

## Report from the CDC

# Influenza and Pregnant Women: Hospitalization Burden, United States, 1998–2002

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### ABSTRACT

Women in later stages of pregnancy are at increased risk for serious influenza-related morbidity; thus, universal influenza vaccination of pregnant women is recommended. However, vaccine uptake in the United States has been suboptimal. We previously described the burden of severe influenza-related morbidity during pregnancy in the United States by examining hospitalizations of pregnant women with respiratory illness during influenza season. Nondelivery hospitalizations with respiratory illness had significantly longer lengths of stay than those without respiratory illness. Hospitalization characteristics associated with greater likelihood of respiratory illness were the presence of a high-risk condition for which influenza vaccination is recommended, Medicaid/Medicare as primary expected payer, and hospitalization in a rural area. These findings may be explained by these women being at higher risk of influenza-related morbidity or reflect disparities in receipt of influenza immunization. Universal vaccination of pregnant women to decrease influenza-related morbidity should be encouraged.

**T**HE PHYSIOLOGICAL CHANGES that accompany pregnancy may leave women more vulnerable to respiratory disorders. Women in their second or third trimester of pregnancy during influenza season are at increased risk of influenza-related morbidity in comparison to nonpregnant and postpartum women.<sup>1</sup> Previous studies of in-

fluenza-related morbidity among pregnant women suggested that 2.5 hospitalizations per 1000 women in the third trimester of pregnancy were attributable to influenza during average periods of viral activity.<sup>1</sup> The increased risk of influenza-related morbidity may result from increases in heart rate, stroke volume, oxygen consumption,

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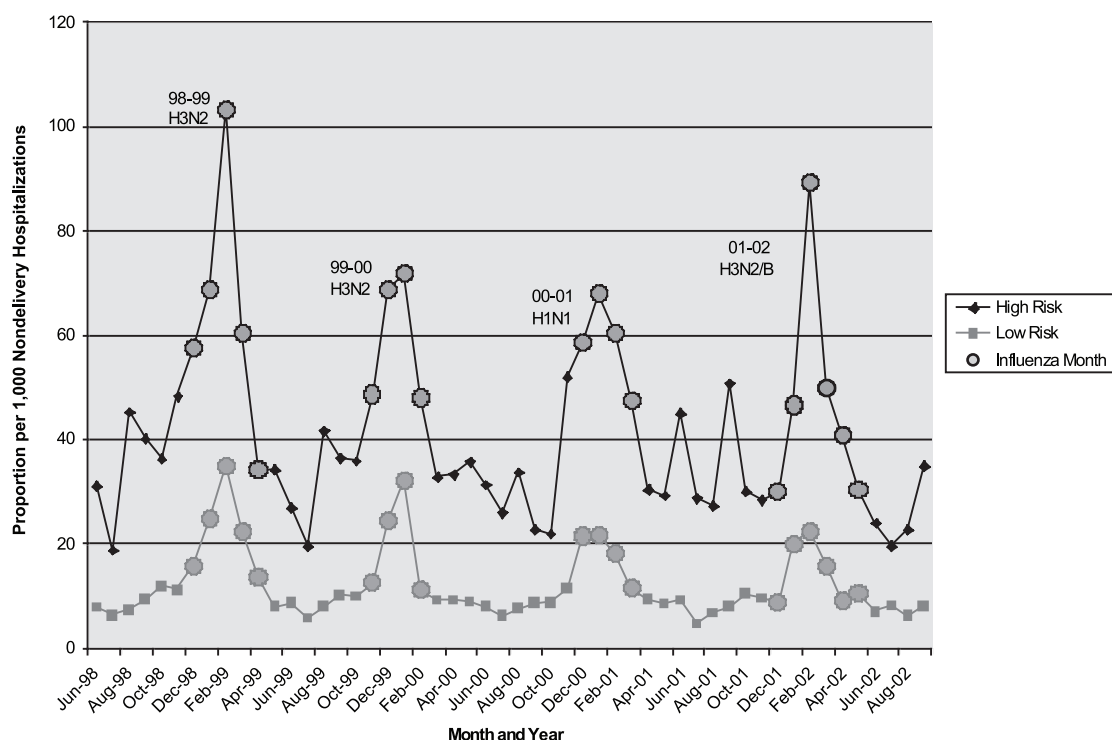
or decreases in lung capacity and changes in immunological function during pregnancy.<sup>2</sup> The Advisory Committee of Immunization Practices (ACIP) of the Centers for Disease Control and Prevention (CDC) and the American College of Obstetrics and Gynecology (ACOG) recommend influenza vaccination for all women who will be pregnant during influenza season<sup>3,4</sup>; in practice, however, vaccination rates among pregnant women are low.<sup>3,5</sup>

We previously described the burden that influenza places on inpatient healthcare of pregnant women.<sup>6</sup> Hospital discharge data were obtained from the Healthcare Cost and Utilization Project (HCUP), Nationwide Inpatient Sample (NIS). The NIS is a research database produced annually through a partnership between the Agency for Healthcare Research and Quality (AHRQ) and public and private statewide data organizations to provide national estimates of inpatient care delivered in the United States.<sup>7</sup> It is the largest collection of all-payer inpatient care

data in the United States and provides patient demographic and diagnostic/procedural data as well as facility information.

Contrary to all hospitalizations of pregnant women, the majority of hospitalizations with respiratory illness among pregnant women during influenza season did not include a delivery. During the four influenza seasons examined (1998–1999 through 2001–2002), there were 21,447 pregnancy hospitalizations with a diagnosis of respiratory illness, 70% of which did not include the delivery of a liveborn infant ( $n = 15,047$ ).<sup>6</sup> This contrasts with overall hospitalizations among pregnant women, of which 88% are for delivery.<sup>8</sup>

During influenza season, nondelivery hospitalizations with respiratory illness among pregnant women are a significant source of maternal morbidity and are associated with increased health services utilization. The proportion of nondelivery hospitalizations with a diagnosis of respiratory illness increased substantially during periods of viral activity (Fig. 1). The proportion of



**FIG. 1.** Proportion of nondelivery hospitalizations with respiratory illness, by presence of high-risk condition, 1998–2002. High-risk hospitalizations include a diagnosis for a high-risk condition for which influenza vaccination is recommended by the Advisory Committee on Immunization Practices (chronic cardiac disease, chronic pulmonary disease, diabetes mellitus, chronic renal disease, malignancies, and immunosuppressive disorders). Influenza months are months in which >5% of specimens sampled by the World Health Organization (WHO) and National Respiratory and Enteric Virus Surveillance System (NRVSS) Collaborating Laboratories tested positive for an influenza isolate. For each influenza season, the predominant viral strain is indicated as H1N1 or H3N2 for influenza A isolates and B for influenza B isolates.

nondelivery hospitalizations with respiratory illness was 22.3/1000 during influenza season and 11.7/1000 during the rest of the year.<sup>6</sup> During influenza season, mean length of stay was significantly longer for nondelivery hospitalizations with respiratory illness than for nondelivery hospitalizations without respiratory illness (3.88 days vs. 2.65 days,  $p < 0.001$ ).<sup>6</sup>

Influenza vaccination is the primary method for preventing influenza-related morbidity. Hospitalization characteristics found to be associated with increased odds of respiratory illness may be reflective of disparities in influenza immunization or limited uptake by pregnant women at high risk (or both). Hospitalizations in rural locations and with intended payer of public origin (Medicaid/Medicare) were associated with increased odds of respiratory hospitalization during influenza season.<sup>6</sup> Nonwhites, rural residents, and lower-income groups are less likely to be immunized than comparison groups, and persons who received the influenza vaccine are most likely to receive it at a private medical clinic.<sup>5</sup> The presence of a condition for which CDC guidelines specifically recommend influenza vaccination increased the odds of having respiratory illness 3-fold among nondelivery hospitalizations.<sup>6</sup> Rates of serious illness are higher among persons with high-risk medical conditions; still, current data suggest that vaccination rates among persons with high-risk medical conditions are low.<sup>3,5</sup>

Programs that aim to decrease morbidity from influenza-associated illness among pregnant women should include interventions to improve influenza vaccine availability and use for both healthy pregnant women and pregnant women at high risk.<sup>9</sup> Universal vaccination with inactivated trivalent influenza vaccine is cost-effective compared with supportive care of influenza-related illness in the pregnant population.<sup>10</sup> Researchers, healthcare providers, and policymakers can use these data to develop strategies for reducing influenza-associated morbidity in pregnant women, specifically by promoting universal influenza immunization during pregnancy.

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