

A Commercial Insurance Study of Vaginal Delivery and Cesarean Section Rates at New Hampshire Hospitals

April 1, 2011



Purpose

The purpose of this study is to investigate what factors may be related to the increase in the rate of cesarean sections (c-sections) at New Hampshire (NH) hospitals and assess the relevance of c-sections as a cost driver to the commercial insurance market.

Summary Findings

The increasing rate of c-sections in NH is consistent with national trends. The amount paid for c-sections in NH is 64 percent higher than for vaginal deliveries, and increases in the amounts paid for c-sections are rising faster than for vaginal deliveries. Overall, the relative payment increases for vaginal deliveries and c-sections are not substantially different than what is observed for hospital admissions in general. Although a c-section is a more expensive alternative to vaginal delivery, the NH experience suggests that c-sections alone are not an unusual cost driver. The charges, determined by the hospital, and amounts paid, determined by the contract between the hospital and the insurer, have a greater impact on costs to the insured population than increases in the incidence of c-sections. However, the upward trend in c-section rates and the risks associated with the surgery are issues that deserve scrutiny.

There are no obvious reasons that explain why c-sections are higher at one NH hospital versus another. Charges and paid amounts for deliveries are highly variable among NH hospitals, and do not appear to be closely related to health status, the ratio of high risk neonates, c-section rates, or patient volume. There is a weak correlation between hospital charges and c-sections that is unlikely a causal relationship, but perhaps a business response to a medical care trend.

Elliot Hospital has the highest volume of commercial deliveries and the second highest c-section rate. Despite the high rate of c-sections, Elliot Hospital is not one of the most expensive hospitals in the state for deliveries overall.

Dartmouth Hitchcock Medical Center has the most resource intensive patient populations for both c-sections and vaginal deliveries and the highest proportion of newborns that are high risk neonates, yet the Dartmouth c-section rate is average for the state and below that of Elliot Hospital.

The number of all deliveries statewide fell more than ten percent in five years.

Background

According to the NH hospital discharge data, approximately 35 percent of commercially insured patient admissions to NH hospitals and twelve percent of the total inpatient charges are for deliveries, including newborns. The rate of c-sections nationally has increased 53 percent between 1996 and 2007, to an average rate of 32 percent¹. There is no consensus about the short and long term benefits and risks to the mother and infant,

¹ NCHS Data Brief, No. 35, March 2010

and even though c-sections are performed routinely, many patients do not realize that the procedure involves major abdominal surgery and is associated with surgical complications and maternal readmissions. C-section provider charges and payments are often substantially higher than for vaginal deliveries, increasing medical care costs to the patient, the insurer, and they health care system in general.

This study focuses on patients covered by commercial insurance, and only includes hospital charges and payments.

Charges and paid amounts are included in this study. The amount paid is referred to as the “allowed amount.” The allowed amount includes both health insurer payments and patient responsibilities (e.g. deductibles, coinsurance, and copays) and is determined by the contract rate between an insurer and a hospital.

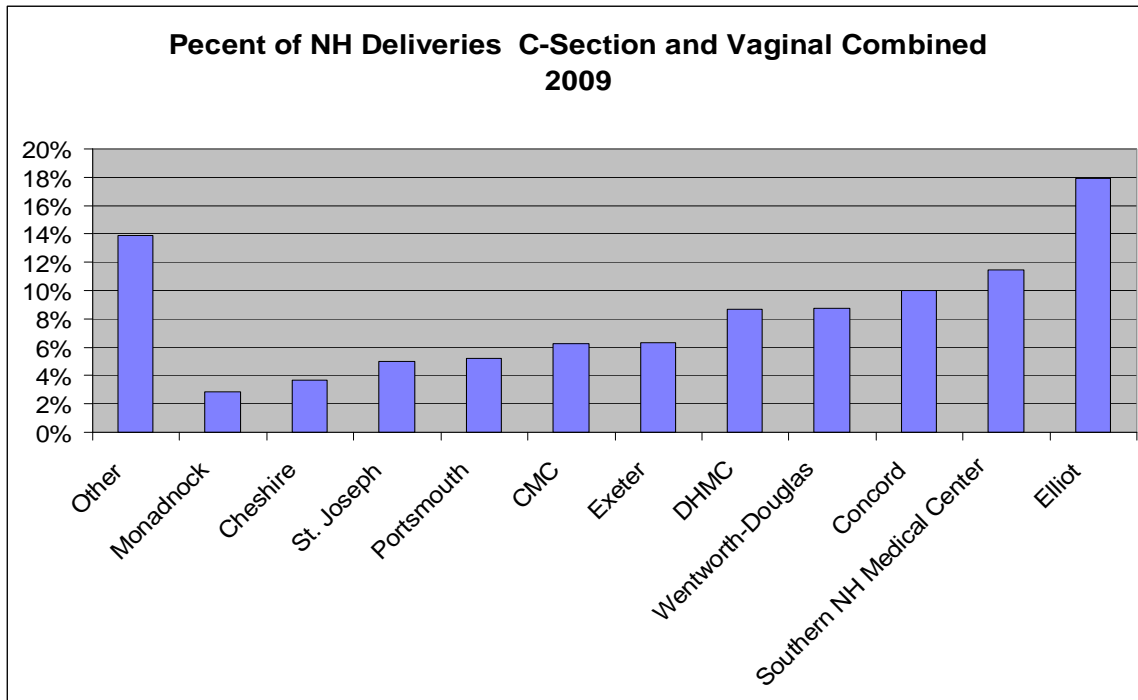
Comparisons are often made between the years 2005 and 2009, and single year data are from calendar year 2009.

Detailed Findings

Overall Volume

Twelve out of 24 hospitals are responsible for 86 percent of commercially insured deliveries in NH. Elliot Hospital performs the most at 18 percent, followed by Southern NH Medical Center at 11 percent and Concord Hospital with ten percent. Two hospitals in NH do not offer obstetrical services.

Chart 1



C-Section Rates

The NH c-section rate steadily grew from 28.0 percent in 2005 to 32.5 percent in 2008. This represents a 16 percent increase in 2008 over the 2005 rate. The 2009 rate dropped to 31.1 percent. Between the years 2005 and 2009 the total number of deliveries fell by 10.2 percent.

Table 1

Calendar Year	All Deliveries	C-Sections	Percent C-Sections
2005	9,321	2,611	28.0%
2006	9,155	2,791	30.5%
2007	8,914	2,806	31.5%
2008	8,624	2,803	32.5%
2009	8,372	2,603	31.1%

C-Section and Vaginal Delivery Charges and Payments

The charges and payments increased every year between 2005 and 2009:

Table 2

Average Charge and Allowed Increase	2005 Average Charge	2009 Average Charge	2005 Average Allowed	2009 Average Allowed	Average Charge Increase	Average Allowed Increase
Vaginal Delivery	\$5,875	\$7,112	\$3,859	\$5,007	5.3%	7.5%
C-Section	\$9,798	\$11,622	\$5,774	\$8,194	4.7%	10.5%

As shown in Table 3 all hospital admissions had an increase in the average charge per case equal to 9.9 percent per year.

During this period the average case complexity increased when measured by the average diagnoses related group (DRG) weight. The weight assigned to a DRG is an indication of the case complexity and the expected resources needed to treat one patient versus another and are based on the Medicare population. The average inpatient case complexity is likely to increase over time as some procedures that were routinely performed on an inpatient basis in 2005 are more often performed on an outpatient basis in 2009. The remaining inpatient cases are more complex on average.

The vaginal and c-section delivery DRGs were virtually unchanged during the period of analysis, but several changes were made to the system overall (see data notes section). Case mix intensity was not analyzed specifically for vaginal and c-section deliveries because the commercial population and the Medicare populations are likely to be particularly different for these admissions.

The calculations for all types of hospital admissions shown in [Table 3](#) are performed to create a comparison group. By understanding the charge increases that took place over the time period of study for all admissions, the relative differences for deliveries can be identified.

Table 3

	2005 Average Per Case	2005 Average DRG Weight	2005 DRG Calculated Coefficient	2009 Average Per Case	2009 Average DRG Weight	2009 DRG Calculated Coefficient	Average Difference Per Year	Adjusted Difference Per Year
Charges	\$14,858	1.0526	\$14,116	\$20,729	1.1696	\$17,724	9.9%	6.4%
Allowed	\$8,959	1.0526	\$8,512	\$13,632	1.1696	\$11,655	13.0%	9.2%

Between 2005 and 2009 the allowed amount as a percent of charges increased from 60.3 percent to 65.76 percent. When this change is considered, the difference in allowed amounts equals an average of 13 percent per year. During the same period the average DRG case complexity increased 11.1 percent (1.0526 vs. 1.1696). After adjusting for the case complexity increase, the allowed rate increased by 9.2 percent per year.

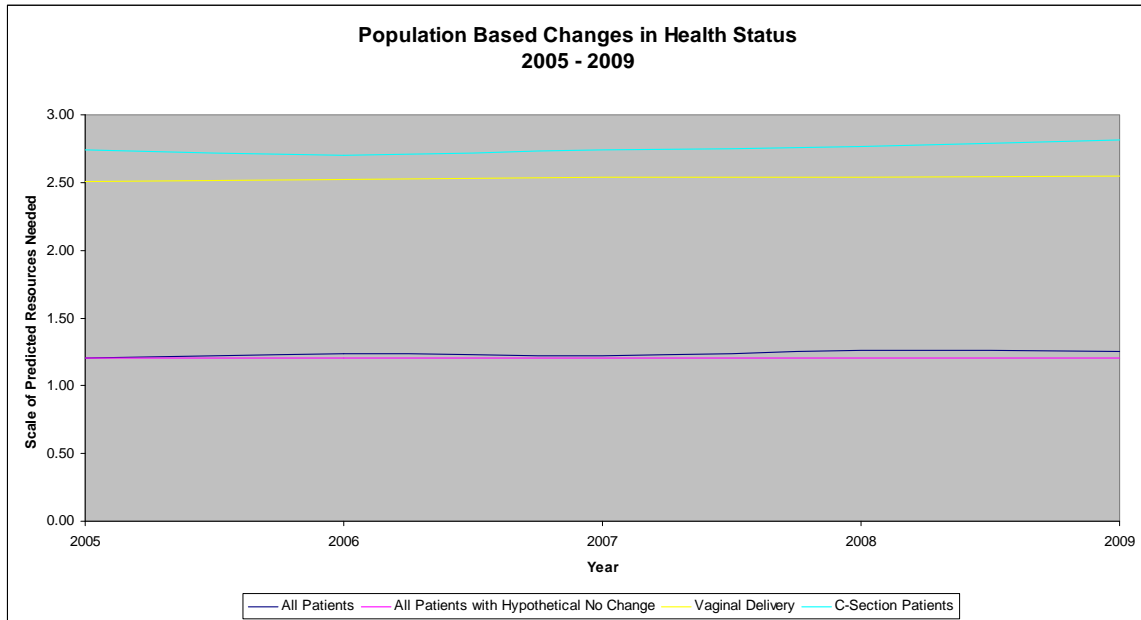
Comparing the rate increase of c-sections and vaginal deliveries to increases overall shows that the rates paid for these services have increases similar to hospital inpatient services in general. However, the allowed rate for c-sections (10.5 percent) exceeds that for vaginal deliveries (7.5 percent) and overall inpatient cases (9.2 percent). In addition, the c-section allowed rate is 64 percent higher than for vaginal deliveries. As the rate of c-sections has risen in recent years, this will further increase the impact to the commercially insured market of the payment differentials, unless mitigated by trends such as the aging of the population² resulting in fewer deliveries.

Population Health Status

Observations so far include increases in typical inpatient complexity and increases in the rate of c-sections. Shown below is a measure of health status changes from year to year that may influence hospital charges and payments for care. The indicators are based on the Chronic Illness and Disability Payment System (CDPS) and consider diagnoses over the period of a year. The values are based on the expected resources necessary to treat one population versus another, and the measure is a relative scale. Although subtle, the expected resources needed for all three populations grew over the period of analysis. Included in [Chart 2](#) is a line that reflects a hypothetical constant in the population health status over time. The actual changes are minor enough that this is an unlikely explanation for the increases in c-section rates or the amounts charged and paid for care.

² The Impact of Aging on Medical Care Services Covered by Commercial Insurance in New Hampshire, NHID report, August 26, 2010

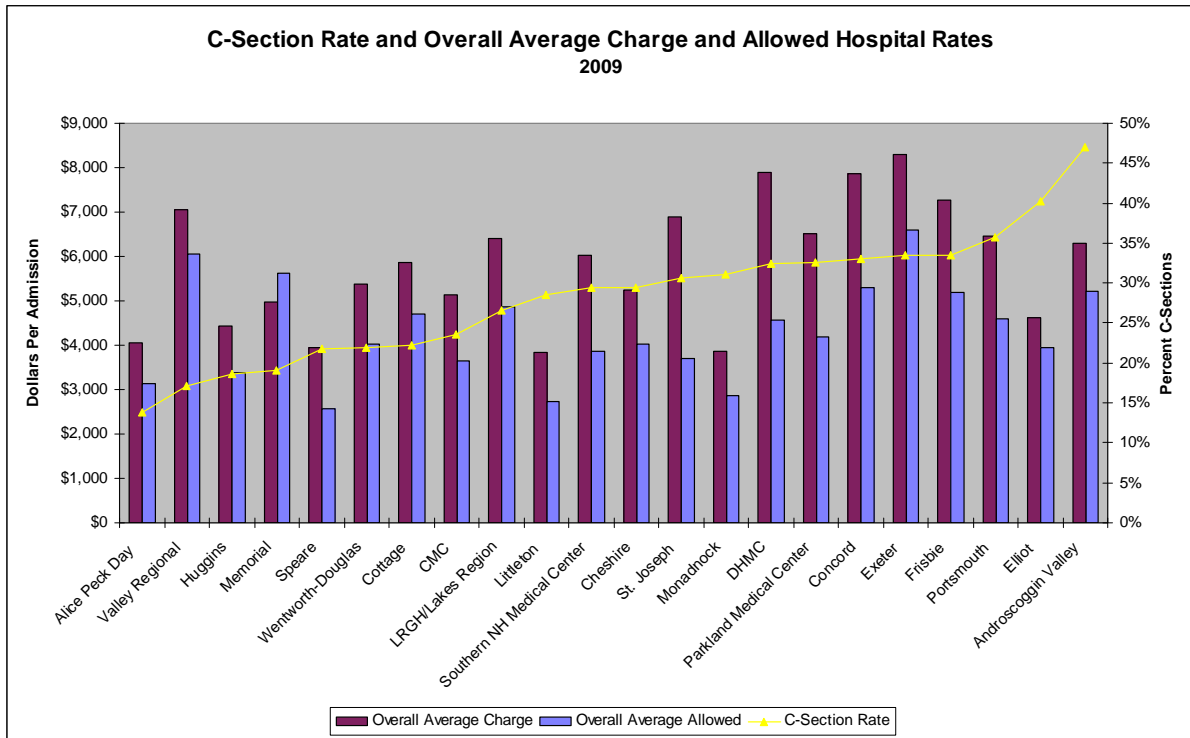
Chart 2



C-Section Rates, Charges, and Allowed Rates

This study explores c-section rates as a potential cost driver, assuming that with an increasing number of c-sections the overall costs associated with births goes up. [Chart 3](#) ranks hospitals from those with the lowest c-section rate to those with the highest, and includes average charges and allowed rates for all deliveries, regardless of whether a c-section was performed.

Chart 3



There is a slight upward trend in charges as the rate of c-section increases, but there are a couple of surprises. The two hospitals with the highest rate of c-sections have neither the highest average charge nor the highest allowed rates. Combined with the substantial variability in hospital charges and payments suggests that hospital charges and pricing (determined by the hospital and through contract rates with insurers) has a greater impact on the cost of deliveries than does the rate of c-sections.

The coefficient of determination (R^2), which measures the linear relationship between multiple sets of values, indicates that only 14 percent of the variation in charges is explained by c-section rates. This calculation is heavily influenced by Elliot Hospital, and by removing this provider, allows the c-section rates to explain 23 percent of the variation in charges.

The two hospitals with the highest c-section rates have very different situations. With only 34 commercially insured deliveries in 2009, Androscoggin Valley Hospital in Berlin had the fewest commercial insured deliveries in NH. The rural nature of this hospital may influence the decision to perform a c-section if on-call obstetrical services are not available or access to appropriate specialists is otherwise limited. Elliot Hospital performs the most deliveries in the state, and even with the second highest rate of c-sections, is able to keep the average charge and allowed amounts below many of NH's hospitals, including those with c-section rates substantially lower than at Elliot Hospital.

Chart 4 shows the c-section rate, charges, and allowed amounts for c-sections only. Hospitals are ranked based on the average charge amount. The display looks as though

there may be a relationship between c-section rates and charges, and indeed the R^2 indicates that 25 percent of the variation in c-section rates is “explained” by charges. It is unlikely that higher charges are caused by higher c-section rates, as might be the case when vaginal and c-section delivery charges are combined and compared to c-section rates. The R^2 value also means that 75 percent of the variation is unexplained, so the relationship is quite weak. Removing Elliot Hospital from the ranking allows the R^2 to improve so that 37 percent of the variation is explained.

Chart 4

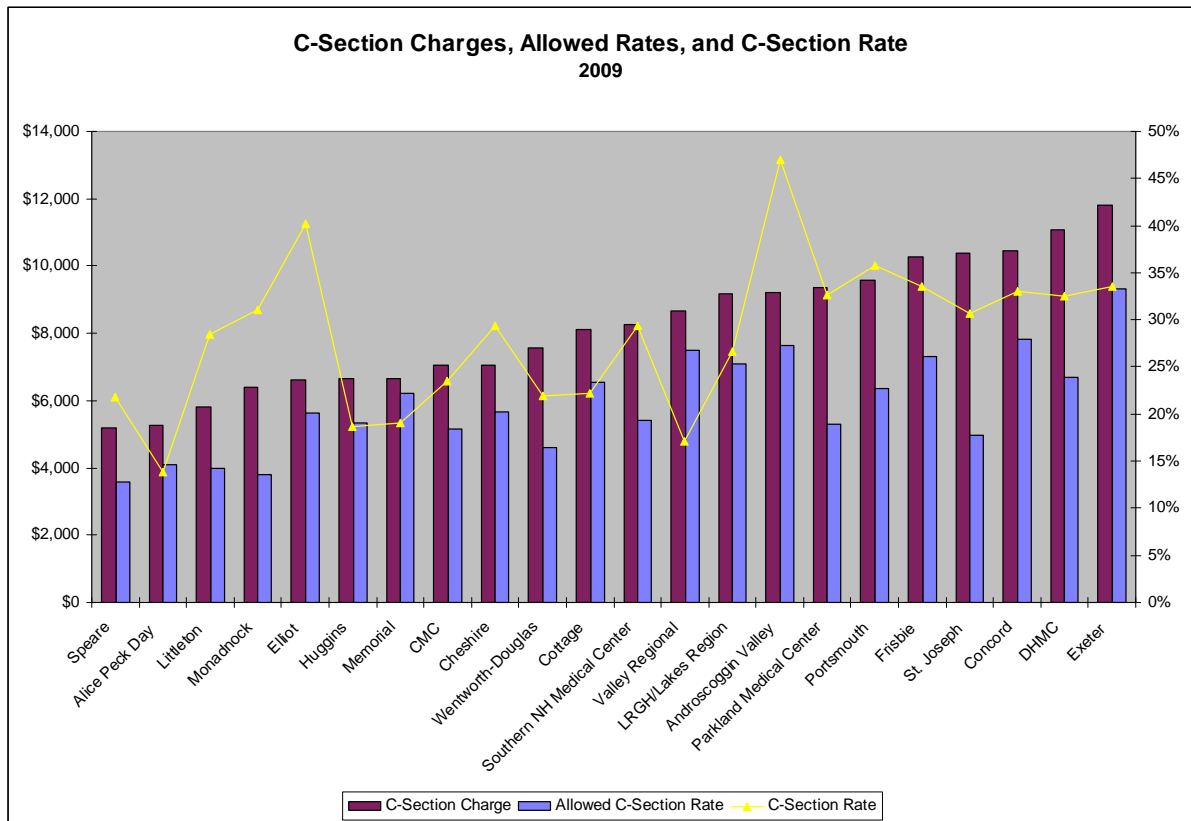
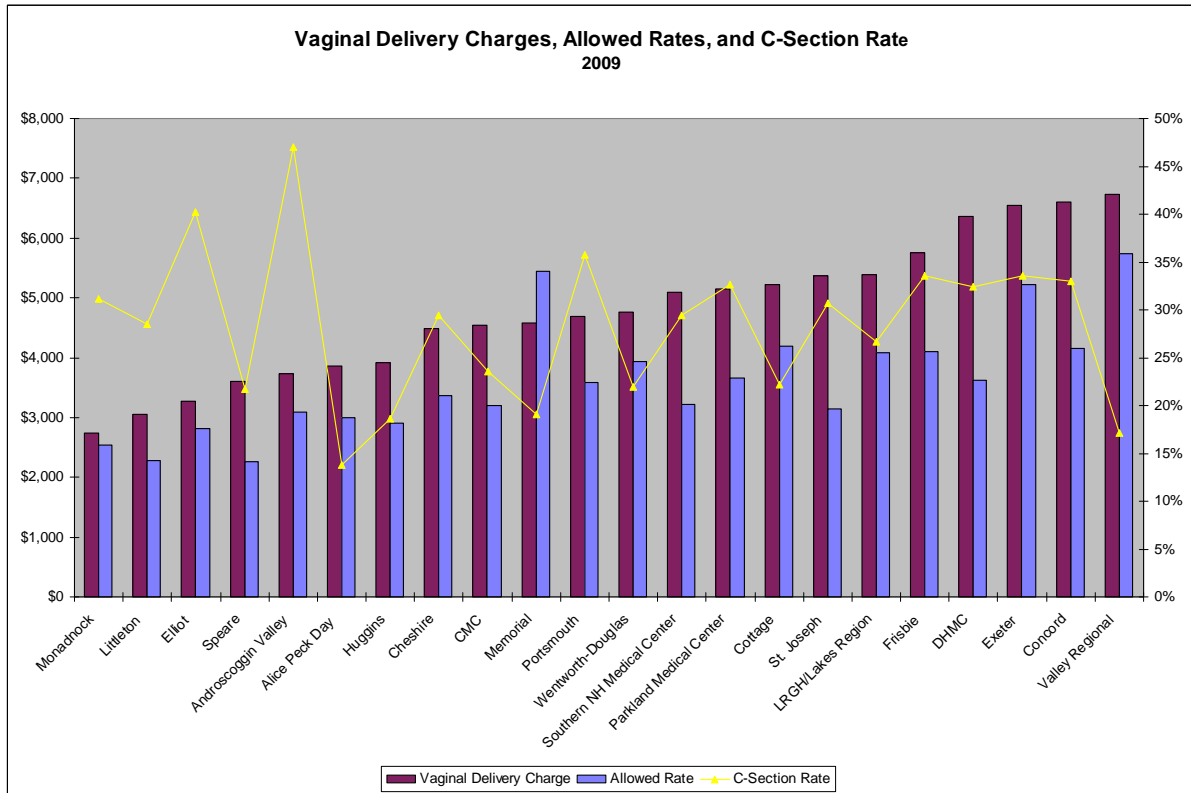


Chart 5 shows similar data for vaginal deliveries. These data do not appear to show any connection between charges (nor allowed rates) and c-section rates and this conclusion is supported by the regression statistics. Wide variation in hospital charges and payments continues with this category of deliveries.

An unusual finding exists with Memorial Hospital in Chart 5. The summary data show that Memorial Hospital receives on average more than the total hospital charges for vaginal deliveries. When reviewing the detailed claims data, Memorial Hospital appears to frequently receive a case payment (e.g. DRG) that exceeds the total charges for an individual patient, resulting in the average difference shown in the graph. Member liabilities do not seem to be adversely impacted by this phenomenon.

Chart 5

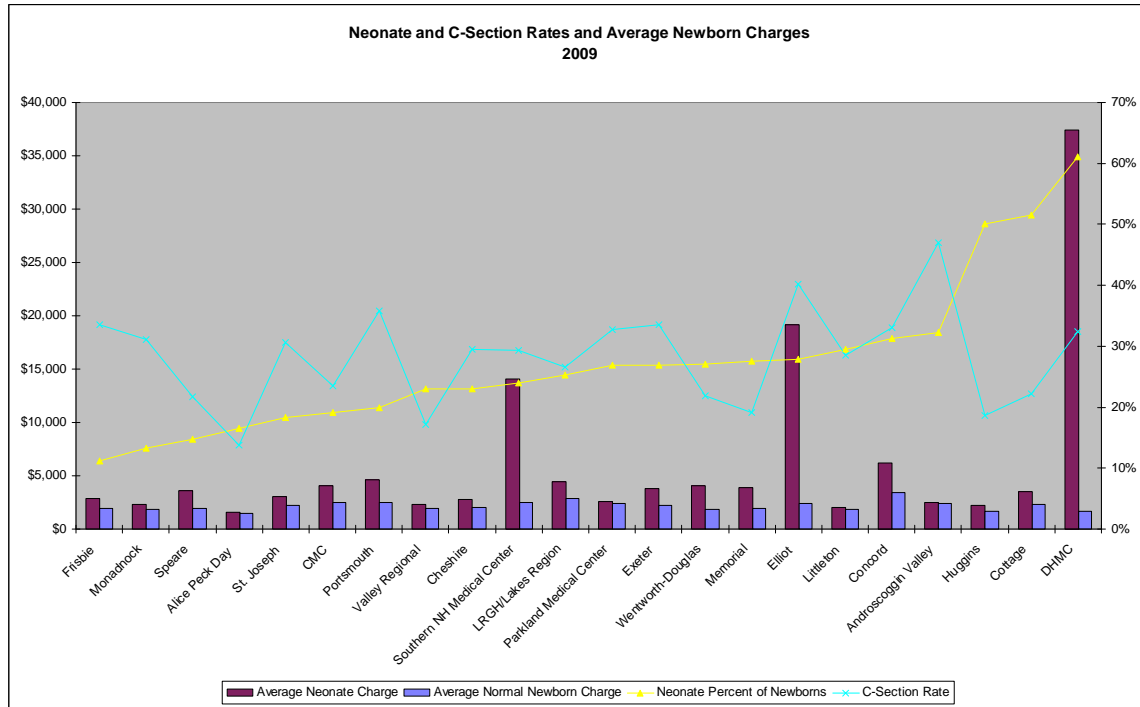


C-Sections, Newborns, and Neonates

Chart 6 explores another possible explanation for variation in c-section rates, the number of newborns that are high risk neonates. Shown is the average charge for high risk neonates, normal newborns, c-section rates, and the percentage of newborns that are high risk neonates. Hospitals are ranked based on the rate of high risk neonates.

Easily seen are the differences in average charges for the three NH hospitals with neonatal intensive care units: Dartmouth Hitchcock Medical Center (DHMC), Elliot Hospital, and Southern NH Medical Center. DHMC clearly has the highest proportion of newborns that are high risk neonates at 61 percent, but has a c-section rate that is consistent with the average rate in the state. R² statistics show no linear relationship between the percent of newborns that are high risk neonates and the rate of c-sections.

Chart 6



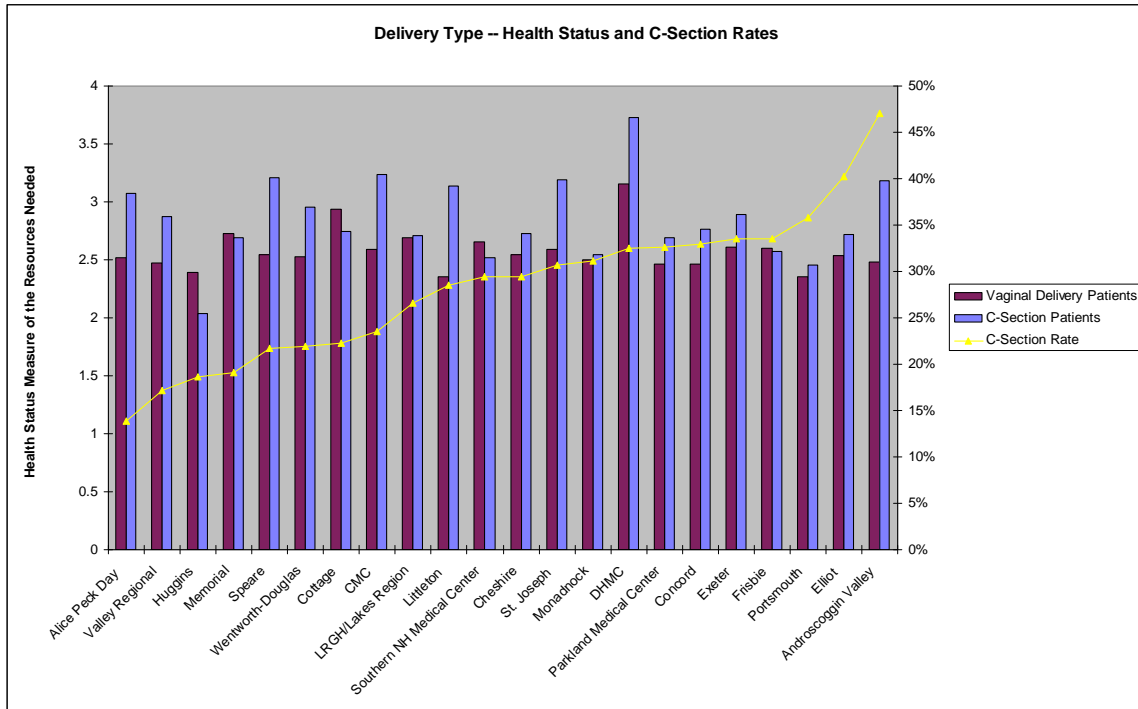
Health Status and C-Section Rates

Chart 7 compares the health status and rate of c-sections at NH hospitals. Health status is determined by patient diagnoses over the period of a year, regardless of the relevance to pregnancy. Since the diagnoses used to rank health status include a range of health issues from cardiac conditions to cancer to mental illness, no specific expectation is made about the impact on deliveries.

The health status indicator is on a relative scale, so a 3.0 means that due to a lower health status, the patient population will need twice the health care resources over the period of a year as a population with a 1.5. In 19 of the 24 hospitals shown, the relative resources needed to treat vaginal delivery patient populations are lower than for the populations with c-sections (within the same hospital). Based on this finding, lower health status might be factor that explains higher c-section rates.

Although within a hospital the health care resources needed to treat the c-section populations are higher, there does not appear to be a relationship between c-section rates and health status among hospitals. DHMC has patients in both the vaginal delivery and c-section categories that require more health care resources than at other hospitals, but DHMC has an average c-section rate. Likewise, the lowest c-section rates at Alice Peck Day Memorial Hospital and Valley Regional Hospital are not paired with proportionally healthier populations. R² statistics show essentially no relationship between hospital population health status (for deliveries) and c-section rates.

Chart 7



Data Analysis Notes

New Hampshire hospital discharge data for the years 2005-2009 was used to identify hospital admissions and deliveries. The payer categories included from the discharge data are: HMO, Blue Cross, and Commercial Insurance. The CHARGENT field was used to identify charges, and the definition provided is “total net charges less professional services.”

Prior to 2008, delivery DRGs included are: 370, 371, 372, 373, 374, and 375. Admissions are identified as c-sections when DRGs 370 and 371 are used. Beginning with 2008, delivery DRGs include: 765, 766, 767, 768, 774, and 775. C-sections are identified with DRGs 765 and 766.

Normal newborns are identified in 2009 data based on DRG 795, and high risk neonates with DRGs 789, 790, 791, 792, 793, and 794.

Readmissions and surgical infections or complications are not considered in this study, but are an additional cost associated with c-sections.

A confounder with the DRG calculations is that the system used to calculate DRG weights was modified by the Centers for Medicare and Medicaid Services (CMS) in 2008. A second issue is that the DRG weights are designed for use with a Medicare population, not the commercial insurance population. Differences in these populations may result in relative weights that are sometimes inconsistent with the actual differences

among commercial patients. The impact of the DRG system change (or the coding changes by providers in response to the DRG change) independent from the change in case complexity is indeterminable using currently available data, but assumed to be minor.

Claims data from the New Hampshire Comprehensive Health Information System (NHCHIS) was used to analyze data during the years 2005 through 2009. Deliveries were identified based on diagnosis codes and c-sections based on procedure codes. Due to the nature of the NHCHIS, not all patients in the NH hospital discharge data are included in the claims data. The claims data were used to identify the equivalent percent of charge for payments, based on average charges and average allowed amounts by hospital for c-section and vaginal deliveries. The average charge from the claims data was comparable to the average charge calculations from the discharge data, but the values always differ slightly. Using the discount level from the claims data and applying this value to the hospital discharge data assumes that the cases in the claims data accurately reflect the hospital discharge data from the perspective of contract reimbursement rates. Deliveries are common in both databases so this assumption was made. This approach was not used with neonates due to the infrequent nature and highly variable charges associated with these cases. Missing only a few admissions in the claims data may result in an incorrect inference about payment levels when discount rates are applied to the hospital discharge data charges.

Health status of patient populations was compared using the Chronic Illness and Disability Payment System (CDPS), a population based risk adjustment tool that uses diagnoses over the period of a year to calculate relative values of necessary resource intensity. The CDPS does not use procedures as an input measure. The values are based on the expected resources necessary to treat one population versus another.

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