

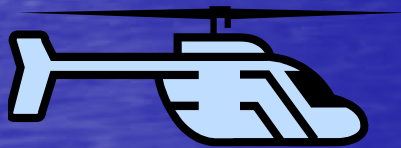
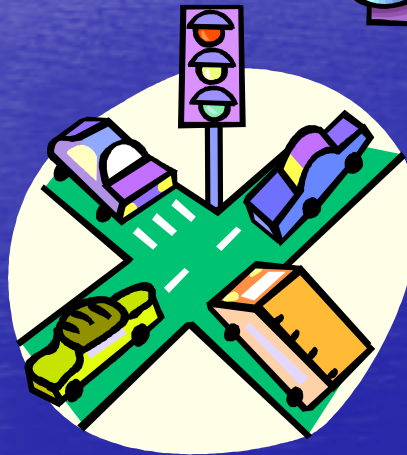
# *Injuries During Pregnancy:*

**Understanding & Tracking  
The Hidden Epidemic  
*A Focus on Mortality***

*Advisory Committee on Infant Mortality  
Washington, DC – March, 2004*




# Introduction



# Objectives

1. Discuss the nature and importance of injuries on fetal and infant mortality.
2. Discuss the deficiencies and barriers of using existing data to look at this issue.
3. Discuss how to improve surveillance of pregnancy-related injury and outcomes.
4. Introduce the morbidity issues

# Fetal Outcome Reporting Age Severity Matrix for Maternal Injury

		Maternal		
		Minor or "No Injury"	Serious Injury (ED visit or Hospitalization)	Death
<20 Wk F E T A L	Minor	None	None	None (Rare)
	Serious	None	None	None (Rare)
	Death	None	None	None
≥20 Wk F E T A L	Minor			Rare
	Serious	Hidden	Hidden	Rare
	Death	FDC?	FDC	FDC?
C H I L D	Minor			Rare
	Serious	Hidden	Hidden	Rare
	Death	DC	DC	DC

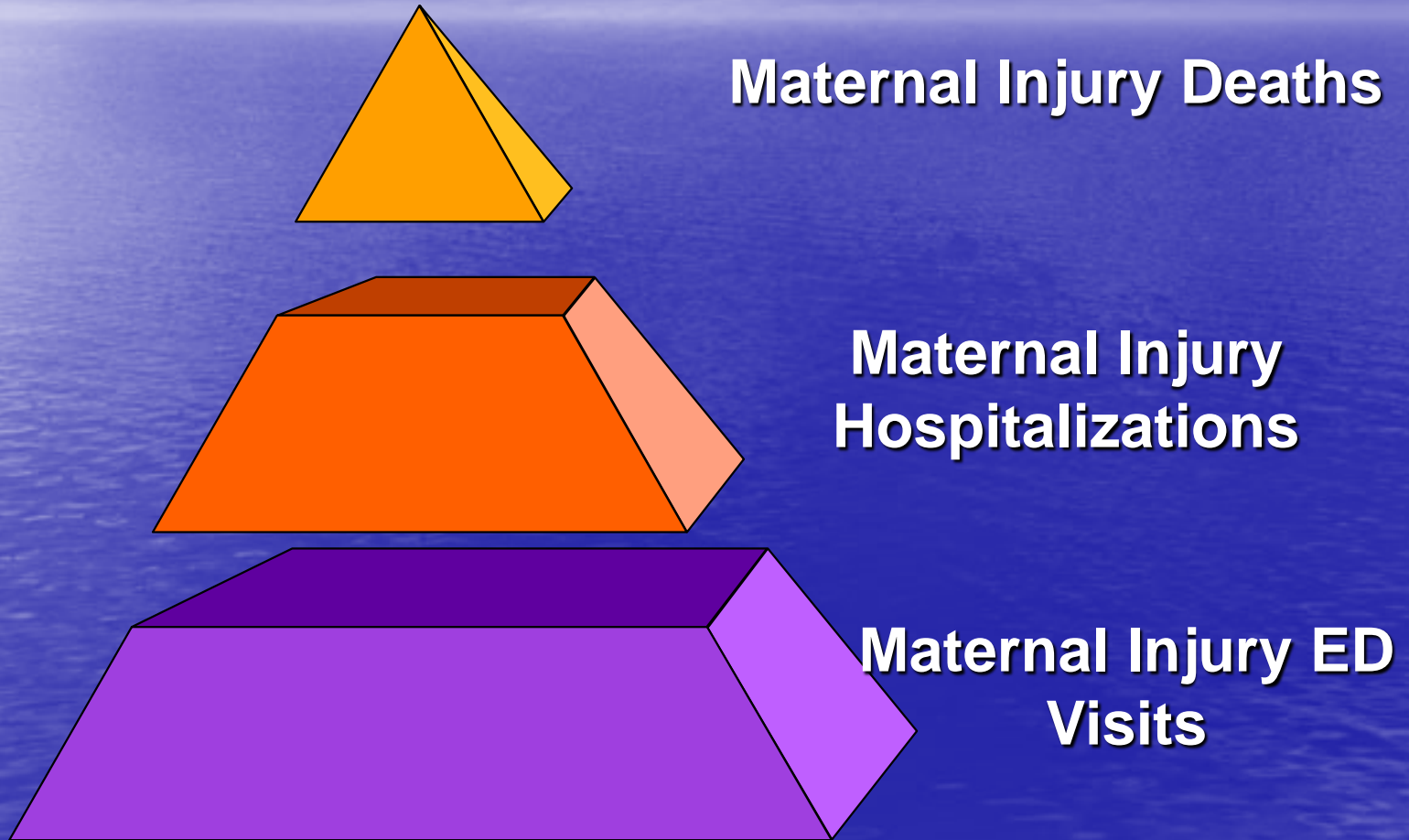


# Maternal Injury

The basis of the threat to fetuses



# Injury Pyramid

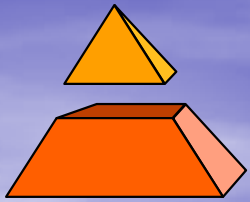


# ▲ Leading Causes of Death U.S. Women, Ages 15-34

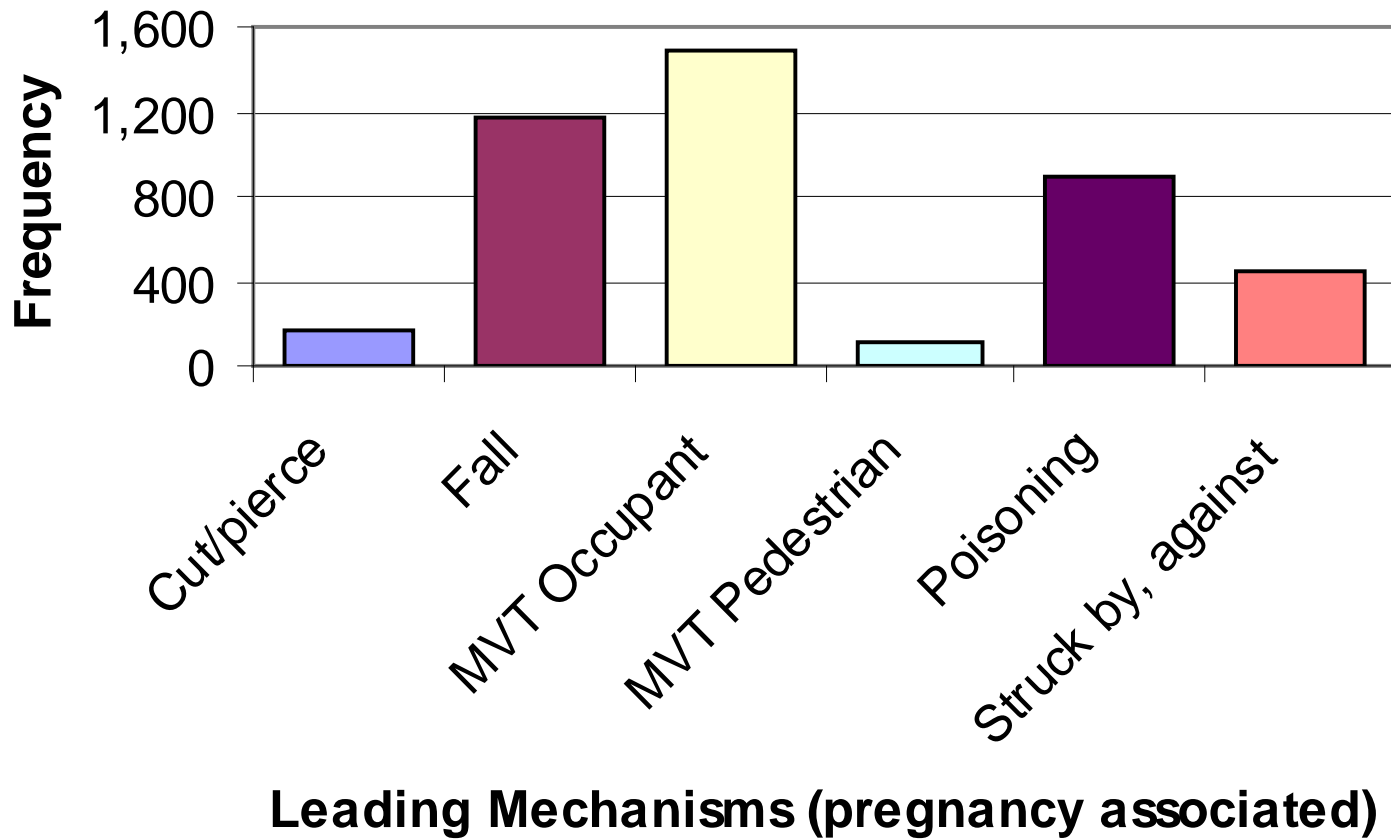
1. Unintentional Injury = 6,363  
→ **MV Traffic= 4,736**
2. Malignant Neoplasms = 2,753
3. Homicide = 1,539
4. Heart Disease = 1,429
5. Suicide = 1,424
- *Maternal Mortality (all ages)* = ~450

**In the U.S., more pregnant women die from intentional & unintentional injury than all “maternal mortality” related conditions combined!**



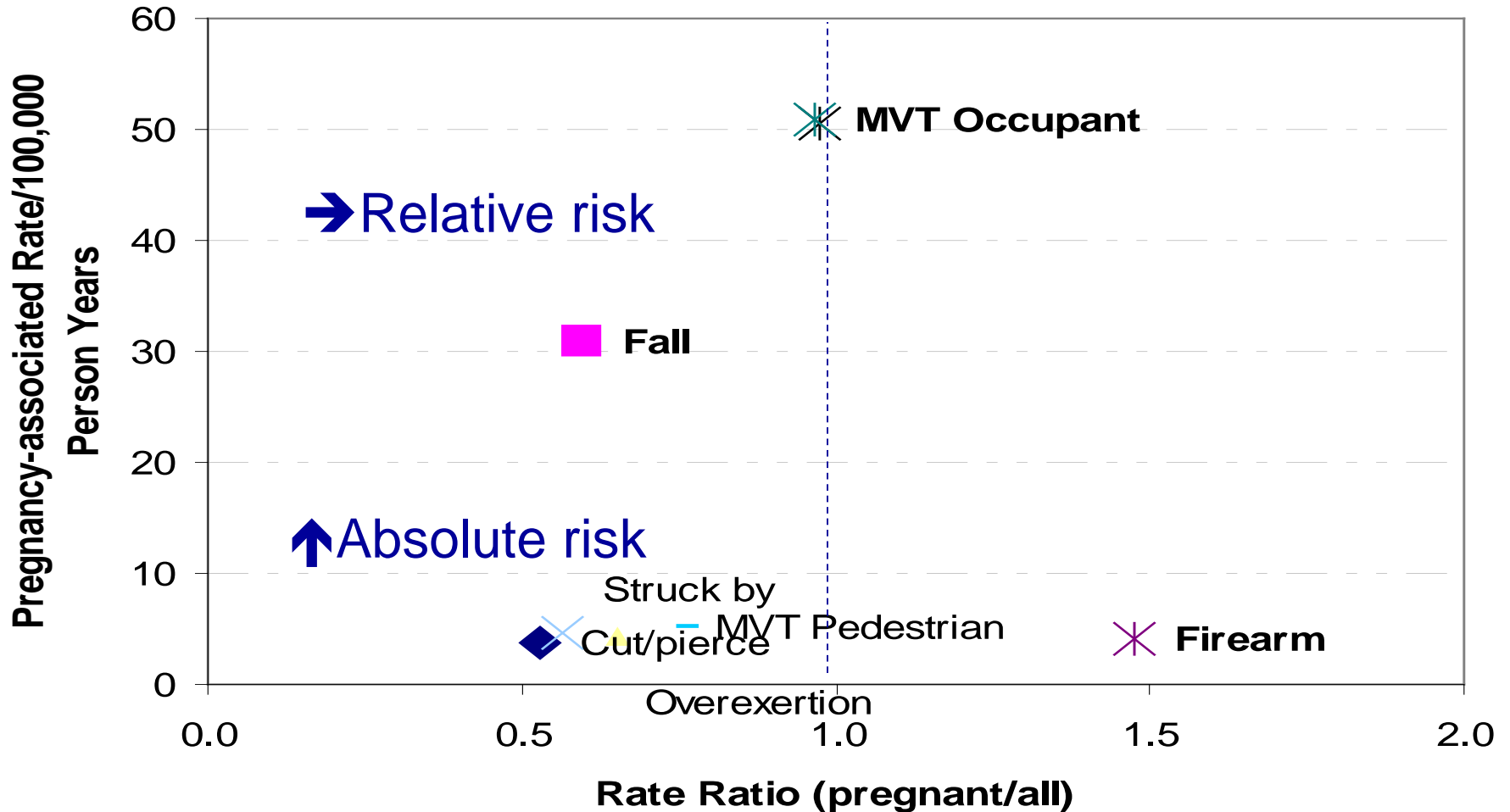


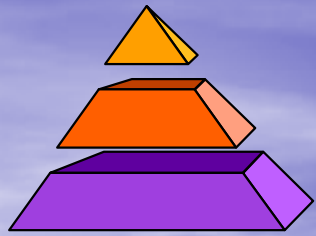
# Pregnancy-associated Injury Hospital Discharges 19 States, '97



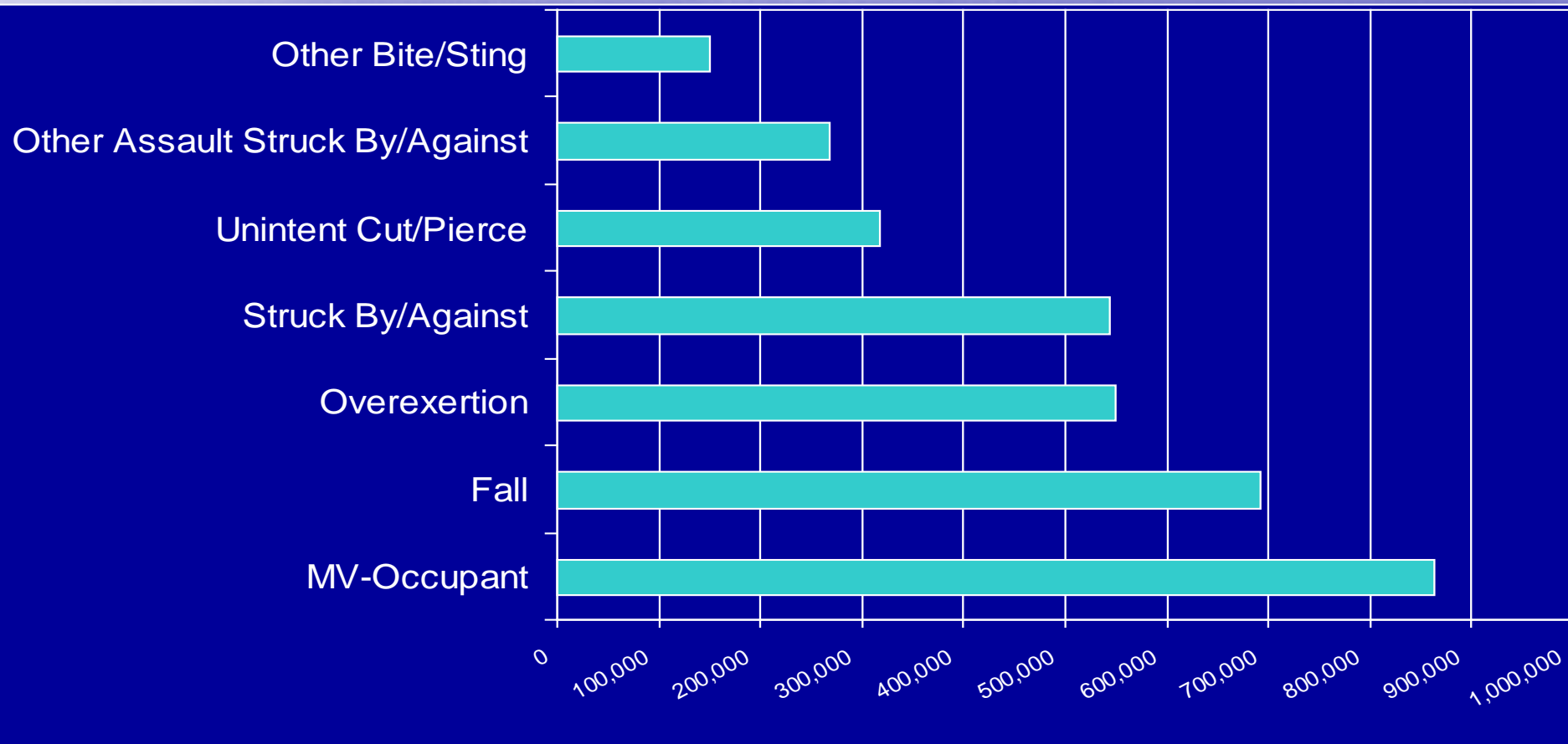
19 State Data, Weiss HB, Lawrence BA and Miller TR. "[Pregnancy associated assault hospitalizations](#)," *Obstet Gynecol*, 2002; 100(3): 773-780.

# Pregnancy-Associated Rate versus Rate Ratio for Leading Hospitalized Injury Mechanisms Discharges with ISS $\geq 4$ , 19 States, 1997



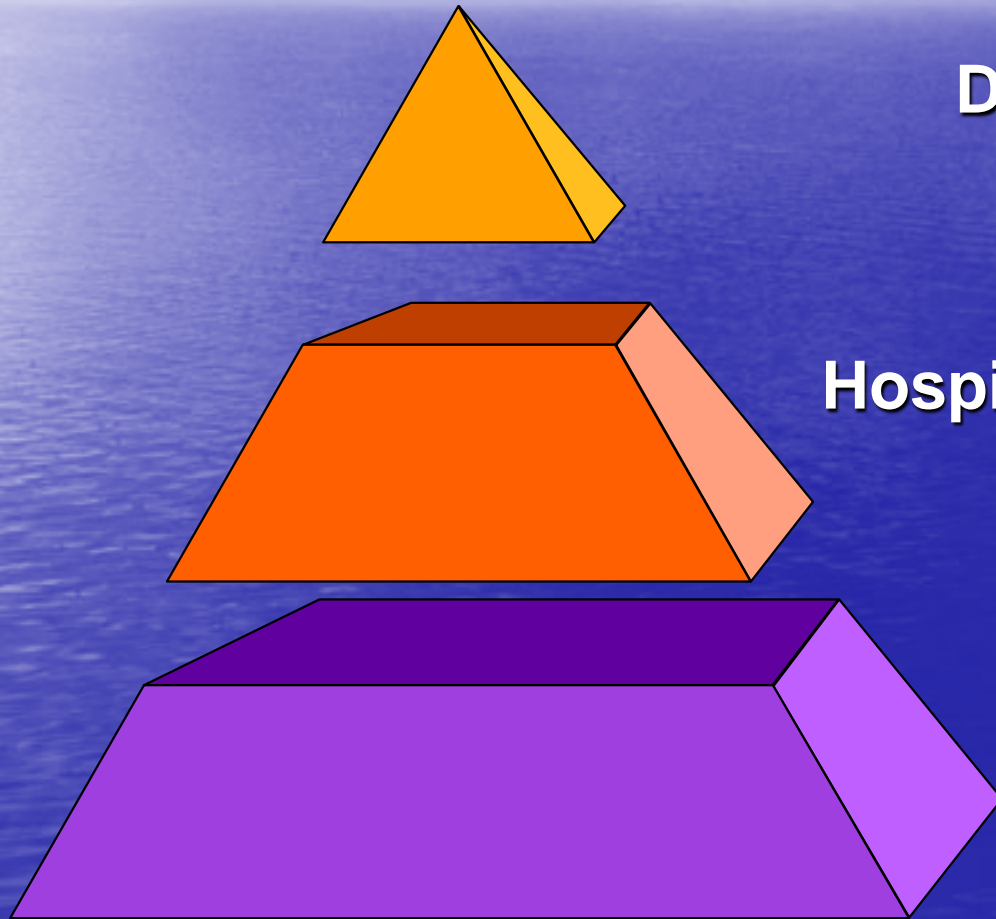


# Leading Causes of ED Injury Visits – Women 17-35



Source: US, 2000 – CDC WISQARS (NEISS)

# Leading Cause of Serious Maternal Injury



Deaths = MV



Hospitalizations = MV



ED Visits = MV

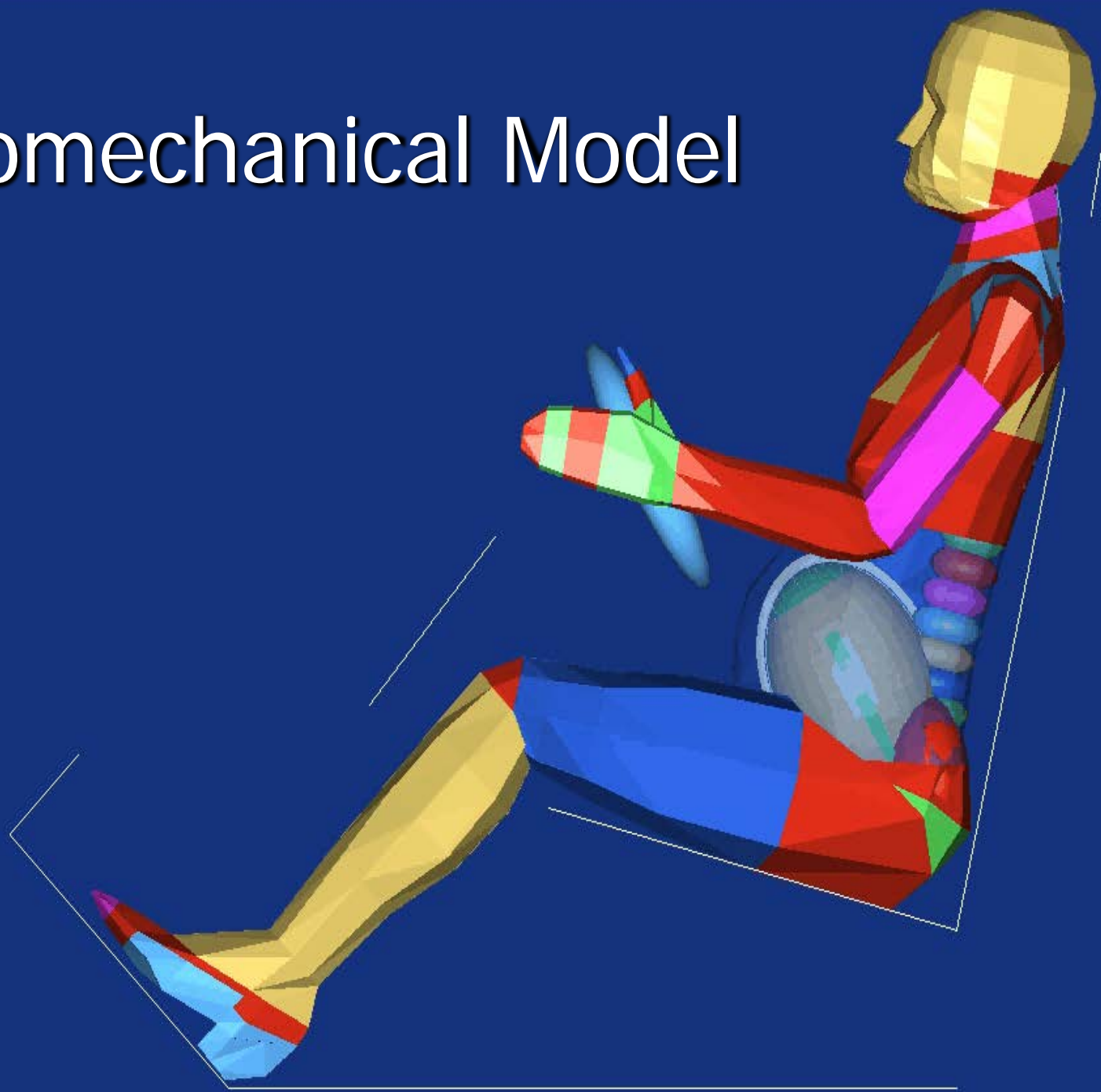


# Biomechanical Considerations

**Unbelted**

Virginia Tech Simulation

# Biomechanical Model



# Fetal Injury Deaths



# ICD Classification

## ICD-9:

- 760.5 = Fetus or newborn affected by maternal conditions classifiable to 800-995

## ICD-10:

- P00.5 = Newborn (suspected to be) affected by maternal *injury*
- P01.6 = Newborn (suspected to be) affected by maternal death (all types)

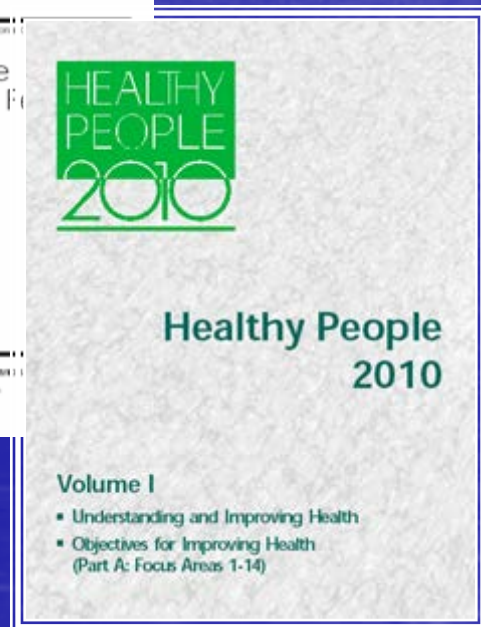


# ICD Guidelines (WHO)

*"For single cause tabulation of the underlying cause of death, the E code should be used as the primary code if, and only if, the morbid condition is classifiable to Chapter XVII*

*(Injury and Poisoning)" (WHO, 1977)*

# Out of Sight Out of Mind?

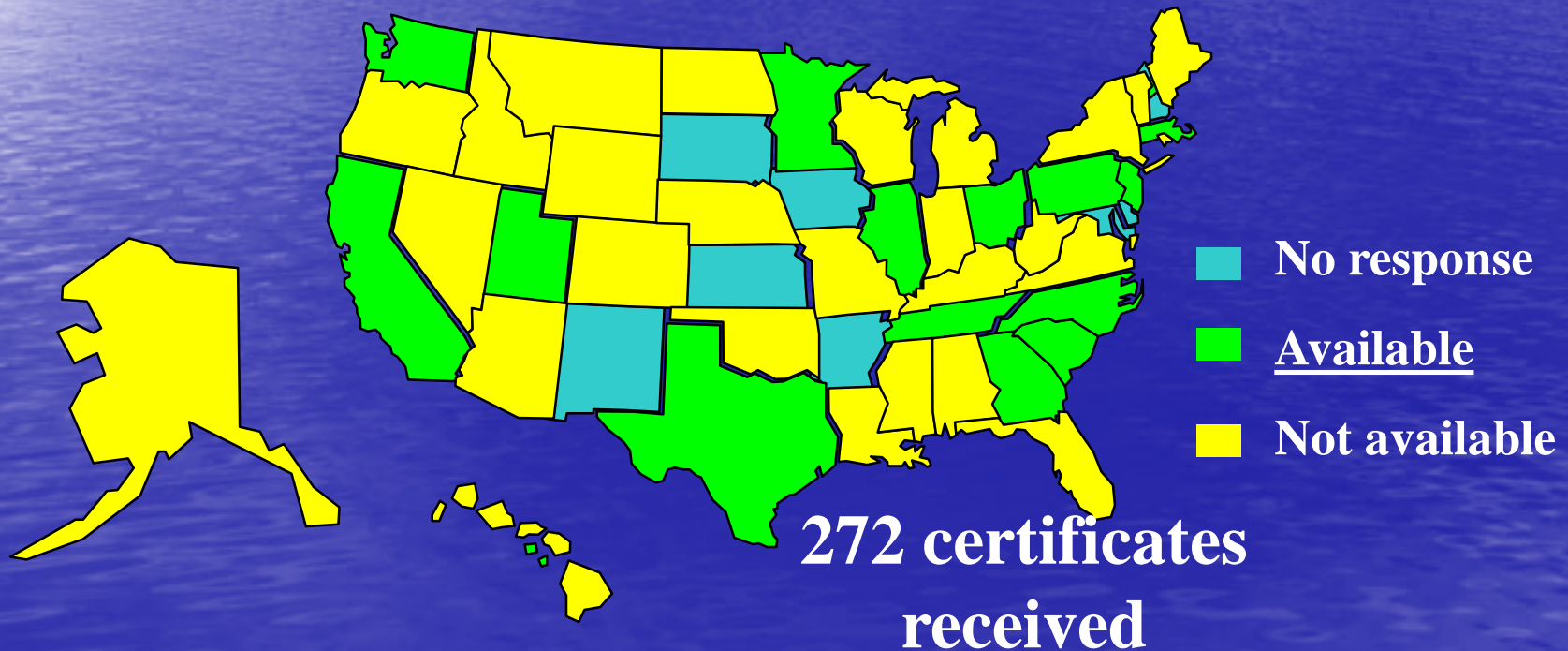


# Fetal Death Registries

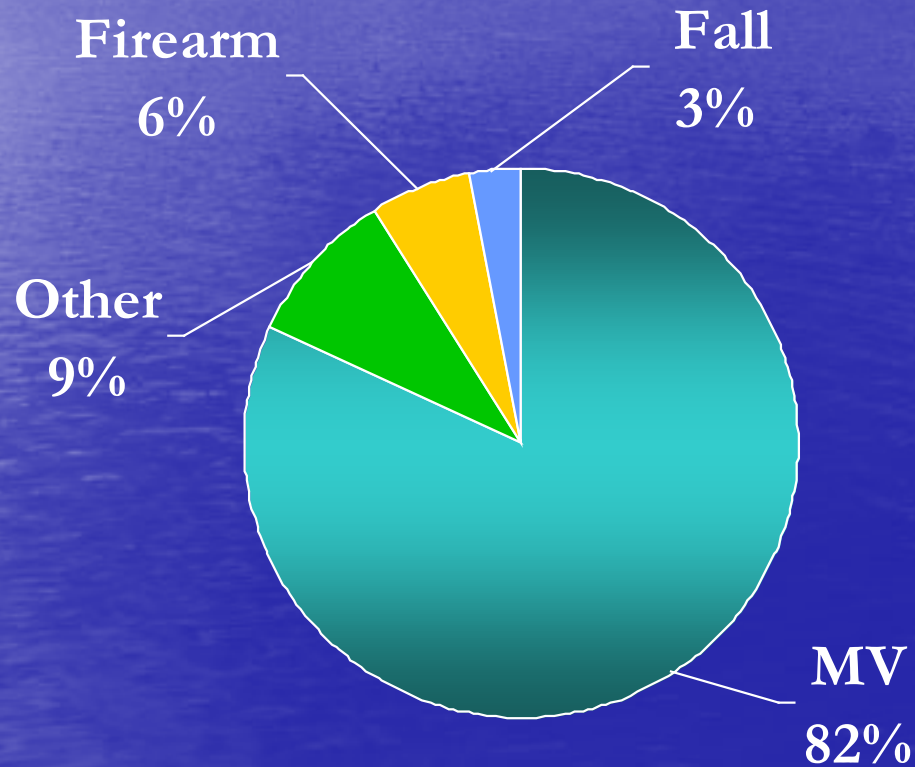
- Most but not all states
- Only 20 weeks are greater included
- ICD limitations (no mechanism codes)
- Reliance on written cause narratives

# Response to FDC Request

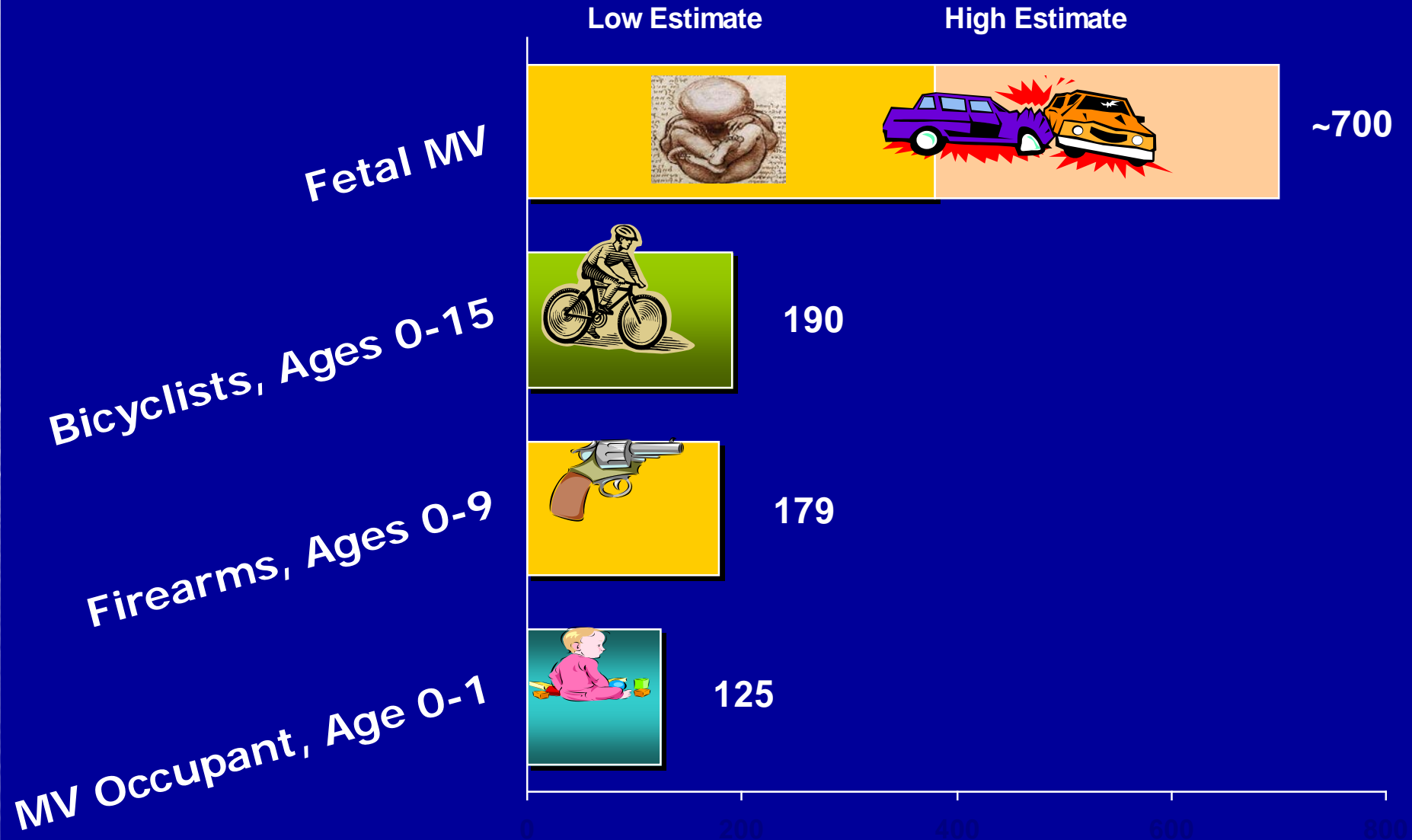
- No response - 8 States
- Not available - 26 states + DC
- Available - 16 states (*55% of U.S. population*)



# Traumatic Fetal Deaths By Mechanism Selected States, 1995-1997



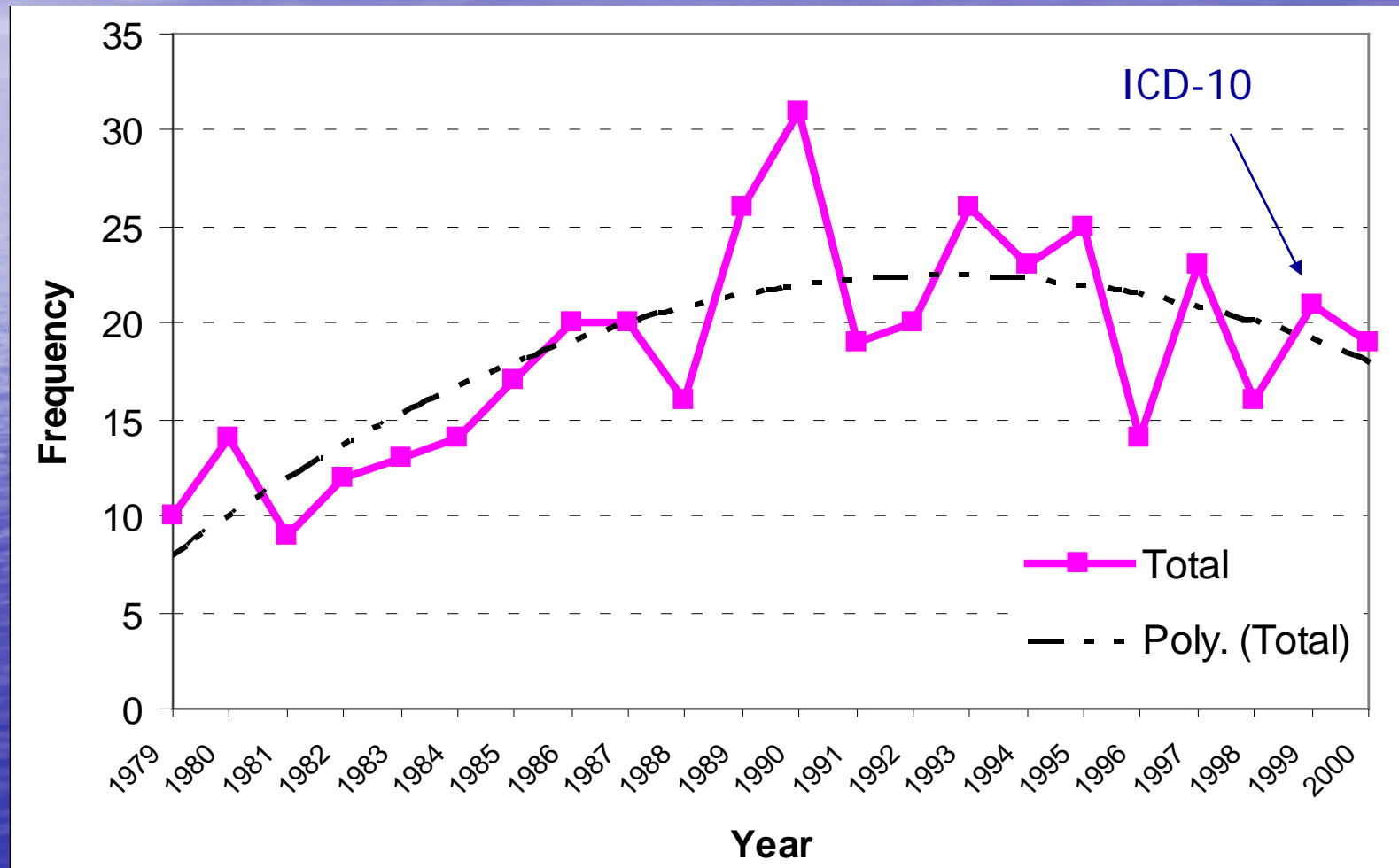
# Fetal Perinatal Crash Death Comparisons, 1998



# Fetal MV Injury Deaths

- **Account for more deaths than several leading childhood injury causes**

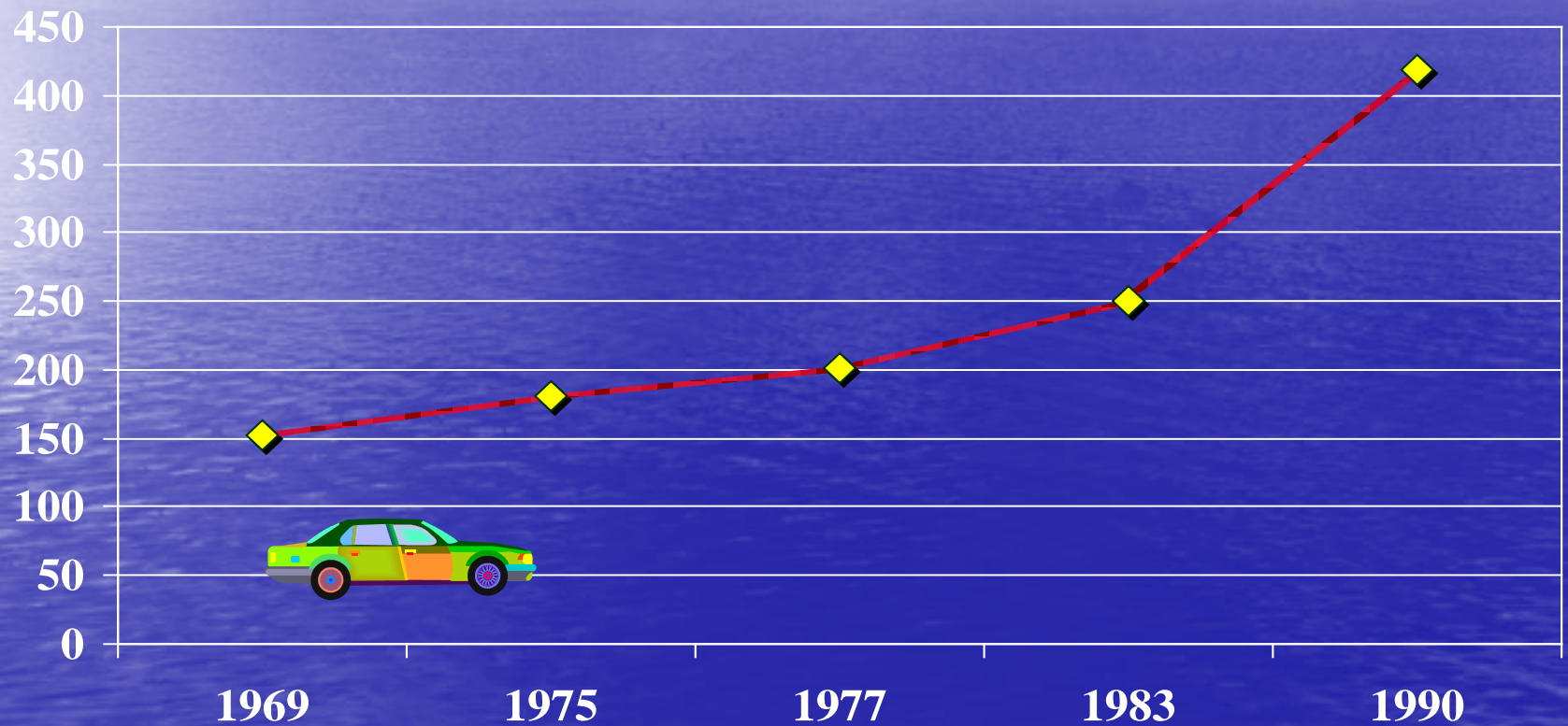
# Neonatal Deaths Due to Maternal Injury, by Year, U.S. 1979-2000



*Underlying Cause of Death: from CDC Wonder, ICD-9 760.5 and P00.5*



# Total Miles (in billions) Driven by Women of Reproductive Age, 1969 to 1990



*Bureau of Transportation Statistics, Omnibus Survey – US  
Department of Transportation*

# Neonatal Deaths Due to Maternal Injury, US, 1991 – 1994, Underlying vs Multiple Cause of Death

Year	Underlying Cause of Death=760.5	All Records with 760.5 in MCOD
1994	23	40
1993	26	46
1992	20	32
1991	19	31
<b>TOTALS</b>	<b>88 (Mean=22)</b>	<b>149 (Mean=37)</b>

# Placental Abruption

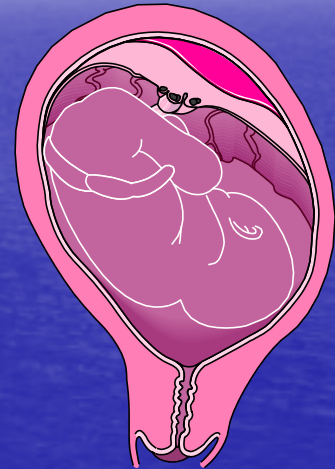
- Reported neonatal deaths related to maternal injury account for at least 3% of all neonatal deaths associated with placental separation

# Morbidity Issues



# Birth Related Threats

- Prematurity
- Low Birthweight
- Obstetric complications
  - Placental injury
  - Uterine rupture
  - Amniotic rupture
  - Trauma-related elective and therapeutic abortion



# Threats to the Baby

- Neonatal Death
- Adverse development due to direct and indirect neural and other organ damage
  - Mental retardation?
  - ADHD?
  - Autism?
  - Cerebral palsy?
  - Epilepsy?
  - ???



# PubMed Keyword Listings – 1/02

- **"Motor vehicle & Pregnancy"** = **155**
- "Alcohol & Pregnancy" = 15,060

# Population Based Fetal Trauma Outcome Studies

- Outcomes at birth:
  - **Wolf** (*J Trauma*, 1993): Non-seat-belt risk in Wash. State.
  - **Hyde** et al (*ObGyn*, 2003): Effect of motor vehicle crashes on birth & fetal outcomes in Utah
  - **Schiff** et al (*J Trauma*, 2002) (89-97): Birth outcome after hospitalized injury in Wash. State
- Outcomes one or more years after birth



# Utah Crash Linkage Summary

- ~3% of births linked to MV crash during pregnancy
- Pregnant women not wearing a seatbelt during an MVC were more likely to:
  - 1.3 times more likely to have low birth weight babies compared to pregnant women not involved in a MVC
  - nearly three times more likely to experience fetal death compared to pregnant women with seatbelts

# Maternal Outcomes (Schiff)

	Adjusted RR* (95% Confidence Interval)
Preterm labor	<b>3.4</b> (3.0-3.9)
Placental abruption	<b>4.0</b> (3.0-5.4)
Labor induction	<b>1.1</b> (0.9-1.2)
Cesarean delivery	<b>1.3</b> (1.1-1.5)

\*Adjusted for smoking, education, PNC initiation

# Infant Outcomes (Schiff)

	Adjusted RR* (95% Confidence Interval)
Preterm delivery	<b>1.5</b> (1.2-1.8)
Low birth weight	<b>1.4</b> (1.1-1.8)
Fetal distress	<b>1.4</b> (1.2-1.7)
Fetal death	<b>2.9</b> (1.2-6.9)

\*Adjusted for smoking, education, PNC initiation

# Fetal Outcomes

- **Fetuses are at unique risk for a variety of adverse outcomes from maternal injury, but research is needed to quantify these and long term risks.**

(Prenatal traumatic disruption)

# Summary

- Injury and motor vehicle injury is a surprisingly common occurrence during pregnancy
- MV trauma to pregnant women has probably increased substantially over last 20 years
- Critical gaps in reporting and surveillance of pregnancy related injury hide the problem
- Fetal injury mortality represents a large proportion of childhood injury mortality
- We are just beginning to understand and measure adverse birth outcomes due to trauma
- No one has measured the long term impact of non-fatal fetal injury among children

# General Recommendations

1. Incorporate maternal/fetal injury in national health prevention and research objectives.
2. Change ICD coding guidelines to encourage coding external cause of maternal injury in vital records.
3. Include maternal injuries in expanded definition of maternal mortality.
4. Incorporate pregnancy status & fetal outcomes in crash and other injury surveillance systems.

# General Recommendations

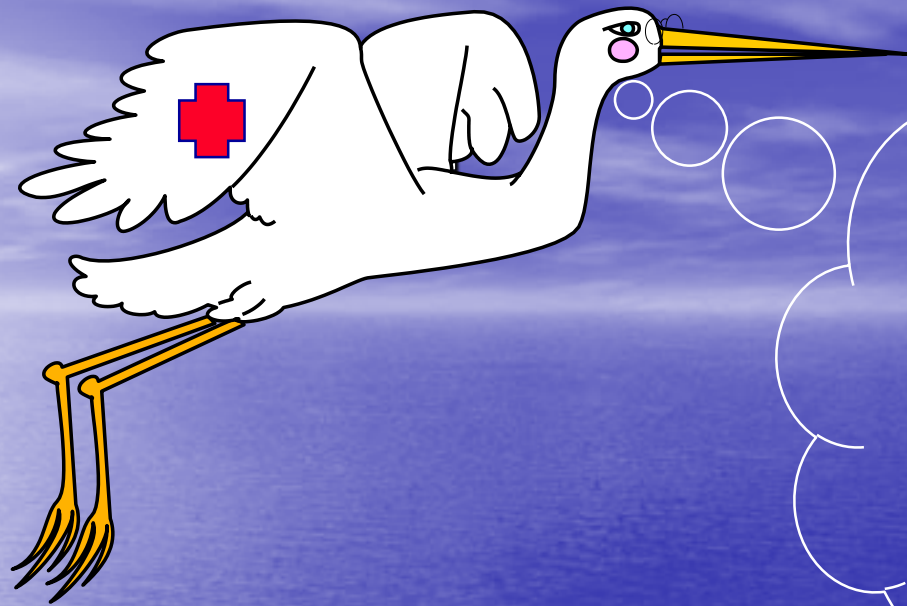
5. States should continuously link birth to hospital discharge data to create a maternal injury surveillance system.
6. CDC should incorporate injury experience in pregnancy risk assessment research (PRAMS).
7. CDC should improve maternal injury details in their birth defects surveillance system.
8. NICHD should examine ways to study developmental outcomes in children exposed to *in utero* trauma.

# Motor Vehicle Recommendations

9. All states should continuously link birth and crash data.
10. The FHA should add pregnancy status to driver behavior surveys so maternal behaviors can be better understood.
11. NHTSA should mandate pregnant crash dummies tests to understand crash dynamics on women & fetuses.
12. States should enhance education and primary belt laws to improve the use and proper use of seat belts by pregnant women.
13. International seat-belt exemptions for pregnant women should be removed.
14. Research should explore ways to reduce maternal:
  - Driving
  - Motor vehicle travel
  - Crash risk
  - Occupant protection







*Questions*  
?

**Injury Prevention  
Begins at Conception!**

# Contact Information

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<http://www.circl.pitt.edu/home/>

