



# Our State, Our Challenge: Preterm Birth In North Carolina

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Preterm Birth Prevention  
**SYMPOSIUM**  
MAY 23, 2016 • CHAPEL HILL



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Community Care  
of North Carolina

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# Preterm Birth



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25 Week neonate 265 gms (9 oz)



# Preterm Birth

- **Preterm**
  - Infant born before 37 weeks of pregnancy
  - Very preterm birth < 32 weeks
  - Extreme preterm birth <28 weeks
- **12,500 preterm births in North Carolina per year**
  - \$70-75 million annually

Source: NC Department of Health and Human Services State Center for Health Statistics (2016)





# Cost of Prematurity

**Table 1.** Neonatal and Maternal Costs and Outcomes by Week of Gestation for Surviving Infants

Gestational age (wk)	n	Neonatal LOS (d)		Neonatal cost		RDS (%)	Ventilation (%)	C/D rate (%)	Nonnormal DRG (%)	Maternal LOS (d)		Maternal cost	
		Mean	Median	\$1000/case	\$ million					Mean	Median	\$1000/cases*	\$1000*
25	192	92.0	87	202.7	38.9	82.3	89.6	43.2	97.9	6.3	5	7.5	1441
26	251	75.9	75	146.6	36.8	70.9	81.7	49.4	100.0	6.9	5	7.8	1958
27	328	66.8	66	119.6	39.2	69.8	71.3	47.3	99.7	7.0	4	8.1	2648
28	402	52.3	51	86.2	34.7	58.5	62.2	50.7	97.3	7.4	4	9.5	3835
29	585	39.5	40	62.6	36.6	48.7	45.8	43.9	93.2	6.1	4	6.9	4007
30	797	30.4	29	46.4	37.0	38.4	41.2	43.0	88.6	6.1	3	7.2	5713
31	1194	21.5	18	29.8	35.5	31.2	27.3	39.1	81.7	5.2	3	6.2	7461
32	1921	14.8	9	18.9	36.3	18.3	16.0	33.9	72.8	4.4	3	5.2	9936
33	3172	9.0	3	11.0	34.7	13.0	9.5	29.6	63.6	4.0	2	4.5	14,389
34	5788	5.9	2	7.2	41.4	7.4	6.3	24.6	57.0	3.3	2	3.8	22,082
35	9898	3.9	2	4.2	41.1	4.5	3.6	23.8	51.3	3.2	2	3.4	34,075
36	16,609	2.8	1	2.6	42.8	2.3	2.3	22.1	42.2	2.5	2	3.1	51,259
37	34,477	2.2	1	1.7	58.2	1.2	1.3	21.2	29.7	2.1	2	2.7	93,048
38	71,610	1.8	1	1.1	81.7	0.6	0.7	20.4	23.6	1.9	2	2.5	175,916

LOS = length of stay; RDS = respiratory distress syndrome; C/D = cesarean delivery; DRG = diagnosis-related group.

\* Includes any prenatal admissions and delivery admission and possible subsequent transfers until mother was sent home.

Gilbert W, Obstet Gynecol 2003;102:488



# Preterm Birth

- **Leading cause of neonatal mortality (35%)**
- **NICU care has improved survival for extreme preterm deliveries but increased the proportion of survivors with disabilities**



# Preterm Birth

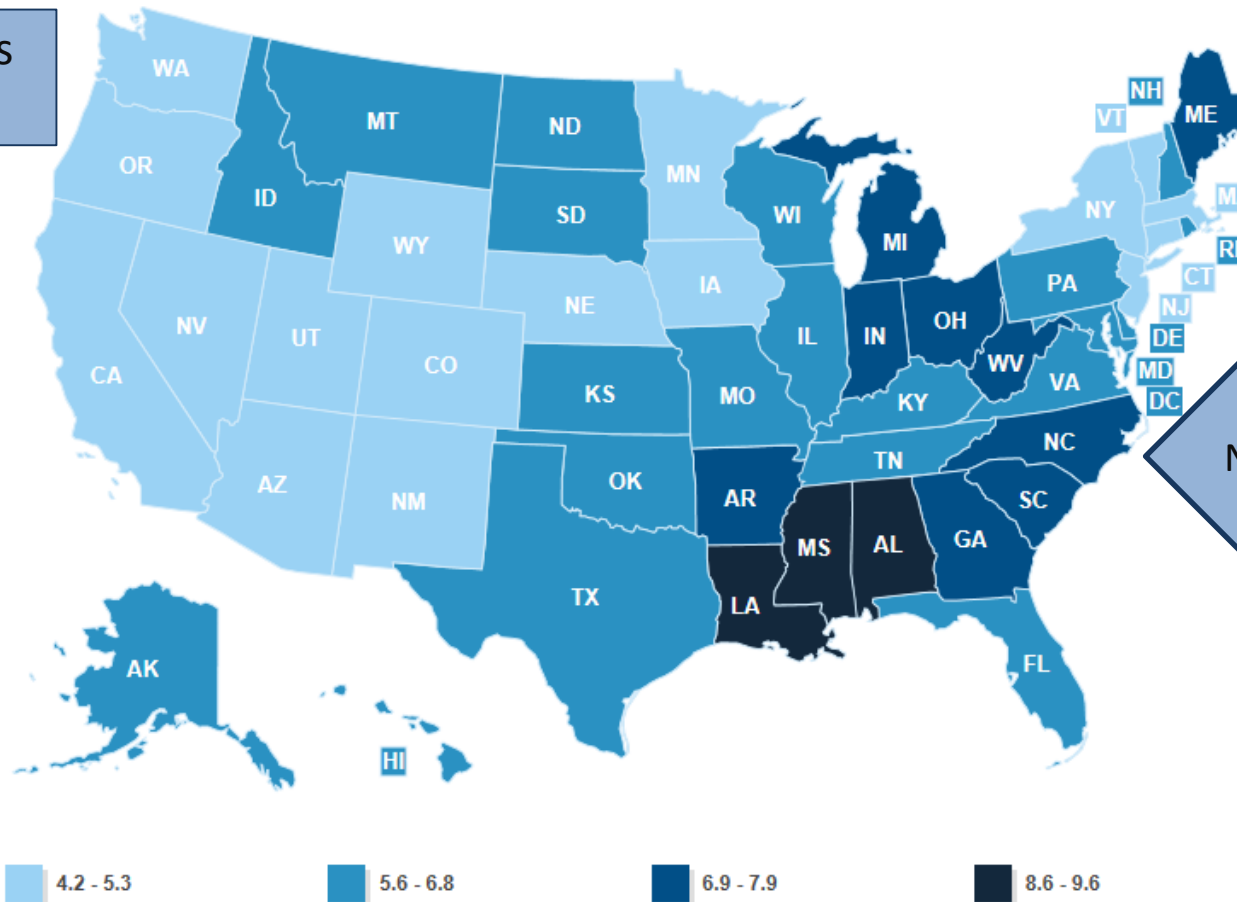
- **Cerebral palsy**
- **Developmental delay**
- **Vision problems**
- **Hearing impairment**

# Infant Mortality Rate (Deaths per 1,000 Live Births) – 2013



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United States  
6.0



The Kaiser Family Foundation State Health Facts. Data Source: Matthews, TJ, M.S., et. al. [Infant Mortality Statistics from the 2013 Period Linked Birth/Infant Death Data Set](http://www.kff.org/other/state-indicator/infant-death-rate/#notes). Division of Vital Statistics, CDC. *National Vital Statistics Report* 64 (9), August 6, 2015. – retrieved from <http://kff.org/other/state-indicator/infant-death-rate/#notes> May 21, 2016



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# Infant Mortality Rate (Deaths per 1,000 Live Births) by Race/Ethnicity – 2011-2013



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Location	Non-Hispanic White	Non-Hispanic Black	American Indian or Alaska Native	Asian or Pacific Islander	Hispanic
United States	5.1	11.3	8.1	4.2	5.1
Alabama	6.9	12.9	NSD	NSD	5.0
Massachusetts	3.5	6.9	NSD	3.3	5.5
Minnesota	4.3	8.9	11.3	4.6	5.4
Mississippi	6.8	12.4	NSD	NSD	6.4
<b>North Carolina</b>	<b>5.4</b>	<b>12.6</b>	<b>10.6</b>	<b>4.3</b>	<b>5.6</b>
South Carolina	5.3	11.5	NSD	NSD	5.0
Virginia	4.8	11.7	NSD	5.0	5.8



Source: The Kaiser Family Foundation State Health Facts. Data Source: Matthews, TJ, M.S., et. al. Infant Mortality Statistics from the 2013 Period Linked Birth/Infant Death Data Set. Division of Vital Statistics. [National Vital Statistics Report](http://www.nvhs.gov/data-research/national-vital-statistics-report), Vol 64, No. 9, August 6, 2015. – Retrieved May 21, 2016 from <http://kff.org/other/state-indicator/infant-mortality-rate-by-race-ethnicity/>.

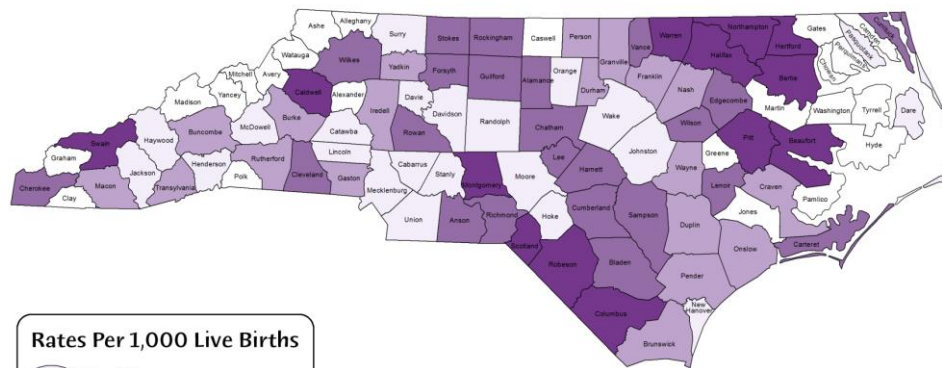


# Infant Mortality Rate by County – North Carolina, 2010-2014



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**North Carolina Infant Mortality Rates by County  
2010 - 2014**



Rates Per 1,000 Live Births

- 3.9 - 6.2
- 6.3 - 7.7
- 7.8 - 10.0
- 10.1 - 15.1
- Suppressed\*

\* Rates based on less than 10 deaths are unreliable and have been suppressed.



Residence	White Rate	African American Rate	Disparity Ratio
Cabarrus	4.6	6.6	1.43
Craven	7.8	8.0	1.03
Iredell	4.2	24.1	5.74
Mecklenburg	3.5	9.9	2.83
New Hanover	2.9	9.0	3.10
Robeson	10.9	15.1	1.39
Rockingham	7.1	23.2	3.27
Scotland	12.8	13.3	1.04
Union	2.7	15.7	5.81

Source: North Carolina State Center for Health Statistics, August 2015 – retrieved May 21, 2016

Map Source: North Carolina State Center for Health Statistics - North Carolina Infant Mortality & Related Data: 2014 Data Update. Kathleen Jones-Vessey. Child Fatality Task Force Presentation Oct. 19, 2015 – Retrieved May 21, 2016 from <http://www.ncleg.net/DocumentSites/Committees/NCCFTF/Presentations/2015-2016/2014%20IMR%20UPDATE%20Jones-Vessey%2010192015.pdf>



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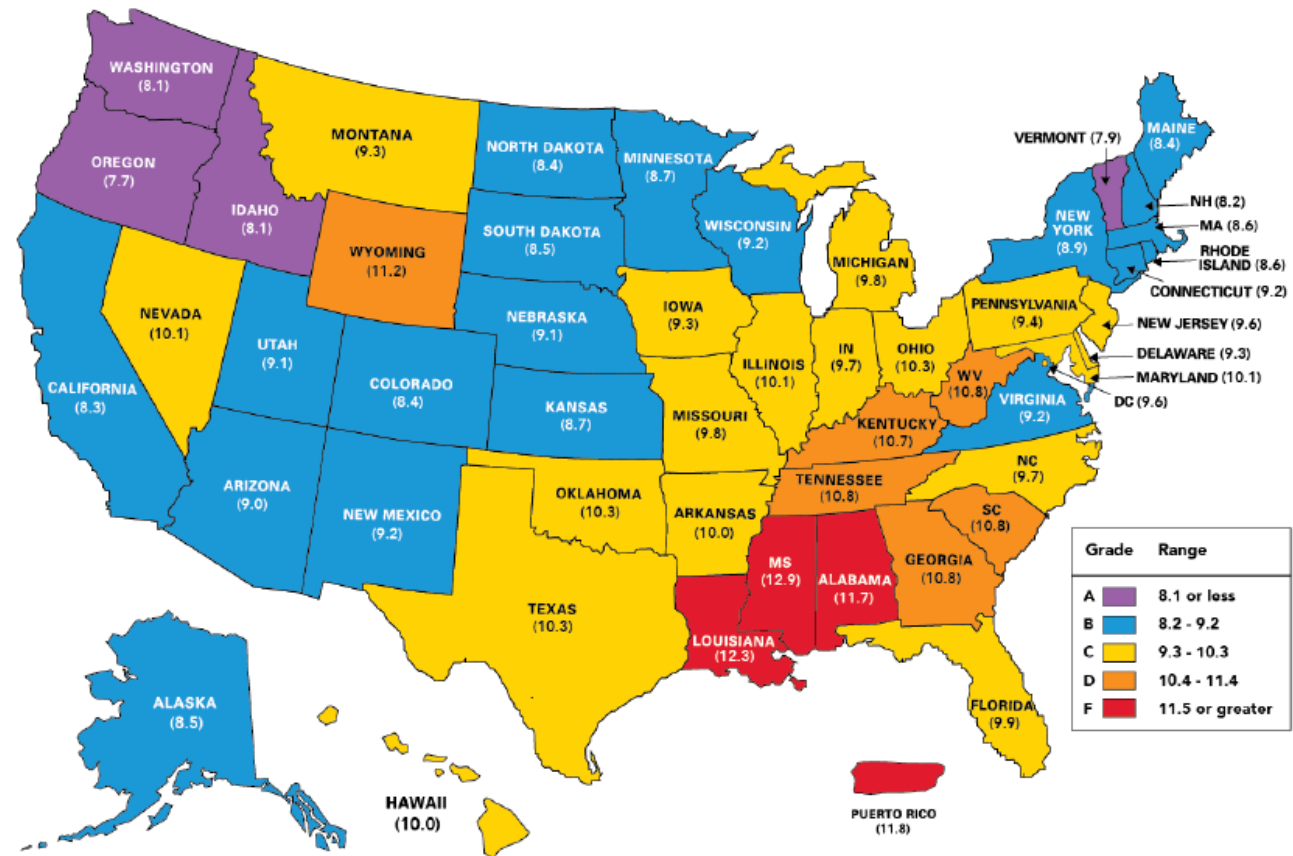
# March of Dimes: 2015 PREMATURE BIRTH REPORT CARD

National  
Preterm Birth  
Rate of **9.6%**



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## PRETERM BIRTH RATES & GRADES BY STATE

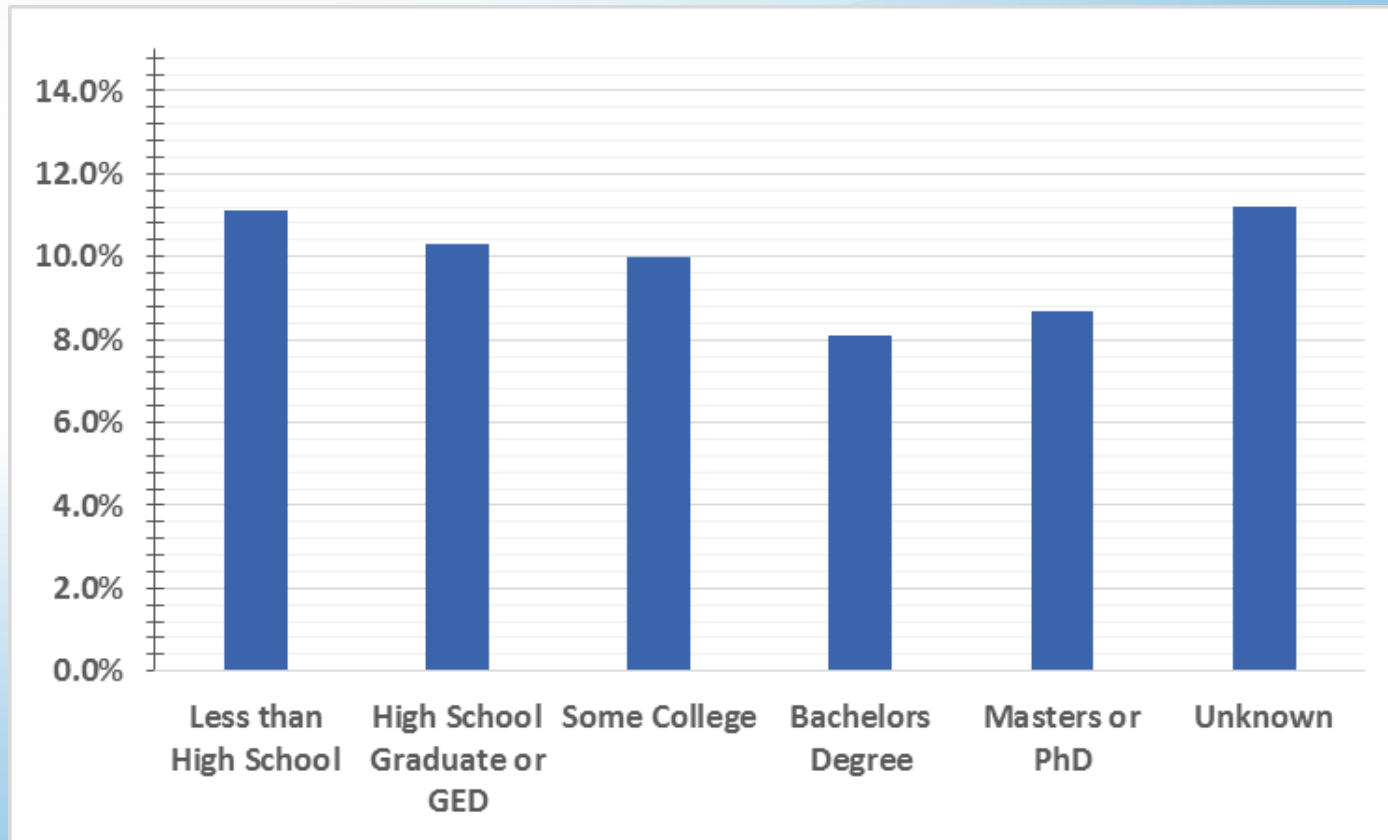


Source: March of Dimes 2015 Premature Birth Report Cards: Grades determined by March of Dimes based on preterm birth rates from National Center for Health Statistics, 2014 final natality data – Retrieved May 21, 2016 from <http://www.marchofdimes.org/mission/prematurity-reportcard.aspx>

# Percent of Preterm Births by Mother's Education Level – NC, 2014



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Source: NC Department of Health and Human Services State Center for Health Statistics (2016)



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# Preterm Birth By State

State	All Races	Non-Hispanic Black	Non-Hispanic White	Disparity Ratio
Alabama	11.7	15.2	10.3	1.48
South Carolina	10.8	13.9	9.5	1.46
North Carolina	9.7	13.3	8.8	1.51
Virginia	9.2	12.6	8.4	1.50
North Dakota	8.4	8.5	8.1	1.05
Minnesota	8.7	8.9	8.6	1.03

Kaiser Family Foundation 2014

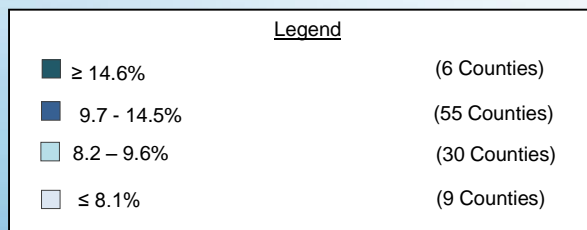
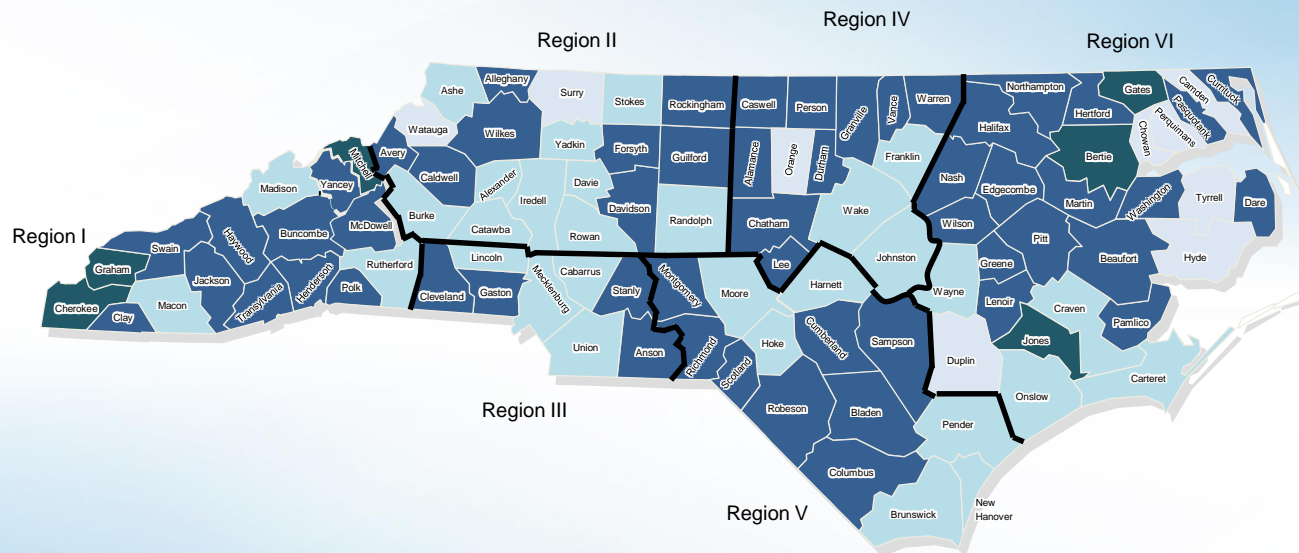


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**Percentage of Preterm Births: 2014 North Carolina Resident Births**  
(NC Statewide Average = 9.7%)



Source: NC Department of Health and Human Services State Center for Health Statistics (2016)



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# What have we learned about preventing preterm birth?



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# Preterm Birth Corticosteroids Before Delivery



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- Respiratory distress reduced by 44%
- Bleeding in the brain reduced by 46%
- Neonatal risk of death reduced by 31%



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# Preterm Birth Successes

- **Magnesium Sulfate given prior to 32 weeks decreases the risk of cerebral palsy by 29%**



# Preterm Birth: What Does Not Work



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- **Bedrest/Pelvic rest**
- **Maintenance tocolytics**
- **Broad spectrum antibiotics**
- **Screening and treating asymptomatic high risk women for lower genital tract infection**
- **Screening and treating gingivitis**



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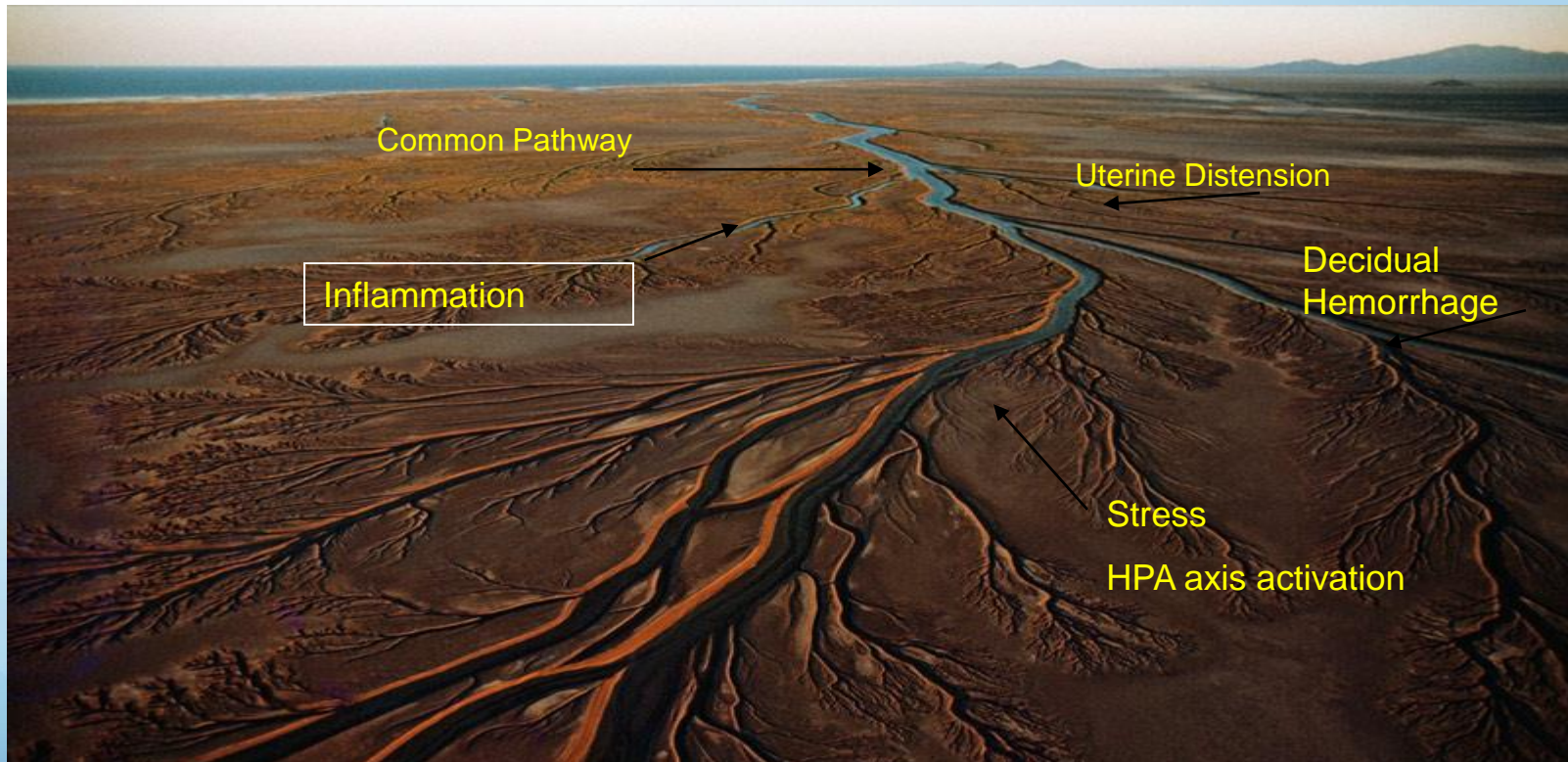
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# The Progression to Preterm Birth

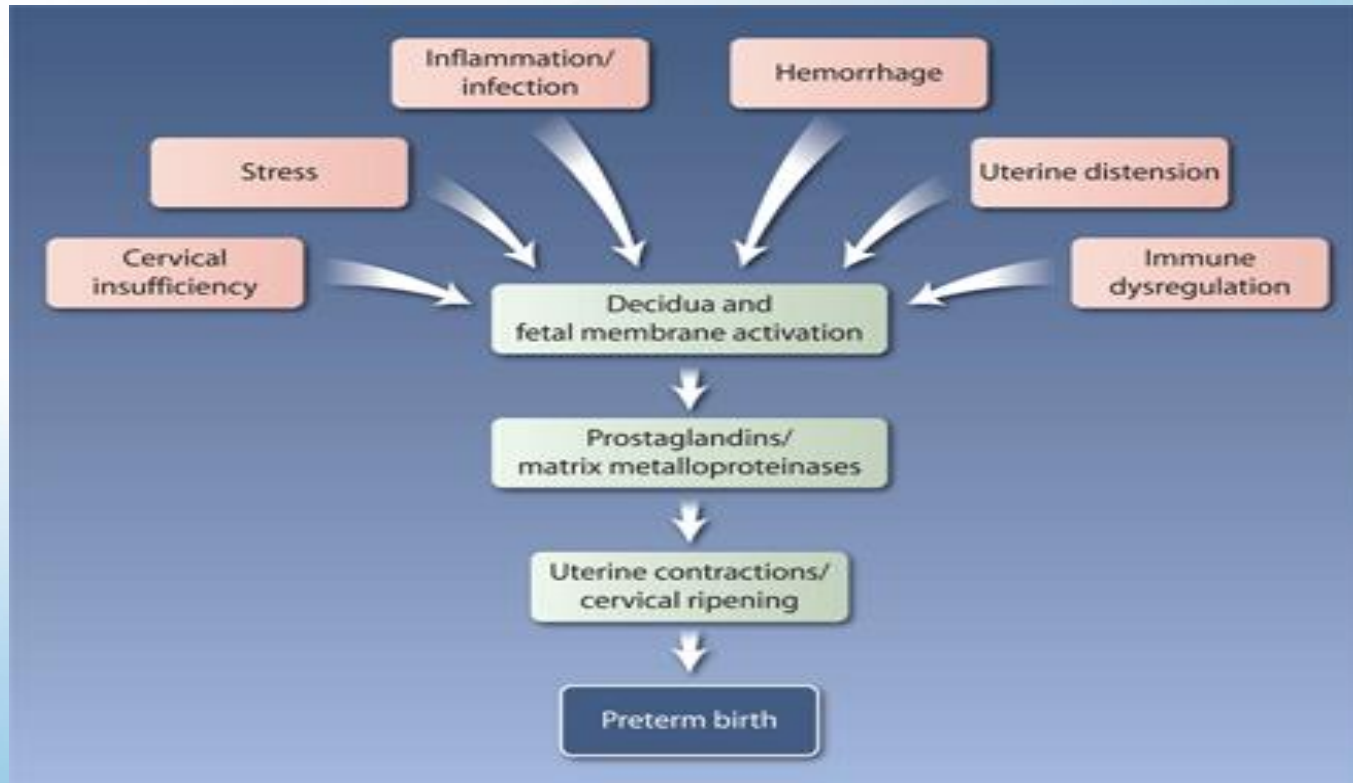


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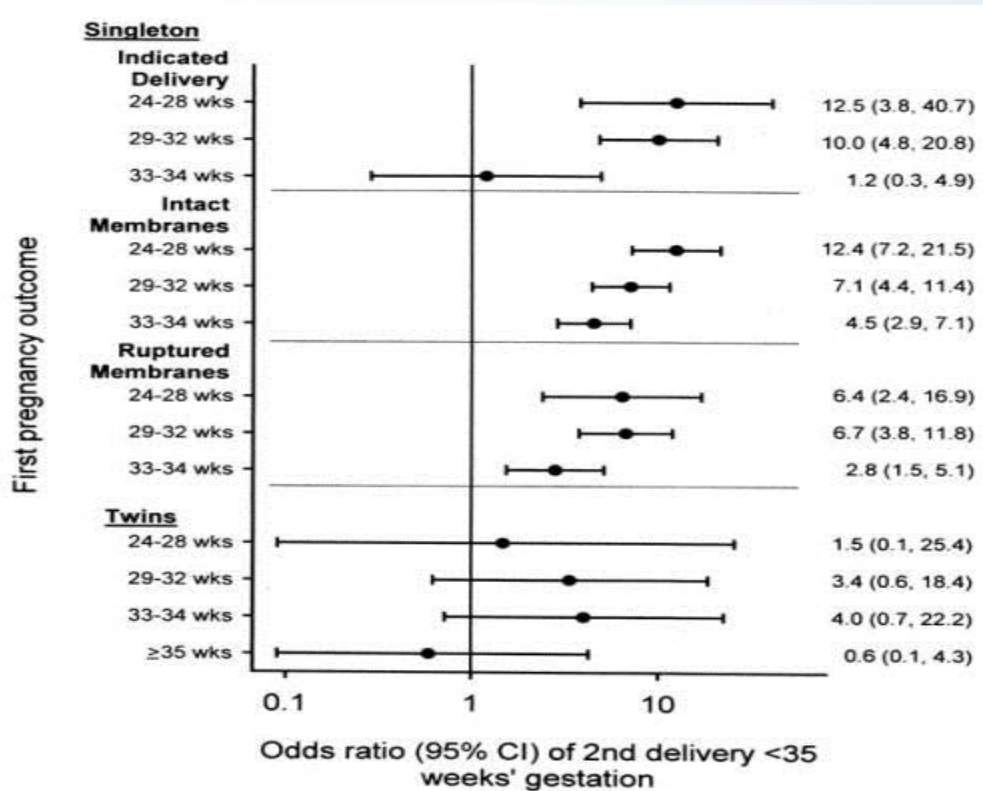
# Preterm Labor: Major Known Pathways







# Recurrent Preterm Birth



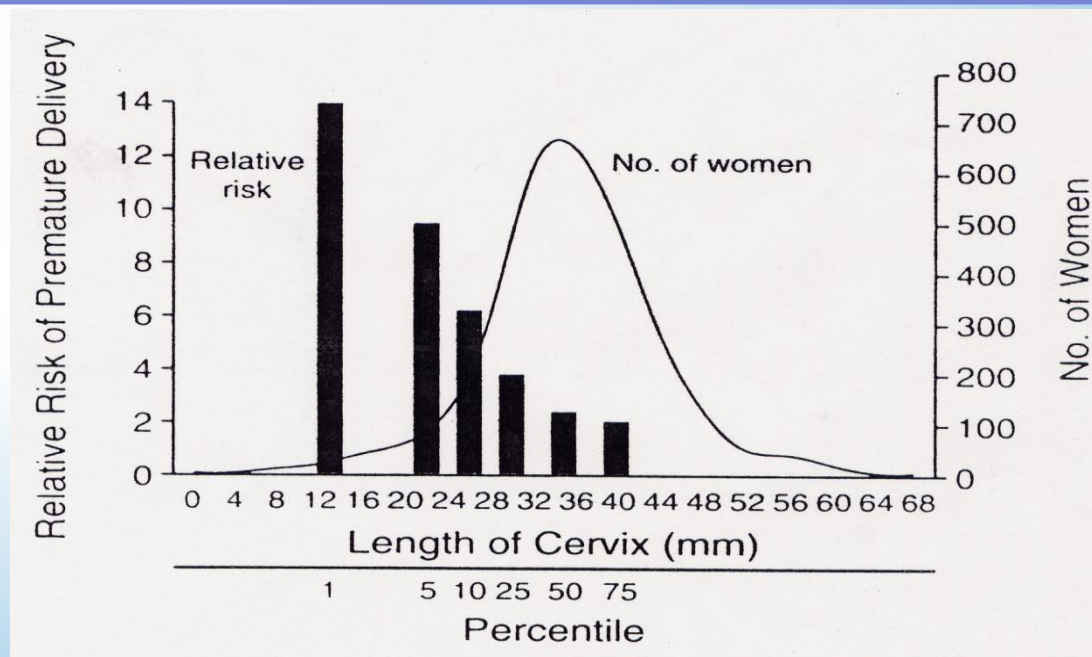
- Only 10-15% of all PTD
- Risk increases from 1 to 2 to 3 prev PTD from 16%, 41%, & 67%
- Previous Delivery 13-24 wks risk 38%, (Goldenberg 1993)

Bloom SL, Obstet Gynecol 2001;98:379





# Relative Risk of Spontaneous Preterm Delivery < 35 Weeks by Percentile of Cervical Length at 24 Weeks



Iams JD, Goldenberg RL, Meis PJ, et al. The length of the cervix and the risk of spontaneous premature delivery. N Engl J Med 1996;334:567-72. Copyright 1996 Massachusetts Medical Society. All rights reserved.



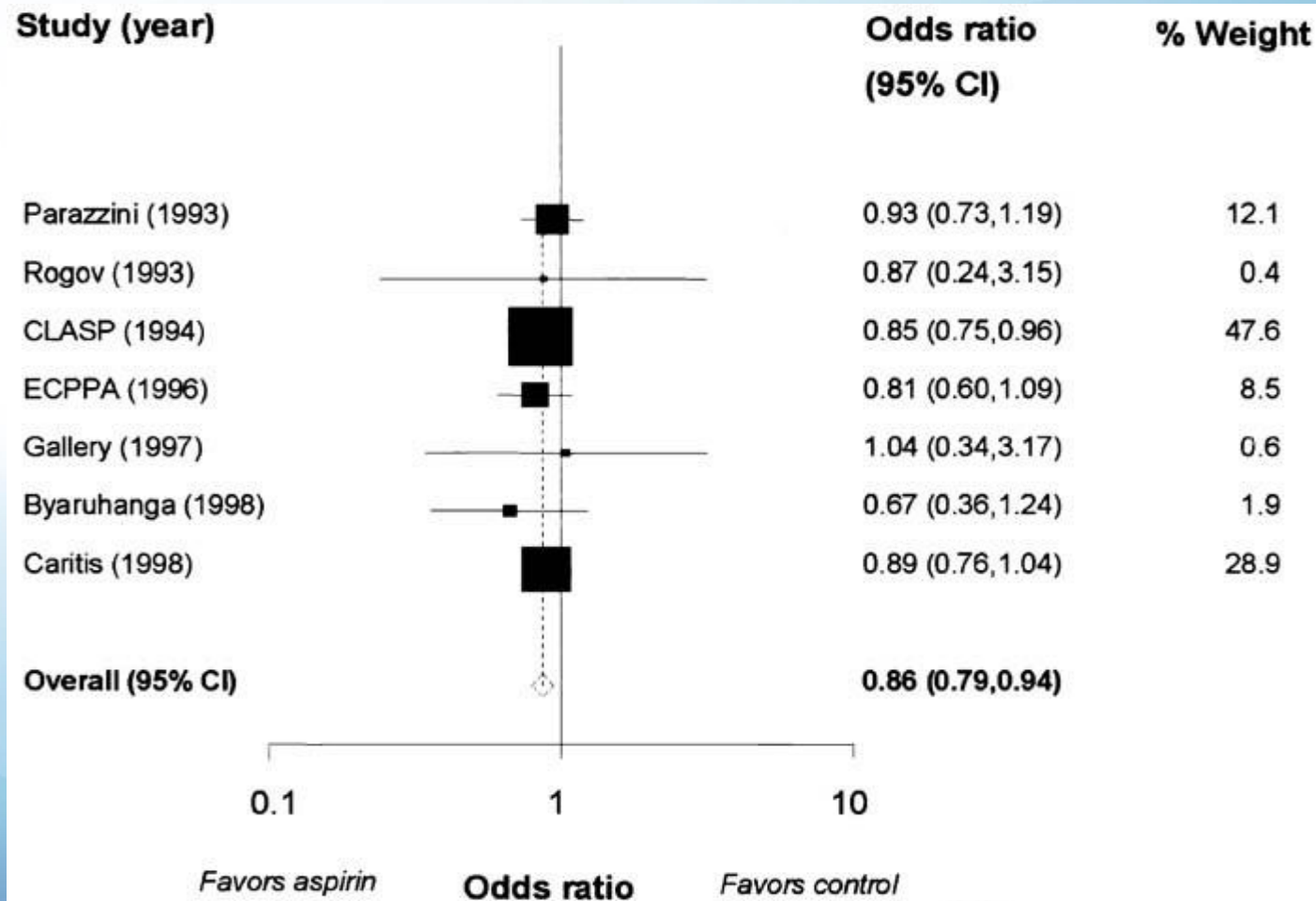
# Preterm Birth Prevention

- In a patient with a prior preterm birth, progesterone reduces the risk by 33%
- In a patient with a prior preterm birth and a short cervix, a cerclage reduces the risk by 30%
- In a patient without a prior preterm birth and a short cervix, progesterone reduces the risk by 40-45%

# Aspirin Preventing Preterm Birth Meta-analysis



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Coomarasamy A, Obstet Gynecol 2003;101:1319

# Prevention of Prematurity

## Low Dose Aspirin Cost-Benefit

### U.S. Preventive Services Task Force



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Preterm birth	RR	95% CI
High-risk	0.86	0.71-0.98
Moderate-risk	0.93	0.71-0.98

Werner EF, Obstet Gynecol 2015;126:1242



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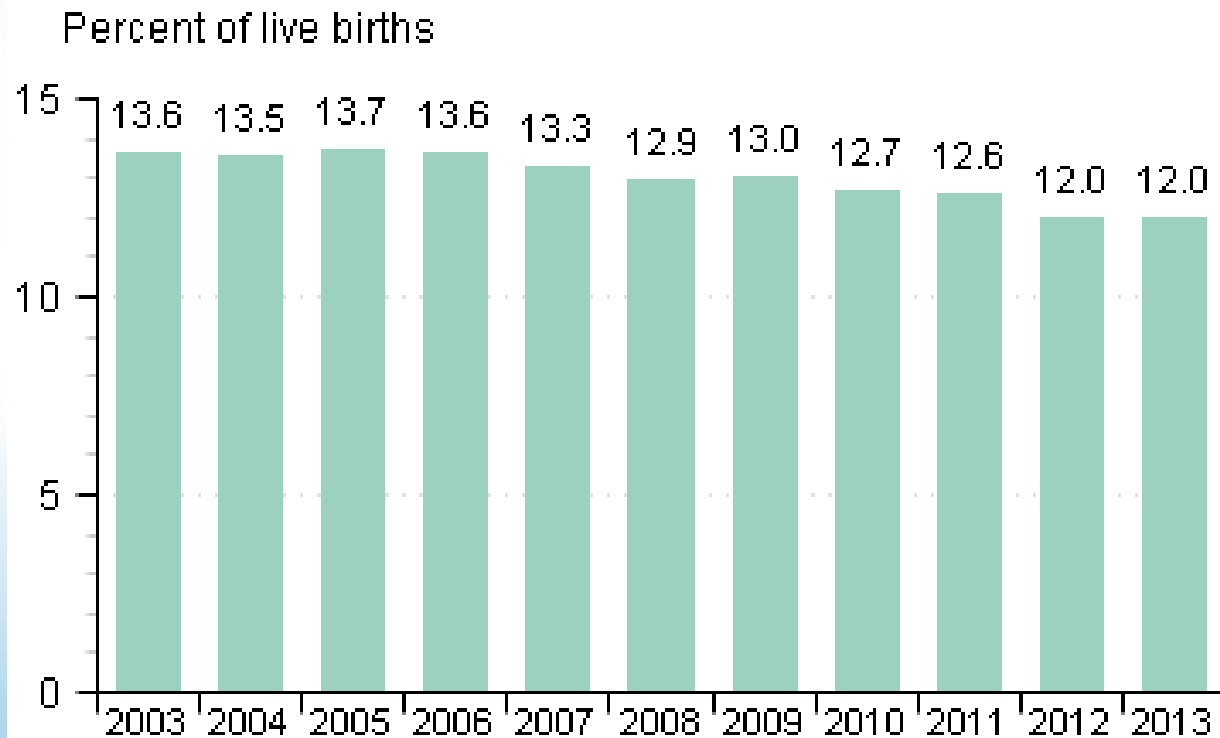
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# North Carolina Preterm Birth Rate, 2003-2013



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March of Dimes Perinatal Data Centers



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# Primate Social Structure



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# Primate Social Status



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- **Social status is one of the most important predictors of quality of an individual's social environment and affects gene regulation**
- **Subordinates have little social support leading to chronic stress, immune compromise and reproductive dysregulation**

Tung J, PNAS 2012;109:6495



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# Maternal Stress



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- Defined as a state that threatens or is perceived to threaten an individual's physiological equilibrium
- Associated with adverse outcomes such as cardiovascular disease, cerebrovascular disease and immunosuppression
- The classic mediators are cortisol, norepinephrine and inflammatory markers including cytokines
- Women in lower socioeconomic groups have an increased risk of stress and complications during pregnancy independent of other factors

Borders AE, Obstet Gynecol 2007;109:331

Cardwell MS, Obstet & Gynecol Surv 2013; 68:119



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# Maternal Stress



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- **Economic, communication and geographic barriers**
- **Safety issues**
- **Unstable housing**
- **Poor nutrition**
- **Substance abuse**
- **Depression symptoms**



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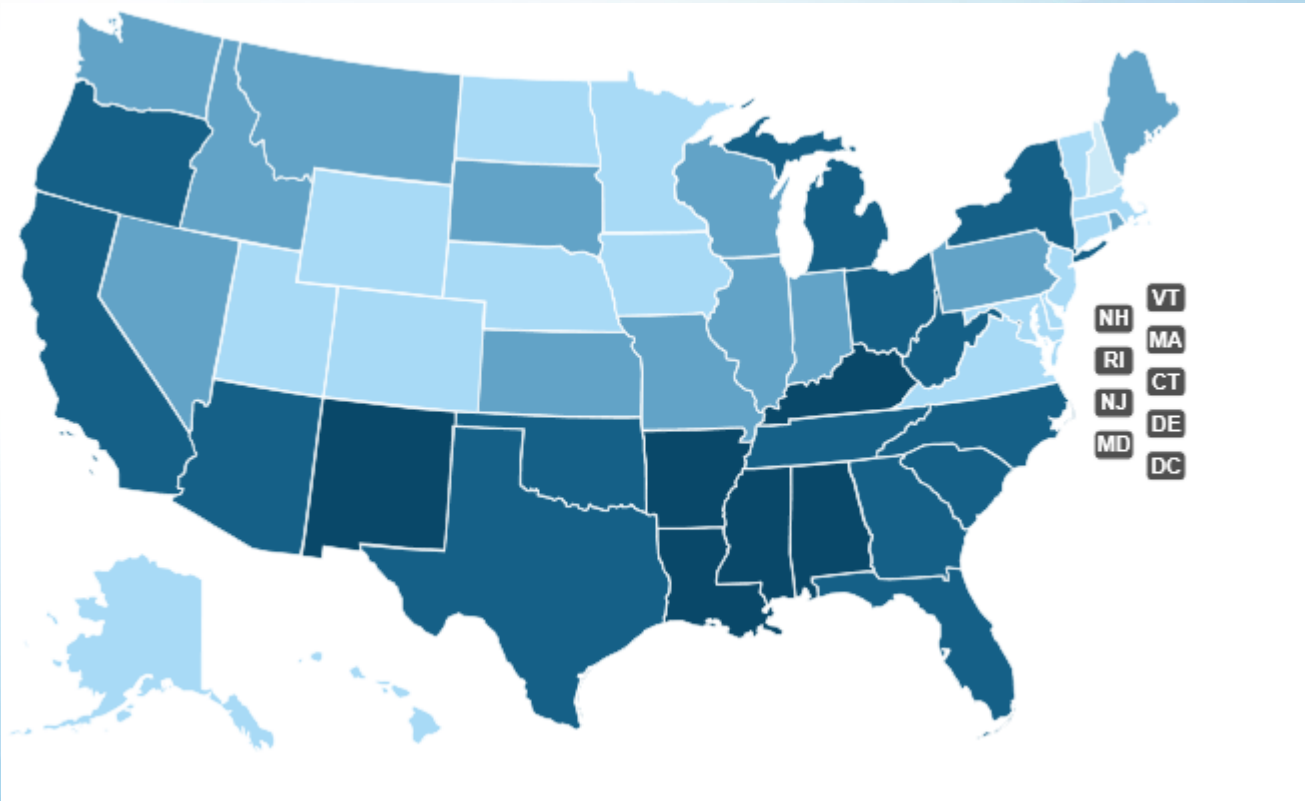
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# Overall Poverty 2015



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Talkpoverty.org

## Map Key

Less than 10 %

10.1 - 12.8 %

12.9 - 15.6 %

15.7 - 18.5 %

More than 18.5 %



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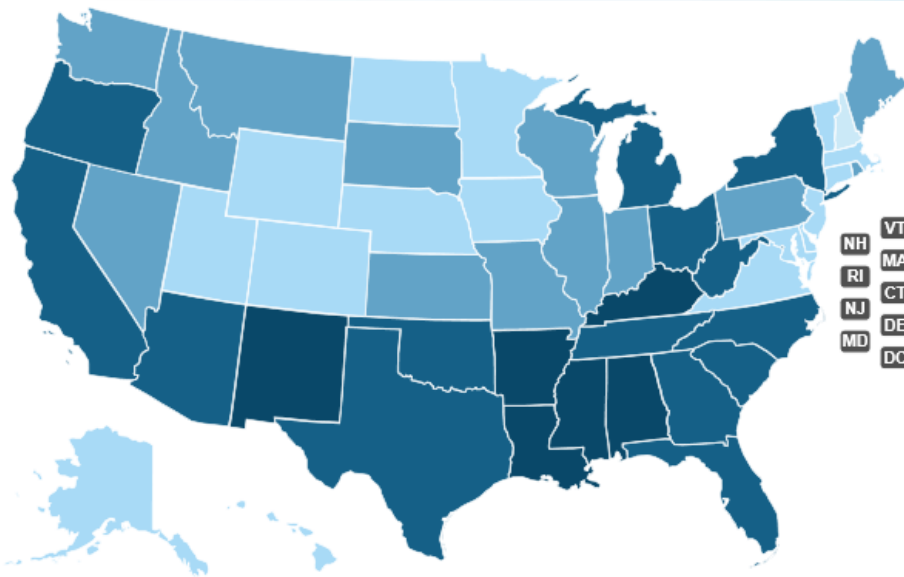


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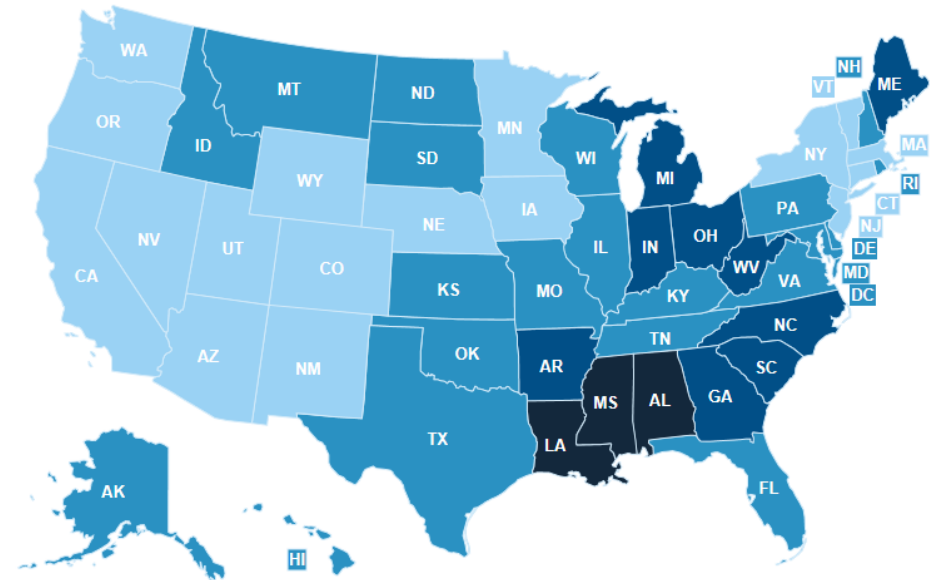
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# Overall Poverty vs Infant Mortality



Overall Poverty

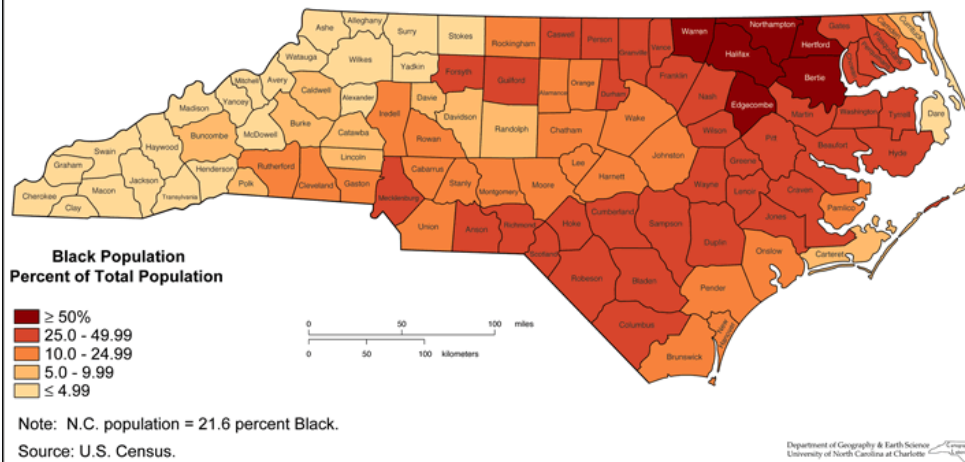


Infant Mortality

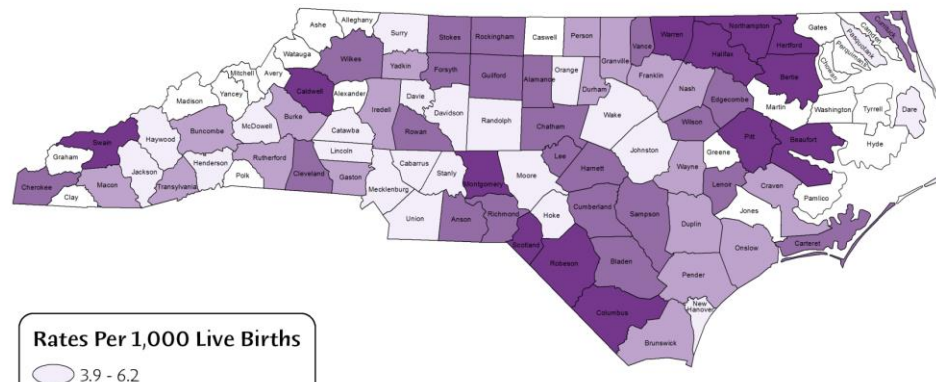


# Race and Infant Mortality

**Figure 19. Black Population**



## North Carolina Infant Mortality Rates by County 2010 - 2014





# Reduce the Risk of Stress Related Illness



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- Spiritual belief
- Loving relationship
- Enjoy work
- Play every day (music, art)
- Exercise

Hsing-Chi C, Complimentary Ther Med 2015;23:509



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# Health Disparity

## Preventing Preterm Birth



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- Tobacco cessation
- Programs to reduce obesity
- Reduce multiple gestations
- Prevent unintended pregnancy
- Outreach: make access to preterm birth prevention interventions easy, (ultrasound, progesterone, ASA)



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# March of Dimes Prematurity Campaign

## Goal: 8.1% by 2020



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- North Carolina 9.7%
- Oregon 7.7%; Mississippi 12.3%
- PTD rate Idaho's Kootenai county 6.2%
- Maine: White 8.0% and Black 8.2%



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# How Does Your Patient Get Progesterone

- 36 y/o G-6 P-3-1-1-4 at 24 + 0 weeks
- Previous 32 week delivery
- School teacher with private insurance
- 1 vial (5 doses) of commercial 17-OHP \$3381
- \$5000 deductible after that 20% copay
- Makena: \$95 per 1250 mg vial, (5 weeks)
- Prometrium: \$135 for 5 weeks (\$27 co pay)
- Started PNC at 19 weeks
- First injection at 25 weeks



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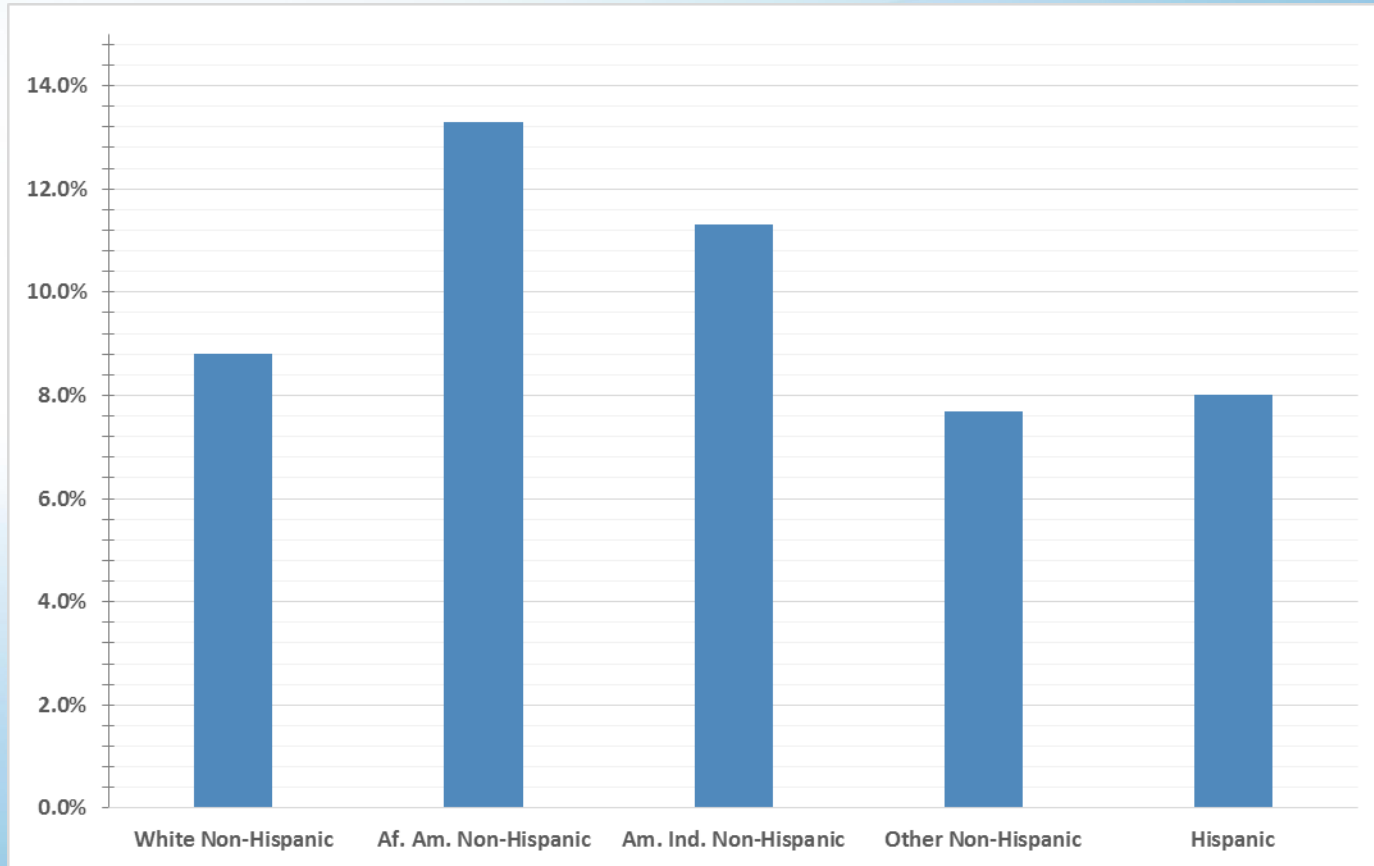
	Very Preterm Birth (%)	Preterm Birth ( %)
Singleton	1.2	9.74
Twins	10.6	58.7
Triplets	39.3	98.4



# Percent of Preterm Births within each Racial and Ethnic group – NC, 2014



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Source: NC Department of Health and Human Services State Center for Health Statistics (2016)



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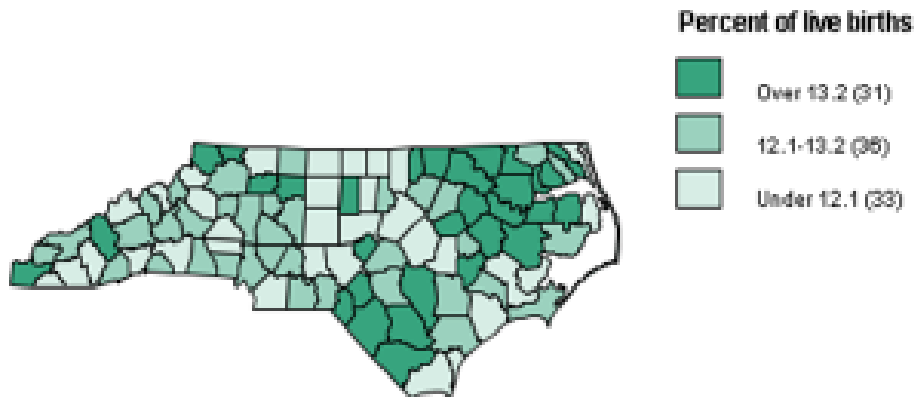
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## Preterm birth

North Carolina, 2010-2013 Average



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Preterm is less than 37 completed weeks gestation.  
Source: National Center for Health Statistics, final natality data. Retrieved May 16, 2016,  
from [www.marchofdimes.org/peristats](http://www.marchofdimes.org/peristats).



Source: March of Dimes Peristats



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