Estimates of Healthcare Spending for Preterm and Low-Birthweight Infants in a Commercially Insured Population: 2008–2016

Andrew L. Beam, Inbar Fried, Nathan Palmer, Denis Agniel, Gabriel Brat, Kathe Fox, Isaac Kohane, Anna Sinaiko, John A. F. Zupancic, and Joanne Armstrong

Department of Biomedical Informatics, Harvard Medical School (A.L.B., I.F., N.P., D.A., I.K.); Department of Epidemiology, Harvard T. H. Chan School of Public Health (A.L.B.); Department of Newborn Medicine, Brigham and Women's Hospital (A.L.B.), Boston, MA; University of North Carolina, School of Medicine, Chapel Hill, NC (I.F.); Department of Surgery, Beth Israel Deaconess Medical Center (G.B., K.F.); Department of Health Policy and Management, Harvard T. H. Chan School of Public Health (A.S.); Department of Neonatology, Beth Israel Deaconess Medical Center (J.A.F.Z.); and Department of Women's Health, Aetna Inc. (J.A.), Boston, MA

J Perinatol 2020;40:1091–1099

ABSTRACT

Preterm birth and low birthweight incur large medical, social, and economic costs on affected families and the US health care system. A 2007 study from the Institute of Medicine estimated that the total cost associated with preterm delivery in the United States was at least $26.2 billion annually or $51,600 per infant born preterm. Multiple other studies have reported similar trends. This study looks at health care expenditures, or total amount billed to the patient, for preterm and low-birthweight infants in a commercially insured population over 8 years. All US states were included except California, as many providers in California have contract arrangements that could potentially decrease the reliability. Health care expenditures for preterm and low-birthweight infants are important to study because it can have implications for medical interventions, research, and policy decisions targeted toward reducing the rate of preterm or low-birthweight infants.

Data were collected from a ~45 million patient administrative database with a commercial Aetna Inc. plan from January 2008 to February 2016. In all, 763,566 infants with insurance coverage through Aetna, Inc, during the first 6 months of life were included from this database. Preterm gestational age (<37 weeks) and low birthweight (<2500 g) were determined based on International Classification of Diseases 9th and 10th revisions billing codes. Preterm infants with unspecified gestational age codes and low-birthweight infants with unspecified birthweight codes were excluded.

Among the 763,566 infants included, 64,575 (8.5%) were preterm, and 45,708 (6.0%) were low birthweight. Health care spending averaged ~$8.4 billion for these infants throughout the study period. Overall, the average 6-month expenditure for preterm infants was $76,153 (SD = $169,931, median = $26,374, n = 50,512) and the 6-month expenditure for infants with low-birthweight was $114,437 (SD = $460,159, median = $48,906, n = 32,508). When looking at the breakdown by gestational age, infants born at 24 weeks had the highest average expenditures of $603,778 (SD = $509,165, median = $548,865, n = 418). Infants with a birthweight of 500–749 g had the highest expenditures with an average of $537,624 (SD = $460,159, median = $467,490, n = 1002). In contrast, a full-term infant had an average expenditure of $6370 (SD = $29,170, median = $3787, n = 713,253). Furthermore, a normal-birthweight infant had an average expenditure of $6743 (SD = $30,360, median = $3826, n = 727,538). Although the total average expenditures for extremely preterm infants (defined as ≤26 weeks) was high, the total spending on moderately preterm (defined as 33–34 weeks) and late preterm (defined as 35–36 weeks) infants was higher because there are more infants born during these gestational ages. There was also a statistically significant (P < 0.000001) spending multiplier of 1.08 for male infants, wherein expenditures were higher for male infants compared with female infants.

Overall, this study demonstrated that there is an inverse relationship between gestational age, birthweight, and infant costs. This can have implications for research, investments in interventions, and understanding the differences in cost of care.

EDITORIAL COMMENT

(Over the years, we have often quoted a 2007 Institute of Medicine review that estimated that the societal economic burden associated with prematurity in the United States was at least $26.2 billion annually, or $51,600 per infant born preterm (https://doi.org/10.1080/01443610802243047). That landmark study estimated the per-capita cost of prematurity at $32,000, most accruing in the first year of
life, as compared with $3325 in term infants. Other studies have estimated a range of medical costs of $47,000 to $78,000 per preterm infant (Pediatrics 2017;140:e20171078; J Pediatr 2019, published online ahead of print).

In this abstracted article, the authors report on more recent health care expenditures for preterm and low-birthweight infants in a commercially insured population. They indicate that more up-to-date data are needed to understand spending in this patient population. Clearly, medicine has changed substantially with technological advancements in maternal and neonatal care, medical cost inflation, variations in care, differences in reimbursement contracting, and health system changes. Accurate assessment of medical care expenditures due to prematurity is a priority for researchers and health policy stakeholders. In the study, the authors also stratified cost by gestational age and birth weight, as clearly more extremely preterm infants require more health care resources. The data were collected from a national administrative database through Aetna insurance, and a total of 763,566 preterm infants were included for the first 6 months of life. Total costs of health care services for these infants approximated $8.4 billion. Preterm infants incurred an average of $76,153 in health care expenditures, and low-birthweight infants (<2500 grams) had average costs of $114,437. Infants born at 24 weeks of gestation had the highest average expenditure of $603,778.

The United States has one of the highest rates of preterm birth of any high-resource country, and there are obviously many reasons that this is a serious concern. In addition to the adverse long-term outcomes experienced by many of these children over their lifetime, this also represents a tremendous burden on the health care system. All the patients in this cohort were insured given that data are derived from an Aetna database. Given that the rates of preterm birth are higher in the underserved population and in underrepresented minority groups, this study may underestimate total costs to the health system as more vulnerable infants may accrue higher costs.

Survival rates of extremely preterm infants have increased over time, and not surprisingly, the smallest and most preterm infants incur the highest costs per individual infant. Again, not unexpectedly, complications associated with prematurity such as necrotizing enterocolitis, bronchopulmonary dysplasia, respiratory distress syndrome, and sepsis were highly associated with increased costs. Given that later preterm birth, at 33 to 34 weeks' gestation, is overall much more common, this group incurred the highest costs overall. As medically indicated delivery is performed more often in this later gestational age group, this is an area where improvements in care may have significant impact on health care costs.

One other interesting finding from this study is the bimodal pattern of expenditures seen in the very most and least preterm groups. In the extremely preterm infants, the low costs attributed to some likely reflect early mortality, which leads to lower costs, with the very high cost at the other end of the spectrum reflecting those few infants who do survive more long term. In the late preterm group, the low end of the expenditure spectrum likely reflects those infants who do well and behave like term infants with limited need for complex medical services, and the other end of the spectrum reflecting those relatively fewer late preterm infants who suffer more significant complications of prematurity.

These data provide an interesting insight into the overall burden of prematurity on the US health care system. While obviously there are many reasons that prematurity is problematic, costs are one of them. For researchers, these data provide additional incentive to work toward prematurity prevention strategies and for individual providers, they provide additional rationale for avoiding iatrogenic prematurity. —MEN)