

# Maternal weight, before, during, and after pregnancy in the United States

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# **Objectives**

**Describe the distribution and trends in maternal weight (before, during, and after pregnancy) among different populations of women in the United States**

**Compare and contrast the national and state data related to maternal weight**

# Presentation overview

- n **Weight before pregnancy**
  - Policy/definitions
  - Prevalence and trends
- n **Weight gain during pregnancy**
  - Policy/recommendations
  - National and state data sources
  - Prevalence, trends and subgroups
- n **Weight after pregnancy**
  - National and state data sources
  - Prevalence of weight retention and obesity

# Materials

§ Presentation

§ Handouts

[www.bocvf.org/pregnancy\\_weight.html](http://www.bocvf.org/pregnancy_weight.html)

§ Additional information

[www.cdc.gov/nchs/births.htm](http://www.cdc.gov/nchs/births.htm)

[www.cdc.gov/pednss](http://www.cdc.gov/pednss)

[www.cdc.gov/PRAMS](http://www.cdc.gov/PRAMS)

[www.nhlbi.nih.gov/guidelines/obesity/ob\\_gdlns.pdf](http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.pdf)

[www.cdc.gov/growthcharts](http://www.cdc.gov/growthcharts)

# **HP 2010 objectives— weight status and growth**

**19-2. Reduce the proportion of adults who are obese**

Target: 15 percent

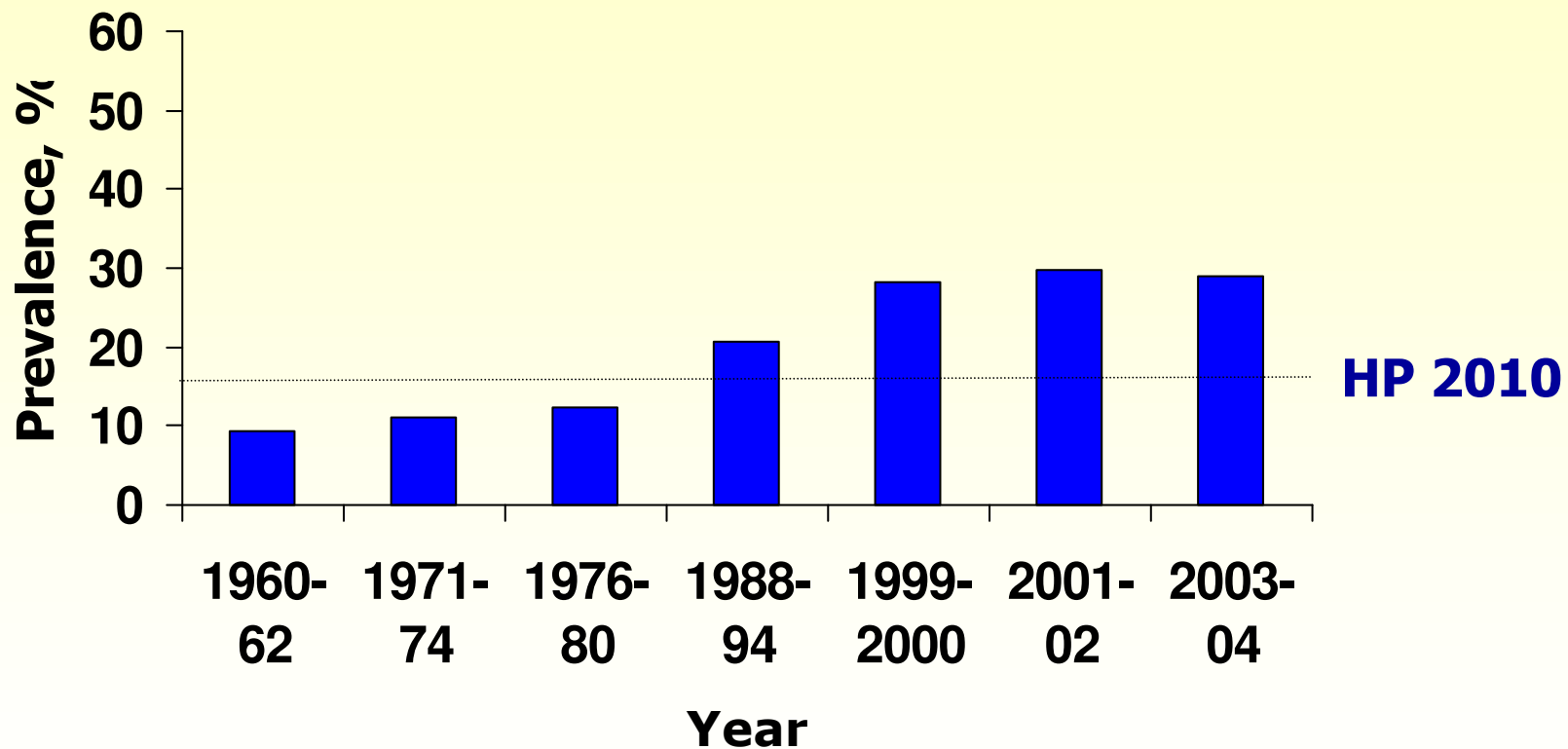
**Data source: National Health and Nutrition Examination Survey, NCHS, CDC.**

# Classification\* of adult underweight, overweight and obesity by BMI

	<i>Obesity class</i>	<i>BMI (kg/m<sup>2</sup>)</i>
Underweight		<18.5
Normal		18.5-24.9
Overweight		25.0-29.9
Obesity	I	30.0-34.9
	II	35.0-39.9
Extreme obesity	III	40+

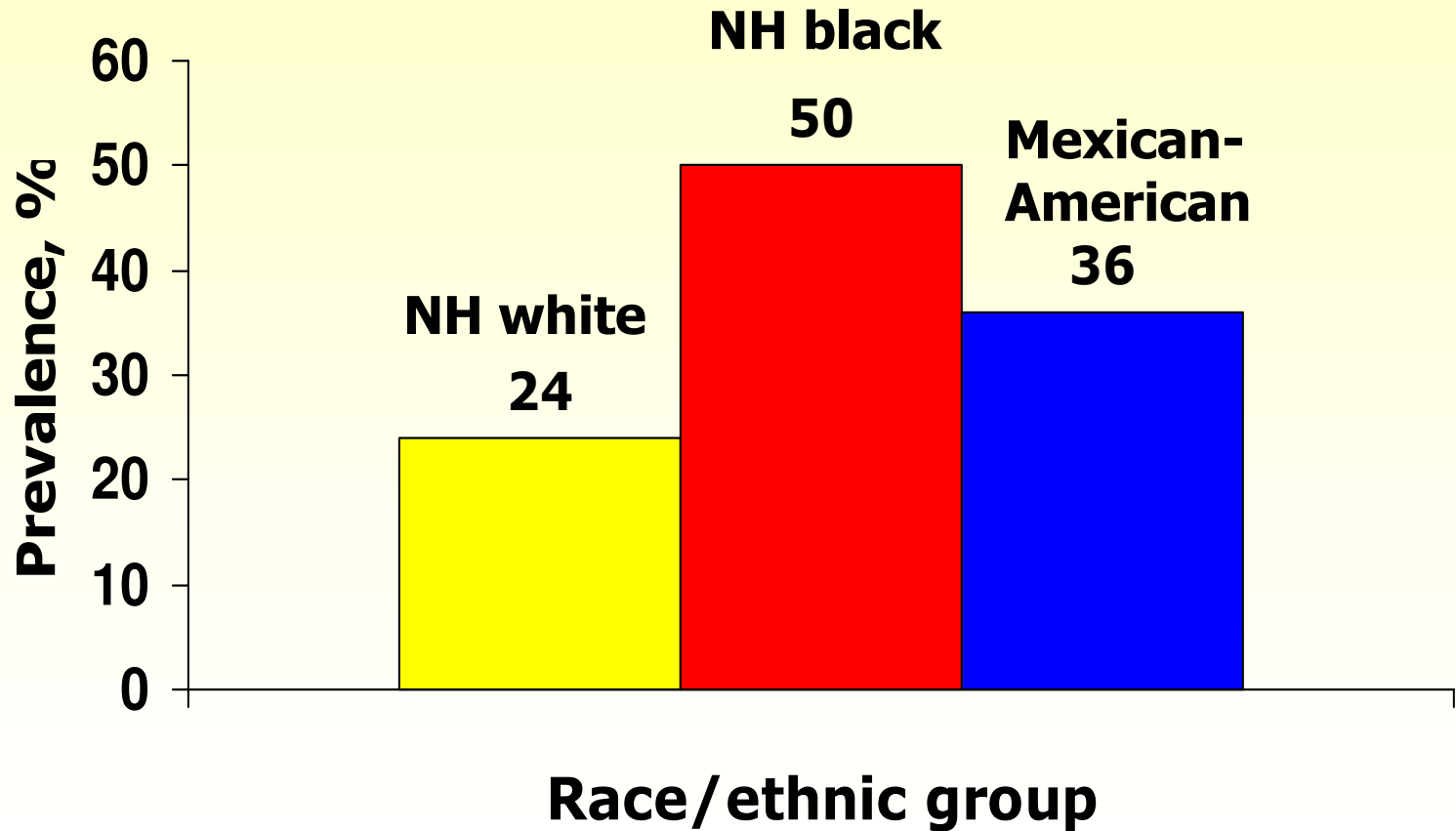
\* *National Heart Lung and Blood Institute (NHLBI), 1998*

# Prevalence (%) of obesity among U.S. non-pregnant females, aged 20-39 y, by year



Source: NHANES, Ogden et al., JAMA 2002; Flegal et al., JAMA 2002; Ogden et al., JAMA 2006

**Prevalence (%) of obesity among US non-pregnant females, aged 20-39 y, by race/ethnicity, 2003-04**



Source: NHANES, Ogden et al., JAMA 2006, NH=non-Hispanic

# **HP 2010 objectives— weight status and growth**

**19-3. Reduce the proportion of children and adolescents who are overweight or obese**

Target: 5 Percent

**Data source: National Health and Nutrition Examination Survey, NCHS, CDC.**

# Classification of adolescent\* weight status by gender- and age-specific BMI percentile

## *Gender and age-specific BMI percentile<sup>+</sup>*

**Underweight**

**<5<sup>th</sup>**

**Normal**

**5<sup>th</sup>-<85<sup>th</sup>**

**At-risk of overweight**

**85<sup>th</sup>-<95<sup>th</sup>**

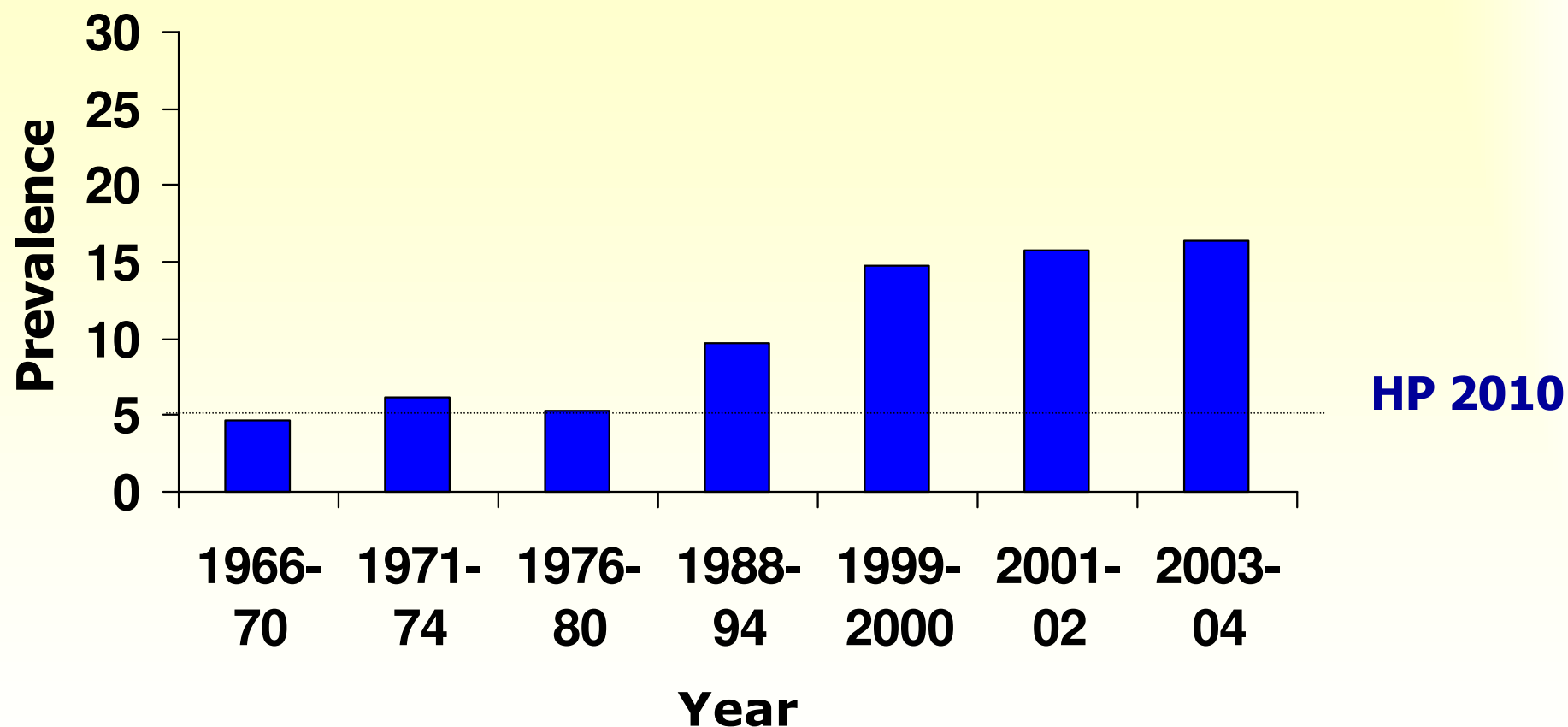
**Overweight**

**≥95<sup>th</sup>**

*\*Adolescents aged < 18 years, reference: Barlow and Dietz,  
Pediatrics, 1998*

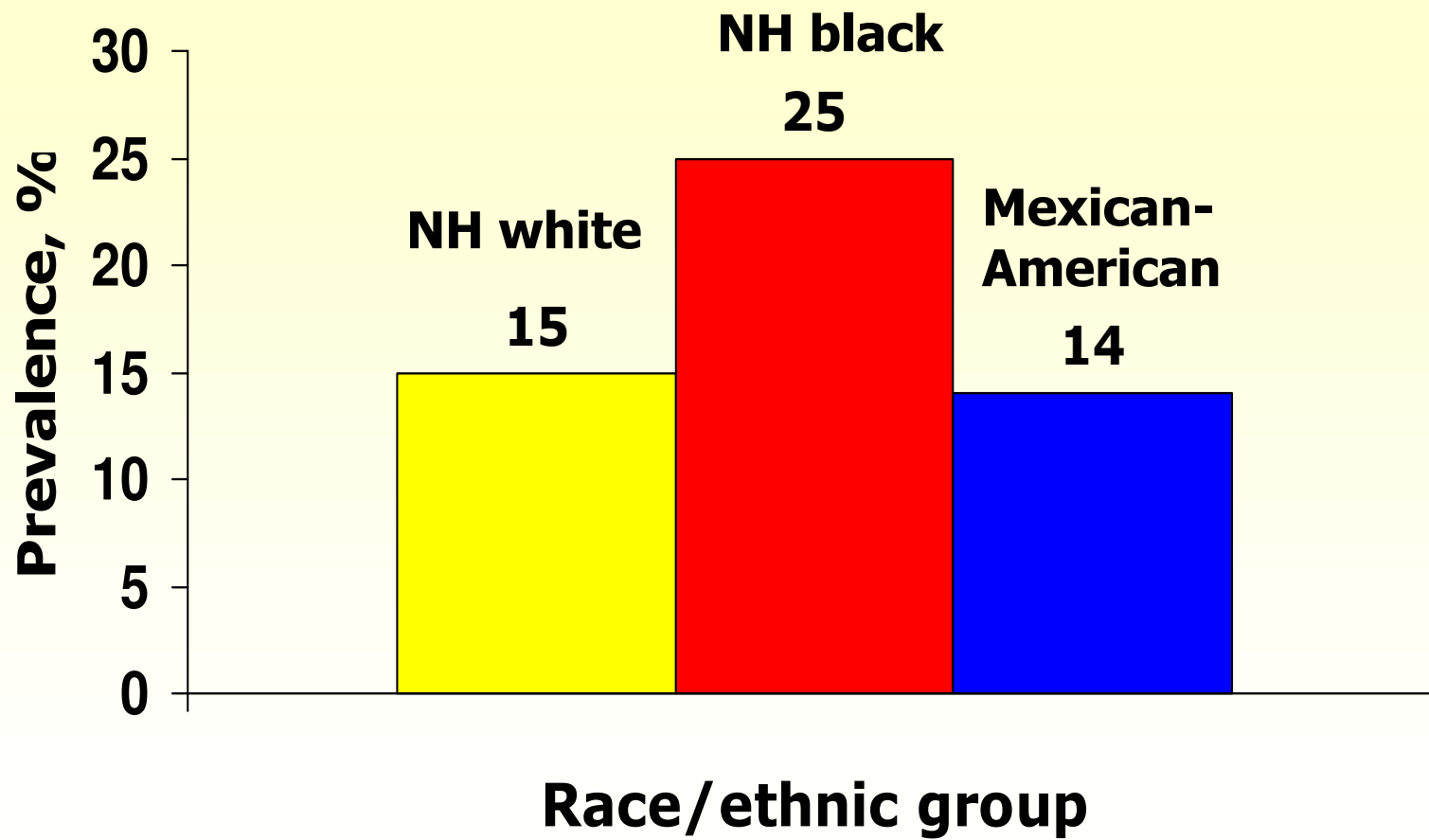
*+Percentiles based on CDC growth charts*

## Prevalence (%) of overweight among US non-pregnant females, aged 12-19 y, by survey year



Source: NHANES, Ogden et al., JAMA 2002; Flegal et al., JAMA 2002; Ogden et al., JAMA 2006

**Prevalence (%) of overweight among US non-pregnant females, aged 12-19 y, by race/ethnicity, 2003-04**



*Source: NHANES, Ogden et al., JAMA 2006, NH=non-Hispanic*

## **Summary: weight status, non-pregnant women (aged 20-39 y) and adolescent girls**

- n Among women, obesity more than doubled from 1966-2000 (34 y), but did not increase significantly from 1999-2004 (6 y)**
- n Compared with white women, non-Hispanic black and Mexican American women are more likely to be obese**
- n The trends in the prevalence of overweight among adolescent girls appear similar to that for obesity among adult women**
- n Compared with adolescent white girls, black, but not Mexican-American girls are more likely to be overweight**

# Criteria for classification of pre-pregnant weight status

## IOM, 1990 Pre-pregnant women

## NHLBI, 1998 Adult women

	BMI	BMI
Underweight	<19.8	<18.5
Normal	19.8-26.0	18.5-24.9
Overweight	>26.0-29.0	25.0-29.9
Obese	>29.0	30.0+

# Distribution of pre-pregnancy BMI, among low income women\* classified by IOM vs. NHLBI criteria

**IOM+, 1990**

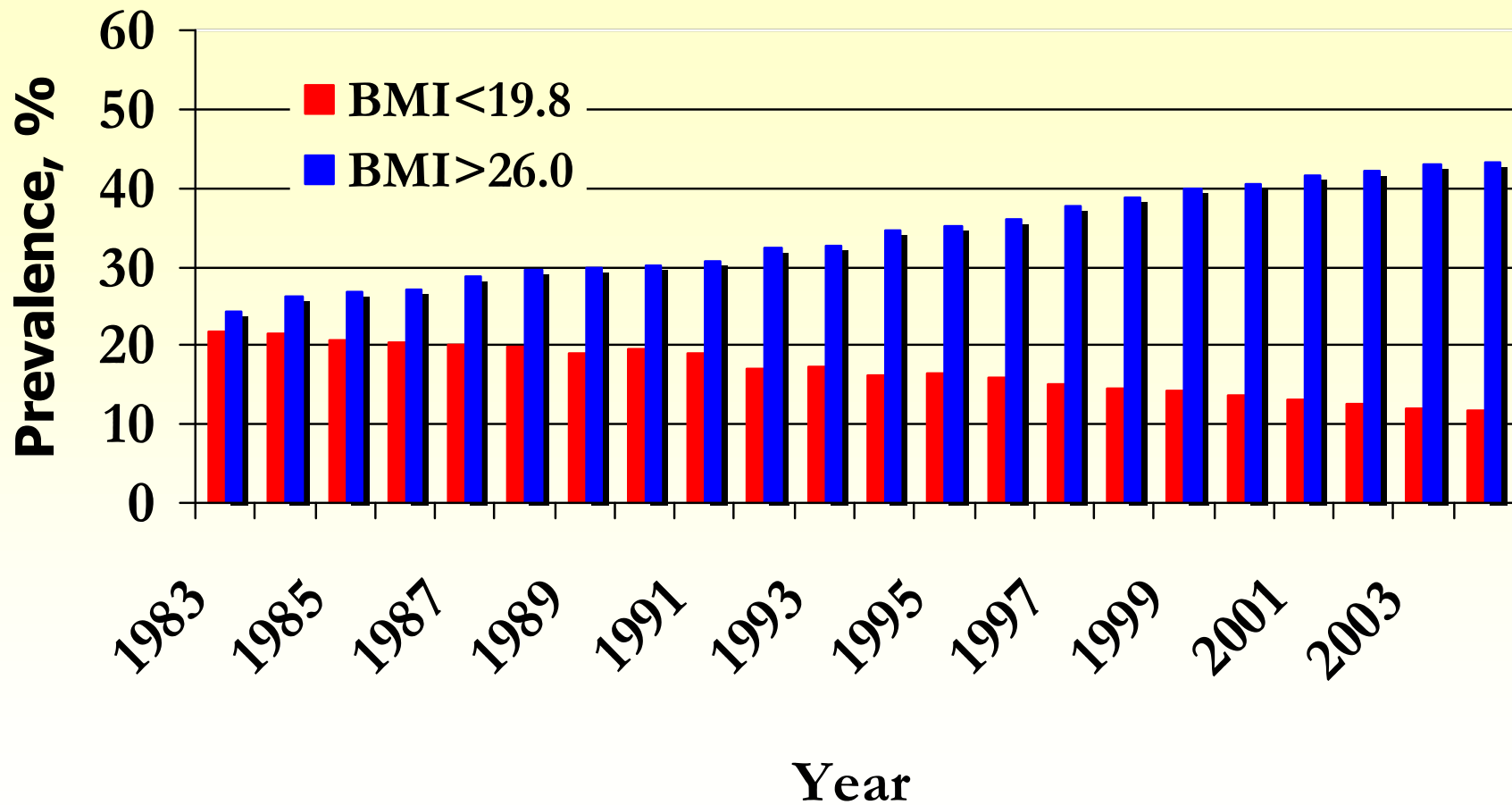
**NHLBI, 1998**

	<b>BMI</b>	<b>%</b>	<b>BMI</b>	<b>%</b>
<b>Underweight</b>	<b>&lt;19.8</b>	<b>12</b>	<b>&lt;18.5</b>	<b>5</b>
<b>Normal</b>	<b>19.8-26.0</b>	<b>45</b>	<b>18.5-24.9</b>	<b>45</b>
<b>Overweight</b>	<b>&gt;26.0-29.0</b>	<b>15</b>	<b>25.0-29.9</b>	<b>25</b>
<b>Obese</b>	<b>&gt;29.0</b>	<b>28</b>	<b>30.0+</b>	<b>25</b>

\*Pregnancy Nutrition Surveillance System, 2004, unpublished data

+Institute of Medicine

# Prevalence of pre-pregnancy underweight (BMI < 19.8) and overweight (BMI > 26), PNSS



## **Summary: pre-pregnancy weight status**

- n Prevalence of underweight and overweight vary substantially by recommended BMI criteria (IOM vs NHLBI)**
- n The prevalence of pre-pregnancy overweight among low income women increased over the last 20 years, while underweight declined**

# Pregnancy Weight Gain



## **HP 2010 objectives— pregnancy weight Gain**

**16-12. (Developmental) Increase the proportion of mothers who achieve a recommended weight gain during their pregnancies.**

**Potential data source: 2003 revision of the U.S. Standard Certificate of live birth, National Vital Statistics System, NCHS, CDC.**

# Indicators of pre-pregnancy weight and pregnancy weight gain, US birth certificate

	1989*	2003*
<i>Indicators:</i>		
Height		SR/MR+
Pre-pregnancy weight		SR/MR+
Delivery weight		MR+
Pregnancy weight gain	MR/SR	

SR=self-report, MR=medical record

\*California did not report weight gain on the birth certificate

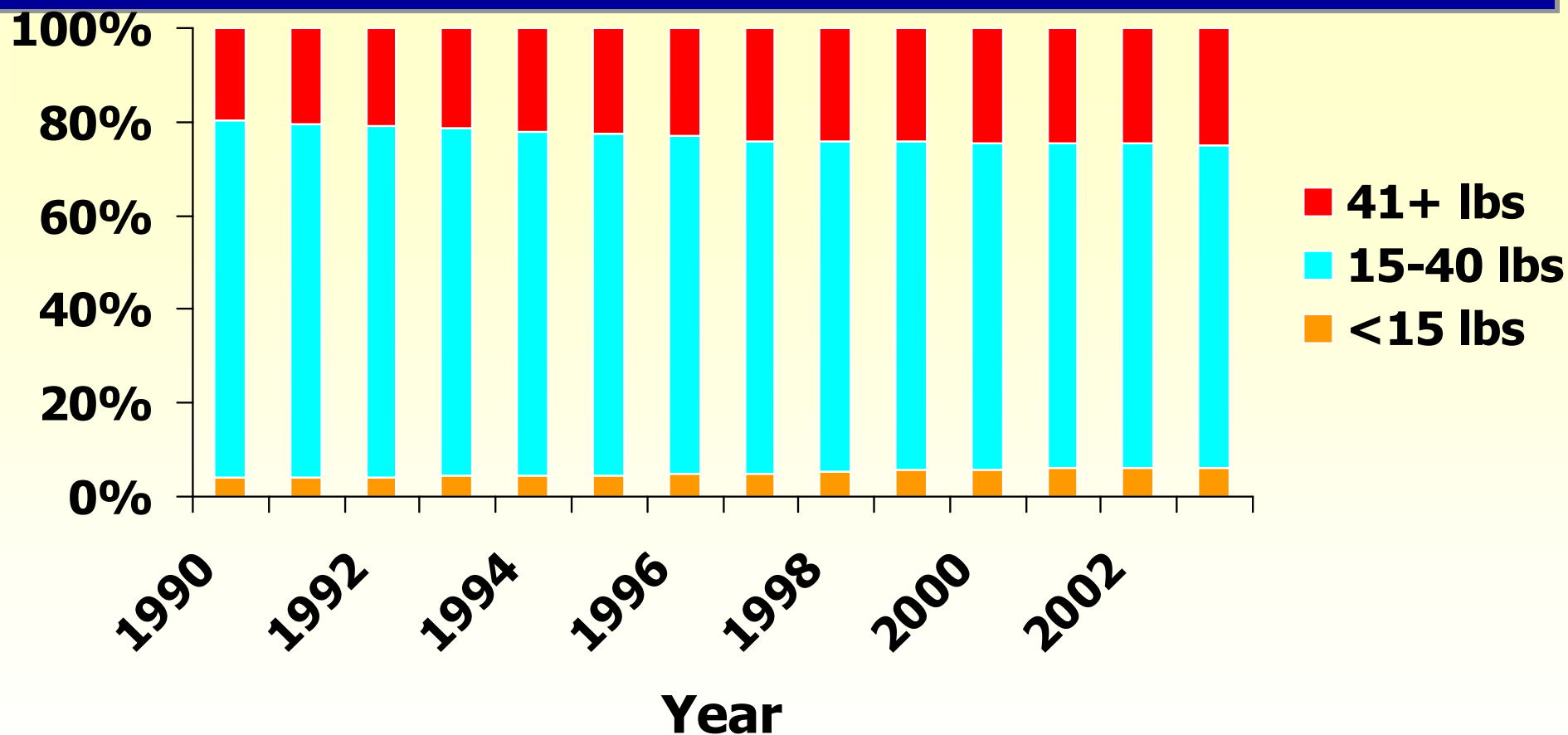
+2 states collected but did not report this data in 2003, 9 states in 2004 the remainder use the 1989 birth certificate.



# Pregnancy weight gain categories (lbs) by pre-pregnancy BMI

<i>Weight gain category:</i>	<i>Low BMI</i>	<i>Normal BMI</i>	<i>High BMI</i>	<i>Obese</i>
<b>&gt;IOM</b>	<b>&gt;40</b>	<b>&gt;35</b>	<b>&gt;25</b>	<b>&gt;25</b>
<b>IOM</b>	<b>28-40</b>	<b>25-35</b>	<b>15-25</b>	<b>15-25</b>
<b>&lt;IOM</b>	<b>&lt;28</b>	<b>&lt;25</b>	<b>&lt;15</b>	<b>&lt;15</b>

# US Trends in weight gain during pregnancy, singleton, term, primiparous births, 1990-2003



Source: National Vital Statistics System, birth data, Rhodes et al., Pediatrics, 2003 and NVSS, birth data unpublished analysis

# **U.S. data sources- trends in pregnancy weight gain**

**National Vital Statistics System, Birth Data (NVSS)** - data on all births in the US as reported on state birth certificates

**Pregnancy Risk Assessment Monitoring System (PRAMS)** – state-specific, population-based survey of maternal attitudes and experiences before, during, and shortly after pregnancy, 1988+

**Pregnancy Nutrition Surveillance System (PNSS)** - 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, 1983+ (1988+ for pregnancy weight gain)

**California Maternal and Infant Health Assessment (CA-MIHA)** – ongoing population-based survey of mothers delivering live infants in California from February-May, 1999+

# Indicators of pre-pregnancy weight and pregnancy weight gain by data source

<i>Indicators:</i>	NVSS	PRAMS	PNSS	CA-MIHA
Height		SR	M	SR
Pre-pregnancy weight		SR	SR	SR
1 <sup>st</sup> prenatal visit			M	
Pregnancy weight gain	MR/SR	BC	SR	SR

SR=self-report, M=measured, BC=birth certificate (vital statistics, birth data)

\*2003 revision includes these items; 2 states have collected but not reported this data.

# Methods

Singleton, term, live births

Twin, term births

Unadjusted analyses

PRAMS and CA-MIHA

weighted to the  
population

Pregnancy weight gain  
categorized by IOM  
recommendations

## *Years examined:*

<i>Source</i>	<i>Trends</i>	<i>Current</i>
NVSS	1993,1998,2003	2003
PRAMS	1993-94,1998,2002-03	2002-03
PNSS	1993-2004	2004
CA- MIHA	1999-2005	2004-05

## Sample size, No. of births\*, % of US births\*, 2003, by data source

<u>Source</u>	<u>n</u>	<u>Weighted n</u>	<u>% US births</u>
NVSS	2,828,009 <sup>+</sup>	NA	87
PRAMS	8,097	463,248	14
PNSS	473,211	NA	15
MIHA	3,020	438,451	14

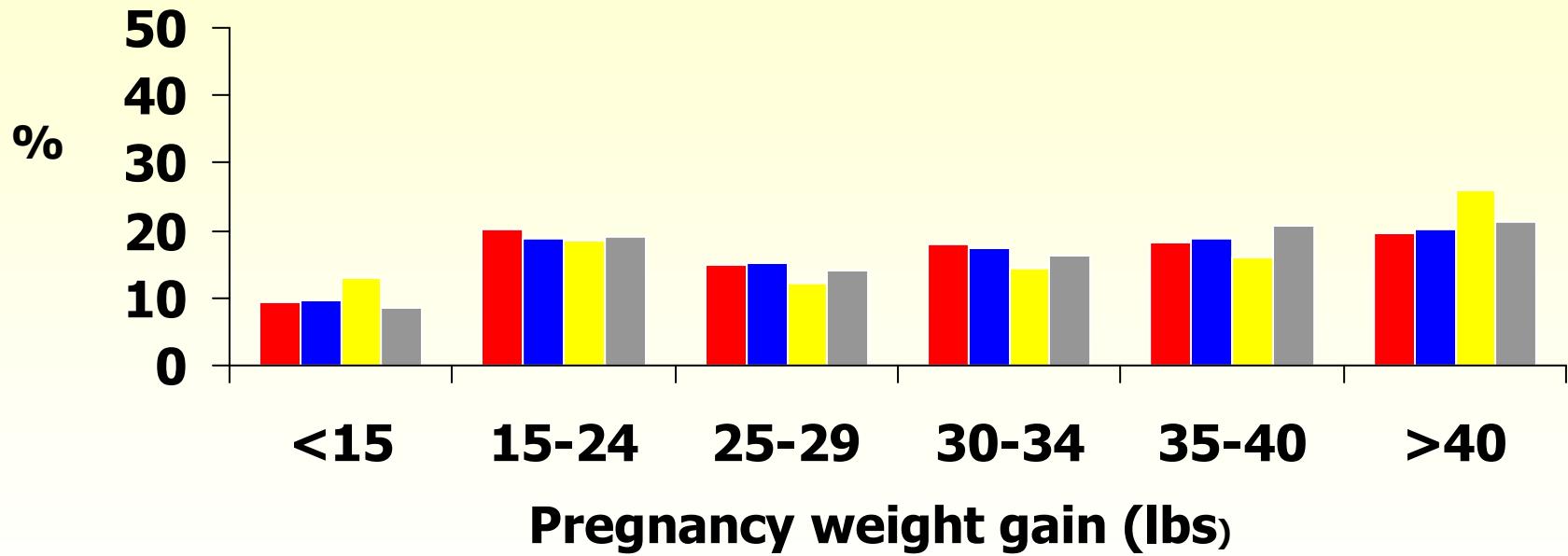
\*Singleton, term, births ( n=3,238,189); term is defined as 37-42 weeks for NVSS, 37-44 wks for PRAMS and PNSS, and 37+ w for MIHA.

# Distributions of age and race/ethnicity by data source, current year

	<b>Natality</b>	<b>PRAMS</b>	<b>PNSS</b>	<b>CA-MIHA</b>
<b>Age</b>	%	%	%	%
<20	10	10	18	8
20-34	73	75	75	75
35+	17	15	7	17
<b>Race/ethnicity</b>				
NH White	62	64	50	35
NH Black	15	15	24	5
Hispanic	18	15	22	45
Other	5	6	4	14

# Pregnancy weight gain distribution, by data source, singleton, term births, 2002-2004

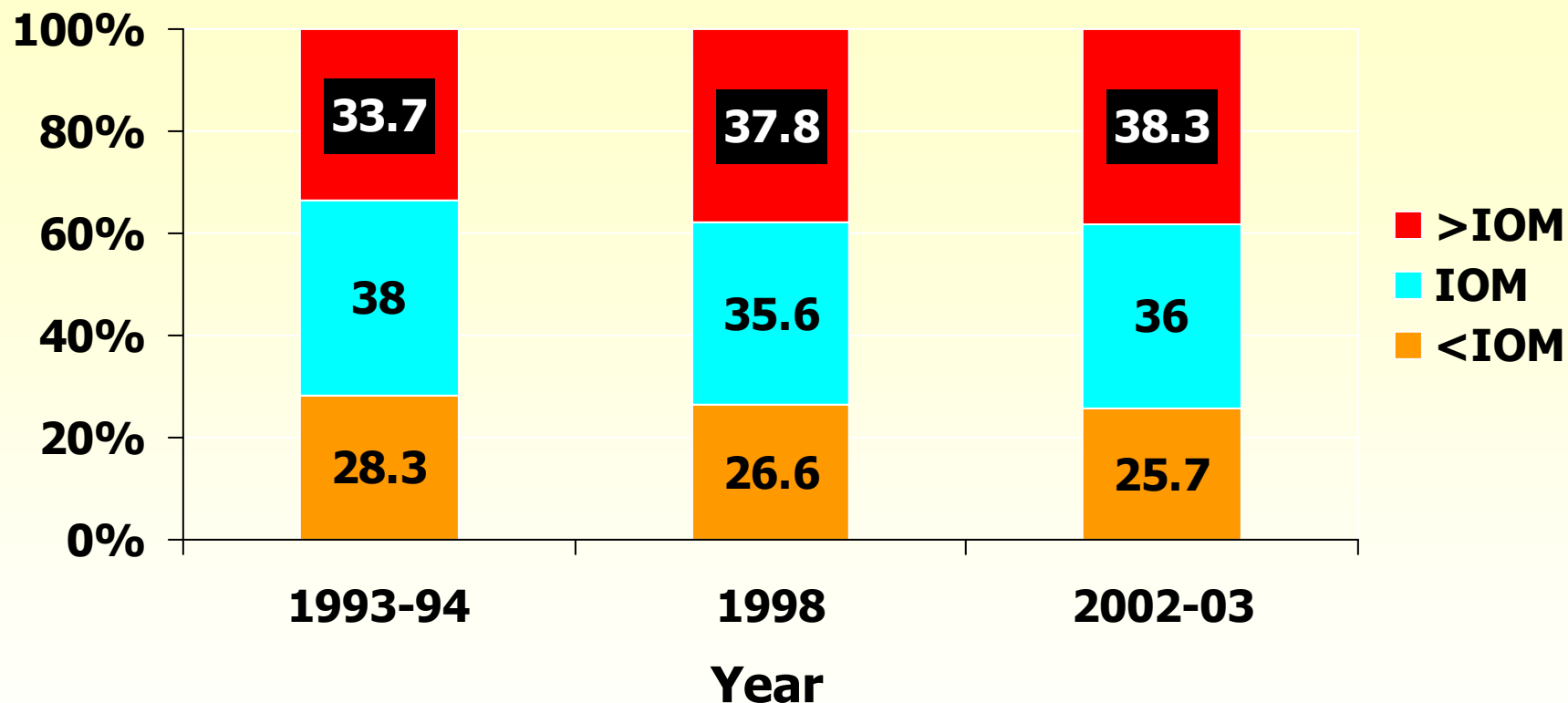
**■ NVSS 2003**                      **■ PRAMS 2002-03**  
**■ PNNS 2004**                      **■ CA-MIHA 2004-05**



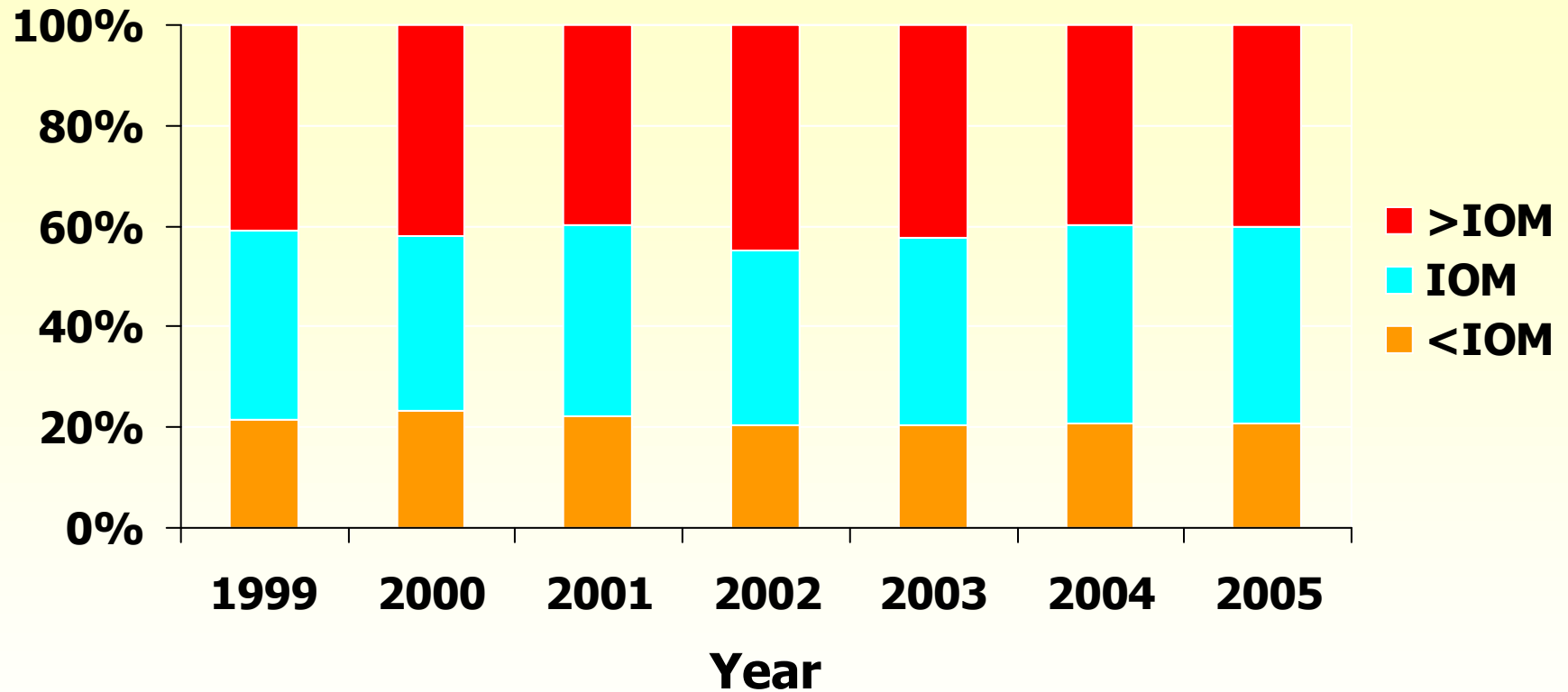
# Pregnancy weight gain categories (lbs) by pre-pregnancy BMI

<i>Weight gain category:</i>	<i>Low BMI</i>	<i>Normal BMI</i>	<i>High BMI</i>	<i>Obese</i>
<b>&gt;IOM</b>	<b>&gt;40</b>	<b>&gt;35</b>	<b>&gt;25</b>	<b>&gt;25</b>
<b>IOM</b>	<b>28-40</b>	<b>25-35</b>	<b>15-25</b>	<b>15-25</b>
<b>&lt;IOM</b>	<b>&lt;28</b>	<b>&lt;25</b>	<b>&lt;15</b>	<b>&lt;15</b>

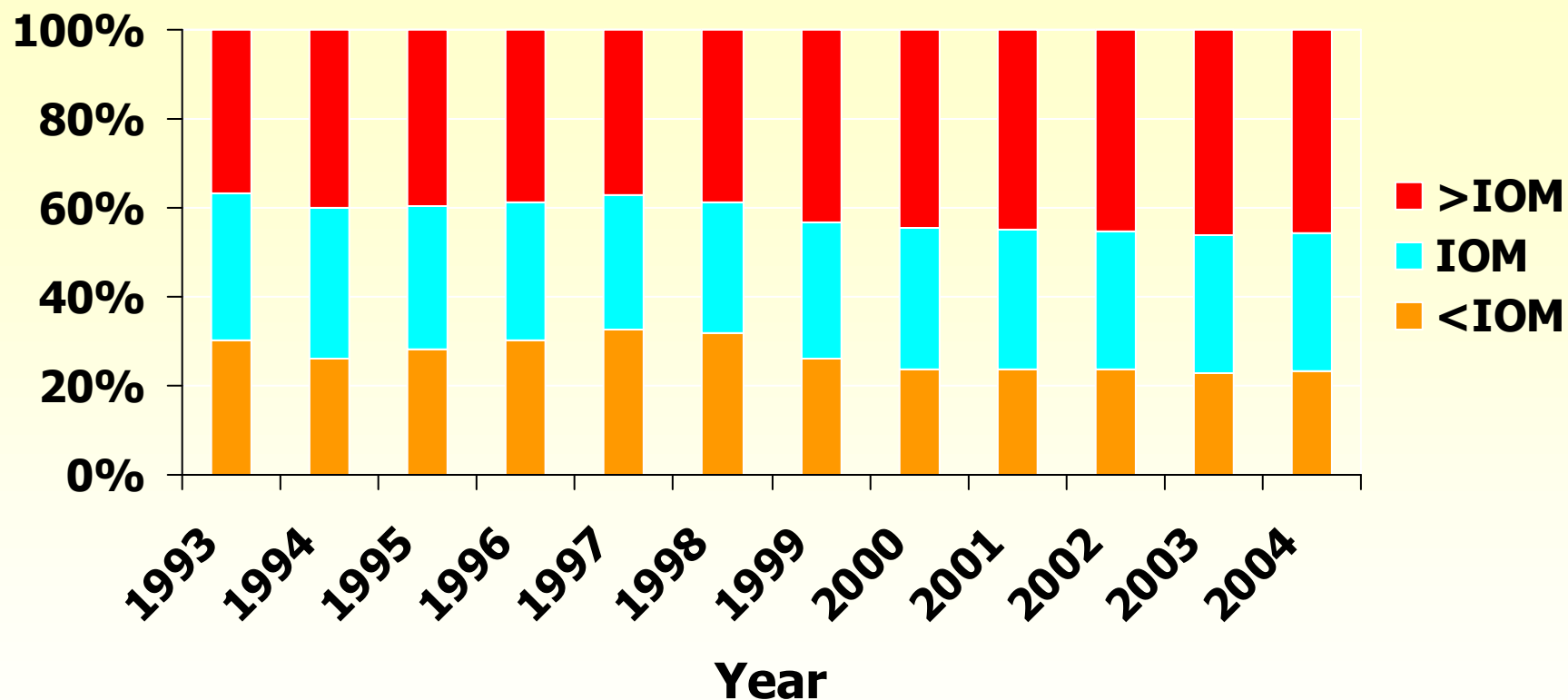
# Trends in pregnancy weight gain, singleton, term, live births, PRAMS



# Trends in pregnancy weight gain, singleton, term, live births, CA-MIHA



# Trends in pregnancy weight gain, singleton, term, live births, PNSS



# **Weight gain recommendations; sub-populations**

- n Young adolescents and black women should strive for gains at the upper end of the recommended range**

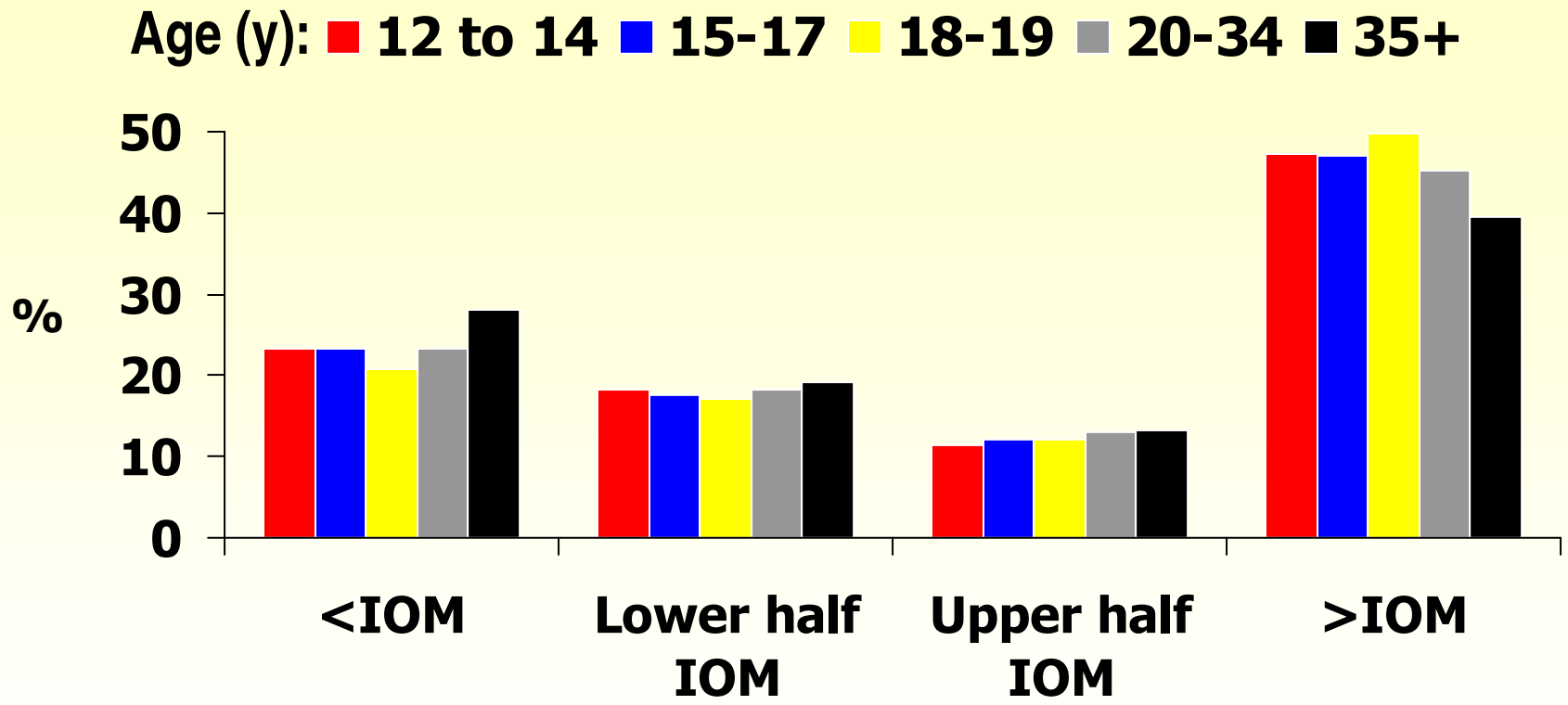
**Institute of Medicine. Nutrition during pregnancy. 1990**

# IOM pregnancy weight gain categories (lbs) by pre-pregnancy BMI

<i>Weight gain category:</i>	<i>Low BMI</i>	<i>Normal BMI</i>	<i>High BMI</i>	<i>Obese</i>
<b>&lt;IOM</b>	<b>&lt;28</b>	<b>&lt;25</b>	<b>&lt;15</b>	<b>&lt;15</b>
<b>Lower half IOM</b>	<b>28-34</b>	<b>25-30</b>	<b>15-20</b>	<b>15-20</b>
<b>Upper half IOM</b>	<b>35-40</b>	<b>31-35</b>	<b>21-25</b>	<b>21-25</b>
<b>&gt;IOM</b>	<b>&gt;40</b>	<b>&gt;35</b>	<b>&gt;25</b>	<b>&gt;25</b>

**Adapted from Table 1. Schieve et al., Obstet Gynecol 1998;91:878-84.**

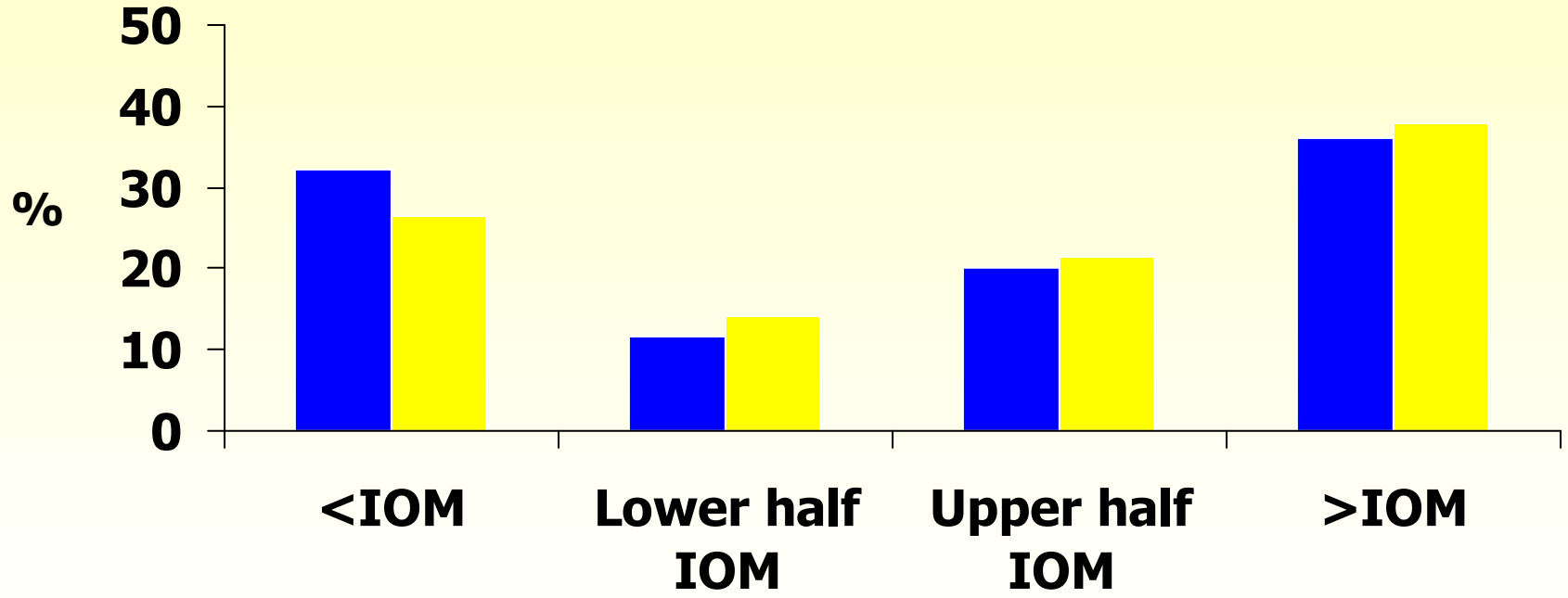
# Pregnancy weight gain distribution, PNSS 2004, singleton, term births, by age, y



PNNS, 25 states and 6 tribal agencies, unpublished data

# Distribution of weight gain, PRAMS 2002-03, singleton, term births, by race

Race: ■ Black ■ White

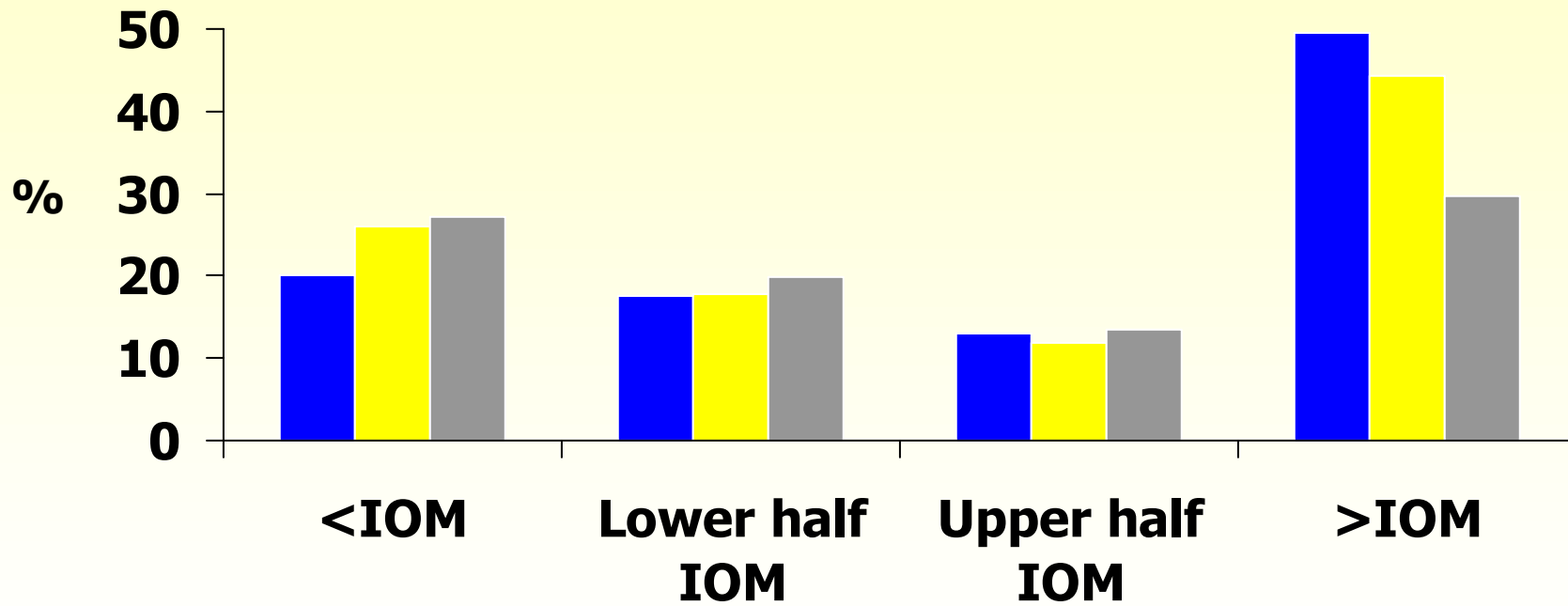


PRAMS, 9 states, unpublished data

# Distribution of weight gain, PNSS 2004, singleton, term births, by race/ethnicity

Race/ethnicity:

■ NH black ■ NH white ■ Hispanic



PNSS, 25 states, 6 tribal agencies, unpublished data

# Weight gain recommendations; sub-populations

- n Young adolescents and black women should strive for gains at the upper end of the recommended range
- n **Short women (<157 cm or 62 in.) should strive for gains in the lower end of the range.**

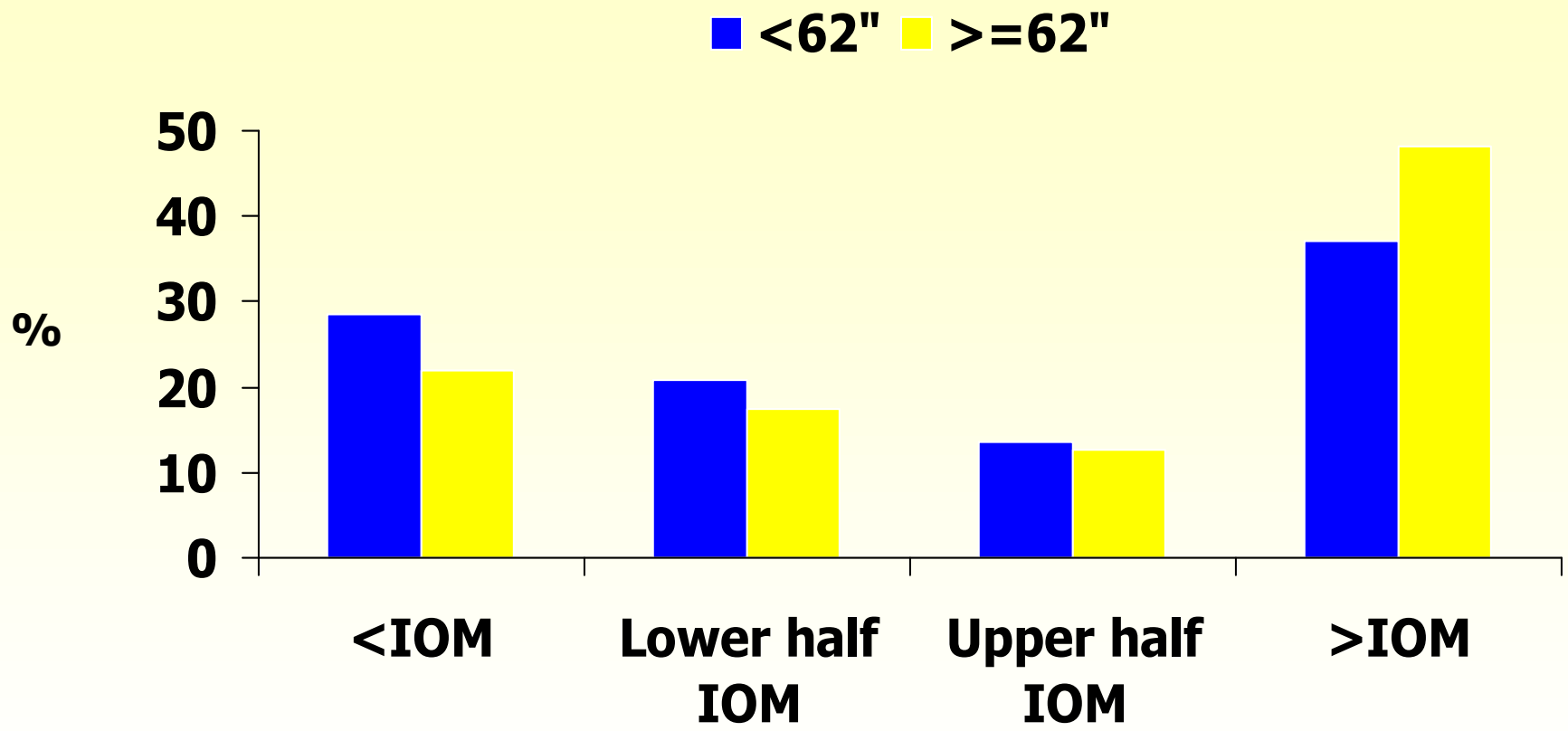
**Institute of Medicine. Nutrition during pregnancy. 1990**

# IOM pregnancy weight gain categories (lbs) by pre-pregnancy BMI

<i>Weight gain category:</i>	<i>Low BMI</i>	<i>Normal BMI</i>	<i>High BMI</i>	<i>Obese</i>
<b>&lt;IOM</b>	<b>&lt;28</b>	<b>&lt;25</b>	<b>&lt;15</b>	<b>&lt;15</b>
<b>Lower half IOM</b>	<b>28-34</b>	<b>25-30</b>	<b>15-20</b>	<b>15-20</b>
<b>Upper half IOM</b>	<b>35-40</b>	<b>31-35</b>	<b>21-25</b>	<b>21-25</b>
<b>&gt;IOM</b>	<b>&gt;40</b>	<b>&gt;35</b>	<b>&gt;25</b>	<b>&gt;25</b>

**Adapted from Table 1. Schieve et al., Obstet Gynecol 1998;91:878-84.**

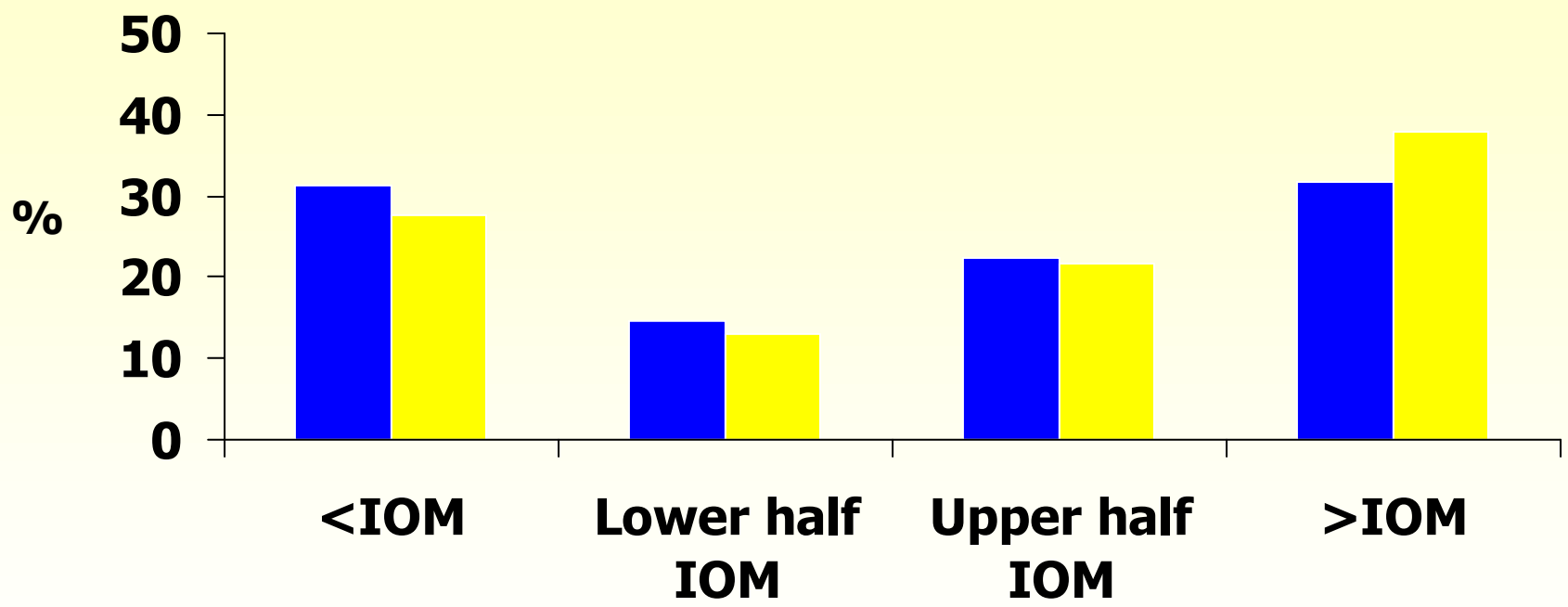
# Pregnancy weight gain, PNSS 2004, singleton, term births, by height



PNSS, 25 states, 6 tribal agencies, preliminary data

# Pregnancy weight gain, PRAMS 2002-2003, singleton, term births, by height

Height (inches): ■ <62" ■ ≥62"



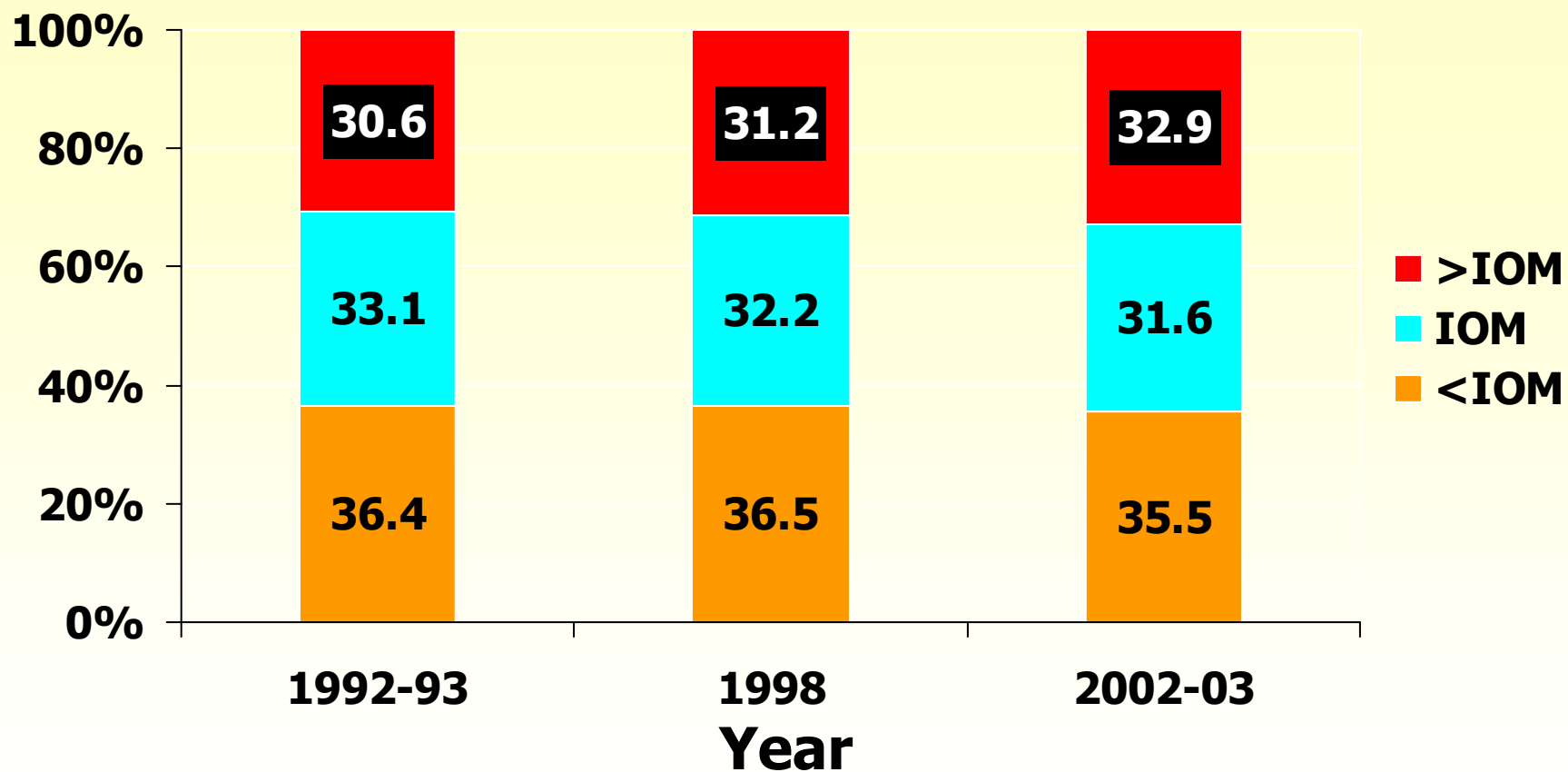
PRAMS, 9 states, preliminary data

# Weight gain recommendations; sub-populations

- n Young adolescents and black women should strive for gains at the upper end of the recommended range
- n Short women (<157 cm or 62 in.) should strive for gains in the lower end of the range.
- n **For twin gestations, recommended range is 35-45 lbs, 1.5 lbs/week in 2nd and 3rd trimester**

**Institute of Medicine. Nutrition during pregnancy. 1990**

# Trends in pregnancy weight gain, twin, term, live US births



National Vital Statistics System, birth certificates

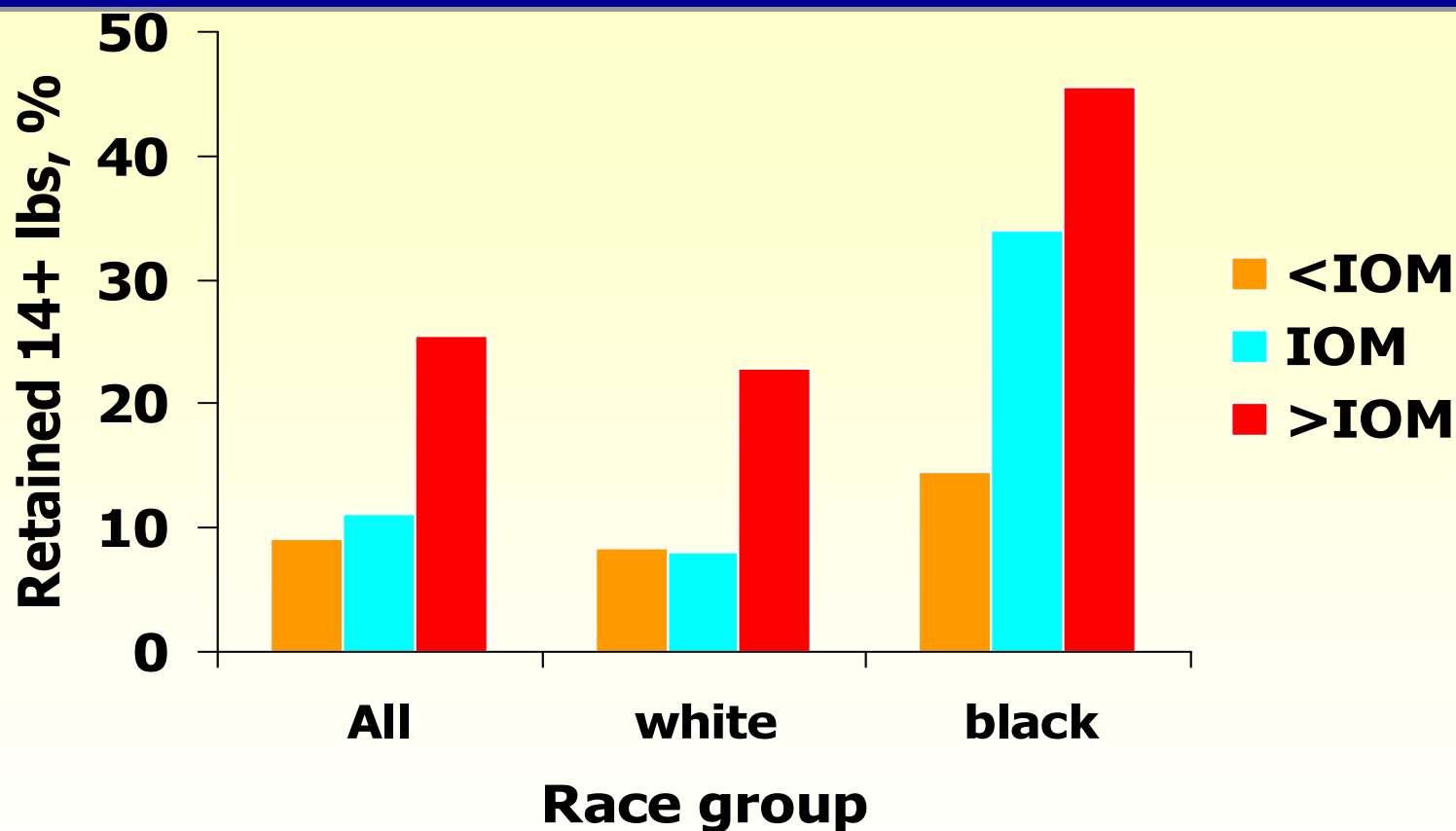
# **Summary: Pregnancy weight gain**

- n Approximately one-third of women gain within IOM recommendations**
- n Weight gain during pregnancy is fairly stable, but slight increase in weight gain above IOM recommendations**
- n No evidence that specific recommendations for subgroups are followed**

# Postpartum Body Mass Index



# Retained weight after delivery (14+ lbs), by pregnancy weight gain, US, 1988\*



Keppel and Taffel, Am J Public Health 1993;83:1100-1103, Source: National Maternal and Infant Health Survey, 1988,\*Excludes women with BMI>29.

# **Current U.S. data sources- Postpartum body mass index**

## **Early Childhood Longitudinal Study Birth Cohort (ECLS-B) –**

National representative longitudinal study of US children born in 2001 that looks at children's health, development, care, and education from birth through 1<sup>st</sup> grade

## **Infant Feeding Practices Survey 2 (IFPS-2)–** National mail panel survey on infant feeding practices that enrolled pregnant women in 2005

## **Pregnancy Nutrition Surveillance System (PNSS) -** 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, 1983+ (1988+ for pregnancy weight gain)

# Indicators of postpartum weight, by data source

<i>Indicators:</i>	<b>ECLS-B 2001</b>	<b>IFPS-2 2005-06</b>	<b>PNSS 1988+</b>
<b>1<sup>st</sup> Postpartum visit</b>			<b>M</b>
<b>3 mo postpartum</b>		<b>SR</b>	
<b>6 mo postpartum</b>		<b>SR</b>	
<b>9 mo postpartum</b>	<b>M</b>	<b>SR</b>	

**M=measured, SR=self-report**

# **Methods: Early Childhood Longitudinal Survey, Birth Cohort (ECLS-B)**

- n **Nationally representative sample of about 10,700 children**
- n **Information from birth certificates, child assessments, parent interviews and father questionnaires at age 9 mo (6-22 mo)**
  - **Weight of respondent or other adult**
- n **Restricted license required for full dataset**

# **Analytic Methods**

**Used data source from training seminar**

**Pre-pregnancy weight (PPW) and pregnancy weight gain (PWG) were categorized on the data source**

**PPW (lbs): <110, 110-129, 130-149, 150-159, 160+**

**PWG (lbs): <10, 10-19, 20-29, 30-39, 40-49, 50-59, 60+**

**Maternal height and 9 mo postpartum weight were continuous**

**– Obesity defined as BMI  $\geq 30$  kg/m<sup>2</sup> regardless of age**

**Unadjusted analyses, weighted to the US population**

# Sample

Birth cohort (n=10,700)\* **(Total)**

Mother was respondent (n=10,550)\*

Mother was weighed at 9 mo postpartum (n=8,050)\* **(BMI)**

Singleton, term births (n=5,350)\*

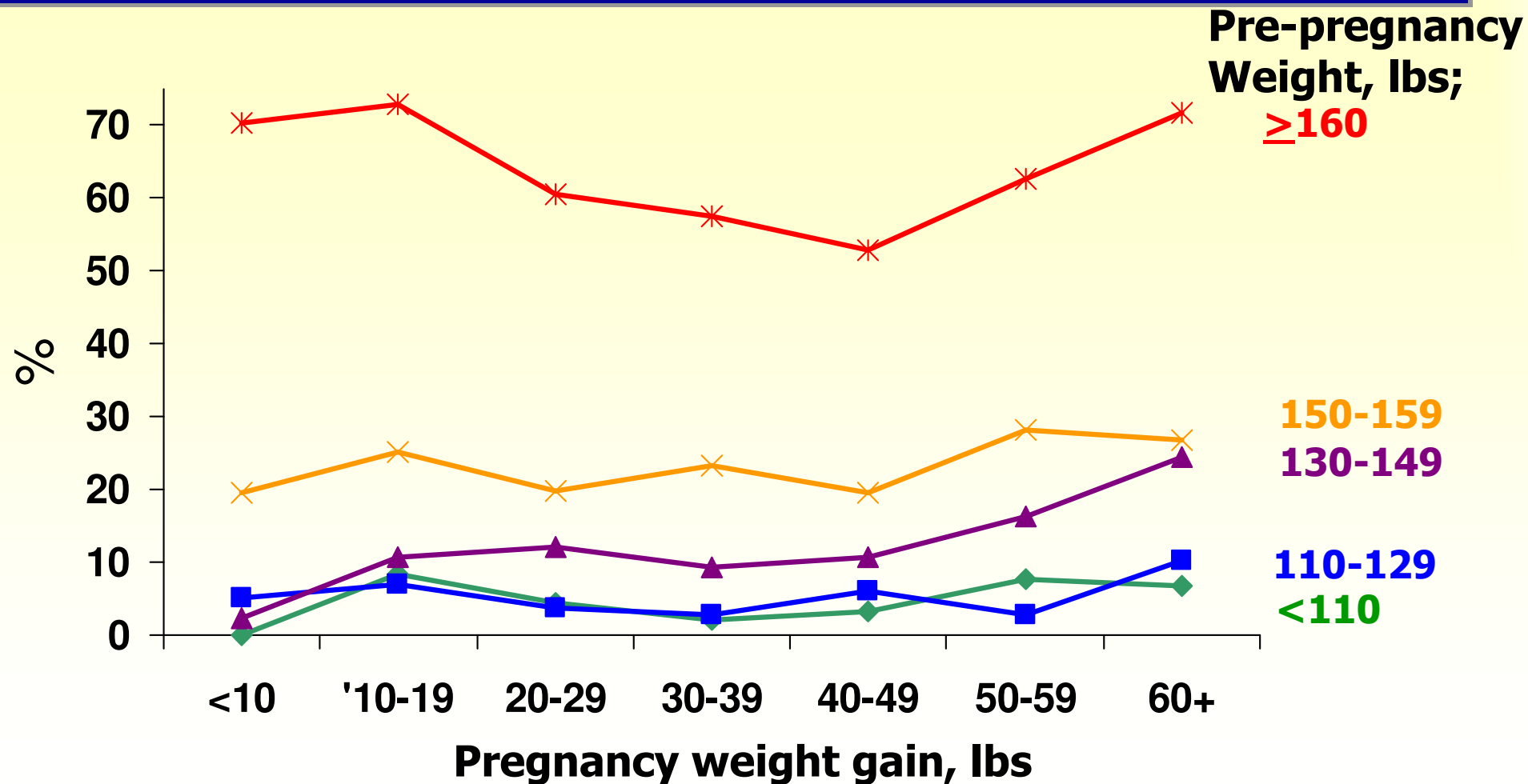
Non-missing information on pre-pregnancy weight, height,  
and pregnancy weight gain (n=5,300)\* **(Final)**

**\*Rounded to the nearest 50**

# Distributions of mother's age and race/ethnicity ECLS-B, 2001, by sample

	<b>Total</b>	<b>BMI</b>	<b>Final</b>
<b>Age</b>	<b>%</b>	<b>%</b>	<b>%</b>
<20	7	8	8
20-34	75	76	76
35+	18	17	16
<b>Race/ethnicity</b>			
NH White	57	58	59
NH Black	14	14	13
Hispanic	23	22	22
Other (includes multiracial)	6	6	6

# Prevalence of postpartum obesity (BMI $\geq$ 30), by pre-pregnancy weight and pregnancy weight gain, singleton, term US births, 2001



CLS-B, preliminary, unpublished data

# Limitations---ECLS-B analysis

- n **Data on mother's weight at 6-22 months available on 75% of births**
- n **Self-reported pre-pregnancy weight, height, and pregnancy weight gain**
- n **Training seminar data source: categorical pre-pregnancy weight and pregnancy weight gain**

# **Summary: Postpartum weight status**

**1988 NMIHS data indicate pregnancy weight gain associated with postpartum weight retention (14+ lbs)**

**National and state data sources may provide useful information about postpartum weight status since IOM recommendations**

**Preliminary analysis of ECLS-B suggests little association between pregnancy weight gain and postpartum obesity except among women who weigh 130-149 lbs before pregnancy**

# Challenges

- § **HP 2010 objectives for obesity and overweight not met**
- § **Different criteria for pre-pregnancy overweight/obesity**
  - § **IOM vs NHLBI**
  - § **Adolescents vs Adults**
- § **No national surveillance system to monitor pregnancy weight gain**
- § **Obese women lack upper limit on weight gain recommendations**
- § **No evidence of increased adherence to IOM recommendations over time or to subgroup recommendations**

# Acknowledgements

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