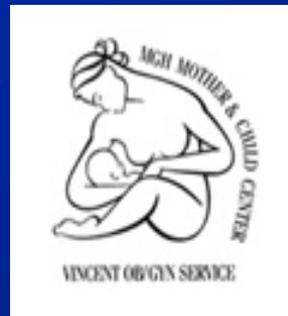
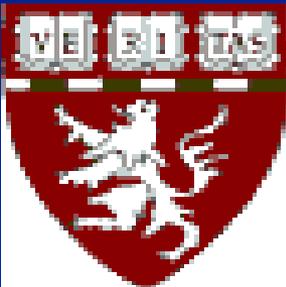


# Perspective on “C” Birth

1940 to Present

Fredric D. Frigoletto, Jr., M.D.  
Massachusetts General Hospital  
Harvard Medical School



“I have no disclosures to announce”

Fredric D. Frigoletto, Jr., M.D.

# 1940's

50% of U.S. Births at home

Maternal Mortality for

Primigravid “C” ~ 6%

“C” rate ~ 3.5%

# 1950's

- “C” rate ~ 5%
- 99% of U.S. births @ hospitals
- Antibiotics
- “C” MMR ~ 1%

# 1960's

- Anesthesia (The Verdict)
- Epidural
- Blood Banks 24/7
- Intensive Care
- More Antibiotics
- EFM

# 1970's

- MFEM
- Neonatology
- Fetus as a patient
- Marked increase “C” rate
- NIH CDC on “C” birth
- “C” MMR 4/10,000

# 1980's

- International comparisons
- AML
- Increasing threat of malpractice
- “C” delivery MMR ~ 4 times greater than vaginal delivery

Many confounding factors make it impossible to assign a specific MMR for all women

# 1990's

- National push for VBAC
- Negative side of VBAC's
- Increasing maternal age, weight, birth weight
- IVF and increasing maternal age leads to increasing multiples
- Plummeting use of operative delivery

# 2000's

- Pelvic floor morbidity
- “C” delivery rate increased greater than 40% since 1996
- “C” delivery on maternal request
- Changing attitudes

# What Happened?

1950's

More medical management of pregnancy

Changes in management of labor pain

EFM – US – Fetus becomes patient

- NICU's
- New discipline of MFM
- Improved infant survival

Medico legal impact

Plummeting use of forceps

Increasing maternal age, weight, and birth weight

Cesarean delivery on maternal request

2000's

## NEJM

January 7, 1937

Ten Yr. Study of 703 “C” Cases at BCH

TYPE	NO	DEATHS	MMR (%)
PRIMIGRAVID	395	27	6.8
REPEAT	308	3	1.0

$22880 / 703 = 3.07\%$  NEJM 216:1:37

# Method of delivery\*

	Primigravidas		Multigravidas	
	No.	%	No.	%
Spontaneous	31	15.5	184	55
Low forceps	115	57	108	32
Midforceps	44	22	36	11
Breech	8	4	3	0.8
Version Extraction	1	0.5	2	0.6
Cesarean Section	2	1	2	0.6
TOTAL	201	100	335	100
<b>*Statistics include 5 sets of twins</b>				
			<b>AJOG 1992;305:65</b>	

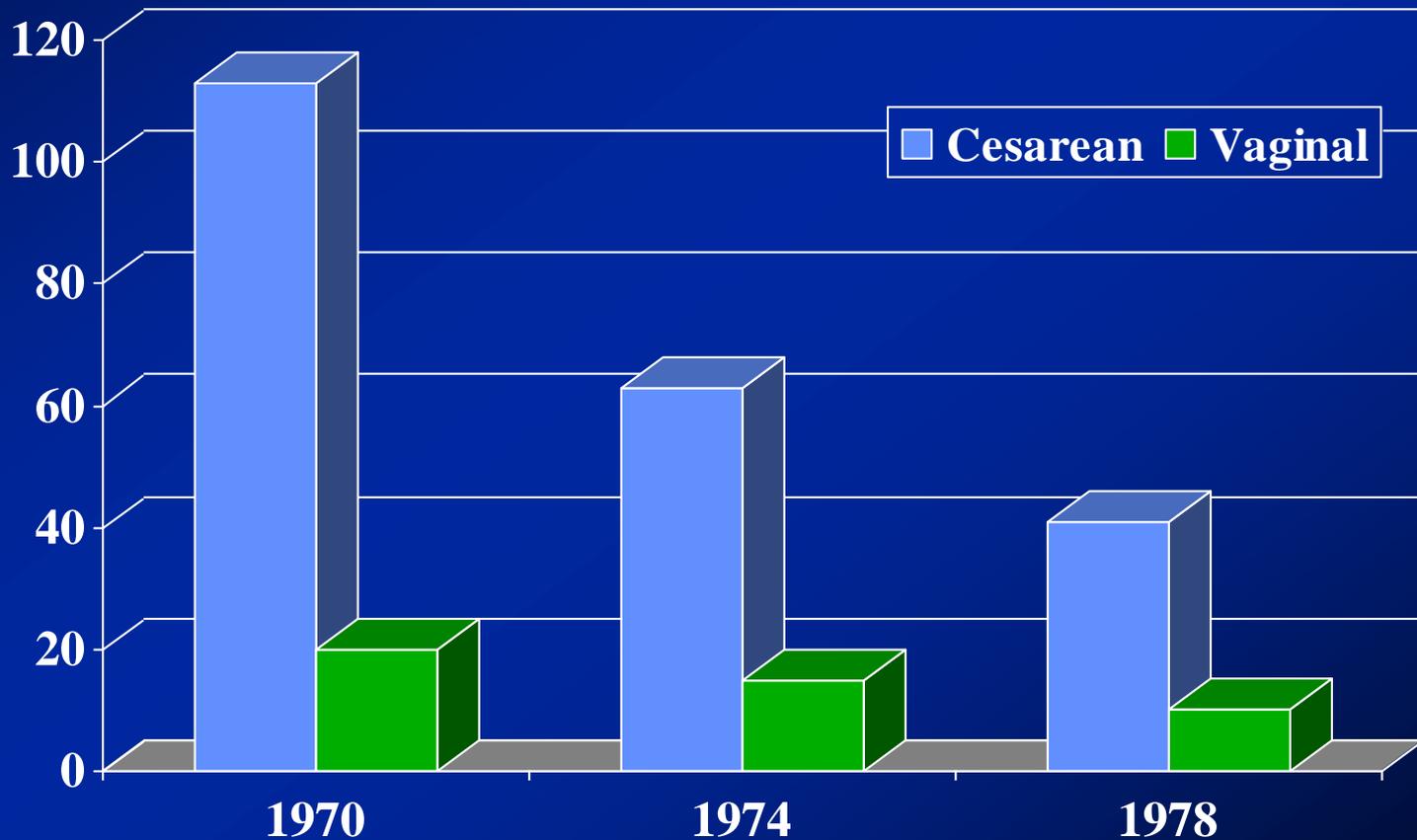
# Cesarean Births USA

1960 to 1980

- Remained at 5 to 6% through the 60's
- From 5.5% in 1970 increased to 15% in 1978
- NICHD TASK FORCE ON "C" BIRTH CREATED
- CD Conference

# Maternal Mortality Ratios

Per 100,000 births



## “C” Section

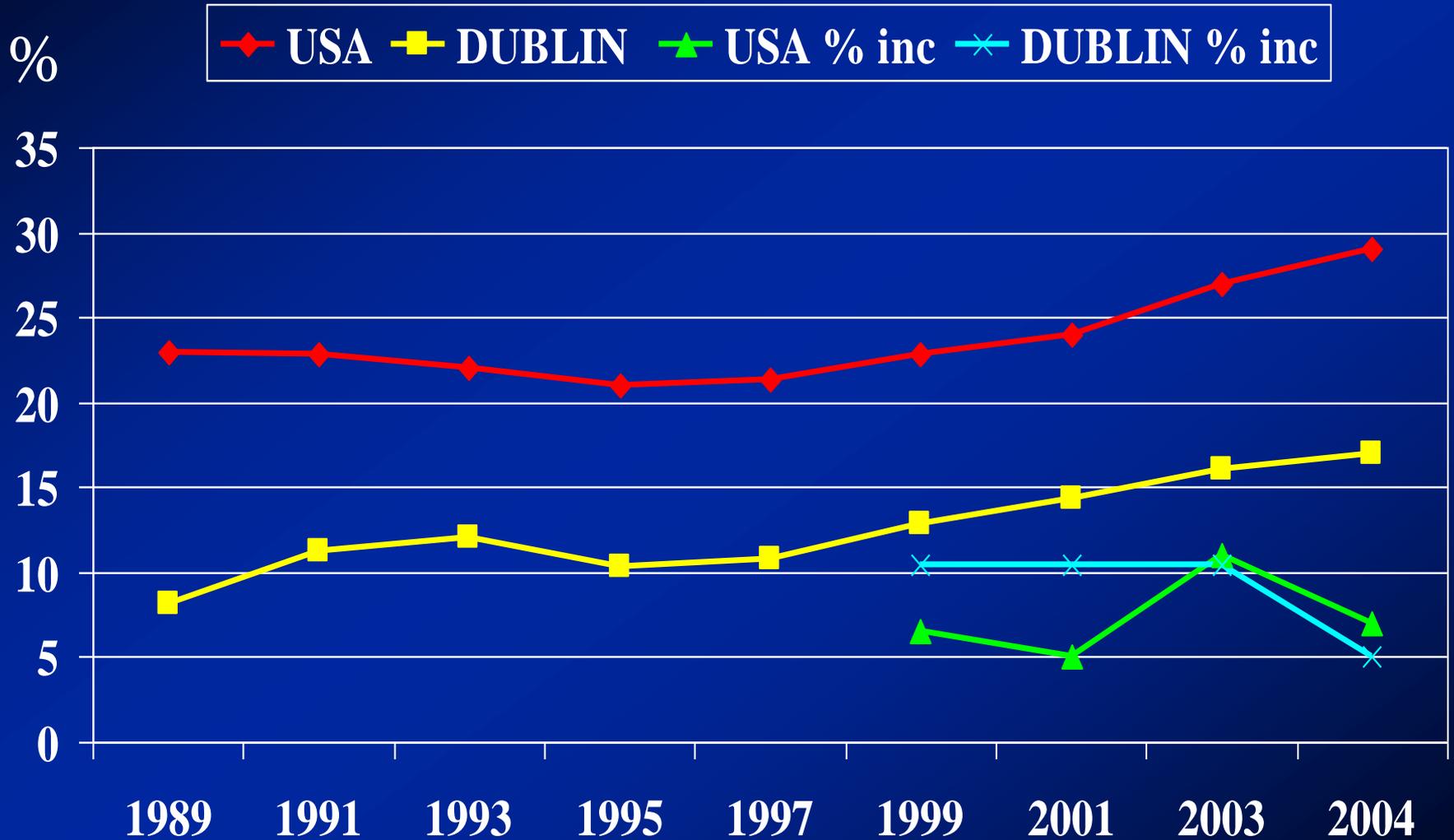
# Massachusetts Hospitals 1992-1993

<b>Total</b>	<b>30,730 = 21.9% (Nat'l Avg)</b>
Primigravid*	14,584 = 25.4%
Multips**	3,802 = 5.7%
*Range 13.3% TO 52.9%	
**Range 1.2% TO 11%	





# Total "C" Rate



# National Maternity Hospital Dublin

## 10 year comparative table

YEAR	#Delivered	Primigravid	% "C"	% Induction
1994	6244	41.1	8.8	16.9
1995	6616	41.5	10.3	16.8
1996	7173	44.8	10.8	15
1997	7546	44.2	10.8	18.8
1998	7814	45.7	12.8	17.1
1999	7534	46	12.9	14.6
2000	7722	44.4	14.2	15.6
2001	7980	44.5	14.4	15.4
2002	8022	45.5	15.6	23.7
2003	8255	45.4	16.1	24.6
2004	8318	44.9	17.0	24.3

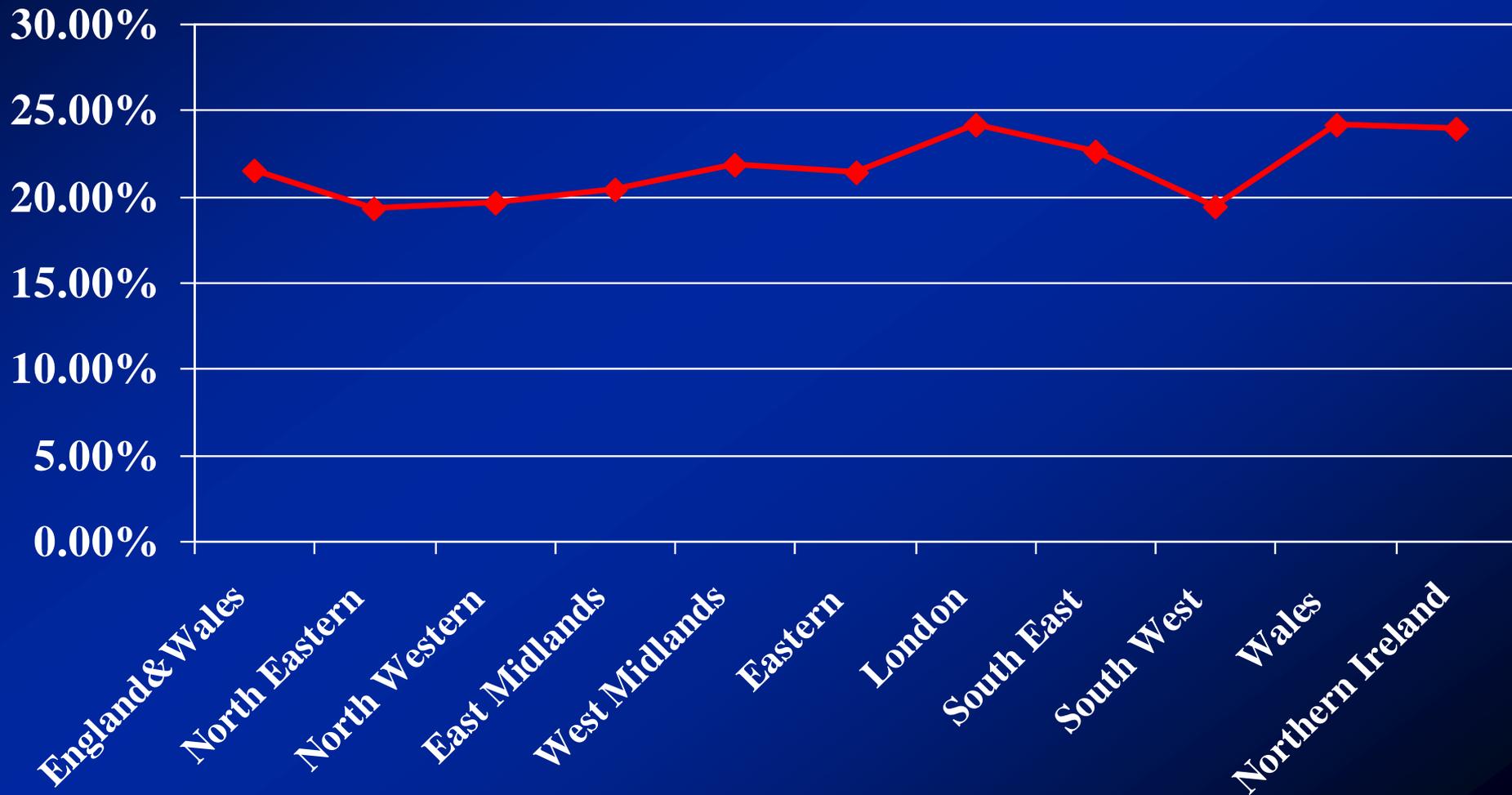
# Dublin “C” Rate

	Total	Primigravid
1994	8.8%	41%
2004	17%	45%

# Huge Rise in Caesarean Births

**BBC NEWS**

October 26, 2001



# Non OB Factors Contributing to “C” Rates

- Hospital volume
- Teaching vs non teaching
- Individual practice style
- 24 hr obstetric coverage
- Payer source
- Intrapartum nursing
- Litigation

# Hospital Volume

No clear relationship

What limited data exists is not  
case mix adjusted

# Teaching vs Non Teaching

Cesarean rates are lower in teaching  
and county hospitals

# Role of the Practitioner

- 24 hour in house obstetrical coverage services have lower cesarean birth rates
- Individual practice style
- Intrapartum nursing

# THE GREENBAY CESAREAN SECTION STUDY

7335 Singleton Deliveries

1986 - 1988

11 Obstetricians

Rates 5.6% - 19.7%

Not Attributable to Risk, S-E, or Service Status

Higher rates  $\nrightarrow$  improved neonatal outcome

**AJOG 1990;162:1593**

# The Physician Factor in C/S Rates

Goyert, Bottoms NEJM 320-706-89

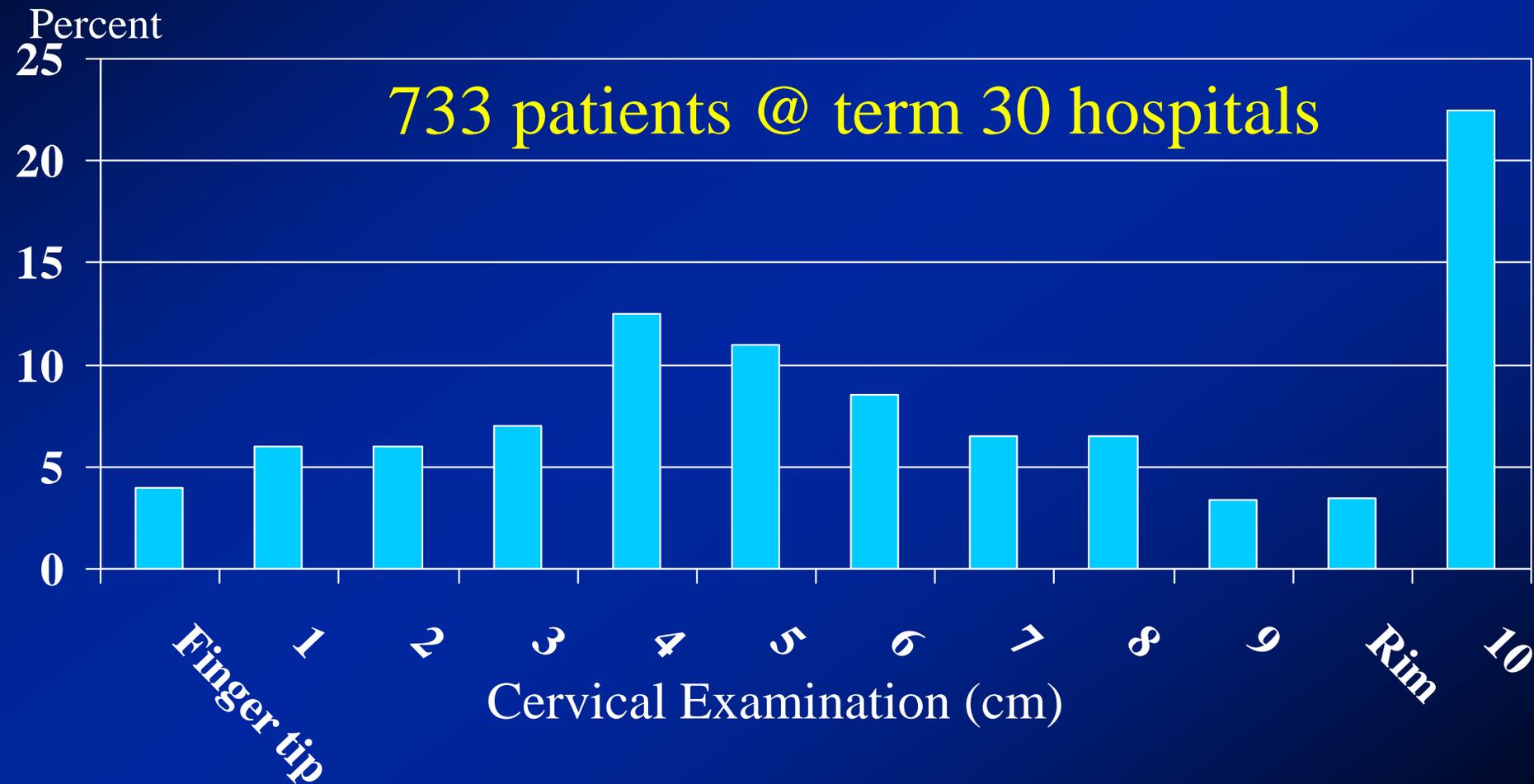
Individual practice style is an important determinant of the wide variations of rates of C/S among OBS

Nullip C/S Rate 17.2

Range 9.6 to 31.8

Low Risk pts/11 OBS

# Distribution of Cervical Examinations at the time of Cesarean Delivery for Dystocia



# Intrapartum Nursing

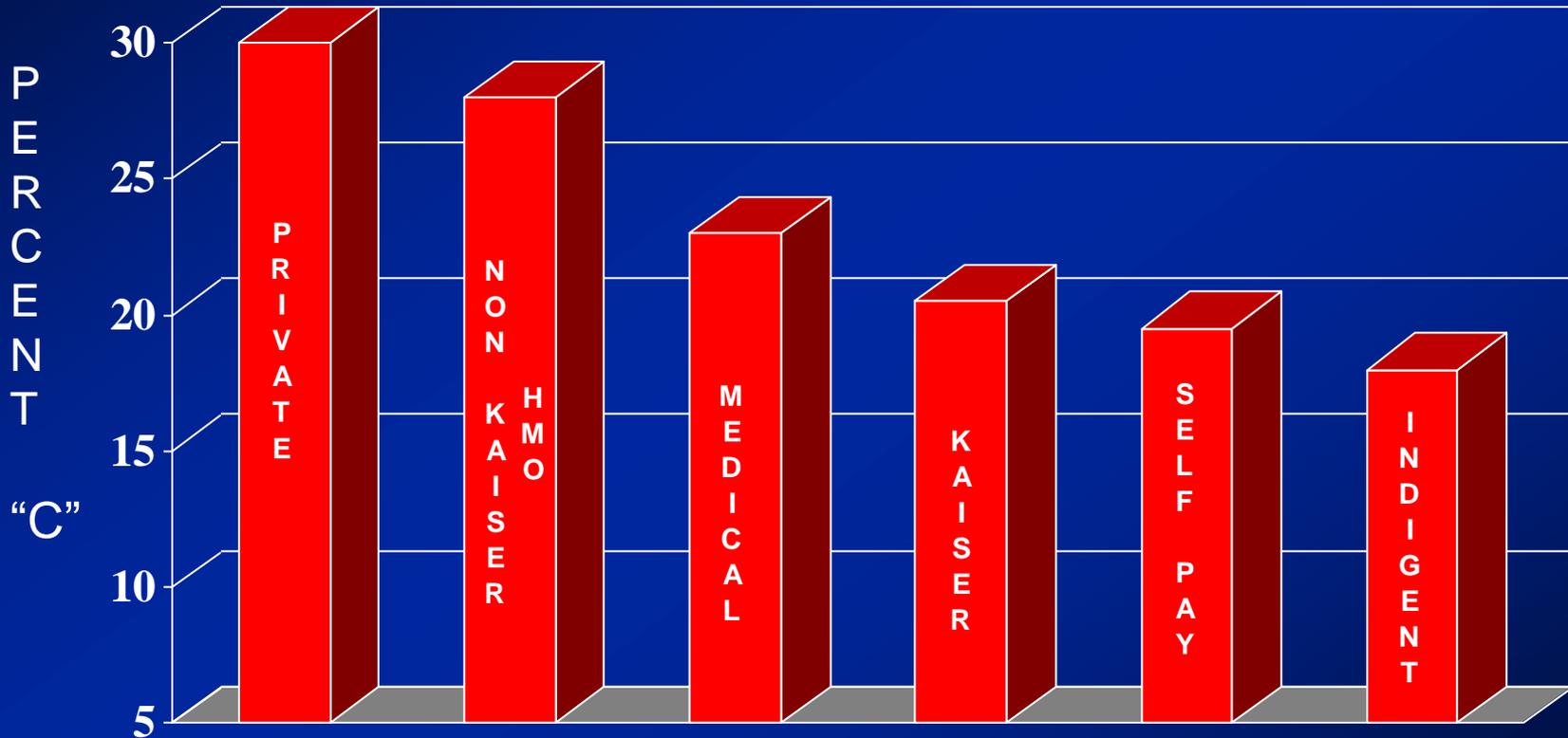
- There is variation in Nurses' cesarean rates
- One study showed range from 4.9% to 19%
- Relationship to proportion of Direct vs. Indirect care; role of continuous presence of trained individual

# Payer Source

Women with private insurance are  
more likely to have “C”

# 461,000 Deliveries in California, 1986

## 24.4% Sectioned



# Fear of Litigation

- Data to support threat of litigation as factor is qualitative
- Threat influences obstetric behavior
- Large number of Cases from Term Pregnancies are for:
  - “ Failure to Perform Timely “C”
- Confusion regarding percentage of health care dollar that goes for malpractice insurance

# States in 1996 with lowest cesarean rates

- Colorado 15.1%
- Wisconsin 15.6%
- Utah 15.9%
- Idaho 16.0%

# States in 1996 with highest cesarean rates

- Mississippi 26.6%
- Louisiana 26.4%
- Arkansas 25.3%
- New Jersey 24.0%

# OB Factors Impacting “C” Delivery Rates

- Maternal Age
- Maternal Weight
- Fetal Weight
- Dx of Dystocia
- AML
- Epidural
- EFM
- Induction
- Breech
- Preterm delivery
- Multiple gestation
- VBAC

# Maternal Age

Increasing age is associated with increased risk of “C”

- Not entirely known: BUT
  - a. Premium Baby Attitude
  - b. Overweight/Obesity
  - c. Diabetes, pre-eclampsia, hypertension

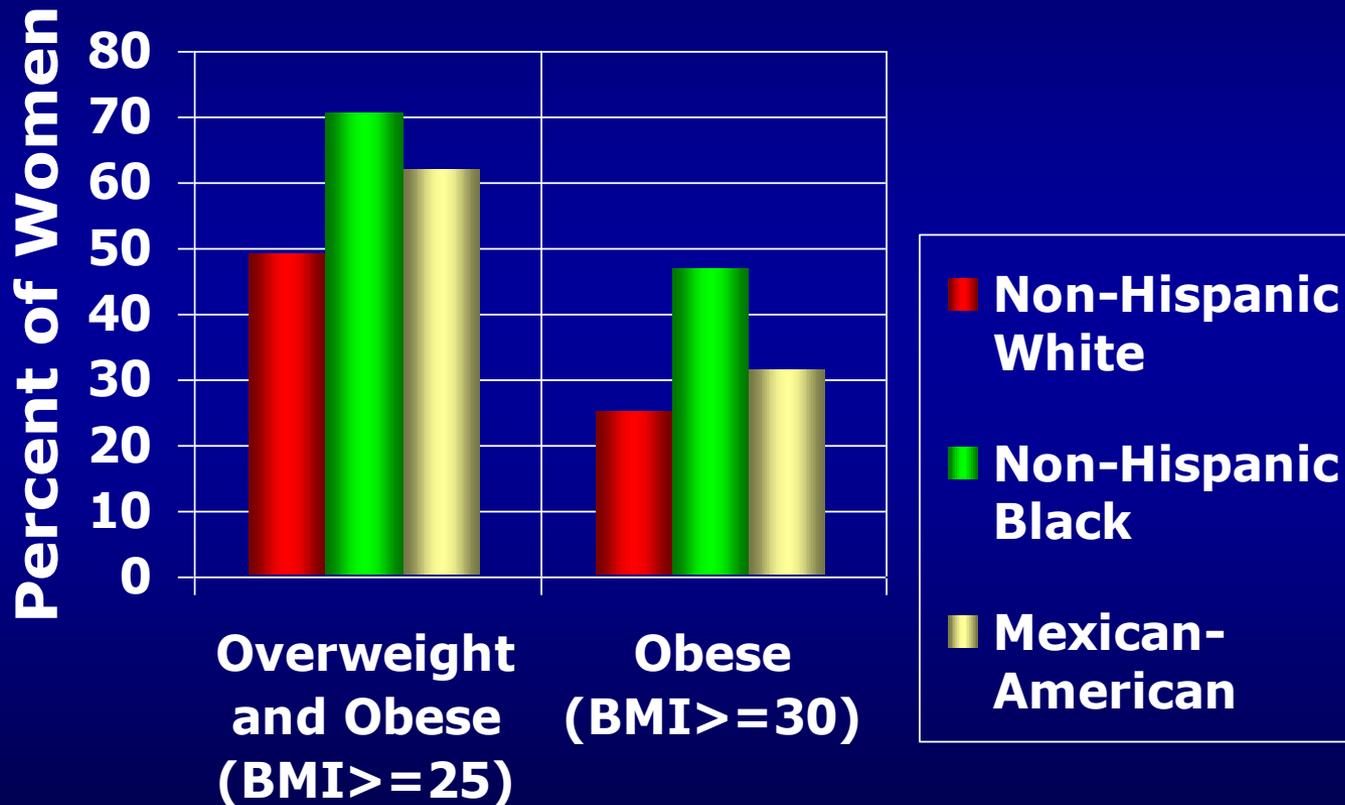
# Cesarean Rate by Age All Races (2003) USA

	%
<20	19.1
20-24	22.6
25-29	26.4
30-34	31.4
35-39	36.8
40-54	42.5

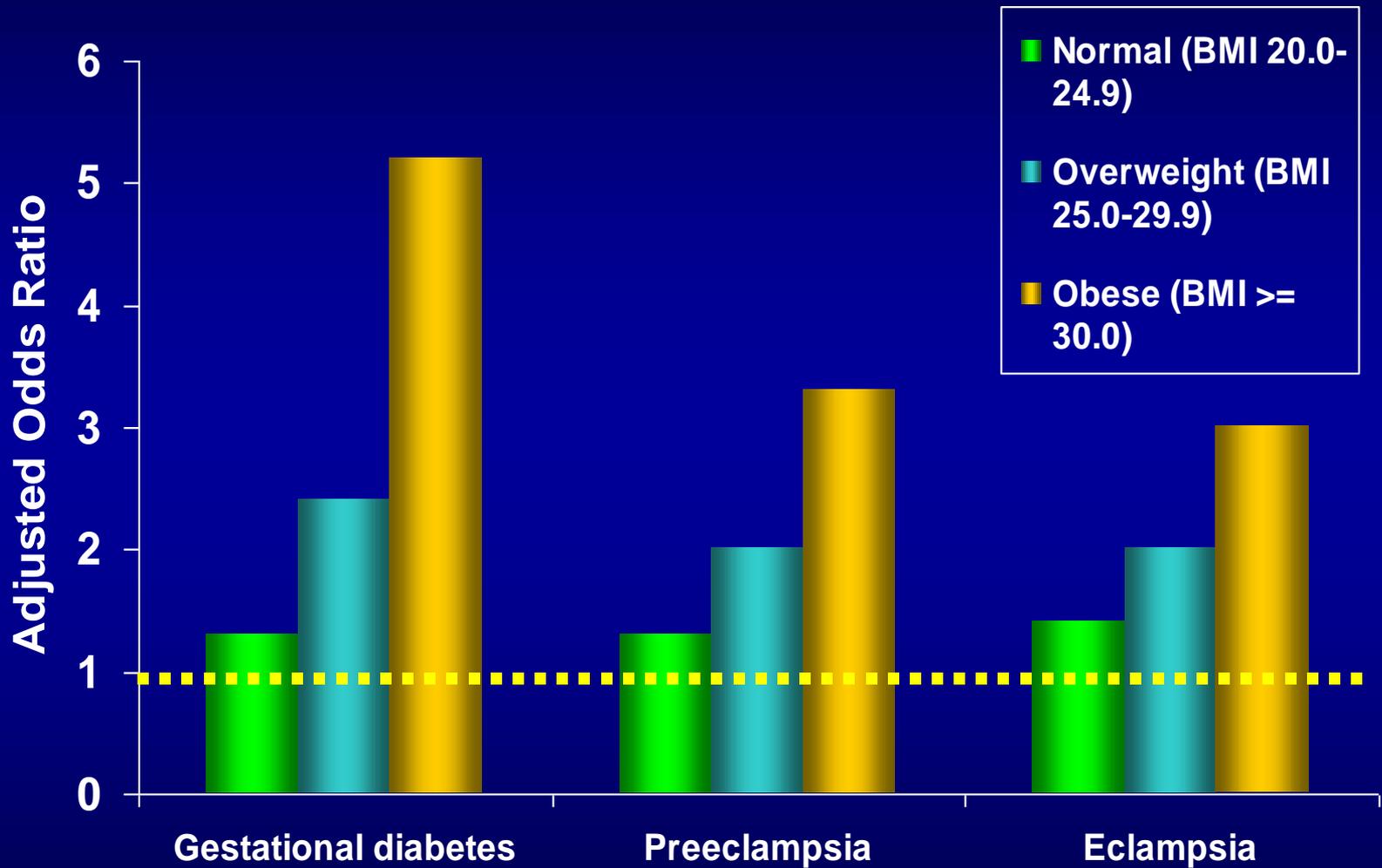
# Weight

- Pre-pregnancy weight
- Weight gain
- Birth Weight

# Prevalence of Overweight and Obesity Among US Women Aged 20-39 Years, 1999-2002, By Racial/Ethnic Group



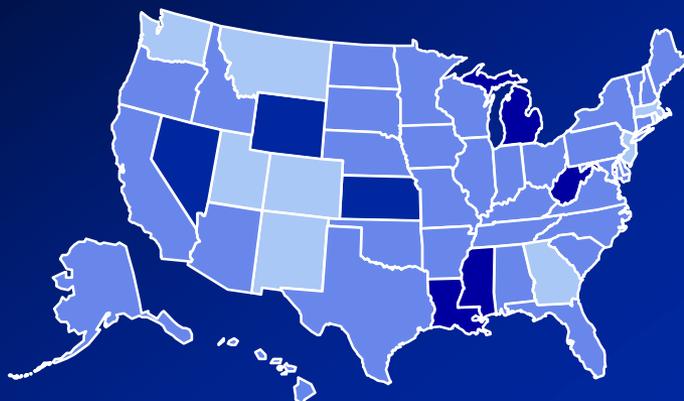
# Adjusted\* Odds Ratios for Pregnancy Complications by Maternal BMI



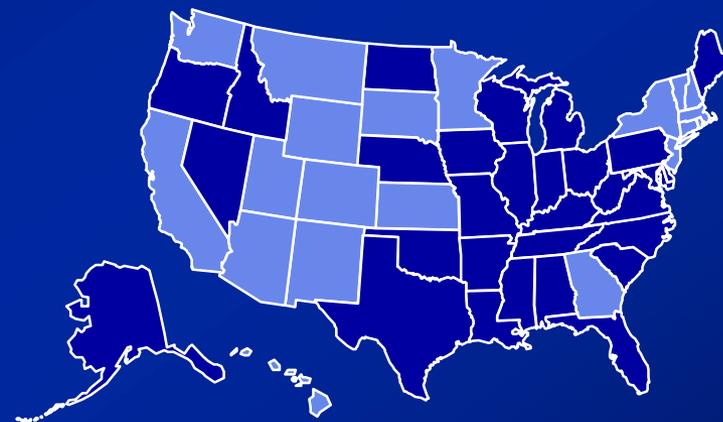
Adjusted for maternal age, smoking, education, marital status, trimester prenatal care began, payer, and weight gain during pregnancy; BMI < 20.0 (lean) reference group

# Obesity Trends\* Among U.S. Adults BRFSS, 1991, 1996, 2004 \*BMI > 30

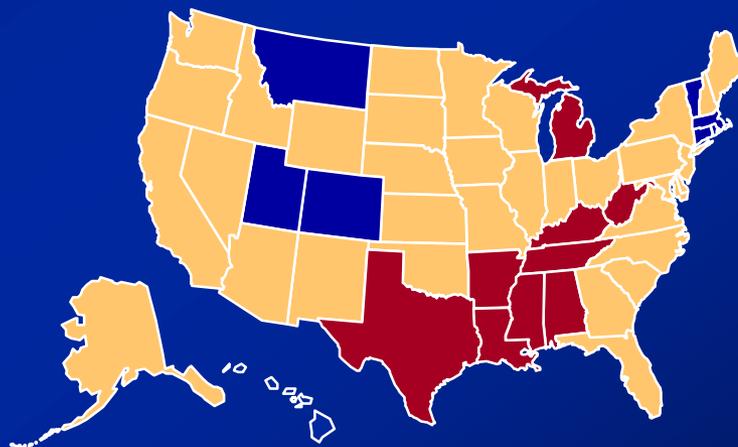
1991



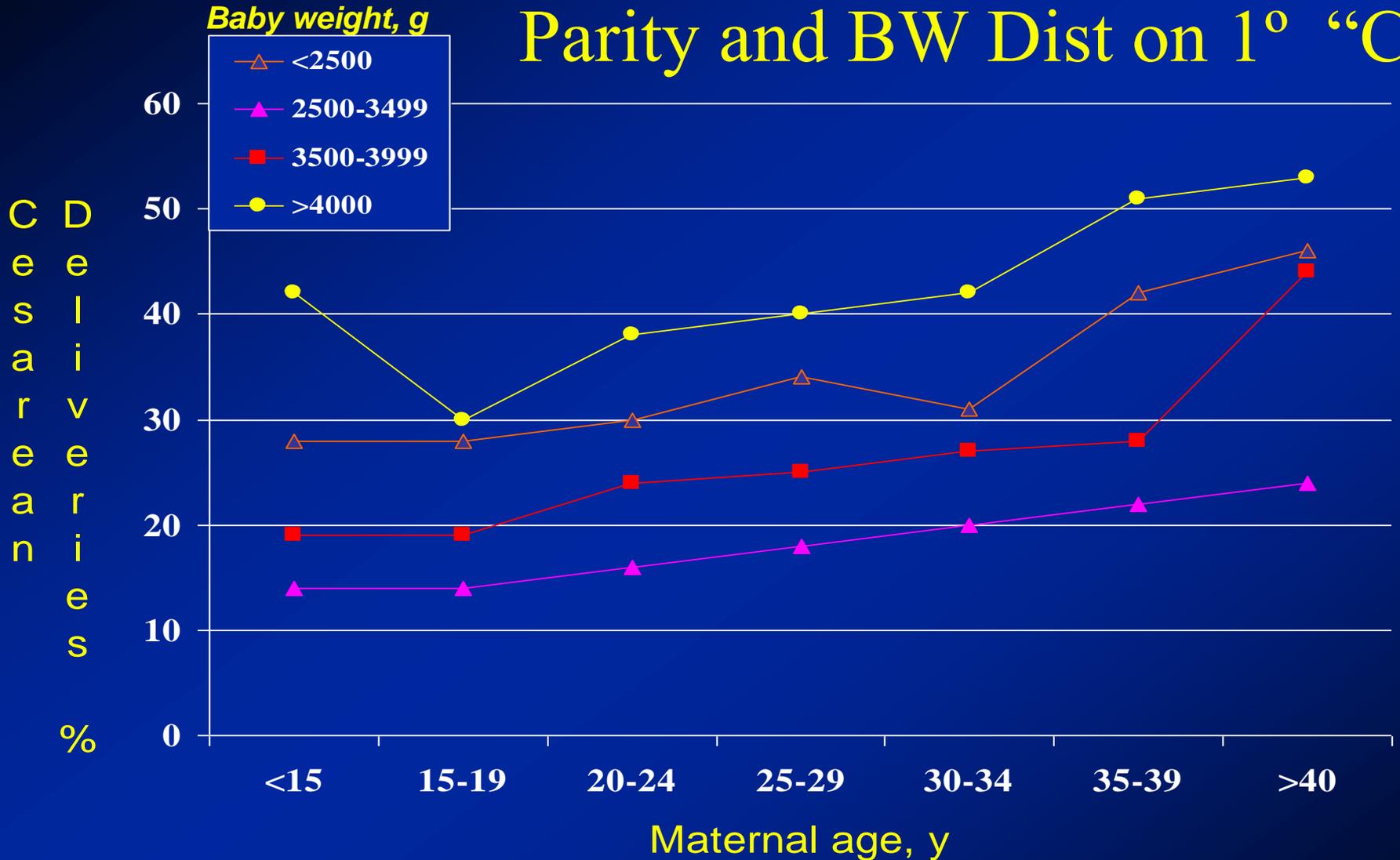
1996



2004



# Effect of Changes in MA Parity and BW Dist on 1<sup>o</sup> “C”



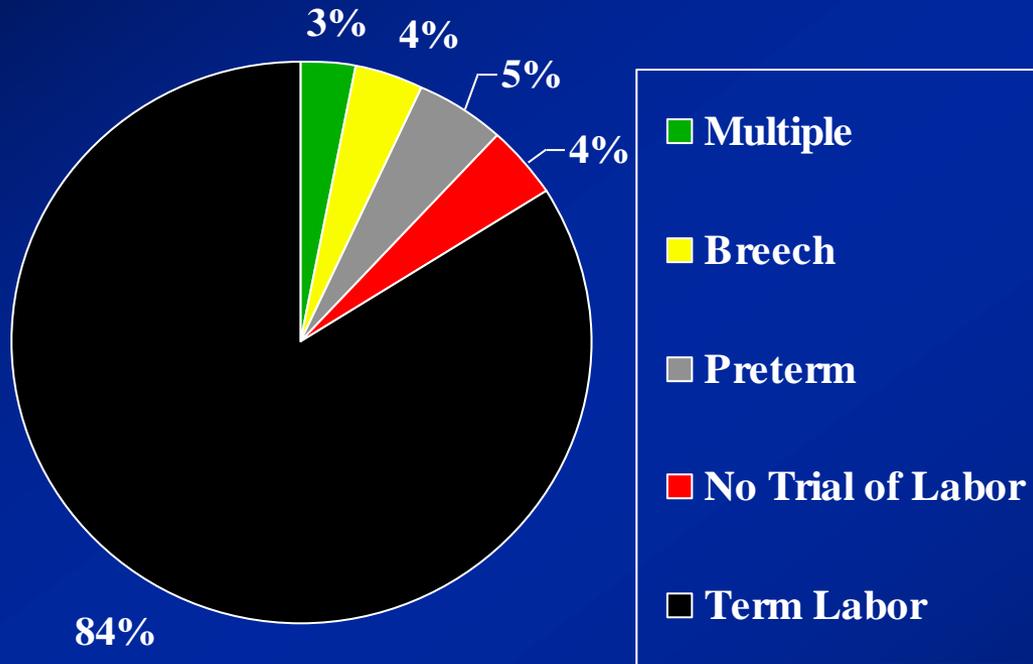
Primary cesarean deliveries by maternal age and birth weight among primiparous women in Washington State from 1987 through 1990.

# Diagnosis of Dystocia

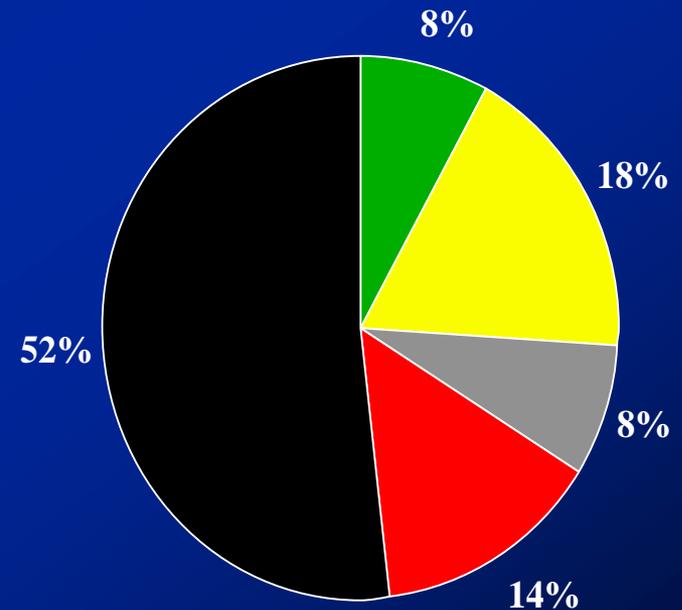
Most common indication for  
“C” birth in nulliparous patient

# Percentage of Population and of C/S According to Obstetric-Condition Group

Percent of Population



Percent of Cesareans



# Delivery Characteristics in RCT's of AML compared with NMH

	NMH	Boston		Chicago	
		AML	UC	AML	UC
Spontaneous Delivery	81	78	74	64	58
Forceps Delivery	14	11	14	25	28
“C” Delivery	5	11	12	11	14
Labor > 12 hrs	2	9	26	5	19

# “C” Risk with Elective Induction, Term, Nulliparous

## RATE

Spontaneous Labor	7.8%
Elective Induction	17.5%*
Medically Indicated	17.7%*

\*Significant  
OB/GYN 1999; 94

# Induction of Labor

Year	%	
2003	20.6	
2002	20.5	
2001	20.5	
2000	19.5	
1995	15.9	
1990	9.3	ACOG Pocket Guide 2006

# National Maternity Hospital Dublin

Year	<u>INDUCTIONS</u> <u>%</u>	<u>CESAREANS</u> <u>%</u>
1994	16.9	8.8
2004	24.3	17.0

# Multiple Births (USA)

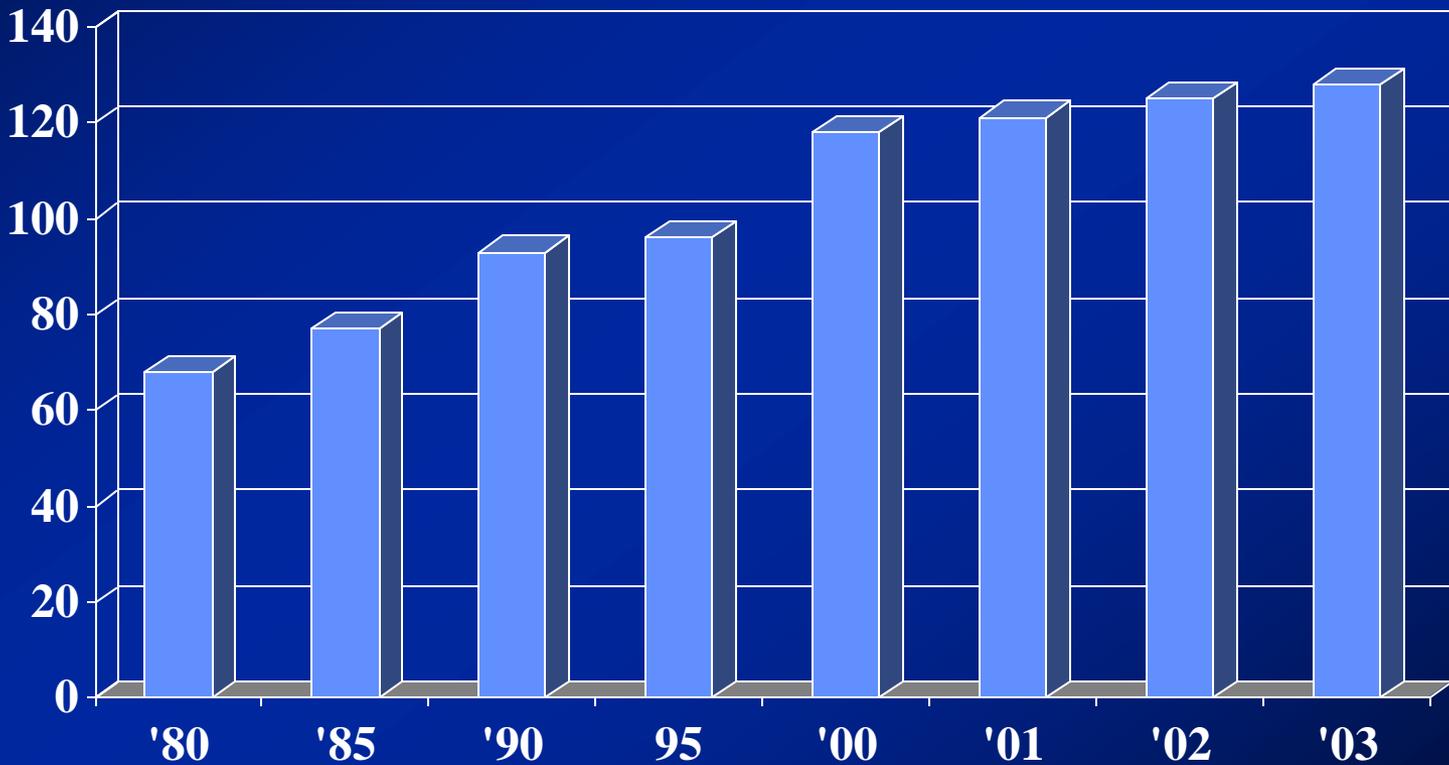
Twins	<u>1980</u>	<u>2003</u>
	68,339	<u>128,665</u>

From 1980 to 1998, the rate for triplets (and more) rose from: 37/100,000 to 193/100,000 live births.

# TWINS

## US 1980 to 2003

Thousands



# TWINS

## US 1980 to 2003

	'80	'85	'90	95	'00	'01	'02	'03
East	68	77	93	96	118	121	125	128

# Number and Rate of Cesarean Sections by Plurality 1993-2003

Year	Singleton		Multiple		Total		Multiples	
	Number	Rate	Number	Rate	Number	Rate	Total	Rate
1993	807,127	20.9	54,860	55.2	861,987	21.8	99304	6.4
1994	775,464	20.3	55,053	54.7	830,517	21.2	100605	6.6
1995	750,663	19.9	56,059	55.6	806,722	20.8	100809	6.9
1996	738,603	19.7	58,516	55.4	797,119	20.7	105600	7.3
1997	737,347	19.7	61,686	56.1	799,033	20.8	109898	3.7
1998	758,691	20.0	67,179	57.3	825,870	21.2	117293	8.1
1999	791,924	20.8	70,162	58.2	862,086	22.0	120607	8.1
2000	848,662	21.7	75,369	60.1	923,991	22.9	125388	8.2
2001	898,058	23.2	80,353	62.7	978,411	24.4	128179	8.2
2002	957,589	24.7	86,257	65.3	1,043,846	26.1	132034	8.3
2003	1,026,992	26.1	92,396	68.0	1,119,388	27.5	135805	8.3

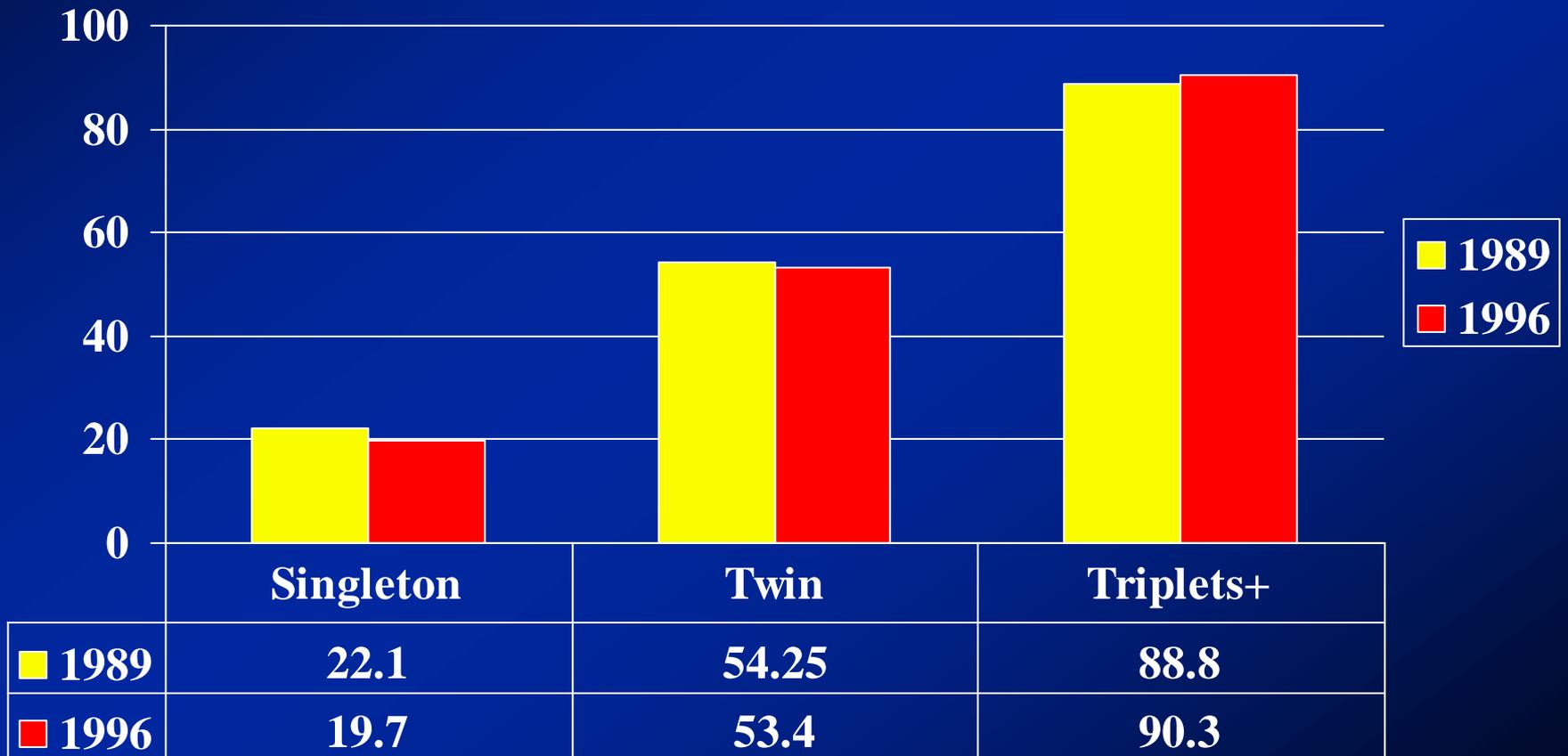
% change 1993-2003

25%

23%

26%

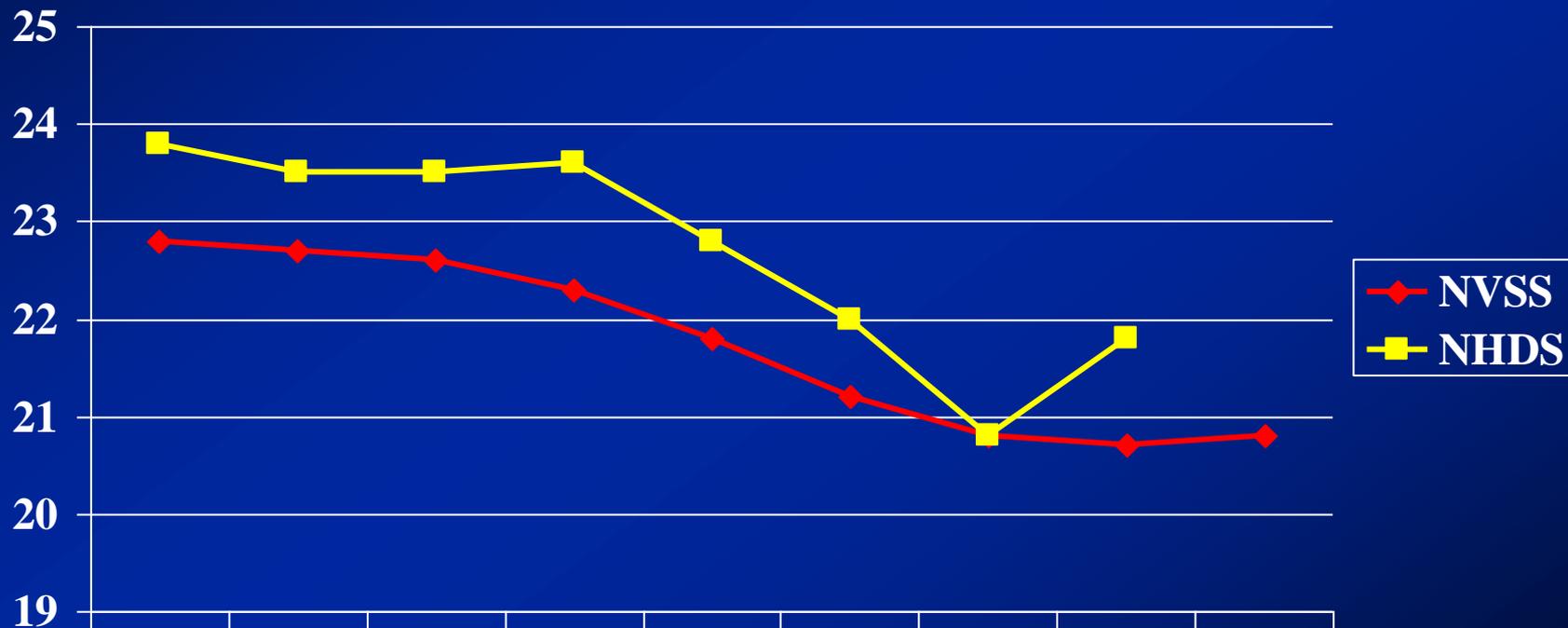
# Cesarean by Plurality: United States, 1989 and 1996



# Reasons for Interest in Cesareans

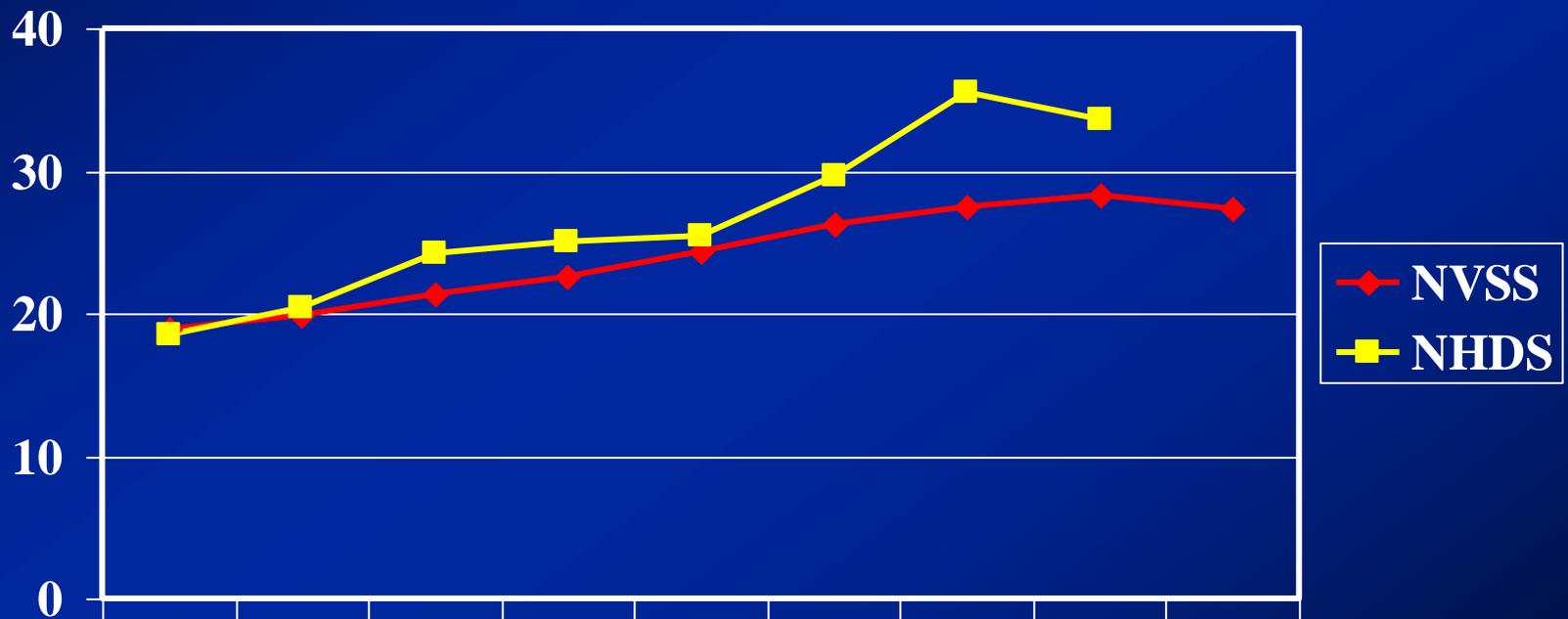
- Most common surgical procedure in U.S.
- 40% of Federal Medicaid Dollars →  
Obstetrical Care
- Payers identify it as a way to save
- “Low risk” patients receive expensive intervention. WHY?

# Total Cesarean Rates: United States, 1989-1996



	1989	1990	1991	1992	1993	1994	1995	1996	1997
<span style="color: red;">◆</span> NVSS	22.8	22.7	22.6	22.3	21.8	21.2	20.8	20.7	20.8
<span style="color: yellow;">■</span> NHDS	23.8	23.5	23.5	23.6	22.8	22	20.8	21.8	NA

# Vaginal Birth After Previous "C" Rates: United States, 1989-1996



	1989	1990	1991	1992	1993	1994	1995	1996	1997
<span style="color: red;">◆</span> NVSS	18.9	19.9	21.3	22.6	24.3	26.3	27.5	28.3	27.4
<span style="color: yellow;">■</span> NHDS	18.5	20.4	24.2	25.1	25.4	29.7	35.5	33.6	NA

# Declining Cesarean Delivery Rates

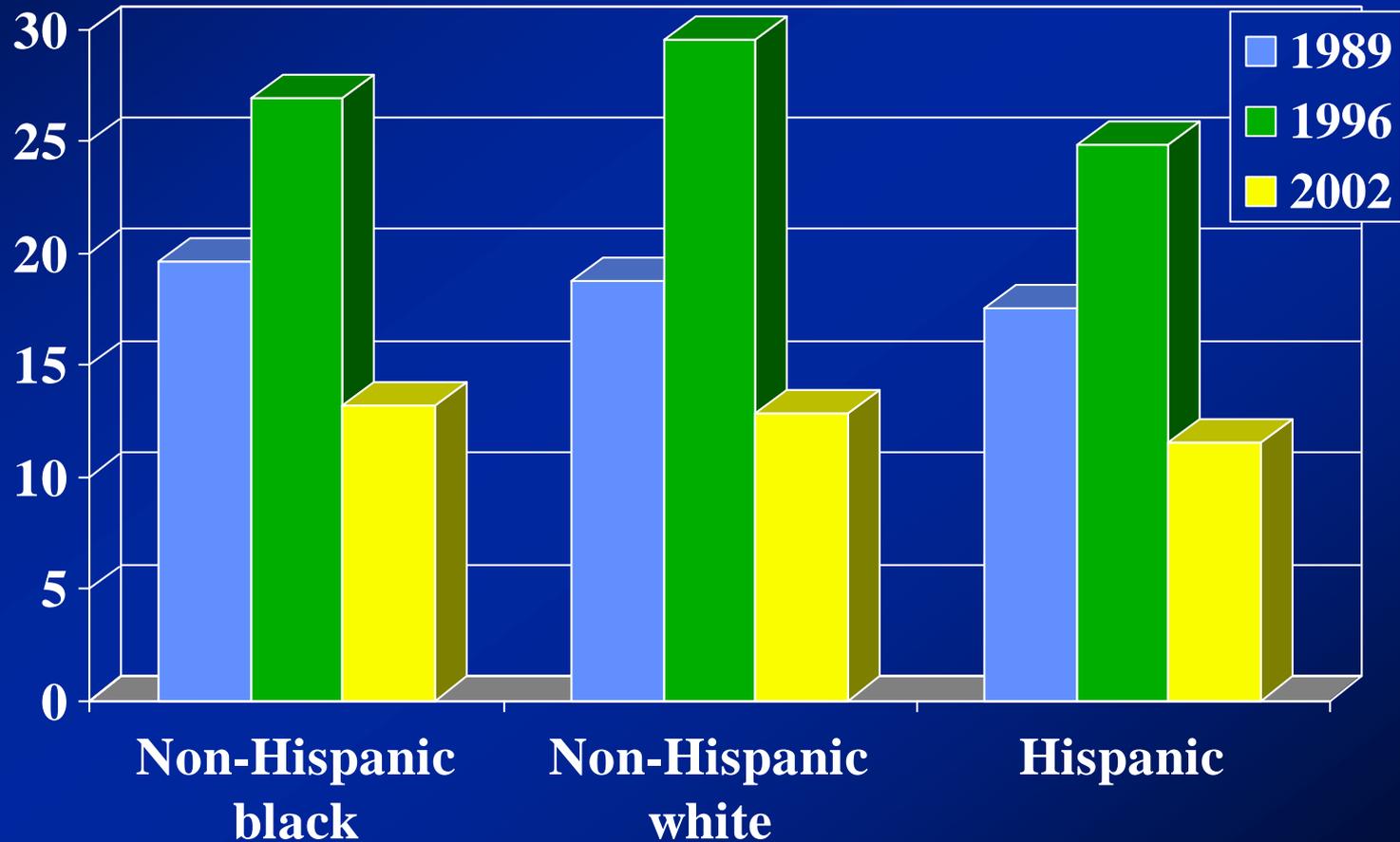
## Calif Hosp Dschg Abstracts '83-'94

- 6,146,809 Deliveries
- Cesarean Rate 22.8%

Peak of 25% fell to 21% in '94, virtually all attributable to decrease "C" for women with previous "C."

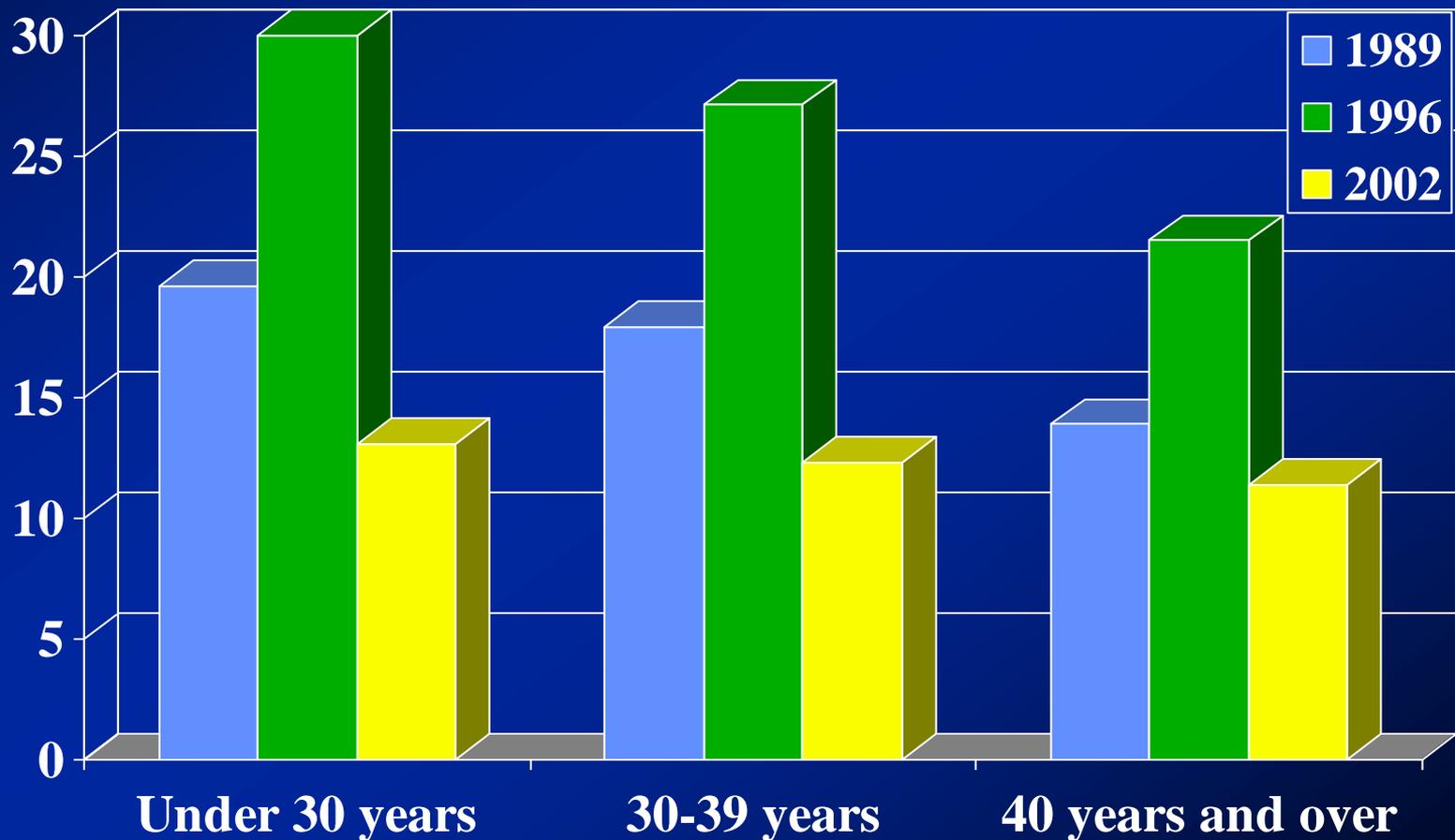
# VBAC RATES

## Race and/or Hispanic Origin



# VBAC RATES

## Age of Mother



# VBAC LATE 90's

Increasing awareness of risks

2000

20%

2002

12.7%

2004

9%

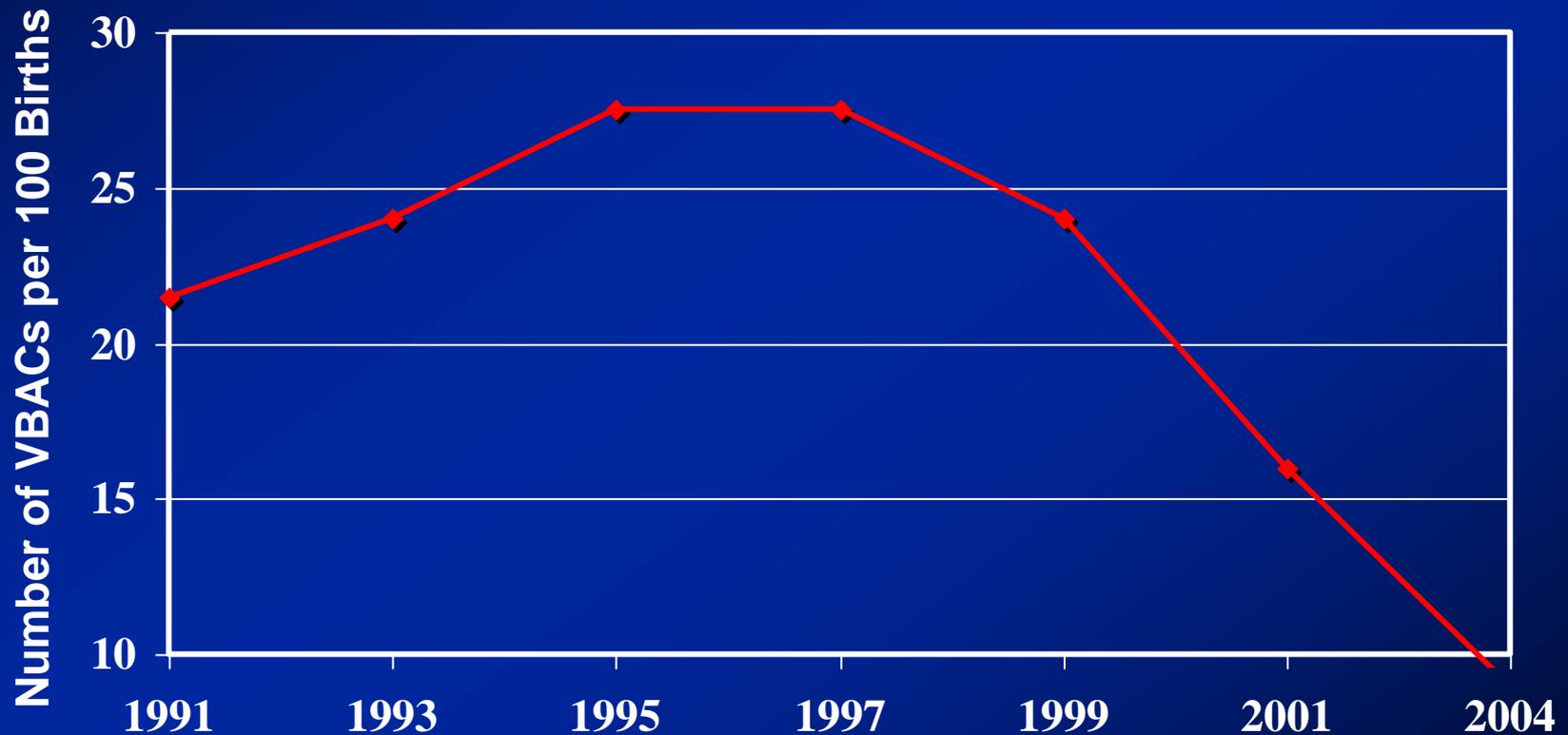
# Early Studies

## VBAC

Probably underestimated maternal and perinatal morbidity and mortality

- Retrospective
- Non randomized
- Lack of comparison groups
- No adjustment for confounding factors
- No data on neonatal outcome linked to uterine rupture estimated 2 to 6/1000 VBACs

# VBAC Rate Continues to Slide



Source: Centers for Disease Control and Prevention

# Is the Lowest Rate the Best Rate ?

'98 to '00

750,000 singletons (293) institutions

Low Risk Mothers (Term)

"C-"Rate

P<.01

P<.02

Low CS Hosp

↑ Fetal hemorrhage  
↑ Birth asphyxia  
↑ Meconium aspiration syn  
↑ Feeding problems  
↑ Infection  
↑ Infused medication

↑ Pressors  
↑ Transfusion for shock  
↑ Mechanical vent

High CS Hosp

↓ Fetal hemorrhage  
↓ Asphyxia  
↓ Birth trauma  
↓ Mechanical vent

Compared to average "CS" Hosp

# 2000's

- “C” on maternal request
- Pelvic floor morbidity
- Increasing number of women of AMA
- Safer and safer
- ? Correct comparisons
- Impact of previa, accreta

# Will the Trend Continue?

- Inductions
- Overweight/Obesity
- Aggressive interventions
- Training
- Malpractice
- Decrease in birth injuries and maternal mortality
- Pelvic floor disorders
- Changes in patients' attitudes and preference
- ~ 2.5% of births by requested "C" (2003)

# Conclusions

- The “C” birth rate is influenced by a number of factors.
- There may be opportunities to effect a change.
- The appropriate “C” Rate cannot be established by a Task Force.
- More intensive local, regional and national peer review have more to offer.
- The best route of delivery for a given patient is decided by the doctor, the patient, the individual circumstances and the resources available.
- Patients must be thoroughly and accurately informed as they participate.