

Hospitalizations With Respiratory Illness Among Pregnant Women During Influenza Season

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OBJECTIVE: To examine hospitalizations with respiratory illness among pregnant women in the United States during periods of influenza activity.

METHODS: Data were obtained from the Healthcare Cost and Utilization Project National Inpatient Sample (NIS), the largest publicly available all-payer hospital discharge database. Hospitalizations for respiratory illness and pregnancy were classified with International Classification of Diseases, 9th Revision, Clinical Modification codes. Analyses were stratified by delivery status. Discharge characteristics, length of stay, and complications of delivery among hospitalized pregnant women with and those without respiratory illness were compared.

RESULTS: During the 1998–2002 influenza seasons, 3.4 per 1,000 hospitalizations of pregnant women included diagnoses of respiratory illness. Characteristics of pregnancy hospitalizations associated with higher odds of respiratory illness were presence of a high-risk condition for which influenza vaccination is recommended (adjusted odds ratio [OR] 3.2, 95% confidence interval [CI] 3.0–3.5 and OR 6.0, 95% CI 5.2–6.9 for nondelivery and delivery, respectively), Medicaid/Medicare as primary

expected payer of care (OR 1.2, 95% CI 1.1–1.3 and OR 1.9, 95% CI 1.7–2.2 for nondelivery and delivery, respectively), and hospitalization in a rural area (OR 1.2, 95% CI 1.1–1.4 for nondelivery). During influenza season, hospitalized pregnant women with respiratory illness had significantly longer lengths of stay and higher odds of delivery complications than hospitalized pregnant women without respiratory illness.

CONCLUSION: Hospitalizations with respiratory illness among pregnant women during influenza season are associated with increased burden for patients and the health care system. Intervention efforts to decrease influenza-related respiratory morbidity among pregnant women should be encouraged.

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LEVEL OF EVIDENCE: III

A population of concern for increased influenza-related morbidity is women who will be in their second or third trimester of pregnancy during influenza season. Influenza-attributable risk of acute cardiopulmonary hospitalization increases with stage of pregnancy.¹ Women in their third trimester of pregnancy were 3–4 times more likely than their postpartum counterparts to be hospitalized for an acute cardiopulmonary illness during influenza season, placing them at risk equal to or higher than persons with high-risk medical conditions for whom the annual influenza vaccine is traditionally recommended.¹ The Advisory Committee of Immunization Practices of the Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists (ACOG) recommend influenza vaccination for all women who will be pregnant during influenza season,^{2,3} but, in practice, vaccination rates among pregnant women are low.^{2,4}

This report describes hospitalizations with respiratory illness among pregnant women during influ-

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enza season using the Healthcare Cost and Utilization Project (HCUP) National Inpatient Database (NIS), a nationally representative sample of inpatient care. Long durations of stay and complications of delivery represent measures of increased burden to health-care systems and pregnant women. We compared characteristics of hospitalizations among pregnant women (pregnancy hospitalizations) with and without a diagnosis of pneumonia or influenza, described the duration of pregnancy hospitalizations with respiratory illness, and noted frequent complications among hospitalized pregnant women who delivered a liveborn infant (delivery hospitalizations) in those with respiratory diagnoses during influenza season.

MATERIALS AND METHODS

Hospital discharge data were obtained from the Healthcare Cost and Utilization Project, National Inpatient Database. The National Inpatient Database 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.⁵ The National Inpatient Database is a stratified probability sample of community hospitals as defined by the American Hospital Association and is designed to approximate a 20% sample of all U.S. community hospitals. The American Hospital Association defines community hospitals as all nonfederal short-term (average length of stay < 30 days) general and specialty hospitals whose facilities are open to the public. The sampling frame consists of state-specific hospital discharge data provided to the Healthcare Cost and Utilization Project. The National Inpatient Database reports all inpatient data from sampled institutions and annually includes more than 900 hospitals and roughly 7 million discharge records that, when weighted, provide national estimates of inpatient care.⁵ 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. This analysis was conducted on data from the National Inpatient Database for the years 1998–2002 combined.

The Centers for Disease Control and Prevention determined the status of this project as nonhuman subject research because of the use of deidentified information in a publicly available administrative data set. The unit of analysis is the hospitalization, not the individual. The analysis was restricted to pregnancy hospitalizations of women aged 15–44 years. Pregnancy hospitalizations, excluding those associ-

ated with pregnancy loss (eg, ectopic/molar pregnancy, spontaneous abortion) were identified by using the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM)⁶ diagnosis codes 640–677, V22–V24, V27, V28, and 792.3. Pregnancy hospitalizations that resulted in delivery were identified by ICD-9-CM fifth-digit coding of “1” or “2” and ICD-9-CM code V27. A respiratory hospitalization was defined as one having a primary or secondary discharge diagnosis of pneumonia or influenza (ICD-9-CM diagnosis codes 480–487). Analyses were stratified by delivery status because of possible bias due to hospitals having a lower threshold for admission or health care policies, such as insurance regulations on duration of stay, which may influence the characteristics of hospitalizations when an infant is delivered.

Influenza season was defined by using data generated by the World Health Organization (WHO) and National Respiratory and Enteric Virus Surveillance System (NRVESS) Collaborating Laboratories.⁷ The total number of respiratory specimens tested and the number positive for influenza types A and B are reported each week. Influenza season was defined as months in which more than 5% of specimens sampled tested positive for an influenza isolate (Table 1).

SUDAAN 9 (Research Triangle Institute, NC) was used to analyze the data to account for the complex survey design and produce accurate standard errors. Logistic regression was used to estimate increased likelihood of respiratory illness among pregnancy hospitalizations by select discharge characteristics. Characteristics of hospitalizations examined included age, primary expected payer (publicly funded insurance [Medicaid/Medicare], private insurance [eg, health maintenance organization], or other [including self-pay and no charge]), hospital location (urban versus rural), geographic region, and presence of a high-risk condition for which CDC guidelines specifically recommend influenza vaccination.² High-risk conditions were assigned by using the Healthcare Cost and Utilization Project Comorbidity Software 3.0 (Agency for Healthcare Research and Quality, Rockville, MD; available at <http://www.hcup-us.ahrq.gov/toolssoftware/comorbidity/comorbidity.jsp>. Retrieved April 4, 2006) and were grouped into categories of chronic cardiac disease, chronic pulmonary disease, diabetes mellitus, chronic renal disease, malignancies, and immunosuppressive disorders (including human immunodeficiency virus [HIV] infection). Characteristics of pregnancy hospitalizations with and those without respiratory illness were first compared individually



Table 1. Description of Influenza Seasons as Reported by Centers for Disease Control and Prevention Influenza Surveillance Reports

Season	Predominant Influenza Viral Strain	Duration*	Pneumonia and Influenza Deaths Exceed Epidemic Threshold†
1998–1999	A (H3N2)	December 1998–April 1999	12 consecutive weeks
1999–2000	A (H3N2)	November 1999–February 2000	31 of 33 weeks‡
2000–2001	A (H3N1)	December 2000–March 2001	Did not exceed epidemic threshold
2001–2002	A (H3N2)/B§	December 2001–May 2002	5 weeks

* Months in which > 5% of specimens tested positive for an influenza isolate.

† An increase of 1.645 standard deviations above the seasonal baseline of pneumonia and influenza deaths is considered the epidemic threshold.

‡ Interpret with caution because of change in case definition this season.

§ Influenza B viruses were reported more often than influenza A viruses toward the end of the season.

using χ^2 analysis and then entered simultaneously into a multivariate model. Estimates obtained from fully adjusted multivariate regressions did not differ appreciably from crude approximations. Fully adjusted odds ratios are presented.

Upon examination of length of stay among pregnancy hospitalizations, only a small proportion of hospitalizations (< 0.1%) exceeded 33 days. We excluded these hospitalizations from our length-of-stay analysis to focus on typical duration of stay for women hospitalized during pregnancy. A linear regression with length of stay as the outcome was performed as a function of pregnancy hospitalizations and the previous set of independent variables. The mean lengths of stay of pregnancy hospitalizations with and those without respiratory illness were compared using *t* tests. Among hospitalizations with respiratory illness, discharge characteristics were evaluated for association with duration of stay.

Logistic regression was used to evaluate the association between complications of delivery and hospitalization with respiratory illness. Complications of delivery that we examined from discharge records were preterm labor with delivery (ICD-9-CM diagnosis code 644), fetal distress (ICD-9-CM diagnosis code 656.3), and cesarean delivery (ICD-9-CM procedure code 74). Models were built separately for each outcome of interest comparing pregnancy hospitalizations with and those without respiratory illness. Estimates were adjusted for age, diagnosis of a high-risk condition, primary intended payer of care, hospital location, geographic region, and calendar year of influenza season.

RESULTS

During the 4 influenza seasons examined, there were 6,277,508 pregnancy hospitalizations, 21,447 of which included a diagnosis of respiratory illness. For every 1,000 pregnancy hospitalizations during influ-

enza season, 3.4 (95% confidence interval [CI] 3.3–3.6) also included a diagnosis of respiratory illness. This proportion was significantly higher in seasons in which the A (H3N2) viral strain predominated (1998–1999 and 1999–2000 influenza seasons) as compared with seasons in which other strains predominated (2000–2001 and 2001–2002 influenza seasons) ($P < .001$).

Thirty percent of pregnancy hospitalizations with respiratory illness included the delivery of a liveborn infant (Table 2). The presence of at least one high-risk condition was noted in 23.5% of pregnancy hospitalizations with respiratory illness; the most common comorbidity present was chronic lung disease (65.8%), followed by chronic heart disease (31.4%).

Respiratory illness was 3–6 times more likely to be diagnosed among hospitalized pregnant women with a high-risk condition for which influenza vaccination is recommended than among pregnant women hospitalized without a comorbid condition (odds ratio [OR] 3.2, 95% CI 3.0–3.5, and OR 6.0, 95% CI 5.2–6.9, for nondelivery and delivery, respectively) (Table 3). Higher odds of having respiratory illness were found among pregnancy hospitalizations with Medicaid/Medicare as the intended payer than among pregnancy hospitalizations with private insurance as the primary intended payer (OR 1.2, 95% CI 1.1–1.3, and OR 1.9, 95% CI 1.7–2.2, for nondelivery and delivery, respectively). For nondelivery hospitalizations, respiratory illness was more likely to be diagnosed among hospitalized pregnant women in rural areas than in urban areas (OR 1.2, 95% CI 1.1–1.4).

Mean length of stay was significantly longer for pregnancy hospitalizations with respiratory illness than pregnancy hospitalizations without respiratory illness (Table 4). The average length of stay for hospitalizations with respiratory illness among



Table 2. Select Characteristics of Pregnancy Hospitalizations During Influenza Season (1998–2002)

Characteristic	Hospitalization With Respiratory Illness [% (95% CI)] (n = 21,447)	Hospitalization Without Respiratory Illness [% (95% CI)] (n = 6,256,061)
Status at discharge		
Delivered	29.8 (28.4–31.3)	89.5 (89.2–89.7)
Undelivered	70.2 (68.7–71.6)	10.5 (10.3–10.8)
Age (y)		
15–24	41.1 (39.4–42.8)	36.7 (35.9–37.5)
25–34	44.6 (43.0–46.2)	49.7 (49.2–50.2)
35–44	14.3 (13.2–15.5)	13.6 (13.2–14.0)
Presence of high-risk condition*		
At least one	23.5 (22.3–24.8)	4.5 (4.3–4.6)
None	76.5 (75.2–77.7)	95.5 (95.4–95.7)
Primary payer		
Public (Medicaid or Medicare)	46.4 (44.4–48.4)	36.1 (34.7–37.4)
Other (including self-pay)	8.3 (7.3–9.6)	6.3 (5.8–6.9)
Private (including HMO)	45.3 (43.2–47.4)	57.7 (56.1–59.2)
Hospital location		
Rural	17.2 (15.7–18.8)	14.8 (13.9–15.7)
Urban	82.8 (81.3–84.3)	85.2 (84.3–86.1)
Geographic region†		
Northeast	15.9 (14.3–17.6)	18.6 (17.4–19.9)
Midwest	27.4 (25.2–29.8)	23.9 (22.6–25.2)
South	35.8 (33.2–38.4)	31.2 (29.3–33.2)
West	20.9 (19.1–23.0)	26.3 (24.9–27.8)

CI, confidence interval; HMO, health maintenance organization.

* High-risk conditions 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).

† Based on United States Census regions.

pregnant women was 3.88 days (standard error [SE] 0.06) and 6.36 days (SE 0.14) for nondelivery and delivery, respectively ($P < .001$). For pregnancy hospitalizations without respiratory illness, the average length of stay was 2.69 days (SE 0.02) and 2.45 days (SE 0.01) for nondelivery and delivery, respectively ($P < .001$).

Among pregnancy hospitalizations with respiratory illness, hospitalizations among women with a high-risk condition had significantly longer lengths of stay than hospitalizations among women without a high-risk condition (4.25 versus 3.87 days for nondelivery and 7.96 versus 6.12 days for delivery, $P < .05$) (Table 5). Nondelivery hospitalizations with Medicaid/Medicare as the primary intended payer had significantly longer lengths of stay (4.27 days) compared with hospitalizations with private insurance as the primary intended payer (3.70 days, $P < .001$). Hospitalizations in urban hospitals had significantly longer lengths of stay than hospitalizations in rural hospitals ($P < .001$). Among nondelivery pregnancy hospitalizations with respiratory illness, those among women in the older age group (35–44) had significantly longer average lengths of

stay compared with those in the younger age groups (15–24 and 25–34) ($P < .001$). Seasons in which the A (H3N2) viral strain predominated were not associated with increased lengths of stay.

Among delivery hospitalizations, discharge records showed that women with a diagnosis of respiratory illness had increased odds of a codiagnosis of preterm labor (OR 4.1, 95% CI 3.6–4.7), fetal distress (OR 2.5, 95% CI 1.8–3.4), and cesarean delivery (OR 3.9, 95% CI 3.5–4.4) than women without respiratory illness (Table 6).

DISCUSSION

During influenza season, 3.4 of every 1,000 pregnancy hospitalizations also included a diagnosis of respiratory illness. This is substantially higher than the proportion of pregnancy hospitalizations with respiratory illness (1.8 per 1,000) during the rest of the year. The majority of hospitalizations with respiratory illness among pregnant women during influenza season did not include a delivery. This contrasts with overall hospitalizations among pregnant women, of which 88% are for delivery.⁸ Excluding hospitalizations during which a delivery



Table 3. Adjusted Odds of Respiratory Illness by Select Characteristics of Pregnancy Hospitalizations, Stratified by Delivery Status, During Influenza Season (1998–2002)

Characteristic	Nondelivery Hospitalizations [OR* (95% CI)]	Delivery Hospitalizations [OR* (95% CI)]
Age (y)		
15–24	0.95 (0.84–1.07)	0.73 (0.61–0.87)
25–34	0.98 (0.87–1.09)	0.72 (0.61–0.85)
35–44	1.00	1.00
Presence of high-risk condition [†]		
At least one	3.22 (2.95–3.52)	5.95 (5.17–6.86)
None	1.00	1.00
Primary payer		
Public (Medicaid or Medicare)	1.15 (1.05–1.25)	1.93 (1.69–2.21)
Other (including self-pay)	1.07 (0.94–1.23)	1.85 (1.47–2.32)
Private (including HMO)	1.00	1.00
Hospital location		
Rural	1.23 (1.10–1.36)	0.87 (0.73–1.03)
Urban	1.00	1.00
Geographic region [‡]		
Northeast	0.86 (0.75–0.99)	0.93 (0.76–1.13)
Midwest	1.28 (1.13–1.44)	1.18 (0.97–1.44)
South	1.15 (1.02–1.29)	1.20 (1.01–1.43)
West	1.00	1.00

OR, adjusted odds ratio; CI, confidence interval; HMO, health maintenance organization.

* Adjusted for all other characteristics in the table and calendar year of influenza season.

[†] High-risk conditions 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).

[‡] Based on United States Census regions.

Table 4. Mean Length of Stay for Pregnancy Hospitalizations During Influenza Season (1998–2002)*

	Nondelivery Hospitalizations		Delivery Hospitalizations	
	Mean LOS (SE) [†]	P [‡]	Mean LOS (SE) [†]	P [‡]
With respiratory illness	3.88 (0.06)	< .001	6.36 (0.14)	< .001
Without respiratory illness	2.65 (0.02)		2.46 (0.01)	

LOS, length of stay; SE, standard error.

* Least-squares means adjusted for age, presence of high-risk conditions 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), primary intended payer of care, hospital location, geographic region, and calendar year of influenza season.

[†] Hospitalizations with length of stay > 33 days are excluded.

[‡] P value for *t* test assessing difference of means.

occurred, the proportion of pregnancy hospitalizations with respiratory illness is 23.2 per 1,000 during influenza season and 11.7 per 1,000 during the rest of the year. Influenza seasons in which the A (H3N2) viral strain predominates are often the most severe in terms of morbidity and mortality. Although we found an increased risk of hospitalization during these years, length of stay did not differ by calendar year and did not reflect season severity.

Pregnancy hospitalizations that included a diagnosis of respiratory illness had longer lengths of stay than other pregnancy hospitalizations during influenza season. The difference in hospital stay is partic-

ularly striking among delivery hospitalizations and may be related to complications of delivery. A previous report using a state-based Medicaid cohort found no difference in hospital length of stay, preterm labor, or mode of delivery comparing pregnancy outcomes of women who experienced an acute cardiopulmonary hospitalization during influenza season with women who did not experience such an event, controlling for the woman's age, race, education, marital status, smoking status, trimester of pregnancy, presence of a high-risk condition, and history of hospitalization in previous 6 months.⁹ This analysis reflects estimates adjusted for some risk factors associated



Table 5. Regression Analysis of Length of Stay for Hospitalizations With Respiratory Illness Among Pregnant Women During Influenza Season (1998–2002)*

	Nondelivery Hospitalizations		Delivery Hospitalizations	
	Mean LOS (SE) [†]	<i>P</i> [‡]	Mean LOS (SE) [†]	<i>P</i> [‡]
Age (y)				
15–24	3.67 (0.09)	< .001	6.35 (0.20)	.291
25–34	4.01 (0.10)	< .001	6.45 (0.22)	.421
35–44	4.76 (0.21)		6.79 (0.36)	
Presence of high-risk condition [§]				
At least one	4.25 (0.12)	.011	7.96 (0.36)	< .001
None	3.87 (0.08)		6.12 (0.15)	
Primary payer				
Public (Medicaid or Medicare)	4.27 (0.11)	< .001	6.75 (0.21)	.050
Other (including self-pay)	3.79 (0.21)	.699	6.38 (0.44)	.684
Private (including HMO)	3.70 (0.09)		6.18 (0.20)	
Hospital location				
Rural	3.12 (0.10)	< .001	4.72 (0.27)	< .001
Urban	4.16 (0.07)		6.76 (0.16)	
Geographic region				
Northeast	4.62 (0.20)	< .001	7.12 (0.37)	< .001
Midwest	3.89 (0.12)	.266	6.77 (0.32)	< .001
South	3.90 (0.10)	.190	6.65 (0.24)	< .001
West	3.69 (0.13)		5.46 (0.20)	

LOS, length of stay; SE, standard error; HMO, health maintenance organization.

* Hospitalizations with length of stay > 33 days are excluded.

[†] Least-squares means adjusted for all other characteristics in the table and calendar year of influenza season.

[‡] *P* value for *t* test assessing difference of means.

[§] High-risk conditions 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).

^{||} Based on United States Census regions.

Table 6. Complications of Delivery Among Pregnancy Hospitalizations During Influenza Season (1998–2002)

	Preterm Delivery [OR* (95% CI)]	Fetal Distress [OR* (95% CI)]	Cesarean Delivery [OR* (95% CI)]
With respiratory illness	4.08 (3.57–4.67)	2.48 (1.84–3.35)	3.91 (3.48–4.39)
Without respiratory illness	1.00	1.00	1.00

OR, adjusted odds ratio; CI, confidence interval.

* Adjusted for age, presence of high-risk conditions 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), primary intended payer of care, hospital location, geographic region, and calendar year of influenza season.

with delivery complications, including age, presence of high-risk conditions, primary intended payer of care, hospital location, geographic region, and calendar year of influenza season. The majority of pregnancy hospitalizations with respiratory illness do not include a delivery; these pregnant women may later deliver without increased risk of complication. Discharged pregnant women who had respiratory illness and delivered a liveborn infant during their hospitalization had higher odds of codiagnosis of preterm labor with delivery, fetal distress, and cesarean delivery. This association may be due to other unmeasured factors associated with both complications of delivery and respiratory illness, and the association may be

strongly mediated by gestational age. Although we can make no inferences about causality, it is important to describe the experience of women who deliver while concurrently diagnosed with respiratory illness as compared with women who deliver without these conditions.

Discharge records for 23% of hospitalizations with respiratory illness among pregnant women listed another condition for which CDC guidelines specifically recommend influenza vaccination. The presence of a comorbidity increased the odds of having respiratory illness 3- to 6-fold among hospitalized pregnant women, depending on delivery status. In addition, the presence of a high-risk condition was associated with



significantly longer lengths of hospital stay. 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.^{2,4}

Hospitalizations in rural locations and with intended payer of public origin (Medicaid/Medicare) were associated with increased odds of respiratory hospitalization during influenza season. 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.⁴ Reasons commonly cited for not receiving influenza vaccination include not believing vaccination is necessary, not thinking about vaccination, and believing vaccination would cause illness.⁴ Programs that aim to decrease morbidity from influenza-associated respiratory illness among pregnant women should propose interventions to increase influenza vaccination rates in this population by addressing erroneous beliefs and reducing disparities in vaccination uptake.

This analysis has limitations. Detailed medical histories, especially gestational age of pregnancy, influenza vaccination coverage, and predisposing medical factors not coded on the discharge record, were not available for a more thorough analysis of pregnancy hospitalizations with respiratory illness. We were not able to look at race as a covariate in this analysis. Race/ethnicity data in the National Inpatient Database are incomplete because of differences in state procedures for collecting and reporting this variable. Misclassification due to ICD-9-CM coding preferences may bias the results.¹⁰ International Classification of Diseases, 9th Revision, Clinical Modification codes are primarily designed for insurance billing purposes and not research. Changes in health care funding, policies, and insurance reimbursement may influence the use of codes used to identify high-risk conditions, pregnancy, or respiratory illness. Because the unit of analysis is individual discharge records, individuals hospitalized repeatedly may be counted more than once. Pregnant women hospitalized with respiratory illness did not have serologically confirmed influenza exposure. During influenza season, excess respiratory hospitalizations are primarily attributed to pneumonia and influenza,¹¹ but many studies of influenza-associated hospitalizations use all acute cardiopulmonary hospitalizations during influenza season to measure fully the impact of influenza morbidity.¹² We chose to be more

conservative in looking at discharge records with a listing of pneumonia or influenza. As population-based surveillance systems for laboratory-confirmed influenza-associated hospitalizations are developed, descriptions of influenza-related morbidity will become more specific.¹³

The Healthcare Cost and Utilization Program provides a sample population that is representative of inpatient care in U.S. community hospitals. This paper provides a nationally representative overview of hospitalizations with respiratory illness among pregnant women during influenza season. It is meant to provide a health services perspective that describes the overall hospitalizations and clinical comorbidities that occur with them that may be associated with respiratory illness, but these issues must be explored further in clinical, rather than administrative, data. Researchers, health care providers, and policy makers can use these data to develop strategies for reducing influenza-associated morbidity in this high-risk population, specifically by promoting influenza immunization during pregnancy.

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