

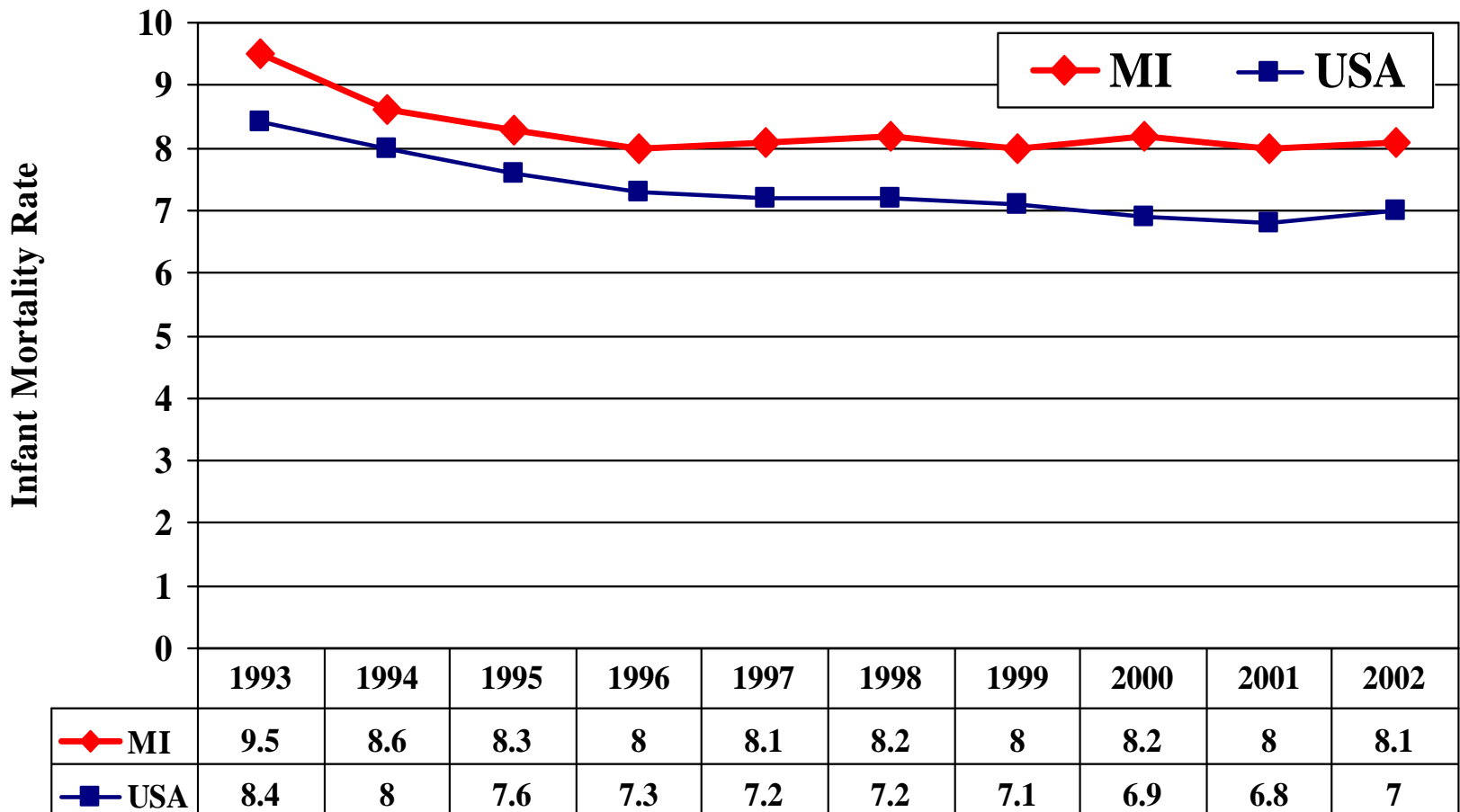
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# **Infant Mortality in Michigan**

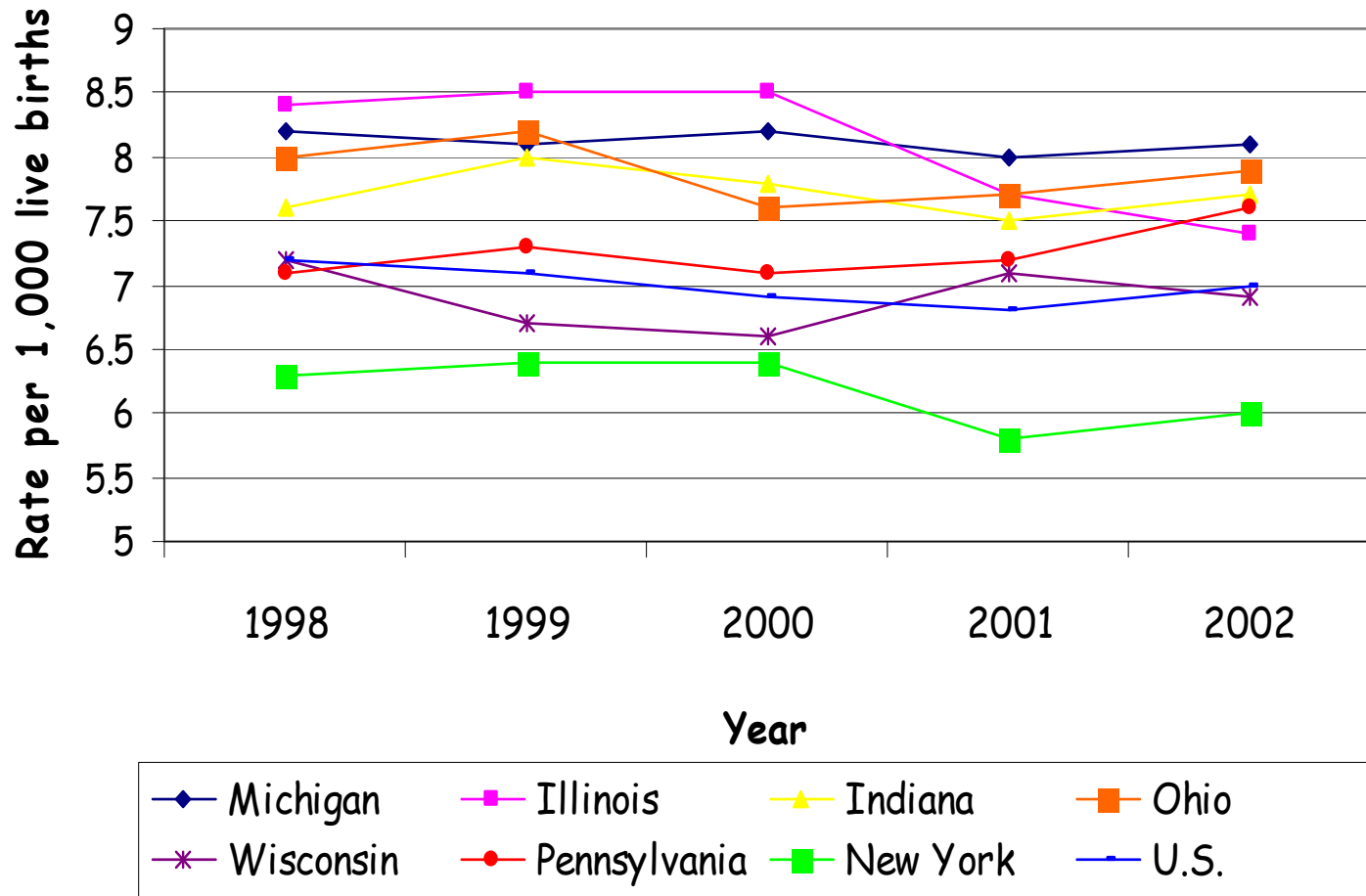
Violanda Grigorescu, MD, MSPH

November 29<sup>th</sup>, 2004

# Infant Mortality Rate Michigan compared to U.S.



# Infant Mortality Rate by State 1998-2002

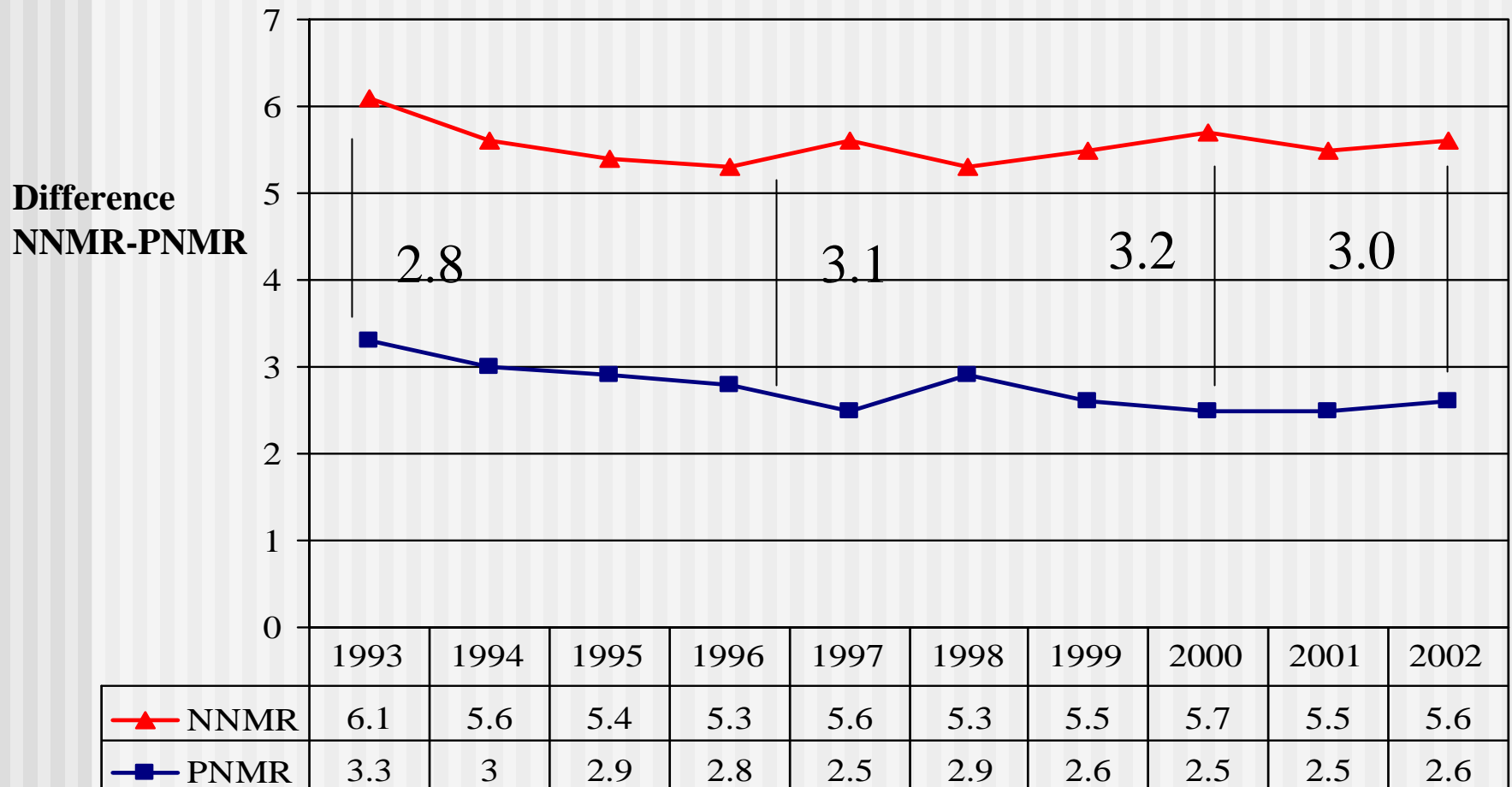


# Infant Mortality Components

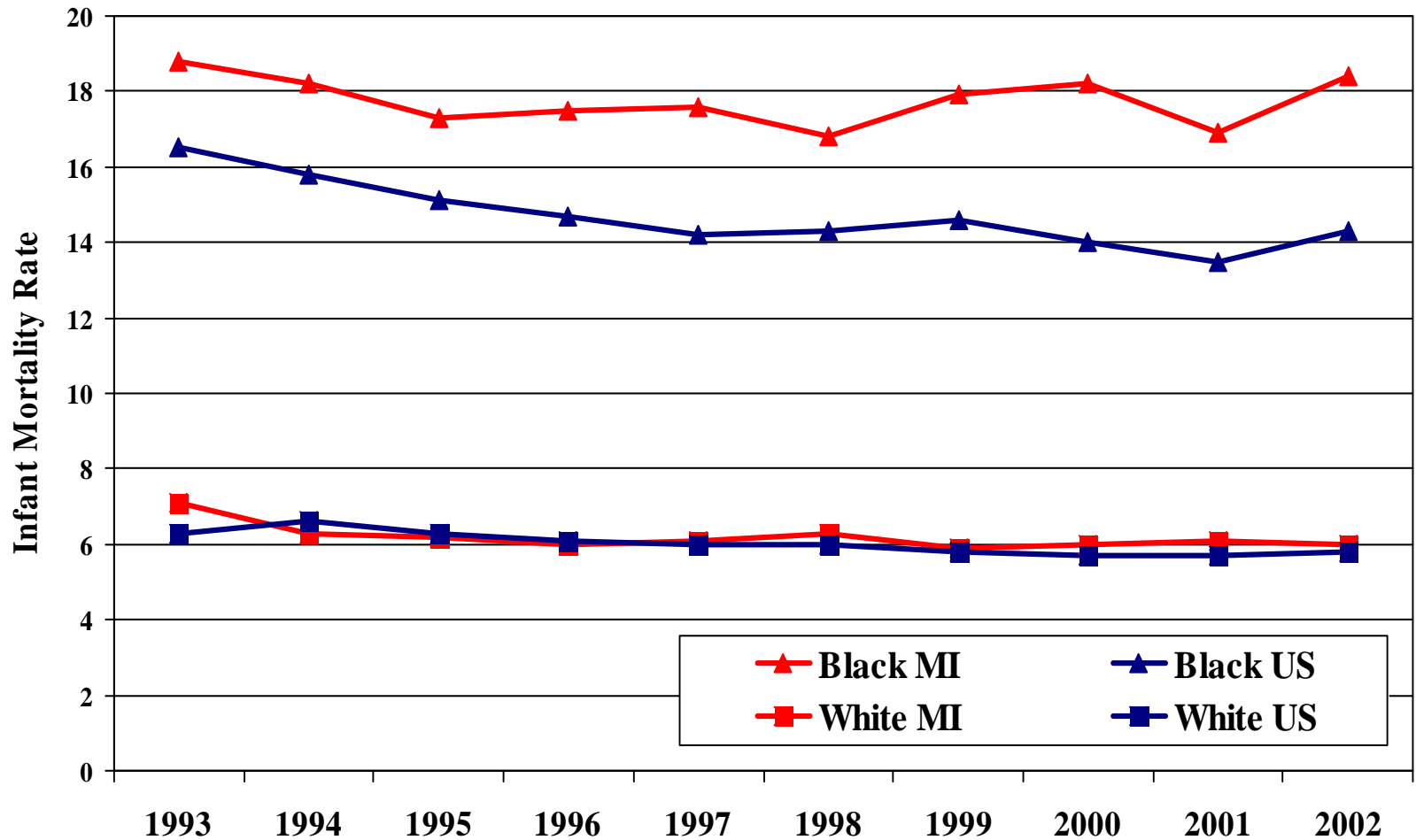
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- Neonatal Mortality (Neonatal Mortality Rate=NNMR): infant deaths within first month (<28 days) after birth / 1,000 live births
- Postneonatal Mortality (Postneonatal Mortality Rate = PNMR): infant deaths between one month and one year after birth / 1,000 live births

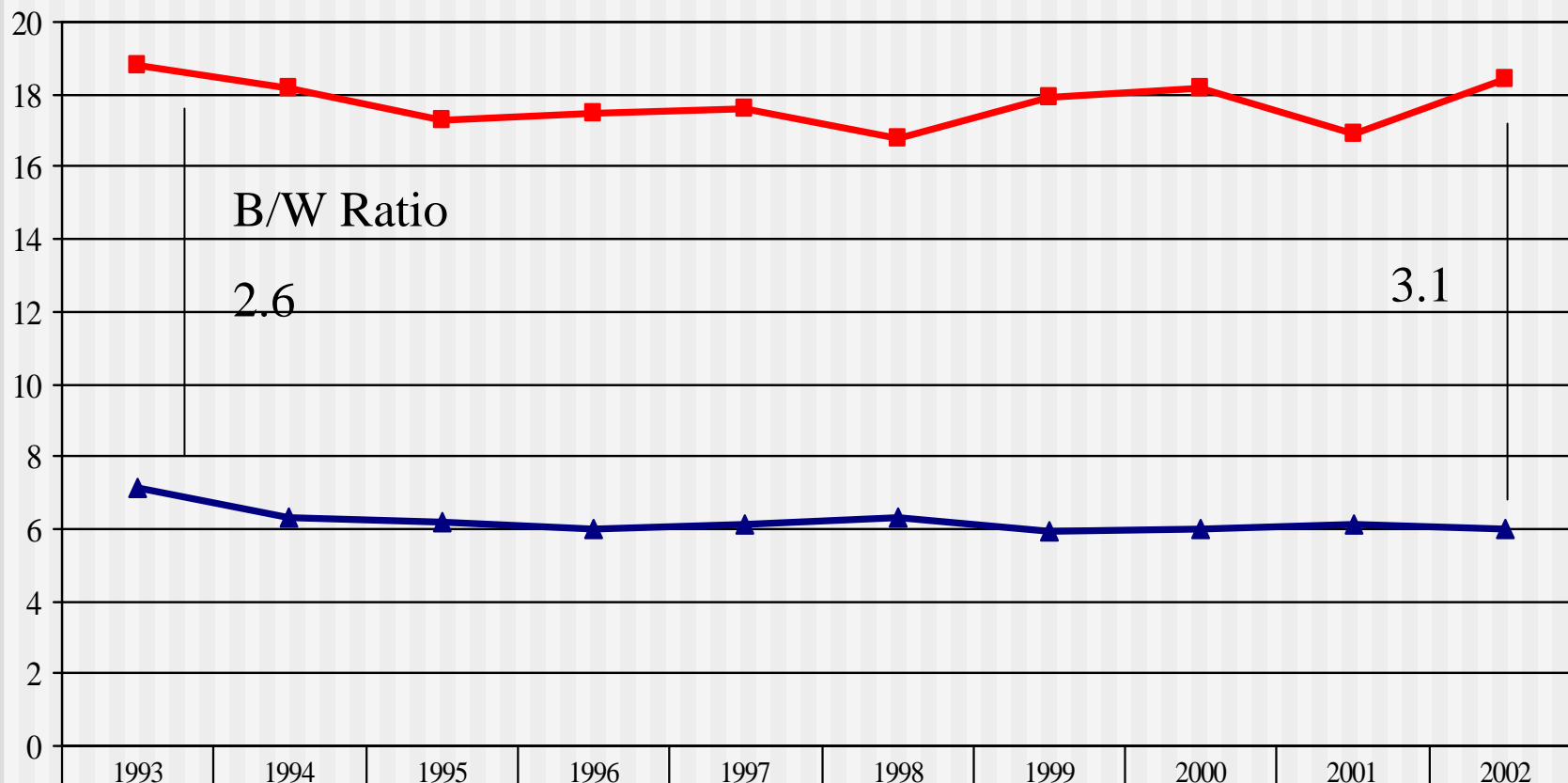
# Neonatal Mortality Rate (NNMR) and Postneonatal Mortality Rate (PNMR)



# Race specific Infant Mortality Rate Michigan compared to US

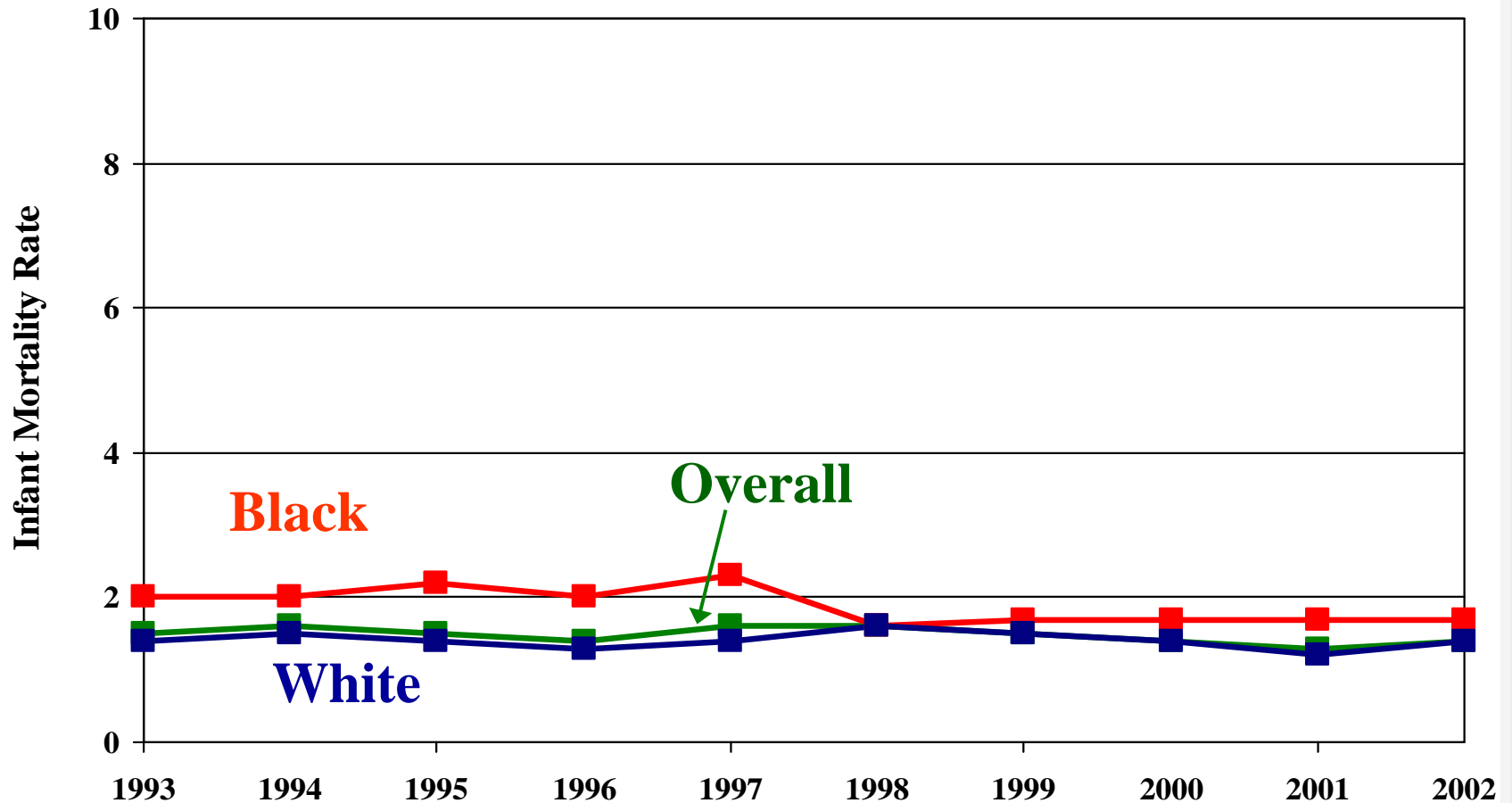


# Michigan IMR by race



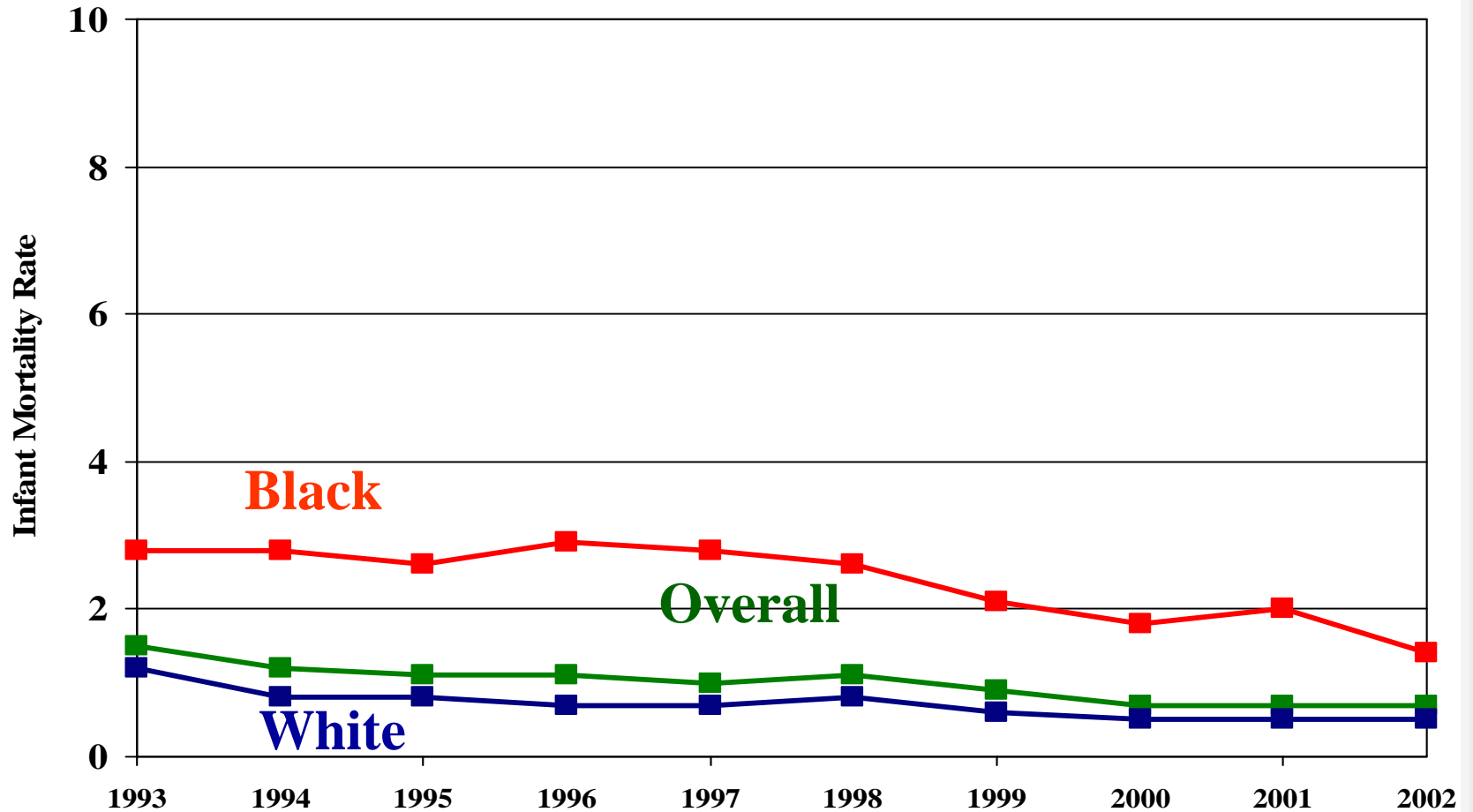
■ Black	18.8	18.2	17.3	17.5	17.6	16.8	17.9	18.2	16.9	18.4
▲ White	7.1	6.3	6.2	6	6.1	6.3	5.9	6	6.1	6

# Race specific Infant Mortality Rate due to Congenital Anomalies Michigan, 1993-2002

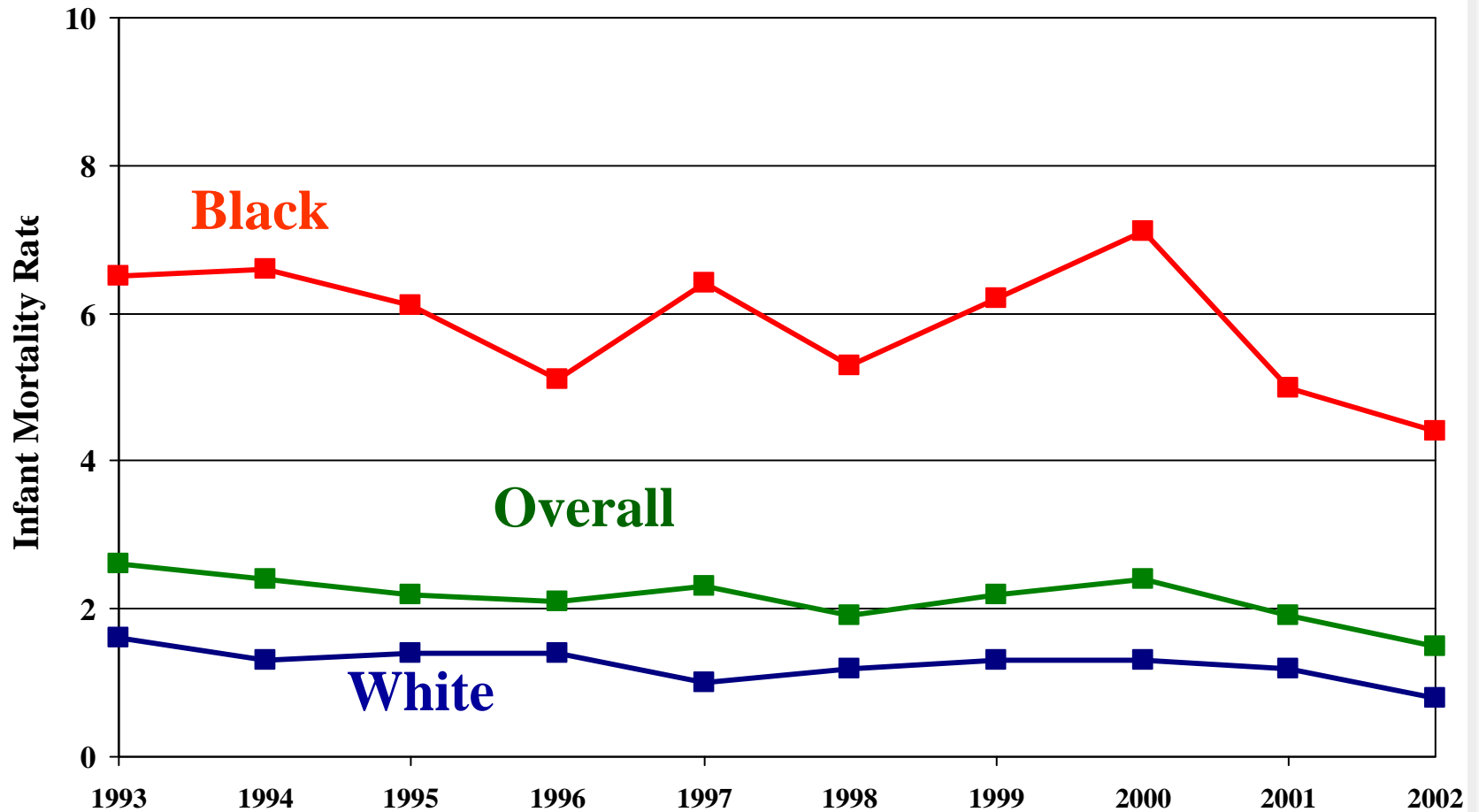




# Race specific Infant Mortality Rate due to SIDS Michigan, 1993-2002



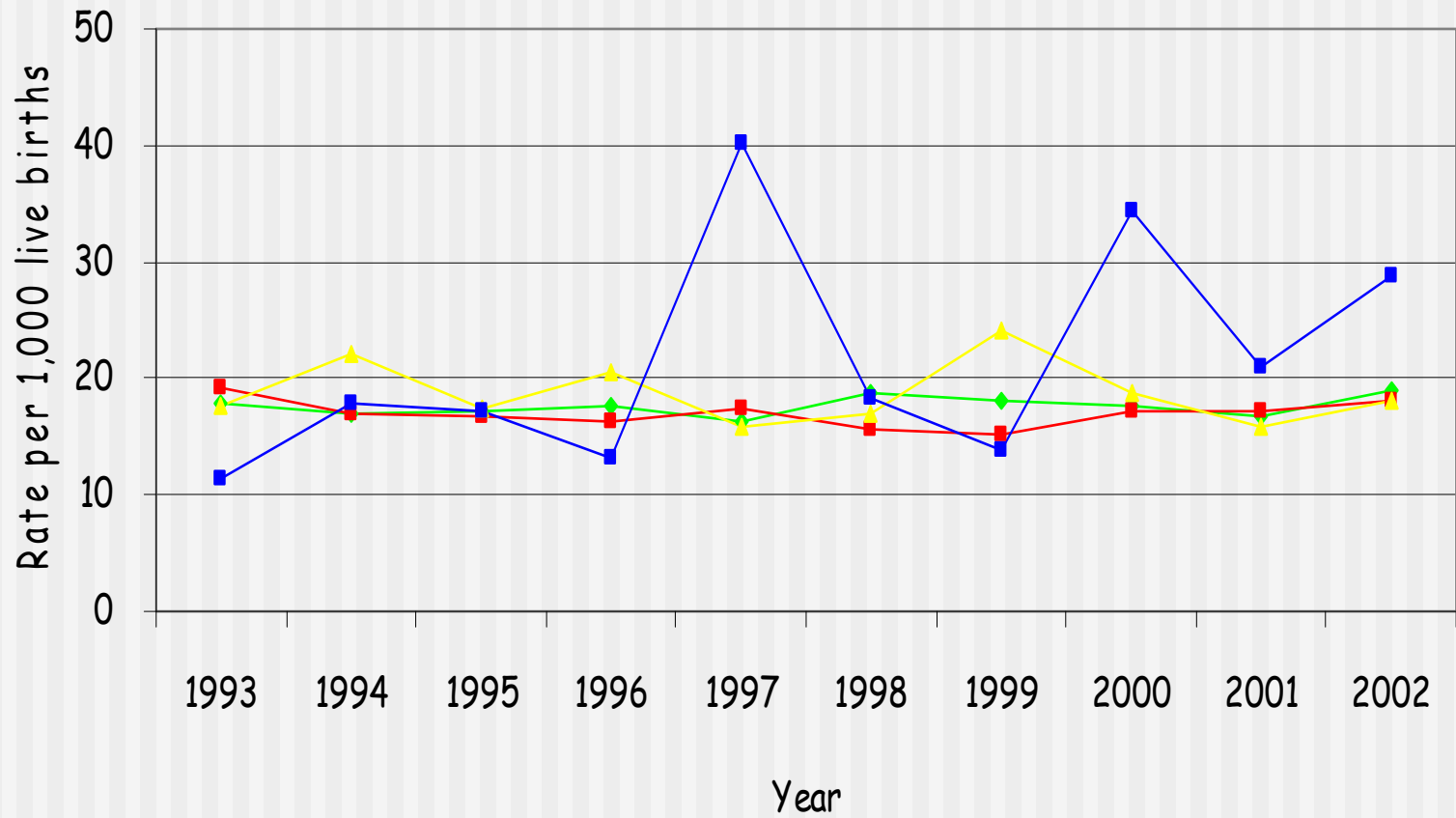
# Race specific Infant Mortality Rate due to LBW/Prematurity Michigan, 1993-2002



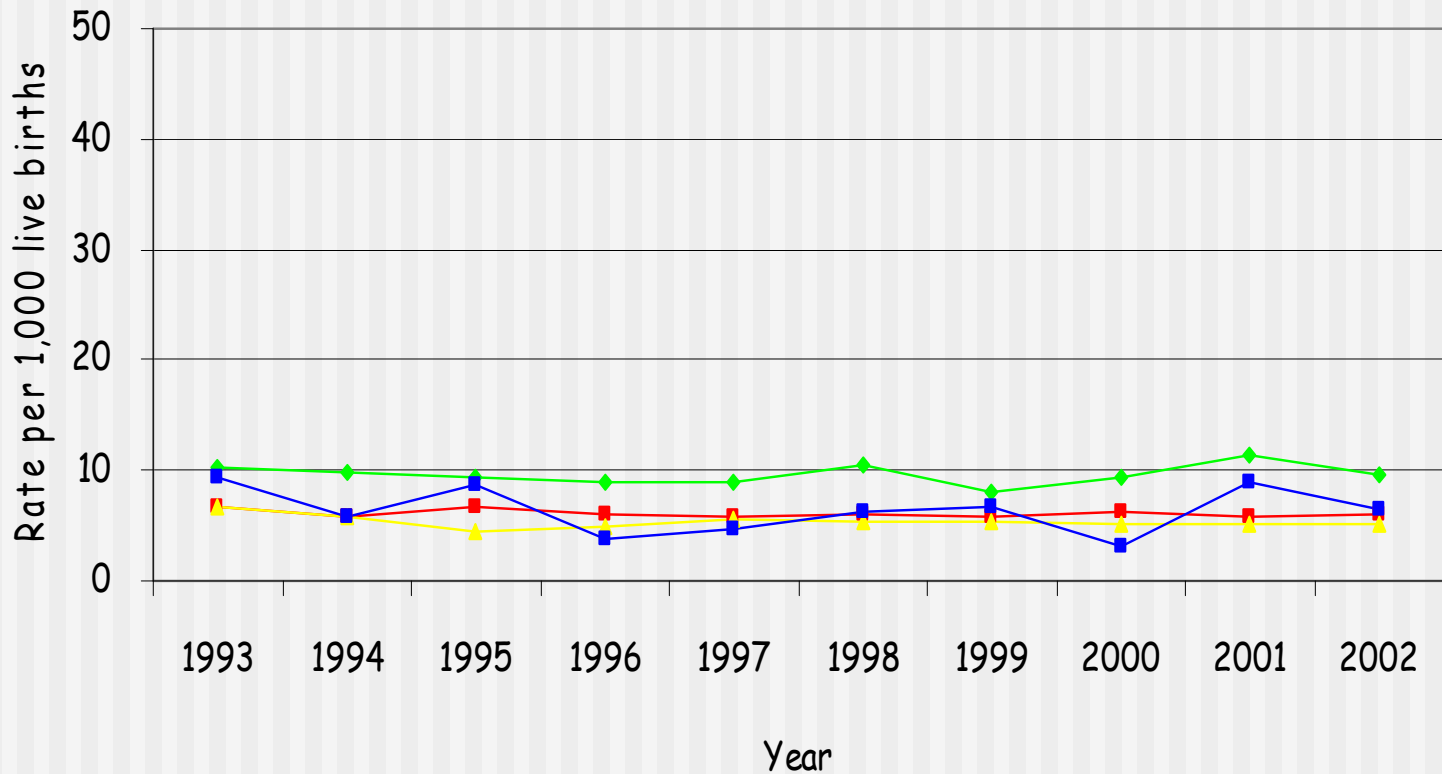
# **Infant Mortality Rate by maternal characteristics**

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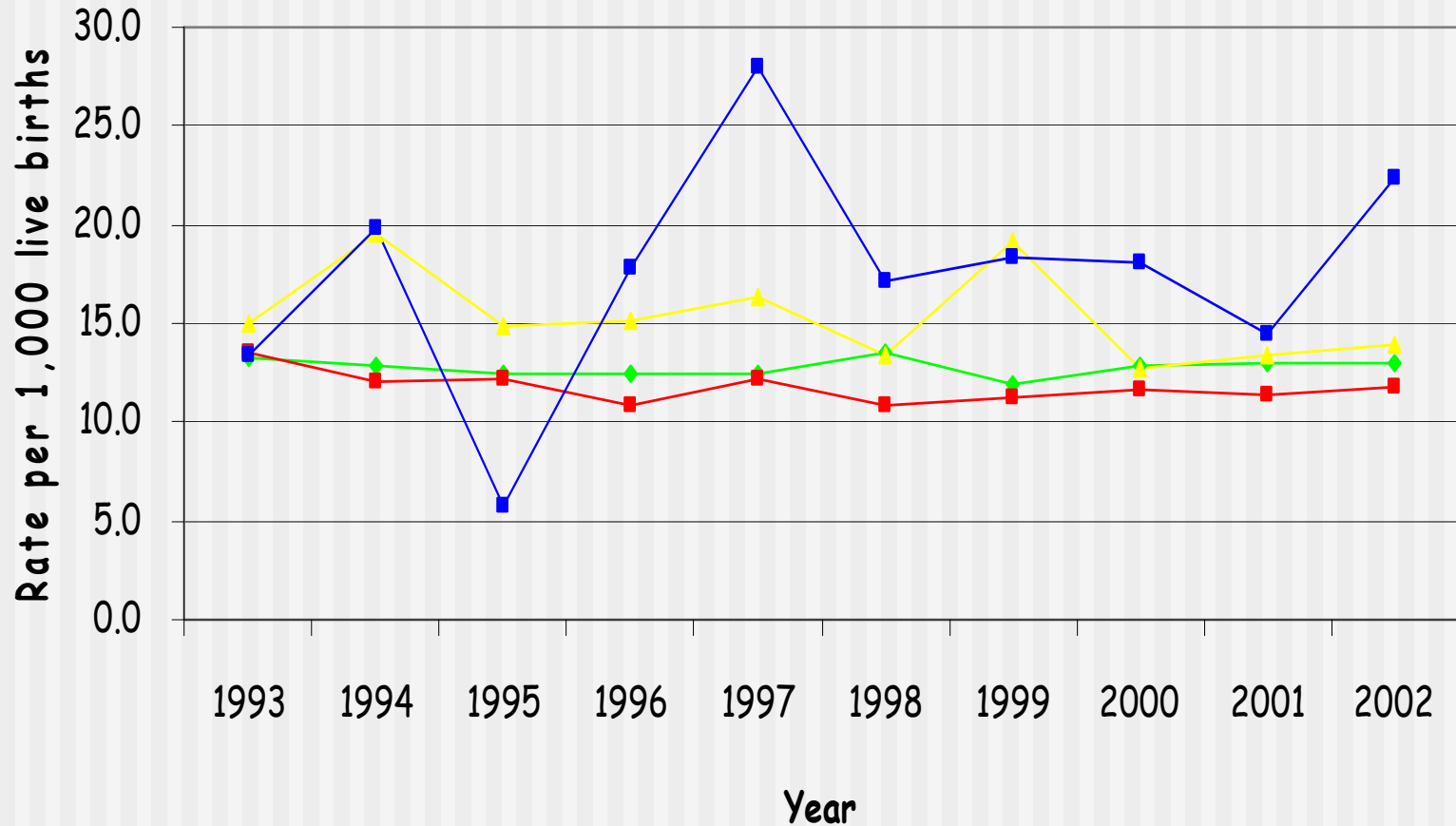
# Infant Death Rates to Black Infants by Age of Mother, 1993-2002



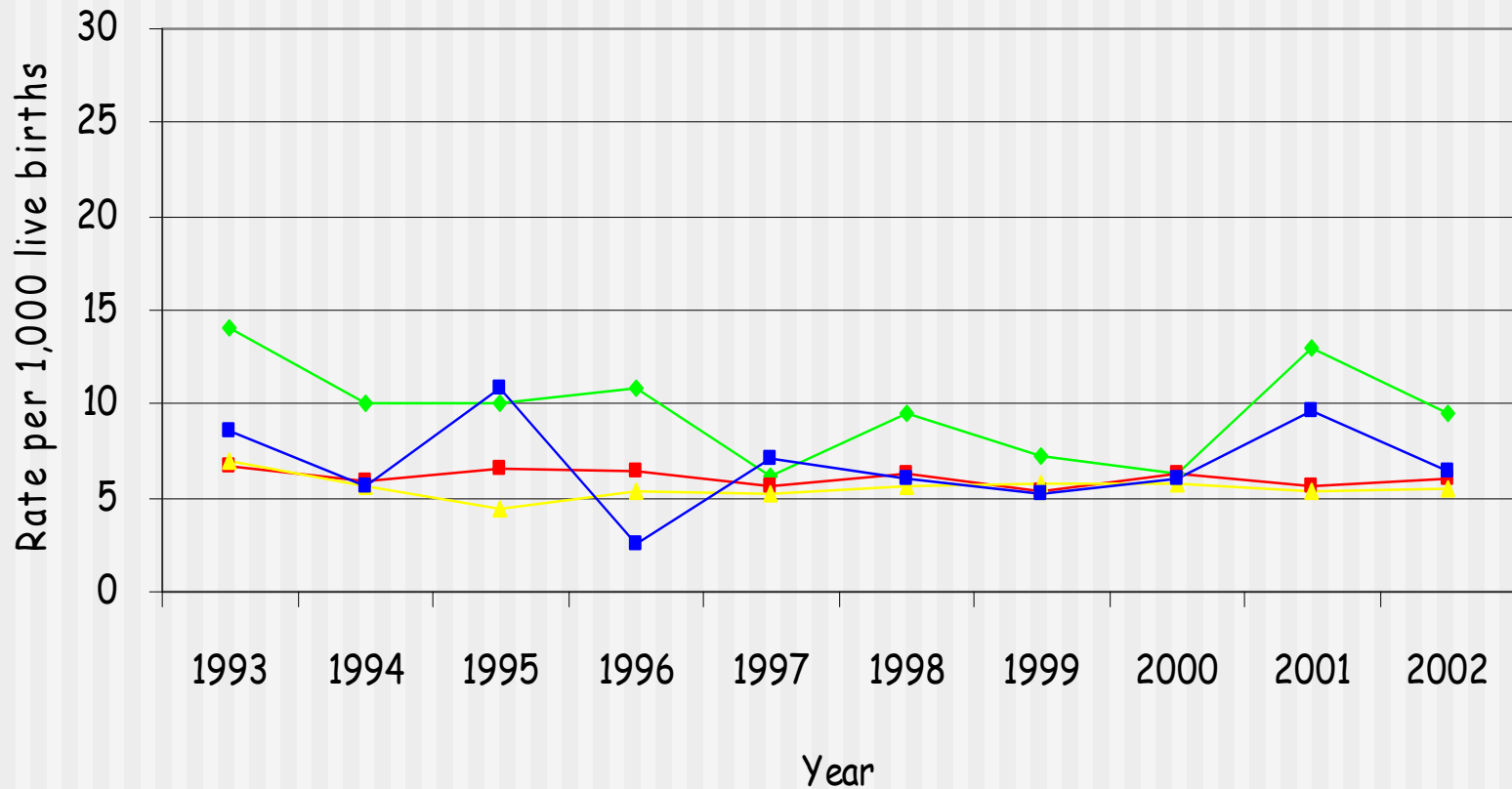
# Infant Death Rates for White Infants by Age of Mother, 1993-2002



# Infant Death Rates to Unmarried Mothers by Age of Mother, 1993-2002

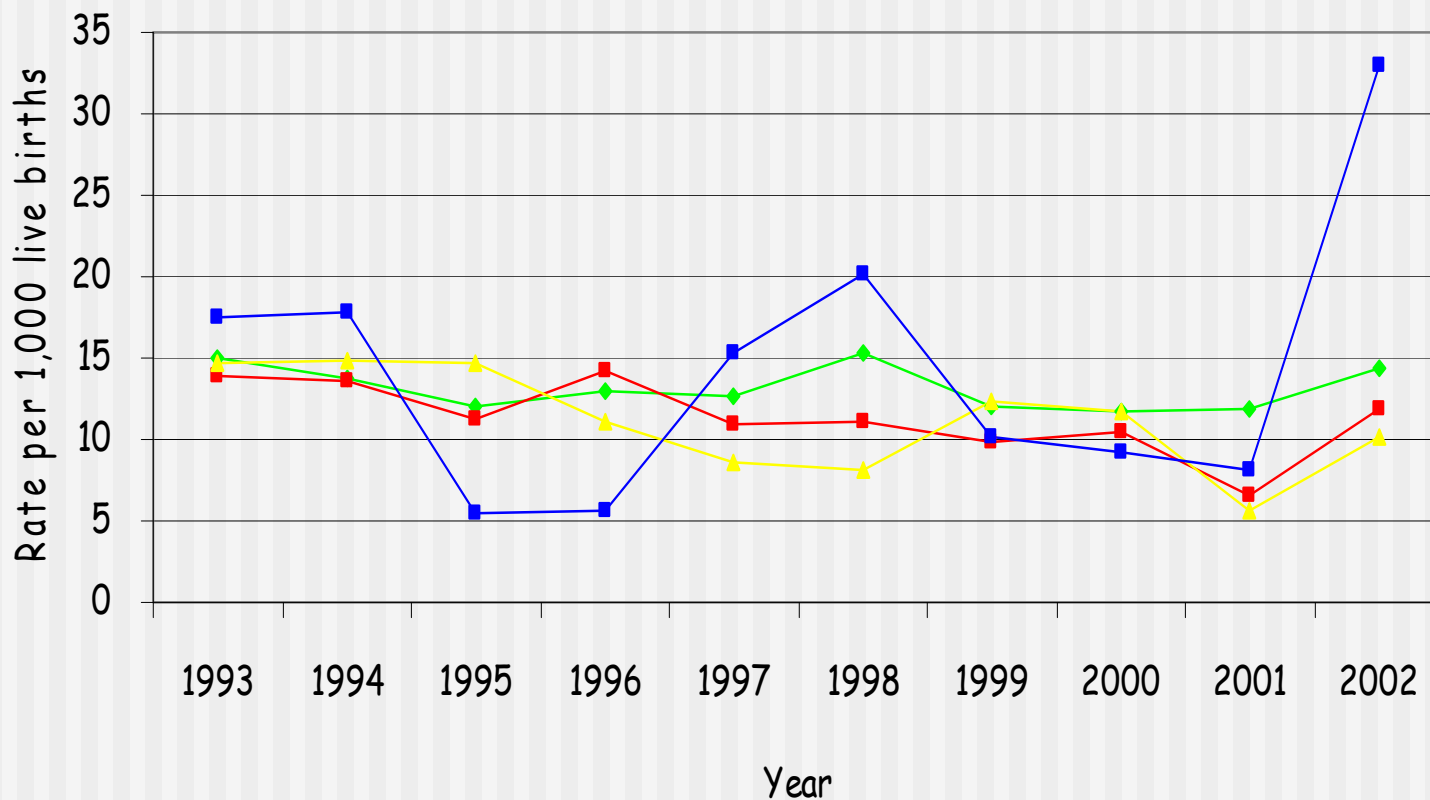


# Infant Death Rates to Married Mothers, 1993-2002



◆ <20 ■ 20-29 ▲ 30-39 ■ 40+

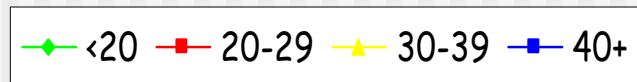
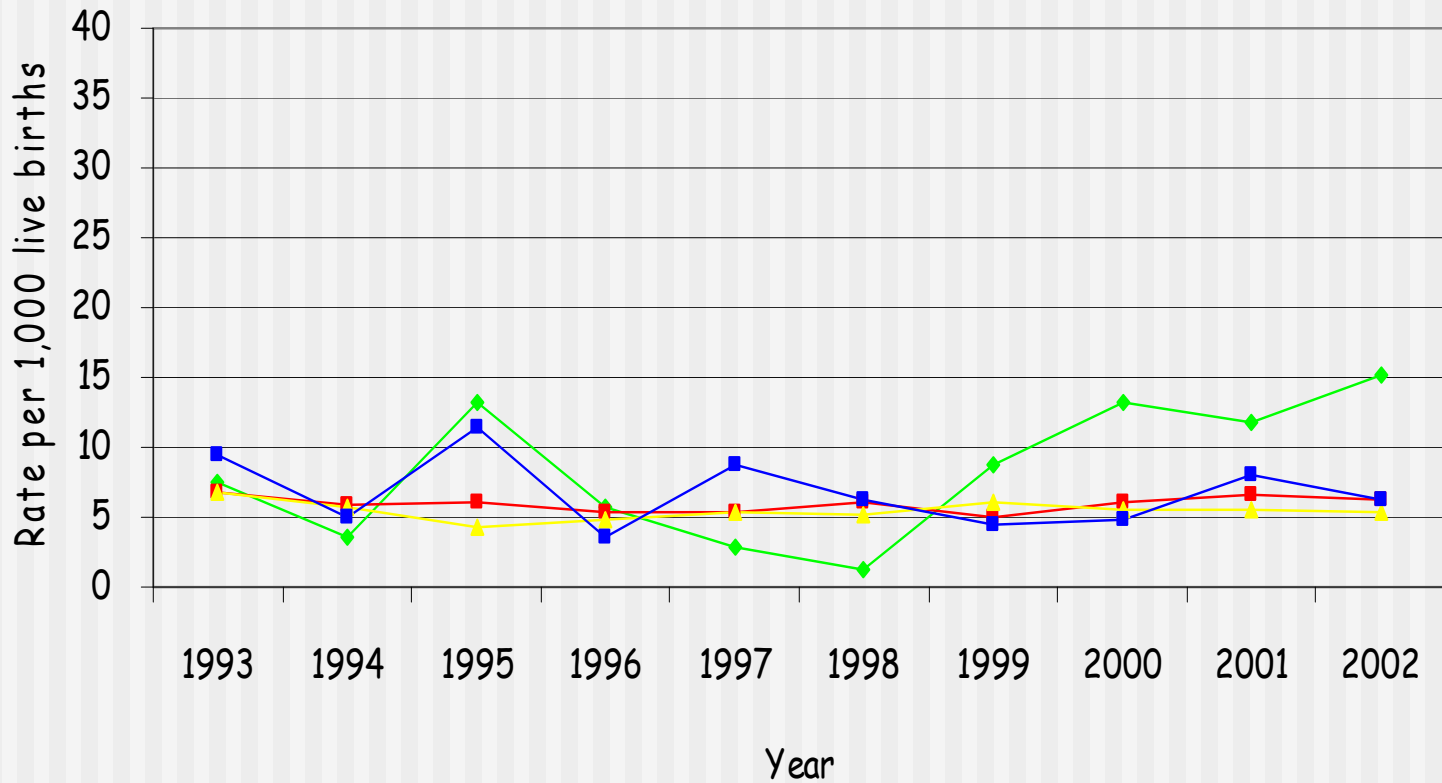
# Infant Death Rates to Mothers With Less Than a High School Education, 1993-2002



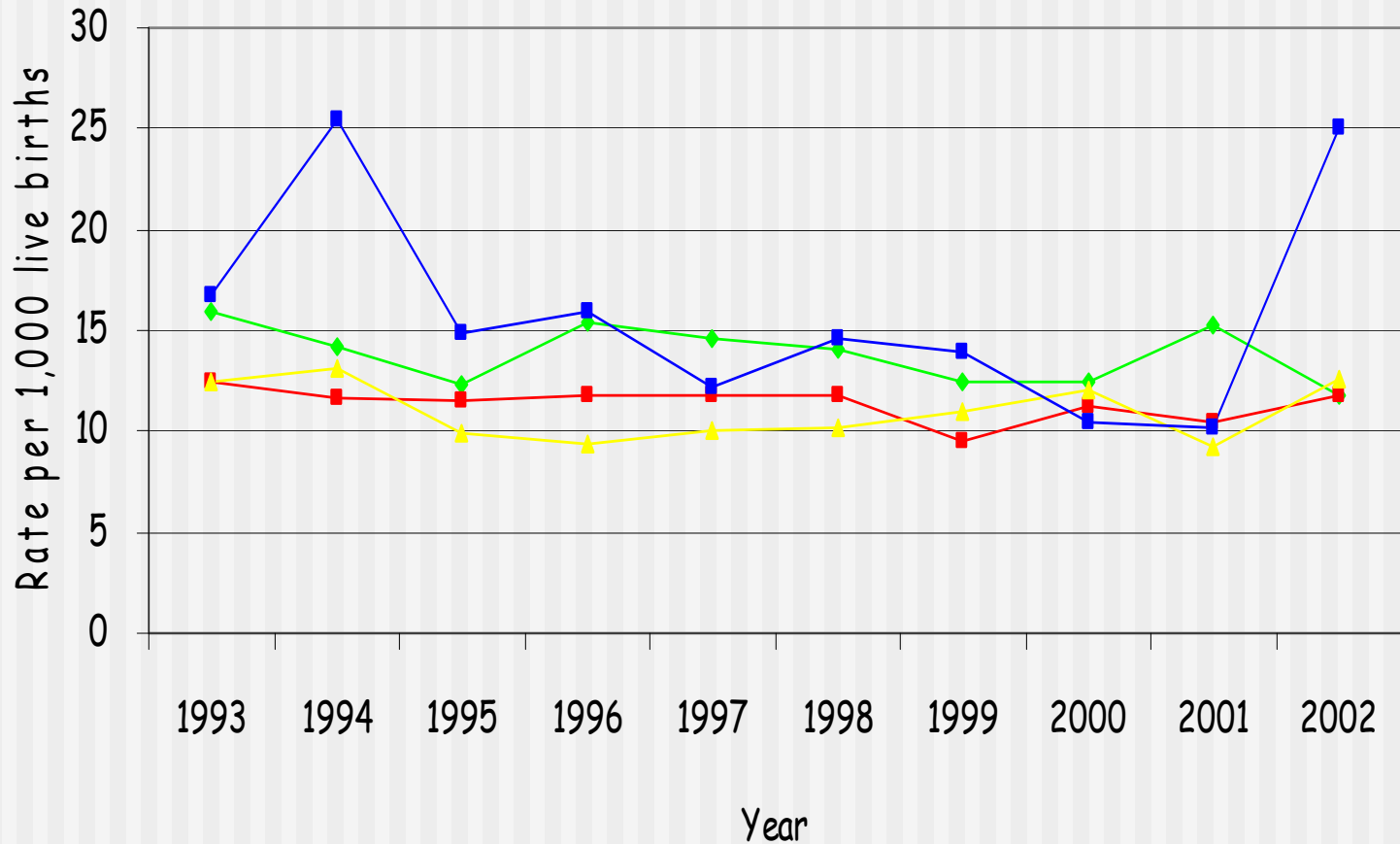
◆ <20   ■ 20-29   ▲ 30-39   ■ 40+



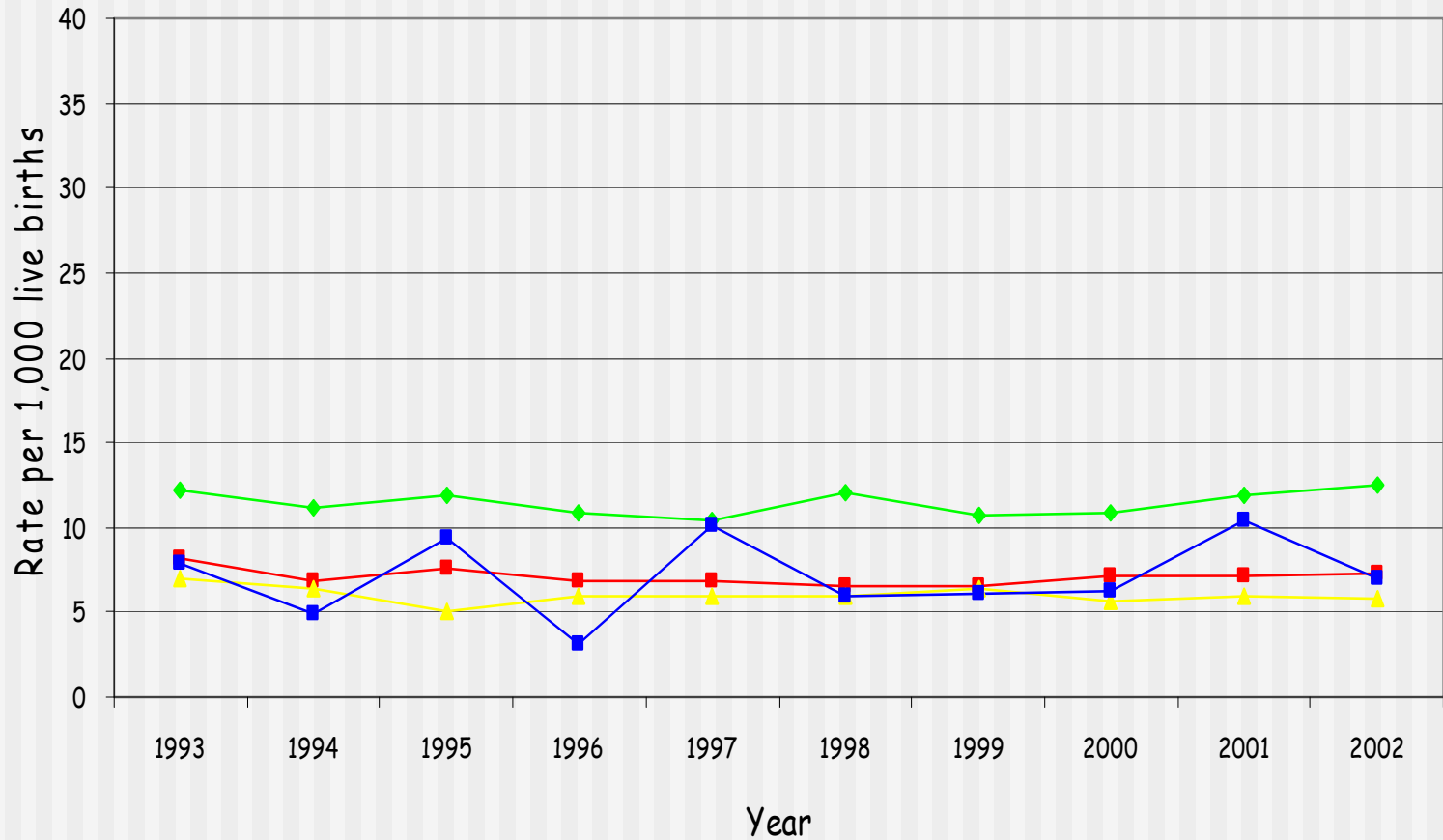
# Infant Death Rates to Mothers With More Than a High School Education, 1993-2002



# Infant Death Rates to Mothers Who Smoked While Pregnant by Age of Mother, 1993-2002

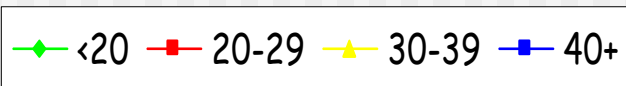
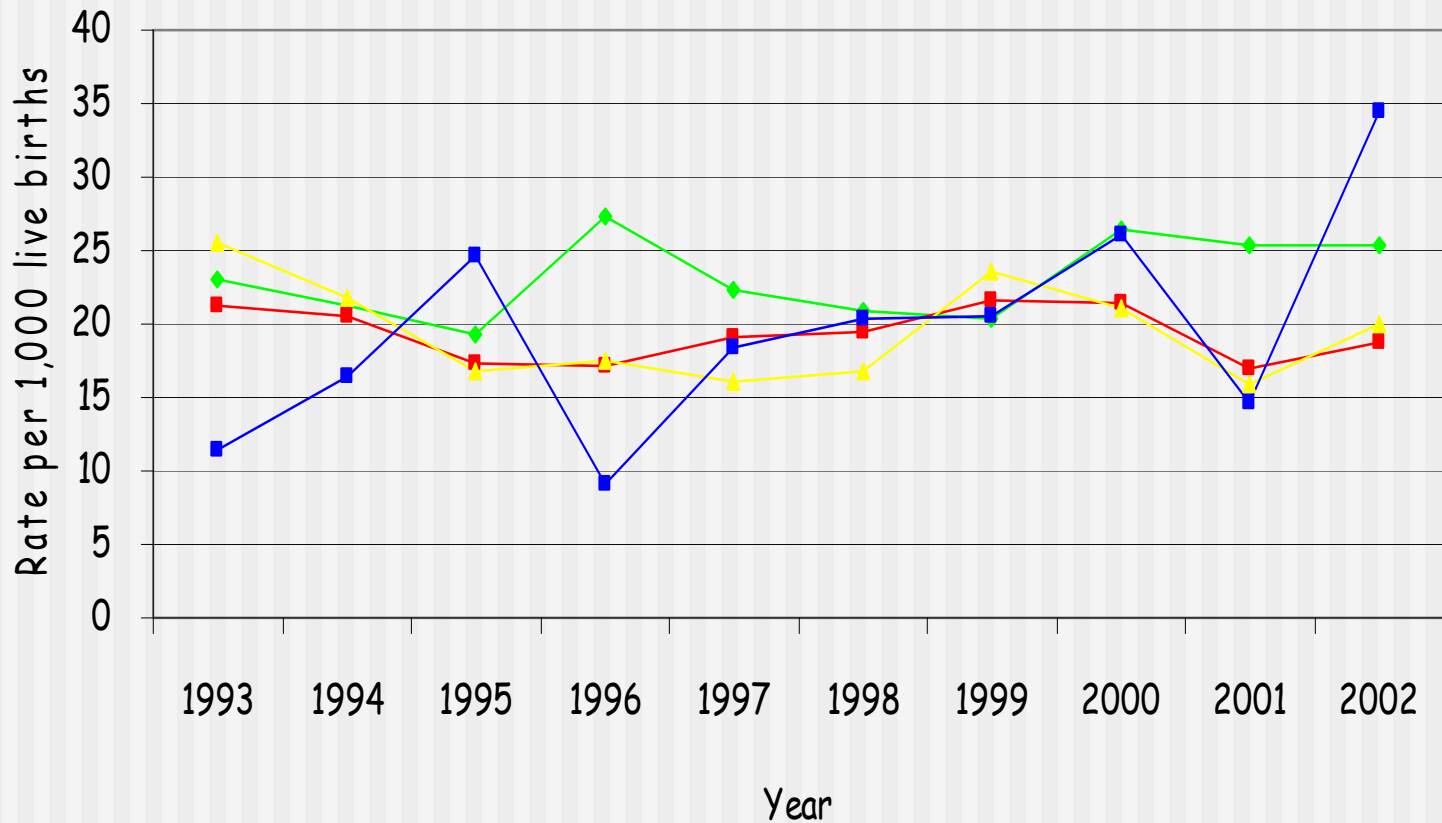


# Infant Death Rates to Mother Who Did Not Smoke While Pregnant by Age of Mother, 1993-2002

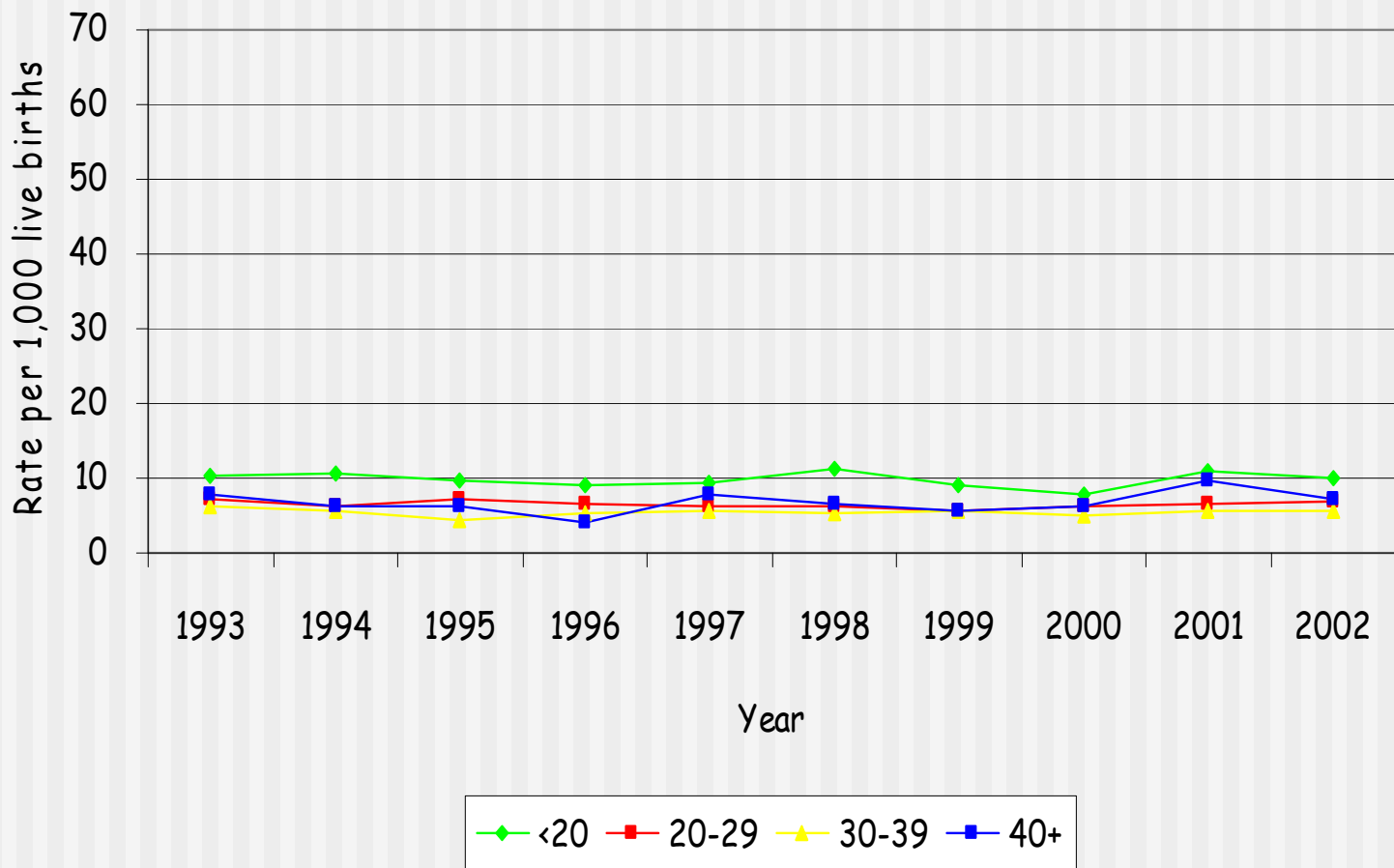


◆ <20    ■ 20-29    ▲ 30-39    ■ 40+

# Infant Death Rates to Mothers Receiving Inadequate Prenatal Care by Age of Mother, 1993-2002



# Infant Death Rates to Mothers Receiving Adequate Prenatal Care by Age of Mother, 1993-2002



# Infant Deaths - Multiple Births Contribution



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# **Counties with high racial disparities**

# Counties with more than 1,000 live births - 2002 data

County	Total	White	Black
Van Buren	1,013	939	57
Midland	1,044	1,004	17
Lapeer	1,066	1,055	2
Lenawee	1,208	1,151	26
Eaton	1,265	1,160	65
Bay	1,291	1,261	19
Allegan	1,468	1,432	14
Monroe	1,667	1,592	38
Calhoun	1,847	1,563	256
Livingston	1,958	1,897	4
Jackson	2,000	1,767	173
St Clair	2,021	1,943	50
Berrien	2,025	1,481	498

County	Total	White	Black
Muskegon	2,309	1,872	418
Saginaw	2,652	1,907	721
Kalamazoo	3,048	2,456	492
Ottawa	3,472	3,316	38
Ingham	3,580	2,802	573
Washtenaw	4,196	3,050	631
Genesee	6,196	4,461	1,636
Kent	9,075	7,657	1,033
Macomb	10,048	8,887	511
Detroit City	14,337	2,557	11,446
Out-Wayne	14,854	12,322	1,603
Oakland	15,267	12,240	1,742

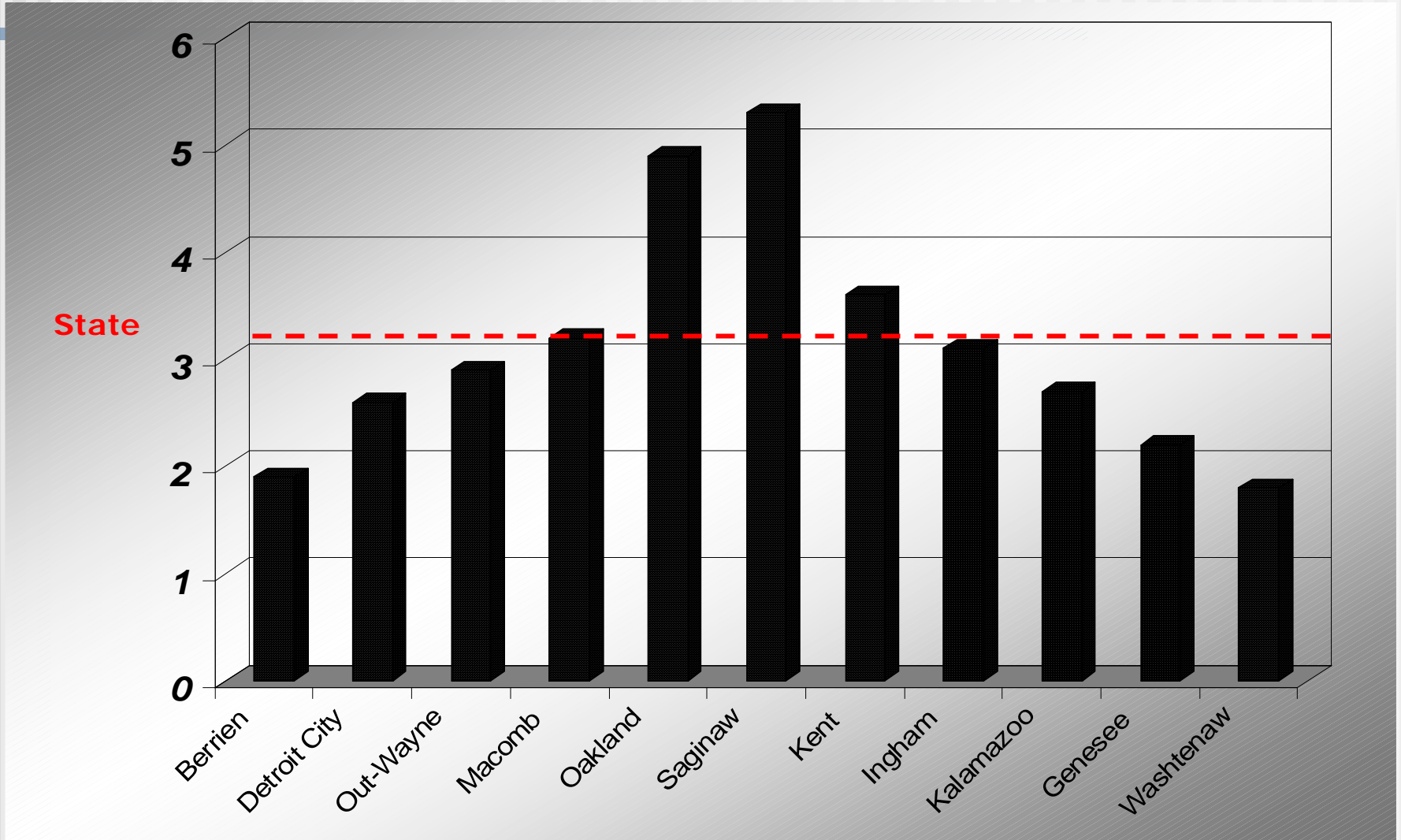


# IMR for 24 counties with more than 1,000 live births - 2002 data

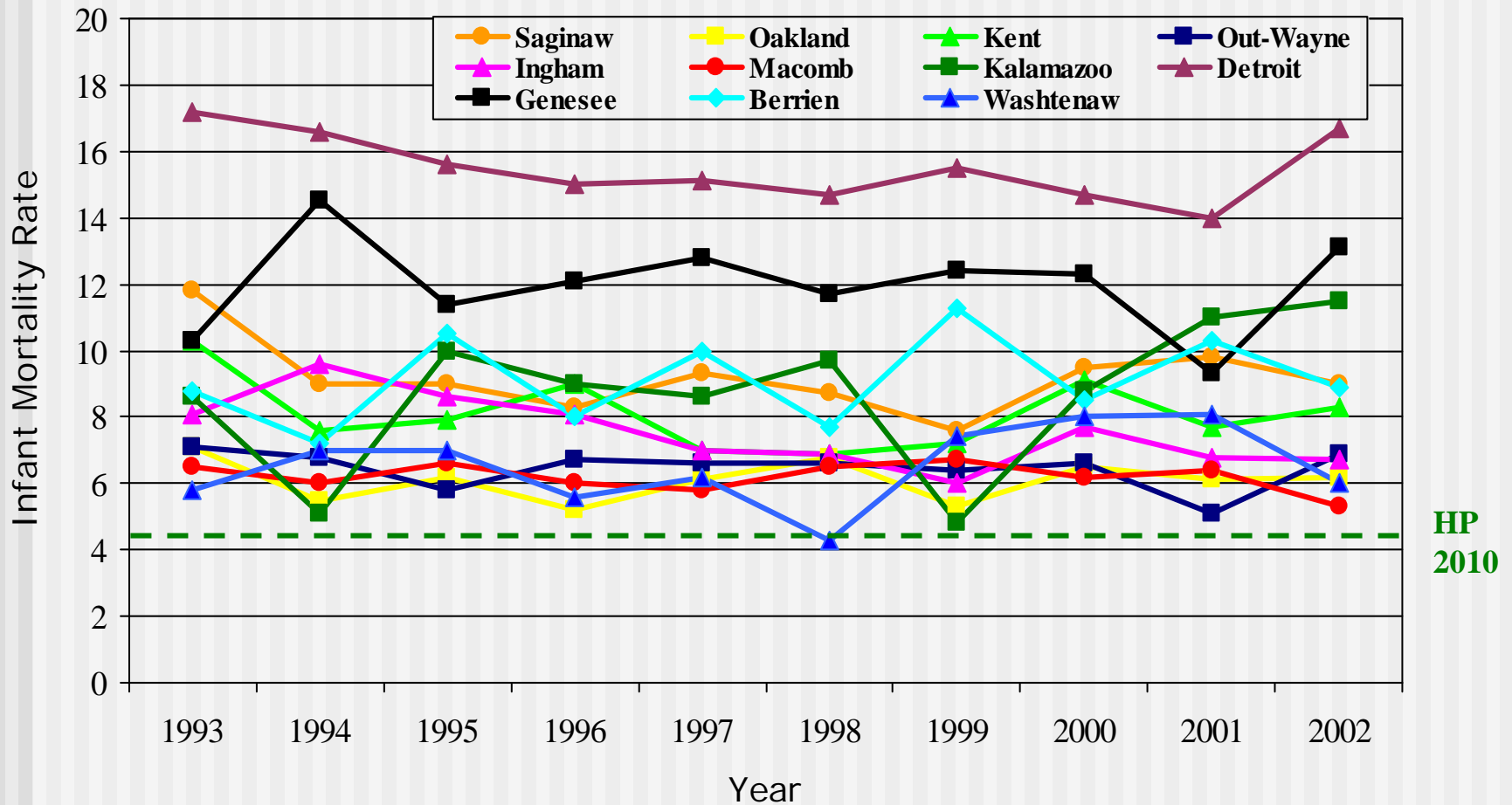
County	Total IMR	B/W IMR
Saginaw	9.0	5.3
Oakland	6.2	4.9
Kent	8.3	3.6
Macomb	5.3	3.2
Ingham	6.7	3.1
Out-Wayne	6.9	2.9
Kalamazoo	11.5	2.7
Detroit City	16.7	2.6
Genesee	13.1	2.2
Berrien	8.9	1.9
Washtenaw	6.0	1.8
Monroe	9.6	0.0
Calhoun	8.10	0.0

County	Total IMR	B/W IMR
Midland	6.7	0.0
Ottawa	6.6	0.0
St Clair	6.4	0.0
Eaton	6.3	0.0
Allegan	6.1	0.0
Muskegon	6.1	0.0
Lapeer	5.6	0.0
Bay	5.4	0.0
Jackson	5.0	0.0
Livingston	3.1	0.0
Van Buren	0.0	0.0
Lenawee	0.0	0.0

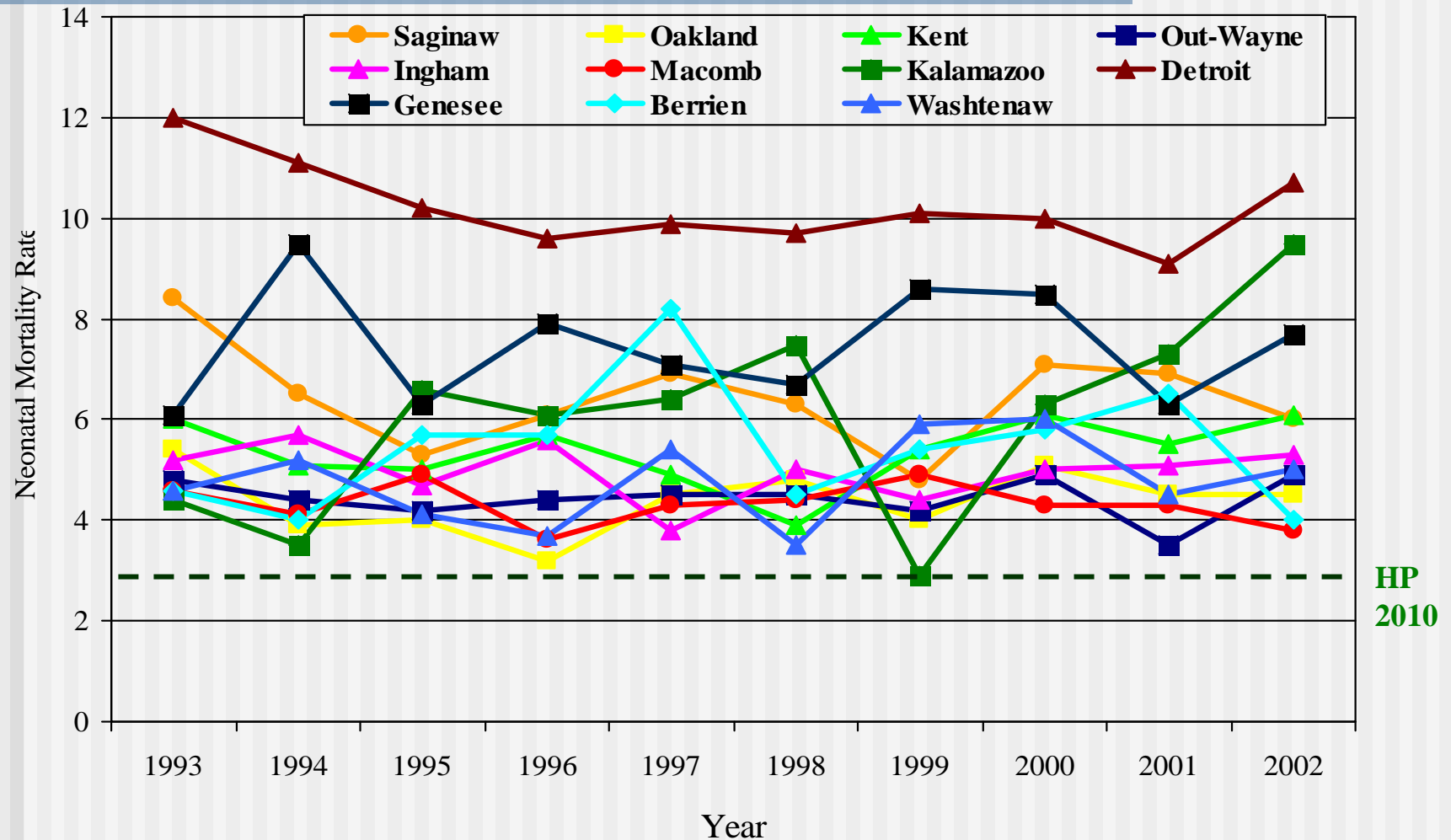
# Targeted Counties 2002 Black/White Ratio



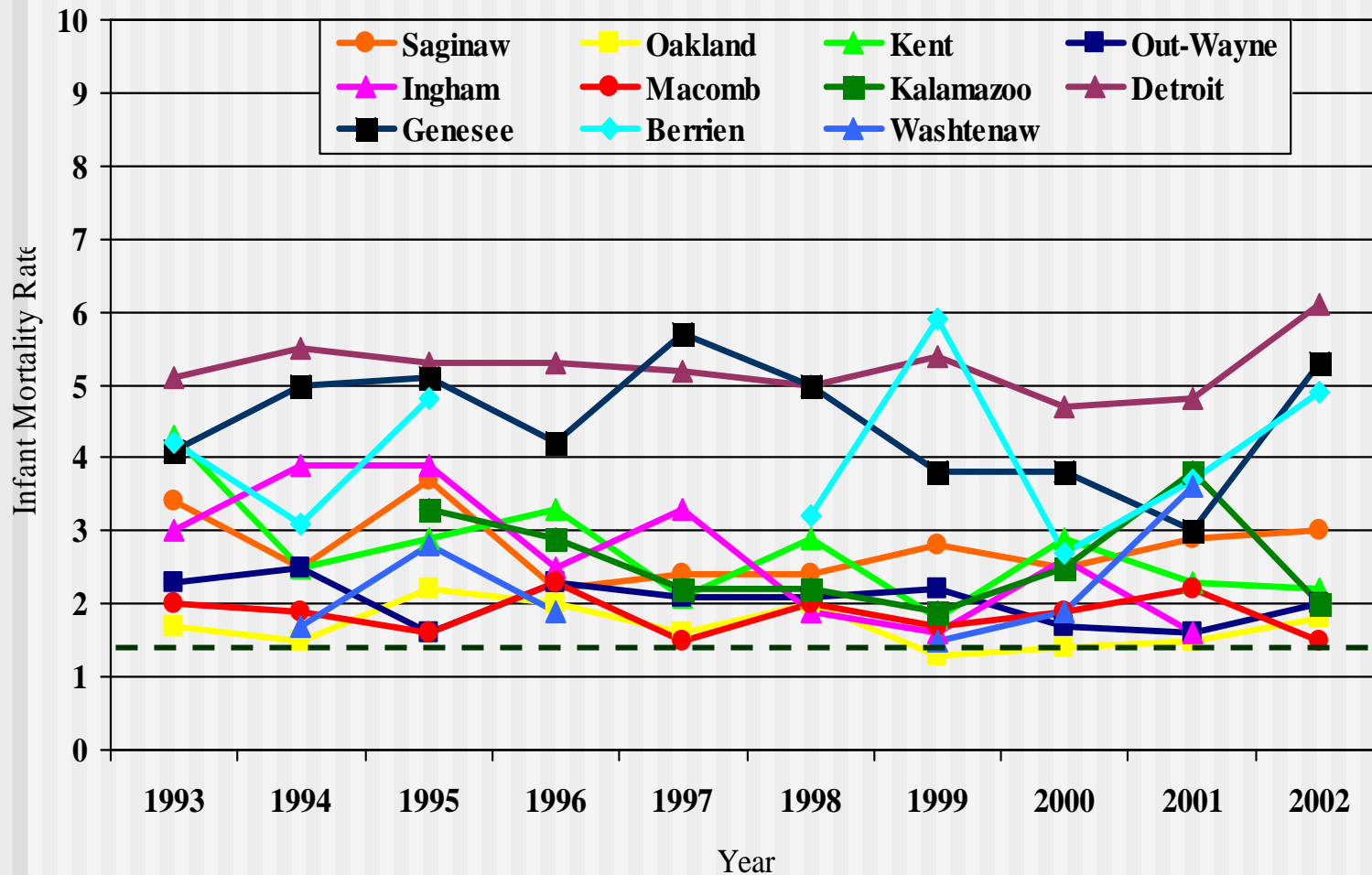
# Trend of Infant Mortality Rate by County



# Trend of Neonatal Mortality Rate by county



# Trend of Postneonatal Mortality Rate by County



The rate was not calculated for the years with 5 or less infant deaths

HP  
2010

# Targeted counties 2002 data

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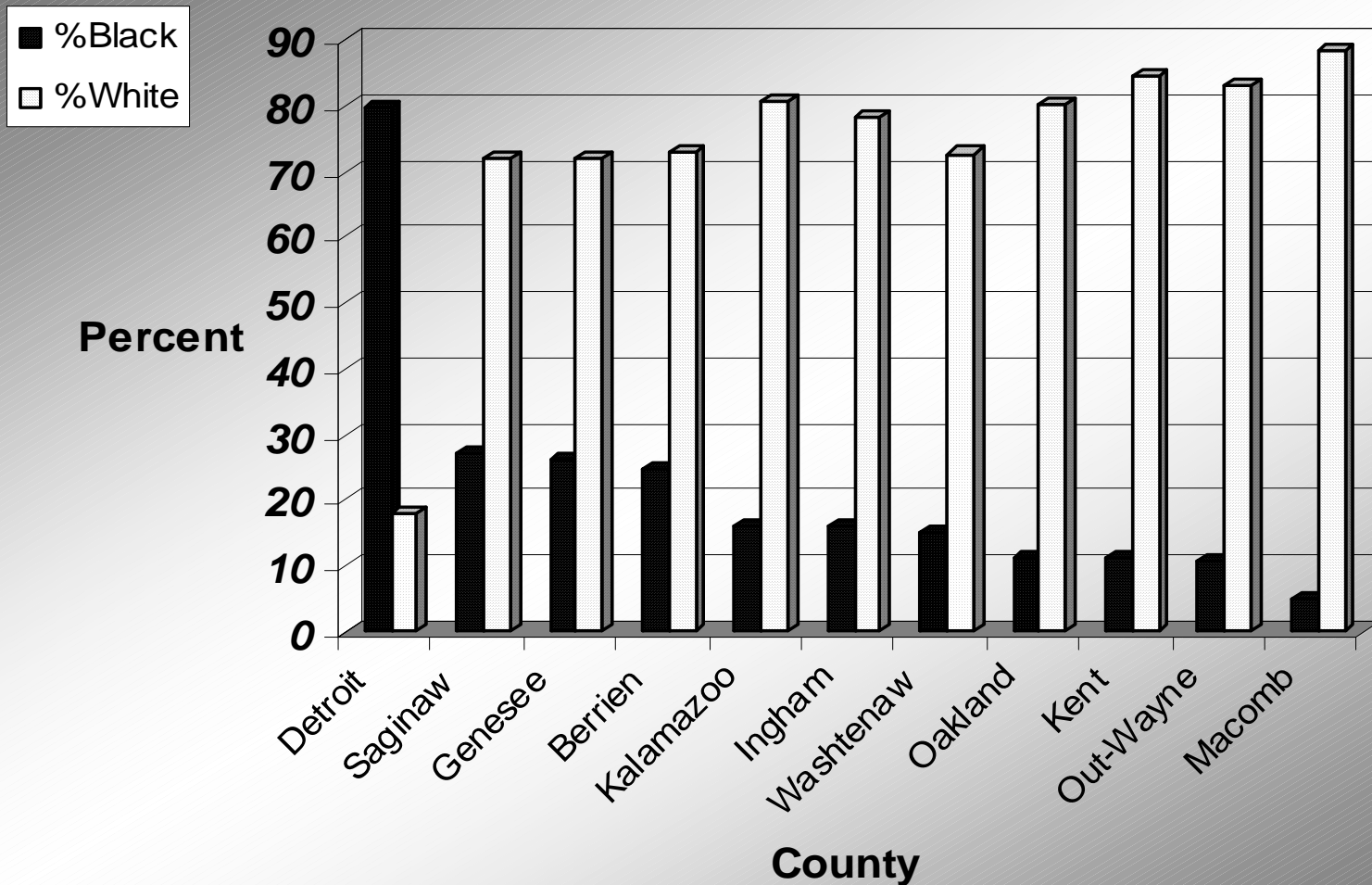
## Live Births

- 85,278 (85.4%) total live births
  - 20,886 to Blacks (93.9% of 22,248 in MI )
  - 59,820 to Whites (58.9% of 101,611 in MI)

## Infant deaths

- 773 overall infant deaths (73.3% of 1,054 in MI )
  - 400 Blacks (97.6% of 410 in MI)
  - 350 Whites (57.3% of 611 in MI)

# 2002 Mother's race distribution in targeted counties

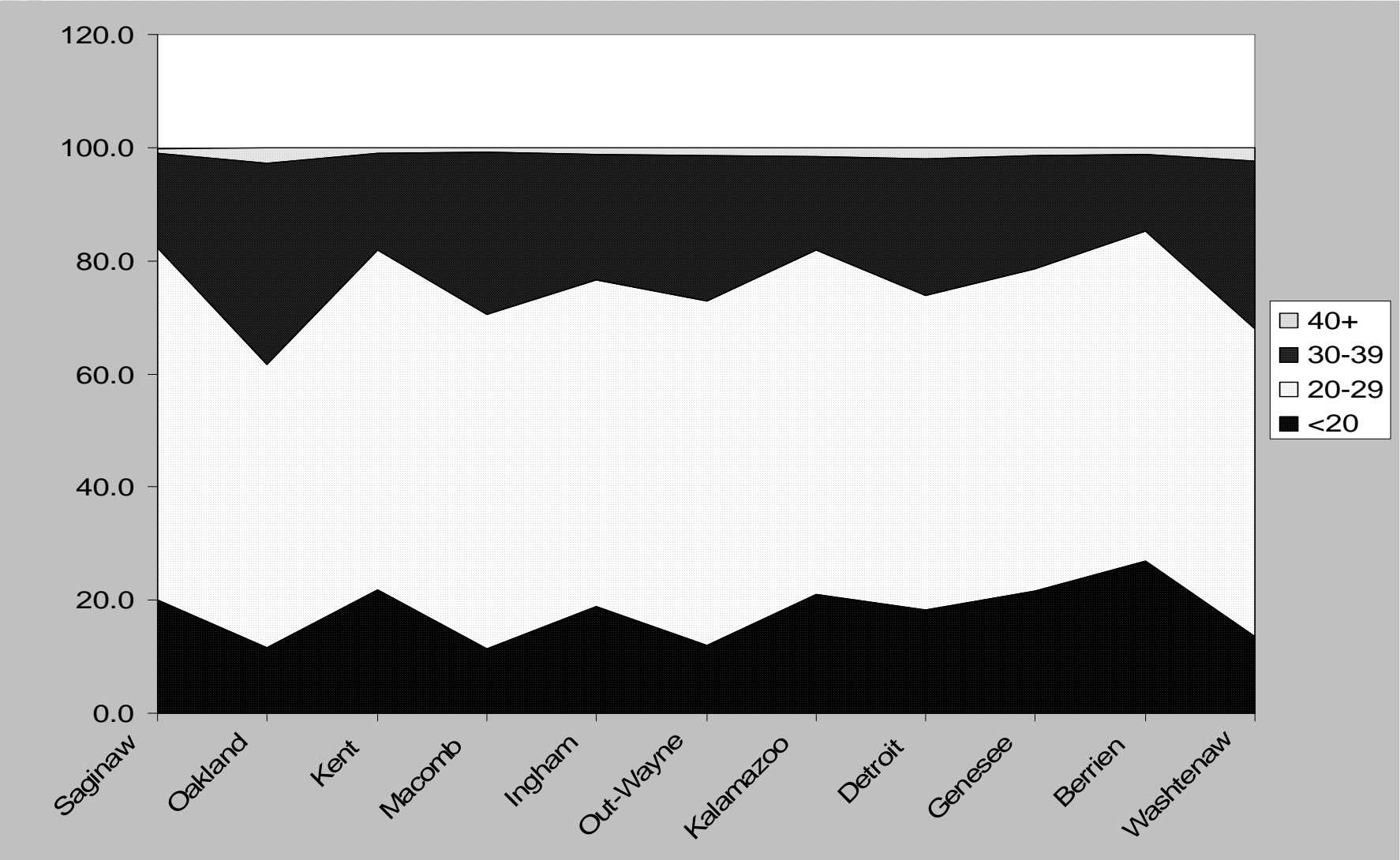


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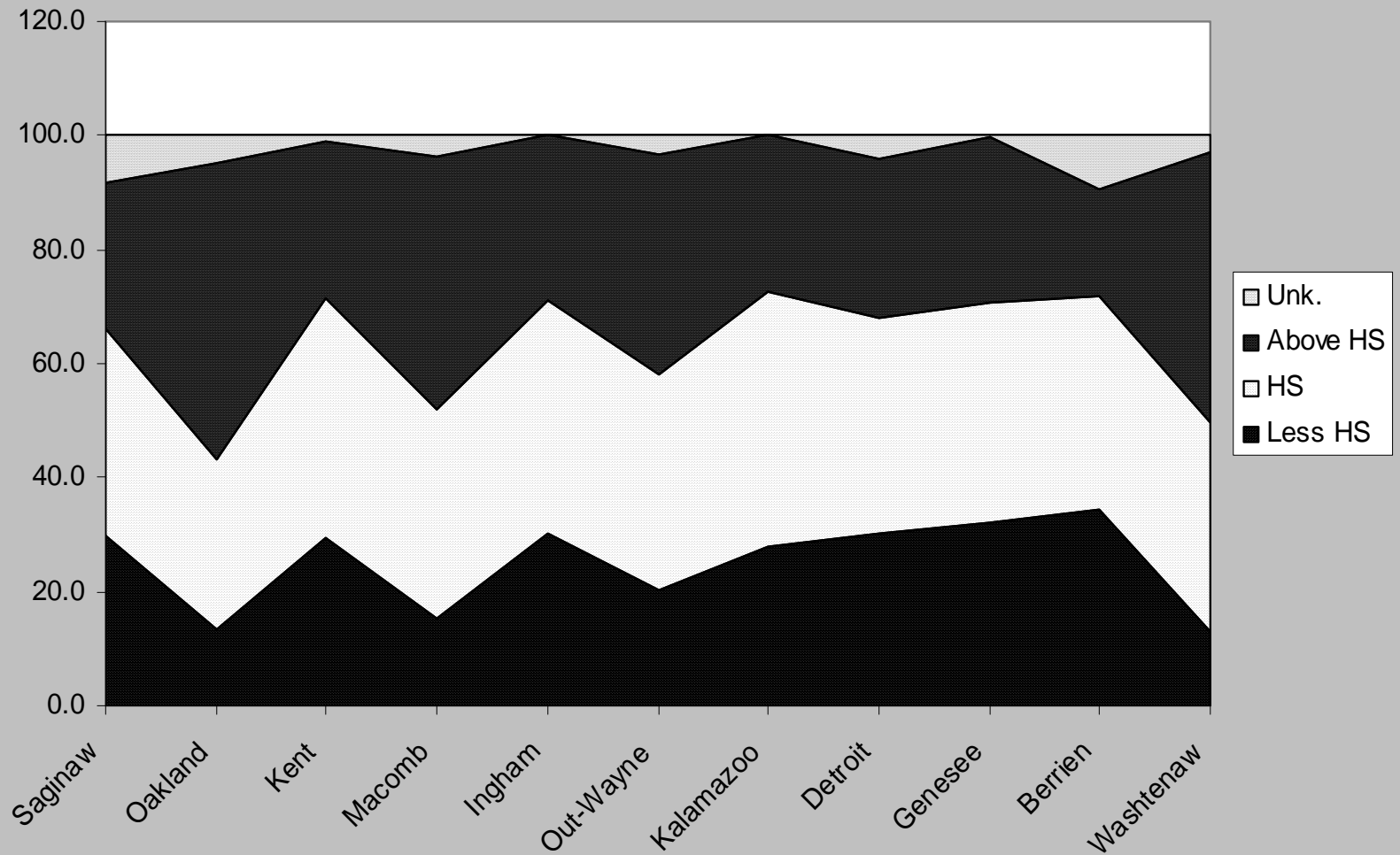
**Characteristics of Black  
Mothers in targeted counties  
2002 data**



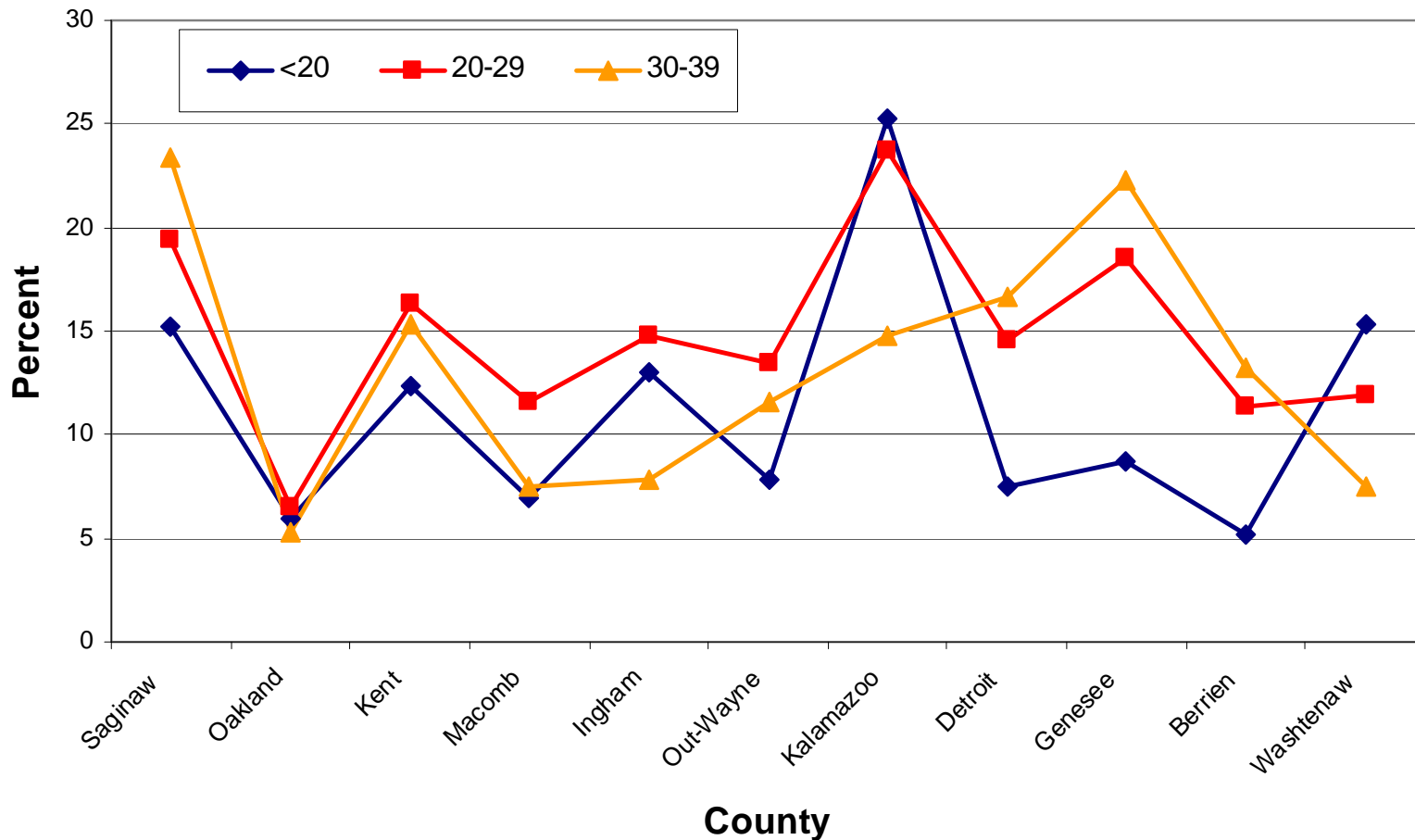
# Mother's age distribution



# Mothers' education distribution



# Mothers who smoked during pregnancy by age groups

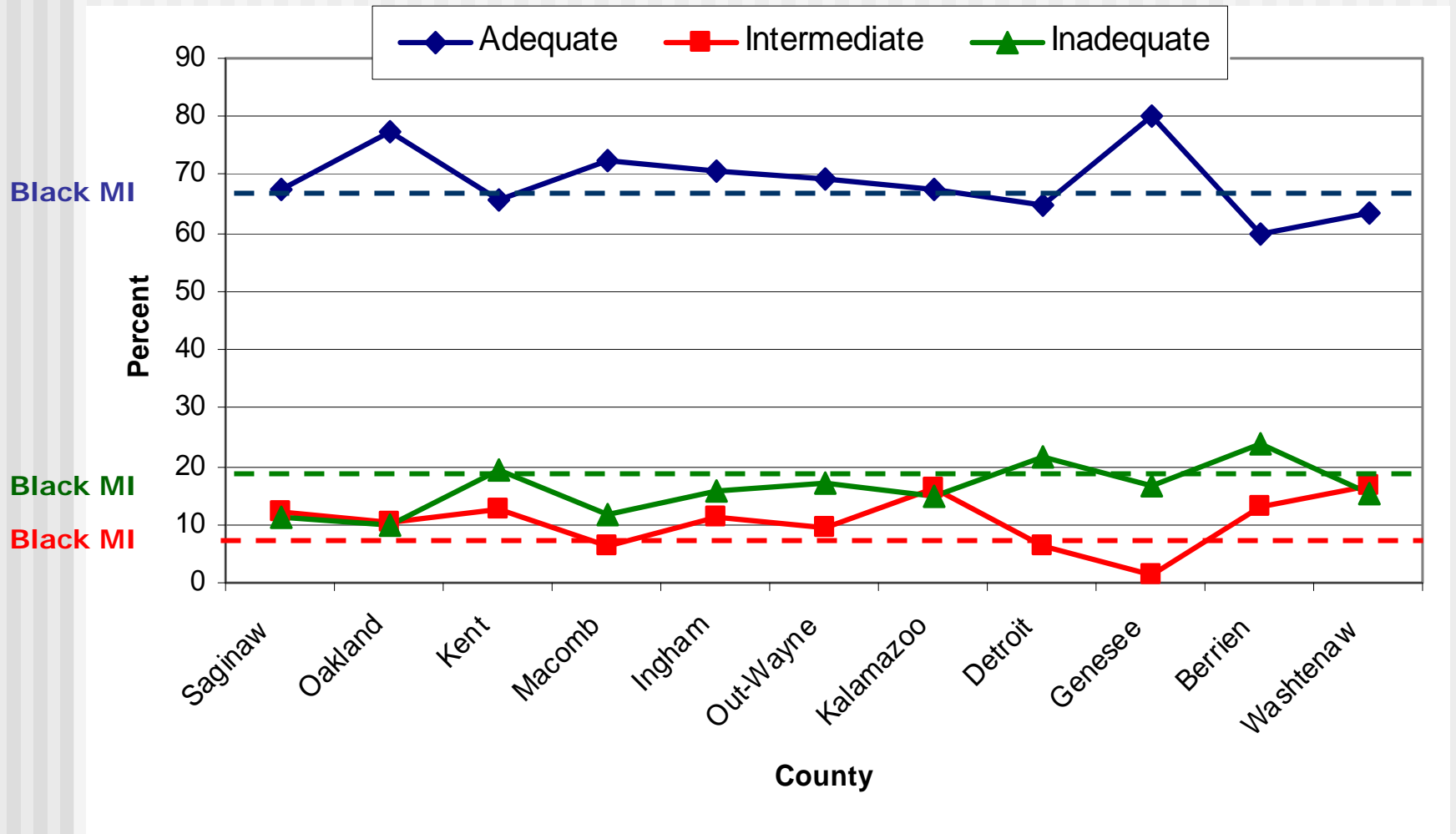


Small # of 40+ years old by county

22.8% of all 40+ years smoked during pregnancy

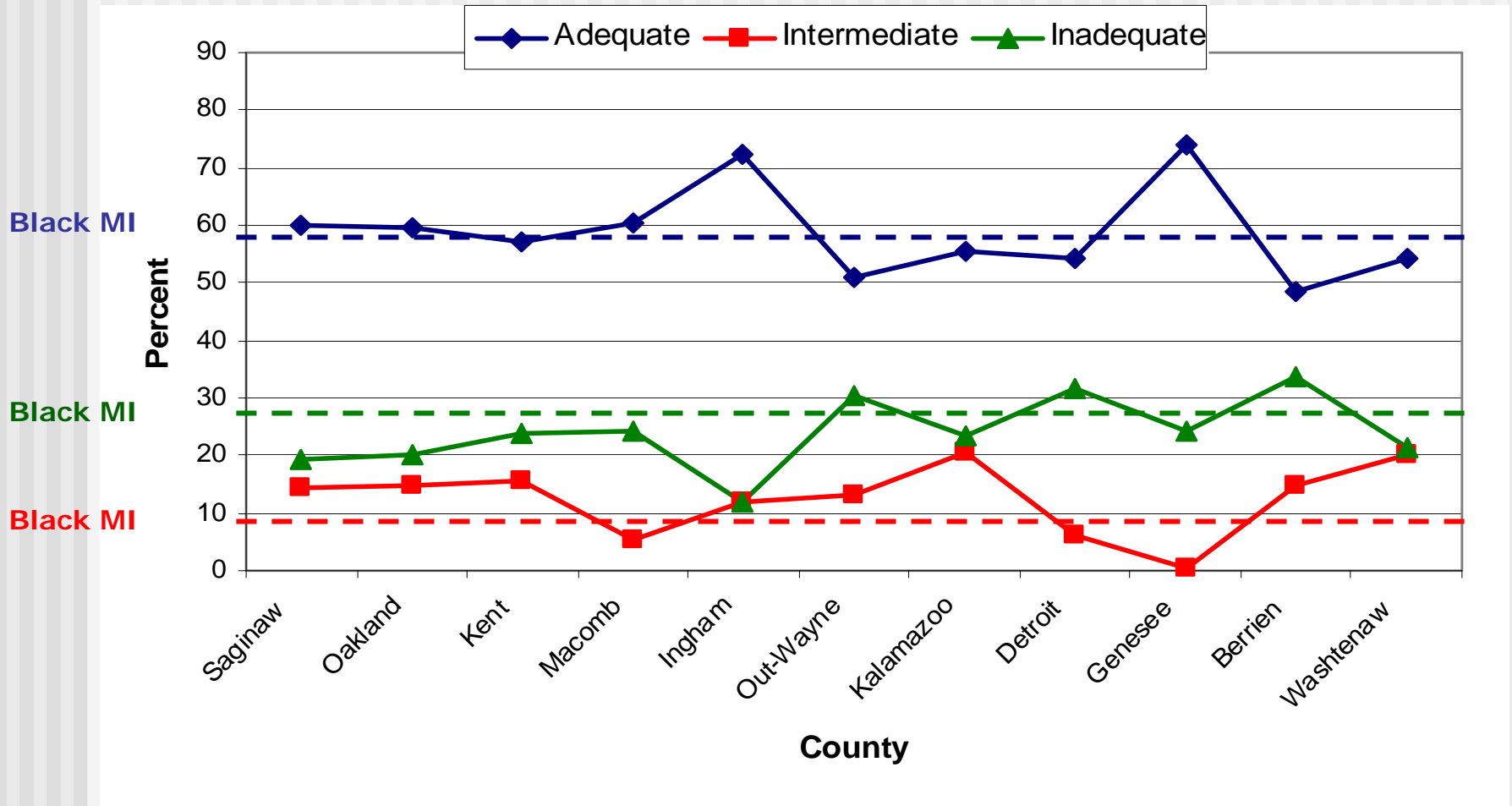
67% of those who smoked were in Detroit

# Prenatal care – Kotelchuck index



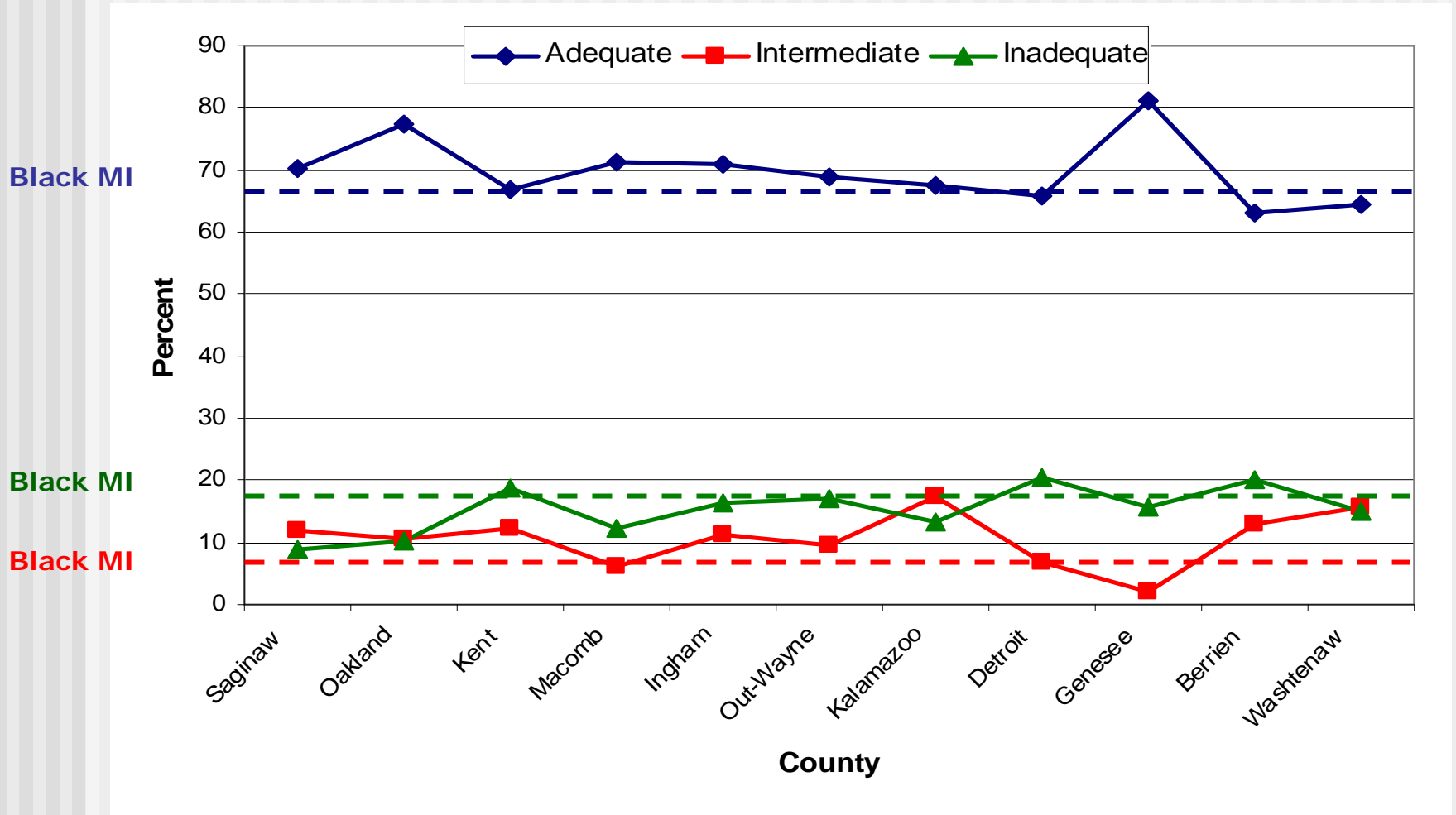
# Prenatal care - Kotelchuck index

## Mothers below 20 years of age



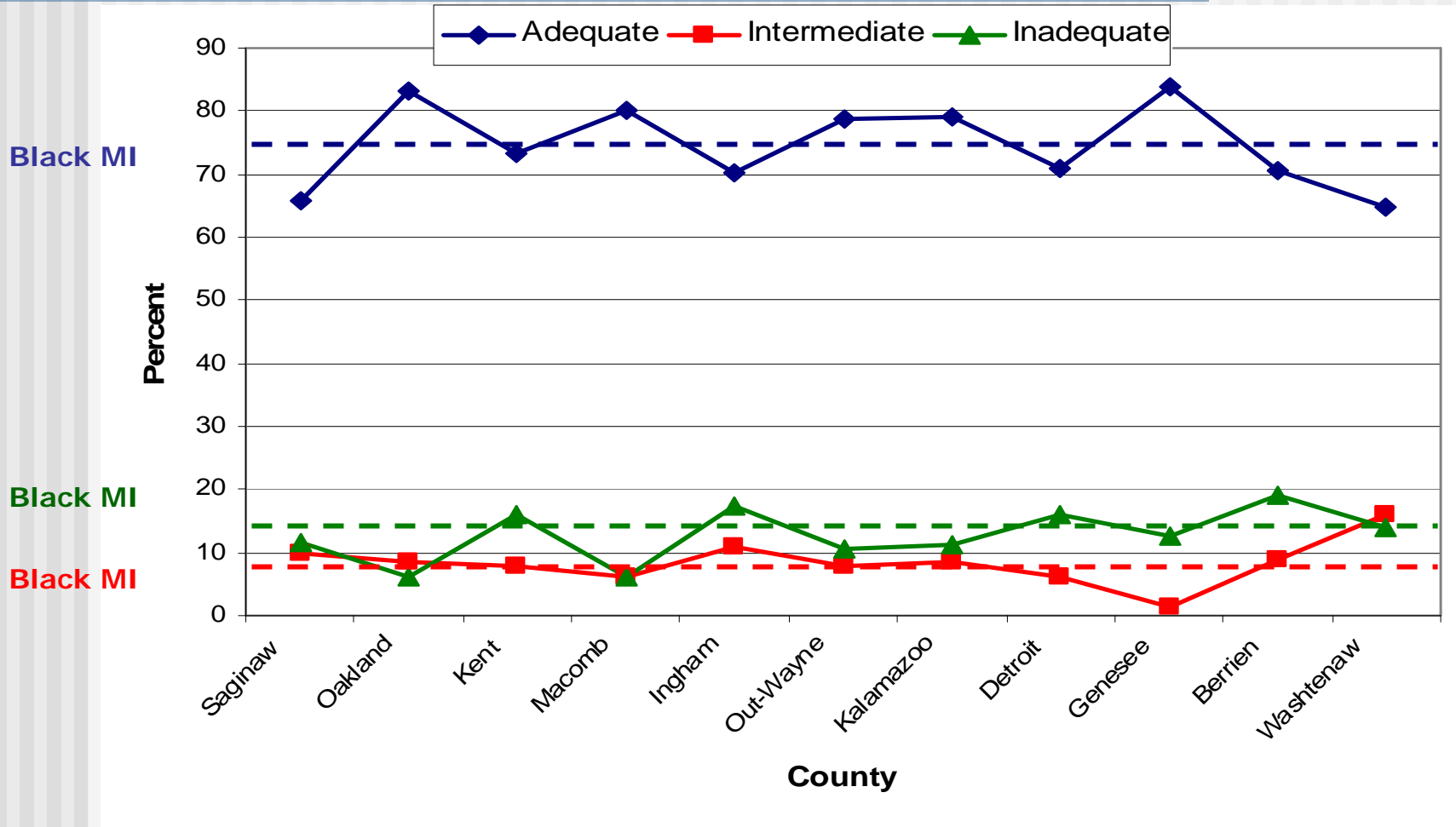
# Prenatal care - Kotelchuck index

## Mothers 20-29 years of age



# Prenatal care - Kotelchuck index

## Mothers 30-39 years of age



# **Perinatal Periods of Risk**

---



# PPOR: Feto-Infant Mortality in Michigan

**1993**

**Maternal Health/  
Prematurity  
3.8**

**Maternal  
Care  
1.8**

**Newborn  
Care  
1.8**

**Infant  
Health  
2.8**

**Overall IMR = 10.2**

**2002**

**Maternal Health/  
Prematurity  
3.7**

**Maternal  
Care  
1.4**

**Newborn  
Care  
1.3**

**Infant  
Health  
2.0**

**Overall IMR = 8.4**

# PPOR: Black Feto-Infant Mortality in Michigan

1993 data

Maternal Health/  
Prematurity  
7.2

Maternal  
Care  
2.1

Newborn  
Care  
2.7

Infant  
Health  
4.7

Overall IMR = 16.7

2002 data

Maternal Health/  
Prematurity  
8.0

Maternal  
Care  
1.5

Newborn  
Care  
1.9

Infant  
Health  
4.5

Overall IMR = 15.9

Rounded rates

# PPOR Comparison Reference Group

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- Defined by **maternal characteristics:**
  - 20 or more years of age
  - 13 or more years of education
  - Non-Hispanic White
- 1998-2002 Michigan as reference

# Reference Group 1998-2002 Michigan

---

**Maternal Health/  
Prematurity  
2.1**

**Maternal  
Care  
1.1**

**Newborn  
Care  
1.2**

**Infant  
Health  
1.0**

**Overall IMR = 5.4**

# 1993 and 2002 Michigan PPOR compared to the reference group

**1993**

**Maternal Health/  
Prematurity  
1.7**

<b>Maternal Care 0.7</b>	<b>Newborn Care 0.6</b>	<b>Infant Health 1.8</b>
----------------------------------	---------------------------------	----------------------------------

**Overall excess = 4.8**

**2002**

**Maternal Health/  
Prematurity  
1.6**

<b>Maternal Care 0.3</b>	<b>Newborn Care 0.1</b>	<b>Infant Health 1.0</b>
----------------------------------	---------------------------------	----------------------------------

**Overall excess = 3.0**

# 1993 and 2002 Black Michigan PPOR compared to the reference group

**1993**

**Maternal Health/  
Prematurity  
5.1**

**Maternal  
Care  
1.0**

**Newborn  
Care  
1.5**

**Infant  
Health  
3.7**

**Overall excess = 11.3**

**2002**

**Maternal Health/  
Prematurity  
5.9**

**Maternal  
Care  
0.4**

**Newborn  
Care  
0.7**

**Infant  
Health  
3.5**

**Overall excess = 10.5**

# PPOR Framework

## Maternal Health/Prematurity

- I. **Improve the health status of women to maximize their chances for having healthy babies**
- II. **Increase the proportion of pregnancies that are planned**
  - Provide access to family planning and effective contraception
  - Assess woman's health and risks before conception/pregnancy
  - Monitor and treat existing maternal medical problems
  - Assure early entry and adequate prenatal care
  - Educate about symptoms of early labor
  - Reduce smoking and alcohol consumption during pregnancies
  - Improve percent of high-risk pregnancies delivered at appropriate hospitals

### **Resources:**

Family Planning

Regional Perinatal System

School Based/Linked Hlth Ctrs

Michigan Model

FQHCs

FAS Prevention Project

Healthy Start-Interconception Care

Rx for Michigan

Tobacco Quitlines

MCH Hotline

# PPOR Framework

## Maternal Care

---

### I. Increase the proportion of births which are full term, at appropriate birth weight, and otherwise at low risk for infant morbidity and mortality

- Assure partners are healthy
- Identify high risk pregnancies and assure specialty care
- Improve health risk behaviors
- Assure early entry and adequate prenatal care
- Monitor and treat maternal medical problems
- Improve percent of high-risk pregnancies delivered at appropriate hospitals

#### **Resources:**

Prenatal Clinics

Medicaid Maternal Support Services

Prenatal Smoking Cessation

Medicaid/Health Plans

Nurse Family Partnership

Healthy Start

WIC

Perinatal HIV/AIDS



# PPOR Framework

## Newborn Care

---

### I. Increase the proportion of newborns whose acute problems are immediately identified and effectively addressed

- Improve appropriate in-hospital preparation for parenting
- Provide newborn screening and follow-up
- Discharge plans to meet the newborn needs
- Assure link to pediatric provider
- Assure link with home visitations programs

#### **Resources:**

Infant Support Services

MiChild

Genetics and Newborn Screening

Medicaid Health Plans

Birth Defects Registry and follow-up

Regional Perinatal System

Early Hearing Screening (EHDI)

# PPOR Framework

## Infant Health

---

### I. Increase the proportion of infants who never experience serious illnesses or injuries

- Improve access to primary care
- Assure assessment of family social/environmental risks
- Assure teaching regarding infant safe sleep and breastfeeding
- Educate about the signs, symptoms and what to do for infection in infancy
- Assure access to developmental assessment and therapies

#### **Resources:**

Infant Support Services

Safe Sleep Program

Injury Prevention

MiChild

Childhood Lead Poisoning Prevention

Immunizations

Fetal Alcohol Diagnostic Clinics

Early On

WIC

Medicaid Health Plans

# 1998-2002 PPOR

## Detroit City compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
4.5**

**Maternal  
Care  
0.4**

**Newborn  
Care  
0.6**

**Infant  
Health  
2.7**

**Overall excess = 8.2**

### Black

**Maternal Health/  
Prematurity  
5.0**

**Maternal  
Care  
0.2**

**Newborn  
Care  
0.7**

**Infant  
Health  
3.1**

**Overall excess = 9.0**

# 1998-2002 PPOR

## Berrien County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
2.0**

**Maternal  
Care  
1.2**

**Newborn  
Care  
0.3**

**Infant  
Health  
2.6**

**Overall excess = 6.1**

### Black

**Maternal Health/  
Prematurity  
6.1**

**Maternal  
Care  
1.8**

**Newborn  
Care  
\*\***

**Infant  
Health  
7.2**

**Overall excess = 15.1**

**\*\* Not reportable (4 deaths)**

# 1998-2002 PPOR

## Kalamazoo County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
2.7**

**Maternal  
Care  
1.2**

**Newborn  
Care  
0.6**

**Infant  
Health  
0.8**

**Overall excess = 5.3**

### Black

**Maternal Health/  
Prematurity  
5.8**

**Maternal  
Care  
1.7**

**Newborn  
Care  
\*\***

**Infant  
Health  
3.3**

**Overall excess = 10.8**

**\*\* Not reportable (3 deaths)**

# 1998-2002 PPOR

## Genesee County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
2.2**

**Maternal  
Care  
0.1**

**Newborn  
Care  
0.4**

**Infant  
Health  
2.1**

**Overall excess = 4.8**

### Black

**Maternal Health/  
Prematurity  
5.4**

**Maternal  
Care  
0.0**

**Newborn  
Care  
1.0**

**Infant  
Health  
4.5**

**Overall excess = 10.9**

# 1998-2002 PPOR

## Saginaw County compared to the reference group

### Overall

**Maternal Health/  
Prematurity**  
1.1

**Maternal  
Care**  
0.3

**Newborn  
Care**  
0.6

**Infant  
Health**  
1.4

**Overall excess = 3.4**

### Black

**Maternal Health/  
Prematurity**  
4.9

**Maternal  
Care**  
1.1

**Newborn  
Care**  
0.2\*

**Infant  
Health**  
3.6

**Overall excess = 9.8**

\* Unstable rate (5 deaths)

# 1998-2002 PPOR

## Kent County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
1.6**

**Maternal  
Care  
0.3**

**Newborn  
Care  
0.5**

**Infant  
Health  
0.7**

**Overall excess = 3.1**

### Black

**Maternal Health/  
Prematurity  
6.7**

**Maternal  
Care  
1.8**

**Newborn  
Care  
1.5**

**Infant  
Health  
3.8**

**Overall excess = 13.8**



# 1998-2002 PPOR

## Ingham County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
1.4**

**Maternal  
Care  
0.5**

**Newborn  
Care  
0.4**

**Infant  
Health  
0.6**

**Overall excess = 2.9**

### Black

**Maternal Health/  
Prematurity  
3.9**

**Maternal  
Care  
0.9**

**Newborn  
Care  
1.1**

**Infant  
Health  
1.3**

**Overall excess = 7.2**

# 1998-2002 PPOR

## Oakland County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
0.8**

**Maternal  
Care  
0.8**

**Newborn  
Care  
-0.2**

**Infant  
Health  
0.4**

**Overall excess = 1.8**

### Black

**Maternal Health/  
Prematurity  
7.3**

**Maternal  
Care  
1.9**

**Newborn  
Care  
0.6**

**Infant  
Health  
3.5**

**Overall excess = 13.3**

# 1998-2002 PPOR

## Macomb County compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
0.9**

**Maternal  
Care  
0.2**

**Newborn  
Care  
0.2**

**Infant  
Health  
0.3**

**Overall excess = 1.6**

### Black

**Maternal Health/  
Prematurity  
8.8**

**Maternal  
Care  
1.5\***

**Newborn  
Care  
1.4\***

**Infant  
Health  
\*\***

**Overall excess = 11.7**

\* Unstable rates (5 deaths)

\*\* Not reportable (3 deaths)

# 1998-2002 PPOR

## Out-Wayne compared to the reference group

### Overall

**Maternal Health/  
Prematurity  
0.5**

**Maternal  
Care  
0.4**

**Newborn  
Care  
0.0**

**Infant  
Health  
0.7**

**Overall excess = 1.6**

### Black

**Maternal Health/  
Prematurity  
4.7**

**Maternal  
Care  
1.5**

**Newborn  
Care  
0.9**

**Infant  
Health  
2.6**

**Overall excess = 9.7**

# 1998-2002 PPOR

## Washtenaw County compared to the reference group

### Overall

**Maternal Health/  
Prematurity**  
1.1

**Maternal  
Care**  
0.0

**Newborn  
Care**  
0.3

**Infant  
Health**  
0.2

**Overall excess = 1.6**

### Black

**Maternal Health/  
Prematurity**  
5.1

**Maternal  
Care**  
\*\*

**Newborn  
Care**  
\*\*

**Infant  
Health**  
1.0

**Overall excess = 6.1**

\*\* Not reportable (1, 4 deaths respectively)

# PPOR Conclusion

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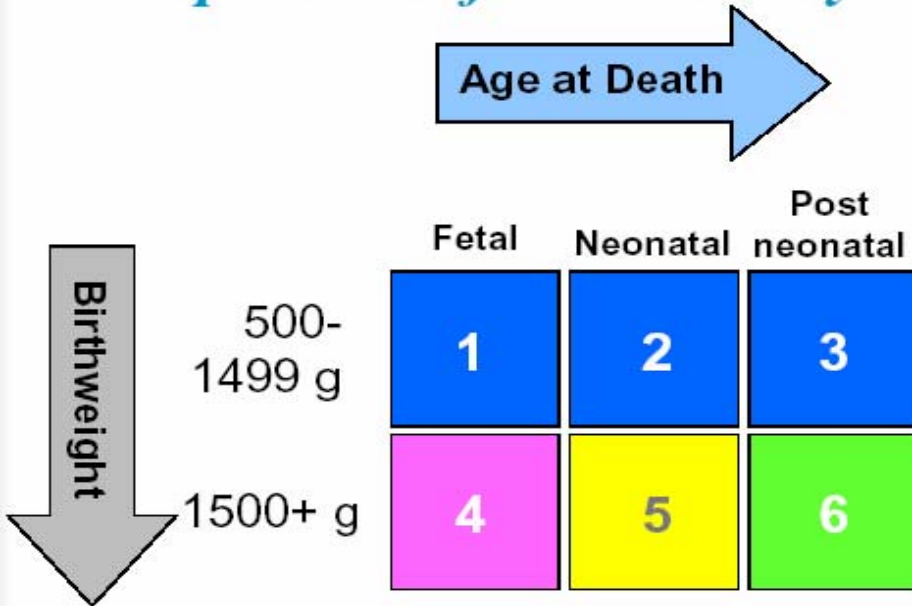
## Overall IMR

- Maternal Health/Prematurity (MH/P) followed by Infant Health (IH): main issues for the majority of the targeted counties
- Exceptions:
  - Berrien, Saginaw, Out-Wayne have highest rates for IH
  - Genesee has almost the same rates for MH/P and IH

## Black IMR

- MH/P followed by IH: main issues for the majority of the targeted counties
- Exception: Berrien county with highest IH rate

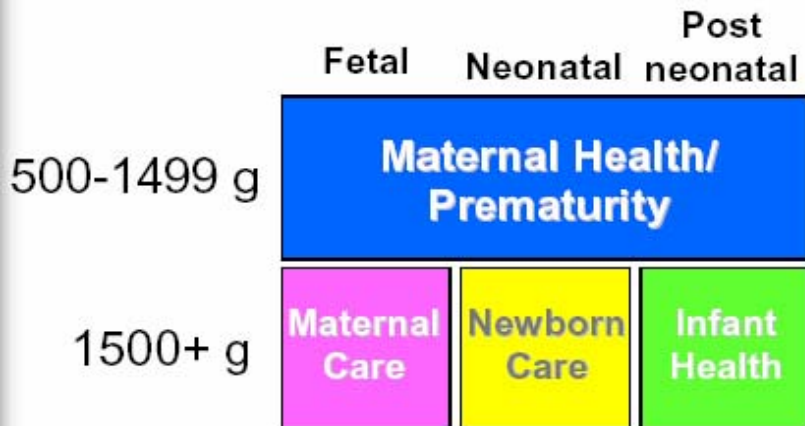
## Map Feto-Infant Mortality



# Important Reminder

- Neonatal deaths and Fetal deaths make up the majority of MH/P group
- Fetal deaths reporting varies by county/hospital
- Neonatal component of MH/P differs than Newborn Care group by birth weight

## Map Feto-Infant Mortality



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# **Gestational weeks or Birthweight?**

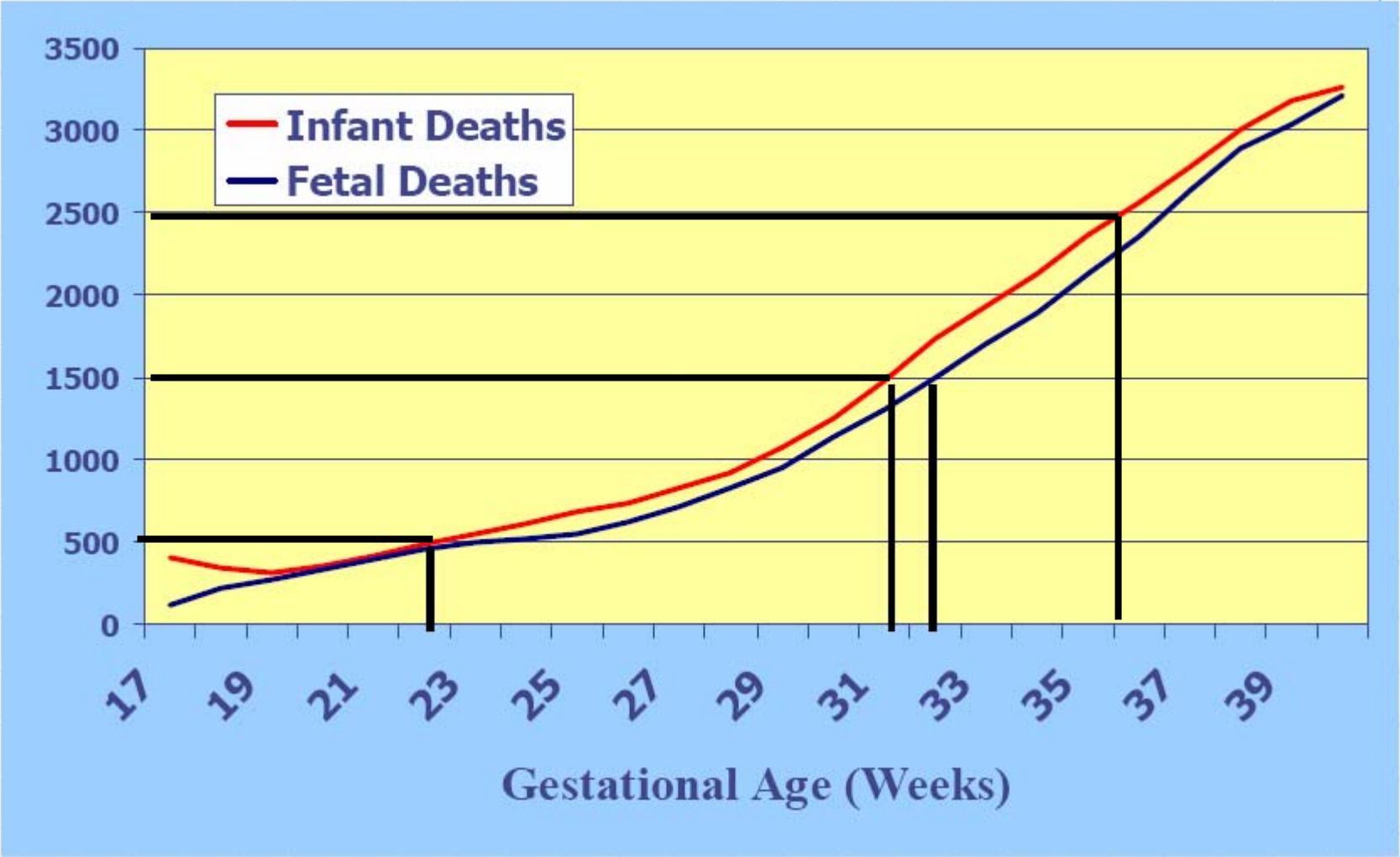


# Issues

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- Two parameters:
  - BW corresponding to GW  
(Normal for gestational age)
  - Lower BW for corresponding GW  
(Small for gestational age)
  - Higher BW for corresponding GW  
(Large for gestational age)
- Both parameters, gestational age (GW) and birth weight (BW) are important
- Reporting issues for both

# Relationship Between Gestational Age and Median Birthweight



# Preterm births: March of Dimes report \*

- A growing public health problem in the United States
- It is not mother's personal problem; it is a public health issue
- Lead to lifelong health complications: slow mental development and physical disabilities including cerebral palsy
- Grossly misunderstood and understudied issue
- Extremely costly:
  - In 2000, hospital bills for 23,000 preterm-related infant stays topped \$1.2 billion with an average cost of \$58,000 per baby
  - The typical newborn infant stay costs around \$4,300

\* March of Dimes survey findings published in February 2003 issue of the American Journal of Preventive Medicine

# 2002 Infants deaths: born prematurely

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- 1054 infants deaths
- 731 (69.4%) born before 37 weeks gestation (preterm)
  - 618 (84.5%) were born before 32 weeks (very preterm)
    - 371 (50.7%) were born before 24 weeks
- 371 (35.2%) born before 24 weeks gestation

# 2002 Infant deaths:born preterm

## Targeted Counties

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	State	Targeted Counties
<b>&lt;24 wks</b>	371	283 <b>76.3%</b>
<b>24-31 wks</b>	247	184 <b>74.5%</b>
<b>32-36 wks</b>	113	84 69%
<b>Total preterm</b>	731	551 <b>74.3%</b>

# 2002 Infant deaths:born preterm Targeted Counties (cont.)

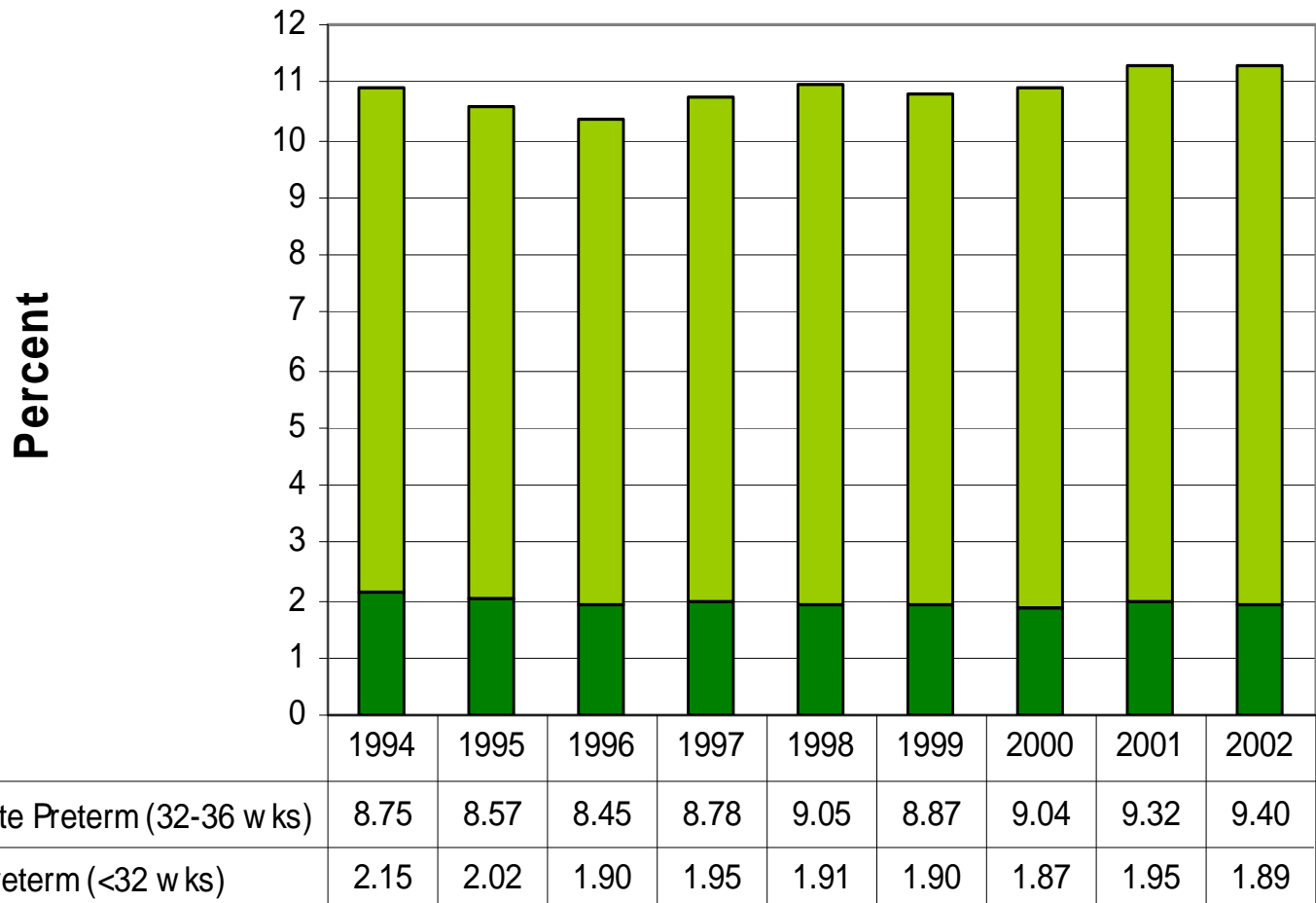
	<b>Total</b>	<b>White</b>	<b>Black</b>	<b>Others</b>
<b>&lt;24 wks</b>	283	118 <b>41.7%</b>	152 <b>53.7%</b>	13
<b>24-31 wks</b>	184	78 <b>42.4%</b>	101 <b>54.9%</b>	5
<b>32-36 wks</b>	84	42 <b>50%</b>	39 <b>46.4%</b>	3
<b>Total preterm</b>	551	238 <b>43.2%</b>	292 <b>53%</b>	21 3.8%

# Maternal Health/ Prematurity

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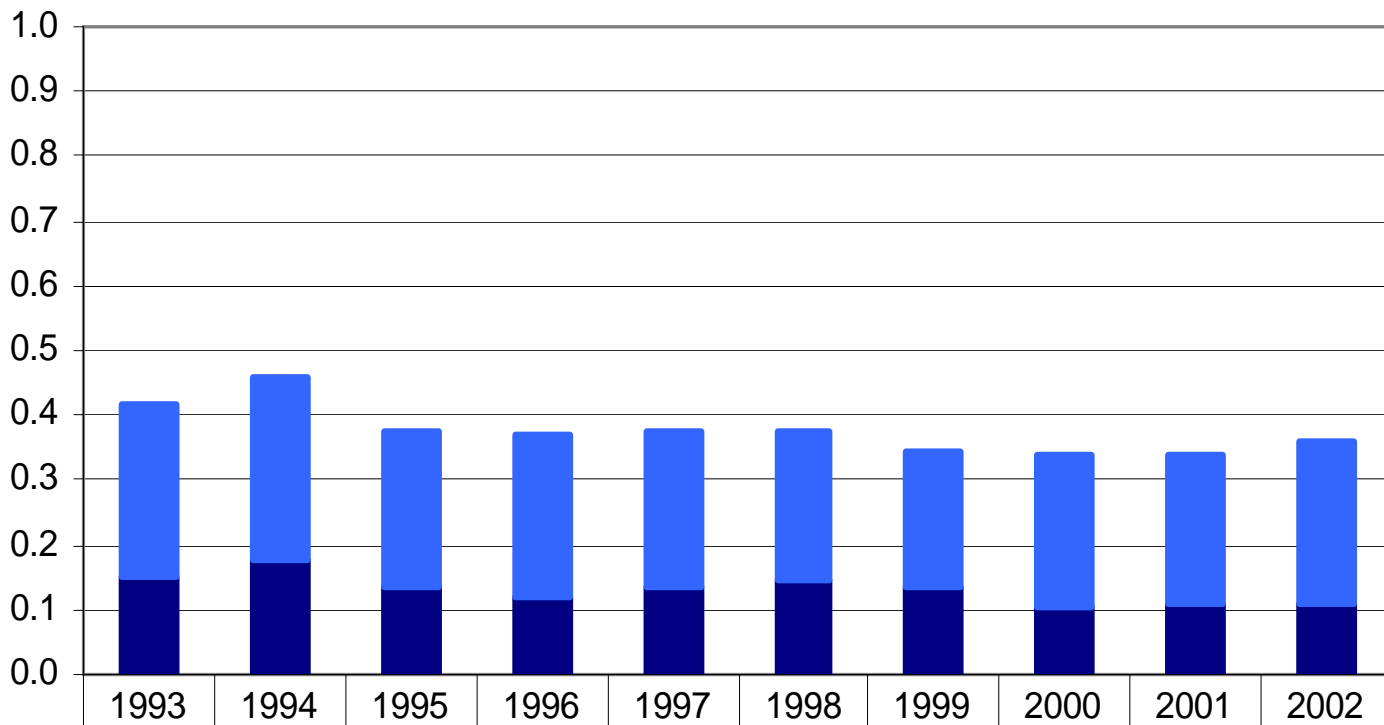
What do we know?

# Trend of Preterm live births Michigan





# Trend of Extreme preterm live births (less than 24 weeks gestation) Michigan



■ 20-23 w ks	0.27	0.28	0.24	0.25	0.24	0.23	0.21	0.23	0.23	0.25
■ <20 w ks	0.15	0.18	0.14	0.12	0.13	0.15	0.13	0.11	0.11	0.11

# 2002 Preterm live births Targeted counties vs. Michigan

	Overall		Black	
	State	Targeted Counties	State	Targeted Counties
Below 24 wks	461	347 75.3%	202 43.8%	194 96%
24-31 wks	1,991	1,433 72%	706 35.5%	672 95.2%
32-36 wks	12,173	8,122 66.7%	2,789 22.9%	2,610 93.6%
Total	14,625	9,902 67.7%	3,697 25.3%	3,476 94%

# Do preterm births matter?

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- 11.3% of all live births in MI in 2002
- 67.7% of all preterm occurred in targeted counties
- One quarter (25.3%) of all preterm recorded in MI are in Black population
- 94% of all preterm in Blacks occurred in targeted counties
- Percent contribution of different gestational ages decreases with increase in gestational weeks
- Higher percent contribution of below 24 wks

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**Where 2002 preterm births  
occurred in targeted counties?**

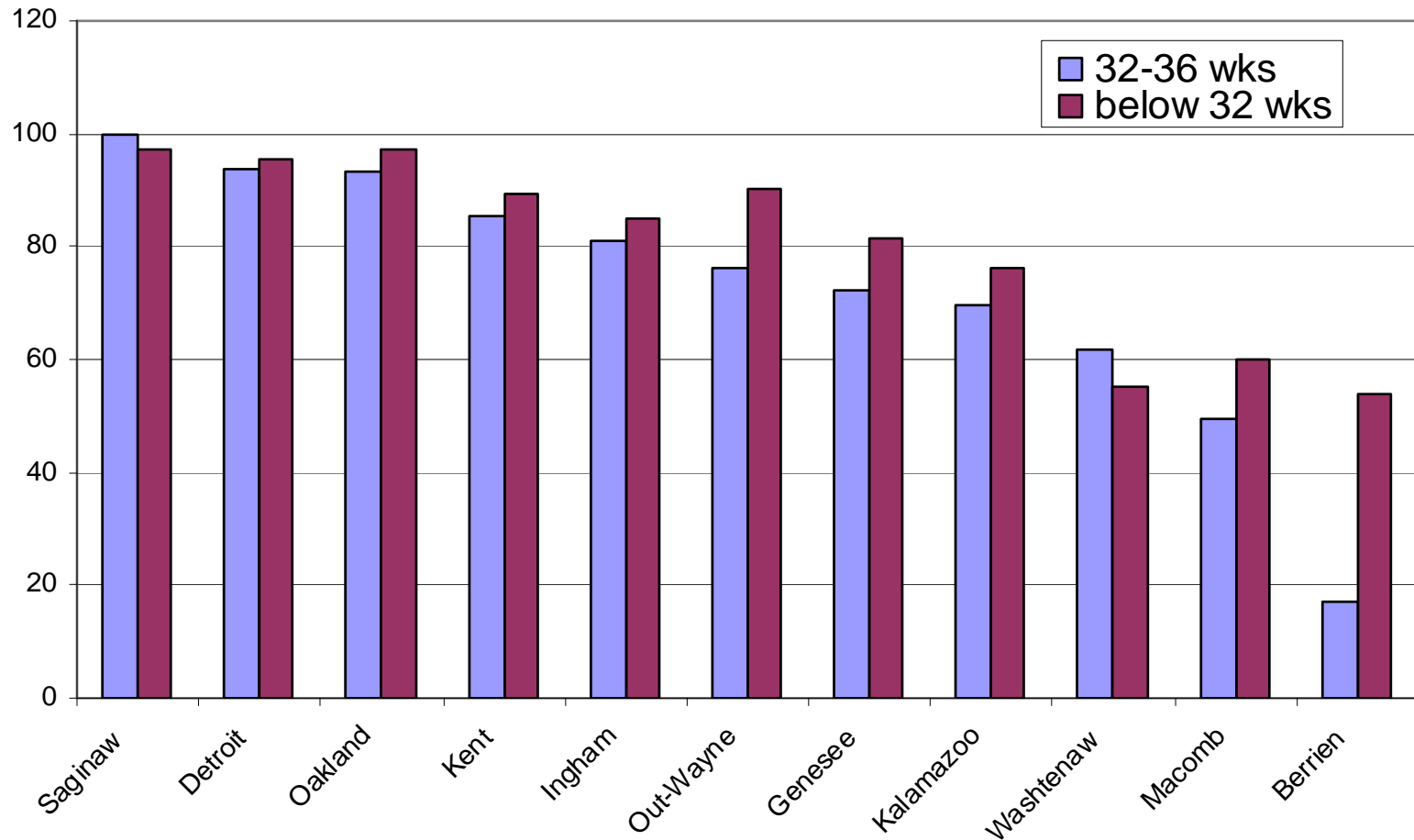
## Preterm births to Blacks at facilities without NICU beds in targeted counties

	Very Preterm	Moderate Preterm
<b>Saginaw</b>	2.7%	0%
<b>Oakland</b>	2.9%	6.8%
<b>Kent</b>	10.8%	14.6%
<b>Macomb</b>	40%	50.7%
<b>Ingham</b>	15%	18.8%
<b>Out-Wayne</b>	9.7%	23.8%
<b>Kalamazoo</b>	24%	30.3%
<b>Detroit City</b>	4.7%	6.2%
<b>Genesee</b>	18.6%	27.8%
<b>Berrien</b>	46.2%	83%
<b>Washtenaw</b>	44.8%	38.5%

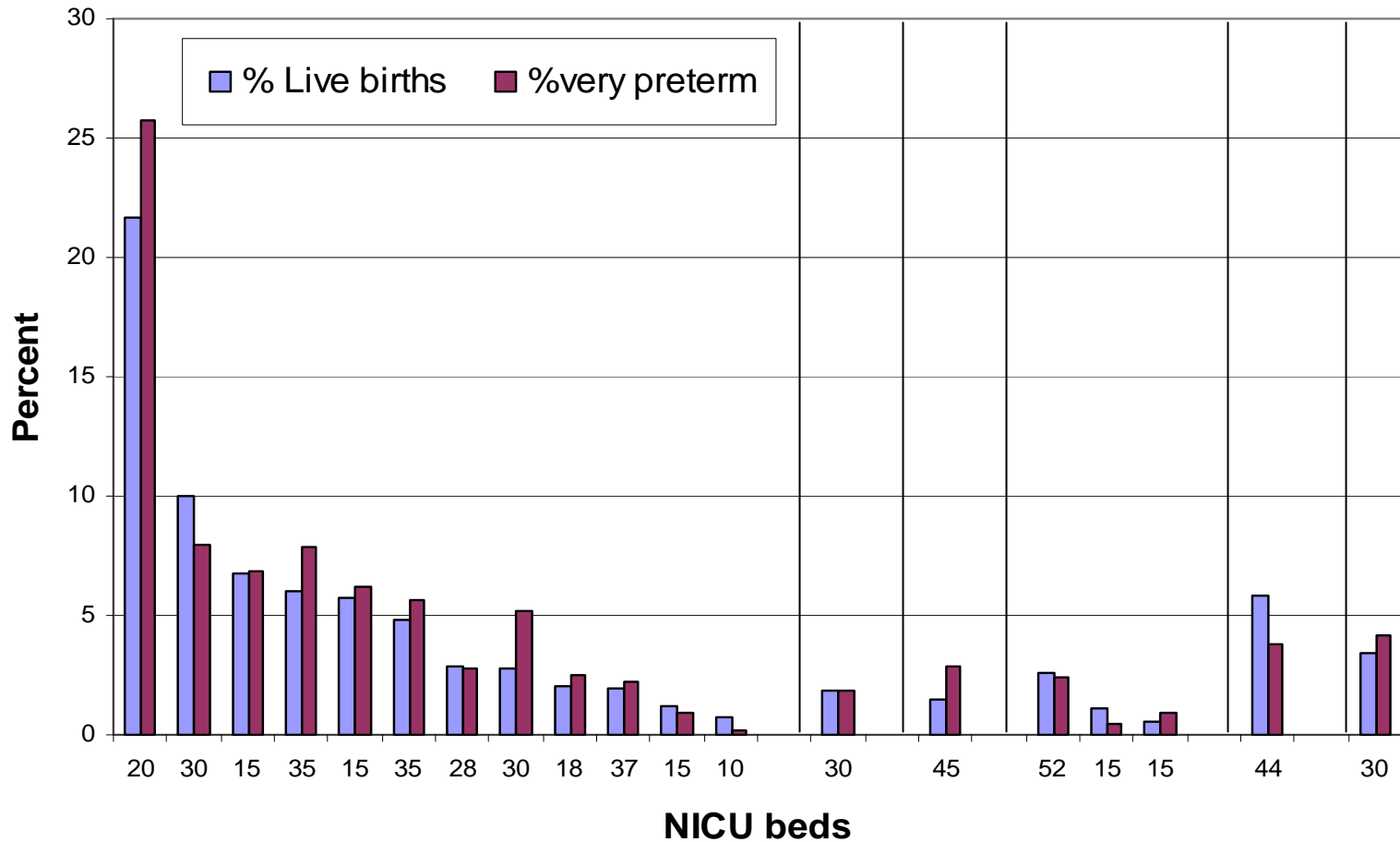
# NICU facilities where 2002 live births in targeted counties occurred

Region	Hospital ID	2002 NICU beds
<b>SOUTHEAST MICHIGAN</b>		
	1	18
	2	15
	3	4
	4	37
	5	10
	6	30
	7	28
	8	15
	9	30
	10	35
	11	15
	12	62
	13	35
	14	20
<b>MID-SOUTH</b>		
	15	30
<b>SOUTHWEST</b>		
	16	45
<b>WEST MICHIGAN</b>		
	17	15
	18	52
	19	15
<b>GENESEE-LAPEER-SHIAWASSEE</b>		
	20	44
<b>EAST CENTRAL</b>		
	21	30

# Percent of Black Preterm born at facilities with NICU in targeted counties

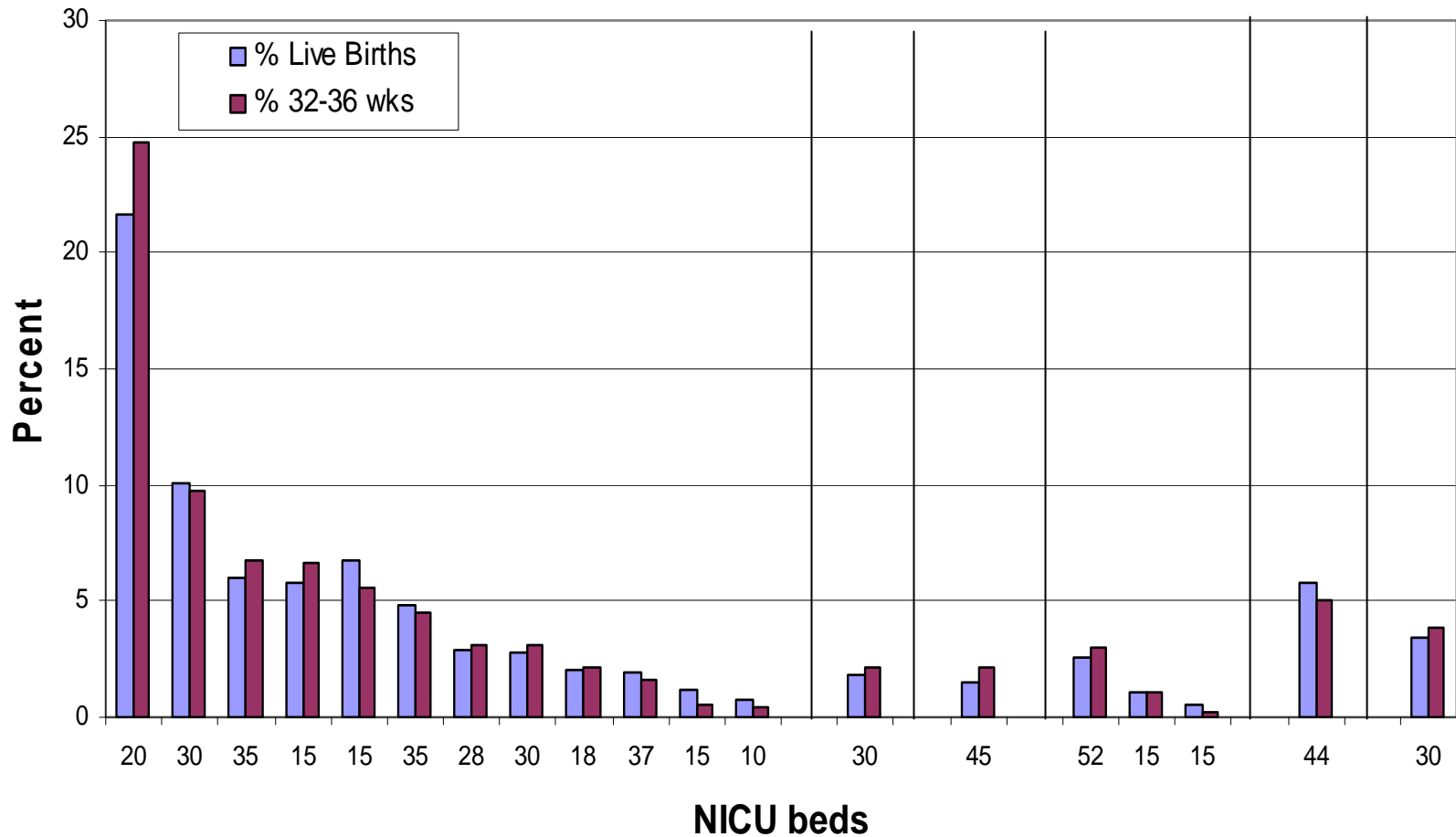


# Distribution of Black very preterm births in targeted counties by Hospitals with NICU





# Distribution of Black moderate preterm births in targeted counties by Hospitals with NICU



# Federal/State Resources by County

County	Healthy Start	REACH 2010	Closing The Gap	CityMatch Member	FIMR	NFP
Saginaw	yes	-	-	-	yes	-
Oakland	-	-	-	-	yes	yes
Kent	yes	-	-	yes	yes	yes
Macomb	-	-	-	yes	-	-
Ingham	-	-	-	yes	yes	-
Out-Wayne	-	-	-	-	-	-
Kalamazoo	yes				yes	-
Detroit City	yes			yes	yes	yes
Genesee	yes	yes	yes	yes	yes	-
Berrien	-	-	-	-	yes	yes
Washtenaw	-	-	-	-	yes	-

# General Conclusions

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- Social and health care issues
- Evaluate and improve the use of the existing resources: e.g. Healthy Start pre and interconceptional assessment, home visitation programs, etc.
- Strengthen the collaboration with birthing hospitals
- Discharge plans adjusted to each mother and newborn needs

# Discussions/Questions

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