



Integrating Infant and Child Injury Prevention into Programs and Services for Expectant Parents

Motor Vehicle Safety during Pregnancy
October 1st, 3-4pm ET



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Speaker



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MOTOR VEHICLE SAFETY DURING PREGNANCY

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UNC
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A story...



Photo source: NHTSA, 2008



Photo source: NHTSA, 2008

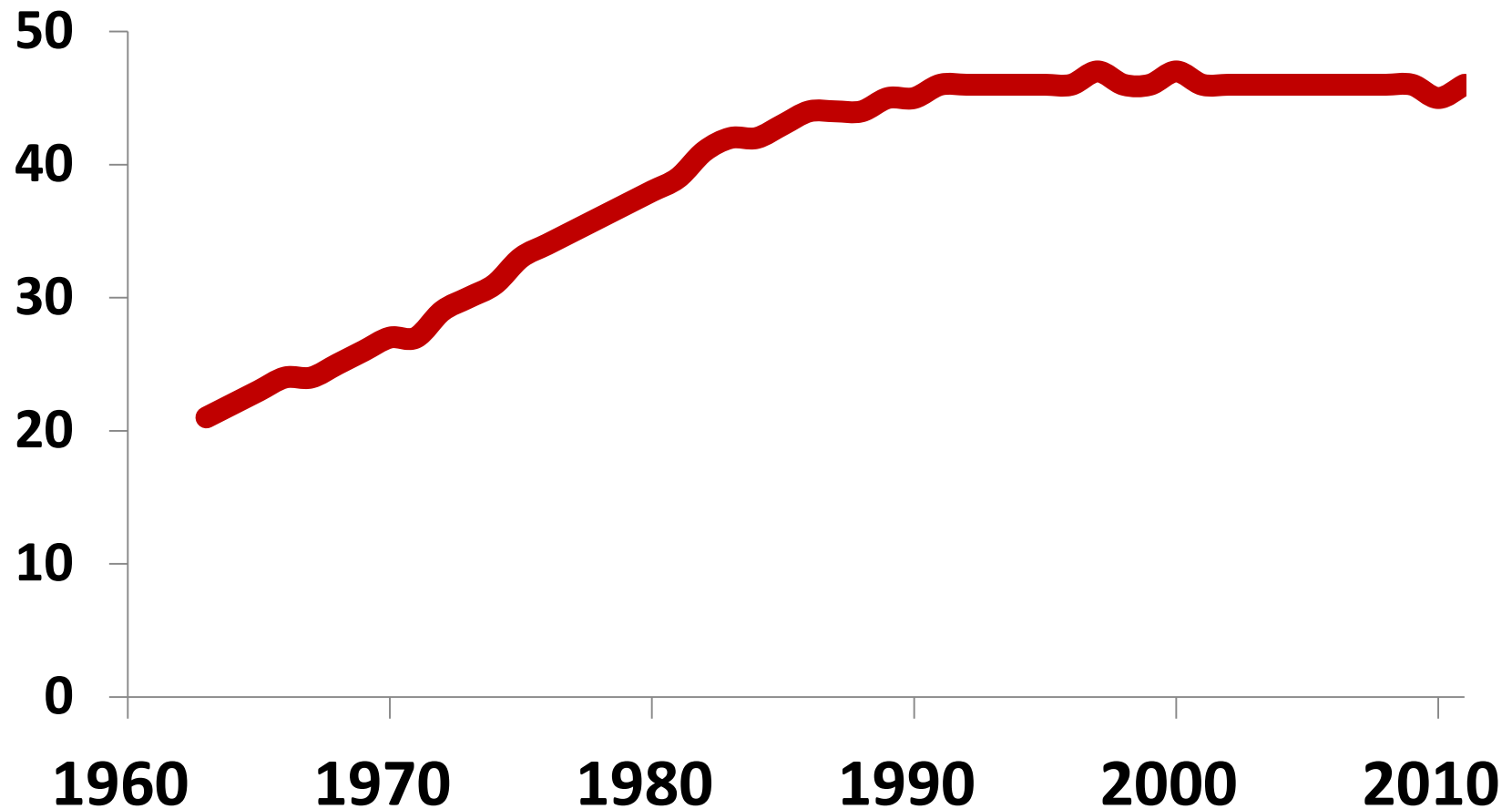
Learning Objectives

- To describe the epidemiology of motor vehicle crashes during pregnancy
- To explain the association between motor vehicle crashes during pregnancy and adverse fetal outcomes
- To describe vehicle safety features and their association with adverse pregnancy outcomes
- To identify interventions that may improve motor vehicle safety during pregnancy

Crashes During Pregnancy

Learning objective: To describe the epidemiology of motor vehicle crashes during pregnancy

Licensed Women Drivers (in Millions), Ages 18 to 44, 1963 to 2011



Source: Federal Highway Administration, U.S. Department of Transportation

Crashes During Pregnancy

- U.S. pregnant occupant crash rate of **13 per 1,000** person-years
- U.S. non-pregnant occupant crash rate of **26 per 1,000** person-years
- Pregnant occupant crash rate is likely underestimated due to limitations in surveillance and reporting

Crash Surveillance

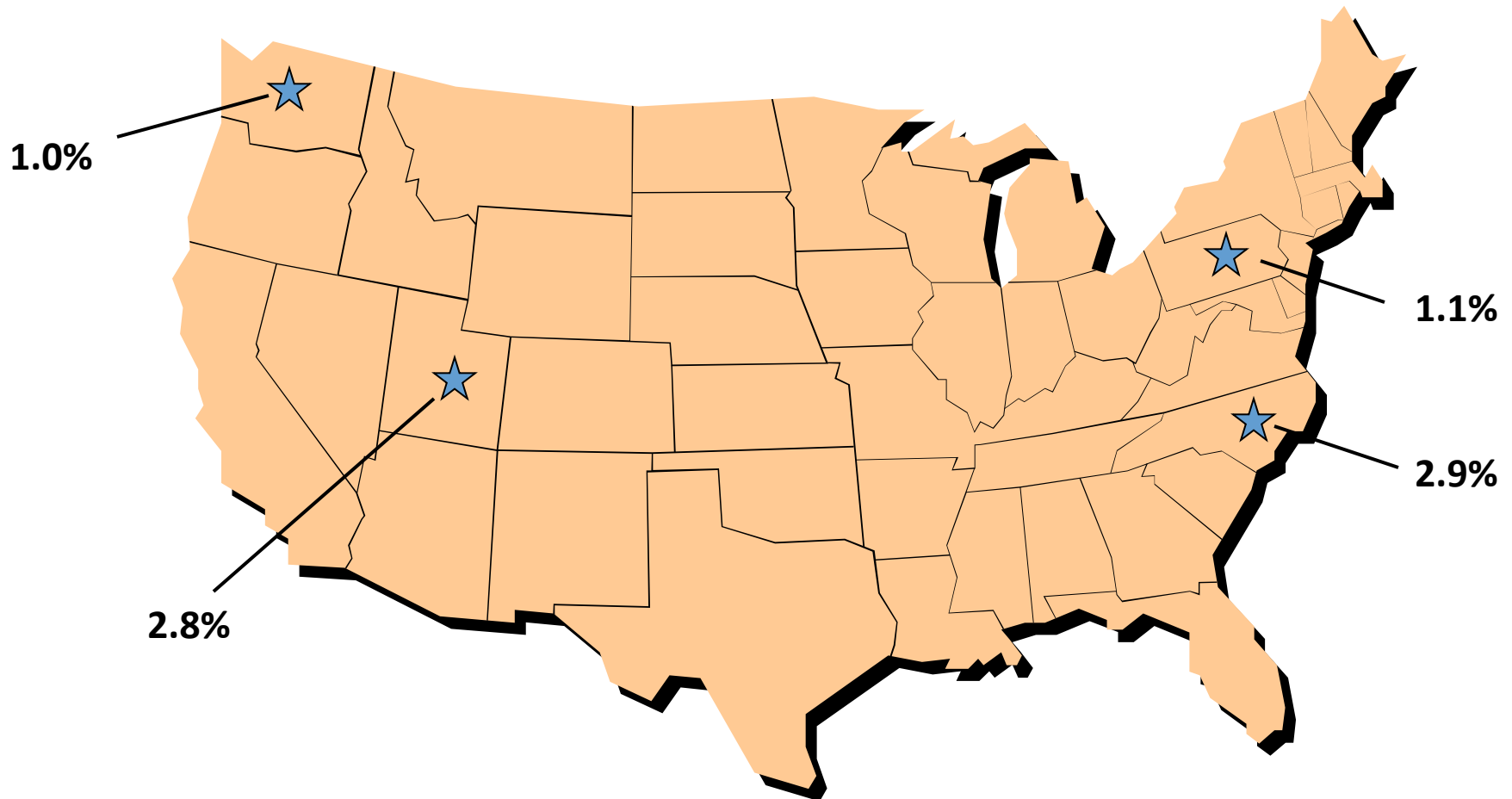
- National data systems:
 - ▣ National Automotive Sampling System (NASS/CDS)
 - ▣ Fatality Analysis Reporting System (FARS)

- State-level databases:
 - ▣ Motor vehicle crash reports
 - ▣ Hospital discharge records
 - ▣ Emergency Department visits



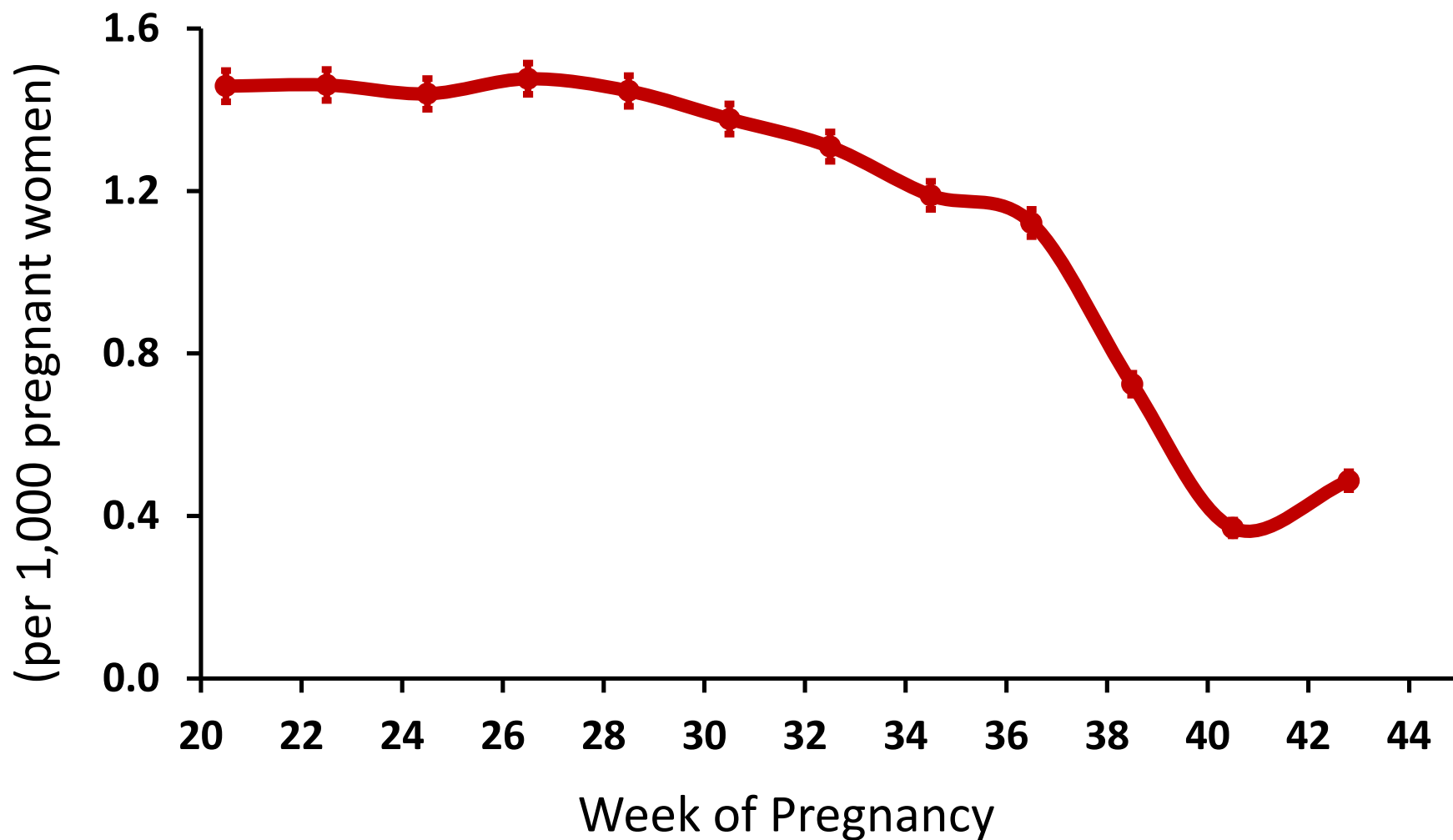
Link to live birth
and fetal death
certificates

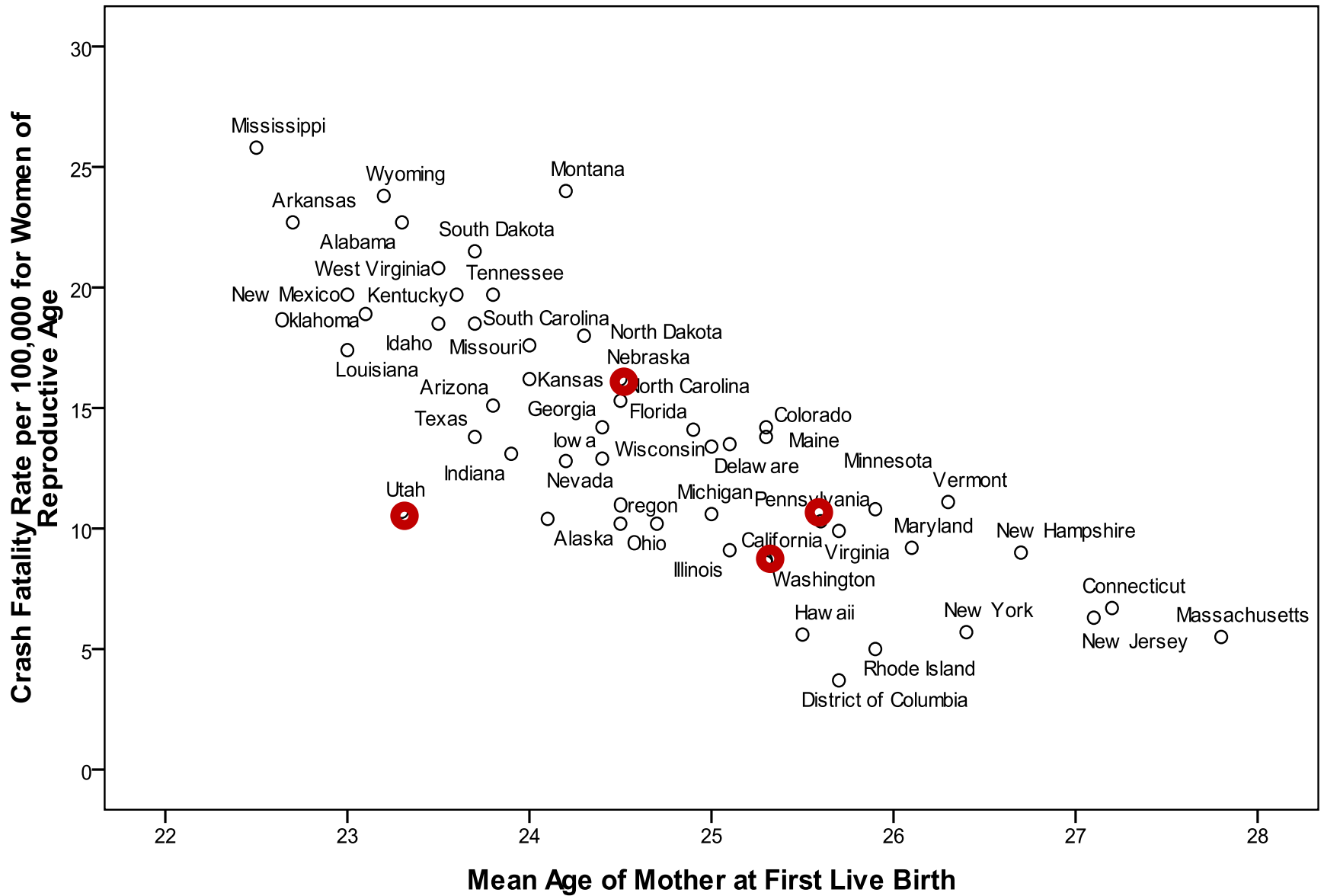
Percent of Pregnant Women in Crashes



Sources: Hyde et al., 2003 (UT); Schiff et al., 2010 (WA); Weiss et al., 2011 (PA); Vladutiu et al., 2013 (NC)

Pregnant Driver Crash Risk in North Carolina, 2001 to 2008





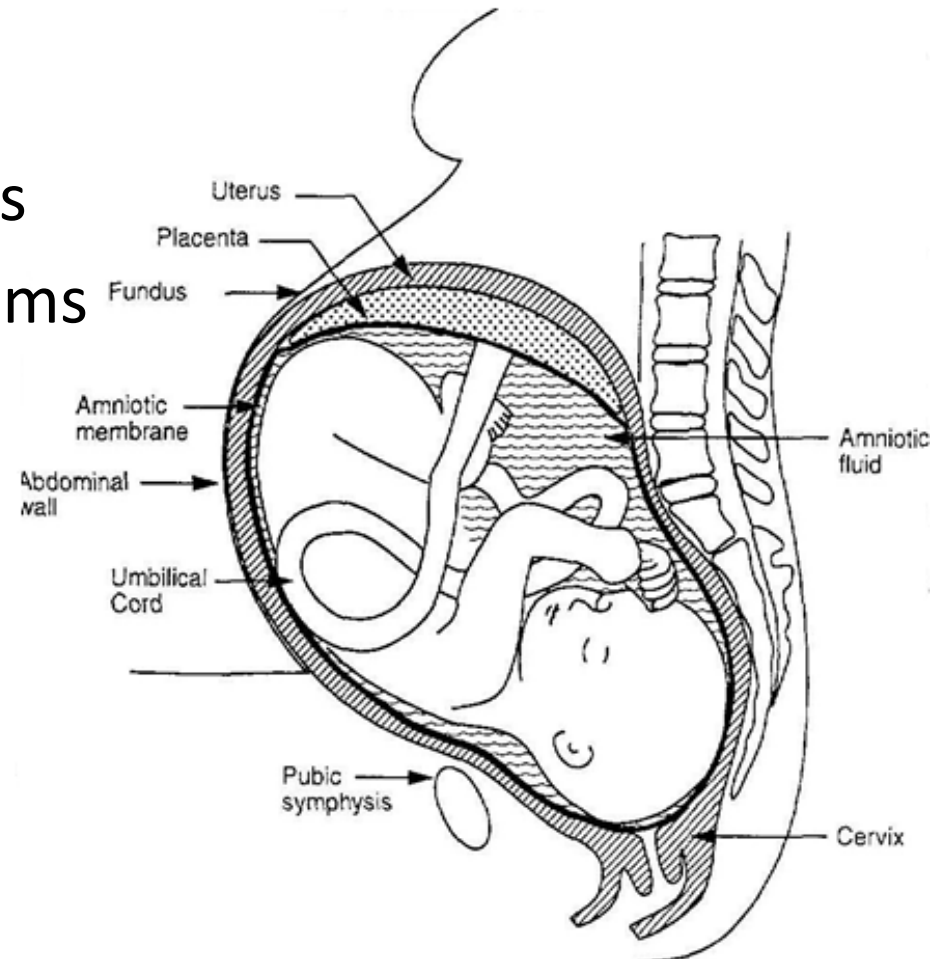
Fetal Health

Learning objective: To explain the association between motor vehicle crashes during pregnancy and adverse fetal outcomes

Fetal Morbidity and Mortality

- Direct injury
 - ▣ Fetal organs and systems
 - ▣ Shared organs and systems

- Indirect harm
 - ▣ Prematurity
 - ▣ Low birth weight
 - ▣ Infant death



Crashes and Fetal Outcomes

- Crash simulation studies
 - ▣ Anthropomorphic devices
 - ▣ Computer simulations
- Case reports
- Population-based studies
 - ▣ Linkage studies in UT, WA, and NC

Population-Based Studies (Crashes)

	Pregnancy Outcomes			
	PTB	Stillbirth	LBW	PA
Crash vs. no crash [RR (95% CI)]				
UT¹	1.02 (0.94, 1.11)		1.03 (0.94, 1.14)	1.00 (0.81, 1.24)
WA¹	1.40 (1.10, 1.90)			6.00 (4.30, 8.20)

Abbreviations: PTB, preterm birth; LBW, low birth weight; PA, placental abruption

1. Estimates are adjusted risk ratios (Hyde et al., 2003; Schiff et al., 2005)

Population-Based Studies (Crashes)

	Pregnancy Outcomes			
	PTB	Stillbirth	PA	PROM
First or second crash vs. no crash [RR (95% CI)]				
NC¹				
First Crash	1.23 (1.19, 1.28)	1.07 (0.90, 1.29)	1.34 (1.15, 1.56)	1.32 (1.21, 1.43)
Second Crash	1.54 (1.24, 1.90)	4.82 (2.85, 8.14)	2.97 (1.60, 5.53)	1.95 (1.27, 2.99)

Abbreviations: PTB, preterm birth; PA, placental abruption; PROM, premature rupture of the membranes

1. Estimates are adjusted rate ratios (Vladutiu et al., in press)

Vehicle Safety Features

Learning objective: To describe vehicle safety features and their association with adverse pregnancy outcomes

Seat Belts

- Designed to secure vehicle occupants against harmful movements from collisions or sudden stops
- Reduce occupant injury and death during crashes in the general population
 - ▣ **15,147** lives were saved by seat belts in 2007¹
- Evidence suggests that seat belts, if worn properly, may minimize injury from crashes during pregnancy

Seat Belts During Pregnancy

- Always wear a safety belt
- Lap belt should be below abdomen and across hips
- Shoulder belt should be above abdomen and placed diagonally across chest and between breasts
- Seat belt should not be behind back or under arm



Population-Based Studies (Seat belts)

	Pregnancy Outcomes				
	PTB	Stillbirth	LBW	PA	PROM
Unbelted vs. belted [RR (95% CI)]					
WA¹		4.10 (0.80, 20.30)	1.90 (1.20, 2.90)	0.90 (0.40, 2.20)	
UT¹	1.00 (0.78, 1.29)	2.80 (1.40, 5.60)	1.18 (0.89, 1.56)	0.88 (0.44, 1.76)	
NC²	1.13 (0.86, 1.51)	2.77 (1.22, 6.28)		1.06 (0.34, 3.31)	1.18 (0.65, 2.15)

Abbreviations: PTB, preterm birth; LBW, low birth weight; PA, placental abruption; PROM, premature rupture of the membranes

1. Estimates are adjusted risk ratios (Wolf et al., 1993; Hyde et al., 2003) with the exception of the unadjusted RR for stillbirth in UT

2. Estimates are adjusted rate ratios (Vladutiu et al., in press)

Airbags

- Designed to deploy in moderate-to-severe frontal and near-frontal crashes
- Reduce occupant injury and death during crashes in the general population
 - ▣ **2,788** lives were saved by frontal air bags in 2007¹
- Mixed evidence regarding the effect of airbags on adverse maternal and fetal outcomes in crashes during pregnancy

Airbags During Pregnancy

- Airbag switch should not be turned off
- Maintain a 10-inch distance between the breastbone and steering wheel
- Angle steering wheel towards breastbone (if tilt wheel)



Population-Based Studies (Airbags)

	Pregnancy Outcomes				
	PTB	Stillbirth	LBW	PA	PROM
Airbag deployed vs. not deployed [RR (95% CI)]					
WA¹	0.80 (0.30, 1.90)		0.80 (0.30, 2.00)		
Airbag available vs. not available [RR (95% CI)]					
WA¹	1.10 (0.80, 1.60)		1.10 (0.70, 1.60)		
Unequipped vs. equipped [RR (95% CI)]					
NC²	1.03 (0.92, 1.14)	0.91 (0.58, 1.44)		1.58 (1.08, 2.30)	0.95 (0.75, 1.20)

Abbreviations: PTB, preterm birth; LBW, low birth weight; PA, placental abruption; PROM, premature rupture of the membranes
 1. Estimates are adjusted risk ratios (Schiff et al., 2010); 2. Estimates are adjusted rate ratios (Vladutiu et al., in press)

Safety Interventions

Learning objective: To identify interventions that may improve motor vehicle safety during pregnancy

Potential Interventions

- Seat belt practices
- Behavior modification
- Protective garments and devices
- Vehicle design
- Legislation

Seat Belt Practices


- Increase the prevalence of seat belt use during pregnancy
 - ▣ Prevalence of **84%** in the U.S.¹
 - ▣ Prevalence of **75% - 96%** across individual studies²⁻⁵
- Minimize concerns and correct misconceptions
 - ▣ Women hindered by **fear of injury**, potential **harm to fetus**, belief that **belts are unnecessary, discomfort**^{3,5}
- Increase proper seat belt use
 - ▣ Proper belt use occurs in **47% - 73%** of pregnant women²⁻⁵

Seat Belt Practices

- Educational interventions
- Prenatal care counseling

The Pregnant Woman's Guide to Buckling Up
Your Top 5 Seat Belt Questions Answered

- "I'm pregnant. Should I wear a seat belt?"**
YES. Doctors recommend it. In a crash, a seat belt is the best protection for both you and your unborn child.
- "Should I adjust my seat?"**
YES. You should move the front seat back as far as possible. If you're driving, make sure that you can still comfortably reach the pedals. But always keep at least 10 inches between the center of your chest and the steering wheel cover or dashboard. As your abdomen grows during pregnancy, adjust your seat to maintain this 10-inch minimum.
- "What if my car or truck has air bags?"**
You still need to buckle up. Air bags are designed to work with seat belts, not replace them. Without a seat belt, you could be thrown into a rapidly opening frontal air bag, which could injure or even kill you and your unborn child. Also, if you're not buckled up, you could collide with other passengers or be ejected from the vehicle.
- "Should I turn the air bag off if my vehicle has an ON-OFF air-bag-disabling switch?"**
NO. Doctors recommend that pregnant women wear seat belts and leave air bags turned on. Seat belts and air bags work together to provide the best protection for you and your unborn child.
- "What's the right way to wear my seat belt?"**
The shoulder belt should lay across your chest (between your breasts) and away from your neck.



Need more help?

Contact us To learn more about seat belts, air bags, child safety seats (including where to find a free child seat inspection station near you), as well as other highway safety topics, call the DOT Vehicle Safety Hotline at 888-327-4236 or visit the NHTSA Web site at www.nhtsa.gov.

Thanks to the National Healthy Mothers, Healthy Babies Coalition and the American College of Obstetricians and Gynecologists for their review and input for this brochure.

"Should I turn off the air bag?"

No. Doctors recommend that pregnant women wear seat belts and leave the air bag switch on; they work together to protect both the mother and the unborn baby in a crash.

"Should I adjust my seat?"

Yes. You should move the front seat as far back as possible. Your breastbone should be at least 10 inches from the steering wheel or dashboard. As your abdomen grows during pregnancy, move the seat back to keep as much distance as possible while still allowing a driver to reach the pedals.

Need more help? Contact us

For more information about child safety seats, booster seats, inspection/fitting stations in your area, seat belts, air bags, and other highway safety issues, call the DOT Auto Safety Hotline at 1-888-DASH-2-DOT (1-888-327-4236) or visit our web site at www.nhtsa.dot.gov





Thanks to the American College of Obstetricians and Gynecologists (ACOG) and National Healthy Mothers, Healthy Babies Coalition for their review and input for this brochure.

DOT HS 809 606
September 2002

"Should pregnant women wear seat belts?"

ANSWERS TO AN EXPECTANT MOTHER'S COMMON QUESTIONS ABOUT TRAFFIC SAFETY

Example brochures:

<http://www.trafficsafetymarketing.gov/newtsm/tk-bua/PregnantWomenSeatBeltFlyer.pdf> (left)

www.nhtsa.gov/.../pregnancybrochure/BUA_PregnancyNHTSAchange.p...(above)

<http://www.acog.org/~media/For%20Patients/faq018.pdf?dmc=1&ts=20130929T1132291724> (Not shown)

Driving Behaviors

- Modify driving behaviors to decrease crash risk
- Consider driving during safer conditions
 - Good weather conditions
 - Well-maintained roads
 - Average speeds
- Reduce driving frequency and distances

Protective Garments



Jennings, J (2009). Maternal expandable protector. U.S. Patent No. 0136798 filed December 17, 2004, and issued May 19, 2009. For more information: www.pregnancyprotectivegarment.com

Protective Devices



For more information: <http://www.tummyshield.com.au/default.php>



Protective Devices



For more information: <http://www.dreambaby.com.au>

Protective Devices



For more information: <http://www.pregnancyseatbeltharness.com>

Vehicle Design

- Performance standards based on male occupant of average weight and height
- Women may adjust devices in the vehicle
 - ▣ Seat belts
 - ▣ Steering wheel
- Auto manufacturers should consider pregnant women when designing and testing vehicles

Legislation

- Seat belt use is higher in “primary law states” vs. “secondary law states” (90% vs. 78%)¹
- Primary seat belt laws²
 - **33 states** and the District of Columbia (front seat)
 - **16 states** and the District of Columbia (rear seat)
- Secondary seat belt laws²
 - **16 states** (**7 states** include rear seats)
- Some states may allow medical exemptions for pregnancy

Summary

- Motor vehicle crashes during pregnancy are not uncommon
- Crashes during pregnancy are associated with an increased risk of several adverse pregnancy outcomes
- Seat belts appear to be effective at minimizing the risk of crash-related adverse fetal outcomes
- Airbags do not appear to increase the risk of crash-related adverse pregnancy outcomes
- Interventions are needed to improve motor vehicle safety during pregnancy

Public Health Implications

- Improve surveillance of crashes during pregnancy
- Encourage safe driving behaviors and practices
- Develop effective programs for improving belt use
- Improve crash protection systems for pregnant women and fetuses



**20 y/o 2nd trimester
Unbelted rear passenger
Dead on arrival**



**25 y/o 1st trimester
Belted front passenger
Hospitalized**



**20 y/o 3rd trimester
Belted driver
Hospitalized**



**18 y/o 1st trimester
Unbelted driver
Dead on arrival**

Questions?

Contact Information

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Thank you for your participation!

Please take a moment to fill out our evaluation:

https://www.surveymonkey.com/s/expectant_cop100113

Questions or Comments? Contact:

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