

Group B Streptococcal Infections in Louisiana

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INTRODUCTION

Group B streptococcus (GBS) causes multiple diseases, most of which affect neonates and the elderly. In newborns, infection can result in stillbirth, neonatal pneumonia, sepsis, meningitis, mental retardation and hearing or vision loss in children who survive infection. Group B streptococci are common inhabitants of the gastrointestinal and genitourinary tract.⁵ Less commonly, they colonize the pharynx. Recent literature estimates between 15 and 40% of pregnant women are carriers of GBS. Neonates can become infected with GBS by aspiration of infected amniotic fluid during gestation or during passage through the birth canal. Less commonly, an infant can acquire GBS in the community from other colonized persons, resulting in late-onset disease. The incidence of GBS disease declines dramatically after three months of age. Nevertheless, up to 10% of pediatric cases occur beyond early infancy, and many, but not all, of these are infants who were born preterm.

In the 1970's, GBS was the leading infectious cause of neonatal morbidity and mortality in the United States and was responsible for an estimated 7,500 cases per year with a fatality rate of almost 50%. In 1992, the Committee on

Infectious Diseases and Committee on Fetus and Newborn of the American Academy of Pediatrics released guidelines for prevention of neonatal GBS disease through intrapartum chemoprophylaxis of selected maternal carriers. In 1996 and 2002, these guidelines were revised. Current guidelines call for universal screening of all pregnant women during the 37th week of gestation and antibiotic treatment of women found to be carriers.

In older adults, GBS generally causes pneumonia that is easily treated with antibiotics.

We examined national and state data to investigate the effects of changes in screening and treatment guidelines for GBS on all diseases caused by GBS. State data were obtained from three sources: the Louisiana Reportable Disease Database, Louisiana Hospital Inpatient Discharge Data (LaHIDD), and Vital Records death certificates. To compare Louisiana and the United States, we used Active Bacterial Core Surveillance (ABCs) reports issued by the Centers for Disease Control and Prevention (CDC). ABCs is conducted by state and local health departments and the CDC. ABCs was established in 1995 in four states and has since grown to include 10 sites representing 38 million persons. Each year, active laboratory and population-based

CME INFORMATION

TARGET AUDIENCE

The September/October GBS feature article is intended for physicians and other health care providers in Louisiana.

EDUCATIONAL OBJECTIVES

After reading this article, physicians should be better able to (1) describe the importance of Group B streptococcal infections in Louisiana newborns; (2) understand the main goal of the CDC guidelines for the prevention of neonatal Group B streptococcal infections; (3) describe the effect of these guidelines on the number of neonatal Group B streptococcal infections in Louisiana. Estimated time to complete this activity is one (1) hour.

CREDIT

The LSMS Educational and Research Foundation designates this educational activity for a maximum of one (1) *AMA PRA Category 1 Credit*TM. Physicians should only claim credit commensurate with the extent of their participation in the activity.

DISCLOSURE

Ms. Eavey has nothing to disclose.
Dr. Ratard has nothing to disclose.

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surveillance is conducted to monitor invasive bacterial pathogens of public health importance, including group B streptococcus. Demographic information is collected for each case of invasive disease identified. Data from local and state health departments are collected and collated by the CDC and released in disease specific annual reports.

We found that increased screening and treatment following the release of national guidelines have dramatically lowered the national and state incidence of GBS disease among newborns. Meanwhile, the incidence of GBS infection among older age groups remains stable.

POPULATION AND METHODS

Reportable Disease Database

In Louisiana, reportable diseases fall into four categories, Class A, Class B, Class C, and Class D diseases. Class A diseases must be reported to the Office of Public Health (OPH) within 24 hours. Diseases in this class, which include possible bioterrorism agents, are severe and/or hold the potential for epidemic spread. Class B includes diseases of public health concern that must be reported within one business day. Class C and D diseases are of significant public health concern and should be reported within five business days.

In Louisiana, invasive infection caused by GBS is a Class C disease that must be reported to the OPH within five business days. Health care providers may communicate reports by way of phone, fax, mail-in cards, or a web-based system (the Reportable Disease Database). Confirmed cases, as defined by the CDC, are entered into surveillance systems at the national level. Case reports include basic demographics and epidemiologic information to allow for routine follow-up.

Data about reportable diseases in Louisiana are recorded in the Reportable Disease Database. Invasive disease caused by GBS became a reportable disease in 2002.

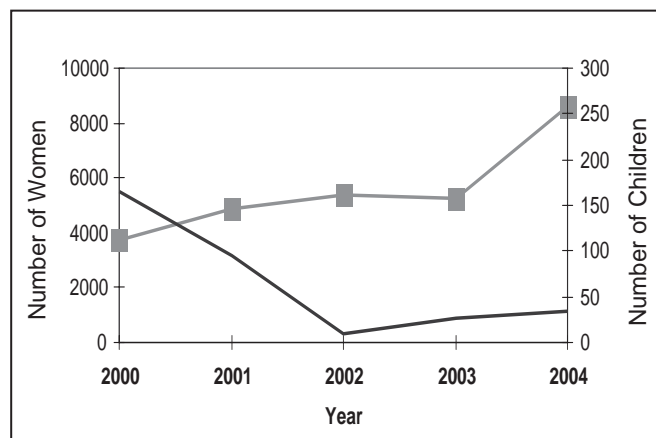


Figure 1. The number of hospitalized women aged 15-44 and the number of newborns diagnosed with group B streptococcus (GBS), Louisiana 2000-2004. ■ Women Aged 15-44 Years, — Children Under 1 Year. (Source: LaHIDD data)

LaHIDD

In 1997, the Louisiana Legislature mandated the reporting of hospital discharge data. The Louisiana Hospital Inpatient Discharge Database, or LaHIDD serves as the state registry containing inpatient discharge data submitted to DHH/OPH by Louisiana hospitals. Yearly LaHIDD datasets contain parish, age, admit date, demographic and diagnosis information on all inpatients. These datasets are a tremendous resource for epidemiologists to examine absolute numbers and trends of morbidity due to infectious disease.

We used these datasets to calculate risk ratios for GBS disease risk factors in pregnant women. The last update we acquired is the 2004 dataset. Using the International Classification of Disease codes, version 9, we identified women who were diagnosed with GBS carriage and disease during a hospital admission in which they gave birth. We compared pregnant GBS infected, hospitalized women with pregnant non-GBS infected, hospitalized women by risk factors identified in recent literature.^{2,3} Confidence intervals of 95% were calculated using EpiInfo.

Mortality Data

Mortality due to infectious disease is monitored through death certificate surveillance. Louisiana Vital Records releases data about the number and nature of deaths in the state during a given year. These data contain both cause of death and demographic information. Complete death certificates are available for deaths occurring through 2004. Hospitalization resulting in death is also recorded in LaHIDD data.

RESULTS

Reportable Disease Database

Data from this database is of limited use because the number of invasive cases represents a very small fraction of the morbidity caused by GBS.

LaHIDD

In the years following the release of the first national screening recommendations (in 1996), the number of newborns diagnosed with GBS has plummeted while the number of women of child bearing age diagnosed as carriers has increased (Figure 1). Previous studies have reported varied risk factors for early onset perinatal GBS disease. These risk factors include gestational age of less than 37 weeks, longer duration of membrane rupture, young maternal age, African American race, and Hispanic ethnicity.^{2,3} Using LaHIDD data, we calculated Louisiana-specific risk ratios for some of these risk factors (Table 1).

Risk ratios have values between zero and infinity. A risk ratio of one indicates there is no difference between the groups being compared; a very small or very large risk ratio indicates that there is a large difference between the groups being compared. A risk ratio of less than one means that the

Table 1. Relative risk of group B streptococcal diagnosis by selected characteristics among hospitalized females giving birth, Louisiana 1999-2004.

Year		Risk Factor						
		preterm	<16 yo	still birth	AA	AA<16	Wh	Wh<16
1999	RR	0.81	1.07	0.28	1.21	1.87	0.71	0.29
	95% CI	(0.66-0.99)	(0.80-1.43)	(0.15-0.51)	(1.12-1.31)	(1.32-2.66)	(0.66-0.77)	(0.07-1.14)
2000	RR	0.74	0.73	0.29	1.18	0.8	0.83	0.66
	95% CI	(0.61-0.88)	(0.56-0.96)	(0.17-0.50)	(1.11-1.26)	(0.57-1.21)	(0.75-0.85)	(0.32-1.35)
2001	RR	0.74	0.84	0.27	1.19	1.02	0.83	0.74
	95% CI	(0.63-0.96)	(0.75-0.95)	(0.16-0.45)	(1.13-1.25)	(0.87-1.19)	(0.79-0.88)	(0.59-0.92)
2002	RR	0.77	1.00	0.19	1.26	1.08	0.81	0.79
	95% CI	(0.66-0.90)	(0.91-1.11)	(0.10-0.34)	(1.19-1.33)	(0.93-1.25)	(0.77-0.86)	(0.63-0.98)
2003	RR	0.58	1.12	0.07	2.00	1.12	0.73	1.01
	95% CI	(0.49-0.68)	(1.01-1.24)	(0.03-0.19)	(1.90-2.12)	(0.98-1.28)	(0.69-0.77)	(0.83-1.24)
2004	RR	0.52	1.06	*	1.33	1.18	0.76	0.80
	95% CI	(0.47-0.59)	(0.97-1.15)	**	(1.27-1.38)	(1.07-1.30)	(0.73-0.79)	(0.67-0.96)

Numbers in bold are significant at the 95% confidence interval. Source: LaHIDD data. * No cases of GBS were recorded among this group making calculation of RR impossible. AA, African American; Wh, White; yo, years old.

group examined has a decreased risk of the outcome while a risk ratio greater than one indicates increased risk of the outcome. In this case, the outcome is GBS infection.

Preterm and still birth appear to be protective factors; women with babies in these categories have small risk ratios of GBS infection. In actuality, the reduced risk ratios are most likely due to a decrease in screening of these women. Because GBS screening occurs at 35-37 weeks' gestation, women giving birth earlier than this are much less likely to be screened for GBS, and their results are less likely to be included in the LaHIDD datasets.

Race of the mother does seem to be a significant risk factor for GBS development, since African American women are up to twice as likely to receive a diagnosis of GBS infection as the general population, and white women are somewhat less likely to be diagnosed. When we examined the effect of young age of the mother on the risk of GBS, we saw that risk ratios between the races nearly equalized from 1999 to 2004 (Figure 2).

As expected, male and female newborns are diagnosed with group B streptococcal infections at the same rates. After the first year of life, however, the number of GBS diagnoses

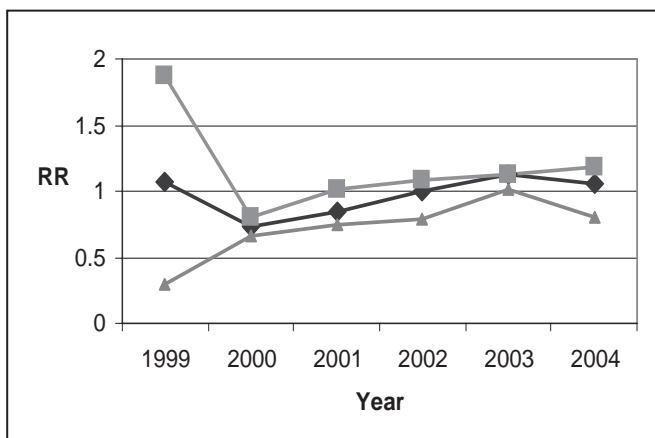


Figure 2. Relative risk of GBS diagnosis among hospitalized young mothers by race, Louisiana 1999-2004, ◆ <16 years old, ■ African Americans <16 years old, ▲ Whites <16 years old. (Source: LaHIDD data)

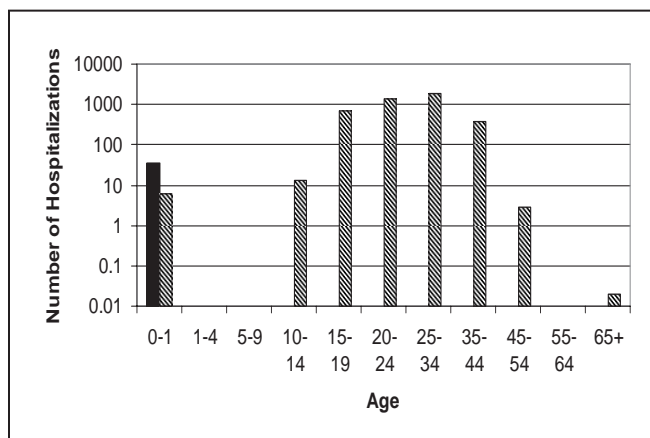


Figure 3. The average annual number of hospitalized women aged 15-44 and the average annual number of newborns diagnosed with group B streptococcus, Louisiana 2000-2004, ■ Males, ▨ Females. (Source: LaHIDD data)

becomes heavily skewed towards females because females are routinely screened during pregnancy (Figure 3).

From 2000 to 2004, a total of 497 neonates were diagnosed with GBS infections in Louisiana. Of these, one died and three were stillborn. Nationally, the CDC estimates that approximately 80 infants die each year of early onset group B streptococcal disease.

In Louisiana, data on invasive disease in neonates is not widely available because invasive GBS only became a reportable disease in 2002. To compare national data to Louisiana data, we looked at all hospital discharge records for neonates diagnosed with any GBS disease condition (both invasive and non-invasive). This data set gives much higher morbidity rates than national data because more data points are included, but the general Louisiana trends match national trends. Incidence of early onset disease decreased from 1999 to 2004 while incidence of late onset disease remained stable (Figures 4, 5).

Group B streptococcus can also cause systemic infections in non-pregnant adults with conditions such as diabetes mellitus, chronic liver or renal disease, malignancy or other immunocompromising conditions, and in adults 65 years of age and older. In general, these infections are easily treated with antibiotics and are rarely life threatening.

From age 0-1 year, whites have slightly higher rates of streptococcal disease. For all other age groups, rates of GBS disease are higher among African Americans. Rates peak for all races from 15- 35 years of age due to increased

screening among pregnant women. Incidence among African American women aged 20 to 24 years is almost three times higher than that among white women of the same age (Figure 6).

Disease caused by streptococcus group B does not exhibit seasonality.

Mortality Data

From 1999 to 2004, 48 persons hospitalized with GBS disease expired during their hospital stay (Figure 7). Over 85% of these persons were over the age of 55 (range 1 day-97 years of age). Of the seven deaths in persons under the age of 55, two occurred among neonates (age 1 and 27 days) each of whom had other serious conditions. Other deaths occurred in a 28-year-old leukemia patient, in a 41-year-old with sepsis, in a 46-year-old with other medical conditions, in a 51-year-old post-surgical patient with alcoholism, and in a 54-year-old with complications of HIV disease.

Five deaths attributed to GBS septicemia were identified using death certificates. Two of these deaths occurred in neonates (both 5 weeks old), and two occurred in adults over 65 years of age.

DISCUSSION

The latest guidelines for the prevention of neonatal GBS disease were released in August of 2002 by the CDC. These guidelines advise health care providers to use a universal



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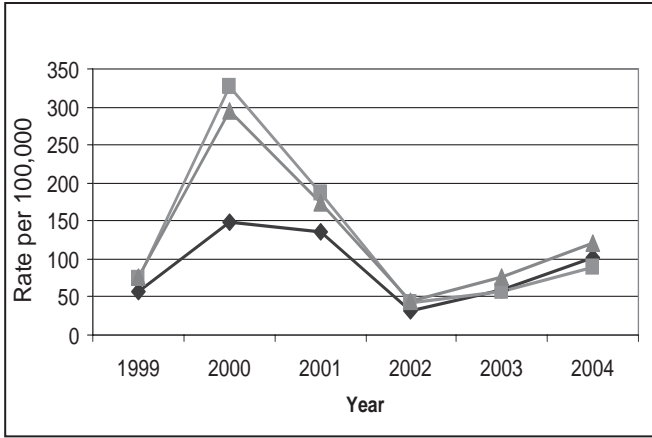


Figure 4. Early onset GBS disease in neonates by race, Louisiana 1999-2004, ◆ White, ■ African American, ▲ All races. (Source: LaHIDD data)

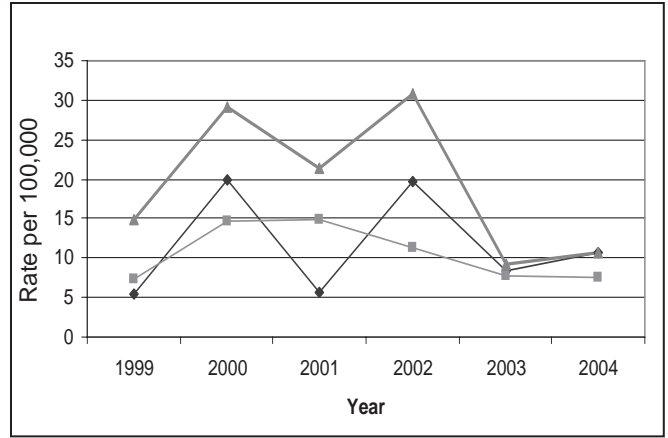


Figure 5. Late onset GBS disease in neonates by race, Louisiana 1999-2004, ◆ White, ■ African American, ▲ All races. (Source: LaHIDD data)

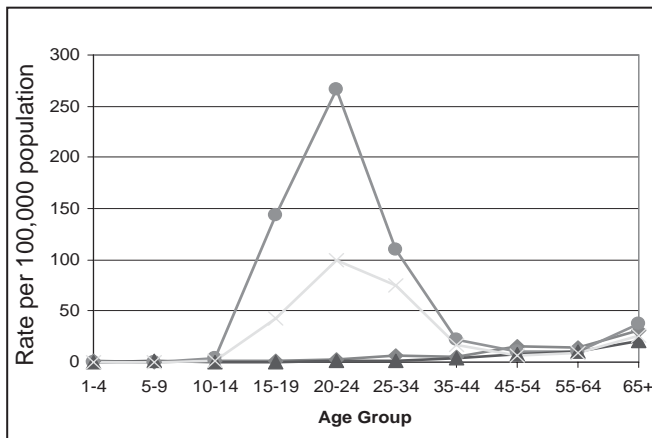


Figure 6. Average annual incidence rates of persons hospitalized with streptococcal group B pneumonia and other group B infections, Louisiana 1999-2004, ◆ African American male, ● African American female, ▲ White male, ✕ White Female. (Source: LaHIDD data)

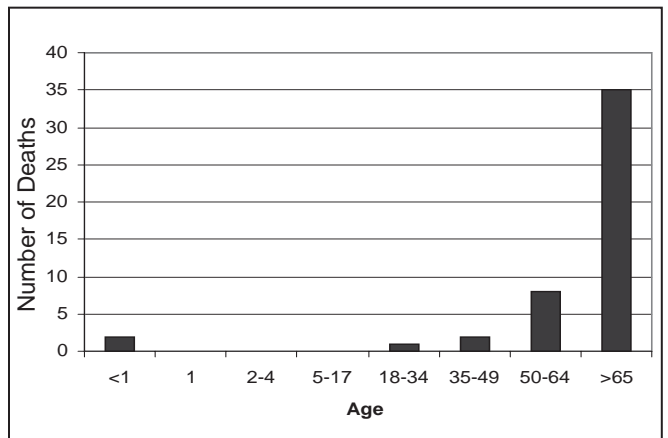


Figure 7. Total deaths among persons hospitalized with GBS, Louisiana 1999-2004.

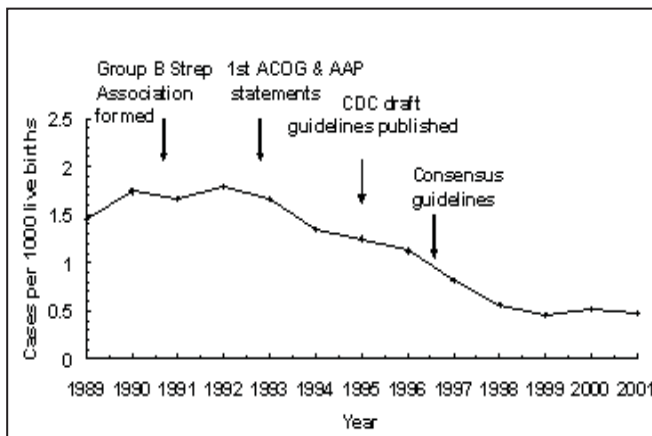


Figure 8. Incidence of early onset invasive group B streptococcal disease, 1989-2001. (Courtesy of CDC)

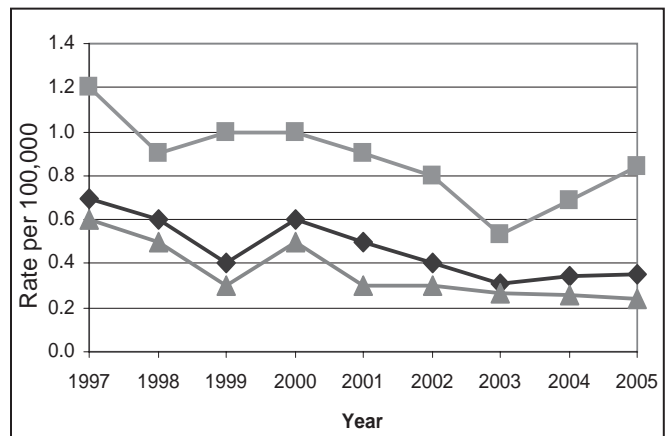


Figure 9. Invasive GBS in neonates <7 days of age by race, United States 1997-2005, ◆ All races, ■ African American, ▲ White. (Source: ABCs data, Centers for Disease Control and Prevention)

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screening-based approach to decide which women may benefit from getting an intravenous antibiotic (penicillin or ampicillin) during delivery. National rates of GBS disease in newborns have fallen over the last decade as public health agencies have issued recommendations for the screening of pregnant women (Figure 8).

Nationally, in neonates the rate of early-onset invasive disease has decreased over the last decade while the rate of late-onset invasive disease has remained stable (Figures 9 and 10). This observation supports current thinking that GBS screening reduces rates of early onset disease, where a neonate is infected in utero or during delivery, but not rates of late onset disease, which is thought to be transmitted after delivery from healthy colonized persons via person-to-person transmission. Although African Americans have higher overall rates of GBS disease, rates of early onset

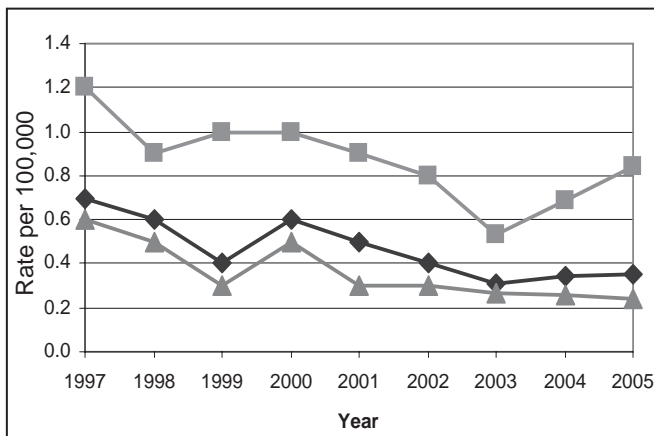


Figure 10. Invasive GBS in neonates 7 to 89 days of age (late onset disease) by race, United States 1997-2005. ◆ All races, ■ African American, ▲ White. (Source: ABCs data, Centers for Disease Control and Prevention)

disease have decreased for all races. When we examined trends in risk ratios among various racial and age groups of pregnant women, we found that testing and screening guidelines have narrowed the disparity between the races. This is yet another positive effect of universal screening and treatment.

GBS is estimated to cause around 10,000 infections in non-pregnant adults each year in the United States. Studies have found that between 20 and 38% of these infections are fatal, amounting to an estimated 2000- 3800 annual deaths nationally. Neither LaHIDD data nor death certificates gave similar figures for Louisiana. The GBS case fatality rate cannot be accurately calculated using LaHIDD data because it is impossible to differentiate between diagnoses of GBS carriage and GBS infection. The number of GBS deaths may not be accurately measured by death certificates due to vagueness and ambiguity in the listed causes of death.

CONCLUSION

The release of national guidelines for GBS screening and treatment have significantly reduced the incidence of neonatal disease in Louisiana and the United States. In the last fifteen years, increased screening and effective antibiotic therapies cut national incidence rates among neonates to 0.33 cases per 1,000 live births in 2005 with a case fatality ratio of 4%.^{1,2} In Louisiana during this same time, incidence rates fell to around 0.75 cases per 1,000 live births. While early onset disease has been lowered dramatically, the incidence of late onset disease and disease in non-pregnant adults has remained stable. While racial disparity still exists, all races show similar trends in GBS disease occurrence.

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Choose the one answer that is most correct for each question.

1. True or False:
The CDC guidelines on prevention of neonatal Group B streptococcal infections recommend a universal screening of pregnant women with treatment of carriers.
2. Comparing the 2000 and 2004 numbers of women 15-44, and the number of newborns diagnosed with Group B streptococcal infections:
 - a. The number of women infected increased while the number of newborns infected decreased.
 - b. The number of women infected decreased while the number of newborns infected increased.
 - c. Both the number of women infected and the number of newborns infected decreased.
 - d. Both the number of women infected and the number of newborns infected increased.
3. True or False:
The effects of these guidelines have been similar in the US and in Louisiana.
4. True or False:
There are more female newborns infected by Group B streptococci than there are male newborns.

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