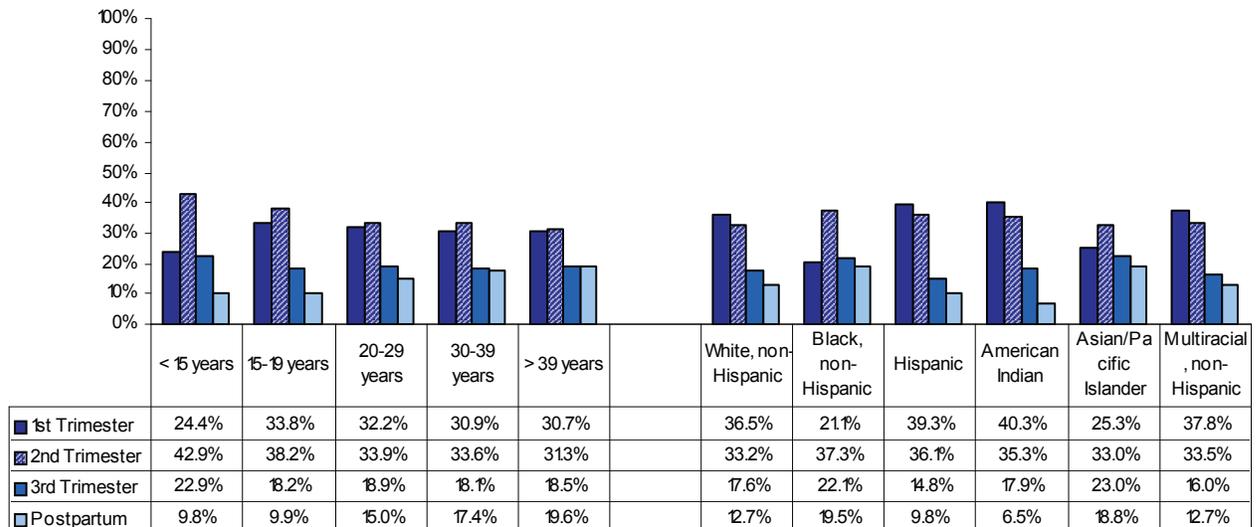
Highest prevalence of 1st trimester Entry	
Agency	%
Luce-Mackinac-Alger-Schoolcraft DHD	60.7
Huron County HD	51.4
Chippewa County HD	49.4
Dickenson-Iron DHD	48.3
Shiawassee County HD	48.0
Lowest Prevalence of 1st trimester Entry	
Agency	%
Detroit Urban League	23.8
Oakland County HD	23.5
Ingham County HD	22.9
Detroit DHWP	22.1
Genesee County HD	21.3

MI PNSS 2007

¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors; frequency missing = 2379

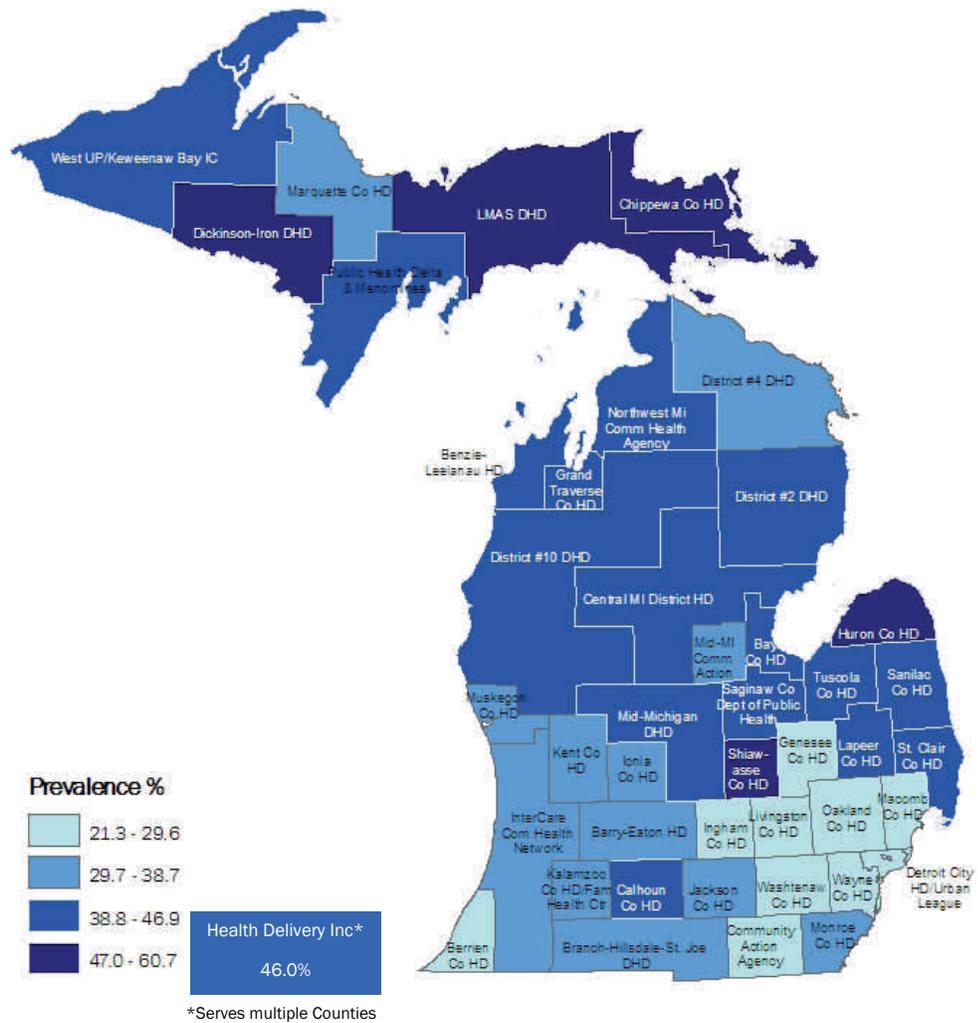
Figure 11 Prevalence of trimester of WIC enrollment by maternal age or race/ethnicity among women enrolled in WIC, MI PNSS 2007 ¹⁻²



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors; frequency missing for race/ethnicity = 2379 & for age = 2389

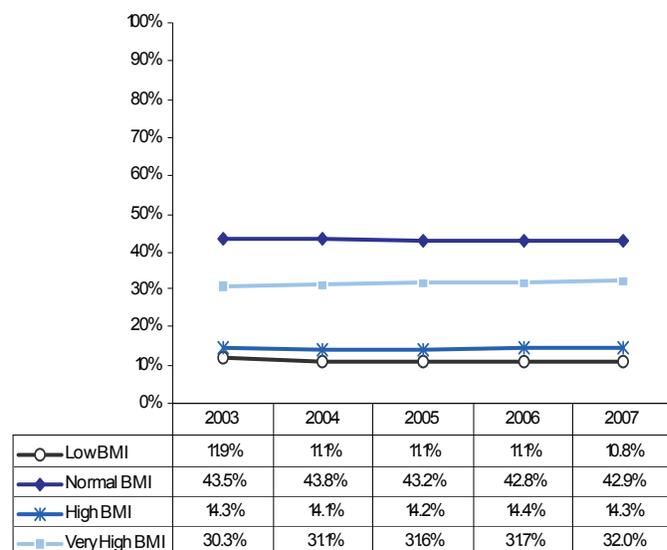
Figure 12 Prevalence of 1st trimester enrollment in WIC by local agency, MI PNSS 2007



Maternal Pre-Pregnancy Body Mass Index

Pre-pregnancy Body Mass Index (BMI) is a weight for height measurement taken before a woman becomes pregnant. Using the 1990 Institute of Medicine’s guidelines, women are classified as underweight, normal weight, overweight or obese (Table 5) (Institute of Medicine, 1990). Pre-pregnancy BMI of 25-30 or greater than 30 is associated with adverse pregnancy and birth outcomes such as gestational diabetes, proteinuric preeclampsia, induction of labor, delivery by emergency c-section, high infant birthweight and intrauterine death (Sebire et al., 2001). Furthermore, maternal obesity in the 1st trimester more than doubles the risk of obesity at ages 2-4 years among low income children (Whitaker, 2004).

Figure 13 Trend of maternal pre-pregnancy BMI prevalence among women enrolled in WIC, MI PNSS 2003-2007 ^{1-2,4}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors = 24,964 ⁴ Based on 1990 IOM report, "Nutrition During Pregnancy":

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

In contrast, underweight women are at higher risk of delivering a pre-term infant (Siega-Riz, Adair, & Hobel, 1996). Results from a recent study suggest that the risk is dose-responsive, meaning those women with the lowest BMI are at the highest risk of delivering a pre-term infant, although some of this risk can be reduced by adequate maternal gestational weight gain (Salihu et al., 2009).

In PNSS, pre-pregnancy BMI is calculated based on the woman’s height (measured) and pre-pregnancy weight estimate at her prenatal visit (self-report or actual value recorded in the clinic early in the 1st trimester). Nearly one-third of the women enrolled in Michigan’s WIC program during 2007 were classified as obese, while the prevalence of obesity increased by 5.6% from 30.3% in 2003 to 32% in 2007 (Figure 13). Fewer than half (42.9%) were normal weight prior to pregnancy and approximately one in ten (10.8%) women enrolled in Michigan WIC were classified as underweight in 2007 (a 10% decrease from 2003).

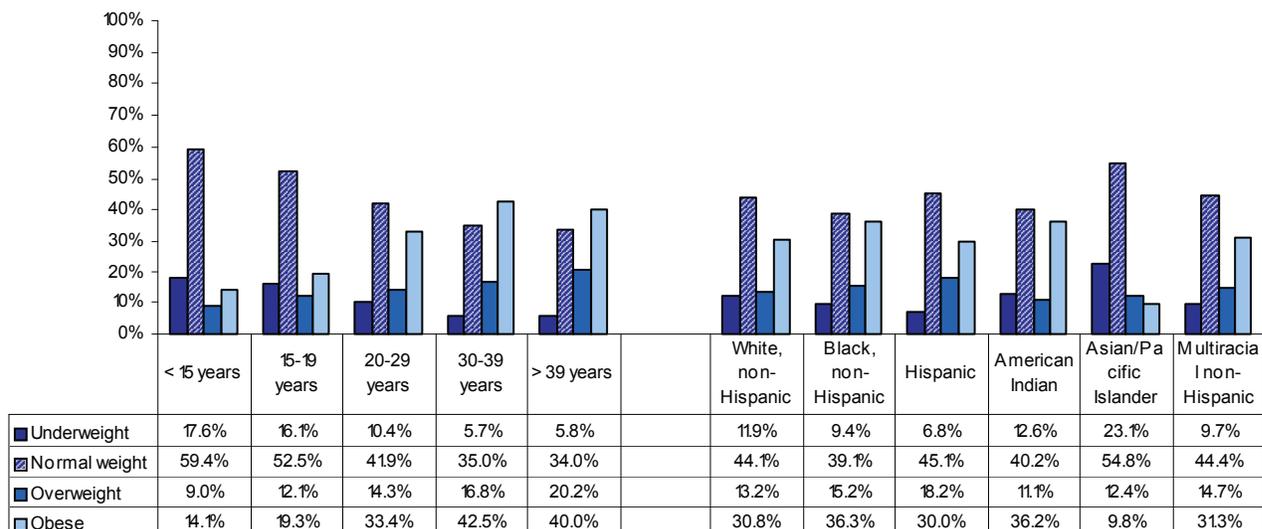
**Michigan WIC
Spotlight**

The prevalence of underweight pre-pregnancy BMI among women enrolled in the Michigan WIC program decreased by 10% from 2003 to 2007

Prenatal BMI prevalence differed by race/ethnicity and by age group (Figure 14). Nearly one-fourth of Asian/Pacific Islander women were classified as underweight (23.1%). Young women were more apt to be underweight; 17.6% of those under the age of 15 and 16.1% of 15-19 year olds were underweight.

Women 30-39 years of age had the highest prevalence of obesity and overweight. Additionally, the highest prevalence of obesity was found among Black, non-Hispanic (36.3%) and American Indian (36.2%) women, while the lowest prevalence of obesity was among Asian /Pacific Islander women (9.8%).

Figure 14 Prevalence of maternal pre-pregnancy BMI by race/ethnicity or age among women enrolled in WIC, MI PNSS 2007 ^{1-2, 4}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors; frequency missing for age = 4791, for race/ethnicity =4781

⁴ Based on 1990 IOM report, "Nutrition During Pregnancy"

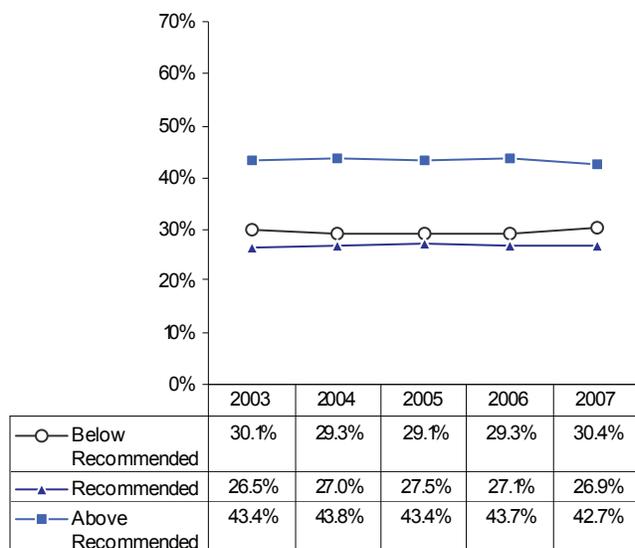
Maternal Weight Gain

Maternal weight gain, or the amount of weight gained from conception to delivery, is considered an important determinant of fetal development and birth outcomes. In 1990, the Institute of Medicine (IOM) recommended ideal maternal weight gain for optimal infant health based on the pre-pregnancy BMI (Table 6) (IOM, 1990). Women with low pre-pregnancy BMI and lower than ideal weight gain are more apt to have a low birth-weight infant; if weight gain is less than ideal during the 2nd and 3rd trimester, infants have smaller than average birthweight and increased risk of fetal growth

Table 6 Maternal weight gain categories based on the 1990 IOM recommendations

Weight	Prepregnancy BMI	Total weight gain (lb)		
		Less than Ideal	Ideal	Above Ideal
Underweight	<19.8	<28	28-40	>40
Normal weight	19.8-26.0	<25	25-30	>35
Overweight	>26.0-29.0	<15	15-25	>25
Obese	>29.0		At least 15	

Figure 15 Trend of pregnancy weight gain prevalence among women enrolled in WIC, MI PNSS 2007 ^{1-2, 5}



restriction. Greater than normal gestational weight gain has been associated with macrosomia (infant weighing more than 4,000 grams) (Frederick et al., 2008) and can lead to an increased risk of caesarean delivery (Siggelkow, Boehm, Skala, Grosslercher, Schmidt, & Koelbl, 2008b). Furthermore, analysis from recent studies suggest an association between high maternal weight gain and high weight of offspring during childhood and adolescence (Kleiser, Schaffrath Rosario, Mensink, Prinz-Langenohl, & Kurth, 2009; Li, Goran, Kaur, Nollen, & Ahluwalia, 2007; Oken, Taveras, Kleinman, Rich-Edwards, & Gillman, 2007). Additionally, an increased risk of obesity and elevated blood pressure among offspring was found (Oken, Kleinman, Belfort, Hammitt, & Gillman, 2009). It is important to consider pre-pregnancy BMI when discussing maternal weight as some women classified as overweight or obese tend to gain less during pregnancy.

From 2003 to 2007, the prevalence of gestational weight gain among women enrolled in Michigan WIC has changed very little (Figure 15). Slightly more than one-quarter of women gained the recommended weight during their pregnancy, a 1.5% increase from 2003.

¹ Recording Period January 1st through December 31st

² Excluded records with unknown data or errors; frequency missing= 72,099

⁵Based on 1990 IOM report "Nutrition during pregnancy": underweight pregnancy (ideal weight gain is 28 to 40 lbs), normal weight pregnancy (ideal weight gain is 25 to 35 lbs, overweight pregnancy (ideal weight gain 15 to 25 lbs) and obese pregnancy (ideal weight gain 15 to 25 lbs).

MI PNSS & PedNSS Report 2003-2007

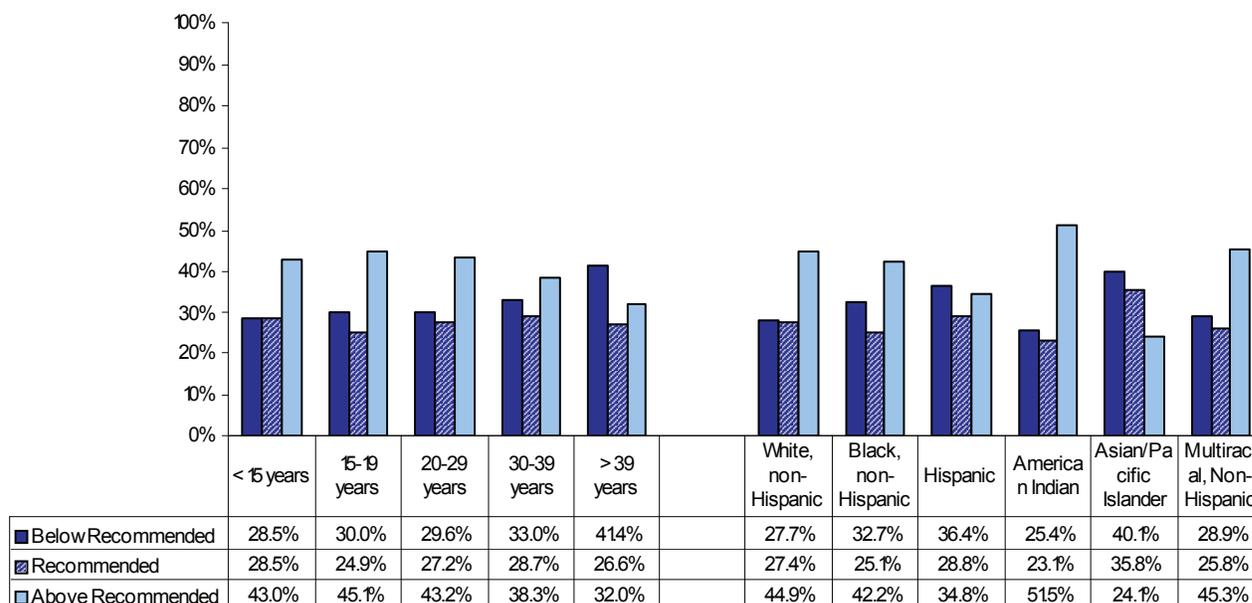
Asian/Pacific Islander women (40.1%) and women over the age of 39 years (41.4%) gained less than the recommended amount of gestational weight compared to other age and racial/ethnic groups (Figure 16). American Indian/Alaska Native women (51.5%) and teens 15-19 years (45.1%) had the highest prevalence of weight gain above the IOM recommendations.

The prevalence of gestational weight gain varied by pre-pregnancy BMI. More than one-third (37.5%) of underweight women gained less than the recom-

mended amount of weight, as did 30% of obese women (Figure 18, pg 28).

Luce-Mackinac-Alger-Schoolcraft District Health Department reported the highest (57.4%) prevalence of inadequate weight gain (Figure 17). Fewer than 20% of enrollees at the Kalamazoo County Health Department gained less than recommended amount, which was the lowest in the state.

Figure 16 Prevalence of pregnancy weight gain by race/ethnicity and by age among women enrolled in WIC, MI PNSS 2007 ^{1-2, 5}

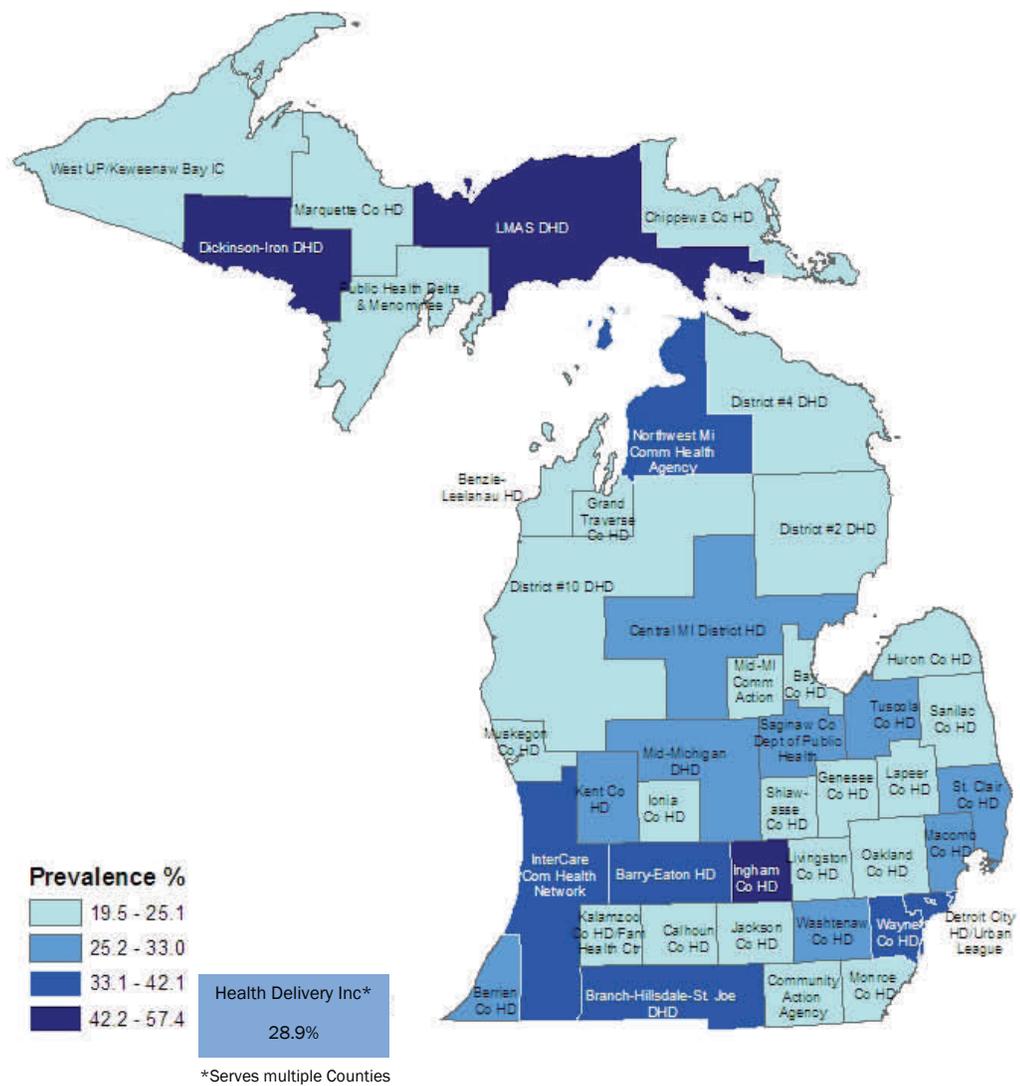


¹ Recording Period January 1st through December 31st

² Excluded records with unknown data or errors; frequency missing= 15403 for age & 15394 for race/ethnicity

⁵ Based on 1990 IOM report "Nutrition during pregnancy": underweight pregnancy (ideal weight gain is 28 to 40 lbs), normal weight pregnancy (ideal weight gain is 25 to 35 lbs, overweight pregnancy (ideal weight gain 15 to 25 lbs) and obese pregnancy (ideal weight gain 15 to 25 lbs).

Figure 17 Prevalence of less than ideal pregnancy weight gain by local agency, MI PNSS 2007



FOCUS ON MATERNAL GESTATIONAL WEIGHT GAIN AND MATERNAL PRE-PREGNANCY BMI

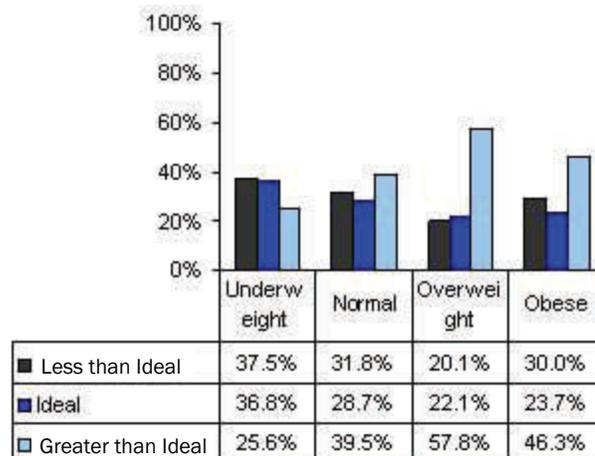
Using a statistical analysis method called logistic regression, the risk of a woman gaining either less than or more than the recommended amount during pregnancy can be determined, while taking into account her pre-pregnancy BMI, race/ethnicity and other factors. Analysis of characteristics which significantly affect the odds that a woman will gain less than or more than the recommended amounts during her pregnancy are shown in Tables 6 (pg 26) and 7. Black, non-Hispanic, Hispanic, Asian/Pacific Islander and women who were classified as underweight prior to pregnancy were at higher risk of gaining less than the recommended amount of weight. WIC enrollment during the first two trimesters was found to be a protective factor by decreasing her risk of low weight gain by 13.9%.

Table 7 Adjusted odds ratios for less than recommended maternal gestational weight gain

Effect	OR	95% CI	
Black, non-Hispanic	1.274	1.219	1.331
Hispanic	1.542	1.45	1.639
Asian/Pacific Islander	1.582	1.362	1.838
Age >29	1.14	1.082	1.202
BMI Underweight	1.333	1.251	1.42
BMI overweight	0.522	0.489	0.557
BMI Obese	0.897	0.857	0.939
Previous Pregnancy	1.207	1.151	1.266
WIC enroll. 1st or 2nd trimester	0.861	0.827	0.898

After adjusting for pre-pregnancy BMI, the association between American Indian/Alaskan Natives and greater than recommended weight gain was not significant (Table 8). Although women under the age of 20 were found to have a higher risk of greater than recommended weight gain, the adjusted odds showed an increased risk by 12.5%. Pre-pregnancy BMI classified as overweight or obese was found to significantly increase a women's risk of greater than normal weight gain. The probability that an overweight or obese woman would gain more than the recommended amount was 69% and 58%, respectively. WIC enrollment during the first two trimesters was significantly associated but had minimal effect on the outcome.

Figure 18 Prevalence of maternal gestational weight gain by pre-pregnancy BMI ^{1,2,5}



¹ Recording Period January 1st through December 31st

² Excluded records with unknown data or errors; frequency missing= 15,562

⁵ Based on 1990 IOM report "Nutrition during pregnancy": underweight pregnancy (ideal weight gain is 28 to 40 lbs), normal weight pregnancy (ideal weight gain is 25 to 35 lbs, overweight pregnancy (ideal weight gain 15 to 25 lbs) and obese pregnancy (ideal weight gain 15 to 25 lbs).

Table 8 Adjusted odds ratio for greater than recommended maternal gestational weight gain

Effect	OR	95% CI	
Hispanic	0.620	0.584	0.659
Asian/ Pacific Islander	0.463	0.389	0.549
Black, Non-Hispanic	0.860	0.824	0.896
Age < 20 years	1.125	1.072	1.179
Age > 29 years	0.828	0.786	0.871
BMI Obese	1.389	1.330	1.450
BMI Underweight	0.503	0.470	0.539
BMI Overweight	2.221	2.101	2.348
Previous pregnancy	0.739	0.705	0.774
WIC enroll 1st or 2nd trimester	1.144	1.100	1.190

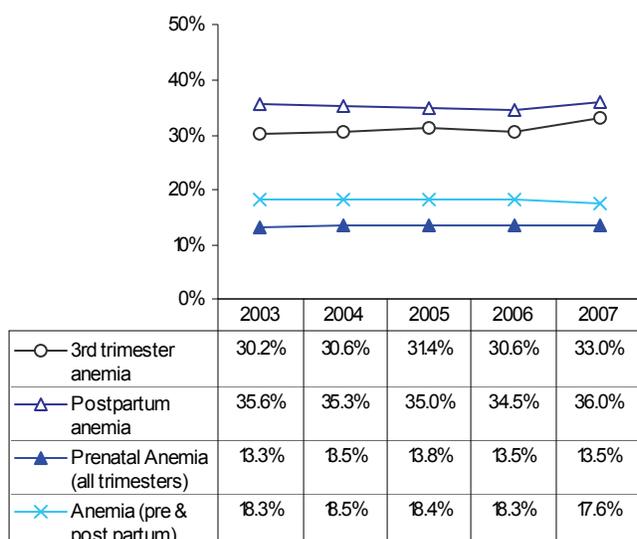
Maternal Anemia

Anemia, defined by decreased hemoglobin (<110g/L) or low red blood cell numbers, is associated with low birth-weight and duration of gestation, as well as perinatal and neonatal mortality (Rasmussen, 2001). Due to increased iron needs during pregnancy, pregnant women are at an increased risk of iron-deficiency anemia. During the 1st and 2nd trimesters, the hematocrit (the percentage of red blood cells within the blood) and hemoglobin levels drop due to blood volume expansion and if women do not take iron supplement, the values will remain low during the 3rd trimester. Studies have shown that the highest prevalence of anemia occurs in

the 3rd trimester; because of this, a *Healthy People 2010* objective was to reduce the prevalence of 3rd trimester anemia to 20% (USHHS, 2000). If women take supplemental iron, the hematocrit and hemoglobin will gradually rise during the 3rd trimester (MMWR, 1998). At the same time, maternal iron levels are associated with infant anemia at 3 months of age, continuing to 6 months of age (Preziosi et al., 1997). Low hemoglobin at 6 months of age was found to be a predictor of childhood anemia (Lozoff, Jimenez, & Smith, 2006).

A woman's hemoglobin level or hematocrit is measured when she enrolls in WIC (at least 4-6 weeks after delivery if she enrolls post partum). The values are adjusted for clinic altitude and maternal smoking. Trimester and age specific cut-offs are used to determine if she is anemic. Because these measurements are taken at enrollment, they reflect the health status of women at the time of their enrollment and not the effect of WIC. These measurements do not determine the cause of the anemia, thus women with sickle cell disease or other non-modifiable causes of anemia are included in this data.

Figure 19 Trend of maternal anemia prevalence among women enrolled in WIC, MI PNSS, 2003-2007 ^{1-2, 6}



¹Recording period is January 1st through December 31st

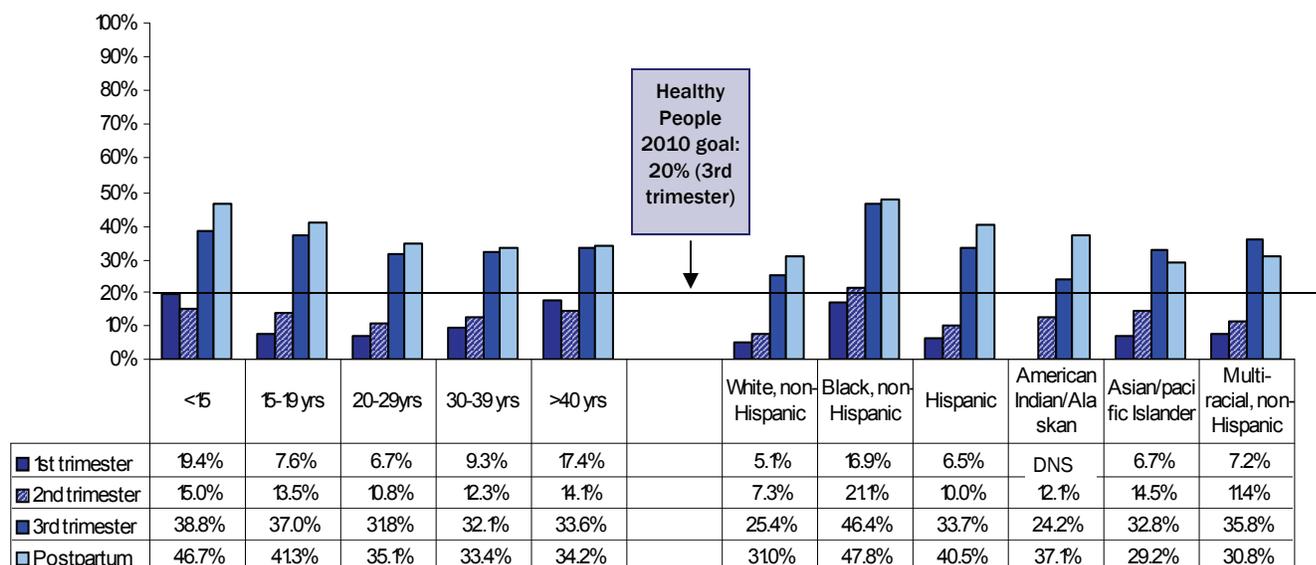
²Excludes records with unknown data and errors; frequency missing:2007 =12,032

⁶Based on 1990 MMWR, "Recommendations to prevent and control Iron deficiency in the United States;" adjusted for altitude and smoking

Amongst Michigan WIC enrollees, the prevalence of anemia during the 3rd trimester was 33%, a 9.1% increase from 2003 (Figure 19). The overall prevalence of maternal anemia among enrollees during 2007 was 17.8%, a 0.5% decrease from 2003. The prevalence of anemia in 2007 was highest among women who had enrolled at their post partum visit (36%) and lower for women who had enrolled prior to giving birth (13.5%).

MI PNSS & PedNSS Report 2003-2007

Figure 20 Prevalence of anemia by trimester by race/ethnicity or age among women enrolled in WIC, MI PNSS 2007 ^{1,2, 6}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors; frequency missing for age= 12307 and for race/ethnicity 12308

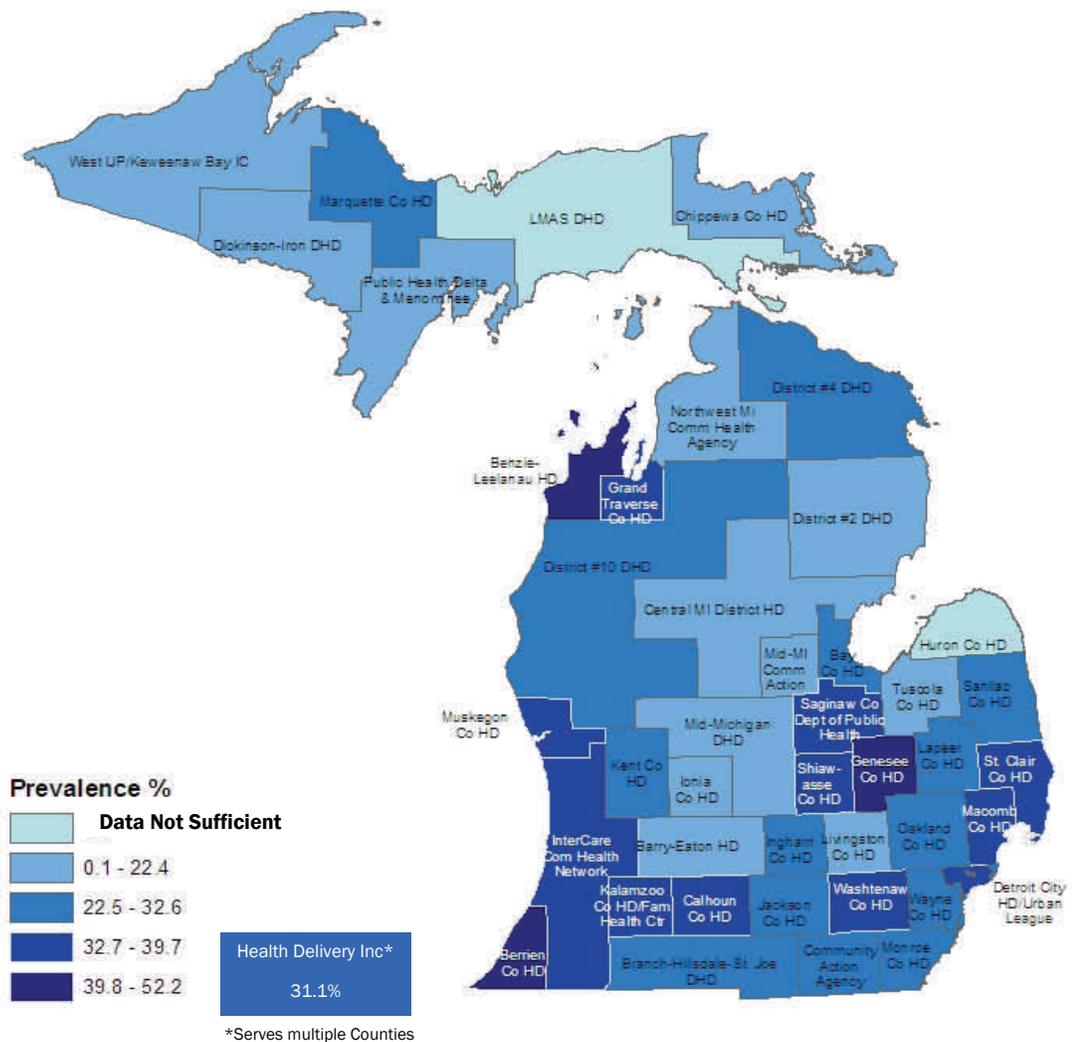
⁶Based on 1990 MMWR, "Recommendations to prevent and control Iron deficiency in the United States;" adjusted for altitude and smoking
DNS=Data not sufficient

The prevalence of anemia during the 3rd trimester exceeds the Healthy People 2010 objective of 20% for all racial/ethnic groups and age groups (Figure 20).

Among women who enrolled during their 3rd trimester in 2007, nearly half of all Black, non-Hispanic women (47.8%) were anemic (highest among race/ethnic categories). In contrast, fewer than one-quarter of American Indian/Alaska Native women that enrolled during their 3rd trimester were anemic (24.2%). Among the age groups, the prevalence of anemia during the 3rd trimester ranged from 31.8% among women ages 20-29 years to 38.8% for women less than 15 years.

The prevalence of anemia among women who enrolled during their 3rd trimester varied by agency (Figure 21). Public Health, Delta & Menominee had the lowest prevalence of 3rd trimester anemia (9.4%) and Benzie Leelanau Health Department reported the highest prevalence (52.2%). Both these health departments serve predominantly rural, White, non-Hispanic populations (96% and 77%).

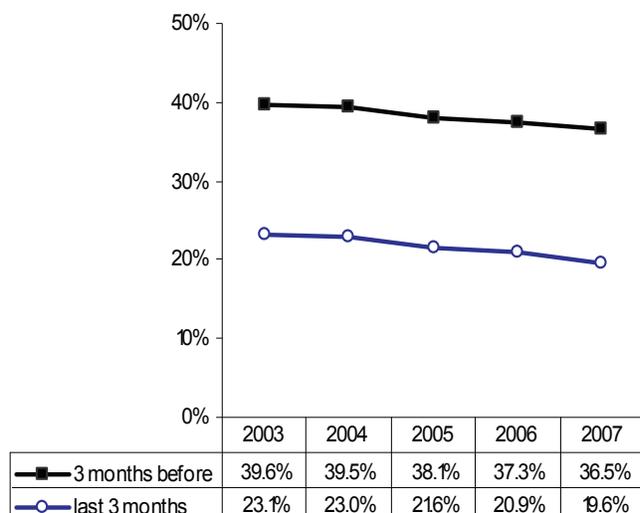
Figure 21: Prevalence of 3rd trimester anemia by local agency, MI PNSS 2007



Maternal Smoking

Smoking during pregnancy has been associated with an increased risk for low birthweight, spontaneous abortion, sudden infant death syndrome, still birth and long term negative effects on the infant (Cnattingius, 2004; U.S. Department of Health and Human Services, 2004). The nicotine in cigarettes may constrict the umbilical blood vessels, reducing the blood supply and oxygen to the developing baby (U.S. HHS, 2004). Smoking during pregnancy was found to account for 5% of infant deaths, primarily due to small-for-gestational age (Salihu, Aliyu, Pierre-Louis, & Alexander, 2003). The proportion of infant deaths due to maternal smoking was three times higher among American Indian infants than the national average (Salihu et al., 2003).

Figure 22 Trend of maternal smoking prevalence (before and during pregnancy among women enrolled in WIC, MI PNSS 2007 ^{1,2}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors frequency missing: smoking 3 months prior =21,774, smoking last 3 months of pregnancy =76836

The Healthy People 2010 objective is to reduce the prevalence of smoking during pregnancy to 1% (USHHS, 2000). To this end, the Michigan WIC program encourages abstaining from smoking and provides women information and referrals for smoking cessation services.

In PNSS, cigarette smoking is self-reported and may be underreported and subject to recall bias. If a woman reported smoking an average of one or more cigarettes per day, she was classified as a smoker.

The prevalence of smoking 3 months prior to pregnancy among women en-

rolled in the Michigan WIC program declined by 8% from 2003 to 2007 (Figure 22). Nearly one in every five women (19.6 %) smoked during the last 3 months of pregnancy; a 15% decrease from 2003. Of the 36.5% of women that reported smoking during the 3 months prior to their pregnancy, 38.6% were not smoking at the time of prenatal visit, while 34.1% quit and remained non-smokers. Nearly one quarter of women (24 %) who enrolled in WIC reported that they were smoking at their first prenatal visit and 22.1% were smoking at their postpartum visit.

HEALTHY PEOPLE 2010 OBJECTIVE

Increase the rate of Abstinence of smoking during pregnancy to 99% (USHHS, 2000)

The overall prevalence of smoking during the last trimester of pregnancy is 19.6% among women enrolled in Michigan's WIC program.

- Varied by agency
- Varied by race/ethnicity

Slightly more than one-third of smokers ceased tobacco use and remained non-users: an 11% increase from 2003 to 2007.

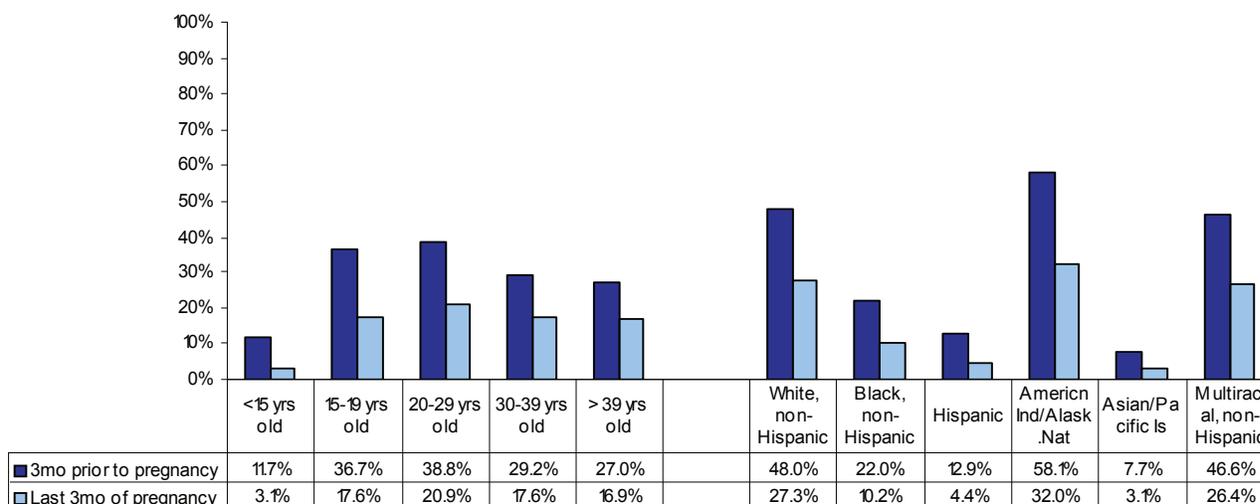
MI PNSS & PedNSS Report 2003-2007

Among racial/ethnic groups, Asian/Pacific Islander women reported the lowest prevalence of smoking during their 3rd trimester (3.1%), while American Indian/Alaska Native (32.0%) women reported the highest prevalence (Figure 23). There was little variation in the prevalence of 3rd trimester smoking by age group.

The prevalence of maternal smoking did vary by agency (Figure 24). The Keweenaw Bay Indian Community agency reported the highest prevalence of smoking during the 3 months prior to pregnancy (66.2%), the lowest prevalence of quitting smoking (19.1%) and the highest prevalence of smoking during the last trimester (45.9%). Women enrolled through the Detroit Urban league and Detroit Department of Health & Wellness Promotion had a lower prevalence of smoking 3 months prior to pregnancy and during the

3rd trimester (8.3% and 7.4% respectively) than women enrolled in other local agencies. Differences in maternal smoking prevalence among the agencies are likely due to differences in racial/ethnic distribution of the agencies as smoking rates differ by race/ethnicity (Figure 23). The distribution of race/ethnicity of the Keweenaw Indian Community agency is predominately Multiracial, non-Hispanic (52.8%) & American Indian/Alaska Native (30.6%); both groups with a high prevalence of maternal smoking (Figure 23). In contrast 77.5% of women enrolled through the Detroit Department of Health & Wellness Promotion agency were Black, non Hispanic and only 0.8% were American Indian/Alaska Native.

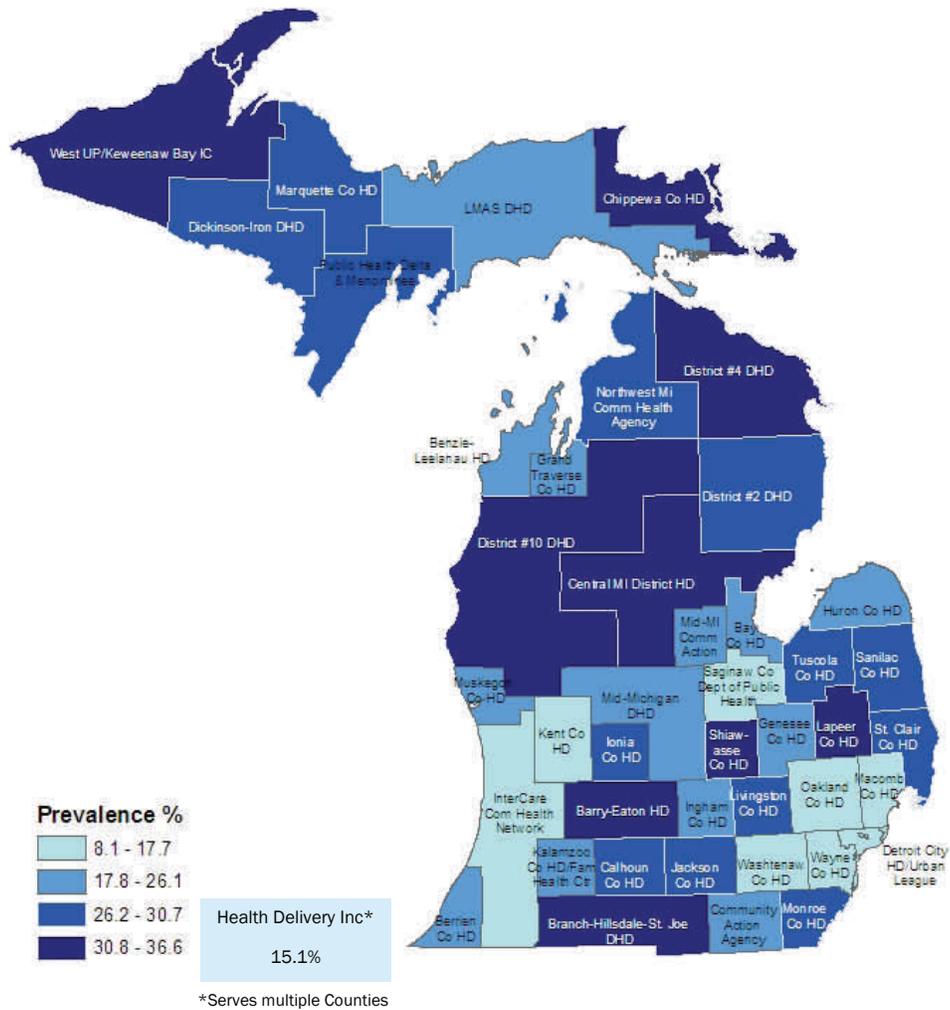
Figure 23 Prevalence of smoking (3 months prior to pregnancy and during the last 3 months of pregnancy) among women enrolled in WIC by age and race/ethnicity MI PNSS, 2007^{1,2}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors frequency missing: smoking 3 months prior & age =7754 & race/ethnicity =7744, smoking last 3 months of pregnancy & age = 16241 & race/ethnicity =16,233

Figure 24 Prevalence of smoking during the last trimester by local agency, MI PNSS 2007



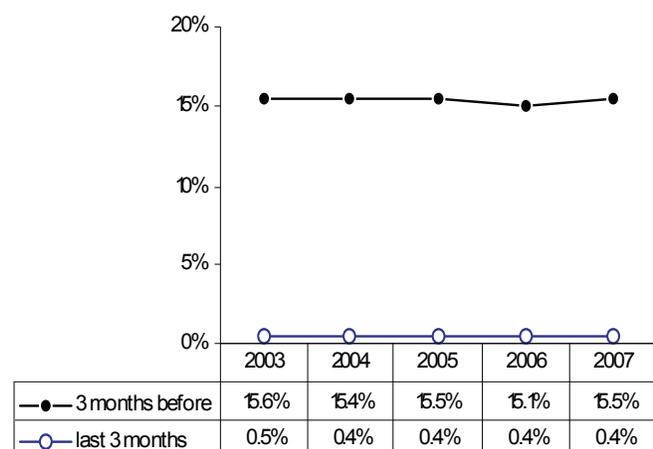
Maternal Drinking

According to the CDC, there is no known safe amount of alcohol to drink during pregnancy. It is recommended that women should not drink alcohol if they are pregnant, planning to become pregnant or are sexually active and not using birth control (CDC, 2009). Alcohol rapidly enters the fetal circulation through the umbilical cord to the developing fetus; it also enters maternal milk. Drinking more than 6 ounces of alcohol per day while pregnant was found to be associated with a 20% risk of the infant having fetal alcohol syndrome (Benson, Pernell 1994). Alcohol consumption during pregnancy can cause miscarriage, stillbirth, and a variety of lifelong disorders known as Fetal Alcohol Spectrum Disorders (FASD) (CDC, 2009). FASD is characterized by a variety of clinical signs and behaviors such as

abnormal facial features, learning disabilities, low body weight, speech & language delays, hyperactive behavior and difficulty paying attention, among others. Care of those with Fetal Alcohol Syndrome (excluding FASD) has been estimate to cost the United States \$4.0 billion annually (Lupton, Burd, & Harwood, 2004).

During WIC enrollment, women are asked on average how many drinks per week they consumed 3 months prior to pregnancy and during the last 3 months of pregnancy. A drink is defined as one glass of wine, wine cooler, can or bottle of beer, a shot of liquor or mixed drink. Because the data is self-reported, it is subject to underreporting and recall bias. In addition, 35% of the data for drinking during the last 3 months of pregnancy was missing in 2007.

Figure 25 Trend of maternal drinking prevalence (before and during pregnancy) among women enrolled in WIC, MI PNSS 2003-2007 ¹⁻²



In 2007, 13.3% of women enrolled in WIC reported drinking prior to pregnancy, while 0.3% reported drinking during their final trimester of pregnancy (Figure 25). These rates have remained fairly stable from 2003 through 2007. The prevalence of drinking prior to pregnancy is lowest among teens less than 15 years of age (2.2%) and those 15-17 years of age (6.1%) when compared to women ages 20-29 (17.9%). American Indian/Alaska Native women had the highest reported prevalence of alcohol consumption prior to pregnancy (31.4%); Asian/Pacific Islander women had the lowest (4.6%).

¹Recording period is January 1st through December 31st

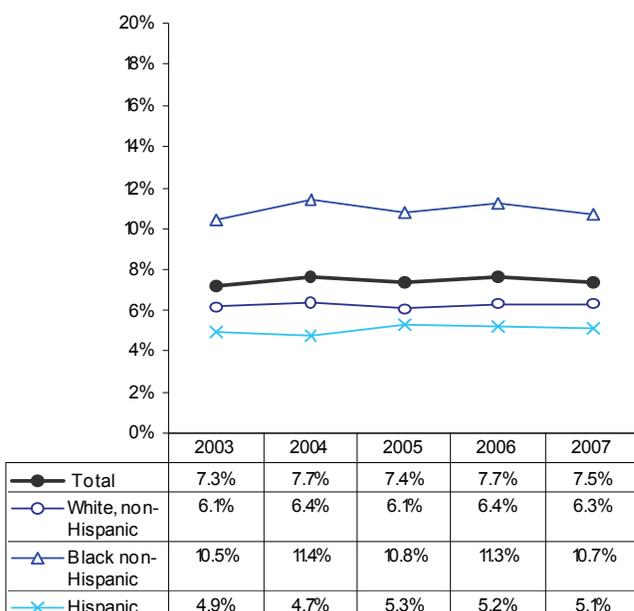
²Excludes records with unknown data and errors frequency missing: drinking 3 months prior = 75,135 drinking last 3 months of pregnancy 81,125 (~26% missing)

Pediatric Health Indicators

Infant Birthweight-Low

Low birthweight, defined as birthweight less than 2,500 grams, is an important medical risk for neonatal and post-neonatal mortality. Low birthweight infants who survive are at increased risk for a variety of health problems including neurodevelopmental disabilities and respiratory disorders. In addition, low birthweight infants may gain excessive weight, which has been associated with development of obesity, hypertension, insulin resistance and risk for later cardiovascular disease (Casey, 2008; Euser et al., 2005; Barker, 2004; Hales & Ozanne,

Figure 26 Trends in low birthweight incidence by race among infants enrolled in WIC 2003-2007 MI PNSS 2003-2007 ^{1-3, 7}



¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors frequency missing =66,418

³ Analyses based on one record per child.

⁷Low birthweight (lbw) < 2,500 grams regardless of gestational age

2003; Regan, Cutfield, Jefferies, Robinson, & Hofman, 2006; Law et al., 2002; Barker et al., 1989). *Healthy People 2010* established a target incidence of 5% for low birthweight (U.S.H.H.S., 2000), a goal yet to be attained in the Michigan or National PNSS population.

Birthweight is reported in both PNSS and PedNSS; PNSS reports infant demographics for infants born to mothers 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.

HEALTHY PEOPLE 2010 OBJECTIVE

Reduce the incidence of low birthweight to 5% (US HHS, 2000)

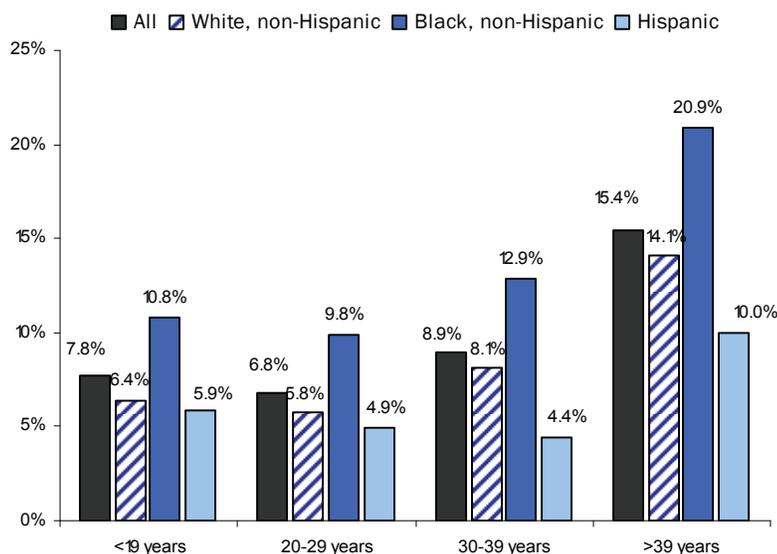
Incidence among babies born to:

- **Hispanic mothers (5.1%)**
- **Mothers who enrolled in WIC during their 1st trimester (5.0%)**
- **Women 20-29 years old (6.8%)**
- **Mothers who didn't smoke during the 3rd trimester (6.8%)**

In 2007, the incidence of low birthweight in Michigan PNSS population was 7.5%, lower than the National PNSS rate of 8.3% (Reinhold et al., 2009). The overall incidence of low birthweight among Michigan PNSS has increased 2.7% from 2003 to 2007 (Figure 26). However, racial disparities are present among Black, non-Hispanics as the rate remains unacceptably high. 10.7% of all Black, non-Hispanic infants weighed less than 2,500 grams, compared to 5.1% of Hispanic infants and 8.3% of White, non-Hispanic infants.

MI PNSS & PedNSS Report 2003-2007

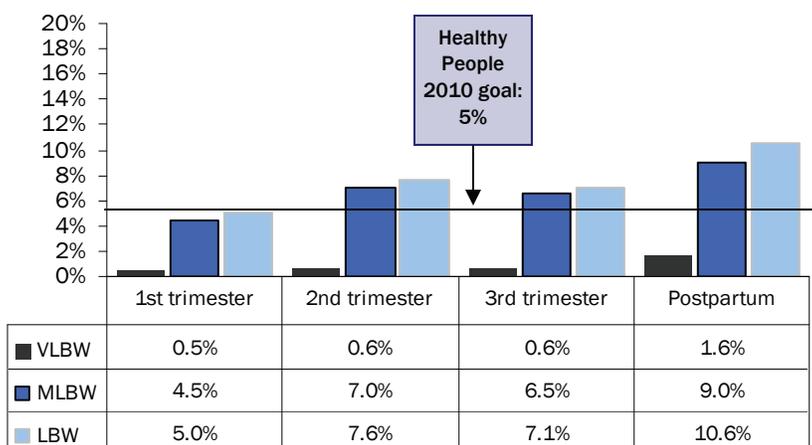
Figure 27 Incidence of low birthweight among infants enrolled in WIC 2007 by maternal age and by maternal race/ethnicity, MI PNSS 2007^{1-3,7}



Results of the analysis of low birthweight by selected maternal factors is shown in Figures 27-30 and Table 10. Overall, low birthweight incidence is highest among Infants born to mothers older than 39 years and lowest among women ages 20-29 years (Figure 27). Racial disparities are also evident; Black, non-Hispanic women reported the highest incidence of low birthweight infants among all age groups. The highest incidence (20.9%) was found among Black, non-Hispanic women over the age of 39 years and lowest (4.4%) among Hispanic women ages 30-39 years.

Figure 28 Incidence of low birthweight among infants enrolled in WIC by maternal trimester of entry into WIC, MI PNSS 2007^{1-3,7}

Infant low birthweight incidence was lower among women who enrolled in WIC during their 1st trimester (5.0%) compared to women who enrolled later (Figure 28), lending support to early WIC enrollment for expecting mothers.

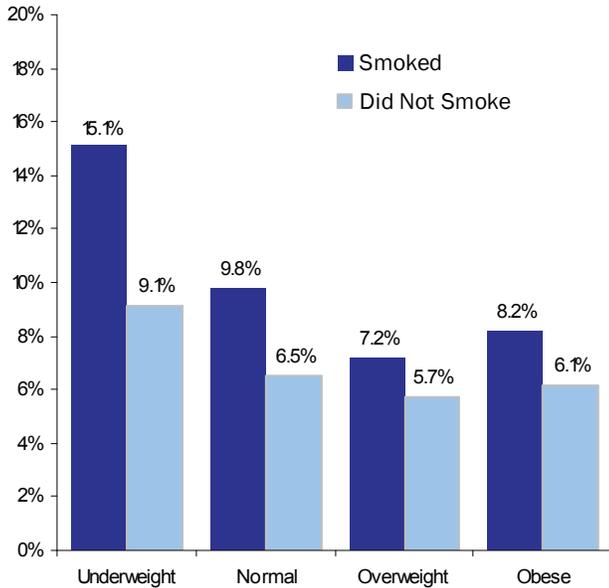


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors = 16,204

³ Analyses based on one record per child. ⁷Low birthweight (lbw) < 2,500 grams, moderately low birthweight (mlbw) < 2,500 g and > 1,500g, very low birthweight < 1,500- regardless of gestational age

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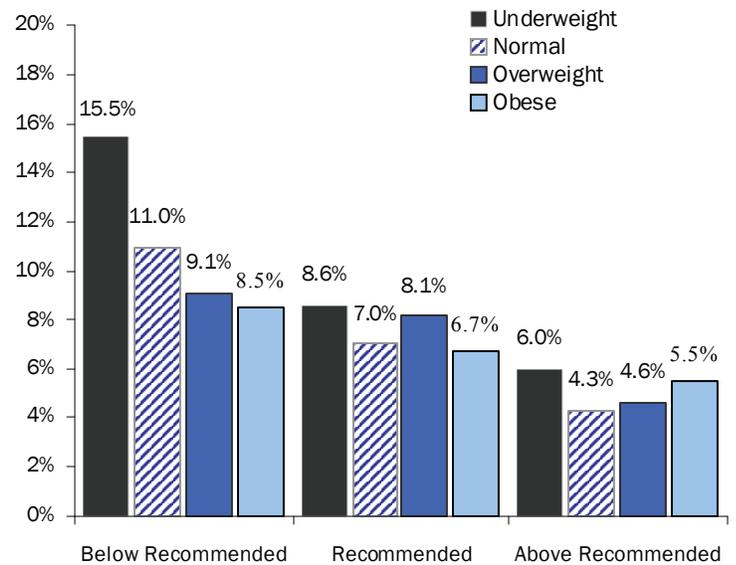
Figure 29 Incidence of low birthweight among infants enrolled in WIC by maternal prenatal BMI and smoking MI PNSS 2007^{1-3,7}



Low birthweight incidence was highest among babies born to mothers who were smokers and/or underweight (Figure 29), therefore, concluding that maternal smoking during pregnancy and maternal prenatal BMI are associated with low birthweight.

Underweight women, or those who gained less than the IOM recommendations, had a higher incidence of low birthweight (Figure 30). Low birthweight incidence was especially high among women who were underweight and gained less than the recommend weight during their pregnancies. Maternal prenatal weight and gestational weight gain affect the infant's birthweight.

Figure 30 Incidence of low birthweight among Michigan infants enrolled in WIC by maternal prenatal BMI and maternal weight gain, MI PNSS 2007^{1-3,7}



¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing for Figure 29 = 19,586 and for Figure 30 = 16632

³ Analyses based on one record per child. ⁷Low birthweight (lbw) < 2,500 grams

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The incidence of low birthweight varied by agency ranging from 10.8% among enrollees at the Detroit Urban League to 3.9% among infants enrolled at the Western Upper Peninsula District Health Department (Table 9 and Figure 31). Several agencies achieved the *Healthy People 2010* objective but efforts continue throughout all of Michigan to lower rates overall.

Table 9 Incidence of low birthweight among Michigan infants enrolled in MI WIC by local agency, MI PNSS 2007 ¹

Highest Incidence of Low Birthweight	
Agency	%
Detroit Urban League	10.8%
Saginaw County Dept PH	9.8%
Detroit Dept. of Health & Wellness Promotion	9.6%
Kalamazoo Family Health Center	9.0%
Genesee County HD	9.0%
Lowest Incidence of Low Birthweight	
Agency	%
Monroe County HD	5.1%
Huron County HD	4.9%
Luce-Mackinac-Alger-Schoolcraft DHD	4.9%
Chippewa County HD	4.4%
Western Upper Penin DHD	3.9%
2007 MI PNSS	

¹LBW < 2,500 grams regardless of gestational age

Table 10 Adjusted Odds ratio estimates for Low Birthweight by maternal factors MI PNSS 2007 ^{1-3,7}

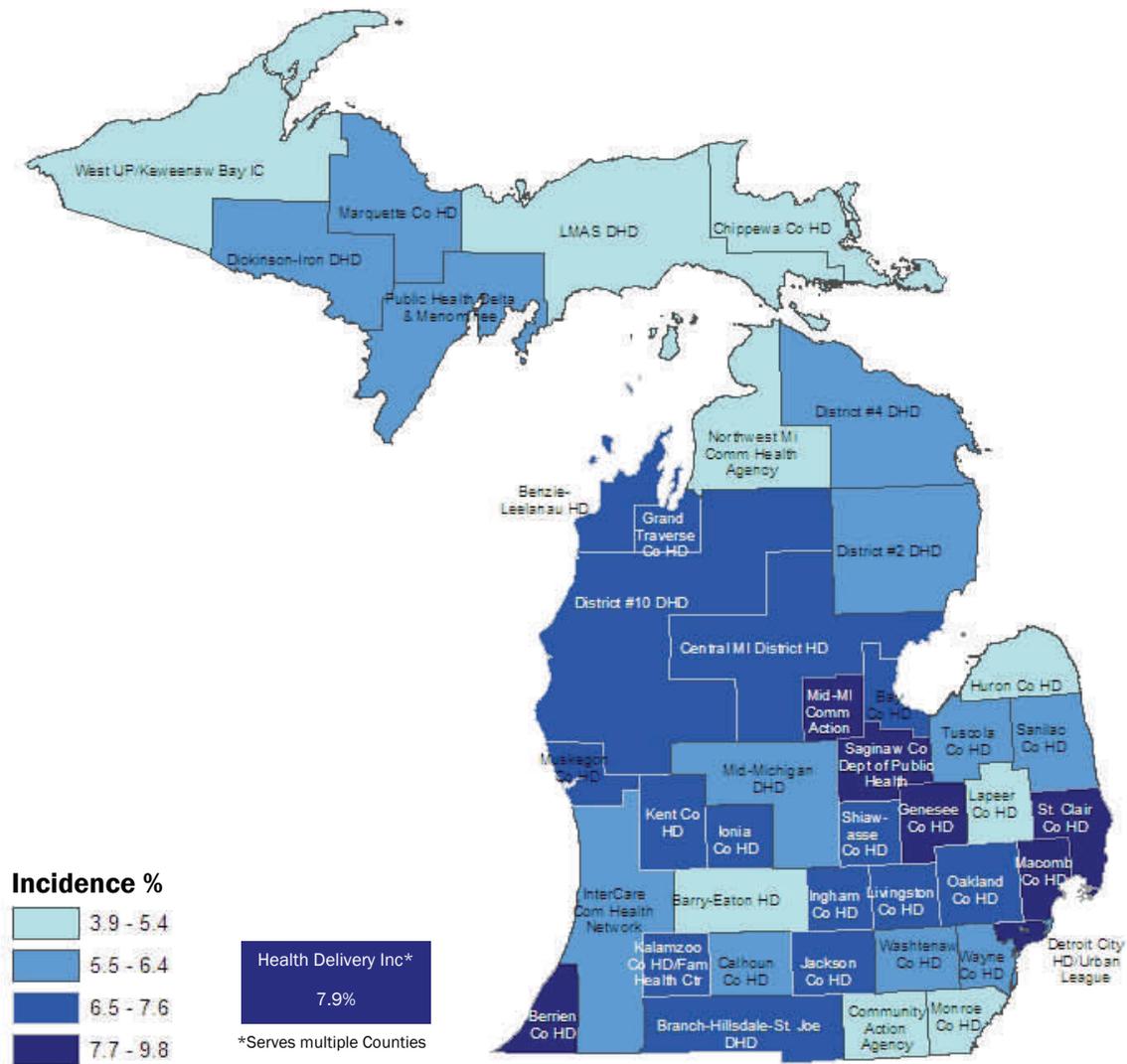
Adjusted Odds Ratio Estimates for Low Birthweight			
Effect	Point Estimate	95% Wald Confidence	
30-39years old	1.341	1.212	1.484
40 years and older	2.111	1.560	2.856
20-29 years old	1.000		
Black, non-Hispanic	1.772	1.625	1.932
White, non-Hispanic	1.000		
Education < High School	1.139	1.015	1.280
Education > High School	1.000		
2nd Trimester WIC enrollment	1.502	1.349	1.672
3rd trimester WIC enrollment	1.396	1.230	1.586
Post partum WIC enrollment	2.064	1.830	2.328
1st trimester WIC enrollment	1.000		
Maternal Prenatal BMI Underweight	1.414	1.261	1.584
Maternal Prenatal BMI Normal	1.000		
Maternal pregnancy weight gain less than recommended	1.490	1.357	1.636
Maternal pregnancy weight gain recommended	1.000		
Smoking last trimester	1.669	1.522	1.830
Non-smoker during last trimester	1.000		

Maternal Factors that increased the odds of a low birthweight infant (Table 10)

- Age 40 years and older - increased odds more than twice that of a 20-29 year old woman
- Black, non-Hispanic race- nearly twice that of White, non-Hispanic race
- WIC enrollment during the 2nd trimester -1.5 times that of enrollment during the 1st trimester
- Underweight prenatal BMI- 1.4 times that of normal weight women
- Pregnancy weight gain less than ideal nearly 1.5 times that of a women who gained the ideal amount during pregnancy
- Smoking during the last trimester more than 1.5 times that of non-smoker

Multinomial regression of low birthweight vs. normal birthweight infant. Model includes: Maternal age, Maternal race & ethnicity, Maternal educa-

Figure 31 Incidence of infant low birthweight by local agency, MI PNSS 2007

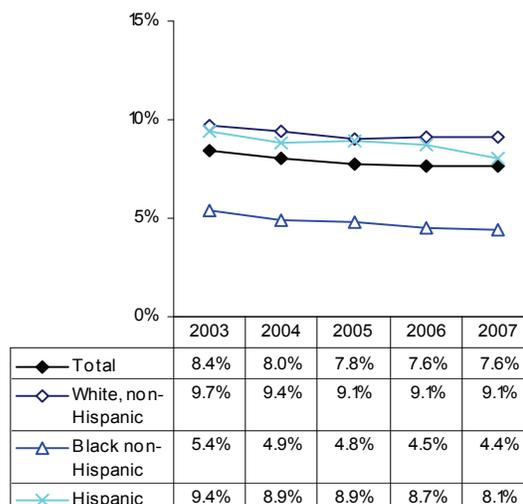


Infant Birthweight-High

High birthweight, or weighing more than 4,000 grams at birth, is associated with prolonged labor, increased likelihood of surgical delivery (Siggelkow, Boehm et.al, 2008a), shoulder dystocia, skeletal fractures and brachial plexus injury (Melendez, Bhatia, Callis, Woolf, & Yoong, 2009). Large for gestational age fetuses can be due to genetic variation, excessive growth secondary to overweight mothers, excessive maternal weight gain during pregnancy, gestational diabetes or insulin-dependent diabetes mellitus (Kramer et al., 2002). The incidence of high birthweight among infants enrolled in WIC in 2007 was 7.6%, a 9.7% decline from 2003 (Figure 32).

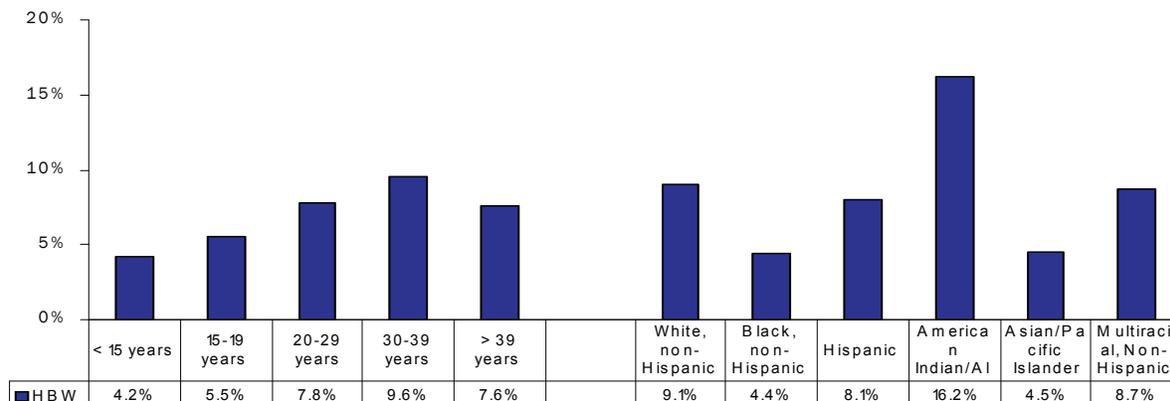
The incidence of high birthweight differs when analyzed by race/ethnicity (Figures 32-33). The high birthweight incidence was lowest among Black, non-Hispanic infants (4.4%), which was an 18.5% decline from 2003. The highest incidence was found among

Figure 32 Trend high birthweight incidence by race/ethnicity among infants enrolled in WIC, MI PNSS 2007 ^{1-2, 8}



American Indian/Alaska Native infants (16.2%). High birthweight incidence was highest among women ages 30-39 years compared to other age groups.

Figure 33 Incidence of high birthweight by maternal age group and race/ethnicity among infants enrolled in WIC, MI PNSS 2007 ^{1-2, 8}

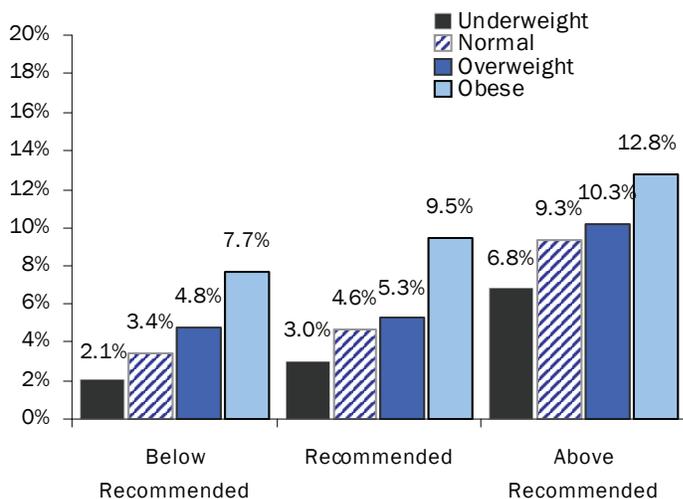


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing for Figure 32=66,418, for Figure 33 race/ethnicity =14,101, for age =14,109

³Analyses based on one record per child, born during the reporting period ⁸High birthweight > 4,000 grams regardless of gestational age

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Figure 34 Incidence of high birthweight by maternal prenatal BMI and maternal gestational weight gain among infants enrolled in WIC, MI PNSS 2007^{1-5, 8}



Women who were overweight or obese had a higher incidence of infant high birthweight (Figure 34). High birthweight incidence was especially high among women who were overweight or obese and gained more than the recommend weight during their pregnancies.

Among local WIC agencies, the Sanilac County Health Department (4.0%) reported the lowest incidence of high birthweight, while the Benzie-Leelanau County Health Department (15.1%) reported the highest (Table 11).

Table 11 Incidence of high birthweight among Michigan infants enrolled in WIC by local agency, MI PNSS 2007⁸

Highest Incidence of High Birthweight	
Agency	%
Benzie-Leelanau DHD	15.1%
Chippewa County HD	14.0%
District Health Dept. #2	12.1%
Luce-Mackinac-Alger-Schoolcraft DHD	11.9%
Huron County HD	11.5%
Lowest Incidence of High Birthweight	
Agency	%
Detroit Urban League	5.8%
St. Clair County HD	5.7%
Detroit Dept. of Health & Wellness Promotion	5.2%
Health Delivery, Inc.	4.5%
Sanilac County HD	4.0%
2007 MI PNSS	

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing = 16,632

³Analyses based on one record per child, born during the reporting period ⁴ Based on 1990 IOM report, "Nutrition During Pregnancy"

⁵Based on 1990 IOM report "Nutrition during pregnancy": underweight pregnancy (ideal weight gain is 28 to 40 lbs), normal weight pregnancy (ideal weight gain is 25 to 35 lbs, overweight pregnancy (ideal weight gain 15 to 25 lbs) and obese pregnancy (ideal weight gain 15 to 25 lbs). ⁸High birthweight > 4,000grams regardless of gestational age

Breastfeeding Initiation and Duration

Breastfeeding has both short and long term benefits for children in such areas as infectious diseases, inflammatory diseases, neurological development and cancer prevention (Schack-Nielsen & Michael- sen, 2007; Martin KM 2005). Though research to date has been inconclusive, it does suggest a mod- est protective effect of breastfeeding on childhood obesity (Stettler, 2007; Horta, Victora, Menezes, & Barros, 1997). Despite the lack of consensus , other benefits of breastfeeding have been well docu- mented and the Michigan WIC program continues to encourage participants to breastfeed.

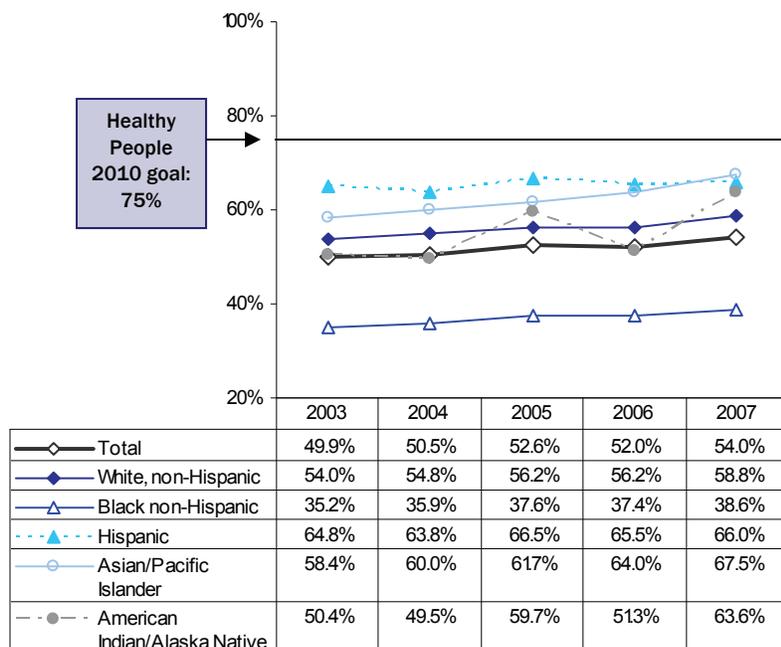
Healthy People 2010 established a target breastfeeding prevalence: 75% of all mothers should be breastfeeding during the early postpartum period, 50% at 6 months and 25% should be breastfeeding to 12 months (U.S. Depart- ment of Health and Human Services, 2000). In addition, the Michigan WIC program's five year plan established goals to increase the prevalence of breastfeeding initiation to 57% and breastfeeding for 6 months to 25% by the year 2008. In 2007, the prevalence of infants ever breastfed

HEALTHY PEOPLE 2010 OBJECTIVE

Increase the prevalence of breastfeeding initiation to 75%

- Three local agencies achieved this goal: Macomb, Grand Traverse and Wayne County Health Departments (USHHS, 2000)

Figure 35 Trend of breastfeeding initiation prevalence by maternal race and ethnicity among infants enrolled in WIC, MI PNSS2003- 2007 ¹⁻³



among the PNSS cohort was 64.7% Nationally and 54.0% in Michigan. Although the prevalence of breast- feeding remains below the Healthy People 2010 recommendations, rates continue to improve. For in- stance, the prevalence of breast- feeding initiation among Black, non- Hispanic women increased by 9.3% from 2003 to 2007, while the over- all prevalence increased by 8.9% (Figure 35).

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing =67,020. ³ Analyses based on one record per infant

MI PNSS & PedNSS Report 2003-2007

The prevalence of breastfeeding for at least 6 months among the national PedNSS cohort was 25.4% and 17.5% of infants were breastfed to 12 months. Among infants enrolled in WIC during 2007, the prevalence of breastfeeding to 6 months was 15.3% (a 3.8% increase from 2003) and 12.4% were breastfed to 12 months (a 5% increase from 2003). The prevalence among Black, non-Hispanic children increased by 15.4% (Figure 36). A majority of breastfeeding women in the Michigan WIC Program discontinue breastfeeding between months two and three after initiation (Figure 37).

Figure 36 Trend of breastfeeding for 6 months by race and ethnicity among infants enrolled in WIC, MI PedNSS 2003-2007 ¹⁻³

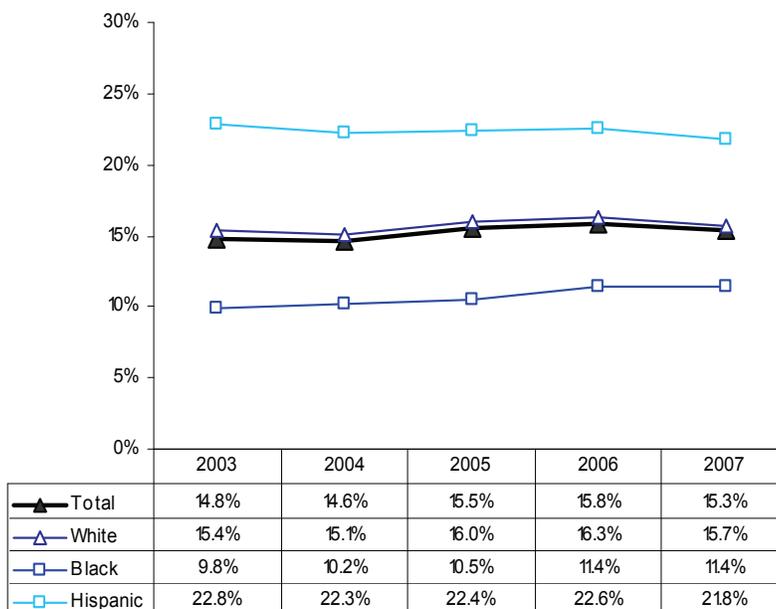
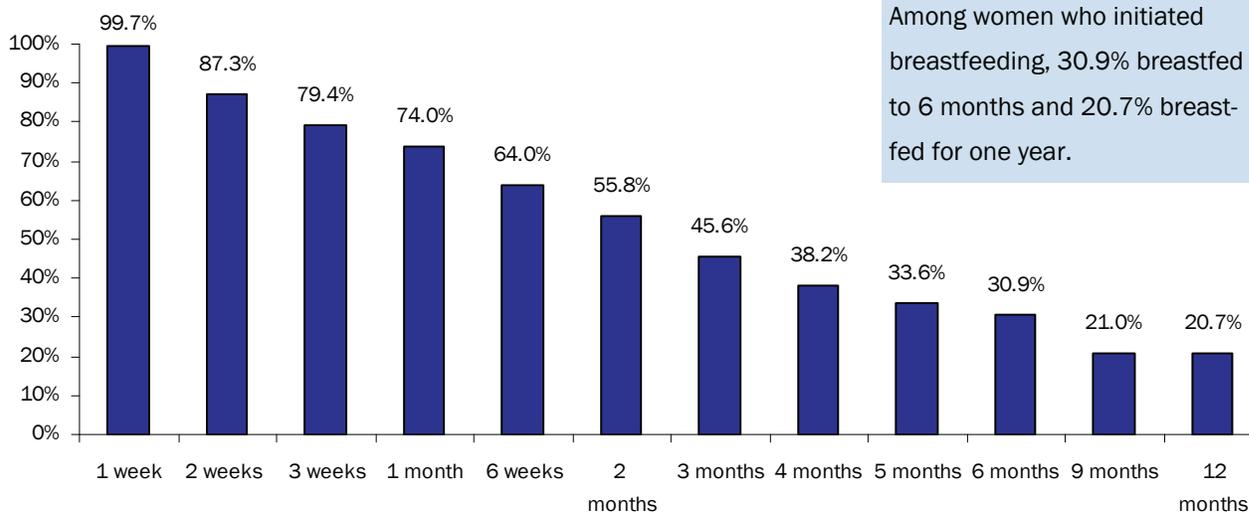


Figure 37 Prevalence of breastfeeding duration among women who were enrolled in WIC during 2007 and who initiated breastfeeding, MI PedNSS/PNSS 2007¹⁻³

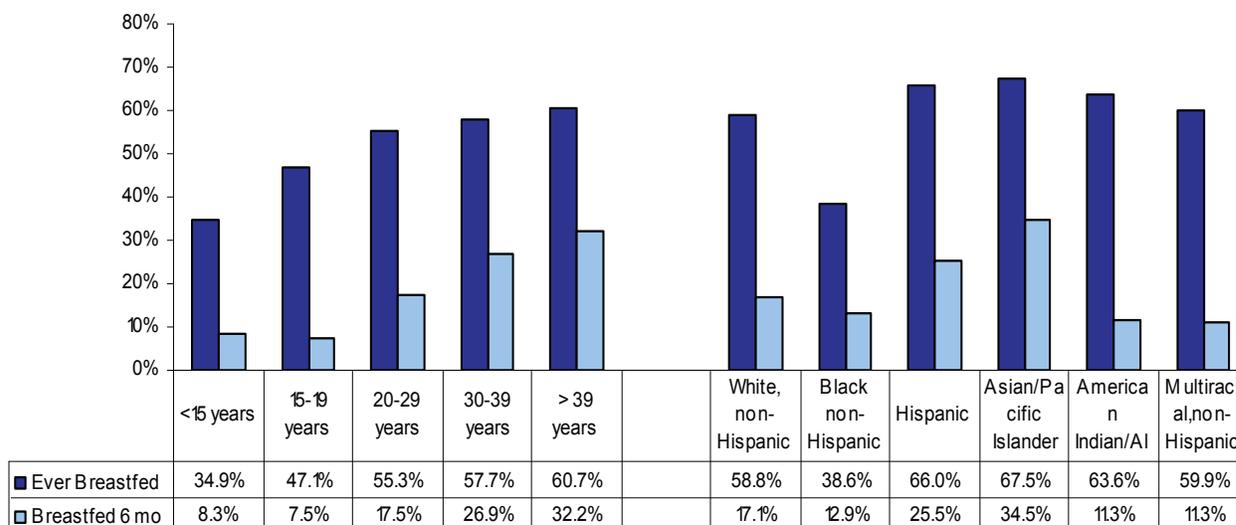


¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. ³Analyses based on one record per child.

MI PNSS & PedNSS Report 2003-2007

Breastfeeding rates varied by both maternal age and race/ethnicity. In general, the prevalence of breastfeeding increased with maternal age (Figure 38). Women 39 years and older had the highest prevalence of breastfeeding ever (60.7%) and breastfeeding to 6 months (32.2%) when compared to younger women. Approximately one-third of teens under the age of 15 breastfed their babies. Breastfeeding was most prevalent among Asian/Pacific Islander (67.5%), Hispanic (66%) and American Indian/Alaska Native (63.6%) women. Black, non-Hispanic women had the lowest prevalence of breastfeeding (38.6%). Asian/Pacific Islander (34.5%) and Hispanic (25.5%) women had the highest prevalence of breastfeeding to 6 months, while American Indian/Alaska Native and Multiracial women had the lowest (both 11.3%).

Figure 38 Prevalence of being breastfed ever and for 6 months among infants whose mothers enrolled in MI WIC 2007 by maternal race/ethnicity and age MI PedNSS/PNSS, 2007 ¹⁻³



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

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Table 12 outlines the prevalence of breastfeeding initiation and breastfeeding to 6 months by selected maternal characteristics. Breastfeeding rates increased with age and were highest among women over 39 years of age. Rates tended to be higher among women with at least 12 years of education (52.7% and above). 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. Fewer women that gained greater than the ideal amount of weight during pregnancy (15.3%) breastfed to 6 months compared to women who gained the ideal amount (18.4%) or less (17.6%).

Women who enrolled in WIC during their 1st trimester (19.0%) were more likely to breastfeed for 6 months than women who enrolled postpartum (13.6%). Although 57.5% of women who smoked during their last trimester initiated breastfeeding, only 6.3% breastfed their infants to 6 months. Finally, less than half (45.3%) of women with anemia during pregnancy initiated breastfeeding, while fewer than 15% breastfed to 6 months.

Table 12 Prevalence of breastfeeding initiation and breastfed to 6 months among infants whose mothers enrolled in Michigan WIC in 2007 by selected maternal characteristics, MI PedNSS/PNSS 2007 ¹⁻³

	Ever Breastfed %	Breastfed 6 mo %
Maternal Education		
<9 years	57.9%	22.6%
9-11 years	40.9%	9.5%
12 years	52.7%	14.7%
13-15 years	65.8%	23.8%
16+ years	81.2%	40.5%
Maternal Prenatal BMI		
Underweight	50.7%	13.6%
Normal weight	54.9%	17.8%
Overweight	54.0%	18.5%
Obese	52.0%	15.6%
Maternal Weight Gain		
Less than ideal	51.9%	17.6%
Ideal	54.2%	18.4%
Greater than ideal	54.0%	15.3%
Smoking 3rd Trimester		
No	57.5%	19.5%
Yes	42.8%	6.3%
Anemia 3rd Trimester		
No	52.5%	15.9%
Yes	42.1%	11.3%

2007 MI PedNS/PNSS

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

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Table 13 Prevalence of ever breastfed among infants enrolled in WIC 2007 by local agency, MI PNSS 2007

Highest prevalence of Breastfeeding Initiation	
Agency	%
Macomb County HD	93.5%
Grand Traverse County HD	80.8%
Wayne County HD	75.2%
Northwest MI Comm Health Agency	73.3%
Benzie-Leelanau DHD	72.0%

Lowest prevalence of Breastfeeding Initiation	
Agency	%
Muskegon County HD	43.4%
Health Delivery, Inc.	42.2%
Genesee County HD	40.9%
Detroit Urban League	39.1%
Detroit Dept. of Health & Wellness Promotion	38.1%

MI PNSS 2007

Table 14 Prevalence of breastfed to 6 months among infants enrolled in WIC 2007 by local agency, MI PNSS/PedNSS 2007

Highest prevalence of Breastfeeding to 6 months	
Agency	%
Benzie-Leelanau DHD	42.9%
Wayne County HD	41.1%
Macomb County HD	39.5%
Grand Traverse County HD	35.4%
Washtenaw County HD	29.9%

Lowest prevalence of Breastfeeding to 6 months	
Agency	%
St. Clair County	9.5%
Tuscola County HD	9.3%
District Health Dept. #2	8.9%
Calhoun County HD	7.8%
Genesee County HD	6.8%

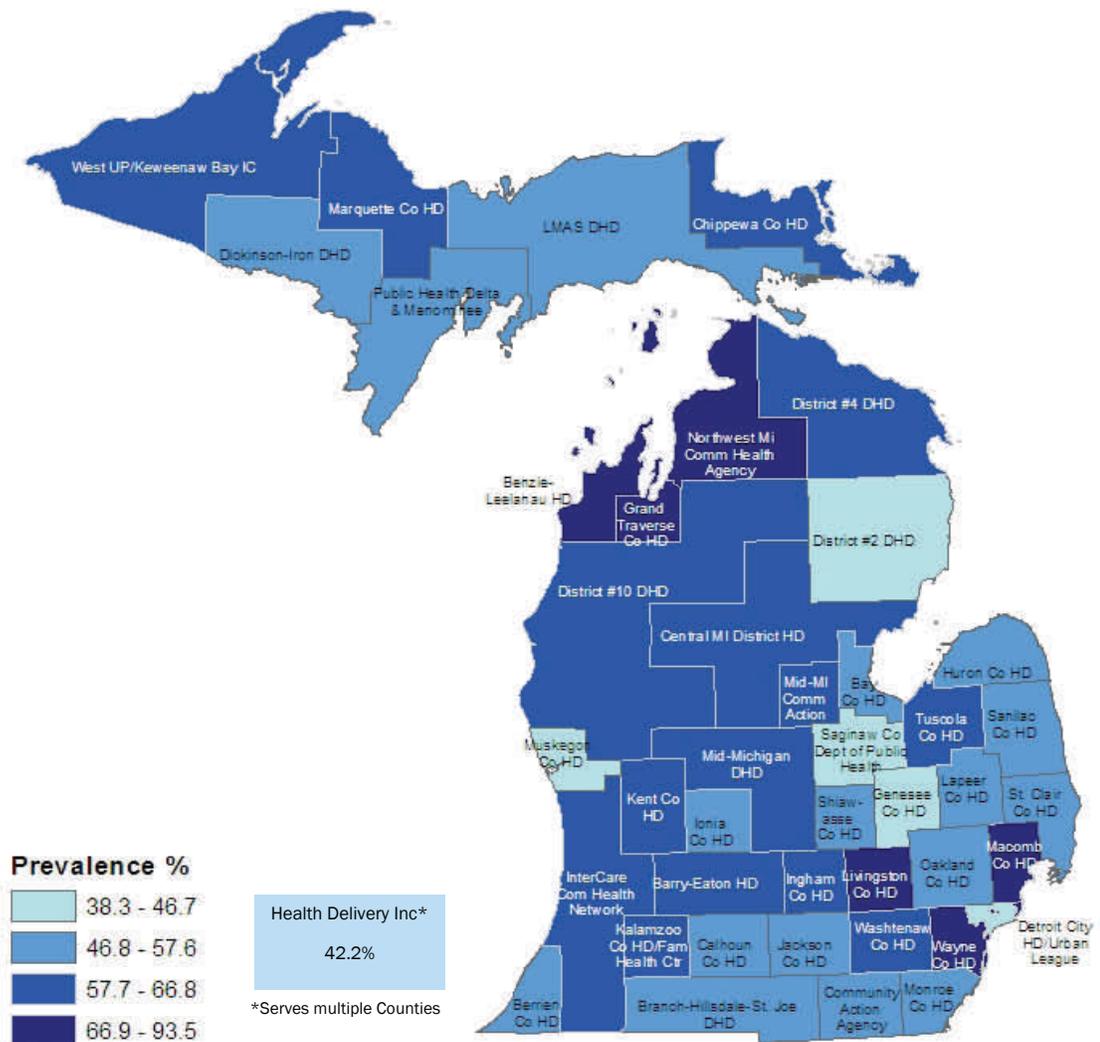
MI PNSS 2007

Three agencies exceeded the Healthy People 2010 objective for breastfeeding initiation (Table 13 and Figure 39). The Macomb County Health Department reporting 93.5 % of women initiated breastfeeding; the lowest prevalence of breastfeeding initiation was reported by the Detroit Department of Health and Wellness Promotion (38.1%).

The Benzie-Leelanau District Health Department reported the highest prevalence (42.9%) for 6 months duration of breastfeeding (Table 14 and Figure 40). In contrast, the Genesee County Health Department reported the lowest prevalence of breastfeeding for 6 months (6.8%). Data for breastfeeding initiation are from infants born to mothers who enrolled in WIC during 2007 (PNSS). Data for 6 months duration are from infants with breastfeeding data in PedNSS and whose mothers were enrolled in WIC during 2007.

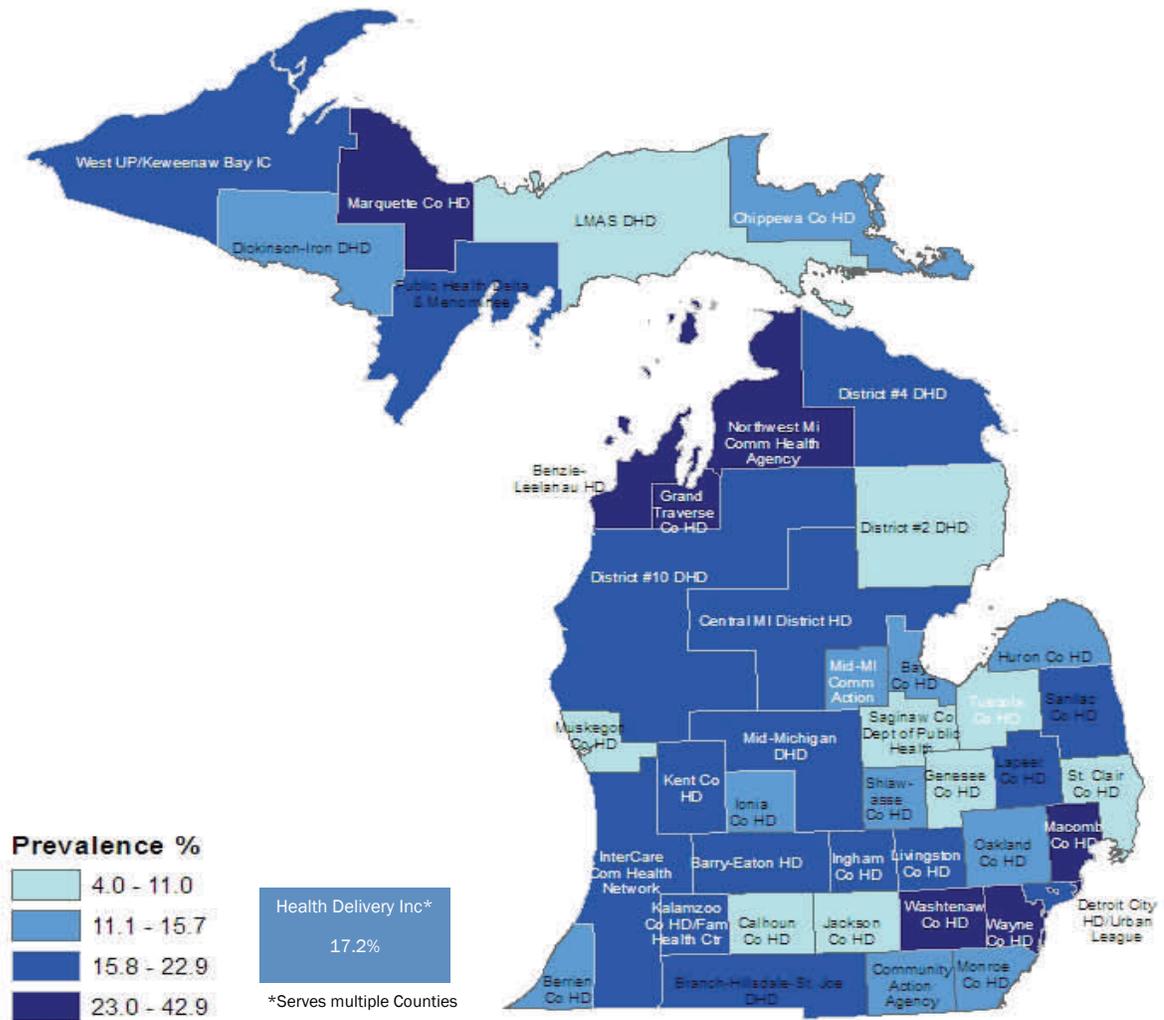
¹Recording period is January 1st through December 31st. ²Excludes records with unknown data and errors. ³Analyses based on one record per child.

Figure 39 Prevalence of breastfed (ever) by local agency, MI PNSS 2007



MI PNSS & PedNSS Report 2003-2007

Figure 40 Prevalence of breastfed to 6 months by local agency, MI PedNSS/PNSS 2007

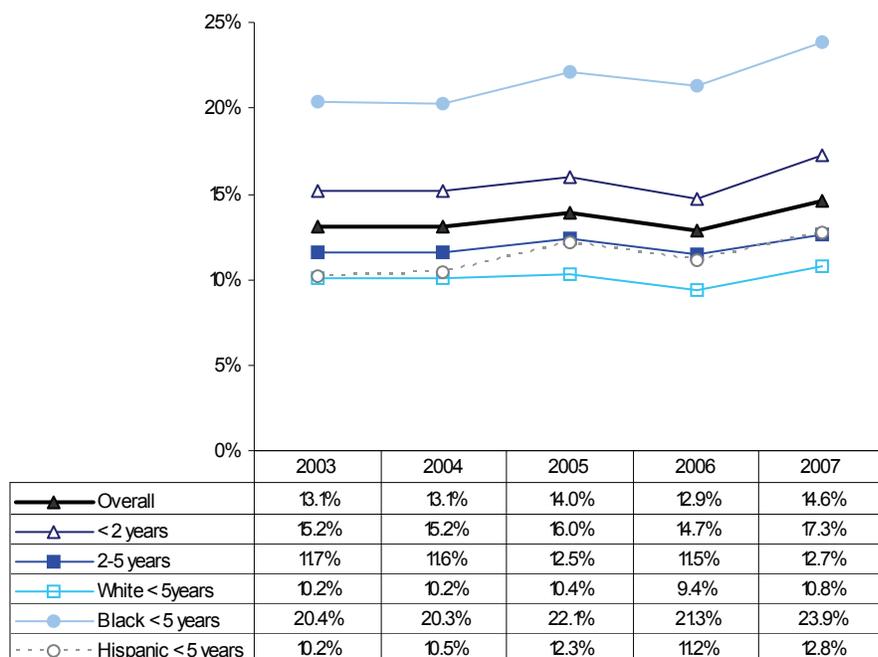


Anemia

Anemia (decreased number of red blood cells or decreased hemoglobin) may be related to nutritional deficiencies of vitamins B₁₂, B₆, C, folate, copper or iron and other conditions such as thalassemias, sickle cell disease, bone marrow suppression or lead poisoning. In children, anemia is associated with poverty, malnutrition, malabsorption and inadequate dietary intake. Children enrolled in WIC are, by definition, at ‘nutritional risk’ thus a higher prevalence of anemia may be expected. Of the nutritional deficiencies, iron deficiency has been associated with poorer motor function in infants (Shafir, Angulo-Barroso, Calatroni,

Jimenez, & Lozoff, 2006) and poorer infant social-emotional behavior (Lozoff et al., 2006). WIC infants and children are not tested specifically for iron deficiency but either their hematocrit (Hct) (% of red blood cells in the blood) or hemoglobin (Hb) (attached to red blood cells and carries oxygen to the tissues) is measured and adjusted for clinic altitude. In PedNSS, children aged 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 11.1 g/dl or their Hct is less than 33.0%.

Figure 41 Trend of pediatric anemia prevalence among children < 5 years enrolled in WIC by age group, MI PedNSS 2003-2007^{1-3, 9}



The prevalence of anemia in children remains high within the Michigan WIC cohort (14.6%) especially among children under 2 years of age (17.3%) (Figure 41). From 2003 to 2007, the prevalence of anemia among all children 5 years and younger enrolled in Michigan’s WIC program increased by 11.3%.

In 2007 the prevalence of anemia among Black, non-Hispanic children (23.9%) was more than double that of White, non-Hispanic children (10.8 %).

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. ³ Analyses based on one record per child. ⁹ Based on 1998 CDC MMWR, "Recommendations to Prevent and Control Iron Deficiency in the United States", altitude adjusted.

MI PNSS & PedNSS Report 2003-2007

The prevalence of anemia among children whose mothers enrolled in WIC during their 1st trimester was lower than among mothers who enrolled later (Figure 42). This was true for Black, non-Hispanic women, White, non-Hispanic women and women overall. (Data was insufficient to analyze the effect of WIC enrollment for other racial and ethnic groups).

Because of racial disparities in anemia prevalence, agencies with a higher proportion of Black, non-Hispanic children tend to have a higher prevalence of anemia (Table 15 and Figure 43). More than one-quarter (29.1%) of the children enrolled in the Detroit Urban League were anemic, where 72.8% of children enrolled are Black, non-Hispanic. Although the proportion of Black, non-Hispanic children enrolled at the Macomb County Health Department is lower (14.6%), the anemia prevalence was the 5th highest in the State (19.4%). Conversely, the Detroit Department of Health & Wellness Promotion serves a predominately Black, non-Hispanic WIC cohort (76%), yet the anemia prevalence was lower (18.8%).

Furthermore, agencies with the lowest prevalence of anemia enrolled less than 2% Black, non-Hispanic children. Public Health, Delta & Menominee Counties reported the lowest prevalence of anemia among children (1.7%).

Figure 42 Prevalence of pediatric anemia by maternal race/ethnicity and trimester of WIC enrollment among children < 5 years enrolled in WIC, MI PedNSS/PNSS2007^{1-3, 9}

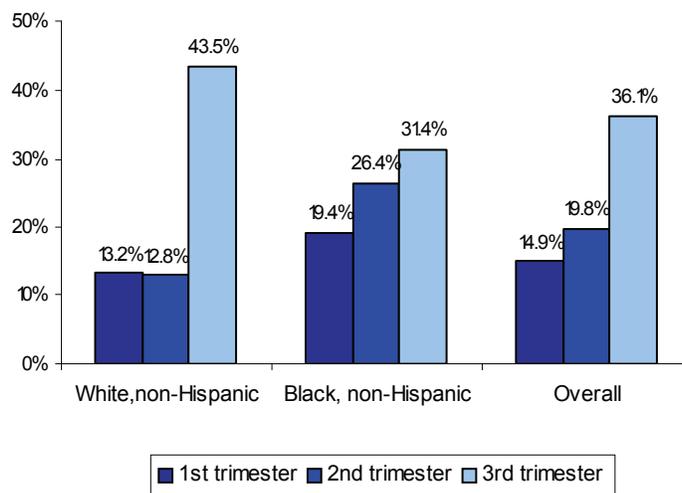


Table 15 Prevalence of anemia among children < 5 years enrolled in WIC by local agency, MI PedNSS 2007

Highest Prevalence of Anemia -children 5 years or younger	
Agency	%
Detroit Urban League	29.1
Genesee County HD	26.1
Kalamazoo Family Health Center	25.9
Washtenaw County HD	22.3
Macomb County HD	19.4
Lowest Prevalence of Anemia -children 5 years or younger	
Agency	%
Western Upper Penin DHD	4.3
Livingston County HD	3.3
Northwest MI Comm Health Agency	2.9
Sanilac County HD	2.8
Public Health Delta & Menominee	1.7

MI PedNSS 2007

¹Recording period is January 1st through December 31st

²Excludes records with unknown data and errors.

³ Analyses based on one record per child.

⁹ Based on 1998 CDC MMWR, "Recommendations to Prevent and Control Iron Deficiency in the United States", altitude adjusted.

Undernutrition

Undernutrition among children has long been recognized as a major public health problem and has been associated with increased mortality, increased susceptibility to infectious diseases, impaired cognitive development and poor school performance (Fishman et al., 2004). Children characterized as ‘stunted’ had more conduct difficulties at home and lower educational achievement than non-stunted children (Chang, Walker, Grantham-McGregor, & Powell, 2002). Therefore, improving health outcomes by improving the level of nutrition remains an imperative public health objec-

tive 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 might be higher than 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%

Three local agencies achieved this goal in 2007:

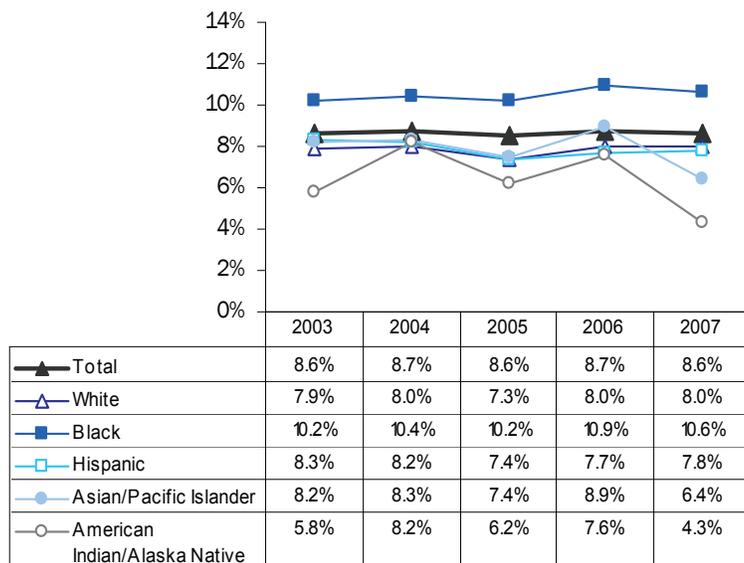
- Luce-Mackinac-Alger-Schoolcraft DHD (4.0%)
- Sanilac County Health Department (4.6%)
- Tuscola County Health Department (4.7%)

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). Using the 2000 CDC gender-specific growth chart, children are categorized as short stature if they are less than the 5th percentile length-for-age (children less than 2 years) and less than 5th percentile height-for-age (children 2 years and older).

MI PNSS & PedNSS Report 2003-2007

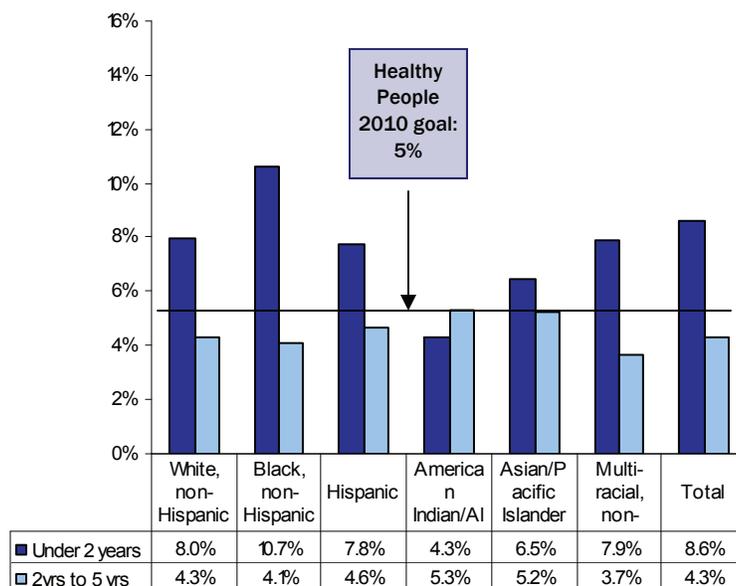
Figure 44 Trend of short stature prevalence by race/ethnicity among the children < 2 years enrolled in WIC , MI PedNSS 2003-2007^{1-3, 10}



From 2003 to 2007, the prevalence of short stature among children less than 2 years of age in the Michigan WIC population remained fairly stable at 8.6 % (Figure 44). Prevalence of short stature remains consistently higher among Black, non-Hispanic children (8.0%) than children of other races and ethnicities. The prevalence of short stature decreased most among American Indian/Alaska Native (26%) and Asian/Pacific Islanders (22%).

Figure 45 Prevalence of short stature among children < 5 years enrolled in WIC by age group and race/ethnicity, MI PedNSS 2007^{1-3, 10}

Short stature is less prevalent among children ages 2-5 years than among children under 2 years of age (Figure 45). By age 2 years, the prevalence of short stature was below or nearly below the Healthy People 2010 objective for all racial/ethnic groups. Among children under the age of 2 years, the highest prevalence of short stature was found among Black, non-Hispanic children (10.6%) and the lowest (4.3%) among American Indian/Alaska Native.



¹Recording period is January 1st through December 31st ²Excludes records with unknown data & errors frequency missing =6764 ³Analyses based on one record per child.¹⁰ Based on 2000 CDC growth chart percentiles for length-for-age for children under 2 years of age and height-for-age for children 2 years of age and older.

MI PNSS & PedNSS Report 2003-2007

Many children with short stature in the Michigan 2007 PedNSS were born with low birthweight (57%). Using logistic regression analysis to take low birthweight into account, 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 race (Table 16).

After controlling 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 PedNSS07/PNSS03-07

Effect	OR	95% CI	
Low Birthweight vs. Normal Birthweight	14.143	12.601	15.874
Smoking at prenatal visit vs. Non-smoker	1.411	1.272	1.564
WIC enrollment: 3rd trimester vs 1st	1.273	1.126	1.439
Black, non-Hispanic (child) vs White, non-Hispanic	1.254	1.126	1.397
Maternal gestational weight gain less than ideal vs. ideal	1.242	1.109	1.391
WIC enrollment: 2nd trimester vs 1st	1.228	1.104	1.365

MI PedNSS 07/PNSS03-07

Table 17 Prevalence of short stature among children < 5 years enrolled in WIC by local agency, MI PedNSS 2007

Highest prevalence of Short Stature	
Agency	%
Lapeer County HD	11.8
Mid-MI Community Action Agency	8.4
Kalamazoo Family Health Center	8.4
Bay County HD	8.1
Calhoun County HD	7.8
Lowest prevalence of Short Stature	
Agency	%
District Health Dept. #4	5.4
Saginaw County Dept. of Pub Hlth	5.4
Tuscola County HD	4.7
Sanilac County HD	4.6
Luce-Mackinac-Alger-Schoolcraft DHD	4.0

MI PedNSS 2007

The prevalence of short stature varied by local WIC agency and ranged from 4.0% reported by the Luce-Mackinac-Alger-Schoolcraft District Health Department to 11.8% at the Lapeer County Health Department (Table 17).

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing =6764³ Analyses based on one record per child.

¹⁰ Based on 2000 CDC growth chart percentiles for length-for-age for children under 2 years of age and height-for-age for children 2 years of age and older.

MI PNSS & PedNSS Report 2003-2007

Undernutrition- Underweight

Underweight is a health indicator related to under nutrition. Based on the 2000 CDC growth chart, a child is classified as underweight if their weight-for-length (children < 2 years of age) or Body Mass Index (children 2 to 5 years of age) is below the 5th percentile.

Compared to the expected prevalence (5%), the overall prevalence for Michigan is 4.0%. Among children younger than 2 years of age, the prevalence is slightly higher at 4.4% and among those 2-5 years old the prevalence is 3.3% (Figure 46). Overall, the prevalence of underweight among children in WIC declined 6.8% from 2003 to 2007, with the largest change among children ages 2-5 years (-17.6%).

Figure 46 Trend of underweight prevalence among children < 5 years of age enrolled in WIC by age group, MI PedNSS 2007^{1-3, 11}

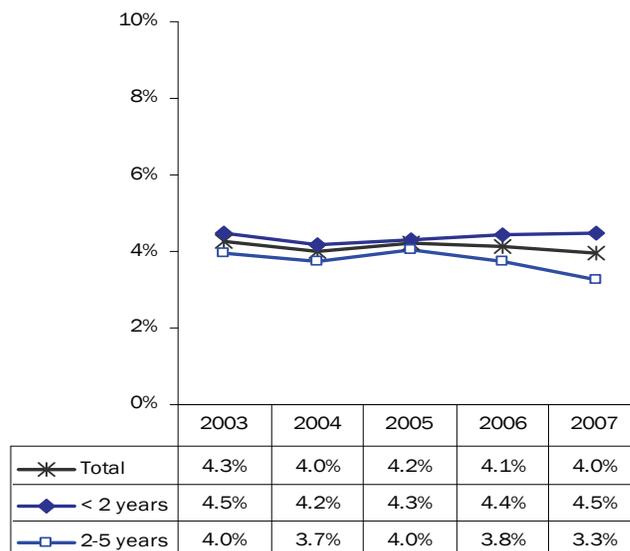
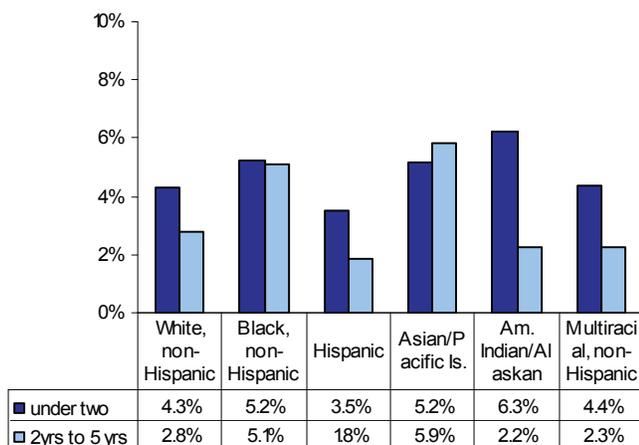


Figure 47 Prevalence of underweight among children < 5 years of age enrolled in WIC by race/ethnicity and age group, MI PedNSS 2007^{1-3, 11}



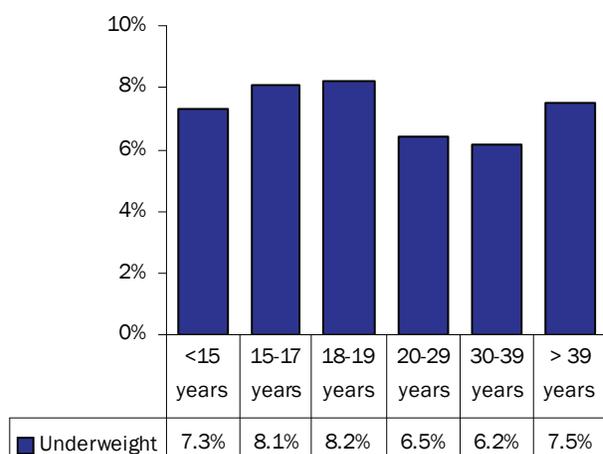
The prevalence of underweight among children of both age groups varied by race/ethnicity (Figure 47). American Indian/Alaska Native children under the age of 2 had the highest prevalence (6.8%). Conversely, the prevalence was lowest among Hispanic children: 3.5% among those less than 2 years of age and 1.8% for those ages 2-5 years.

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors frequency missing for Figure 46 = 52,545 & for Figure 47=6764 ³ Analyses based on one record per child.

¹¹Based on 2000 CDC growth chart percentiles for weight-for-length for children under 2 years of age and BMI-for-age for children 2 years of age and older <5th percentile category identifies underweight.

MI PNSS & PedNSS Report 2003-2007

Figure 48 Prevalence of underweight among children < 5 years of age enrolled in WIC by maternal age group MI PNSS/ PedNSS 2007 ^{1-3, 11}



As shown in figure 48, the prevalence of underweight among children younger than 5 years of age was highest for those whose mothers were under 19 years or over 40 years of age. The lowest prevalence was found among children born to women ages 20-29 (6.5%) and ages 30-39 (6.2%).

Highlight

The reported prevalence of underweight was less than or equal to 5% for 30 local agencies in Michigan during 2007

Marquette County Health Department reported the lowest prevalence of underweight (1.6%), while St. Clair County Health Department reported the highest (10.6%) (Table 18).

Table 18 Prevalence of underweight among children < 5 years of age enrolled in WIC by local agency, MI PedNSS 2007

Highest prevalence of Underweight	
Agency	%
St. Clair County HD	10.6
Detroit Urban League	9.2
Shiawassee County HD	8.9
Kalamazoo County HD	8.5
Kalamazoo Family Health Center	8.0
Lowest Prevalence of Underweight	
Agency	%
Kent County HD	2.6
Macomb County HD	2.4
Berrien County HD	2.1
Ingham County HD	2.0
Marquette County HD	1.6

MI PedNSS 2007

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. ³ Analyses based on one record per child. ¹¹Based on 2000 CDC growth chart percentiles for weight-for-length for children under 2 years of age and BMI-for-age for children 2 years of age and older <5th percentile category identifies underweight.

Overweight and Obesity

Similar to adults, obesity in children has become an epidemic in the United States and in other industrialized countries. Obesity in children has been associated with an increased risk of asthma, sleep disorders, skin infections, diabetes mellitus type II and hypertension, among others. Obese children tend

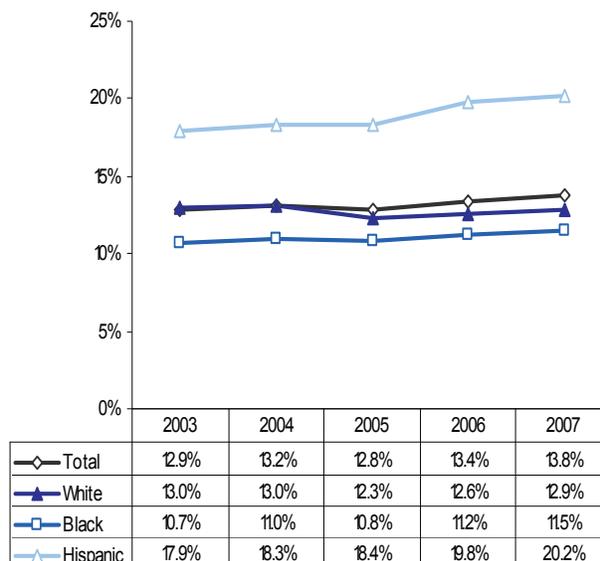
MICHIGAN WIC PROGRAM FIVE YEAR PLAN
Decrease the prevalence of obesity among children to 12.0% by 2008
** 11 local agencies achieved this goal in 2007.*

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). As an 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 birth weight 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. 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

Figure 49 Trend of obesity prevalence by race/ethnicity among children ages 2 to < 5 yrs enrolled in WIC MI PedNSS 2003-2007^{1-3, 11}



¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. Frequency Missing = 10,228

³ Analyses based on one record per child. ¹¹Based on 2000 CDC growth chart percentiles for weight-for-length for children under 2 years of age and BMI-for-age for children 2 years of age and older <5th percentile category identifies underweight. 85th - < 95th percentile category identifies overweight children and >= 95th percentile category identifies obese children.

MI PNSS & PedNSS Report 2003-2007

equal to 95% are considered overweight (previously 'risk of overweight') (American Academy of Pediatrics, 2009). By definition, 5% of children are expected to be above the 95th percentile due to normal variation, thus a prevalence of obesity greater than 5% indicates that there is a higher than usual proportion of children who are obese.

In 2007, the overall prevalence of obesity among children ages 2-5 years in Michigan PedNSS was 13.8% compared to 14.5% nationally; this exceeds the expected 5% prevalence (Figure 49). The prevalence of obesity has increased by 7% from 2003 to 2007 and was highest among Hispanic children. The prevalence of overweight children increased a modest 1.5% from 16.2% in 2003 to 16.4% in 2007 (Figure 50). The prevalence was consistently higher among Hispanic children and lower among Black, non-Hispanic children. The prevalence of obesity among Black, non-Hispanic and Asian/Pacific Islander children is less than the Michigan WIC program goal (11.5% and 11.2%) (Figure 51).

Figure 50 Trend of overweight prevalence by race/ethnicity among children 2 to < 5 yrs enrolled in WIC MI PedNSS 2003-2007^{1-3, 11}

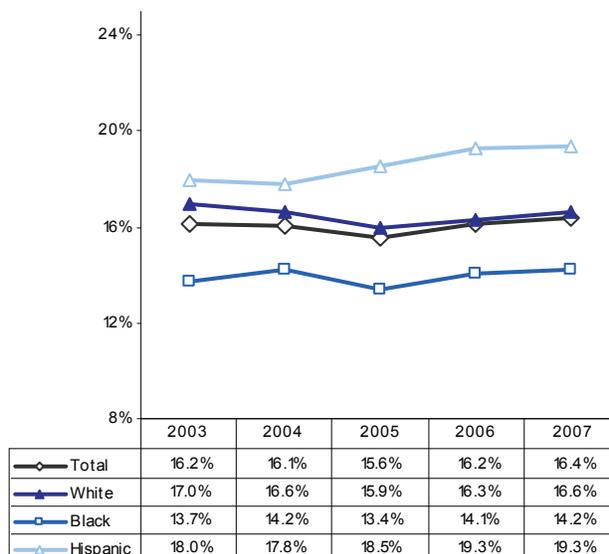
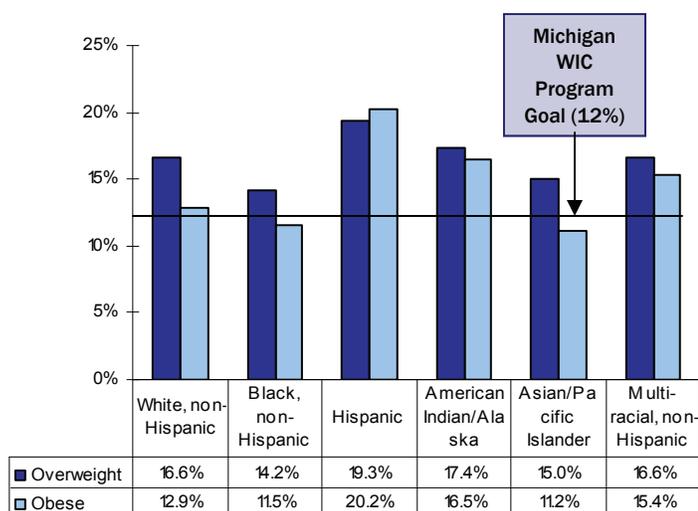


Figure 51 Prevalence of obese & overweight among Children ages 2-5 years enrolled in WIC by race and ethnicity, MI PedNSS 2007^{1-3, 11}



¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. Frequency Missing for Figure 50= 10,228 & for Figure 51 = 2065

³ Analyses based on one record per child. ¹¹Based on 2000 CDC growth chart percentiles for weight-for-length for children under 2 years of age and BMI-for-age for children 2 years of age and older <5th percentile category identifies underweight. 85th - < 95th percentile category identifies overweight children and >= 95th percentile category identifies obese children.

MI PNSS & PedNSS Report 2003-2007

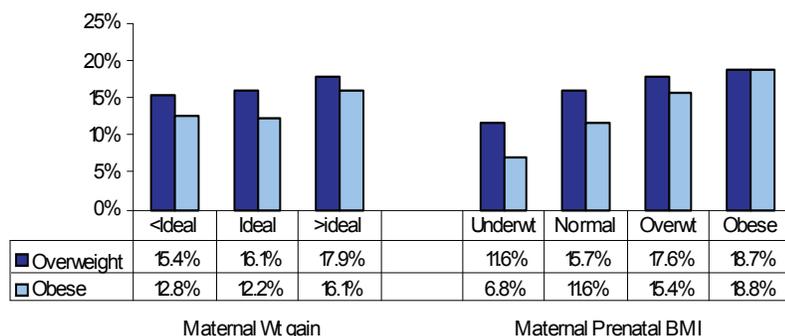
Analysis of pediatric overweight and obesity by selected maternal and infant characteristics yielded results outlined in Table 19 and Figure 52. Maternal education, smoking during the last trimester and full term low birth-weight all appear to be associated with obesity. There also appears to be an association between maternal pre-pregnancy BMI, maternal gestational weight gain and child's BMI. The prevalence of overweight and obesity was highest for children whose mothers gained more than the ideal weight during pregnancy or had a prenatal BMI categorized as overweight or obese. Results of logistic regression analysis of factors that may affect the odds of a child becoming obese follows on page 61. Although breastfeeding did not appear to be associated with overweight or obesity when looking at a simple cross tabulation, it was inversely associated with obesity when controlled for other characteristics. However, this is a simple model and the effect of longer duration of breastfeeding was not examined.

Table 19 Prevalence of overweight and obesity among children ages 2-5 enrolled in MI WIC by selected maternal and infant characteristics, MI PedNSS 2007, MI PNSS 2003-2007 ^{1-3, 11}

	Overweight %	Obese %
Maternal Education		
Less than 12 years	17.1%	15.6%
12 years	16.3%	13.3%
More than 12 years	15.9%	11.9%
Breastfeeding ever		
No	16.4%	14.5%
Yes	16.7%	14.5%
Smoking 3rd Trimester		
No	16.4%	13.6%
Yes	17.6%	15.9%
Full Term Low Birthweight		
No	17.0%	14.5%
Yes	11.2%	8.7%
Gender		
Male	16.6%	14.5%
Female	16.1%	13.0%

2007 MI PedNS/2003-2007 MI PNSS

Figure 52 Prevalence obesity and overweight by maternal prenatal BMI and by pregnancy weight gain, among children ages 2 to 5 years enrolled in WIC, MI PNSS03-07 PedNSS 2007^{1-5, 11}



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 1990 IOM Report, "Nutrition during pregnancy" ⁵Based on 1990 IOM report "Nutrition during pregnancy": underweight pregnancy (ideal weight gain is 28 to 40 lbs), normal weight pregnancy (ideal weight gain is 25 to 35 lbs), overweight pregnancy (ideal weight gain 15 to 25 lbs) and obese pregnancy (ideal weight gain 15 to 25 lbs) ¹¹Based on 2000 CDC growth chart percentiles for weight-for-length for children under 2 years of age and BMI-for-age for children 2 years of age and older <5th percentile category identifies underweight. 85th - < 95th percentile category identifies overweight children and >= 95th percentile category identifies obese children.

FOCUS ON PEDIATRIC OBESITY

The odds of a child having a BMI categorized as overweight (>85th percentile), obese (>95th percentile) or having a BMI percentile greater than or equal to the 97th percentile were estimated using a logistic regression model. 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). Results of analysis of significant characteristics are shown in Table 20. Some effects have higher odds ratio as 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 1.66 (compared to a child whose mother had a BMI categorized as normal). The effect of maternal obesity increases to 1.889 for children whose BMI is in the 95th percentile and to 2.053 for children with a BMI of 97%

or greater. Other characteristics which were significantly associated with an increased risk of a child being overweight, obese or with a BMI greater than the 97th percentile 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, infant low birthweight and underweight maternal prenatal BMI were found to be protective against obesity. Furthermore, ever breastfed as an infant was mildly protective, though this should be interpreted cautiously as duration of breastfeeding was unavailable for the 2-5 year old cohort at the time of analysis. Age at which formula was introduced was not significant and not included in this model.

Table 20 Adjusted Odds ratios for Child BMI >85th percentile, >95th percentile & ≥ 97th percentile by infant, child & maternal effects among children ages 2-5 years, MI PedNSS 2007/PNSS 2003-2007

Adjusted Odds ratio of BMI (Children ages 2 to 5yrs) by Maternal, Child & Infant Effects									
Effect	>85th			>95th			≥97th		
	AOR	95% CI		AOR	95% CI		AOR	95% CI	
Child: Hispanic vs White, non-Hispanic	1.652	1.544	1.768	1.739	1.597	1.894	1.862	1.698	2.041
Child: Male vs female	1.082	1.134	1.032	1.109	1.042	1.179	1.125	1.203	1.051
Infant: Very Low Birthweight vs normal	0.468	0.322	0.678	0.444	0.252	0.783	0.504	0.280	0.907
Infant: Low Birthweight vs normal	0.593	0.53	0.665	0.626	0.533	0.736	0.661	0.555	0.788
Infant: High Birthweight vs normal	1.729	1.598	1.87	1.742	1.585	1.913	1.684	1.522	1.866
Maternal prenatal Obese vs Normal	1.66	1.573	1.752	1.889	1.759	2.029	2.053	1.898	2.222
Maternal prenatal Overweight vs Normal	1.27	1.183	1.362	1.418	1.292	1.556	1.439	1.299	1.595
Maternal prenatal Underweight vs Normal	0.662	0.604	0.726	0.602	0.522	0.694	0.620	0.529	0.728
Maternal Weight gain > Ideal vs Ideal	1.213	1.145	1.285	1.281	1.186	1.384	1.263	1.160	1.376
Maternal < High School vs > High School	1.164	1.086	1.248	1.303	1.187	1.431	1.362	1.229	1.511
Ever breastfed	0.905	0.862	0.95	0.892	0.837	0.951	0.906	0.844	0.971
Maternal smoking at the prenatal visit	1.267	1.197	1.342	1.334	1.238	1.437	1.404	1.295	1.522

MI PedNSS 20007/PNSS 2003-2007

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 2003-2007

Table 21 Prevalence of obesity among children 2 to 5 years of age enrolled in WIC by local agency, MI PedNSS 2007 ^{1-3,11}

Highest Prevalence of Obesity	
Agency	%
Ionia County HD	18.9
Branch-Hillsdale-St. Joe DHD	17.4
Mid-MI Community Action Agency	16.6
Benzie-Leelanau DHD	16.5
Livingston County HD	15.8
Lowest Prevalence of Obesity	
Agency	%
Mid-Michigan DHD	11.4
Berrien County HD	11.2
Sanilac County HD	10.3
Grand Traverse County HD	10.1
Tuscola County HD	9.9
MI Pednss 2007	

Table 22 Prevalence of overweight among children 2 to 5 years of age enrolled in WIC by local agency, MI PedNSS 2007^{1-3,11}

Highest Prevalence of Overweight	
Agency	%
Keweenaw Bay Indian Community	25.6
Marquette County HD	20.9
District Health Dept. #2	19.7
Luce-Mackinac-Alger-Schoolcraft DHD	19.4
Northwest MI Comm Health Agency	19.3
Lowest Prevalence of Overweight	
Agency	%
Macomb County HD	14.8
Muskegon County HD	14.6
Jackson County HD	14.2
Detroit DHWP	14.1
Huron County HD	13.9
MI Pednss 2007	

Prevalence of obesity and overweight varied by local agency (Figures 53 & 54; Tables 21 & 22). The lowest prevalence of obesity among children was reported by the Tuscola County Health Department (9.9%) and highest by the Ionia County Health Department (18.9%). The lowest prevalence of overweight children was reported by the Huron County Health Department (13.9%), while the highest was reported by the Keweenaw Bay Indian Community (25.6%).

¹Recording period is January 1st through December 31st ²Excludes records with unknown data and errors. Frequency missing= 2065 ³ Analyses based on one record per child.

¹¹Based on 2000 CDC growth chart percentiles for weight-for-length for children under 2 years of age and BMI-for-age for children 2 years of age and older <5th percentile category identifies underweight. 85th - < 95th percentile category identifies overweight children and >= 95th percentile category identifies obese children.

Figure 53 Prevalence of overweight among children ages 2 to 5 years by local agency, MI PedNSS 2007

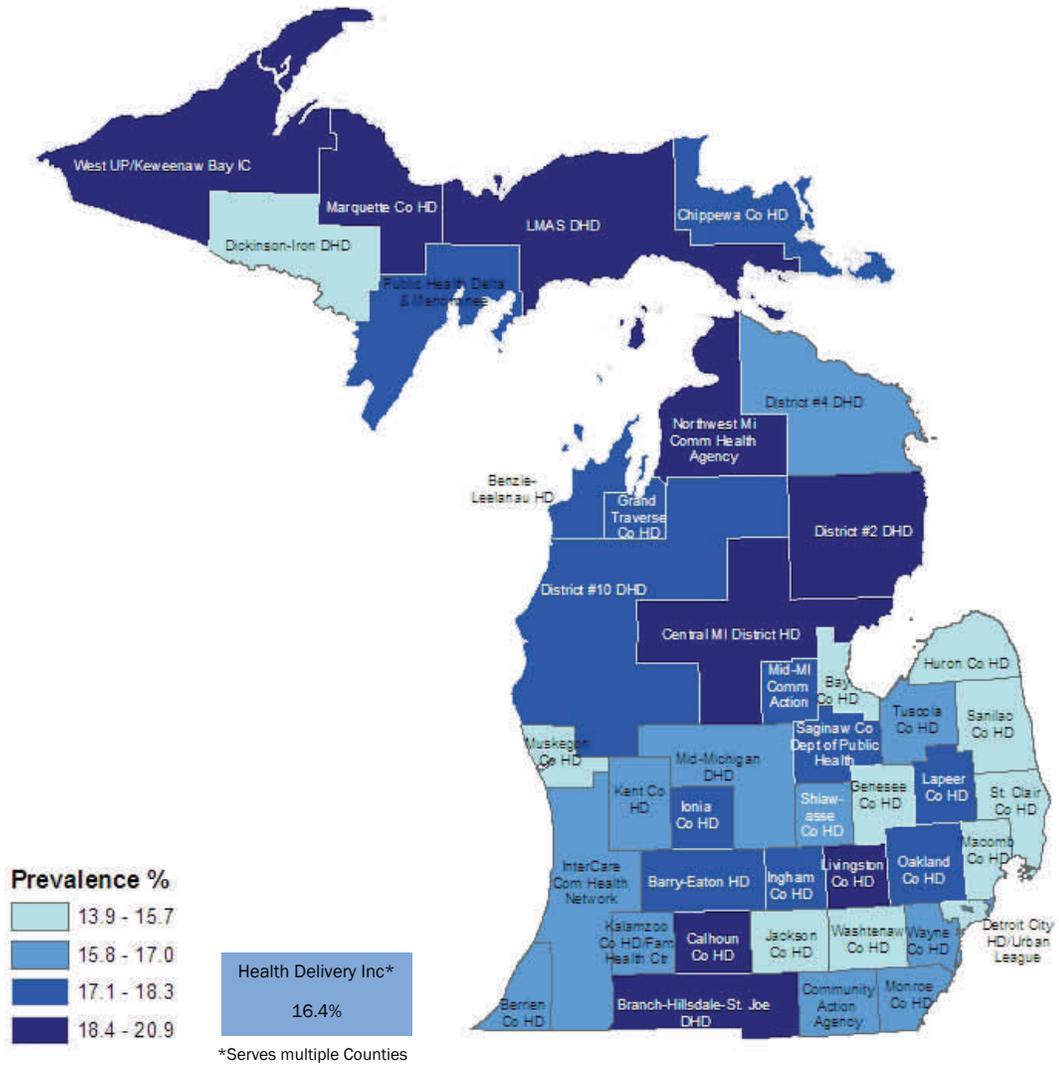
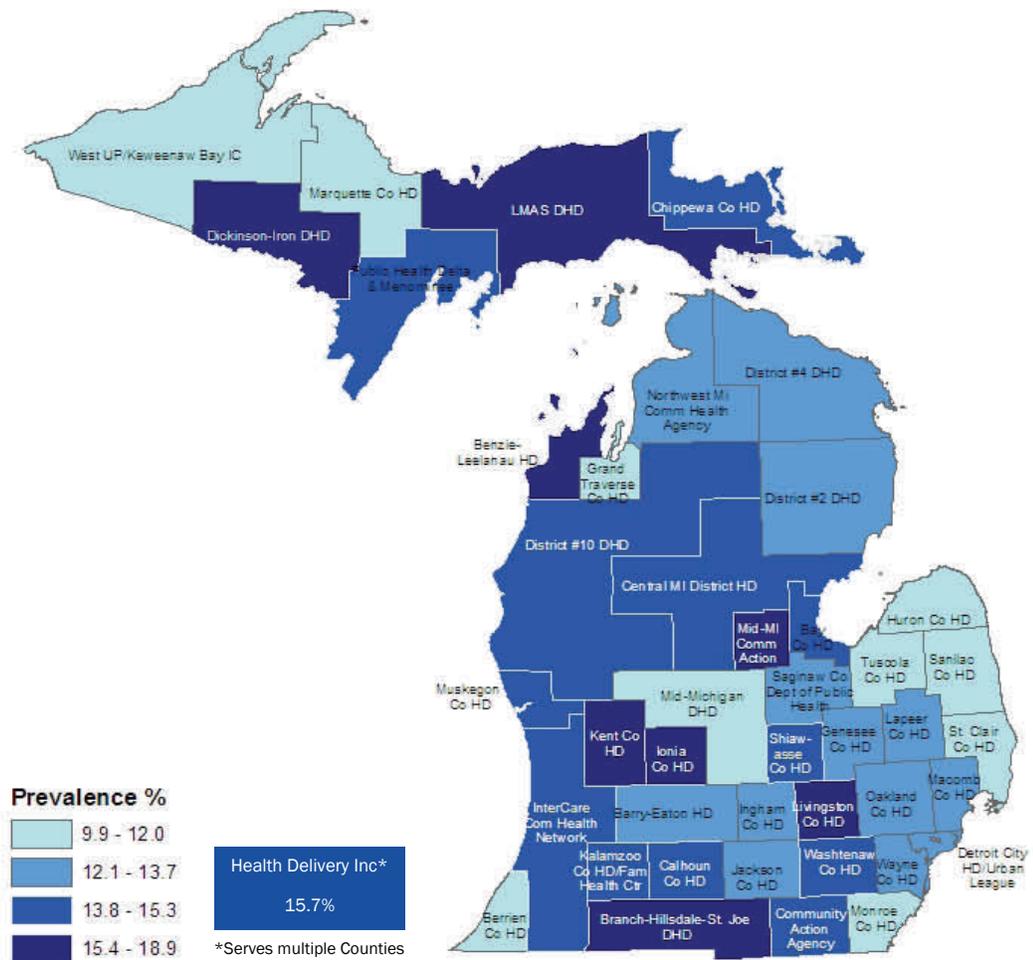


Figure 54 Prevalence of obesity among children ages 2 to 5 years by local agency, MI PedNSS 2007



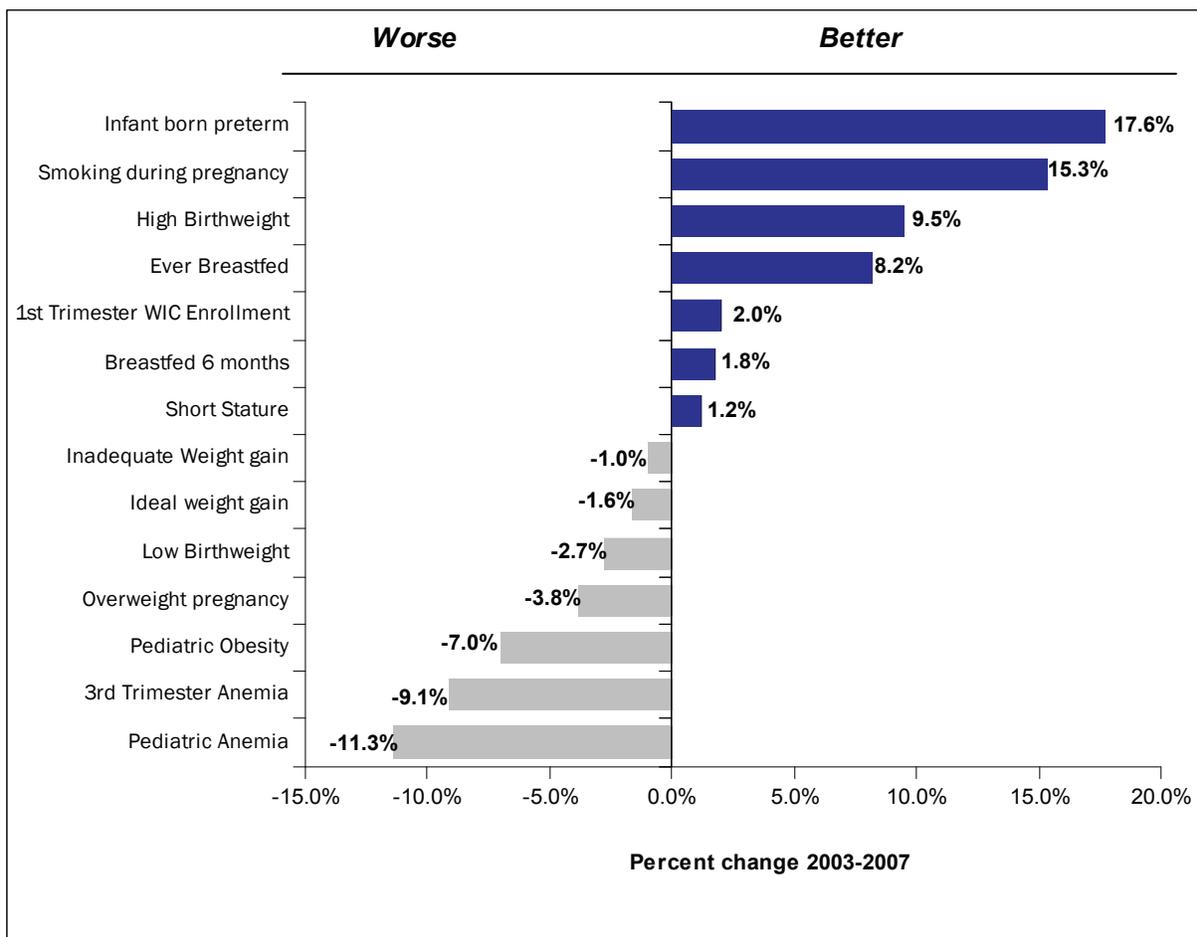
Health Progress Review

Changes in maternal health, maternal behavior, and child health indicators were observed among the Michigan WIC population from 2003 to 2007. Improvements were seen in several health indicators notably: preterm births (18% decline), prevalence of smoking during pregnancy (15% decline) and high birthweight (10% decline) (Figure 54). Modest improvements were made in the proportion of women enrolling in WIC during the 1st trimester (2% increase); breastfeeding initiation (8.2% increase) and 6 month duration (2% in-

crease); and short stature among children (1% decrease).

Despite these improvements, areas of concern remain. Anemia among children increased 11% and maternal 3rd trimester anemia increased by 9%, both disproportionately affecting Black, non-Hispanic women and children. At the same time, pediatric obesity increased by 7%, in addition to maternal weight gain increasing by 4%.

Figure 55 Changes in maternal, infant and child health status, MI PedNSS 2003-2007 & PNSS 2003-2007



Maternal & Pediatric Nutrition Recommendations

Results of the analysis of the Michigan PNSS and PedNSS data indicate that public health programs need to continue to support the following actions:

- Decrease the prevalence of preterm deliveries and low birthweight infants by providing preconception health and nutrition care.
- Promote outreach activities to identify pregnancy in its early stages.
- Provide prenatal counseling about the importance of appropriate weight gain during pregnancy and the health risks of excess weight gain and post partum weight gain retention, especially to women who are overweight or obese prior to conception.
- Promote weight control and monitoring prior to and after delivery.
- Continue to promote early WIC enrollment, particularly among groups with disproportionately higher prevalence of health related risks.
- Continue to promote and support breastfeeding while developing innovative interventions aimed at increasing the prevalence of breastfeeding initiation, duration and exclusivity.
- Continue to provide information regarding the harmful effects of tobacco and alcohol use on the developing fetus and encourage referral to smoking cessation and alcohol counseling programs.
- Promote screening and adequate dietary iron intake to women and children at risk for anemia.
- Promote routine screening of weight status by physicians or allied health care providers in all children for obesity (BMI $\geq 95^{\text{th}}$ percentile for age and sex) and overweight (BMI $\geq 85^{\text{th}}$ percentile to $< 95^{\text{th}}$ percentile for age and sex) based on the Expert Committee recommendations.
- Implement promising approaches to prevent obesity and chronic diseases as recommended by the CDC's Division of Nutrition, Physical Activity and Obesity. The recommendations include:
 - ◊ increasing breastfeeding initiation, duration, and exclusivity
 - ◊ increasing physical activity
 - ◊ increasing the consumption of fruits and vegetables
 - ◊ decreasing the consumption of sugar-sweetened beverages
 - ◊ reducing the consumption of high energy dense foods
 - ◊ decreasing television viewing
- Expand collaboration with other public health programs to better understand the underlying causes of health issues, as well as promote early WIC enrollment.

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Appendix A: Local Agency Trend Tables

Table A-1. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2007

	PNSS	PedNSS	Total ^a	Race/Ethnicity ^a				1st Trimester WIC Enrolment ^b	Weight Gain ^b		Low Birthweight ^b		
	N	N	N	White	Black	Hispanic	Multi-racial		< Ideal	> Ideal	Total	White	Black
Michigan	64,948	237,338	302,286	53.7%	26.8%	13.4%	4.3%	32.3%	30.4%	42.7%	7.5%	6.3%	10.7%
Local Agency													
Bary-Eaton DHD	776	2813	3,589	91.1%	1.9%	4.6%	2.1%	35.6%	35.9%	41.1%	5.2%	5.0%	*
Bay County HD	738	2827	3,565	76.8%	2.5%	12.9%	7.4%	41.5%	25.1%	46.9%	7.3%	6.8%	*
Benzie-Leelanau DHD	179	792	971	71.0%	0.3%	18.0%	7.1%	46.9%	19.7%	54.4%	7.2%	5.1%	*
Berrien County HD	1101	3976	5,077	47.8%	40.4%	5.3%	5.8%	29.6%	28.1%	45.8%	8.4%	8.2%	8.4%
Branch-Hillsdale-St. Joe DHD	1383	5247	6,630	80.2%	2.0%	15.5%	1.8%	38.7%	39.4%	35.5%	6.7%	7.1%	*
Calhoun County HD	1267	4614	5,881	60.8%	22.0%	9.2%	7.1%	41.1%	22.2%	49.4%	6.0%	5.0%	8.4%
Central MI District HD	1262	5128	6,390	93.1%	0.7%	2.0%	3.7%	43.7%	28.2%	45.0%	6.6%	6.6%	*
Chippewa County HD	261	1103	1,364	53.6%	0.1%	1.6%	22.1%	49.4%	20.7%	53.7%	4.4%	4.3%	*
Community Action Agency	639	2130	2,769	67.8%	2.3%	25.2%	4.3%	27.0%	24.1%	43.8%	5.4%	5.0%	*
Detroit Dept. of Health & Wellness	10186	33971	44,157	8.0%	74.5%	15.0%	1.1%	22.1%	34.6%	40.1%	9.6%	6.9%	10.9%
Detroit Urban League	2095	8239	10,334	9.3%	67.8%	12.9%	2.8%	23.8%	38.1%	36.6%	10.8%	8.0%	12.3%
Dickinson-Iron DHD	271	1039	1,310	95.1%	0.6%	1.3%	2.8%	48.3%	56.7%	25.7%	6.3%	6.0%	*
District Health Dept #10	2262	8477	10,739	80.0%	1.2%	13.8%	4.2%	40.8%	23.3%	48.1%	6.8%	6.8%	*
District Health Dept. #2	427	1667	2,094	95.7%	0.9%	1.1%	1.8%	41.0%	22.9%	48.7%	6.2%	6.1%	*
District Health Dept. #4	519	1935	2,454	92.4%	0.6%	1.3%	5.4%	37.6%	24.2%	48.4%	5.5%	5.5%	*
Genesee County HD	3372	11687	15,059	52.3%	43.0%	2.4%	1.9%	21.3%	24.4%	48.1%	9.0%	6.3%	12.1%
Grand Traverse County HD	587	2210	2,797	91.6%	0.4%	4.8%	2.6%	43.4%	23.0%	43.5%	6.6%	6.7%	*
Health Delivery, Inc.	583	2634	3,217	9.0%	51.7%	36.6%	2.4%	46.0%	28.9%	45.2%	7.9%	8.9%	9.9%
Huron County HD	222	941	1,163	94.5%	0.3%	3.4%	1.6%	51.4%	19.5%	52.4%	4.9%	4.5%	*
Ingham County HD	1968	6239	8,207	50.5%	25.0%	15.1%	4.3%	22.9%	53.9%	28.3%	7.4%	6.9%	10.7%
InterCare Comm Health Network	3587	13790	17,377	56.5%	3.3%	34.6%	4.3%	38.4%	42.1%	34.5%	6.3%	5.9%	13.1%
Ionia County HD	429	1690	2,119	84.0%	0.4%	11.4%	5.3%	37.6%	20.9%	50.8%	7.3%	7.5%	*
Jackson County HD	1299	4513	5,812	71.1%	13.9%	6.7%	7.5%	33.9%	22.2%	48.2%	6.7%	6.1%	9.0%
Kalamazoo County HD	937	3446	4,383	59.6%	18.5%	9.0%	10.9%	37.6%	19.1%	52.0%	7.4%	6.2%	14.4%
Kalamazoo Family Health Center	752	2896	3,648	30.9%	44.0%	16.1%	11.8%	38.6%	30.2%	43.3%	9.0%	7.8%	12.0%
Kent County HD	5164	19042	24,206	37.5%	20.7%	33.8%	5.6%	37.4%	27.9%	41.9%	6.7%	6.6%	9.4%
Keweenaw Bay WIC Program	72	262	334	7.2%	0.0%	2.7%	59.6%	39.1%	20.3%	52.5%	1.7%	*	*
Lapeer County HD	500	1778	2,278	89.8%	0.6%	5.5%	3.6%	40.2%	24.4%	47.9%	5.4%	5.2%	*
Livingston County HD	478	1566	2,044	91.9%	1.0%	5.1%	3.8%	27.1%	20.2%	53.0%	7.2%	7.0%	*
Luce-Mackinac-Alger-Schoolcraft DHD	235	1002	1,237	82.7%	0.4%	0.9%	10.1%	60.7%	57.4%	20.5%	4.9%	5.1%	*
Macomb County HD	2109	8720	10,829	67.3%	18.5%	4.1%	5.9%	25.4%	31.1%	40.4%	8.3%	6.9%	14.4%
Marquette County HD	412	1445	1,857	87.3%	0.6%	1.4%	8.8%	38.2%	20.0%	51.7%	5.9%	6.4%	*
Mid MI Comm Action Agency	447	1627	2,074	93.3%	1.2%	1.5%	4.0%	35.8%	24.2%	45.3%	8.0%	8.2%	*
Mid-Michigan DHD	1020	4042	5,062	89.9%	0.6%	7.2%	2.1%	40.6%	28.9%	44.8%	6.0%	5.9%	*
Monroe County HD	853	2395	3,248	82.3%	4.1%	7.5%	6.3%	37.7%	23.3%	46.4%	5.1%	4.8%	*
Muskegon County HD	1763	6504	8,267	54.9%	26.2%	10.8%	7.3%	38.5%	23.4%	47.0%	6.8%	5.7%	9.9%
Northwest MI Comm Health Agency	761	3054	3,815	91.4%	0.4%	1.8%	4.7%	46.0%	38.9%	36.3%	5.4%	5.4%	*
Oakland County HD	4071	14433	18,504	48.5%	30.9%	15.0%	3.2%	23.5%	23.6%	47.3%	7.2%	7.1%	8.8%
Pub Hlth Delta & Menominee Counties	391	1533	1,924	91.5%	0.1%	1.4%	6.6%	45.6%	22.7%	49.1%	6.2%	6.4%	*
Saginaw County Dept PH	1231	4606	5,837	50.8%	29.6%	15.4%	3.8%	40.5%	25.9%	45.9%	9.8%	6.7%	17.3%
Sanilac County HD	295	1155	1,450	91.3%	0.1%	6.0%	2.6%	43.7%	23.6%	44.2%	6.3%	5.9%	*
Shiawassee County HD	517	2056	2,573	92.8%	0.3%	3.1%	3.5%	48.0%	24.0%	42.9%	7.6%	7.4%	*
St. Clair County HD	961	3964	4,925	78.5%	4.8%	7.3%	8.8%	40.6%	28.5%	44.8%	7.9%	7.4%	*
Tuscola County HD	389	1602	1,991	92.6%	0.2%	4.8%	2.3%	46.4%	27.6%	44.9%	5.7%	5.6%	*
Washtenaw County HD	1504	4679	6,183	39.4%	39.3%	11.5%	5.1%	28.7%	33.0%	39.4%	5.7%	5.8%	6.7%
Wayne County HD	3889	15227	19,116	69.1%	18.6%	4.9%	4.1%	29.1%	36.1%	38.5%	6.1%	5.9%	7.5%
Western Upper Penin DHD	411	1618	2,029	92.2%	1.1%	0.9%	3.1%	42.7%	21.8%	46.4%	3.9%	4.1%	*

^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-1 (continued) Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2007

	Breastfeeding ^c		Overweight ^{d,e}				Obese ^{d,e}				Anemia < 5 yrs ^d
	Initiation ^b	6 months duration ^d	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	54.0%	15.3%	16.4%	16.6%	14.2%	19.3%	13.8%	12.9%	11.5%	20.3%	14.6%
Local Agency											
Bary-Eaton DHD	58.3%	12.8%	17.7%	17.4%	*	25.7%	12.8%	11.8%	*	20.0%	5.3%
Bay County HD	53.1%	10.7%	15.7%	15.4%	19.4%	16.3%	14.3%	13.4%	*	15.1%	11.8%
Benzie-Leelanau DHD	72.0%	37.1%	18.0%	18.8%	*	13.5%	16.4%	13.3%	*	27.0%	8.0%
Berrien County HD	49.4%	14.2%	16.4%	15.9%	17.5%	21.3%	11.2%	12.3%	9.8%	12.8%	18.4%
Branch-Hillsdale-St. Joe DHD	57.6%	14.7%	19.1%	18.5%	14.3%	23.3%	17.4%	15.2%	10.7%	27.9%	9.7%
Calhoun County HD	52.1%	9.5%	18.7%	18.8%	19.2%	18.8%	14.7%	15.0%	13.4%	16.4%	16.7%
Central MI District HD	62.3%	15.0%	18.5%	18.3%	*	27.7%	14.5%	14.2%	*	12.8%	11.8%
Chippewa County HD	65.5%	19.0%	17.9%	18.0%	*	*	14.2%	9.8%	*	*	10.3%
Community Action Agency	55.6%	13.7%	16.6%	15.5%	*	19.4%	15.3%	14.9%	16.0%	17.8%	14.9%
Detroit Dept. of Health & Wellness	38.1%	14.5%	14.1%	14.0%	13.0%	19.4%	13.0%	10.9%	11.3%	21.8%	18.8%
Detroit Urban League	39.1%	19.1%	15.4%	14.6%	14.3%	20.9%	12.8%	9.9%	11.6%	19.6%	29.1%
Dickenson-Iron DHD	56.6%	17.7%	15.2%	16.0%	*	*	15.7%	14.6%	*	*	6.8%
District Health Dept #10	64.0%	15.6%	17.6%	16.6%	*	23.6%	14.6%	12.6%	*	25.0%	10.9%
District Health Dept. #2	46.5%	9.7%	19.6%	19.6%	*	*	13.4%	13.4%	*	*	13.1%
District Health Dept. #4	63.8%	16.2%	16.4%	16.5%	*	*	13.1%	12.6%	*	*	10.0%
Genesee County HD	40.9%	8.3%	15.5%	15.7%	15.3%	19.3%	12.3%	12.6%	11.5%	14.1%	26.1%
Grand Traverse County HD	80.8%	32.7%	17.3%	16.8%	*	18.8%	10.1%	9.2%	*	20.8%	12.0%
Health Delivery, Inc.	42.2%	12.2%	16.4%	16.8%	12.1%	21.9%	15.7%	14.2%	11.6%	21.1%	16.9%
Huron County HD	51.4%	12.0%	13.9%	14.5%	*	*	12.0%	11.9%	*	*	8.1%
Ingham County HD	65.7%	17.6%	17.4%	17.7%	16.1%	19.8%	13.7%	13.3%	12.9%	15.8%	9.2%
InterCare Comm Health Network	58.9%	18.4%	16.6%	15.6%	14.9%	18.2%	14.5%	12.3%	7.9%	18.7%	17.1%
Ionia County HD	54.3%	9.4%	17.2%	17.2%	*	20.2%	18.9%	16.7%	*	36.9%	7.3%
Jackson County HD	51.7%	9.6%	14.2%	15.4%	10.3%	9.9%	13.5%	13.0%	12.6%	22.3%	12.1%
Kalamazoo County HD	58.6%	14.4%	18.0%	18.9%	14.9%	20.6%	14.6%	16.0%	13.9%	13.5%	17.2%
Kalamazoo Family Health Center	59.2%	15.4%	15.6%	15.3%	16.4%	15.3%	14.6%	13.9%	12.5%	17.2%	25.9%
Kent County HD	61.7%	16.8%	16.7%	15.3%	14.9%	19.0%	15.7%	12.2%	10.7%	21.5%	13.5%
Keweenaw Bay WIC Program	46.6%	*	26.3%	*	*	*	11.9%	*	*	*	11.6%
Lapeer County HD	50.1%	16.0%	17.2%	17.3%	*	13.8%	12.8%	12.2%	*	22.4%	14.8%
Livingston County HD	71.3%	20.0%	18.6%	18.7%	*	18.5%	15.7%	14.4%	*	37.0%	3.3%
Luce-Mackinac-Alger-Schoolcraft DHD	57.5%	14.5%	19.4%	19.2%	*	*	15.7%	15.5%	*	*	13.4%
Macomb County HD	93.5%	11.4%	14.5%	14.6%	10.9%	15.9%	12.9%	12.9%	10.9%	21.2%	19.4%
Marquette County HD	63.1%	23.0%	21.0%	20.2%	*	*	11.9%	11.8%	*	*	5.2%
Mid MI Comm Action Agency	63.7%	12.5%	17.7%	18.0%	*	*	16.6%	16.6%	*	*	4.5%
Mid-Michigan DHD	63.2%	16.7%	16.5%	15.9%	*	23.8%	11.4%	10.9%	*	17.5%	5.0%
Monroe County HD	51.6%	12.3%	16.2%	16.4%	*	16.7%	11.4%	11.1%	*	12.1%	10.2%
Muskegon County HD	43.4%	11.4%	14.6%	14.6%	12.0%	16.2%	14.1%	13.0%	13.7%	19.6%	15.5%
Northwest MI Comm Health Agency	73.3%	21.5%	19.2%	19.2%	*	17.9%	13.7%	13.4%	*	*	2.9%
Oakland County HD	48.9%	15.0%	17.4%	17.6%	15.0%	21.0%	13.6%	12.8%	11.5%	19.4%	15.0%
Pub Hlth Delta & Menominee Counties	50.5%	15.7%	18.3%	18.8%	*	*	14.2%	12.9%	*	33.3%	1.7%
Saginaw County Dept PH	46.7%	8.1%	17.2%	16.5%	19.3%	16.6%	13.5%	14.0%	9.6%	17.8%	14.3%
Sanilac County HD	51.4%	13.1%	15.4%	15.3%	*	20.8%	10.2%	9.9%	*	*	2.8%
Shiawassee County HD	56.5%	13.8%	17.0%	16.1%	*	38.9%	14.2%	14.2%	*	*	6.0%
St. Clair County HD	51.6%	10.9%	15.5%	14.9%	18.7%	16.8%	11.8%	10.8%	16.0%	13.9%	13.5%
Tuscola County HD	61.1%	11.0%	16.7%	16.9%	*	13.5%	9.9%	10.4%	*	*	5.6%
Washtenaw County HD	66.8%	28.2%	14.9%	14.3%	15.8%	15.0%	14.0%	14.6%	11.7%	23.5%	22.3%
Wayne County HD	75.2%	20.6%	16.2%	16.4%	13.7%	23.8%	13.4%	13.2%	13.1%	17.7%	11.9%
Western Upper Penin DHD	65.6%	25.1%	18.4%	18.4%	*	*	11.8%	12.1%	*	*	4.3%

^b PNSS Data. ^c Analysis limited to children < 2 years of age. ^d PedNSS data. ^e Analysis limited to children 2-5 years of age. *Data insufficient for analysis

Table A-2. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2006

	PNSS	PedNSS	Total ^a	Race/Ethnicity ^a				1st Trimester WIC Enrollment ^b	Weight Gain ^b		Low Birthweight ^b		
	N	N	N	White	Black	Hispanic	Multi-racial		< Ideal	>Ideal	Total	White	Black
Michigan	61,660	232,137	293,797	53.8%	26.8%	13.3%	4.1%	33.7%	29.3%	43.7%	7.7%	6.4%	11.3%
Local Agency													
Barry-Eaton DHD	753	2,720	3,473	89.1%	2.3%	5.2%	2.5%	41.6%	35.5%	40.9%	7.0%	7.2%	*
Bay County HD	693	2,783	3,476	77.6%	2.3%	12.0%	7.2%	42.7%	25.8%	47.3%	6.3%	6.7%	*
Benzie-Leelanau DHD	189	808	997	72.1%	0.3%	15.3%	6.6%	46.7%	25.2%	48.3%	5.5%	5.8%	*
Berrien County HD	1,102	3,812	4,914	47.5%	41.4%	4.9%	4.8%	33.6%	24.6%	50.8%	6.5%	5.6%	8.3%
Branch-Hillsdale-St. Joe DHD	1,274	5,067	6,341	80.3%	2.6%	15.0%	1.6%	38.7%	31.8%	44.6%	5.6%	5.6%	*
Calhoun County HD	1,110	4,610	5,720	61.4%	22.4%	9.6%	5.5%	39.8%	22.9%	48.6%	6.3%	6.7%	5.4%
Central MI District HD	1,207	5,085	6,292	92.5%	0.8%	2.2%	3.4%	41.3%	26.8%	46.1%	7.1%	6.9%	*
Chippewa County HD	291	1,156	1,447	53.6%	0.3%	1.5%	19.4%	58.2%	19.6%	52.0%	5.3%	7.2%	*
Community Action Agency	569	1,973	2,542	67.2%	1.7%	26.8%	3.6%	25.9%	23.2%	47.2%	8.4%	8.7%	*
Detroit Dept. of Health & Wellness	9,830	33,791	43,621	8.2%	74.5%	14.6%	0.9%	24.1%	36.5%	39.4%	11.1%	5.3%	12.5%
Detroit Urban League	2,066	8,044	10,110	8.1%	66.3%	13.8%	2.7%	26.9%	39.7%	34.9%	10.2%	11.5%	11.0%
Dickinson-Iron DHD	247	1,080	1,327	93.9%	0.5%	1.7%	2.9%	47.3%	36.7%	39.3%	4.8%	4.6%	*
District Health Dept #10	2,055	8,157	10,212	79.8%	1.5%	13.3%	4.6%	43.1%	21.7%	48.6%	6.3%	6.7%	*
District Health Dept. #2	442	1,661	2,103	96.5%	1.0%	1.0%	1.0%	43.7%	26.4%	48.1%	5.3%	5.2%	*
District Health Dept. #4	476	1,961	2,437	92.9%	0.5%	0.9%	5.5%	41.5%	25.0%	46.3%	6.7%	6.3%	*
Genesee County HD	3,298	11,916	15,214	53.2%	41.4%	2.6%	2.3%	27.6%	23.9%	48.8%	8.5%	6.8%	10.6%
Grand Traverse County HD	551	2,086	2,637	89.7%	0.9%	5.8%	2.2%	49.4%	20.6%	47.3%	7.0%	6.8%	*
Health Delivery, Inc.	591	2,678	3,269	8.9%	53.1%	35.3%	2.3%	53.4%	28.8%	43.3%	10.0%	*	13.5%
Huron County HD	243	1,004	1,247	93.1%	0.1%	4.9%	1.5%	43.8%	24.0%	43.4%	6.8%	7.2%	*
Ingham County HD	1,799	6,241	8,040	50.8%	24.3%	15.2%	3.6%	23.8%	43.8%	35.0%	7.6%	6.2%	12.8%
InterCare Comm Health Network	3,246	13,086	16,332	56.7%	3.4%	34.2%	3.9%	38.5%	34.8%	38.5%	6.7%	7.0%	6.7%
Ionia County HD	440	1,659	2,099	83.0%	0.4%	11.8%	3.7%	39.7%	26.4%	45.2%	3.8%	3.9%	*
Jackson County HD	1,139	3,950	5,089	72.1%	14.0%	6.9%	5.7%	40.6%	27.6%	48.1%	8.5%	8.9%	10.7%
Kalamazoo County HD	834	3,356	4,190	61.3%	18.4%	8.7%	9.4%	39.8%	18.8%	53.8%	7.4%	6.1%	10.2%
Kalamazoo Family Health Center	663	2,736	3,399	29.9%	45.8%	15.7%	6.6%	44.2%	30.5%	43.5%	7.1%	5.1%	9.7%
Kent County HD	4,899	18,659	23,558	37.6%	20.8%	34.1%	4.8%	39.4%	27.2%	42.5%	6.5%	6.3%	10.1%
Keweenaw Bay WIC Program	53	254	307	10.1%	0.0%	2.3%	48.5%	32.7%	20.9%	51.2%	*	*	*
Lapeer County HD	453	1,669	2,122	88.9%	0.6%	6.6%	3.2%	39.9%	28.0%	44.4%	8.5%	7.9%	*
Livingston County HD	415	1,368	1,783	92.5%	1.2%	4.2%	0.8%	23.3%	21.3%	54.9%	3.7%	3.5%	*
Luce-Mackinac-Alger-Schoolcraft DHD	209	992	1,201	82.7%	0.5%	0.9%	8.1%	54.2%	51.2%	28.7%	5.5%	5.9%	*
Macomb County HD	2,239	9,047	11,286	68.4%	15.1%	6.9%	5.7%	28.0%	32.8%	40.6%	5.0%	4.7%	8.6%
Marquette County HD	320	1,362	1,682	87.7%	0.5%	1.7%	7.8%	54.4%	19.9%	47.4%	5.9%	6.5%	*
Mid MI Comm Action Agency	390	1,581	1,971	93.3%	1.0%	1.7%	3.6%	38.1%	25.0%	47.1%	8.4%	7.7%	*
Mid-Michigan DHD	979	3,959	4,938	90.1%	0.7%	7.1%	1.8%	36.2%	22.3%	49.9%	6.5%	6.0%	*
Monroe County HD	791	2,128	2,919	83.1%	4.2%	7.2%	4.6%	38.9%	21.7%	46.8%	6.5%	6.4%	*
Muskegon County HD	1,563	5,977	7,540	55.0%	26.1%	10.7%	6.2%	40.1%	22.6%	48.7%	6.6%	6.0%	9.3%
Northwest MI Comm Health Agency	735	3,008	3,743	90.9%	0.5%	2.2%	4.0%	47.6%	35.6%	36.1%	4.5%	4.6%	9.8%
Oakland County HD	3,959	14,071	18,030	49.1%	29.8%	15.4%	3.2%	25.4%	22.2%	46.7%	7.1%	5.8%	9.8%
Pub Hlth Delta & Menominee Counties	368	1,562	1,930	90.6%	0.1%	1.8%	6.1%	41.5%	22.5%	52.6%	5.6%	5.3%	*
Saginaw County Dept PH	1,152	4,640	5,792	50.3%	29.7%	15.6%	3.9%	40.7%	20.1%	52.2%	8.5%	6.4%	12.6%
Sanilac County HD	234	1,124	1,358	93.2%	0.0%	4.9%	1.7%	46.1%	23.0%	44.0%	4.8%	4.5%	*
Shiawassee County HD	530	2,095	2,625	93.4%	0.4%	3.1%	2.6%	49.1%	28.2%	44.1%	7.1%	7.4%	*
St. Clair County HD	995	4,011	5,006	80.2%	4.3%	6.8%	8.0%	34.5%	25.0%	47.6%	7.8%	7.5%	20.0%
Tuscola County HD	342	1,622	1,964	93.2%	0.3%	4.6%	1.6%	38.5%	25.1%	43.7%	6.8%	6.7%	*
Washtenaw County HD	1,400	4,813	6,213	38.6%	40.0%	11.5%	4.2%	30.6%	36.4%	38.5%	7.8%	7.4%	9.5%
Wayne County HD	4,048	15,036	19,084	71.7%	17.9%	4.2%	2.8%	26.2%	30.1%	41.7%	6.3%	5.8%	8.8%
Western Upper Penin DHD	392	1,616	2,008	92.3%	1.1%	0.6%	3.0%	41.1%	28.0%	41.2%	5.1%	5.4%	*

^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 2006

	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	52.0%	15.8%	16.2%	16.3%	14.1%	19.3%	13.4%	12.5%	11.2%	19.8%	12.9%
Local Agency											
Barry-Eaton DHD	57.7%	16.1%	16.9%	17.2%	*	15.3%	12.4%	12.4%	*	*	5.3%
Bay County HD	49.5%	10.2%	18.2%	18.8%	*	15.8%	13.6%	13.2%	*	15.1%	7.3%
Benzie-Leelanau DHD	76.0%	27.3%	17.7%	15.3%	*	22.6%	16.8%	12.9%	*	24.5%	6.5%
Berrien County HD	50.9%	13.4%	18.3%	19.1%	16.9%	22.4%	12.3%	11.9%	12.7%	11.9%	17.4%
Branch-Hillsdale-St. Joe DHD	54.3%	11.9%	16.2%	15.3%	11.1%	21.5%	17.2%	14.7%	11.1%	29.8%	10.5%
Calhoun County HD	44.7%	9.3%	20.7%	19.8%	22.0%	20.0%	13.8%	11.9%	15.5%	20.4%	15.9%
Central MI District HD	58.6%	15.1%	17.2%	16.9%	*	26.1%	15.1%	14.6%	*	21.7%	8.6%
Chippewa County HD	60.8%	26.9%	19.5%	21.2%	*	*	17.0%	13.9%	*	*	10.0%
Community Action Agency	53.5%	13.7%	17.8%	16.6%	*	22.6%	17.3%	17.4%	*	17.7%	11.6%
Detroit Dept. of Health & Wellness	38.1%	15.6%	14.1%	12.2%	13.2%	19.4%	12.2%	7.6%	10.6%	22.4%	19.0%
Detroit Urban League	35.1%	23.2%	15.0%	16.6%	14.4%	16.7%	14.1%	14.9%	11.7%	24.6%	19.4%
Dickinson-Iron DHD	57.2%	16.5%	19.2%	19.6%	*	*	17.2%	16.3%	*	22.2%	5.5%
District Health Dept #10	62.4%	15.7%	16.5%	15.8%	9.8%	22.0%	12.2%	10.8%	11.8%	19.7%	9.8%
District Health Dept. #2	47.5%	8.6%	19.5%	19.3%	*	*	15.6%	15.9%	*	16.7%	10.2%
District Health Dept. #4	59.9%	15.1%	16.5%	16.6%	*	*	12.9%	13.0%	*	*	10.5%
Genesee County HD	43.2%	8.9%	16.1%	18.0%	13.2%	19.1%	12.1%	11.9%	11.5%	19.8%	21.2%
Grand Traverse County HD	79.8%	32.3%	14.9%	14.4%	*	15.1%	9.9%	9.1%	*	22.6%	9.7%
Health Delivery, Inc.	41.5%	11.4%	15.2%	23.5%	14.5%	15.1%	16.7%	13.3%	12.9%	22.5%	13.4%
Huron County HD	47.5%	11.7%	15.0%	15.3%	*	*	13.4%	12.9%	*	16.7%	10.0%
Ingham County HD	62.1%	19.0%	17.0%	16.5%	17.4%	18.9%	13.8%	13.6%	11.1%	18.3%	11.0%
InterCare Comm Health Network	61.7%	19.9%	16.3%	14.8%	14.8%	18.6%	14.5%	12.5%	11.7%	18.3%	14.0%
Ionia County HD	49.2%	13.5%	19.8%	18.2%	*	26.7%	19.5%	18.0%	*	32.6%	6.2%
Jackson County HD	50.2%	11.9%	15.1%	15.8%	10.2%	15.5%	12.7%	12.8%	11.4%	17.5%	8.8%
Kalamazoo County HD	57.2%	20.3%	18.8%	19.3%	19.9%	13.6%	16.1%	15.3%	14.7%	22.9%	21.3%
Kalamazoo Family Health Center	57.5%	12.6%	17.2%	12.9%	19.7%	18.6%	13.5%	14.2%	11.8%	16.2%	22.8%
Kent County HD	58.8%	15.9%	16.8%	15.4%	13.4%	20.1%	15.3%	12.1%	12.1%	20.1%	8.0%
Keweenaw Bay WIC Program	37.8%	17.1%	18.4%	12.5%	*	*	18.4%	12.5%	*	*	21.4%
Lapeer County HD	49.5%	13.3%	15.2%	14.9%	25.0%	20.4%	11.0%	11.1%	*	12.2%	13.5%
Livingston County HD	69.9%	19.7%	17.5%	16.3%	16.7%	27.6%	13.5%	13.1%	*	24.1%	3.5%
Luce-Mackinac-Alger-Schoolcraft DHD	55.4%	18.3%	18.4%	17.8%	33.3%	*	18.4%	17.5%	*	*	14.8%
Macomb County HD	94.4%	11.2%	14.1%	14.2%	11.0%	21.1%	14.2%	14.0%	9.4%	18.6%	18.2%
Marquette County HD	56.5%	22.6%	19.0%	19.0%	*	*	13.6%	12.9%	*	21.4%	6.0%
Mid MI Comm Action Agency	62.2%	16.1%	19.5%	19.6%	25.0%	*	16.9%	16.9%	*	6.3%	7.4%
Mid-Michigan DHD	58.4%	16.4%	10.8%	10.7%	6.7%	12.2%	9.3%	9.1%	*	11.5%	4.6%
Monroe County HD	48.1%	12.5%	15.8%	15.9%	3.3%	22.4%	10.6%	10.3%	*	12.2%	9.2%
Muskegon County HD	44.3%	12.0%	18.3%	17.9%	16.6%	22.1%	13.0%	12.4%	12.8%	16.4%	13.7%
Northwest MI Comm Health Agency	68.4%	26.0%	15.1%	14.8%	*	27.6%	10.7%	10.6%	*	13.8%	3.8%
Oakland County HD	50.2%	16.2%	14.4%	15.8%	10.1%	17.5%	11.0%	10.1%	8.4%	18.1%	13.0%
Pub Hlth Delta & Menominee Counties	56.4%	14.3%	17.3%	16.8%	*	*	14.8%	14.0%	*	20.0%	2.0%
Saginaw County Dept PH	44.4%	7.6%	17.6%	18.2%	14.5%	21.4%	13.4%	14.3%	10.1%	15.5%	9.1%
Sanilac County HD	50.3%	11.2%	15.3%	15.5%	*	*	10.5%	10.2%	*	21.1%	5.4%
Shiawassee County HD	58.5%	14.8%	17.0%	16.7%	83.3%	*	12.0%	11.9%	*	16.7%	6.7%
St. Clair County HD	44.8%	8.7%	16.4%	15.9%	14.1%	18.9%	10.7%	10.5%	9.0%	11.4%	9.4%
Tuscola County HD	59.1%	11.8%	14.7%	14.1%	*	21.1%	11.9%	12.1%	*	13.2%	5.7%
Washtenaw County HD	63.3%	26.7%	18.0%	18.6%	16.5%	20.6%	13.9%	13.6%	14.5%	19.0%	22.8%
Wayne County HD	57.8%	22.4%	16.6%	17.0%	15.3%	17.4%	13.8%	13.9%	11.3%	19.3%	9.9%
Western Upper Penin DHD	62.2%	25.3%	18.2%	19.2%	*	*	11.8%	11.7%	*	33.3%	7.1%

^b PNSS Data. ^c Analysis limited to children < 2 years of age. ^d PedNSS data. ^e Analysis limited to children 2-5 years of age.

*Data insufficient for analysis

Table A-3. Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2005

	PNSS	PedNSS	Total ^a	Race/Ethnicity ^a				1st Trimester WIC Enrollment ^b	Weight Gain ^b		Low Birthweight ^b		
	N	N	N	White	Black	Hispanic	Multi-racial		< Ideal	>Ideal	Total	White	Black
Michigan	65,204	229,602	294,806	50.5%	25.3%	11.4%	10.3%	32.6%	29.2%	43.3%	7.5%	6.1%	10.8%
Local Agency													
Bary-Eaton DHD	756	2813	3,422	95.5%	2.0%	4.8%	2.2%	36.3%	28.4%	43.4%	7.2%	7.4%	*
Bay County HD	732	2827	3,348	81.8%	2.7%	13.8%	7.9%	47.9%	25.3%	45.1%	4.0%	3.8%	*
Benzie-Leelanau DHD	206	792	972	70.9%	0.3%	18.0%	7.1%	43.7%	27.8%	40.7%	6.5%	7.7%	*
Berrien County HD	1,081	3976	5,062	48.0%	40.5%	5.3%	5.8%	35.6%	24.2%	48.1%	6.2%	6.8%	5.6%
Branch-Hillsdale-St. Joe DHD	1,345	5247	6,103	87.2%	2.1%	16.8%	1.9%	39.0%	34.2%	40.0%	5.4%	5.7%	*
Calhoun County HD	1,293	4614	5,816	61.5%	22.2%	9.3%	7.1%	35.1%	23.3%	50.6%	6.6%	6.6%	8.3%
Central MI District HD	1,330	5128	6,338	93.8%	0.7%	2.0%	3.7%	43.2%	24.6%	47.7%	4.7%	4.4%	*
Chippewa County HD	306	1103	1,492	49.0%	0.1%	1.5%	20.2%	48.7%	26.5%	46.6%	3.2%	*	*
Community Action Agency	633	2130	2,613	71.8%	2.4%	26.7%	4.5%	28.4%	23.4%	48.2%	5.4%	5.9%	*
Detroit Dept. of Health & Wellness	10,348	33971	43,206	8.2%	76.1%	15.3%	1.1%	20.8%	36.1%	39.2%	10.6%	7.3%	11.7%
Detroit Urban League	2,206	8239	10,293	9.3%	68.1%	12.9%	2.8%	24.6%	32.0%	41.1%	9.3%	5.2%	10.5%
Dickinson-Iron DHD	278	1039	1,393	89.4%	0.6%	1.2%	2.7%	45.9%	24.1%	42.4%	3.8%	3.6%	*
District Health Dept #10	2,223	8477	10,263	83.7%	1.3%	14.4%	4.4%	44.9%	22.9%	47.3%	6.6%	5.8%	*
District Health Dept. #2	435	1667	2,158	92.9%	0.9%	1.0%	1.8%	42.4%	24.0%	52.3%	6.1%	5.4%	*
District Health Dept. #4	476	1935	2,423	93.6%	0.6%	1.3%	5.4%	45.0%	25.4%	45.0%	4.5%	4.5%	*
Genesee County HD	3,464	11687	15,358	51.3%	42.2%	2.3%	1.9%	28.2%	22.6%	47.9%	7.7%	5.1%	11.3%
Grand Traverse County HD	565	2210	2,618	97.8%	0.4%	5.2%	2.8%	44.6%	23.7%	47.5%	6.3%	6.0%	*
Health Delivery, Inc.	621	2634	3,280	8.8%	50.7%	35.9%	2.3%	53.0%	27.0%	42.7%	9.3%	*	10.8%
Huron County HD	247	941	1,173	93.7%	0.3%	3.3%	1.6%	46.9%	27.2%	48.4%	3.0%	3.2%	*
Ingham County HD	1,958	6239	8,160	50.8%	25.1%	15.1%	4.3%	21.6%	46.2%	31.5%	6.4%	6.0%	10.0%
InterCare Comm Health Network	3,382	13790	16,115	60.9%	3.6%	37.3%	4.6%	37.6%	37.8%	36.8%	6.5%	6.5%	11.3%
Ionia County HD	435	1690	1,959	90.9%	0.4%	12.4%	5.7%	31.4%	25.1%	47.1%	7.0%	6.4%	*
Jackson County HD	1,275	4513	5,529	74.8%	14.7%	7.1%	7.8%	32.1%	24.1%	45.3%	6.5%	6.0%	8.1%
Kalamazoo County HD	970	3446	4,359	60.0%	18.6%	9.1%	11.0%	36.5%	21.4%	50.4%	8.2%	6.9%	12.0%
Kalamazoo Family Health Center	738	2896	3,426	32.9%	46.8%	17.2%	12.5%	43.1%	33.1%	43.2%	8.3%	6.7%	10.2%
Kent County HD	5,210	19042	23,560	38.5%	21.2%	34.7%	5.7%	39.4%	27.2%	42.7%	7.4%	6.9%	11.5%
Keweenaw Bay WIC Program	59	262	311	7.7%	0.0%	2.9%	64.0%	43.9%	11.8%	58.8%	8.2%	*	*
Lapeer County HD	471	1778	2,207	92.7%	0.6%	5.7%	3.7%	37.2%	19.5%	51.1%	5.1%	4.8%	*
Livingston County HD	430	1566	1,747	107.6%	1.1%	6.0%	4.5%	27.4%	18.3%	52.6%	6.6%	6.7%	*
Luce-Mackinac-Alger-Schoolcraft DHD	242	1002	1,313	77.9%	0.4%	0.8%	9.5%	61.4%	51.0%	30.0%	5.3%	4.9%	*
Macomb County HD	2,123	8720	11,103	65.6%	18.1%	4.0%	5.8%	24.9%	31.4%	42.0%	7.8%	7.1%	10.5%
Marquette County HD	359	1445	1,767	91.8%	0.6%	1.5%	9.3%	44.5%	19.7%	50.2%	5.3%	5.4%	*
Mid MI Comm Action Agency	407	1627	2,032	95.3%	1.2%	1.6%	4.1%	41.7%	24.7%	46.2%	7.0%	7.3%	*
Mid-Michigan DHD	1,008	4042	4,863	93.6%	0.6%	7.5%	2.2%	40.5%	26.7%	45.2%	6.7%	6.6%	*
Monroe County HD	771	2395	3,052	87.5%	4.4%	8.0%	6.7%	38.1%	23.2%	46.9%	6.7%	7.3%	*
Muskegon County HD	1,699	6504	7,917	57.4%	27.4%	11.3%	7.6%	38.0%	23.2%	49.1%	8.3%	6.9%	10.9%
Northwest MI Comm Health Agency	754	3054	3,761	92.7%	0.5%	1.8%	4.8%	50.6%	32.6%	37.3%	6.6%	6.6%	*
Oakland County HD	3,995	14433	17,638	50.9%	32.4%	15.7%	3.4%	21.7%	24.4%	45.9%	7.9%	7.2%	9.3%
Pub Hlth Delta & Menominee Counties	409	1533	2,015	87.3%	0.0%	1.3%	6.3%	46.9%	19.5%	51.5%	6.3%	6.1%	*
Saginaw County Dept PH	1,320	4606	6,170	48.1%	28.0%	14.6%	3.6%	43.5%	19.7%	49.6%	7.2%	6.4%	11.0%
Sanilac County HD	310	1155	1,483	89.3%	0.1%	5.9%	2.6%	39.1%	22.1%	48.2%	7.6%	7.8%	*
Shiawassee County HD	521	2056	2,585	92.4%	0.3%	3.1%	3.5%	50.3%	22.1%	48.8%	5.2%	5.3%	*
St. Clair County HD	1,043	3964	5,066	76.3%	4.7%	7.1%	8.5%	37.8%	21.8%	50.7%	6.2%	5.7%	*
Tuscola County HD	386	1602	1,998	92.2%	0.2%	4.8%	2.3%	40.1%	23.5%	44.4%	6.2%	6.1%	*
Washtenaw County HD	1,458	4679	6,266	38.9%	38.8%	11.4%	5.0%	29.2%	25.7%	44.6%	6.6%	6.1%	8.7%
Wayne County HD	4,453	15227	18,894	69.9%	18.8%	5.0%	4.2%	26.2%	35.1%	39.1%	6.9%	5.9%	10.5%
Western Upper Penin DHD	382	1618	1,982	94.3%	1.2%	1.0%	3.1%	47.0%	47.4%	29.0%	3.0%	3.0%	*

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

Table A-3 (continued) Selected indicators by Local WIC Agency, Michigan PNSS & PedNSS 2005

	Breastfeeding ^f		Overweight ^{d,e}				Obese ^{d,e}				Anemia <5yrs ^d
	Initiation ^b	6 months duration ^d	Total	White	Black	Hispanic	Total	White	Black	Hispanic	
Michigan	52.6%	15.5%	15.6%	15.9%	13.4%	18.5%	12.8%	12.3%	10.8%	18.4%	14.0%
Local Agency											
Barry-Eaton DHD	59.5%	10.6%	18.7%	18.8%	23.1%	18.4%	13.8%	13.7%	*	13.2%	6.4%
Bay County HD	50.6%	16.0%	17.9%	17.5%	23.5%	23.6%	12.5%	12.3%	17.6%	15.3%	8.8%
Benzie-Leelanau DHD	80.9%	23.5%	16.7%	14.1%	*	18.5%	13.6%	13.3%	*	10.8%	8.8%
Berrien County HD	49.8%	11.0%	15.3%	14.1%	15.2%	27.9%	11.6%	12.1%	11.6%	*	14.8%
Branch-Hillsdale-St. Joe DHD	51.4%	12.1%	16.1%	15.6%	17.0%	21.8%	15.1%	13.2%	13.2%	27.7%	12.9%
Calhoun County HD	49.9%	10.8%	17.3%	16.5%	18.4%	18.5%	14.5%	13.3%	13.1%	18.9%	18.2%
Central MI District HD	60.8%	16.8%	17.4%	17.5%	*	20.0%	13.6%	13.4%	20.0%	23.3%	9.8%
Chippewa County HD	62.9%	18.1%	19.0%	19.0%	*	*	16.2%	13.8%	*	*	10.3%
Community Action Agency	56.4%	12.6%	16.7%	17.1%	22.2%	14.9%	14.6%	14.1%	13.9%	15.5%	11.7%
Detroit Dept. of Health & Wellness	38.8%	16.0%	12.1%	12.2%	11.5%	15.5%	10.6%	9.0%	9.9%	16.4%	20.3%
Detroit Urban League	36.1%	15.8%	14.8%	13.4%	14.4%	17.2%	12.9%	17.5%	10.9%	20.8%	24.2%
Dickenson-Iron DHD	55.9%	19.2%	19.3%	19.1%	*	*	14.9%	15.2%	*	*	11.1%
District Health Dept #10	59.8%	18.7%	14.6%	13.9%	14.5%	17.2%	12.3%	11.2%	14.5%	19.4%	10.7%
District Health Dept. #2	44.5%	7.7%	18.2%	18.7%	*	*	14.5%	14.6%	*	*	12.2%
District Health Dept. #4	57.1%	18.8%	15.1%	15.0%	*	*	12.9%	12.6%	*	*	10.7%
Genesee County HD	44.3%	8.3%	14.4%	13.9%	14.2%	16.7%	12.3%	12.1%	12.3%	16.0%	22.4%
Grand Traverse County HD	76.9%	33.2%	14.3%	14.3%	*	*	10.6%	10.7%	*	17.5%	10.9%
Health Delivery, Inc.	44.1%	12.2%	17.9%	17.0%	16.6%	19.2%	14.6%	17.0%	11.0%	20.8%	15.0%
Huron County HD	45.4%	12.4%	16.9%	17.0%	*	*	15.4%	14.5%	*	*	9.7%
Ingham County HD	62.0%	18.4%	16.9%	16.5%	15.1%	21.6%	11.5%	10.2%	11.7%	15.0%	13.6%
InterCare Comm Health Network	64.9%	18.4%	17.1%	15.9%	12.6%	19.8%	13.8%	12.6%	8.7%	16.6%	13.5%
Ionia County HD	53.4%	14.1%	22.3%	21.3%	*	30.7%	18.1%	16.2%	*	36.0%	9.3%
Jackson County HD	51.9%	10.8%	16.5%	16.7%	12.8%	20.2%	12.1%	12.8%	10.0%	16.9%	9.2%
Kalamazoo County HD	57.6%	14.7%	18.5%	18.8%	15.5%	25.3%	14.9%	15.3%	14.4%	13.8%	21.4%
Kalamazoo Family Health Center	55.8%	13.0%	16.8%	16.0%	16.5%	19.9%	12.8%	10.1%	11.6%	17.6%	23.3%
Kent County HD	60.5%	16.2%	17.5%	16.9%	15.5%	20.3%	15.0%	10.9%	11.1%	20.9%	7.5%
Keweenaw Bay WIC Program	35.4%	5.7%	19.4%	15.4%	*	*	23.1%	38.5%	*	*	16.9%
Lapeer County HD	51.8%	10.3%	15.8%	15.4%	*	*	13.1%	12.5%	*	14.3%	7.3%
Livingston County HD	68.9%	17.9%	18.2%	18.0%	*	*	11.7%	12.4%	*	15.4%	7.0%
Luce-Mackinac-Alger-Schoolcraft DHD	55.9%	18.1%	19.1%	18.5%	*	*	17.5%	15.9%	*	*	15.3%
Macomb County HD	93.7%	13.3%	12.0%	12.6%	11.0%	12.2%	12.2%	12.3%	8.2%	20.1%	18.5%
Marquette County HD	67.9%	19.4%	22.2%	22.6%	*	*	11.2%	11.1%	*	*	5.1%
Mid MI Comm Action Agency	59.9%	14.0%	18.8%	19.1%	41.7%	*	16.2%	16.5%	*	11.8%	11.8%
Mid-Michigan DHD	58.2%	15.5%	13.3%	13.7%	*	10.3%	10.8%	10.6%	*	17.5%	6.1%
Monroe County HD	50.2%	13.6%	13.1%	13.4%	*	*	11.5%	11.0%	15.6%	13.3%	9.5%
Muskegon County HD	42.5%	13.0%	18.2%	17.5%	16.4%	23.6%	12.1%	10.6%	11.7%	15.8%	19.6%
Northwest MI Comm Health Agency	80.1%	22.9%	14.2%	14.3%	*	*	10.8%	10.5%	*	10.0%	5.0%
Oakland County HD	50.8%	15.5%	14.2%	14.7%	10.7%	17.4%	10.9%	9.5%	7.8%	17.9%	14.7%
Pub Hlth Delta & Menominee Counties	57.5%	12.8%	17.3%	17.0%	*	*	15.5%	14.9%	*	25.0%	2.0%
Saginaw County Dept PH	44.1%	8.8%	16.6%	19.4%	12.4%	19.4%	13.4%	12.9%	12.5%	17.2%	8.8%
Sanilac County HD	54.0%	9.8%	16.7%	17.1%	*	*	13.8%	12.7%	*	37.5%	4.5%
Shiawassee County HD	55.2%	19.0%	15.9%	15.8%	*	21.7%	11.0%	10.2%	*	13.0%	5.2%
St. Clair County HD	45.6%	10.7%	14.9%	15.2%	16.8%	14.7%	12.1%	12.2%	7.5%	16.5%	13.6%
Tuscola County HD	57.9%	8.4%	13.6%	14.1%	*	*	11.9%	11.2%	*	30.0%	4.4%
Washtenaw County HD	63.2%	30.1%	16.6%	17.2%	15.4%	17.0%	13.6%	14.8%	14.4%	16.3%	25.1%
Wayne County HD	52.0%	18.8%	15.7%	16.7%	14.1%	13.5%	14.0%	14.1%	11.7%	19.3%	10.2%
Western Upper Penin DHD	65.6%	26.1%	13.8%	14.0%	*	*	7.9%	8.0%	*	*	8.6%

^b PNSS Data. ^c Analysis limited to children < 2 years of age. ^d PedNSS data. ^e Analysis limited to children 2-5 years of age.

*Data insufficient for analysis

*Michigan Department
of Community Health*



**Rick Snyder, Governor
Olga Dazzo, Director**

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