

EDUCATION

Healthcare expenses associated with multiple vs singleton pregnancies in the United States

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OBJECTIVE: The purpose of this study was to document cost that is associated with multiple births vs singleton births in the United States.

STUDY DESIGN: This was a retrospective cohort study that used a claims database. Women 19-45 years old with live-born infants from 2005-2010 were identified. Infant deliveries were identified by *International Classification of Diseases*, 9th Revision, Clinical Modification diagnosis codes. The cost entailed all payment made by insurers and patients. For mothers, the cost included expenses from 27 weeks before delivery to 1 month after delivery. For infants, the cost contained all expenses until their first birthday. Adjusted cost was estimated by generalized linear models after adjustment for the potential confounding variables with a gamma distribution and a log link.

RESULTS: The analysis included 437,924 eligible deliveries. Of them, 97.02% were singletons; 2.85% were twins, and 0.13% was triplets or more. Women with multiple pregnancies had higher systemic and localized comorbidities compared with women with singleton pregnancies ($P < .0001$). Twins and triplets or more were more likely to have stayed in a neonatal intensive care unit than were singletons ($P < .0001$). On average, adjusted total all-cause health care cost was \$21,458 (95% confidence interval [CI], \$21,302–21,614) per delivery with singletons, \$104,831 (95% CI, \$103,402–106,280) with twins, and \$407,199 (95% CI, \$384,984–430,695) with triplets or more.

CONCLUSION: Pregnancies with the delivery of twins cost approximately 5 times as much when compared with singleton pregnancies; pregnancies with delivery of triplets or more cost nearly 20 times as much.

Cite this article as: Lemos EV, Zhang D, Van Voorhis BJ, et al. Healthcare expenses associated with multiple vs singleton pregnancies in the United States. *Am J Obstet Gynecol* 2013;209:586.e1-11.

BACKGROUND AND OBJECTIVE

Multiple pregnancy is a major public health concern for its high related morbidity and mortality rates in mothers and infants and increased health care cost. The prevalence of multiple pregnancies is increasing worldwide in parallel with

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E.V.L. is a research fellow funded by Merck. D.Z. and X.H.H. are employees of Merck. B.J.V. reports no conflict of interest.

Presented as a poster at the 61st Annual Clinical Meeting of the American Congress of Obstetricians and Gynecologists, New Orleans, LA, May 4-8, 2013.

0002-9378/free

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<http://dx.doi.org/10.1016/j.ajog.2013.10.005>

★ EDITORS' CHOICE ★

the increased use of assisted reproductive technology.

No recent update on the economic impact of multiple pregnancy in the United States has appeared in the literature. The aim of the present study was to document and compare US costs that are associated with multiple vs singleton pregnancy.

MATERIALS AND METHODS

This study investigated the cost associated with multiple vs singleton pregnancy by analyzing the MarketScan database (Truven Health Analytics Inc, Ann Arbor, MI). The source population included all women 19-45 years old who delivered at least 1 liveborn infant. Delivery types (singleton, twins, triplets or more) were reported from Jan. 1, 2005, through Sept. 30, 2010. We included only women who had continuous enrollment for at least 1 year both before and after the delivery date. Deliveries of singletons, twins, and triplets or more were identified with *International*

Classification of Diseases, 9th Revision, Clinical Modification diagnosis codes. Presence of comorbidities during pregnancy was tabulated based on these codes during the last 27 weeks of a pregnancy, which was expected to reflect the second and third trimesters of a full-term delivery.

The cost entailed all payments made by insurers and patient out-of-pocket medical expenses and included all-cause payment for inpatient and outpatient services and prescription drugs. For mothers, the cost included medical expenses during the 27 weeks before and up to 30 days after the delivery date. For infants, costs contained all medical expenses up to their first birthday. Infants were linked with their mothers by family identification number. Birth year had to be the same as the year of the woman's delivery date. Women's age, plan type, and geographic region were based on the values recorded on the delivery date in the database.

Because health care expenses may vary by maternal age, year of delivery, health plan, and geographic region, we used



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TABLE
Adjusted all-cause health care cost by multiplicity

Variable	Pregnancy ^a		
	Singleton	Twins	Higher-order multiples
Infant			
In vitro fertilization or intracytoplasmic sperm injection	\$11,358 (\$10,959–11,772)	\$81,757 (\$77,785–85,932)	\$376,622 (\$311,947–454,704)
Others	\$8300 (\$8199–8402)	\$72,995 (\$71,214–74,821)	\$334,942 (\$300,516–373,313)
All infants	\$8327 (\$8226–8430)	\$74,369 (\$72,673–76,106)	\$344,822 (\$313,787–378,927)
Mother			
In vitro fertilization or intracytoplasmic sperm injection	\$15,542 (\$15,322–15,765)	\$33,729 (\$33,066–34,405)	\$61,541 (\$57,090–66,339)
Others	\$13,084 (\$13,020–13,148)	\$29,335 (\$29,047–29,625)	\$59,711 (\$57,185–62,349)
All mothers	\$13,102 (\$13,039–13,167)	\$30,043 (\$29,767–30,320)	\$60,089 (\$57,871–62,391)
Infant and mother			
In vitro fertilization or intracytoplasmic sperm injection	\$26,922 (\$26,354–27,501)	\$115,238 (\$111,875–118,702)	\$434,668 (\$388,595–486,204)
Others	\$21,412 (\$21,257–21,569)	\$102,865 (\$101,364–104,388)	\$398,763 (\$373,854–425,331)
All infants and mothers	\$21,458 (\$21,302–21,614)	\$104,831 (\$103,402–106,280)	\$407,199 (\$384,984–430,695)

^a Data are given as mean (95% confidence interval).

Lemos. Multiple pregnancy cost in the United States. *Am J Obstet Gynecol* 2013.

generalized linear models to adjust for these variables with a gamma distribution and a log link.

RESULTS

We identified 437,924 eligible delivery events during the study period. Of the eligible deliveries, 424,880 were singletons (97.02%); 12,482 were twins (2.85%), and 562 were triplets or more (0.13%).

Women with twins or higher-order multiples had significantly higher comorbidities in each systemic and localized comorbidity that was examined than did women who delivered singletons ($P < .0001$). Mothers with twins or triplets or more had longer hospital stays for delivery and higher mortality rates than did mothers who delivered singletons ($P < .0001$). For mothers with singletons, 22.0% of deliveries were cesarean in contrast to women with twins or higher-order multiples for whom cesarean section was the dominant delivery modality (79.1% and 96.3%, respectively). Twins and triplets or more were

more likely to be admitted to the neonatal intensive care unit (NICU) and to have higher mortality rates than singleton infants (47.7% [triplets or more] vs 24.2% [twins] and 2.9% [singletons]; 2.0% [triplets or more] vs 0.5% [twins] and 0.06% [singletons]; all $P < .0001$). Similarly, among infants who stayed in the NICU, twins and triplets or more had longer stays than singletons (63.6 [triplets or more] vs 31.1 [twins] and 15.2 [singletons] days; all $P < .0001$).

The Table displays mean health care expenses for infants, mothers, and overall after adjustment for maternal age, year of delivery, health plan, and geographic region. On average, for singleton deliveries, the combined all-cause health care expense from the second trimester to 30 days after delivery for mothers and up to the first birthday for infants was \$21,458 (95% confidence interval [CI], \$21,302–21,614) compared with twins at \$104,831 (95% CI, \$103,402–106,280) and higher-order multiple births at \$407,199 (95% CI, \$384,984–430,695).

COMMENT

This study shows substantially increased health care expenses that are associated with twins and higher-order multiple births from the second trimester to 30 days after delivery for mothers and up to the first birthday for infants. On average, combined all-cause health care expenses for mothers with twins or higher-order multiple births were approximately 5 and 20 times more expensive, respectively, than singleton delivery. The greater expenses were likely to have been attributable to increased systemic and localized comorbidities, nearly exclusive use of cesarean section and longer hospital stay for the deliveries in women with multiple pregnancies, and increased admission and longer stay in the NICU for twins and higher-order multiple neonates. We also demonstrated increased mortality rates for both mothers and infants that were associated with multiple pregnancies, although the absolute rates were small.

To our knowledge, this is the first study to take into account a comprehensive assessment of the incremental cost that is associated with multiple pregnancies by estimating all-cause medical expenses from the second trimester to 30 days after the delivery for

mothers and up to the first birthday for infants.

CLINICAL IMPLICATIONS

■ For women who undergo in vitro fertilization, the risk of multiple

pregnancies is nearly entirely due to multiple embryo transfer.

■ Strategies that aim at minimizing multiple embryo transfer should be considered to reduce the financial burden that is associated with multiple pregnancies. ■

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