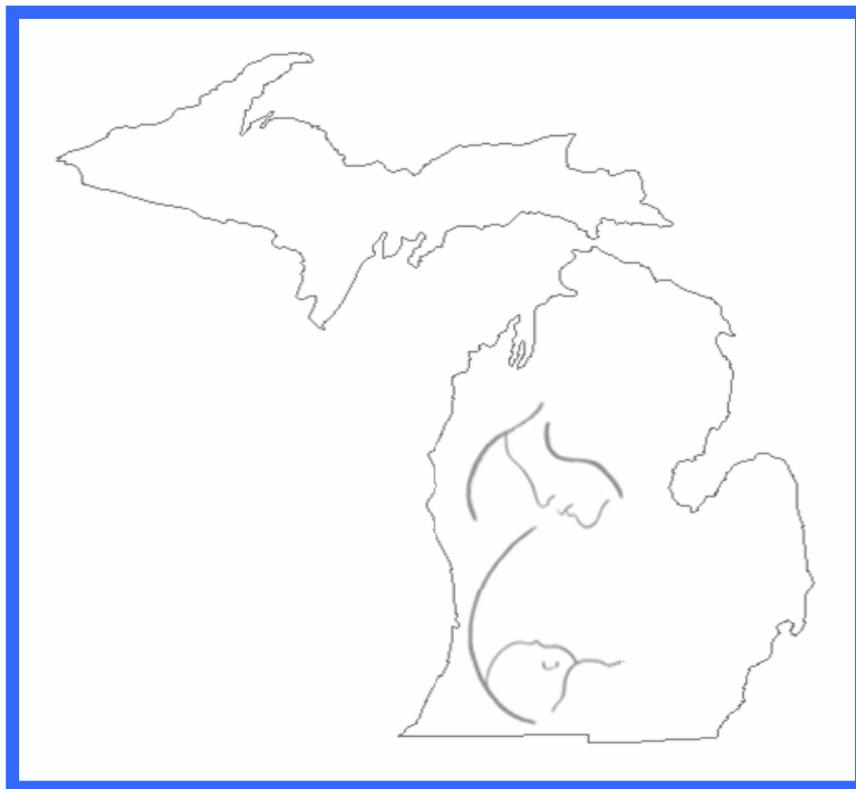




Michigan Pregnancy Nutrition Surveillance



2000-2003 PNSS Trend Report

Michigan Department of Community Health

2008

Michigan Department of Community Health.....Janet Olszewski, Director
Public Health Administration.....Jean Chabut, Deputy Director
Bureau of Family, Maternal, and Child Health.... Alethia Carr, Director
**Special Supplemental Nutrition Program for
Women, Infant, and Children (WIC) Division**.....Stan Bien, Acting Director

Suggested Citation

Larrieux C., Eghtedary K., Grigorescu V., Sachau D., Revitte D. M., and Carr A. Michigan Pregnancy Nutrition Surveillance 2000-2003 Trend Report. Michigan Department of Community Health, WIC Division, 2008.

Acknowledgments

It is with great appreciation that we acknowledge all the contributors to the Michigan Pregnancy Surveillance System (PNSS). The efforts of WIC local agency coordinators, health professionals, and clerical staff at each local clinic to collect participant data make the Michigan Nutrition Surveillance possible.

For additional copies of this report, please contact Michigan Department of
Community Health, WIC Division, www.michigan.gov/mdch
Michiganwic@michigan.gov
(517) 335-8979



Jennifer Granholm, Governor
Janet Olszewski, Director

Michigan Department of Community Health, WIC Division is an equal opportunity Provider.

Table of Contents

Index of Figures & Tables	ii
Summary	iv
Introduction	1
Maternal Demographic Characteristics	5
Maternal Age	5
Teen Pregnancy	6
Maternal Race/Ethnicity	7
Maternal Education	8
Maternal Behavior & Nutrition	10
Prenatal Care	10
WIC Enrollment	12
Pre-pregnancy BMI	16
Weight Gain during Pregnancy	19
Iron Deficiency Anemia	23
Tobacco Use	24
Alcohol Consumption	28
Birth Outcome & Infant Health	30
Birthweight	30
Breastfeeding	35
Pregnancy Outcome Health Progress Review	40
Conclusion and Recommendations	42
References	43
Appendix: Selected Health Indicators Among WIC Local Agencies	A-1

Index of Figures & Tables

Figures

Figure 1.	Map of WIC geographic areas	4
Figure 2.	Trend in Teenage Participation in WIC, 2000-2003 MI PNSS	6
Figure 3.	Race/ethnicity of women participating in WIC, 2003 MI PNSS	7
Figure 4.	Racial/ethnic distribution of selected WIC agencies, 2003 MI PNSS	8
Figure 5.	Years of Education Attained by Michigan WIC Participants, 2003 MI PNSS	9
Figure 6.	1 st Trimester entry into prenatal care among selected WIC agencies, 2003 MI PNSS	11
Figure 7.	Trend in Trimester of entry into WIC, 2000-2003 MI PNSS	13
Figure 8.	1 st trimester entry into WIC by WIC geographic area, 2003 MI PNSS	15
Figure 9.	Trends in pre-pregnancy BMI, 2003 MI PNSS	17
Figure 10.	Trend in weight gain during pregnancy, 2003 MI PNSS	18
Figure 11.	Less than recommended weight gain by WIC geographic area, 2003 MI PNSS	22
Figure 12.	Anemia by age and trimester of entry into WIC, 2003 MI PNSS	24
Figure 13.	Trend in smoking three months before pregnancy by maternal age, 2000-2003 MI PNSS	25
Figure 14.	Trend in smoking three months before pregnancy by maternal race/ethnicity, 2003 MI PNSS	25
Figure 15.	Trend in smoking in the last three months of pregnancy by maternal age, 2003 MI PNSS	27
Figure 16.	Trend in smoking in the last three months of pregnancy by maternal race/ethnicity, 2003 MI PNSS	27
Figure 17.	Trend in alcohol consumption during pregnancy, 2000-2003 MI PNSS	29
Figure 18.	Trend in Incidence of LBW and VLBW among WIC participants, 2000-2003 MI PNSS	30
Figure 19.	Incidence of low birth weight by maternal age and maternal race/ethnicity, 2003 MI PNSS	31
Figure 20.	Incidence of low birthweight by pre-pregnancy BMI and smoking status, 2003 MI PNSS	33
Figure 21.	Incidence of low birthweight and very low birthweight by trimester of entry into WIC, 2003 MI PNSS	33
Figure 22.	Incidence of low birthweight by pre-pregnancy BMI and weight gain during pregnancy, 2003 MI PNSS	33
Figure 23.	The incidence of low birthweight by WIC geographic area, 2003 MI PNSS	35
Figure 24.	Prevalence of ever breastfed by trimester of entry into WIC, 2003 MI PNSS	37
Figure 25.	Prevalence of ever breastfed by WIC geographic area, 2003 MI PNSS	38
Figure 26.	Pregnancy Nutrition Surveillance System Health Progress Review, 200-2003 MI PNSS	40

Tables

Table 1.	Number of records in Michigan PNSS, by WIC local agency in 2003, (N= 61,040)	3
Table 2.	Age of women enrolled in WIC compared to age of all mothers delivering a live born infant* in Michigan, 2003	5
Table 3	Trimester of entry into PNC among WIC participants by race/ethnicity and Age, 2003 MI PNSS	10
Table 4	Trimester of WIC entry by maternal age and maternal race/ethnicity, 2003 MI PNSS	13
Table 5	Pre-pregnancy BMI by maternal age and maternal race/ethnicity, 2003 MI PNSS	17
Table 6	Weight gain during pregnancy by maternal age and maternal race/ethnicity, 2003 MI PNSS	21
Table 7	Incidence of low birthweight by various maternal behaviors and characteristics, 2003 MI PNSS	32
Table 8	Prevalence of ever breastfeeding by maternal demographic characteristics, 2003 MI PNSS	37

Appendix

MI PNSS state and agency statistics, 2003 PNSS.....	A-2
MI PNSS state and agency statistics, 2002 PNSS.....	A-4
MI PNSS state and agency statistics, 2001 PNSS.....	A-6
MI PNSS state and agency statistics, 2000 PNSS.....	A-8

Summary

Favorable maternal health prior to and throughout pregnancy typically results in positive birth outcomes. The Pregnancy Nutrition Surveillance System (PNSS) is a program-based public health surveillance system that monitors risk factors associated with infant mortality and poor birth outcomes among low-income pregnant women who participate in federally funded public health programs. This report summarizes the health and birth outcomes of women participating in the Michigan WIC program in 2003 and the preceding three years.

Statistics from state and national PNSS based on 2000 to 2003 data shows:

- The proportion of teenage women in the Michigan WIC population in 2003 is approximately double that of the general population of Michigan in 2003: 21.0% versus 9.5%
- Most WIC participants, in all age groups, enter prenatal care either in the first or second trimester of their pregnancy.
- Two-thirds of women enrolled in WIC before their third trimester (31.7% in the first trimester and 33.6% in the second trimester).
- Underweight among WIC participants in Michigan declined from 14.6% in 2000 to 11.9% in 2003.
- The prevalence of pre-pregnancy overweight among Michigan WIC participants increased from 41.6% in 2000 to 44.6% 2003.
- Fewer women enrolled in WIC with less than recommended weight gain in 2003 compared to 2000 (30.1% versus 34.0%).
- There were fewer women with greater than ideal weight gain in Michigan WIC compared to the national PNSS (43.4% compared to 44.2%).
- The prevalence of anemia was higher for women who enrolled later in their pregnancy. Among first trimester participants, the prevalence of anemia was 6.8%. The prevalence of anemia was 10.4% and 30.2% for second trimester and third trimester enrollees, respectively.
- Among women who enrolled in WIC prenatally, nearly 40% reported smoking before becoming pregnant. During pregnancy, the prevalence of smoking dropped to 23.1%.

- In Michigan WIC, the proportion of women who drank alcohol either before or during pregnancy declined since 2000. During the three year interval, the percentage of participants who reported drinking during pregnancy declined by an average of 1.1% annually.
- WIC enrolls women most at risk for an adverse birth outcome. Between 2000 and 2003, the incidence of LBW varied from 8.0% to 8.4% among WIC participants, while the overall state incidence was 7.9% to 8.2%.
- Women who enroll in WIC during their pregnancy had lower incidences of LBW and VLBW when compared to women who enroll postpartum. Women who enrolled in WIC prenatally had an incidence of LBW at or below 7.2%. Among women who enrolled postpartum, the incidence of LBW was 11.2%.
- Breastfeeding prevalence decreased for women who enrolled in WIC later during their pregnancy. Women who entered WIC in the first trimester had the highest prevalence of breastfeeding: 53.9%. They were followed by women entering in their second trimester (49.9%), in the third trimester (45.7%) and in the postpartum period (44.2%).

Introduction

The health of an infant is linked to that of its mother before and during pregnancy. The first few weeks after conception is a period of rapid development for the fetus. By the fourth week after conception most of the development of the brain has taken place; the heart has developed enough to begin beating rudimentary blood throughout the body; and limbs begin to form. Optimum maternal health before and during pregnancy usually translates to improved birth outcomes. Optimum maternal health includes: reducing or eliminating adverse behaviors (e.g. smoking); maintaining good physical and nutritional status to support the developing infant (e.g. folic acid for neural tube defects); receiving appropriate genetic screenings and counseling to determine the risk of passing on a genetic disorder (e.g. sickle cell anemia); proper management of chronic conditions (e.g. diabetes); and identifying and treating infections that can negatively impact pregnancy and infant health (e.g. syphilis). Identifying and ameliorating risk before and during pregnancy can decrease the probability of experiencing a complicated and expensive pregnancy.

The Pregnancy Nutrition Surveillance System (PNSS) is a program-based public health nutrition surveillance system that monitors the birth outcome of low-income women who participate

in federally funded maternal and child health programs. The purpose of PNSS is to identify and explore risk factors associated with adverse birth outcomes (e.g. infant mortality, pre-term birth, and low birthweight, etc.) in this vulnerable population. PNSS information is used to evaluate programs, guide, and formulate public policy. National PNSS data consist of programmatic data from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) and Title V Maternal and Child Health Program (MCH). In Michigan, however, PNSS data consist solely of pregnant and postpartum women participating in the state's WIC program.

Self-reported demographic, behavioral, and health information is collected at the local WIC agency and verified by a nurse, registered dietitian, nutritionist, or other competent health professional. The information is then transmitted to the state WIC agency. Information relevant to PNSS is further extracted and forwarded to the CDC. There the information is edited and crosschecked for accuracy. A data quality report is generated and sent back to the state. The CDC further processes the information, calculates indices related to nutrition and health and sends the data with an initial report, back to the state. If the data file is acceptable, it is then included in the national PNSS master file.

PNSS collects a variety of information related to health and nutrition. The data collected for PNSS

include: demographic information (age, race/ethnicity, education); anthropometric measurements (height, current weight, pre-pregnancy weight); health history (parity, pre-existing conditions, and interpregnancy interval); health utilization (entry into prenatal care); adverse maternal behavior (smoking and alcohol consumption) and environmental factors (smoke exposure at home); health indicator status (weight gain/lost during pregnancy, hematocrit/hemoglobin level, maternal morbidity); birth outcome (birthweight, infant mortality, pre-term birth); and breastfeeding initiation.

The process for collecting PNSS data in Michigan is designed to collect participant information as accurately as possible. Nevertheless, PNSS data has several limitations common to self-reported data: recall bias and loss to follow-up (due to changes in participants' eligibility and participants' length of WIC enrollment). Although recall bias cannot be completely negated when gathering health information from clients, data collection techniques employed by WIC agencies (i.e. verification of participant information by a health professional) help to minimize this type of bias. In addition, WIC provided nutrition services to low-income, nutritionally at risk women who select themselves to participate in the program, therefore the data is not representative of all low income women. For pregnant women, data is

collected only once during pregnancy, therefore indicators like hemoglobin or hematocrit levels, which fluctuate during pregnancy, represent the anemia status at the time blood was drawn.

As mentioned earlier, Michigan data for PNSS is gathered, exclusively, from participants in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). The WIC program's state administration is housed within the Bureau of Family, Maternal, and Child Health in the Michigan Department of Community Health. WIC provides food prescriptions to supplement diet; nutrition education/counseling; breastfeeding support and counseling; and referral to health and social services to participants who qualify. There are four eligibility criteria that must be met to participate in Michigan WIC: be a pregnant or postpartum woman, infant, or child (under the age of five); be a resident of Michigan; be at or below 185% of the Poverty Income Guideline or participate in another state-administered program that utilizes the same income guideline; and be classified by a health professional as "nutritionally at risk."¹

There are forty-eight WIC agencies in Michigan (Table 1). The agencies with the largest total number of pregnant and postpartum women are: Detroit Department of Health & Wellness Promotion (Detroit DHWP) (16.8%), Kent County Health Department (7.8%), Wayne County Health Department (6.5%), Oakland

Table 1: Number of records in Michigan PNSS, by WIC local agency in 2003, (N= 61,040)

Agency	N	%	Agency	N	%
Barry-Eaton DHD	723	1.2%	Kalamazoo Family Health Center	642	1.1%
Bay County HD	735	1.2%	Kent County HD	4,777	7.8%
Benzie-Leelanau DHD	193	0.3%	Keweenaw Bay WIC Program	49	0.1%
Berrien County HD	1,004	1.6%	Lapeer County HD	489	0.8%
Branch-Hillsdale-St. Joseph CHA	1,231	2.0%	Livingston County HD	358	0.6%
Calhoun County HD	1,232	2.0%	Luce-Mackinac-Alger-Schoolcraft DHD	214	0.4%
Central MI District HD	1,098	1.8%	Macomb County HD	1,812	3.0%
Chippewa County HD	288	0.5%	Marquette County HD	341	0.6%
Community Action Agency	595	1.0%	Mid MI Comm Action Agency	422	0.7%
Detroit Dept. of Health and Wellness Promotion	10,244	16.8%	Mid-Michigan DHD	888	1.5%
Detroit Urban League	1,735	2.8%	Monroe County HD	763	1.3%
Dickinson-Iron DHD	280	0.5%	Muskegon County HD	1,599	2.6%
Dist. Health Dept. #4	490	0.8%	Northwest MI Comm Health Agency	747	1.2%
District Health Dept #10	2,106	3.5%	Oakland County HD	3,539	5.8%
District Health Dept. #2	423	0.7%	Pub Hlth Delta & Menominee Counties	417	0.7%
Genesee County HD	3,371	5.5%	Saginaw County Dept PH	1,235	2.0%
Grand Traverse County HD	518	0.9%	Saginaw-Chippewa Indian Tribe	14	0.0%
Health Delivery, Inc.	577	1.0%	Sanilac County HD	296	0.5%
Huron County HD	226	0.4%	Shiawassee County HD	504	0.8%
Ingham County HD	1,959	3.2%	St. Clair County HD	1,019	1.7%
InterCare Comm Health Network	3,115	5.1%	Tuscola County HD	440	0.7%
Ionia County HD	440	0.7%	Washtenaw County HD	1,323	2.2%
Jackson County HD	1,241	2.0%	Wayne County HD	3,989	6.5%
Kalamazoo County HD	901	1.5%	Western Upper Penin DHD	438	0.7%

2003 MI PNSS

County Health Division (5.8%), and Genesee County Health Department (5.5%) (Table 1). Statistics for selected indicators for the state as well as each individual agency are located in the Appendix. Statistics in which the number of observations for an indicator is less than five were not reported.

The geographic area served by a particular agency varies throughout the state. An agency’s jurisdiction may encompass a single county or multiple counties. In addition, multiple agencies may serve the residents of a single county, city or target a particular racial/ethnic group. For the geospatial representation of the above, agencies were grouped into geographic areas (Figure 1). Multiple agencies serving the same geographic area were grouped and their data combined to

calculate the prevalence of health and nutritional indicators for that area. Consequently, statistics for multi-agency geographic areas represent the proportion of participants with a given condition over the total number of participants in that particular region. Thus, due to overlapping regions, we present data for the forty-eight WIC agencies in forty-two geographic areas. Health Delivery, Inc. was not represented geospatially due to the size of its jurisdiction (Figure 1). When mapping the health indicators by geographic area, the mid-color represents an indicator range that includes the overall state’s incidence/prevalence. Lighter shaded areas signify a range lower than the state’s incidence/prevalence and darker shaded areas indicate a range higher than the state’s incidence/prevalence.

Figure 1: Map of WIC geographic areas



This report summarizes the health and birth outcome of women participating in the Michigan WIC program in 2003 and the preceding three years. Nutrition health indicators such as underweight, overweight, weight gain during pregnancy, iron deficiency anemia, low birthweight, and breastfeeding initiation were analyzed by age, race/ethnicity, education, trimester of entry into prenatal care, and trimester of entry into WIC to generate statistics about pregnant and postpartum women participating in WIC between 2000 and 2003. The purpose of these statistics are to estimate the health status of participants; document and identify correlations

in their birth outcomes, and identify changes in the health and birth outcome indicators from 2000-2003 at both the state and agency level.

There are four considerations to take into account when reading the statistics presented in this report. First, the racial/ethnic groupings are slightly different for point estimates than for trends. Point estimates are calculated for non-Hispanic Whites, non-Hispanic Blacks, Hispanics, Asian/Pacific Islanders, and American Indians/Alaskan Natives. For trends, the five racial/ethnic groups are collapsed into four, with Asian/Pacific Islander and American Indians/Alaskan Natives being grouped together in the

‘Other’ category due to their small sample sizes. Second, it is expected that the prevalence of adverse health outcomes be higher in the PNSS population when compared to the general population. The aim of WIC is to reach out to those women, infants, and young children who are at highest risk and improve their health outcomes. Therefore, comparing point estimates to the general population gives a distorted picture of the effectiveness of the program. A more accurate way to view program effectiveness is to focus on health indicator trends. Finally, because the WIC population is a dynamic one, with participants entering and leaving the program at various points in time, this framework for viewing program effectiveness is not precise, but it is more accurate.

Maternal Demographic Characteristics

Maternal Age

WIC births constitute a considerable portion of annual live births in Michigan. Of the 2,125,430 women between the ages of fifteen to forty-four years old in Michigan, there were 188,462 estimated pregnancies.² About 70% of those pregnancies (130,850) resulted in a live birth.² Over half, 56.1%, of those live births were to WIC participants.³

The Michigan WIC population has a high proportion of women under the age of twenty years old, 21%, compared to the 9.5% in the general population in 2003. The majority of the women participating in the WIC program were under twenty-nine years of age (Table 2). This proportion is similar to that of women in the general population who gave birth in 2003.

Table 2. Age of women enrolled in WIC compared to age of all mothers delivering a live born infant* in Michigan, 2003

Woman's Age	WIC participants		Michigan Mothers	
	#	%	#	%
<20 years	12,789	21.0%	12,378	9.5%
20-29 years	36,817	60.3%	68,507	52.4%
30-39 years	10,696	17.5%	46,977	35.9%
> 39 years	735	1.2%	2,977	2.3%
<i>Total</i>	60,302	100.0%	130,850	100.0%

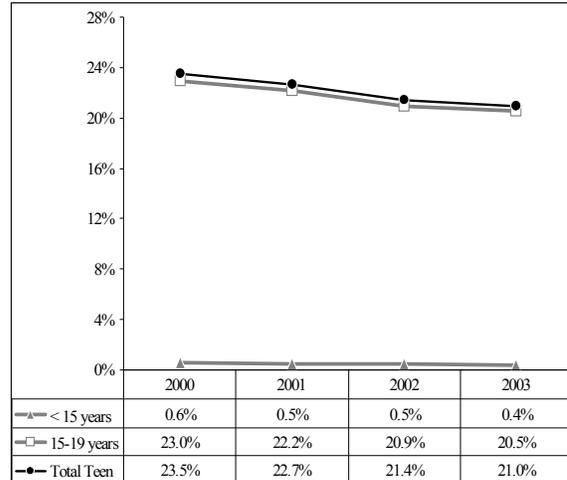
2003 MIPNSS

However, a higher percent of WIC participants were under the age of twenty-nine (81.3%) compared to the general population (61.9%).² Subsequently, older mothers were under represented in the WIC population. Among women in the general population who delivered a live born infant in 2003, 35.9% were between the ages of 30-39 years old whereas only 17.5% of women participating in WIC are within that age group.²

Teen Pregnancy

Of particular concern to Michigan WIC and other health professionals are teenage mothers (under the age of twenty). Although at menses a female is reproductively capable of becoming pregnant, teenage mothers are at high risk of pregnancy complications. A pregnant teen is less likely to seek prenatal care and less likely to gain the appropriate amount of weight during pregnancy. Pregnancy is nutritionally taxing for the mother, teens are still themselves developing and their nutritional needs compete with that of the infant. In addition to the physiological immaturity, teens tend to be socially, emotionally, and economically unprepared for motherhood. Teen pregnancies are usually unplanned and often result in a disruption of the mother’s schooling, which, in turn, affects the mother’s future earning potential.

Figure 2: Trend in Teenage Participation in WIC, 2000-2003 MI PNSS

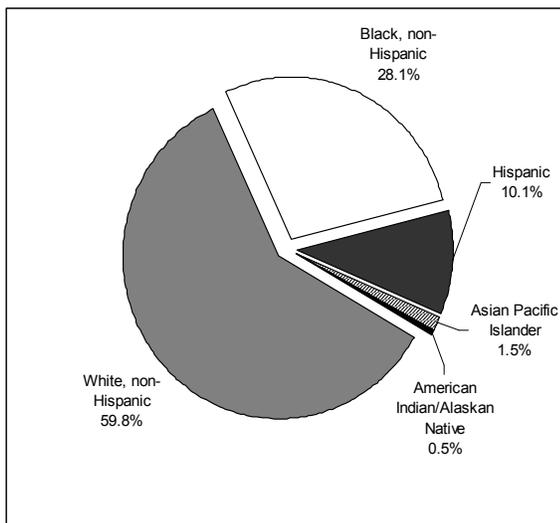


The proportion of teenage women in the WIC population in 2003 was approximately double that of the general population of women having a live birth in 2003 (21.0% compared to 9.5%).² However, the trend in teenage participation in WIC has declined from 2000-2003 (Figure 2). This decline was primarily driven by a decline in the percentage of participants fifteen to nineteen years old (23.0% in 2000 to 20.5% in 2003). Concurrently, the proportion of females participating in WIC under the age of fifteen remained relatively static (Figure 2). The decline in teenage participation reflects the decline in the percentage of births to teenage mothers in Michigan. From 2000 to 2003, the percentage of teen mothers in Michigan dropped from 10.5% to 9.5%.² The national PNSS data showed almost two-third of teen participants were between the ages of eighteen and nineteen years old and approximately one-third under the age of fifteen years old.

Maternal Race/Ethnicity

The Michigan PNSS population is a racially and ethnically diverse group of women. Nevertheless more than half (59.8%) of women who participate in WIC in 2003 reported being non-Hispanic White (Figure 3). Non-Hispanic Black followed with 28.1%, Hispanic (10.1%), Asian/Pacific Islander (1.5%), and American Indian/Alaskan Native (0.5%). Natality statistics for the general population of Michigan show that 71.4% of births were to non-Hispanic White women, 17.0% were to non-Hispanic Black women, 5.9% were to Hispanic women, and 5.7% to women of other race/ethnicities in 2003.² When comparing 2003 PNSS statistics to 2003 Michigan natality statistics, the ranking of the race/ethnic groups were the same, but a higher percentage of racial/ethnic minorities were represented in the

Figure 3: Race/ethnicity of women participating in WIC, 2003 MI PNSS



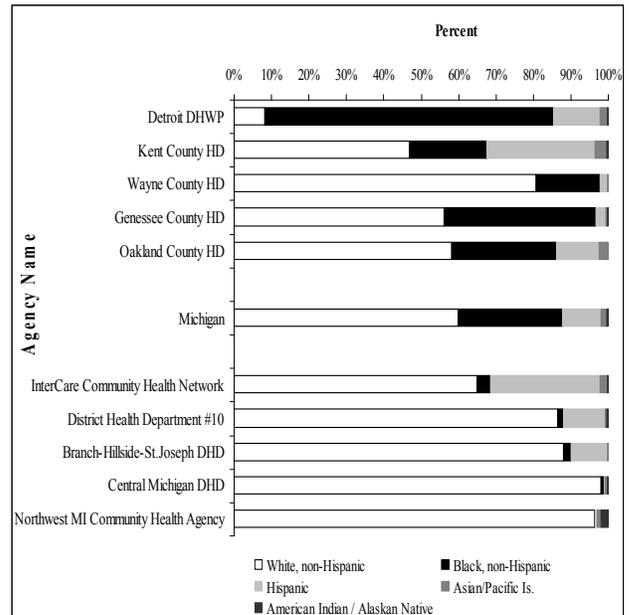
WIC population compared to the general population.

Although the dominate race/ethnicity in WIC is non-Hispanic White, some local agencies populations consisted primarily of racial/ethnic minorities. When the local WIC agencies were stratified by race/ethnicity and ranked according to the prevalence of each racial/ethnic group those agencies with the largest proportion of Black participants were: Detroit Department of Health and Wellness Promotion (Detroit DHWP), Detroit Urban League, Health Delivery, Inc., Kalamazoo Family Health Center, and Berrien County Health Department (HD). The percentage of Black women served in those agencies was: 77.2%, 72.7%, 52.7%, 46.0%, and 43.3%, respectively. Health Delivery, Inc., InterCare Community Health Network, Kent County Health Department, Community Action Agency, and Saginaw-Chippewa Indian Tribe had the largest percentage of Hispanic women in their populations (equaling 34.3%, 29.3%, 28.7%, 22.2%, 21.4%, respectively). The local agencies with the largest proportion of American Indian women were: Keweenaw Bay Indian Tribe (67.4%), Saginaw-Chippewa Indian Tribe (64.3%), Chippewa County HD (27.4%), Luce-Mackinac-Alger-Schoolcraft DHD (8.4%), and Benzie-Leelanau DHD (8.3%). The largest proportion of Asian/Pacific Islander women were served in Washtenaw County HD (7.3%), Ingham County HD (5.2%), Macomb County HD (3.2%),

Kent County HD (3.1%), and Grand Traverse County HD (2.7%).

Using United States Census information, local WIC agencies are classified as being either urban or rural. The five largest WIC agencies that were classified as urban were: Detroit DHWP, Kent County, Wayne County, Genesee County health departments, and Oakland County Health Division. The five largest rural agencies were InterCare Community Health Network, District Health Department #10, Branch-Hillside-St. Joseph District Health Department, Central Michigan District Health Department, and Northwest MI Community Health Agency. The number of women participants of the five largest urban and rural agencies was stratified by race/ethnicity (Figure 4). Agencies classified as urban tend to have a higher proportion of racial/ethnic minorities compared to rural agencies. The percentage of White participants range from 64.9% to 96.3% in the largest rural agencies, whereas in the largest urban agencies the percentage of White participants range from 8.2% to 58.1% (with the exception of Wayne County HD who has 80.8% White participants). Of the most populous urban and rural agencies, the agency that represents the state demographically was Oakland County Health Division WIC agency.

Figure 4: Racial/ethnic distribution of selected WIC agencies, 2003 MI PNSS

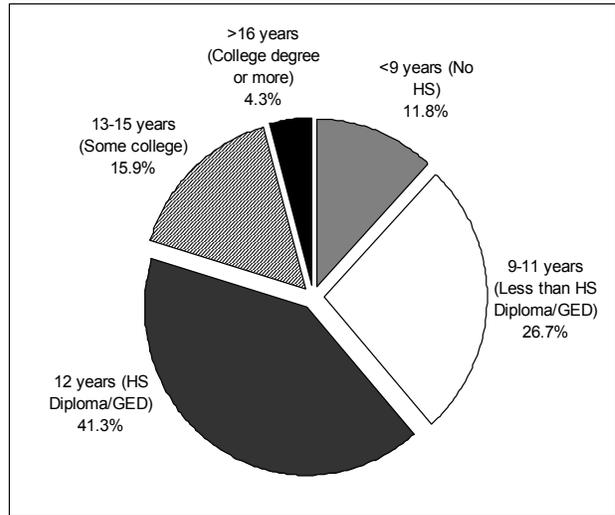


Maternal Education

Women who participate in WIC differ from women in the general population in terms of education level completed. Within the group of Michigan WIC participants 11.8% had no high school education at all (less than nine years of education); 26.7% (nine to eleven years of education); 41.3% had a high school diploma or a GED (twelve years of education); 15.9 % had some college (thirteen to fifteen years of education); and 4.3% had a college degree (sixteen or more years of education) (Figure 5). In 2003, Michigan data from the National Center of Health Statistics showed: 6.1% of births were to women with less than a high school education (less than eight years); 15.2% to women

with some high school education (nine-eleven years); 30.1% to women with a high school diploma or GED; 21.0% to women with some college education (thirteen-fifteen years); and 26.2% to women with at least a college degree (sixteen or more years). Approximately 1.4%, of women did not indicate an educational level.⁴ It was observed, in the previous section about maternal age, that the WIC population had a higher proportion of younger women compared to the general population of women delivering a live born infant in 2003. The high percentage of WIC participants with a high school diploma or less maybe partially explained by the age distribution of that group. Also, although the women who participate in WIC do not represent all low-income or high-risk women, education level is important to keep in mind when developing health interventions for this group.

Figure 5: Years of Education Attained by Michigan WIC Participants, 2003 MI PNSS



Maternal Behavior & Nutrition

Prenatal Care

Prenatal care continues to be essential for favorable maternal and infant health outcomes.

Prenatal care is the comprehensive care that women receive and provide for themselves throughout their pregnancy. In addition to regular visits to a healthcare provider, prenatal care includes: education on nutrition to achieve a favorable birth outcome; awareness and monitoring of early labor warning during pregnancy; as well as assessment and education related to the use of tobacco and other substances that may adversely effect pregnancy. For some women prenatal care is their entry into the healthcare system. It is during that time they receive health visits at regular intervals and previously undiagnosed conditions may be uncovered and treated. Socioeconomically

vulnerable women, who are at greatest risk for adverse pregnancy outcomes and who would benefit the most from early intervention, tend not to enroll into prenatal care in the first trimester if at all.

Although the ideal time to enter prenatal care is in the first trimester, women may enter prenatal care at various times during their pregnancy. In the general population in Michigan, 84.1% percent of women enter prenatal care in their first trimester.² At WIC enrollment 74.3% of participants entered prenatal care in their first trimester. Nationally, the PNSS prevalence of first trimester entry into prenatal care was 77.1%.

Most WIC participants, in all age groups, enter prenatal care either in the first or second trimester of their pregnancy (Table 3). More than half of women above the age of fifteen years old entered

Table 3: Trimester of entry into PNC, at the time of WIC enrollment, among WIC participants by Race/Ethnicity and Age, 2003 MI PNSS

		1st Trimester	2nd Trimester	3rd Trimester	No PNC
Woman's Age					
	< 15 years	44.1%	36.8%	7.7%	11.4%
	15-19 years	68.5%	17.4%	1.9%	12.3%
	20-29 years	75.6%	12.9%	17.4%	10.3%
	30-39 years	77.2%	12.8%	1.2%	8.9%
	> 39 years	73.7%	17.0%	2.0%	7.3%
Woman's Race/Ethnicity					
	White, non-Hispanic	77.9%	10.2%	1.0%	11.0%
	Black, non-Hispanic	69.1%	21.3%	2.2%	7.5%
	Hispanic	15.9%	67.2%	15.0%	1.9%
	American Indian	11.3%	76.3%	12.0%	<i>DSU</i>
	Asian/Pacific Islander	7.7%	73.7%	17.0%	1.7%

2003 PNSS

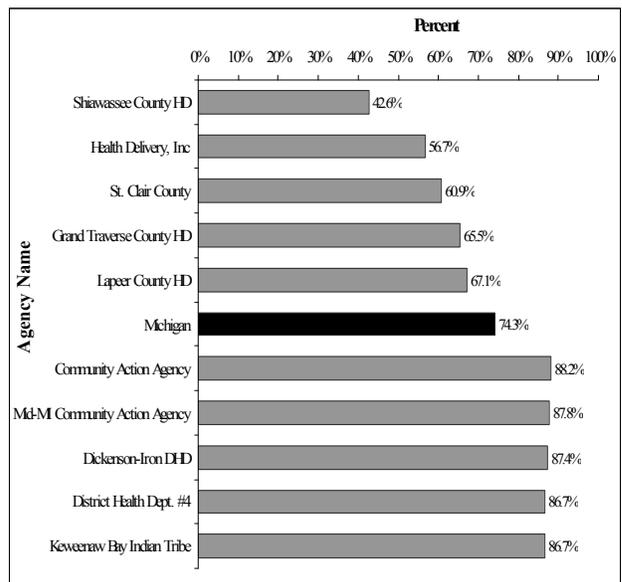
prenatal care in their first trimester (Table 3). Only 44.1% of women under the age of fifteen years entered prenatal care in their first trimester. Nevertheless, by their third trimester 80.9% of women, regardless of age, entered prenatal care. More than two-thirds (77.2%) of WIC participants between the ages of thirty to thirty-nine years entered prenatal care in the first trimester. Generally, the percentage of women entering prenatal care in their first trimester increased with age among WIC participants. Among the general population in Michigan, half of the women between the ages of eighteen to thirty-nine entered prenatal care in their first trimester in 2003. Women between thirty to thirty-four years old have the highest proportion of women entering prenatal care in their first trimester 87.7% ± 3.3%.²⁶ In addition, more than half of PNSS women nationally entered prenatal care during their first trimester. Also, the percentage of women entering prenatal care in their first trimester increased with age up to thirty-nine years old. Nationally, the highest prevalence of first trimester entry into prenatal care was for women twenty to thirty-nine years old.

White participants had the highest proportion of women entering prenatal care in the first trimester among state PNSS, national PNSS, and the state general population of women having a live birth in 2003,. Within the general population in Michigan and in national PNSS, Asian/Pacific

Islanders and America Indian/Alaskan Native women were the next highest proportions of women entering prenatal care in the first trimester. However, in Michigan PNSS, Black and Hispanic women were the next highest racial/ethnic groups entering prenatal care in the first trimester.

In addition to maternal age and race/ethnicity, trimester of entry into prenatal care also varied by geographic area. The percentage of women who entered prenatal care in their first trimester for the five highest and the five lowest agencies, as well as the state average are illustrated in Figure 6. The overall percentage of women who enter prenatal care in the first trimester recorded in Michigan PNSS was 74.3% (Figure 6). The percentage of those agencies with the lowest

Figure 6: 1st Trimester entry into prenatal care among selected WIC agencies, 2003 MI PNSS



proportion of women who enter prenatal care in the first trimester ranged from 42.6% to 67.1%. These agencies, with the exception of Grand Traverse County HD, were located in the mid-eastern section of the state. At the other end of the spectrum, are those agencies with the highest percentages of participants entering prenatal care in the first trimester. Statistics show Community Action Agency, Mid-MI Community Action Agency, and Dickinson-Iron DHD with the highest percentage of women who entered prenatal care in the first trimester (88.2%, 88.0%, and 87.4%, respectively) (Figure 6).

Despite the fact that most women receive medical care in their first trimester of their pregnancy, an unacceptably high number of women do not receive prenatal care in a timely manner. The proportion of Michigan WIC participants having no prenatal care at the time of enrollment was 10.4%. In national PNSS, the percent of women who indicated receiving no prenatal care at enrollment was 8.9%.

In 2003, Michigan WIC participants between fifteen and nineteen years old had the highest proportion of women who did not receive timely prenatal care compared to other age groups. The group with the next highest proportion of women receiving no prenatal care was women under the age of fifteen years old, 11.4%. The proportion of women who do not receive any prenatal care during pregnancy decreased as age increased. Nationally, the highest proportion of PNSS

women who receive no prenatal care at the time of enrollment were women above the age of forty years old, with a prevalence equaling 10.3%. Following them were women between fifteen to seventeen years old and women age eighteen to nineteen years old, with prevalences of 9.5% and 9.4%, respectively.

When stratified by race/ethnicity, 11.0% of White Michigan WIC participants received no prenatal care before enrolling in the program according to 2003 MI PNSS data. Black participants followed them, with a prevalence of 7.5%. In national PNSS, Hispanic women had the highest proportion of women receiving no prenatal care prior to enrollment (11.9%). Asian/Pacific Islanders (9.9%) and finally White women (8.7%) followed them.

Locally, in Michigan WIC, Shiawassee County, St. Clair County, and Lapeer County health departments had the highest prevalence of women who had no prenatal care before enrollment in WIC, with prevalence equaling 53.5%, 27.3%, and 24.7%. Meanwhile, InterCare Community Health Network, Community Action Agency, and Ingham County Health Department, have the lowest prevalence: 3.5%, 3.4%, and 3.3%.

WIC Enrollment

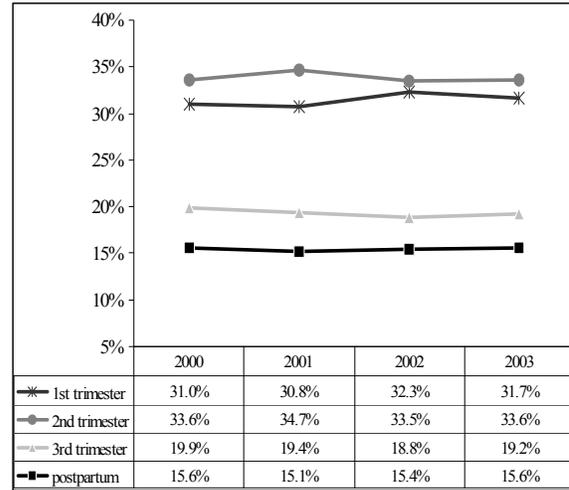
Eligible women are able to enroll in WIC at any time during their pregnancy and up to one year

postpartum. WIC encourages eligible women to enroll in the program as soon as they think they are pregnant. By doing this WIC seeks to positively impact birth outcome by intervening during the crucial early stages of fetal development. The longer a woman participates in WIC the longer the opportunity she has to receive the benefits of the program. Numerous research studies in various states have linked early entry into WIC with positive birth outcomes.^{5, 6, 7, 8} According to data from the 2003 MI PRAMS survey, 76.2% (95% CI: 72.2%-79.8%) of eligible women enrolled in WIC prenatally.²⁶

Pre-Pregnancy Enrollment

The majority of women entered WIC before their third trimester. In 2003, 31.7% of women entered WIC during the first trimester of their pregnancy and 33.6% entered during their second trimester.

Figure 7: Trend in Trimester of entry into WIC, 2000-2003 MI PNSS



The trends of trimester of entry into WIC were mostly static during the four-year interval (Figure 7). A slight majority of women enrolled in WIC in their second trimester compared to other periods. The prevalence of second trimester entry into WIC ranges from 31.0% in 2000 to 31.7% in 2003. The average annual percent change for each of the trends were 0.79% for first trimester

Table 4: Trimester of WIC entry by maternal age and maternal race/ethnicity, 2003 MI PNSS

	1st Trimester	2nd Trimester	3rd Trimester	Postpartum
Woman's Age				
< 15 years	27.8%	39.8%	19.3%	13.1%
15-19 years	34.2%	36.2%	18.8%	10.8%
20-29 years	31.6%	32.9%	19.4%	16.0%
30-39 years	29.1%	32.8%	18.8%	19.3%
> 39 years	27.4%	30.8%	19.0%	22.7%
Woman's Race/Ethnicity				
White, non-Hispanic	36.1%	32.3%	18.0%	13.7%
Black, non-Hispanic	20.9%	35.3%	22.6%	21.1%
Hispanic	36.4%	36.2%	16.6%	10.8%
American Indian	43.8%	30.9%	13.5%	11.8%
Asian/Pacific Islander	23.5%	35.7%	21.3%	19.6%

2003 PNSS

entry into WIC, 0.05% for second trimester entry into WIC, -1.10% for third trimester entry into WIC and -0.10% for postpartum entry.

According to these figures first and second trimester entry into WIC increased slightly since 2000 whereas third trimester and postpartum entry declined. Meanwhile second trimester entry into WIC was stable.

Most women regardless of age enter WIC before their third trimester (Table 4). Approximately one-third of women between fifteen and thirty-nine years old entered WIC during their first trimester. The lowest proportion of women entering WIC in their first trimester was women over the age of thirty-nine or under the age of fifteen years. The majority of women in all age groups, however, enter during their second trimester. In 2003, 39.8% of women under the age of fifteen, 36.2% of women fifteen to nineteen, 32.9% of women twenty to twenty-nine, 32.8% of women thirty to thirty-nine, and 30.8% of women age forty or more entered WIC during their second trimester. Nationally, just as in state PNSS, women in the extreme age groups, less than fifteen years or greater than thirty-nine years, had the lowest proportion of women enrolling in WIC during the first trimester. Whereas the prevalence of first trimester WIC enrollment ranged from, 25.4% to 31.0% for women fifteen to thirty-nine, it varied 22.9% and 23.7% for women over thirty-nine and under fifteen years old, respectively.

The prevalence of first trimester enrollment into WIC ranges from 20.9% among Black women to 43.8% among Native American women (Table 4). Nationally, White and Asian Pacific Islander participants had the highest and lowest first trimester WIC enrollment (33.4% and 19.1%, respectively). Peak enrollment for White, Hispanic and Native American women was in the first trimester. Enrollment for Black and Asian/Pacific Islander participants peaked during their second trimester. Most women, regardless of race/ethnicity, enrolled in WIC by their third trimester.

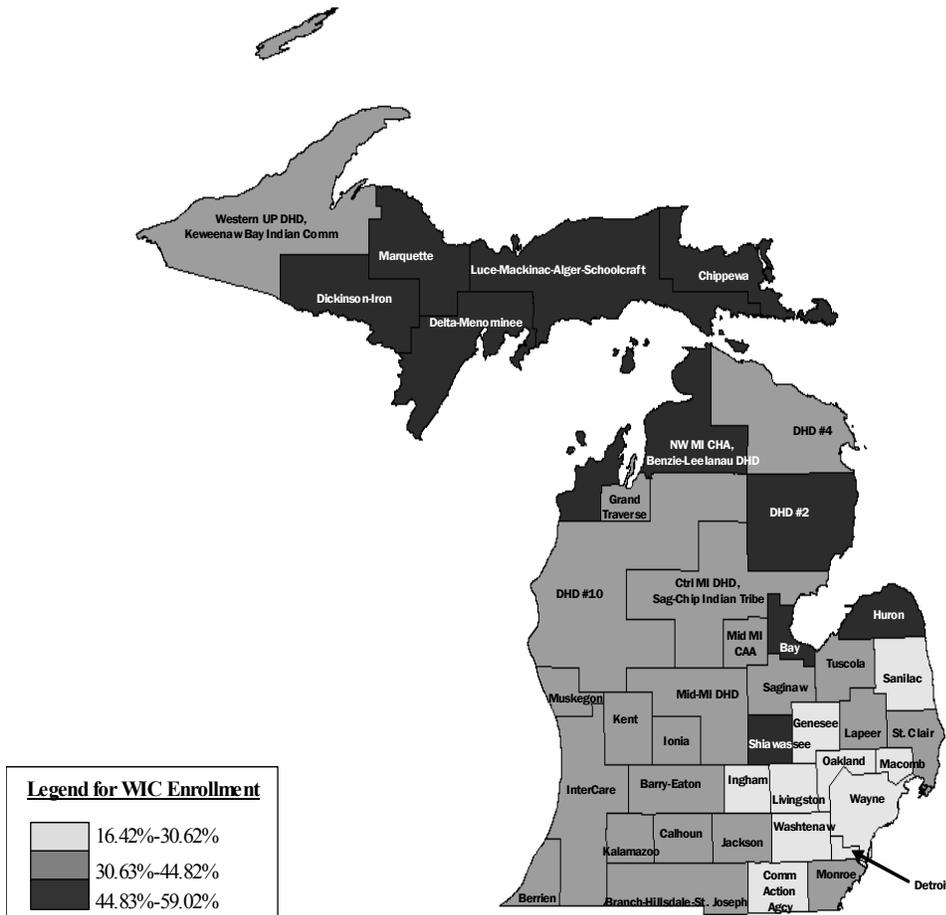
Areas of WIC enrollment in the first trimester below the state prevalence were concentrated in the densely populated southeast portion of the state (Figure 8). Areas where enrollment was above the state prevalence were concentrated in the Upper Peninsula, the upper part of the Lower Peninsula, and around Saginaw Bay. Agencies with the highest proportion of women enrolling during the first trimester in 2003 were: Luce-Mackinac-Alger-Schoolcraft DHD, Marquette County HD, and Health Delivery, Inc with percentages of 59.0%, 53.0%, and 52.8% respectively. Those with the lowest proportion include Genesee County HD (24.8%), Oakland County Health Division (20.9%), and Detroit Urban League (20.7%).

Postpartum Enrollment

Eligible women are able to enroll in Michigan WIC up to one year postpartum. WIC eligibility is determined based on income, residency, nutritional risk, and lactation status. Women who choose to breastfeed their infant may receive supplemental food benefit for themselves for up to one year postpartum. Non-lactating women are able to receive services for six months after the birth of their infant. The proportion of women entering WIC during their postpartum

period increased with age. In 2003, 10.8% of Michigan women between fifteen to nineteen years old enrolled in WIC postpartum, meanwhile, 22.7% of women above the age of thirty-nine were postpartum enrollees. Variations in postpartum enrollment were also observed between the different racial/ethnic groups represented in Michigan. The proportion of women enrolled in WIC during the postpartum period ranged from 10.8% to 21.1% when stratified by race/ethnicity. Hispanic and Native American participants in Michigan had the lowest

Figure 8: 1st trimester entry into WIC by WIC geographic area, 2003 MI PNSS



percentage of postpartum enrollment, 10.8% and 11.8% respectively. Meanwhile, Black and Asian/Pacific Islander participants had the highest proportion of women entering Michigan WIC postpartum (with proportions equaling 21.1% and 19.6% respectively). Detroit DHWP, Oakland County Health Division, and Genesee County HD had the highest proportion of women entering WIC postpartum (23.0%, 19.7%, and 18.8%, respectively).

Pre-pregnancy BMI

Pre-pregnancy weight is associated with both positive and negative maternal health and birth outcomes. Pre-pregnancy obesity is associated with menstrual irregularities, infertility problems, pregnancy complications, cesarean deliveries, and postpartum anemia.^{9, 10} Pre-pregnancy underweight is also unsafe. Intrauterine growth retardation, shorter gestation, and pre-term births have all been found to be associated with pre-pregnancy underweight.^{9, 11} Pre-pregnancy weight in PNSS is self-reported and measured using the body mass index (BMI). BMI is a unit of anthropometric measurement to describe weight relative to height. BMI is calculated by dividing a woman's weight (in pounds) by her height (in inches) squared, then multiplying that figure by 703, using English units. In the metric system, BMI is calculated by weight (in kilograms) by height (in meters) squared. In PNSS, pre-pregnancy BMI is divided into three

categories: underweight/low BMI ($BMI \leq 19.7 \text{ kg/m}^2$), normal weight/normal BMI ($19.7 \text{ kg/m}^2 < BMI \leq 26.0 \text{ kg/m}^2$), and overweight/high BMI ($BMI > 26.0 \text{ kg/m}^2$).

Low pre-pregnancy BMI/ Underweight

In 2003, 11.9% of WIC participants in Michigan were classified as being underweight prior to their pregnancy. An almost equal percentage of PNSS women, nationally, were considered underweight. The national PNSS prevalence of underweight for 2003 was 12.1%. Underweight among Michigan WIC participants declined over the previous three years from 14.6% to 11.9%. This represents an average annual percent decrease of 6.5% per year (Figure 9).

Both locally and nationally, the proportion of underweight women within each age group decreased as age increased (Table 5). Older WIC participants were less likely to be underweight. In fact, pre-pregnancy underweight was observed in less than 10% of women above the age of thirty. The proportion of underweight women in Michigan WIC, when stratified by age, ranges from 5.7% to 14.8%. WIC participants between the ages of fifteen to nineteen years old had the highest proportion of underweight women compared to all the other age groups: 18.5%. This tendency is also observed nationally. The national PNSS prevalence of underweight, when stratified by age, ranges from 5.8% to 20.9%. Less than 10% of women thirty years old or

older, nationally, were classified as being underweight. Meanwhile 20.9% of women between fifteen to seventeen years old and 20.3% of women under fifteen years old were considered underweight.

The prevalence of underweight also varied by maternal race/ethnicity (Table 5). Asian/Pacific Islander women in PNSS, at both the state and

national level, had the highest proportion of women classified as underweight. Asian/Pacific Islander participants in Michigan WIC program had an underweight prevalence of 27.3% in 2003; meanwhile in national PNSS the prevalence of underweight among that same racial/ethnic group was 24.6%. Conversely, pre-pregnancy underweight was observed less often in Hispanic women in state and national PNSS. In Michigan, the prevalence of underweight was only 8.0% among Hispanic women in 2003. The prevalence of underweight among the other race/ethnicities in Michigan WIC ranged from 9.8% to 27.3%. Nationally, in 2003, 7.8% of Hispanic women were considered underweight. Meanwhile the prevalence for other racial/ethnic groups ranged from 9.8% to 27.2%. Black women had near identical prevalence of underweight at the state and national level: 9.8% for Michigan PNSS and 10.0% nationally.

Figure 9: Trends in pre-pregnancy BMI, 2003 MI PNSS

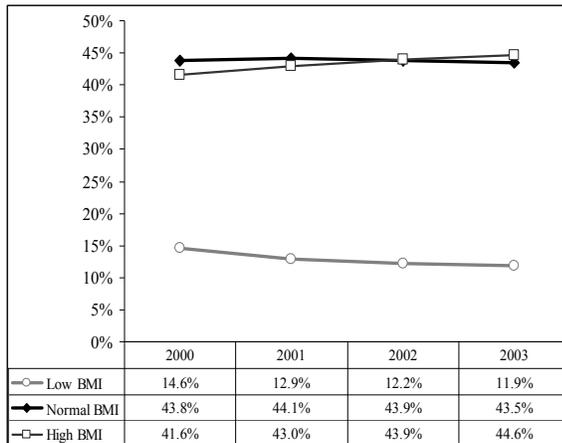


Table 5: Pre-pregnancy BMI by maternal age and race/ethnicity, 2003 MI PNSS

	Low BMI	Normal BMI	High BMI
Woman's Age			
< 15 years	14.8%	62.7%	22.5%
15-19 years	18.5%	52.1%	29.4%
20-29 years	11.3%	42.4%	46.4%
30-39 years	6.7%	36.9%	56.4%
> 39 years	5.7%	35.2%	59.1%
Woman's Race/Ethnicity			
White, non-Hispanic	13.2%	44.5%	42.3%
Black, non-Hispanic	9.8%	39.7%	50.4%
Hispanic	8.0%	46.4%	45.6%
American Indian	11.0%	44.8%	44.1%
Asian/Pacific Islander	27.3%	54.2%	18.5%

2003 PNSS

At the local level, the agencies with the lowest prevalence of pre-pregnancy underweight were: Saginaw County Dept. of Public Health (7.4%), Luce-Mackinac-Alger-Schoolcraft DHD (7.5%), and Benzie-Leelanau DHD (7.5%). Livingston County HD, Keweenaw Bay Indian Tribe, and St. Clair County had the highest prevalences of underweight, 18.5%, 15.2%, and 15.2%, respectively.

High pre-pregnancy BMI/Overweight

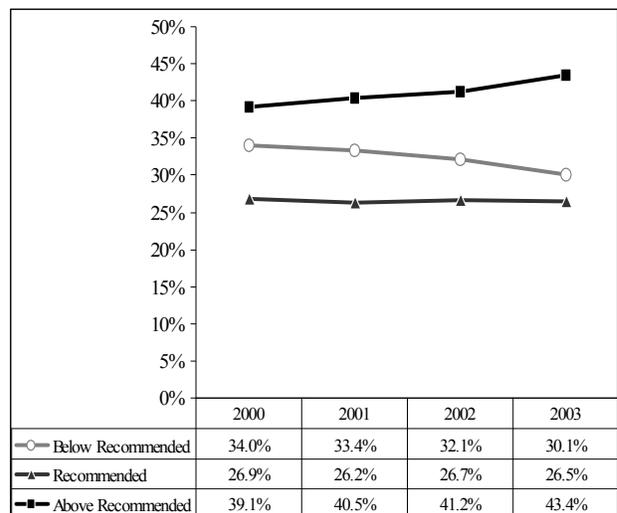
Being overweight or obese prior to pregnancy has its own set of health risks. Women whose BMI are above 26.0 kg/m² are at an increased risk of delivering a high birthweight infant and delivering via cesarean section.¹⁰ Overall, the prevalence of pre-pregnancy overweight in Michigan WIC in 2003 was 44.6%, slightly above that of the national PNSS prevalence of 43.0%. Between 2000 and 2003, the prevalence of overweight among Michigan WIC participants increased. In 2000, the prevalence of overweight was 41.6%. By 2003, it rose to 44.6%. The increase between 2000 and 2003 represents an average increase of 2.4% annually (Figure 9).

Unlike underweight, which was observed more often among younger women, older women tend to be overweight prior to pregnancy (Table 5). In Michigan, the prevalence of pre-pregnancy overweight ranged from 22.5%, among WIC participants under the age of fifteen years, to 59.1% in participants over the age of thirty-nine years. A similar trend is observed nationally. Women in national PNSS under the age of fifteen years had a prevalence of overweight of 20.0%; meanwhile women over the age of thirty-nine years had an overweight prevalence of 56.1%. When comparing the state and national prevalence of overweight within each age group, Michigan PNSS tend to have a higher prevalence of overweight compared to their national

counterparts. The largest difference was observed among women between fifteen and twenty-nine years old.

At both the state and national level, most racial/ethnic minorities have a higher prevalence of overweight compared to White participants (Table 5). The proportion of overweight White women in Michigan WIC program was 42.3% in 2003. This represents a 1.1 percentage points above the prevalence of overweight White women in national PNSS (with prevalence of 41.2%). With the exception of Asian/Pacific Islander participants, the prevalence of overweight was higher among racial/ethnic minorities than in White participants. In Michigan, the prevalence of overweight were 44.1%, 45.6%, and 50.4% for Native American, Hispanic, and Black, participants, respectively. The prevalence for Asian/Pacific Islander was

Figure 10: Trend in weight gain during pregnancy, 2003 MI PNSS



only 18.5%. A similar pattern was observed nationally. The prevalence of overweight in national PNSS for Asian/Pacific Islander was 20.9% meanwhile for Native American, Black, and Hispanic participants it was 52.6%, 49.6%, and 41.4%.

When stratified by WIC local agency, Livingston County HD, Western Upper Peninsula DHD, Monroe County HD had the lowest prevalence of high pre-pregnancy BMI. Their prevalences were 32.7%, 34.6%, and 37.7%, respectively.

Concurrently, Health Delivery, Inc., Huron County HD, and Saginaw County Dept. of Public Health had the highest percentage of women who had a high pre-pregnancy overweight (53.5%, 52.6%, and 50.6%, respectively).

Weight Gain during Pregnancy

Weight gain during a woman's pregnancy is an important factor effecting birth outcome. The amount of weight gained can either mitigate or compound the effects of pre-pregnancy weight. Inadequate weight gain during pregnancy has been associated with both pre-term birth and low birthweight.^{9,12}

According to the National Academy of Science, Institute of Medicine (IOM) the recommended total weight gain for women based on their BMI pre-pregnancy category are: 28 lbs-40 lbs for

underweight women; 25 lbs-30 lbs for normal weight women; and 15 lbs-25 lbs for overweight/obese women.¹³ Based on these recommendations, PNSS categorized women as having less than ideal, ideal, or greater than ideal weight gain during pregnancy. Less than ideal weight gain is: < 28 lbs for underweight women; < 25 lbs for normal weight women; <15 lbs for overweight /obese women. Greater than ideal weight gain is described as: >40 lbs for underweight women, >35 lbs for normal weight women, and >25 lbs for overweight/obese women.¹³

Less Than Ideal Weight Gain

Statistics indicate that Michigan WIC effectively seeks out and enrolls women who are at risk for gaining less then the recommended amount of weight during pregnancy. In the general population of Michigan in 2003, 11.8% of women gained less than 16 lbs during their pregnancy.² In 2003, approximately one-third of women in Michigan WIC (30.1%) gained below the recommended amount of weight for their pre-pregnancy BMI. Nationally, only 25.2% of PNSS women gained less than the recommended amount of weight during their pregnancy. The prevalence of less than ideal weight gain has decreased in women participating in Michigan WIC between 2000 and 2003 (Figure 10). Between 2000 and 2003, the prevalence of less than ideal weight gain dropped from 34.0% to

30.1% representing an average decline of 4.0% per year.

When stratified by maternal age, the prevalence of less than ideal weight resembles a J-shaped curve (Table 6). The prevalence of less than ideal weight gain, for WIC participants under the age of fifteen years, was 33.8%. For women between fifteen to nineteen years, the prevalence was lower, 27.8%. Less than recommended weight gain then increased with age for women over nineteen years old (Table 6). A similar trend was observed at the national level. The prevalence of less than recommended weight gain for PNSS women under the age of fifteen was 25.5%. It declined to 23.8% and 22.2% for women age fifteen-seventeen and eighteen-nineteen respectively. The prevalence of less than recommended weight gain increased with age for women above the age of nineteen years.

With the exception of Native American women, racial/ethnic minorities in Michigan had a higher proportion of women with less than recommended weight gain compared to White participants (Table 6). White WIC participants in Michigan had a less than recommended weight gain proportion of 27.1%, meanwhile Black, Hispanic, and Asian/Pacific Islander participants had a prevalence of 32.7%, 38.2%, and 40.9% respectively. Native American WIC participants had a prevalence of less than recommended weight gain of 24.3%. This relationship was not

observed at the national PNSS level. There the prevalence of less than recommended weight gain was higher for all racial/ethnic minorities. The prevalence of less than recommended weight gain for White participants in national PNSS was 22.1%, but for Black, Hispanic, American Indian, and Asian/Pacific Islander participants the prevalence was 28.0%, 28.7%, 28.8%, and 31.8%.

The geographic distribution of WIC participants with less than ideal weight gain during pregnancy does not conform to the racial/ethnic distribution of the indicator. In Michigan, Native American participants had the lowest proportion of women gaining less than the recommended amount of weight during pregnancy. However geographically, the two areas with prevalences higher than the state average were Western Upper Peninsula DHD/ Keweenaw Bay Indian Tribe and Luce-Mackinac-Alger-Schoolcraft DHD (Figure 11). Washtenaw County local WIC agency had a high proportion of Asian/Pacific Islanders participants, who had the highest proportion of participants gaining less than ideal weight gain during pregnancy, but because of the proportion of women in other racial/ethnic groups gaining the recommended amount of weight during pregnancy, Washtenaw County had a prevalence better than the state average. Local WIC agencies with the highest prevalence of women gaining less the recommended ideal weight were: Western Upper Peninsula DHD

(62.8%), Detroit Urban League (49.3%), and Luce-Mackinac-Alger-Schoolcraft DHD (44.6%). Agency-level statistics also show the agencies with the least proportion of women gaining less than the ideal amount of weight during pregnancy were: Dickinson-Iron DHD (16.0%), Marquette County HD (15.6%), and Livingston County HD (15.5%).

Greater Than Ideal Weight Gain

In Michigan, over one-third of women in WIC gained above the recommended amount of weight for their BMI. In 2003, the overall Michigan WIC prevalence of greater than recommended weight gain was 43.4%, up from 39.1% in 2000 (Figure 10) The prevalence of greater than ideal weight gain in Michigan was slightly less than that of the national PNSS, 43.4% compared to 44.2%. Over the preceding three years, in Michigan, the prevalence of greater than ideal

weight gain increased on the average by 3.6% per year. Greater than ideal weight gain, when stratified by local WIC agency, was observed most often in Livingston County HD, Dickinson-Iron DHD, and Chippewa County HD. The prevalence of greater than ideal weight gain in these locations was, 53.5%, 52.5%, and 52.3%, respectively. Western Upper Peninsula (21.5%) DHD, Luce-Mackinac-Alger-Schoolcraft DHD (32.6%), and the Detroit Urban League (32.6%), meanwhile had the lowest observed prevalence of greater than ideal weight gain.

In Michigan’s WIC population, almost half of the women between fifteen and twenty-nine years old gained more than the recommended amount of weight for their BMI group (Table 6). Women between the ages of fifteen to nineteen years old and twenty to twenty-nine years old had a prevalence of greater than recommended weight

Table 6: Weight gain during pregnancy by maternal age and maternal race/ethnicity, 2003 MI PNSS

		Below recommended	Recommended	Above recommended
Woman's Age				
	< 15 years	33.8%	25.5%	40.7%
	15-19 years	27.8%	24.6%	47.6%
	20-29 years	29.4%	26.8%	43.8%
	30-39 years	34.6%	28.0%	37.5%
	> 39 years	37.8%	25.9%	36.4%
Woman's Race/Ethnicity				
	White, non-Hispanic	27.1%	26.9%	46.0%
	Black, non-Hispanic	32.7%	24.9%	42.4%
	Hispanic	38.2%	27.9%	33.9%
	American Indian	24.3%	28.6%	47.1%
	Asian/Pacific Islander	40.9%	34.3%	24.8%

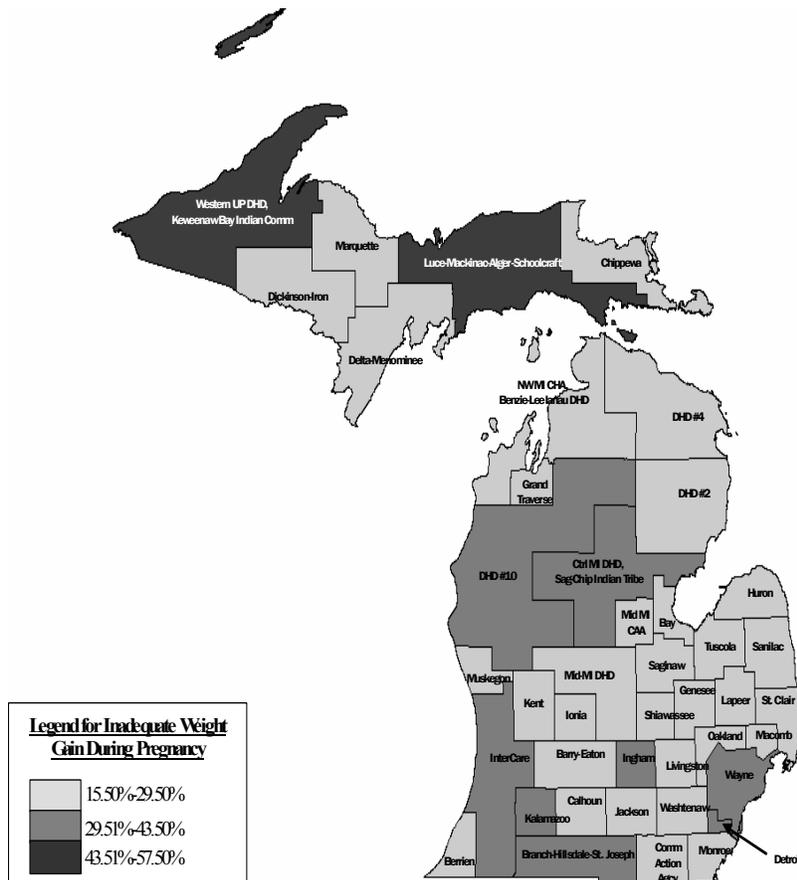
2003 PNSS

gain of 47.6% and 43.8%, respectively. The prevalence for the remaining age groups range from: 36.4% to 40.7%. Nationally, greater than recommended weight gain was also more prevalent among younger women. For women under the age of thirty the prevalence of greater than recommended weight gain ranged from 44.3% to 48.7%. For women thirty to thirty-nine years old and forty and older the prevalences are 37.5% and 36.4% respectively.

Both locally and nationally, the prevalence of greater than normal weight gain is most prevalent

among White, Black, and American Indian PNSS participants. In Michigan WIC, the prevalence of greater than ideal weight gain ranged from 24.8% to 47.1% (Table 6). When stratified by race ethnicity, three groups had more than 40% of their participants having greater than ideal weight gain: non-Hispanic White (46.0%), non-Hispanic Black (42.4%) and Native American participants (47.1%). In contrast, only 33.9% of Hispanic and 24.8% of Asian/Pacific Islander women gained more than the recommended amount of weight during pregnancy. At the national level, these same groups once more had a high proportion of

Figure 11: Less than recommended weight gain by WIC geographic area, 2003 MI PNSS



women gaining an excess amount of weight during pregnancy. The prevalence for White, Black, and Hispanic participants were 47.7%, 42.9%, and 44.6% respectively.

Iron Deficiency Anemia

Iron deficiency anemia (IDA) continues to be problematic in developed countries among low-income women and children. It is particularly detrimental among pregnant women. Iron deficiency anemia has been associated with preterm birth, which increases the risk of infant morbidity and mortality.^{14,15} During pregnancy, iron deficiency anemia is defined relative to the trimester of pregnancy. During the first and third trimester, women who have less than 11.0g of hemoglobin per deciliter (dL) of blood or who have a hematocrit level of 33.0% or lower are considered anemic.¹⁶ During the second trimester, women with less than 10.5g of hemoglobin per dL of blood or have a hematocrit level of 32% or lower are considered to have iron deficiency anemia.¹⁶ When a woman is not pregnant, anemia is defined relative to her age. Women between the ages of twelve and fifteen are considered anemic if they have a hemoglobin concentration of less than 11.8 g/dL of blood or a hematocrit level at or below 35.7%.¹⁶ Women fifteen-eighteen years old with a hemoglobin concentration of 12.0 g/dL of blood or a hematocrit level of 35.9% are considered anemic.

¹⁶ For women above eighteen years old, anemia

is defined as a hemoglobin concentration of 12.0 g/dL of blood or a hematocrit level of 35.7%.¹⁶

The overall prevalence of IDA among prenatal participants in WIC was 13.4%, however, the prevalence of women experiencing anemia increased for each consecutive trimester of WIC enrollment. Among first trimester participants the prevalence of anemia was 6.8%. It increased to 10.4% among second trimester enrollees and then to 30.2% in third trimester enrollees. The national PNSS prevalence of third trimester IDA is nearly identical to that of Michigan WIC: 30.3% nationally versus 30.2% in Michigan. The Healthy People 2010 target for the prevalence of IDA among pregnant women in their third trimester is 20%.¹⁷ Among postpartum WIC participants in Michigan, the prevalence of IDA was 35.6%. Nationally, according to PNSS, the prevalence of postpartum anemia is 29.5%. The Healthy People 2010 target for the prevalence of IDA among non-pregnant women is 7%.¹⁷

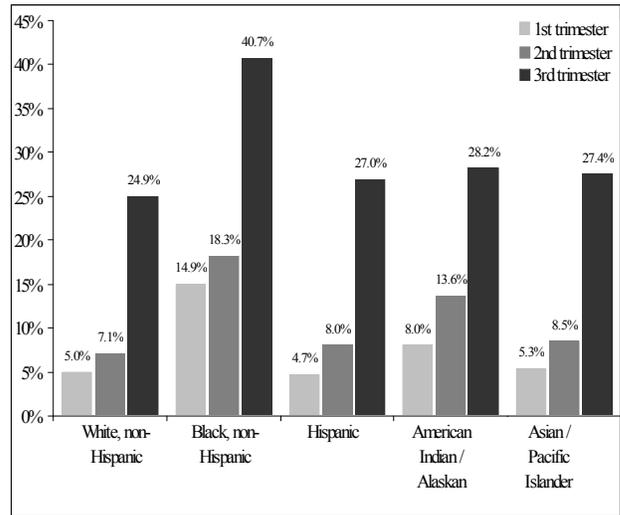
When IDA was stratified by trimester of pregnancy and race/ethnicity, disparities between and within race/ethnicities was observed. Figure 12 depicts the prevalence of IDA during each trimester of entry into WIC for all racial/ethnic groups. The excess prevalence of third trimester anemia for each racial/ethnic group is apparent. When comparing IDA prevalence among third trimester enrollees, Black participants had the highest prevalence compared to the other racial/ethnic groups, 40.7%. The prevalence of

third trimester IDA ranged from 24.9% to 28.2% for White, Hispanic, Asian/Pacific Islander, and Native American participants. The excess prevalence of third trimester IDA among Black women compared to other racial/ethnic groups was also evident nationally. In national PNSS statistics, the prevalence of third trimester IDA among Black women was 43.9%, whereas for other groups the prevalence of IDA ranged from 21.1% to 30.3%.

When looking at the prevalence of IDA during the other trimesters of enrollment, Black participants continued to be disproportionately affected. For Black WIC participants in their second trimester the prevalence of IDA was 18.3%, meanwhile for the other racial/ethnic groups the prevalence of IDA ranged from 7.1% to 13.6%. For first trimester anemia, the prevalence for Black participants was 14.9% and for the other groups the prevalence ranged from 5.0% to 8.0%.

At the local level, Genesee County HD, Berrien County HD, and Kalamazoo Family Health Center had the highest prevalence of prenatal IDA: 22.9%, 21.0%, and 20.3%, respectively. Livingston County HD (3.5%), Western Upper Peninsula DHD (3.9%), and Chippewa County HD (4.1%) had the lowest prevalence of prenatal IDA.

Figure 12: Anemia by race/ethnicity and trimester of entry into WIC, 2003 MI PNSS



Tobacco Use

Women performing harmful behavior during pregnancy risk causing harm to their unborn baby in addition to themselves. One such adverse behavior is smoking. Smoking is known to cause premature death, cardiovascular disease, and cancer among men and women who engage in the activity. Among pregnant women, other additional risks associated with smoking are pre-term birth, intrauterine growth retardation (IUGR), and a variety of birth defects.

There are limitations to smoking information in PNSS. Smoking information in PNSS is self-reported. Secondly, there are no statistics available of the number of women who cut the number of cigarettes smoked during pregnancy. Also in Michigan’s PNSS data there is no

information on women’s exposure to second-hand smoke.

Smoking 3 months before pregnancy

Overall, the prevalence of smoking prior to pregnancy in WIC participants improved. Pre-pregnancy smoking in WIC participants dropped from 44.4% in 2000 to 39.6% in 2003, representing an average 3.8% decline per year.

Michigan WIC participants between fifteen to twenty-nine years old had the highest proportion of smokers compared to other age groups. Approximately, 44.1% of women between the age of fifteen and nineteen years and 40.5% of women twenty to twenty-nine years old smoked three months prior to their pregnancy. A similar

observation was noticed at the national level. PNSS women eighteen to nineteen years old and twenty-nine years old had the highest proportion of smokers, 36.8% and 30.0%, respectively. Nevertheless, between 2000 and 2003, the prevalence of smoking within each age group declined (Figure 13). The largest decline was observed among women under the age of fifteen years and above the age of thirty-nine years. The average percent decline for both groups was 8.7% and 8.5% respectively per year.

The overwhelming majority of women who smoked three months before pregnancy were non-Hispanic White women. In 2003, about half of White Michigan WIC participants indicated smoking three months before their pregnancy. Approximately one quarter of Black (25.4%) and

Figure 13: Trend in smoking three months before pregnancy by maternal age, 2000-2003 MI PNSS

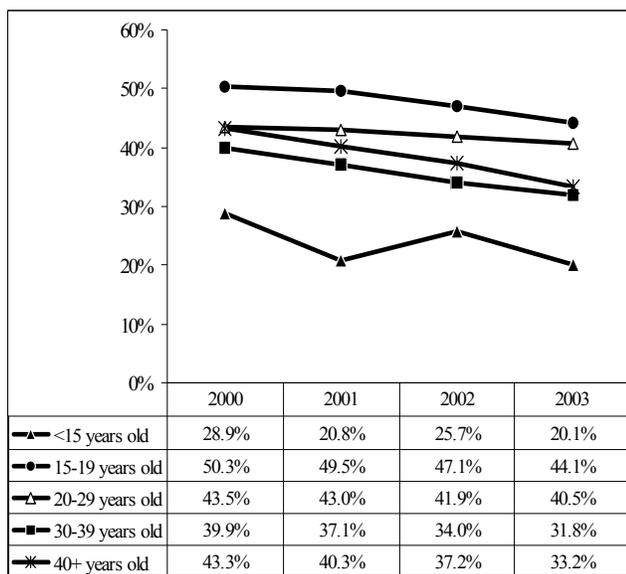
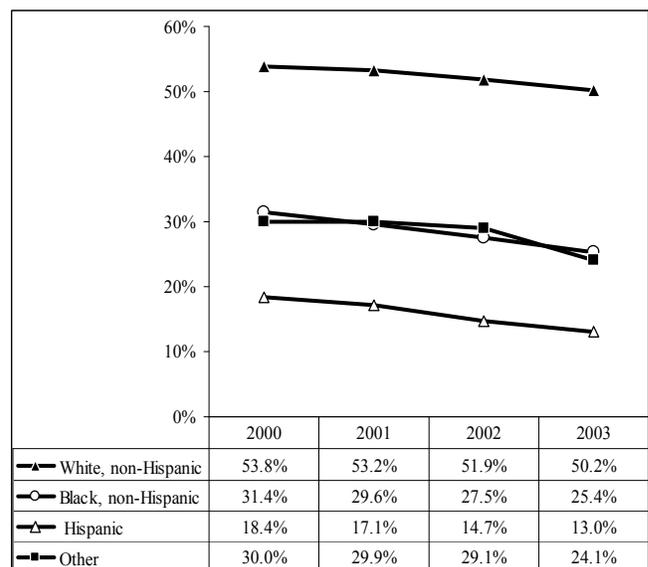


Figure 14: Trend in smoking three months before pregnancy by maternal race/ethnicity, 2003 MI PNSS



Other, combined Asian/Pacific Islander and American Indian participants, (24.1%) indicated smoking during pregnancy. Smoking was least prevalent among Hispanic women with only 13.0% indicating that they smoked three months before pregnancy. Hispanic WIC participants also had the highest average annual percent decline of the various racial/ethnic groups (Figure 14). The percentage of Hispanic women who smoked before pregnancy declined by an average of 10.9% per year from 2000 to 2003. When stratified by WIC local agency, Detroit Urban League (18.6%), Detroit DHWP (21.1%), and Health Delivery, Inc. (25.4%) had the lowest percentage of women who indicated smoking before pregnancy. Conversely, District Health Dept. #2, St. Clair County HD, and Central MI District HD had the highest prevalence of women smoking before pregnancy (61.0%, 58.0%, and 57.9%, respectively).

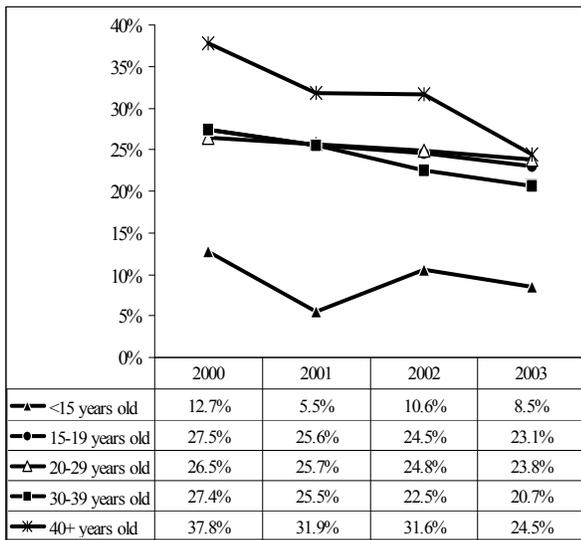
Smoking in the Last 3 months of Pregnancy

Usually smoking behavior decreases during pregnancy. Almost forty percent of women in the Michigan WIC program indicated smoking before their pregnancy in 2003. The prevalence of smokers dropped 16.5-percentage point to 23.1% during pregnancy. This was observed nationally as well. About one third, (29.1%) of women in national PNSS smoked during pregnancy in 2003. During pregnancy, the

prevalence dropped to 18.9%, for a percentage point difference of 10.2.

Within each age group, the proportion of women who smoked during pregnancy was lower than the percentage who smoked before pregnancy. When stratified by maternal age, women over the age of thirty-nine years and women between the ages of twenty to twenty-nine years had the highest proportion of smokers in their group in 2003. About one quarter of women above the age of thirty-nine years, (24.5%) and 23.8% of women between the ages of twenty to twenty-nine years smoked during pregnancy. Nevertheless, in both groups, the prevalence of women who smoked during pregnancy was lower than the number of women who smoked before. There was an 8.8-percentage point decline in the proportion of women, over thirty-nine years old, who smoked before and during their pregnancy. In women between the age of twenty and twenty-nine the percentage of women who smoked during their pregnancy dropped almost seventeen percentage points from the percentage of women who smoked prior to their pregnancy. The largest difference in smoking status before and during pregnancy was observed among women between the age of fifteen and nineteen years old. The percent of women who smoked during pregnancy was 23.1%, a 21-percentage point decline for the proportion of women in that age group that smoked during their pregnancy. Nationally, PNSS women between the ages of eighteen to

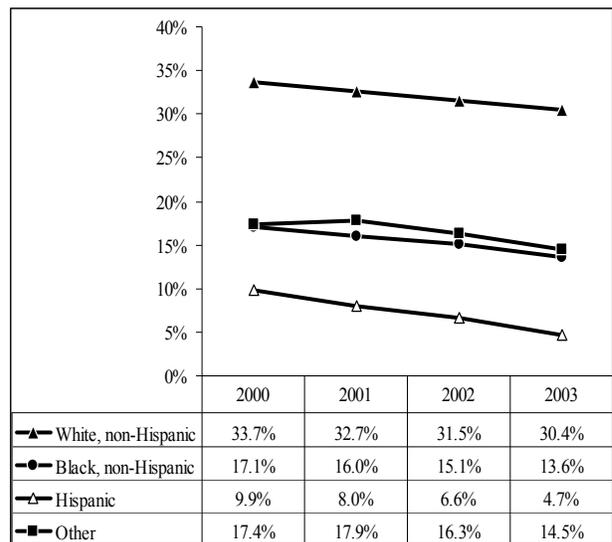
Figure 15: Trend in smoking in the last three months of pregnancy by maternal age, 2003 MI PNSS



nineteen had the highest proportion of smokers within their group, 21.3%, and the prevalence for the remaining age groups ranged from 7.4% to 19.6%.

When stratified by race/ethnicity, the proportion of women who smoked during pregnancy was lower than those who smoked pre-pregnancy. Among the different racial/ethnic groups in Michigan WIC, the prevalence of smokers during pregnancy was highest among White participants (Figure 16). About a third of White women (30.4%) smoked during the last three months during their pregnancy. They were followed by ‘Other’ (combined Asian/Pacific Islander and American Indian participants), and Black women, who had a prevalence of 14.5% and 13.6%. Hispanic women had the lowest proportion of women, fewer than 5%, of women smoking during their pregnancy. When comparing the

Figure 16: Trend in smoking in the last three months of pregnancy by maternal race/ethnicity, 2003 MI PNSS



difference between pre-pregnancy and pregnancy smoking status, White women showed the greatest decline. The difference between their pre-pregnancy and pregnancy smoking for 2003 was 20.2 percentage points. Black, Other (combined Asian/Pacific Islander and American Indian participants), and Hispanic participants followed with declines of 13.0, 11.8, and 8.5 percentage points.

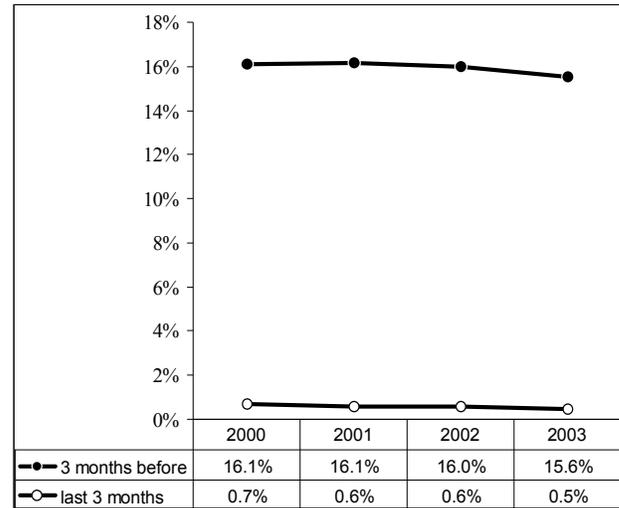
Just as in smoking three months before pregnancy, Detroit DHWP, Detroit Urban League, and Health Delivery, Inc. were the agencies with the lowest prevalence smoking during pregnancy (11.2%, 12.0%, and 14.5%, respectively). Those agencies with the highest prevalence of smoking during pregnancy were District Health Dept. #2 (36.4%), Dickinson-Iron DHD (38.4%), and Benzie-Leelanau DHD (38.8%).

Alcohol Consumption

Alcohol is a potent teratogen, a chemical or biological agent causing malformation in a fetus, and its consumption is unsafe in any trimester of pregnancy. Fetal Alcohol Syndrome (FAS) is a preventable medical condition directly related to maternal alcohol consumption. FAS is characterized by distinct facial abnormalities (short eyelid openings; long flat groove between nose and upper lip; thin upper lip; and flattened upper jaw bone), prenatal and postnatal growth retardation, and central nervous system dysfunction.¹⁸ Because of inconsistencies surrounding diagnoses, the prevalence of FAS in the United States is estimated to range from 0.3 to 20 per 1,000 live births among various population groups.¹⁹ A study in the early 1990's, assuming a prevalence of FAS of 0.3 per 1,000 live births, calculated the annual fiscal burden of the condition in the United States as approximately \$76 million dollars.¹⁹ Other adverse health outcomes associated with maternal alcohol consumption are: low birthweight, other birth defects, and behavioral disorders.

Generally, the proportion of women who reported consuming alcohol during pregnancy was smaller than the proportion that drank before pregnancy. PNSS collects information about alcohol consumption before and during pregnancy. Information regarding pre-pregnancy alcohol consumption is requested for several reasons, two

Figure 17: Trend in alcohol consumption during pregnancy, 2000-2003 MI PNSS



of which were: to calculate changes in behavior, and to identify infants at risk of FAS. According to Michigan PNSS, the prevalence of alcohol consumption among women in WIC was 15.6% in 2003. This was higher than the national PNSS prevalence, 9.4%. When asked about drinking in the last three months of pregnancy, 1.5% of women in national PNSS and one-half of a percent (0.5%) in Michigan PNSS reported drinking. These statistics indicate an 84% decline in alcohol consumption in national PNSS and a 97% decline in women participating in Michigan WIC.

In Michigan, the proportion of women who drank either before or during pregnancy declined since 2000 (Figure 17). At that time, the prevalence of drinking alcohol before pregnancy was 16.1%. In the last three months of pregnancy, it was 0.7%. During the four year interval, the average percent

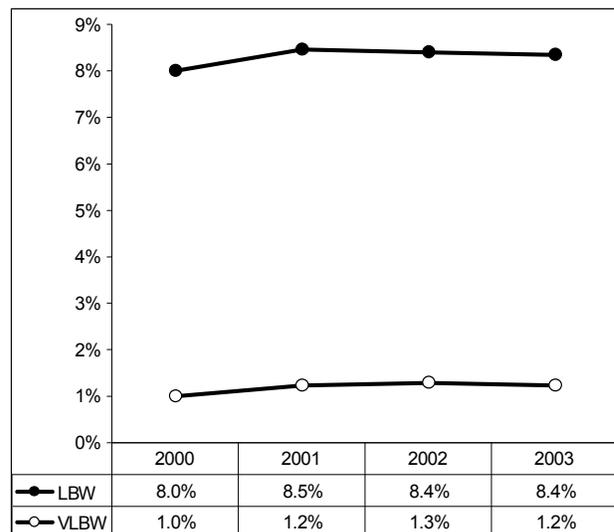
of participants who reported drinking during pregnancy declined by 1.1% per year. Among women who reported drinking during pregnancy the percent decline was about 11% per year.

Birth Outcome & Infant Health *Birthweight*

Birthweight is the single most important factor effecting infant morbidity and mortality. Low birthweight is associated with two-thirds of neonatal deaths, as well as, neuro-developmental problems, lower respiratory tract infection, learning disorders, disability, and behavioral problems.²⁰ A low birthweight infant weighs less than 2500 grams or 5 lbs 9 oz at birth. The incidence of LBW in Michigan WIC was slightly higher that of the general population of the state. In 2003, the incidence of LBW for WIC women was 8.4%, meanwhile the state incidence of LBW was 8.2%.² The WIC incidence of LBW was consistently higher than the state's prevalence throughout the preceding four years. Between 2000 and 2003 the WIC/PNSS incidence of LBW was 8.0% - 8.4%, meanwhile the state incidence was 7.9% - 8.2%. Nationally, PNSS participants had an incidence of LBW of 8.0%. The Healthy People 2010 objective for low birthweight is an incidence of 5%.¹⁷ Just as the trend of LBW in the general population is increasing, the trend among WIC participants in Michigan is also increasing. The rise in the incidence of LBW from 8.0% in 2000 to 8.4% in 2003 translated to a 1.5% increase, on average, per year (Figure 18). Infants who are born with a very low birthweight (VLBW) are at an even greater risk of adverse health outcomes than the LBW infants. VLBW

infants weigh less than 1500 grams (3 lbs 5oz). Clinical problems associated with VLBW include: hypothermia, hypoglycemia (due to decreased stores of glycogen and fat), perinatal asphyxia, respiratory distress syndrome, anemia, neurological problems, and an increased risk of infection. In addition, neonatal intensive care stays are among the most expensive types of hospitalizations. In 1999, Jeannette Rogowski calculated the median treatment cost of \$31,531 for infants weighing between 1251g and 1500g in 1994.²¹ Unlike LBW, the incidence of VLBW in WIC women is lower than that of women in the general population. The VLBW incidence in women participating in Michigan WIC was 1.2% in 2003, but for women in the general population the incidence was 1.7%.

Figure 18: Trend in Incidence of LBW and VLBW among WIC participants, 2000-2003 MI PNSS



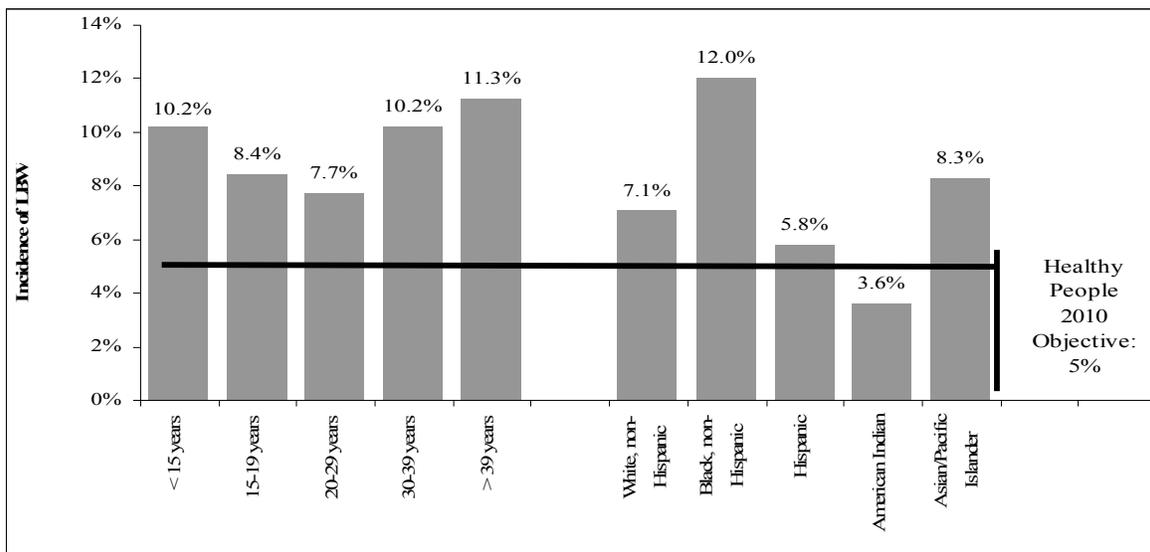
Low Birthweight and Maternal Demographics

When stratified by maternal age, the incidence of LBW was highest for the youngest and oldest women. Figure 19 depicts the incidence of LBW among Michigan WIC participants stratified by both maternal age and maternal race/ethnicity. The distribution of LBW outcome by maternal age resembles a J-shaped curve. At the extreme ends of this J-shaped curve were WIC/PNSS participants less than fifteen years old and forty years or above, with incidences of 10.2% and 11.3%, respectively. Women between twenty to twenty-nine years old had the best outcome with an incidence of LBW of 7.7%. The incidence of LBW in PNSS among the various age groups in Michigan was slightly higher than the national incidence. Nevertheless the distribution was equivalent. In national PNSS, women less than seventeen years old had an incidence of 7.9% and

women above the age forty years had an incidence of 10.0%. Like Michigan PNSS, national PNSS participants twenty to twenty-nine years old had the lowest incidence of LBW compared to other age groups, 6.5%. Michigan PRAMS data for 2003 also show a J-shaped curve for LBW stratified by maternal age. The incidence of LBW among women between the age of eighteen and nineteen in the general population of Michigan was 10.0% (95% CI: 6.5%-15.0%).²⁶ The incidence of LBW decreased for each successive age group until reaching a low of 6.0% (95%CI: 5.0%-7.3%) among women between the ages of twenty-five and twenty-nine years.²⁶ Then the incidence rose until it reached a high of 11.0% (95%CI: 6.1%-19.0%) in women above the age of thirty-nine years.²⁶

The incidence of LBW was not uniform across

Figure 19: Incidence of low birth weight by maternal age and maternal race/ethnicity, 2003 MI PNSS



the various racial/ethnic groups (Figure 19). LBW was consistently higher among non-Hispanic Black women than other racial/ethnic groups regardless of the population observed. Black women participating in Michigan WIC had the highest incidence of LBW compared to other racial/ethnic minorities, 12.0%. Among PNSS women nationally, 11.4% of Black women experienced a LBW outcome. Even among the general population in Michigan, Black women were disproportionately affected by LBW. In 2002, an almost equal amount of Black women in the general population delivered a LBW infant as did Michigan WIC women, 11.9% (95% CI: 9.6%-28.5%).²⁶ At the opposite end of the LBW spectrum, Hispanic and American Indian/Alaskan Natives had the lowest incidences of LBW. In Michigan, Hispanic and American Indian/Alaskan Native WIC participants had incidences of 5.8% and 3.6%, respectively.

Compared to Michigan PNSS, the national PNSS LBW incidences were nearly equivalent for Hispanics participants (5.9% nationally versus 5.8% in Michigan).

Beginning with Michigan WIC participants with at least some high school education, the incidence of LBW gradually decreased as the level of maternal education increased: from 9.1% among women with some high school to 8.0% among women with at least a college degree (Table 7). This pattern was analogous to the general population of Michigan, according to PRAMS, and national PNSS. The incidence of LBW in Michigan decreased from 9.9% (95%CI: 7.7-12.6) to 5.5% (95%CI: 4.6-6.7) and nationally the incidence of LBW decreased from 7.2% to 6.5% as the level of maternal education increased.²⁶ Married Michigan women, both in WIC and in the general population, delivered a lower

Table 7: Incidence of low birthweight by various maternal behaviors and characteristics, 2003 MI PNSS

	Percent		Percent	
Education	<9 years	7.8%	Prenatal Care Entry	
	9-11 years	9.1%		1st trimester
	12 years	8.2%	2nd or 3rd trimester	8.8%
	13-15 years	8.1%	Gestational Weight Gain	
	16+ years	8.0%		Below Recommended
		Recommended		6.9%
Marital Status	Married	7.3%	Above Recommended	4.9%
	Not Married	8.9%	Smoked in the Last 3 Months of Pregnancy	
Pre-pregnancy BMI	Underweight	11.6%		Smoked
	Normal	8.1%	Did Not Smoke	6.5%
	Overweight	7.3%	Drank in the Last 3 Months of Pregnancy	
		Drank Alcohol		8.6%
			Did Not Drink Alcohol	7.1%

2003 PNSS

incidence of LBW infants compared to women who were not. Overall, in the state, married women had an incidence of 5.6% (95% CI: 5.0-6.2), whereas unmarried women had an incidence of 10.3% (95%CI: 8.9-11.8).²⁶ The difference among WIC participants was smaller, but still present. The incidence of LBW for unmarried WIC participants was 8.9%, but for married participants it was 7.3% (Table 7).

Low Birthweight and other Maternal Characteristics

Adverse maternal behavior, like smoking, also negatively impacts the incidence of LBW (Table 7). Women who drank during their pregnancy had a LBW incidence of 8.6% in Michigan WIC while non-drinkers had an incidence of 7.1%. Michigan WIC participants who smoked during their pregnancy had a LBW incidence of 9.2% compared to participants who did not smoke, 6.5%. When the incidence of LBW was stratified by smoking status and pre-pregnancy weight, several observations are apparent (Figure 20). First, women who did not smoke had a lower incidence of LBW compared to women who did, regardless of pre-pregnancy weight. Second, the incidence of LBW decreased with increasing pre-pregnancy weight for smokers as well as non-smokers. Finally, the LBW incidence difference between smokers and non-smokers decreased as pre-pregnancy weight increases. Among underweight women, there was a 3.7 percentage

Figure 20: Incidence of low birthweight by pre-pregnancy BMI and smoking status, 2003 MI PNSS

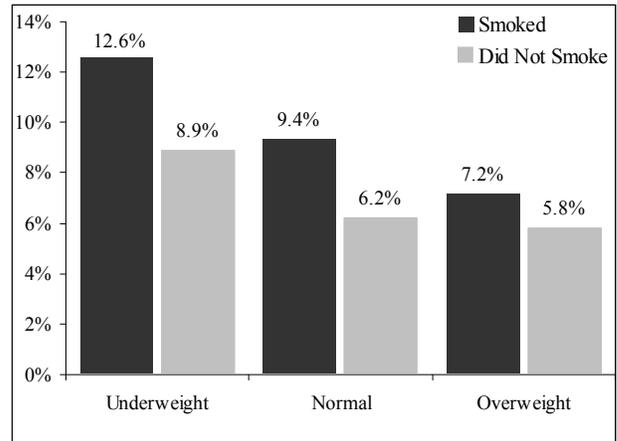


Figure 21: Incidence of Low birthweight and very low birthweight by trimester of entry into WIC, 2003 MI PNSS

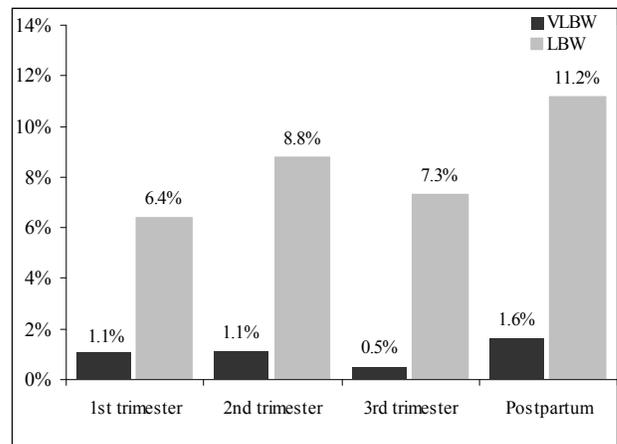
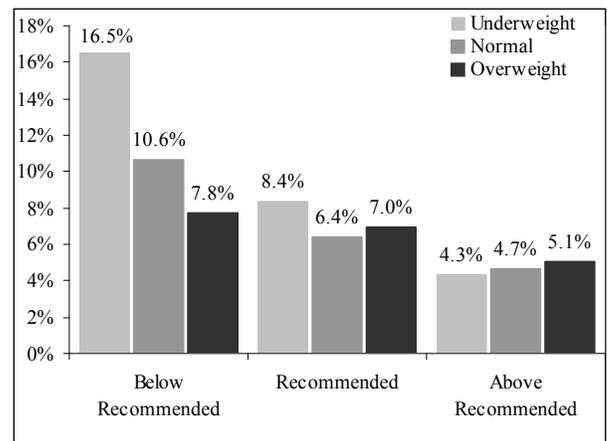


Figure 22: Incidence of low birthweight by pre-pregnancy BMI and weight gain during pregnancy, 2003 MI PNSS



point difference between smokers and non-smokers. For overweight women the difference dwindled to 1.4 percentage points.

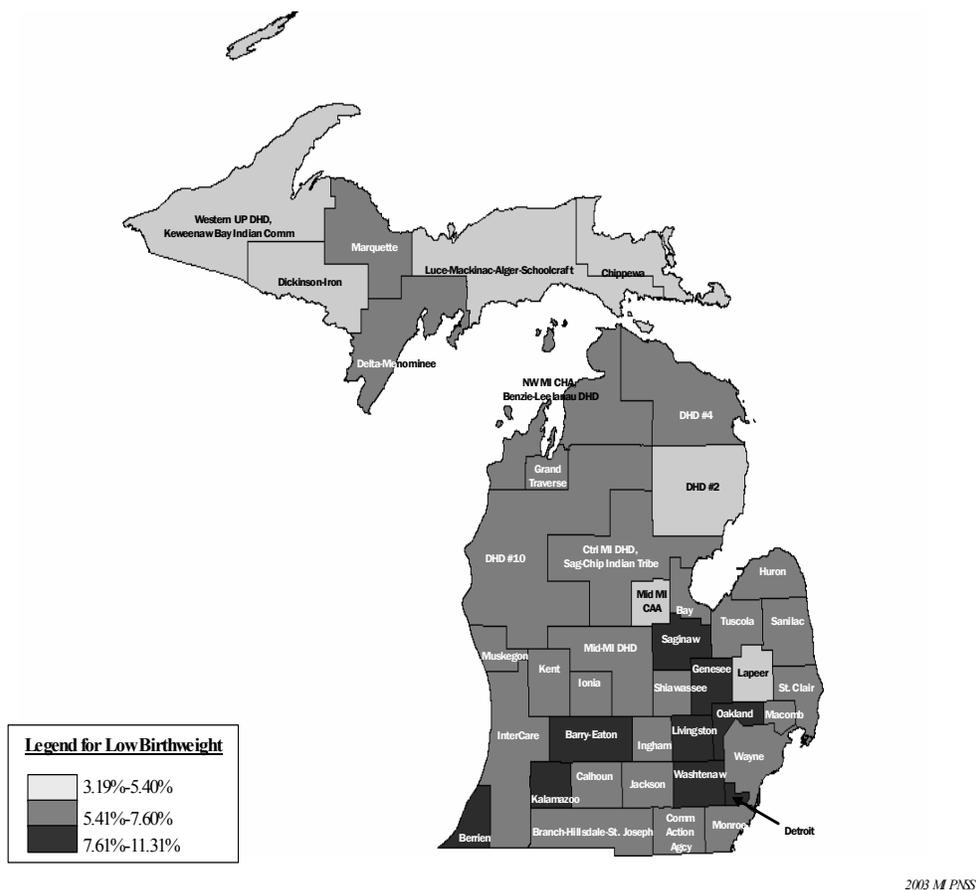
The incidence of LBW increases as maternal pre-pregnancy weight decreases. In Michigan PNSS, underweight women had a LBW incidence of 11.6%, while normal weight and overweight women had an incidence of LBW of 8.1% and 7.3% each (Table 7).

Women who enter prenatal care in the first trimester have better outcome compared to those who enter in the second or third trimester (Table 7). In addition, time of entry into WIC determines the quantity of WIC services a woman receives, which, in turn, affects birth outcomes. Figure 21 shows the incidence of LBW and VLBW by trimester of WIC enrollment in 2003. Overall, women who enroll during their pregnancy had lower incidences of LBW and VLBW when compared to women who enroll postpartum. Women who enrolled in WIC prenatally had incidences of LBW between 4.5% and 7.2%. Among women who enrolled postpartum, the incidence of LBW was of 11.2%. Similarly, with VLBW, women who enrolled prenatally had incidences of either 0.5% or 0.6%, but women who enrolled postpartum had incidences of 1.6%. Among women who enrolled prenatally, those entering the program in the first trimester had better outcomes compared to those entering after their first trimester. The incidence of LBW was 4.5% for women entering

the program in their first trimester, while women entering in their second or third trimester have incidences of 7.2% and 6.8%, respectively. For this reason, women are encouraged to apply as soon as they are aware of their pregnancy.

The effect of WIC's primary intervention in women, supplementing the diet of women with nutritious foods and nutritional education, was best observed by looking at LBW stratified by both pre-pregnancy weight and weight gain during pregnancy. Figure 22 depicts the incidence of LBW stratified by both pre-pregnancy BMI and weight gain during pregnancy. When underweight women were stratified by weight gain during pregnancy, a four-fold decrease in the incidence of LBW was observed between underweight women who gained less than ideal weight and underweight women who gained more than the recommended amount of weight (16.5% versus 4.3%). Low birthweight incidences decreased as weight gain during pregnancy increased for normal weight and overweight women as well. However among those women who gained more than the recommended amount of weight for their pre-pregnancy BMI, women who were overweight before pregnancy have the highest incidence of LBW (5.1%) compared to the other pre-pregnancy BMI group (4.7% among women with a normal BMI and 4.3% among women with a low BMI).

Figure 23: The incidence of low birthweight by WIC geographic area, 2003 MI PNSS



2003 MI PNSS

When the incidence of LBW in WIC was mapped, it was highest in those areas with the largest Black population. Berrien County HD, Kalamazoo, Genesee County HD, Livingston County HD and the city of Detroit all have incidences of LBW higher than the state PNSS incidence (Figure 23). Meanwhile most of the Upper Peninsula, central and northeast section of the Lower Peninsula had incidences below that of the state PNSS. Luce-Mackinac-Alger-Schoolcraft DHD (3.1%), Chippewa County HD (3.2%), and District Health Dept. #2 (3.8%), located in that region, had the lowest incidence of

LBW. Detroit Urban League, Detroit DHWP, and Kalamazoo Family Health Center, all agencies with a large Black participant population, had the highest incidences of LBW: 11.5%, 11.1%, and 11.0%, respectively.

Breastfeeding

In addition to being cost effective, breastfeeding continues to be beneficial to both mother and infant. Breastfeeding is considered the optimum source of nutrition for infants. It provides nutrients in proper age-appropriate proportions

and it contains maternal antibodies that help the infant ward off infections. Prolonged breastfeeding is associated with a reduced risk of overweight among non-Hispanic white children. Breastfeeding longer than six months provides health benefits to children well beyond the period of breastfeeding.²² Breastfeeding helps the mother develop the mother-infant bond and decreases the risk of developing certain cancers (i.e. breast and ovarian cancers). Because of the benefits of breastfeeding, many maternal and infant health programs strongly encourage women to breastfeed for as long as possible.

There is a Healthy People 2010 breastfeeding objective for those women who are able to safely breastfeed (women who are not taking illegal drugs, do not have active, untreated tuberculosis, are not HIV positive, and those who are not taking certain prescribed medications). That objective is to increase the proportion of women who initiate breastfeeding to 75%; have 50% of women breastfeeding to six months; and have 25% of women breastfeeding through their infant's first year of life.^{23, 24, 25, 17} PNSS data contains information for breastfeeding initiation. Information regarding breastfeeding duration in Michigan WIC participants is located in Pediatric Nutritional Surveillance System (PedNSS).

Approximately half of PNSS women initiate breastfeeding. In Michigan PNSS, the overall incidence of ever breastfed was 49.9% in 2003.

Concurrently, national PNSS had a slightly higher prevalence of breastfeeding initiation: 55.7%. Both however were below the prevalence of the general population. Overall in Michigan, the percent of women who ever breastfed their infant was 68.5% (95% CI: 65.7%-71.2%) in 2003.²⁶ Nevertheless the rate of breastfeeding initiation among participants in Michigan WIC increased since 2000. The prevalence of breastfeeding initiation among WIC women was 46.9% in 2000. The increase from 46.9% in 2000 to 49.9% in 2003, represents an average increase of 2.1% annually.

Breastfeeding and Maternal Characteristics

Breastfeeding initiation increased with increasing maternal age. When stratified by age, the prevalence of breastfeeding initiation was 23.7% among Michigan WIC participants under the age of fifteen years old (Table 8). For participants between the ages of fifteen to nineteen years old, the percentage of those who breastfed was 43.5%. Subsequently, the prevalence of ever breastfed increased until it peaked at 55.8% among women over the age of thirty-nine years. Similar trends were observed in national PNSS as well as in the general population of Michigan. Nationally PNSS participants under the age of fifteen years had an ever breastfed prevalence of 36.4%. As maternal age increased, the percentage of women breastfeeding also increased, peaking at 63.3%

among women over the age of thirty-nine years. Likewise, in the general population in Michigan ever breastfeed prevalence increases from 38.9% among women under the age of eighteen years to 77.5% in women above the age of thirty-nine years.²⁶

At least half of PNSS women, excluding Black participants, breastfed their infants. In Michigan PNSS, ever breastfed prevalence was highest among Hispanic and Asian/Pacific Islander women: 64.8% and 58.4%, respectively. Among Black participants the prevalence was 35.2%. Nationally, the prevalence of ever breastfed among Black PNSS participants was 43.0%. The group with the highest prevalence of ever breastfed was Hispanic women, with a prevalence of 74.1%. In the general population in Michigan, PRAMS statistics for ever breastfed was reported only for non-Hispanic White, non-Hispanic Black, and Hispanic participants. Between those three groups, Hispanics had the highest prevalence of ever breastfed (77.2%), followed by non-Hispanic White women (70.5%), and lastly non-Hispanic Black women (59.6%).²⁶

Breastfeeding was also strongly correlated with maternal education. In Michigan WIC breastfeeding increased as the level of maternal education increased for women with at least nine years of education. The prevalence, among those women, ranged from 36.6% to 77.4%.

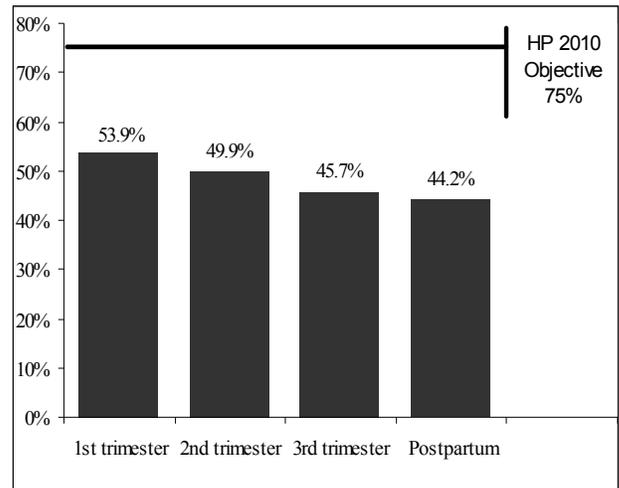
Remarkably, more than half of women (54.5%)

Table 8: Prevalence of ever breastfeeding by maternal demographic characteristics, 2003 MI PNSS

	Percent
Maternal Age	
< 15 years	23.7%
15-19 years	43.5%
20-29 years	50.6%
30-39 years	55.0%
> 39 years	55.8%
Maternal Race/Ethnicity	
White, non-Hispanic	54.0%
Black, non-Hispanic	35.2%
Hispanic	64.8%
American Indian	50.4%
Asian/Pacific Islander	58.4%
Maternal Education	
<9 years	54.5%
9-11 years	36.6%
12 years	49.2%
13-15 years	61.8%
16+ years	77.4%

2003 PNSS

Figure 24: Prevalence of ever breastfed by trimester of entry into WIC, 2003 MI PNSS



with less than nine years of education chose to breastfeed their infants. In fact, women with less than nine years of education had a prevalence of breastfeeding initiation higher than that of high

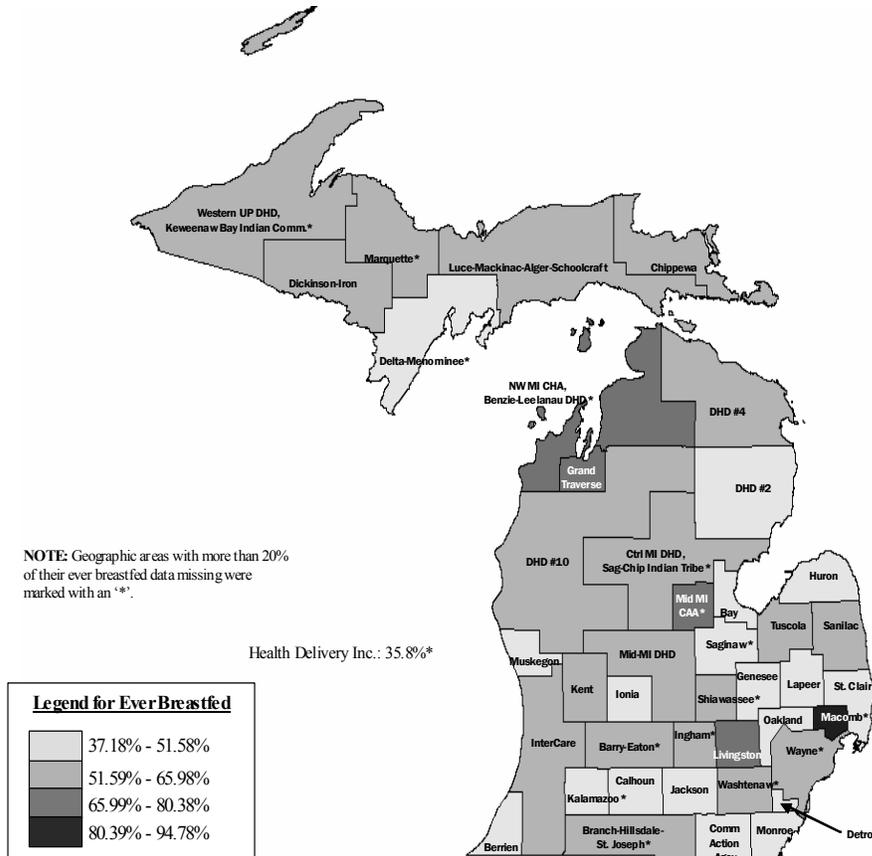
school graduates. In national PNSS, educational level is divided into three categories: less than high school, high school, and more than high school. The breastfeeding initiation prevalence for those groups was 51.4%, 53.6%, and 68.3% respectively. In the general population of Michigan, the ever breastfed prevalence ranged from 46.9% in women with less than a high school education to 86.5% in women with at least a college degree. ²⁶

Breastfeeding also varied by trimester of WIC enrollment among Michigan WIC participants

(Figure 24). Women who entered WIC in the first trimester had the highest prevalence of ever breastfed: 53.9%. Breastfeeding declined for each successive period of entry. Women entering the program in their second trimester had an ever breastfed prevalence of 49.9%, followed by women in the third trimester with 45.7%. Women who entered the program postpartum had the lowest prevalence of all, 44.2%.

When breastfeeding statistics were mapped for geographical area, a cluster of low breastfeeding prevalence was observed around the southeast

Figure 25: Prevalence of ever breastfed by WIC geographic area, 2003 MI PNSS



region of the state (Figure 25). Outside of that area, low prevalences of ever breastfeed were observed in Muskegon, Genesee, and Berrien county health departments (areas with a high proportion of Black participants). Looking at agency-level statistics, Grand Traverse County HD had the highest prevalence of ever breastfed, 76.7%. Other agencies with a high prevalence of ever breastfed are: Livingston County HD (68.2%) and InterCare Community Health Network (60.7%). Agencies with the lowest prevalence of ever breastfed are: Genesee County HD (37.2%), Detroit DHWP (38.6%), and Muskegon County HD (39.4%).

Pregnancy Outcome Health Progress Review

Progress was made in eight of the twelve PNSS health indicators between the years 2000 and 2003. Breastfeeding initiation increased by 6% as more WIC participants chose to breastfeed their infants. More women were also able to enroll into prenatal care in their first trimester (3.0% increase between 2000 and 2003). Also first trimester WIC enrollment improved. By 2003, 2% more women enrolled in WIC in their first trimester compared to 2000. The number of women experiencing iron deficiency anemia during pregnancy declined by 3%. Smoking prevalences before and during pregnancy also improved. Compared to 2000 statistics, 14%

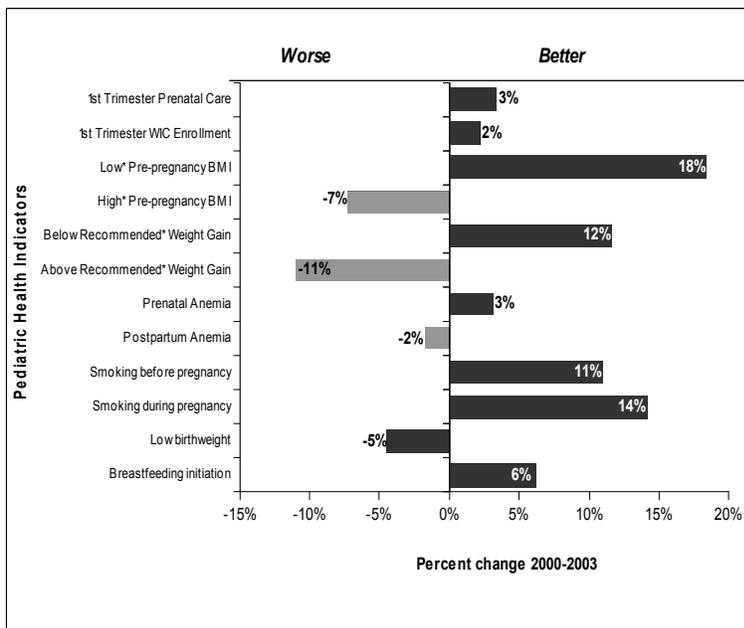
fewer women smoked during their pregnancy and 11% less women smoked before their pregnancy in 2003. Low pre-pregnancy BMI also improved, with an 18% decrease in four years.

Despite the overall progress, the prevalence of some nutritional indicators, including one major indicator, worsened from 2000 to 2003. The incidence of LBW in Michigan WIC participants increased 5% during the four-year period and postpartum anemia increased by 2%.

Several indicators, depending on the characteristics of the woman, can be either beneficial or detrimental. For example, by itself, greater than recommended weight gain is protective against LBW. Among women who gained above the recommended amount of weight

during pregnancy the incidence of LBW was 4.9% among Michigan WIC participants. For those who gained the recommended amount or less than the recommended amount, the incidence of LBW was 6.9% and 10.3% respectively. When, however, weight gain during pregnancy is stratified by pre-pregnancy weight differences in the effect that weight gain during pregnancy has on the incidence of LBW were observed (Figure 22). Underweight women have the highest prevalence of LBW among

Figure 26. Pregnancy Nutrition Surveillance System Health Progress Review, 2000-2003 MI PNSS



women who gain the recommended amount of weight and below the recommended amount of weight. Among women who gain more than the recommended amount of weight the incidence of LBW was highest among not underweight, but overweight women. Given the example above, it would be improper to evaluate the effect of pre-pregnancy weight independent of weight gain during pregnancy alone. Nevertheless below recommended weight gain and pre-pregnancy underweight are, for most women predictive of an adverse birth outcome. Therefore, indicators related to weight gain during pregnancy and pre-pregnancy overweight were included in the Figure 26.



Conclusion and Recommendations

Optimum maternal health before and during pregnancy usually translates to good birth outcomes. The mission of the Michigan WIC program is to improve the health outcomes and quality of life of eligible women, infants, and children by providing nutritious food, nutrition education, breastfeeding promotion and support, and referrals to health and other services. Using statistics generated from the Pregnancy Nutritional Surveillance System (PNSS), Michigan WIC can identify risk that may effect health outcomes and quality of life, develop policy, and modify services to reduce those risks. Based on the information in this report, recommendations that may further improve the health and birth outcomes of women and infants participating in Michigan WIC are:

- Target resources in locations with high African American population and low breastfeeding rates
- Proportion of women who breastfeed decreases among women who enter WIC later in their pregnancies, compared to women who enter earlier. Therefore, breastfeeding encouragement needs to be intensified among women who enter WIC after their first trimester.
- Encourage proper weight management for postpartum women to increase the proportion of women beginning their next pregnancy at an appropriate weight.
- Encourage teen mothers to eat an appropriate amount of nutritious foods to maintain their weight and promote their infant's proper development.
- Emphasize the sources of iron in foods and encourage women to increase consumption of iron-fortified food during pregnancy.
- Continue to encourage early entry into the WIC Program among eligible pregnant women.

References

1. Oliveira V, Racine E, Olmsted J, Ghelfi LM. *The WIC Program: Background, Trends, and Issues*. Washington D.C.: Food and Rural Economics Division, Economics Research Services, U.S. Department of Agriculture, 2002.
2. Division for Vital Records and Health Statistics, Michigan Department of Community Health using Population Estimates (latest update 9/2004) released by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, U.S. Department of Health and Human Services.
3. Larrieux C. Live births in WIC in 2003. Unpublished raw data. 1/24/2006.
4. Martin JA, Hamilton BE, Sutton PD, et al. Births: Final data for 2003. National vital statistics reports; vol 54 no 2. Hyattsville, MD: National Center for Health Statistics.2005.
5. Ahluwalia IB, Hogan VK, Grummer-Strawn L, Colville WR, Peterson A. The effect of WIC participation on small-for-gestational-age births: Michigan, 1992. *Am J Public Health*. 1998 Sep;88(9):1374-7.
6. Avruch S, Cackley AP. Savings achieved by giving WIC benefits to women prenatally. *Public Health Rep*. 1995 Jan-Feb;110(1):27-34.
7. Kotelchuck M, Schwartz JB, Anderka MT, Finison KS. WIC participation and pregnancy outcomes: Massachusetts Statewide Evaluation Project. *Am J Public Health*. 1984 Oct;74(10):1086-92.
8. Lazariu-Bauer V, Stratton H, Pruzek R, Woelfel ML. A comparative analysis of effects of early versus late prenatal WIC participation on birth weight: NYS, 1995. *Matern Child Health J*. 2004 Jun;8(2):77-86.
9. Schieve LA, Cogswell ME, Scanlon KS, Perry G, Ferre C, Blackmore-Prince C, Yu SM, Rosenberg D. Prepregnancy body mass index and pregnancy weight gain: associations with preterm delivery. The NMIHS Collaborative Study Group. *Obstet Gynecol*. 2000 Aug;96(2):194-200.
10. Rhodes JC, Schoendorf KC, Parker JD. Contribution of excess weight gain during pregnancy and macrosomia to the cesarean delivery rate, 1990-2000. *Pediatrics*. 2003 May;111(5 Part 2):1181-5.
11. Negggers Y, Goldenberg RL. Some thoughts on body mass index, micronutrient intakes and pregnancy outcome. *J Nutr*. 2003 May;133(5 Suppl 2):1737S-1740S.
12. Carmichael SL, Abrams B. A critical review of the relationship between gestational weight gain and preterm delivery. *Obstet Gynecol*. 1997 May;89(5 Pt 2):865-73.
13. Committee on Nutritional Status During Pregnancy and Lactation. Food and Nutrition Board. Institute of Medicine. Nutrition during pregnancy. Part I: weight gain, Part II: nutrient supplements. Washington, DC: National Academy Press, 1990.
14. Allen LH. Anemia and iron deficiency: effects on pregnancy outcome. *Am J Clin Nutr*. 2000 May;71(5 Suppl):1280S-4S.
15. Allen LH. Biological mechanisms that might underlie iron's effects on fetal growth and preterm birth. *J Nutr*. 2001 Feb;131(2S-2):581S-589S.
16. Centers for Disease Control and Prevention. Recommendations to Prevent and Control Iron Deficiency in the United States. *MMWR* 1998; 47 (No. RR-3):1-30.
17. U.S. Department of Health and Human Services. *Healthy People 2010*. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health. 2 vols. Washington, DC: U.S. Government Printing Office, November 2000.
18. Astley SJ, Bailey D, Talbot C, Clarren SK. Fetal alcohol syndrome (FAS) primary prevention through FAS diagnosis: I. Identification of high-risk birth mothers through the diagnosis of their children. *Alcohol Alcoholism*. 2000 Sep-Oct;35(5):499-508.

19. Wilcox LS, Marks JS, eds. From data to action: CDC's public health surveillance for women, infants, and children. U.S. Centers for Disease Control and Prevention. Atlanta, Georgia. 1994.
20. Wallace HM, Sweeney PJ, Nelson RP, eds. Maternal & Child Health Practices (4th ed.) Oakland, CA: Maternal and Child Health Practices; 1994.
21. Rogowski J. Measuring the cost of neonatal and perinatal care. *Pediatrics*. 1999 Jan;103(1 Suppl E):329-35.
22. Grummer-Strawn LM, Mei Z; Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. Does breastfeeding protect against pediatric overweight? Analysis of longitudinal data from the Centers for Disease Control and Prevention Pediatric Nutrition Surveillance System. *Pediatrics*. 2004 Feb;113(2):e81-6.
23. American Academy of Pediatrics, Work Group on Breastfeeding. Breastfeeding and the use of human milk [policy statement no. RE9729]. *Pediatrics*. 101(1): e9
24. American Academy of Pediatrics, Committee on Drugs. The transfer of drugs and other chemicals into human milk. *Pediatrics* 93:137-150, 1994.
25. American Academy of Pediatrics, Committee on Pediatric AIDS. Human milk, breastfeeding, and transmission of human immunodeficiency virus in the United States. *Pediatrics* 96:977-979, 1995.
26. Patel R, Grigorescu V, Bouraoui Y, Kirk G. Michigan Department of Community Health. Michigan Pregnancy Risk Assessment Monitoring System (PRAMS) 2003 Annual Report. Family and Community Health, Michigan Department of Community Health, June 2006.

Appendix:
Selected Health Indicators among WIC Local Agencies

2003 PNSS Local Agency Table

	N	%	Race				1st Trimester WIC Entry	Weight Gain			Low Birth weight**			Breastfeeding Initiation	
			White	Black	Hispanic	Other		< Ideal	Ideal	> Ideal	Total	White	Black		Hispanic
Michigan	61,040	100.0%	59.8%	28.1%	10.1%	2.1%	31.7%	30.1%	26.5%	43.4%	8.4%	7.1%	12.0%	5.8%	49.8%
Barry-Eaton DHD	723	1.2%	97.6%	-	1.4%	-	39.2%	27.8%	26.9%	45.2%	8.7%	8.8%	25.0%	-	53.8%*
Bay County HD	735	1.2%	96.7%	1.8%	1.1%	-	47.7%	23.6%	29.3%	47.1%	6.2%	6.3%	8.3%	-	51.5%
Benzie-Leelanau DHD	193	0.3%	75.6%	-	15.5%	8.8%	52.4%	22.3%	32.4%	45.3%	8.9%	11.0%	-	-	76.8%*
Berrien County HD	1,004	1.6%	53.7%	43.3%	1.9%	1.1%	33.5%	25.6%	27.7%	46.7%	9.0%	7.2%	11.0%	6.3%	45.1%
Branch-Hillsdale-St. Joseph DHD	1,231	2.0%	88.1%	2.0%	9.7%	-	33.0%	31.7%	27.6%	40.7%	7.1%	7.1%	-	9.8%	51.6%*
Calhoun County HD	1,232	2.0%	71.3%	21.7%	6.2%	0.8%	36.5%	24.8%	28.3%	46.9%	7.8%	6.3%	14.9%	1.4%	40.8%
Central MI District HD	1,098	1.8%	98.1%	0.7%	-	0.9%	39.7%	32.2%	23.9%	43.8%	6.9%	7.0%	-	-	61.2%*
Chippewa County HD	288	0.5%	68.1%	-	2.1%	28.5%	45.7%	18.9%	28.8%	52.3%	3.2%	3.5%	-	16.7%	58.8%
Community Action Agency	595	1.0%	76.1%	1.3%	22.2%	-	28.3%	24.3%	30.6%	45.1%	6.1%	6.0%	16.7%	5.9%	45.1%
Detroit City HD	10,244	16.8%	8.2%	77.1%	12.5%	2.1%	18.9%	35.0%	24.6%	40.4%	11.1%	7.0%	12.5%	4.8%	38.6%
Detroit Urban League	1,735	2.8%	12.9%	72.7%	11.8%	2.6%	20.7%	49.3%	18.1%	32.6%	11.5%	8.0%	12.8%	9.0%	30.3%*
Dickinson-Iron DHD	280	0.5%	99.6%	-	-	-	45.8%	16.0%	31.5%	52.5%	4.9%	5.0%	-	-	55.6%
District Health Dept #10	2,106	3.5%	86.4%	1.7%	11.0%	0.9%	44.1%	29.6%	26.4%	44.0%	7.1%	7.1%	-	6.9%	57.3%
District Health Dept. #2	423	0.7%	98.6%	-	-	-	52.1%	18.6%	29.6%	51.8%	3.8%	3.8%	-	-	44.1%
District Health Dept. #4	490	0.8%	99.2%	-	-	-	42.5%	27.1%	27.4%	45.5%	7.8%	7.8%	-	-	58.0%
Genesee County HD	3,371	5.5%	56.1%	40.3%	2.8%	0.7%	24.8%	22.9%	27.8%	49.3%	9.2%	7.3%	12.0%	8.1%	37.2%
Grand Traverse County HD	518	0.8%	92.1%	-	3.3%	3.9%	43.8%	22.9%	29.4%	47.7%	7.6%	7.5%	-	-	70.7%
Health Delivery, Inc.	577	0.9%	12.7%	52.7%	34.3%	-	47.7%	29.3%	26.6%	44.1%	7.8%	7.9%	-	-	43.9%
Huron County HD	226	0.4%	98.2%	-	-	-	47.7%	43.3%	26.6%	44.1%	7.9%	7.9%	-	-	65.7%*
Ingham County HD	1,959	3.2%	59.7%	23.5%	11.3%	5.5%	16.4%	43.3%	21.6%	35.1%	7.9%	7.2%	10.7%	5.3%	60.7%
Intercare Comm Health Network (Spartan+Pulman)	3,115	5.1%	64.9%	3.6%	29.3%	2.2%	36.9%	41.2%	23.6%	35.2%	7.0%	7.4%	11.3%	5.1%	60.7%
Ionia County HD	440	0.7%	91.8%	-	7.0%	-	38.5%	19.8%	31.4%	48.7%	8.3%	8.5%	-	-	45.8%
Jackson County HD	1,241	2.0%	80.4%	13.5%	5.2%	0.9%	39.0%	19.6%	28.6%	51.7%	7.8%	6.6%	13.2%	8.9%	51.5%
Kalamazoo County HD	901	1.5%	81.1%	16.1%	2.0%	0.8%	33.5%	33.3%	24.2%	42.5%	8.6%	8.2%	11.5%	-	47.5%*
Kalamazoo Family Health Center	642	1.1%	36.4%	46.0%	15.3%	2.3%	39.6%	34.9%	23.5%	41.6%	11.0%	8.4%	13.0%	12.5%	49.1%*
Kent County HD	4,777	7.8%	46.8%	20.9%	28.7%	-	38.4%	26.8%	29.4%	43.7%	7.4%	7.6%	60.0%	5.1%	60.0%
Keweenaw Bay WIC Program	49	0.1%	30.6%	-	-	67.3%	36.2%	18.6%	30.2%	51.2%	-	-	-	-	34.1%
Lapeer County HD	489	0.8%	98.0%	-	1.2%	-	42.2%	20.2%	30.1%	49.7%	5.7%	5.4%	-	-	50.4%
Livingston County HD	358	0.6%	96.9%	-	2.2%	-	25.5%	15.5%	31.0%	53.5%	8.8%	8.7%	-	-	68.2%
Luce-Mackinac-Alger-Schoolcraft DHD	214	0.4%	90.2%	-	-	8.4%	59.0%	44.6%	22.9%	32.6%	3.1%	3.4%	-	-	56.7%
Macomb County HD	1,812	3.0%	80.5%	12.2%	4.1%	3.2%	25.7%	27.8%	28.5%	43.7%	7.1%	6.4%	9.9%	8.6%	94.8%*
Marquette County HD	341	0.6%	96.2%	-	1.4%	-	44.0%	15.6%	32.2%	52.2%	6.6%	6.2%	-	-	62.3%*
Mid MI Comm Action Agency	422	0.7%	97.2%	-	1.2%	-	53.0%	21.8%	26.5%	51.7%	5.0%	5.2%	-	-	67.1%*
Mid-Michigan DHD	888	1.5%	97.3%	1.1%	1.5%	-	38.7%	25.8%	27.7%	46.5%	5.9%	5.9%	-	-	53.8%
Monroe County HD	763	1.3%	92.4%	4.5%	2.9%	-	34.2%	24.2%	27.6%	48.1%	8.3%	7.8%	19.4%	-	44.8%
Muskegon County HD	1,599	2.6%	65.9%	25.5%	7.7%	0.9%	38.3%	23.7%	27.0%	49.3%	7.4%	7.0%	10.7%	-	39.4%
Northwest MI Comm Health Agency	747	1.2%	96.3%	-	0.8%	2.8%	46.1%	28.2%	29.2%	42.7%	7.0%	7.0%	-	-	73.5%*
Oakland County HD	3,539	5.8%	58.1%	28.2%	11.3%	2.4%	20.9%	28.3%	26.0%	45.7%	8.7%	7.3%	12.3%	7.2%	47.9%
Pub Hlth Delta & Menominee Counties	417	0.7%	99.0%	-	-	-	45.7%	23.2%	31.8%	45.0%	6.9%	7.0%	-	-	44.4%*
Saginaw County Dept PH	1,235	2.0%	59.4%	31.0%	9.6%	-	43.1%	20.1%	29.8%	50.0%	8.7%	6.3%	12.8%	10.3%	37.5%*
Sanilac County HD	296	0.5%	99.0%	-	-	-	30.2%	24.0%	28.8%	47.2%	7.0%	7.1%	-	-	53.9%
Shiawassee County HD	504	0.8%	98.4%	-	-	-	46.2%	21.1%	30.0%	48.8%	6.8%	6.7%	-	-	55.3%*
St. Clair County HD	1,019	1.7%	87.1%	6.0%	4.9%	2.0%	39.7%	22.8%	31.1%	46.1%	7.7%	7.4%	14.8%	-	41.2%
Tuscola County HD	440	0.7%	99.5%	-	-	-	41.5%	22.8%	31.1%	46.2%	6.9%	6.9%	-	-	56.0%
Washtenaw County HD	1,323	2.2%	47.1%	37.6%	8.0%	7.3%	30.0%	26.9%	29.6%	43.5%	8.5%	8.6%	8.9%	6.5%	57.9%*
Wayne County HD	3,989	6.5%	80.8%	17.1%	1.8%	0.3%	26.6%	33.3%	24.8%	41.9%	8.0%	7.3%	11.1%	7.8%	51.8%*
Western Upper Penin DHD	438	0.7%	97.0%	1.1%	1.8%	-	44.6%	62.8%	15.8%	21.5%	5.6%	5.8%	-	-	65.4%*

- Small sample size prohibits analysis (fewer than 5 observations)
 * Agency had more than 20% of their ever breastfed data missing

2002 PNSS Local Agency Table

	N	%	Race			Other	1st Trimester WIC Entry	Weight Gain			Low Birth weight**			Breastfeeding Initiation	
			White	Black	Hispanic			< Ideal	Ideal	> Ideal	Total	White	Black		Hispanic
Michigan	52,276	100.0%	59.4%	28.8%	10.0%	1.8%	32.3%	32.1%	26.7%	41.2%	8.4%	7.0%	12.2%	5.7%	49.3%
Barry-Eaton DHD	682	1.3%	96.5%	2.1%	1.2%	-	36.5%	27.6%	26.0%	46.4%	8.6%	8.0%	-	-	56.0%
Bay County HD	746	1.4%	97.1%	1.1%	1.6%	-	51.7%	25.0%	32.2%	42.8%	5.7%	5.7%	-	-	49.7%*
Benzie-Leelanau DHD	184	0.4%	75.0%	-	14.7%	9.8%	53.7%	27.1%	28.6%	44.3%	5.6%	5.2%	-	-	72.2%*
Berrien County HD	1,043	2.0%	53.5%	43.5%	1.2%	1.7%	32.6%	24.9%	29.0%	46.1%	9.0%	6.7%	11.9%	-	46.8%
Branch-Hillsdale-St. Joseph DHD	1,078	2.1%	88.9%	2.8%	8.2%	-	36.3%	33.8%	24.6%	41.6%	6.7%	7.0%	-	-	45.9%
Calhoun County HD	1,211	2.3%	72.4%	18.9%	8.2%	0.5%	38.7%	22.5%	28.7%	48.7%	6.5%	6.4%	8.0%	-	40.3%*
Central MI District HD	1,151	2.2%	97.7%	0.8%	0.6%	0.9%	38.2%	27.6%	27.5%	44.9%	7.9%	7.6%	-	-	54.7%*
Chippewa County HD	271	0.5%	67.5%	-	-	30.6%	57.4%	21.3%	23.9%	54.8%	3.4%	3.8%	-	-	61.2%*
Community Act on Agency	578	1.1%	77.2%	2.1%	20.4%	-	30.9%	28.4%	32.0%	39.6%	7.5%	7.8%	-	-	46.2%
Detroit City HD	10,251	19.6%	7.5%	77.9%	13.0%	1.6%	16.8%	37.9%	24.6%	37.4%	10.9%	7.8%	12.2%	5.0%	37.0%
Detroit Urban League	1,353	2.6%	8.8%	79.8%	10.8%	0.6%	21.7%	44.4%	20.7%	34.9%	11.9%	9.2%	13.0%	6.9%	27.9%*
Dickinson-Iron DHD	261	0.5%	98.1%	-	-	-	47.6%	18.5%	28.9%	52.6%	6.3%	6.5%	-	-	52.9%
District Health Dept #10	1,970	3.8%	85.7%	1.4%	12.1%	0.7%	42.9%	31.8%	26.0%	42.2%	6.3%	6.2%	24.0%	4.3%	58.0%
District Health Dept. #2	459	0.9%	98.0%	-	1.1%	-	44.5%	21.1%	27.4%	51.4%	7.3%	7.5%	-	-	48.1%
District Health Dept. #4	479	0.9%	99.2%	-	-	-	47.7%	23.6%	27.6%	48.7%	5.9%	5.7%	-	-	58.5%
Genesee County HD	3,386	6.5%	53.5%	43.0%	3.0%	0.5%	30.7%	23.1%	29.0%	47.9%	9.4%	7.4%	11.7%	10.3%	36.2%*
Grand Traverse County HD	473	0.9%	90.3%	1.3%	5.5%	3.0%	48.2%	18.9%	32.6%	48.4%	5.6%	5.9%	-	-	73.5%
Health Delivery, Inc.	535	1.0%	12.1%	53.3%	34.2%	-	50.8%	29.3%	32.8%	38.0%	10.9%	-	17.8%	-	39.8%*
Huron County HD	235	0.4%	95.3%	-	4.3%	-	48.3%	23.6%	35.0%	41.4%	4.3%	4.0%	-	-	37.6%
Ingham County HD	1,878	3.6%	58.3%	25.6%	11.9%	4.2%	20.2%	33.5%	25.9%	40.5%	10.0%	8.8%	14.7%	7.5%	62.3%*
Inter Care Comm Health Network (Sparta--Pullman)	3,196	6.1%	63.9%	3.5%	30.7%	1.9%	39.1%	39.2%	26.4%	34.4%	7.3%	7.4%	14.5%	5.8%	59.1%*
Ionia County HD	429	0.8%	95.6%	-	3.5%	-	40.4%	22.3%	28.0%	49.7%	6.8%	7.1%	-	-	46.9%
Jackson County HD	1,117	2.1%	80.5%	13.8%	5.1%	0.6%	40.4%	21.4%	31.8%	46.8%	8.5%	7.1%	15.4%	14.0%	52.3%
Kalamazoo County HD	893	1.7%	81.1%	14.8%	2.9%	1.2%	42.8%	53.2%	17.6%	29.2%	7.5%	6.9%	12.2%	-	43.3%*
Kalamazoo Family Health Center	561	1.1%	38.5%	46.5%	13.9%	1.1%	44.1%	43.4%	23.4%	33.2%	7.8%	7.4%	9.8%	-	51.8%*
Kent County HD	4,607	8.8%	48.4%	21.3%	27.2%	3.0%	37.2%	31.2%	27.5%	41.4%	7.9%	7.9%	11.0%	6.0%	58.3%
Keweenaw Bay WIC Program	48	0.1%	25.0%	-	-	75.0%	45.8%	15.4%	28.2%	56.4%	-	-	-	-	60.5%*
Lapeer County HD	507	1.0%	98.8%	-	-	-	42.7%	14.6%	28.0%	57.3%	4.7%	4.6%	-	-	53.6%
Livingston County HD	328	0.6%	97.0%	-	-	-	27.3%	19.2%	25.6%	55.2%	6.3%	6.0%	-	-	64.3%
Luce-Mackinac-Alger-Schoolcraft DHD	267	0.5%	90.3%	-	-	9.0%	57.5%	34.0%	27.8%	38.3%	6.2%	6.3%	-	-	51.3%
Macomb County HD	1,830	3.5%	80.2%	12.1%	4.6%	3.1%	28.1%	31.1%	26.9%	42.0%	6.8%	6.4%	8.6%	-	94.8%*
Marquette County HD	325	0.6%	97.8%	-	1.7%	-	46.7%	21.9%	32.7%	45.4%	7.6%	7.3%	-	-	58.2%*
Mid Michigan Action Agency	411	0.8%	97.8%	-	1.7%	-	43.8%	27.4%	33.2%	39.4%	7.8%	7.7%	-	-	74.6%*
Mid-Michigan DHD	861	1.6%	96.4%	0.7%	2.8%	-	37.8%	37.7%	24.0%	38.4%	7.1%	7.2%	-	-	51.8%
Monroe County HD	763	1.5%	92.9%	4.2%	2.4%	-	36.1%	20.0%	31.8%	48.2%	8.2%	7.5%	-	-	47.0%
Muskegon County HD	1,535	2.9%	65.1%	27.4%	6.4%	1.1%	38.7%	23.0%	29.0%	48.0%	8.7%	6.1%	14.4%	9.6%	39.4%
Northwest MI Comm Health Agency	732	1.4%	96.6%	0.8%	-	2.3%	47.0%	31.9%	27.0%	41.1%	6.8%	6.4%	-	-	69.5%*
Oakland County HD	3,087	5.9%	59.9%	27.3%	10.3%	2.5%	20.3%	41.0%	22.9%	36.1%	8.4%	6.6%	13.6%	4.5%	51.4%*
Pub Hlth Delta & Menominee Counties	404	0.8%	99.5%	-	-	-	43.8%	54.9%	15.6%	29.5%	7.7%	7.7%	-	-	70.0%*
Saginaw County Dept PH	1,321	2.5%	60.0%	31.7%	8.2%	-	41.4%	19.4%	31.7%	48.9%	9.3%	7.5%	12.8%	8.4%	39.0%
Sanilac County HD	284	0.5%	97.9%	-	1.8%	-	43.3%	30.3%	28.7%	41.0%	8.7%	8.9%	-	-	51.7%
Shiawassee County HD	477	0.9%	97.1%	-	1.9%	-	44.6%	18.9%	32.1%	48.9%	8.8%	8.6%	-	-	51.4%
St. Clair County HD	923	1.8%	92.2%	4.7%	2.1%	1.1%	44.7%	23.6%	28.8%	47.6%	7.2%	6.6%	22.2%	-	49.0%*
Tuscola County HD	403	0.8%	99.0%	-	-	-	35.9%	25.1%	29.7%	45.2%	6.7%	6.8%	-	-	51.6%
Washtenaw County HD	1,418	2.7%	49.6%	37.6%	6.3%	6.4%	32.1%	26.9%	30.5%	42.6%	6.9%	5.8%	9.4%	-	56.3%*
Wayne County HD	3,906	7.5%	78.1%	20.2%	1.3%	0.4%	24.8%	39.2%	25.0%	35.8%	8.3%	7.5%	11.2%	-	52.3%*
Western Upper Penn DHD	358	0.7%	97.5%	-	-	1.7%	48.5%	57.9%	18.8%	23.4%	5.0%	5.1%	-	-	63.2%*

- Small sample size prohibits analysis (fewer than 5 observations)
 * Agency had more than 20% of their ever breastfed data missing

2001 PNSS Local Agency Table

	N		Race				1st Trimester WIC Entry	Weight Gain			Low Birth weights**				Breastfeeding Initiation
	N	%	White	Black	Hispanic	Other		< Ideal	Ideal	> Ideal	Total	White	Black	Hispanic	
Michigan	53,967	100.0%	59.0%	29.3%	10.0%	1.7%	30.8%	33.3%	26.2%	40.4%	8.3%	7.0%	12.3%	5.9%	49.5%
Berry-Eaton DHD	732	1.4%	98.9%	1.0%	-	-	37.5%	35.6%	24.3%	40.0%	5.6%	5.4%	-	-	55.2%*
Bay County HD	810	1.5%	94.0%	2.5%	3.3%	-	49.1%	31.0%	26.2%	42.8%	7.7%	8.0%	-	-	50.3%*
Benzie-Leelanau DHD	178	0.3%	75.3%	-	15.7%	9.0%	51.5%	28.6%	26.3%	45.1%	8.5%	9.6%	-	-	69.2%
Berrien County HD	1,123	2.1%	51.7%	46.2%	1.0%	1.1%	28.9%	23.8%	29.3%	46.9%	7.4%	6.8%	8.4%	-	43.4%
Branch-Hillsdale-St. Joseph DHD	1,169	2.2%	89.2%	1.7%	9.0%	-	32.6%	28.2%	26.1%	45.7%	7.7%	8.3%	-	-	45.6%
Calhoun County HD	1,153	2.1%	72.8%	18.6%	8.2%	-	43.3%	24.0%	28.9%	47.1%	6.5%	5.4%	11.7%	-	41.9%*
Central MI District HD	1,142	2.1%	97.4%	1.2%	0.8%	0.6%	38.5%	31.3%	26.6%	42.1%	6.8%	6.7%	-	-	57.3%*
Chippewa County HD	281	0.5%	68.3%	-	2.1%	29.2%	48.7%	21.8%	27.6%	50.6%	4.5%	4.8%	-	-	59.5%*
Community Action Agency	606	1.1%	82.0%	1.8%	16.2%	-	28.5%	37.3%	26.3%	36.5%	5.5%	5.7%	-	-	47.8%
Detroit City HD	11,008	20.4%	6.9%	79.0%	12.8%	1.3%	15.3%	35.6%	24.7%	39.7%	11.4%	8.8%	12.4%	6.1%	36.2%*
Detroit Urban League	1,305	2.4%	8.4%	80.2%	11.0%	0.5%	22.5%	43.6%	22.1%	34.3%	11.0%	6.2%	12.3%	4.8%	24.7%*
Dickinson-Iron DHD	261	0.5%	99.6%	-	-	-	43.7%	21.9%	30.7%	47.4%	4.6%	4.6%	-	-	57.3%*
District Health Dept #10	2,103	3.9%	86.3%	1.9%	11.0%	0.8%	42.8%	32.9%	24.2%	42.9%	6.1%	6.0%	-	-	59.7%*
District Health Dept #2	454	0.8%	99.1%	-	-	-	43.7%	24.0%	27.8%	48.2%	9.0%	9.1%	-	-	49.6%
District Health Dept #4	558	1.0%	98.9%	-	-	-	46.4%	24.8%	29.9%	45.3%	6.7%	6.6%	-	-	55.2%
Genesee County HD	3,489	6.5%	51.4%	42.7%	5.1%	0.9%	25.7%	25.1%	29.6%	45.3%	10.4%	7.5%	13.9%	8.0%	35.4%*
Grand Traverse County HD	492	0.9%	91.5%	1.8%	4.3%	2.4%	48.4%	21.5%	30.7%	47.8%	9.6%	9.0%	-	-	75.1%
Health Delivery, Inc.	557	1.0%	11.7%	57.6%	30.3%	-	49.0%	32.0%	32.2%	35.8%	12.6%	10.3%	15.6%	7.5%	35.9%*
Huron County HD	220	0.4%	95.0%	-	4.1%	-	49.5%	24.2%	29.1%	46.7%	6.5%	6.3%	-	-	46.0%
Ingham County HD	1,872	3.5%	58.9%	25.0%	12.1%	4.0%	17.4%	29.6%	26.3%	44.1%	9.1%	8.2%	11.7%	7.1%	62.8%*
InterCare Comm Health Network (Spartan-Pullman)	3,327	6.2%	61.3%	3.7%	32.7%	2.3%	36.8%	35.0%	27.6%	37.4%	7.2%	6.8%	15.2%	6.4%	58.5%*
Ionia County HD	393	0.7%	92.9%	-	5.9%	-	35.5%	21.5%	31.1%	47.4%	8.6%	8.7%	-	-	40.7%
Jackson County HD	1,171	2.2%	80.0%	13.9%	5.6%	0.4%	36.7%	23.8%	30.0%	46.2%	9.2%	7.8%	17.4%	8.1%	52.4%
Kalamazoo County HD	1,052	1.9%	83.6%	12.9%	2.6%	1.0%	36.6%	67.3%	12.2%	20.5%	7.6%	7.0%	12.0%	-	43.3%*
Kalamazoo Family Health Center	507	0.9%	33.5%	51.3%	14.4%	-	40.8%	34.6%	23.4%	42.0%	8.6%	6.1%	12.2%	-	53.5%*
Kent County HD	4,581	8.5%	47.6%	22.1%	26.8%	3.4%	32.8%	36.1%	26.2%	37.7%	7.1%	6.3%	11.7%	4.2%	55.6%
Keweenaw Bay WIC Program	50	0.1%	32.0%	-	68.0%	-	36.7%	17.8%	33.3%	48.9%	-	-	-	-	45.2%
Lapeer County HD	505	0.9%	96.6%	-	2.4%	-	41.8%	19.9%	32.9%	47.2%	7.3%	7.3%	-	-	48.9%
Livingson County HD	344	0.6%	95.6%	-	2.3%	-	30.1%	16.5%	30.5%	52.9%	5.2%	5.5%	-	-	63.4%*
Luce-Mackinac-Alge-Schoolcraft DHD	237	0.4%	89.0%	-	9.3%	-	56.2%	43.6%	25.1%	31.3%	5.9%	6.1%	-	-	47.8%
Macomb County HD	2,049	3.8%	82.2%	11.4%	3.8%	2.7%	28.6%	29.1%	28.9%	42.0%	8.0%	7.3%	11.1%	10.4%	95.7%*
Marquette County HD	361	0.7%	96.7%	-	1.7%	-	45.3%	27.3%	31.3%	41.4%	4.4%	4.2%	-	-	65.2%*
Mid MI Comm Action Agency	431	0.8%	97.9%	1.9%	-	-	44.8%	36.3%	21.5%	42.2%	9.9%	9.5%	-	-	98.8%*
Mid-Michigan DHD	908	1.7%	95.9%	1.0%	2.4%	0.7%	34.4%	23.5%	22.5%	35.0%	8.3%	8.5%	-	-	48.5%
Monroe County HD	748	1.4%	93.9%	3.7%	2.4%	-	34.5%	23.5%	29.6%	47.0%	8.3%	8.5%	-	-	41.1%
Muskegon County HD	1,647	3.1%	64.8%	27.8%	6.5%	0.9%	39.6%	22.7%	29.2%	48.0%	9.6%	8.2%	13.3%	7.1%	38.8%
Northwest MI Comm Health Agency	692	1.3%	96.0%	1.0%	1.7%	1.3%	43.8%	28.3%	31.6%	40.1%	7.8%	7.9%	-	-	72.0%*
Oakland County HD	2,710	5.0%	58.0%	27.7%	12.7%	1.6%	22.9%	43.7%	22.3%	34.0%	8.4%	6.6%	13.2%	7.0%	62.2%*
Pub Hlth Delta & Nemominee Counties	455	0.8%	99.6%	-	-	-	46.1%	71.7%	12.1%	16.2%	6.0%	6.0%	-	-	78.7%*
Saginaw County Dept PH	1,444	2.7%	61.6%	30.6%	7.5%	0.3%	39.6%	22.4%	28.8%	48.7%	8.5%	6.5%	12.8%	8.0%	41.9%
Sanilac County HD	278	0.5%	98.6%	-	-	-	44.5%	27.9%	35.6%	36.5%	7.8%	7.5%	-	-	57.7%
Shiawassee County HD	534	1.0%	99.3%	-	-	-	42.0%	22.0%	30.6%	47.5%	6.2%	6.0%	-	-	52.0%
St. Clair County HD	980	1.8%	91.0%	4.5%	1.8%	0.7%	40.1%	22.9%	29.2%	48.0%	8.9%	9.3%	-	-	59.6%*
Tuscola County HD	399	0.7%	99.2%	-	-	-	39.8%	23.1%	28.4%	48.4%	5.5%	5.5%	-	-	54.9%
Washtenaw County HD	1,354	2.5%	49.9%	37.9%	5.5%	6.7%	31.0%	36.1%	24.2%	39.7%	8.6%	6.6%	12.1%	-	56.6%*
Wayne County HD	4,006	7.4%	78.2%	20.5%	0.9%	0.4%	25.7%	48.7%	22.9%	28.3%	6.8%	6.2%	8.7%	-	55.2%*
Western Upper Penin DHD	422	0.8%	96.9%	-	2.1%	-	50.9%	54.9%	21.1%	24.0%	5.2%	5.1%	-	-	57.8%*

- Small sample size prohibits analysis (fewer than 5 observations)
 * Agency had more than 20% of their ever breastfed data missing.

2000 PNSS Local Agency Table

	N	%	Race				1st Trimester WIC Entry	Weight Gain			Low Birth weight**			Breastfeeding Initiation	
			White	Black	Hispanic	Other		< Ideal	Ideal	> Ideal	Total	White	Black		Hispanic
Michigan	55,162	100.0%	59.1%	29.8%	9.5%	1.6%	31.0%	34.0%	26.9%	39.1%	8.0%	6.5%	11.5%	6.3%	46.9%
Barry-Eaton DHD	725	1.3%	97.8%	0.8%	1.2%	-	41.8%	30.7%	28.3%	41.0%	5.9%	5.6%	-	-	52.4%*
Bay County HD	692	1.3%	95.7%	1.3%	3.0%	-	49.1%	17.6%	30.6%	51.8%	8.9%	8.8%	-	-	46.6%
Benzie-Leclaire DHD	212	0.4%	67.9%	-	25.0%	6.6%	41.8%	32.9%	25.5%	41.6%	9.1%	8.3%	-	-	73.5%
Berrien County HD	1,166	2.1%	53.2%	44.3%	2.0%	0.6%	30.5%	25.9%	29.4%	44.7%	7.8%	6.0%	10.2%	-	41.3%*
Branch-Hillsdale-St. Joseph DHD	1,280	2.3%	88.4%	2.9%	8.6%	-	36.5%	28.6%	27.2%	44.2%	7.0%	6.9%	16.1%	-	48.0%
Calhoun County HD	1,186	2.2%	71.7%	22.2%	5.6%	0.6%	40.4%	26.9%	27.3%	45.8%	5.3%	5.1%	6.9%	-	40.4%*
Central MI District HD	1,127	2.0%	96.9%	0.9%	1.5%	0.7%	38.9%	39.3%	25.7%	35.0%	5.9%	5.7%	-	-	54.4%*
Chippewa County HD	313	0.6%	70.9%	-	-	28.1%	46.1%	24.3%	28.8%	46.8%	4.9%	5.0%	-	-	62.8%
Community Action Agency	532	1.0%	76.3%	3.2%	20.1%	-	25.5%	25.6%	35.4%	39.1%	7.5%	8.3%	-	-	48.6%
Detroit City HD	10,869	19.7%	6.6%	81.1%	11.4%	0.9%	14.6%	40.0%	23.9%	36.1%	10.9%	6.0%	12.0%	-	36.0%*
Detroit Urban League	1,351	2.4%	9.1%	81.3%	9.3%	-	22.9%	44.4%	22.4%	33.2%	10.6%	7.7%	11.0%	-	24.5%*
Dickinson-Iron DHD	255	0.5%	99.6%	-	-	-	43.3%	18.6%	34.3%	47.1%	5.4%	5.5%	-	-	51.5%
District Health Dept #10	2,092	3.8%	85.4%	2.3%	11.5%	0.8%	42.1%	32.5%	27.6%	40.0%	6.8%	6.9%	-	-	57.6%*
District Health Dept. #2	489	0.9%	99.2%	-	-	-	47.6%	25.1%	31.0%	43.8%	6.6%	6.6%	-	-	51.4%*
District Health Dept. #4	533	1.0%	98.9%	-	-	-	45.3%	22.0%	29.5%	48.5%	4.5%	4.5%	-	-	53.4%
Genesee County HD	3,450	6.3%	50.1%	44.3%	5.1%	0.6%	30.1%	24.8%	28.8%	46.5%	8.5%	5.7%	11.6%	-	33.2%*
Grand Traverse County HD	509	0.9%	92.7%	1.2%	3.9%	2.2%	41.1%	25.1%	31.1%	43.8%	9.3%	9.1%	12.1%	-	7.1%
Health Delivery, Inc.	571	1.0%	11.9%	48.2%	39.8%	-	50.5%	31.9%	32.6%	35.4%	10.4%	10.6%	-	-	41.3%*
Huron County HD	268	0.5%	97.8%	-	2.2%	-	41.1%	22.5%	35.3%	42.2%	6.6%	6.6%	-	-	47.7%
Ingham County HD	1,937	3.5%	57.5%	26.2%	11.0%	5.3%	22.0%	38.8%	24.8%	36.4%	6.6%	6.6%	7.9%	-	70.0%*
InterCare Comm Health Network (Spartan-Pullman)	3,337	6.0%	63.7%	3.5%	30.6%	2.2%	34.6%	35.2%	27.8%	37.0%	6.2%	6.6%	5.7%	-	56.5%*
Ionia County HD	408	0.7%	95.3%	-	3.9%	-	32.3%	19.9%	30.8%	49.3%	6.6%	6.7%	-	-	36.6%
Jackson County HD	1,215	2.2%	85.8%	10.6%	3.1%	0.4%	37.4%	31.9%	35.9%	32.1%	7.0%	6.8%	8.3%	-	45.2%
Kalamazoo County HD	1,060	1.9%	82.1%	14.1%	3.0%	0.8%	39.6%	73.9%	10.6%	15.4%	4.0%	3.3%	6.8%	-	36.3%*
Kalamazoo Family Health Center	483	0.9%	33.7%	49.7%	15.3%	1.2%	41.5%	28.6%	29.6%	41.8%	7.8%	5.7%	9.9%	-	52.4%*
Kent County HD	4,674	8.5%	47.5%	24.0%	25.0%	3.5%	35.2%	38.6%	25.7%	35.7%	9.3%	8.6%	13.6%	-	53.5%*
Keweenaw Bay WIC Program	50	0.1%	28.0%	-	-	72.0%	52.1%	12.5%	27.5%	60.0%	-	-	-	-	41.9%
LaPeer County HD	436	0.8%	97.9%	-	1.4%	-	39.0%	19.8%	29.3%	50.9%	7.7%	7.8%	-	-	48.5%*
Livingston County HD	354	0.6%	97.2%	-	1.7%	-	30.4%	17.2%	32.3%	50.5%	7.0%	7.2%	-	-	58.3%
Luce-Mackinac-Alger-Schoolcraft DHD	263	0.5%	93.5%	-	2.3%	4.2%	62.0%	46.5%	20.5%	33.0%	3.8%	3.6%	-	-	50.9%
Macomb County HD	2,192	4.0%	85.9%	9.6%	2.1%	2.4%	29.0%	23.7%	29.7%	46.6%	7.1%	6.3%	14.0%	-	59.4%*
Marquette County HD	318	0.6%	97.8%	-	-	1.9%	45.7%	21.3%	33.3%	45.4%	5.2%	5.3%	-	-	58.7%*
MidMI Comm Action Agency	397	0.7%	98.7%	-	-	-	36.1%	23.1%	33.0%	43.9%	9.6%	9.4%	-	-	90.2%*
Mid-Michigan DHD	854	1.5%	96.7%	1.2%	2.0%	-	39.8%	31.7%	29.6%	38.7%	6.3%	6.4%	-	-	53.1%
Monroe County HD	717	1.3%	93.7%	4.5%	1.7%	-	38.4%	20.0%	33.3%	46.7%	8.0%	7.7%	-	-	43.3%*
Muskegon County HD	1,711	3.1%	66.6%	26.1%	6.1%	1.2%	40.4%	23.8%	29.9%	46.2%	7.4%	5.6%	10.9%	-	37.4%
Northwest MI Comm Health Agency	673	1.2%	95.8%	1.2%	0.9%	2.1%	43.6%	33.5%	27.7%	38.8%	5.4%	5.2%	-	-	66.4%*
Oakland County HD	3,426	6.2%	57.6%	28.0%	11.8%	2.6%	18.9%	28.5%	28.7%	42.8%	9.2%	8.5%	11.3%	-	43.5%
Pub Hlth Delta & Menominee Counties	438	0.8%	99.1%	-	-	-	43.7%	81.3%	7.5%	11.2%	6.0%	6.1%	-	-	65.5%*
Saginaw County Dept PH	1,449	2.6%	59.3%	31.0%	9.5%	-	43.2%	21.3%	33.7%	45.0%	8.2%	5.7%	13.8%	-	37.2%
Sanilac County HD	269	0.5%	99.3%	-	-	-	38.6%	36.7%	31.6%	31.0%	7.7%	7.7%	-	-	55.0%*
Shawasssee County HD	534	1.0%	99.6%	-	-	-	44.8%	21.2%	27.6%	51.2%	7.6%	7.6%	-	-	59.5%
St. Clair County HD	975	1.8%	94.5%	4.3%	1.0%	-	41.8%	19.8%	30.6%	49.7%	5.1%	5.3%	-	-	60.7%*
Tuscola County HD	384	0.7%	99.2%	-	-	-	38.8%	23.9%	34.9%	41.2%	6.1%	5.8%	-	-	50.3%
Washtenaw County HD	1,322	2.4%	51.5%	38.7%	3.9%	5.9%	29.8%	36.4%	26.1%	37.5%	7.2%	6.0%	9.0%	-	58.3%*
Wayne County HD	4,144	7.5%	75.6%	22.0%	2.0%	0.4%	25.4%	47.4%	21.7%	30.9%	7.2%	6.2%	10.7%	-	46.3%*
Western Upper Penin DHD	412	0.7%	96.1%	2.2%	1.7%	-	46.7%	46.6%	20.1%	33.3%	2.9%	3.0%	-	-	62.4%*

- Small sample size prohibits analysis (fewer than 5 observations)
 * Agency had more than 20% of their ever breastfed data missing.