MIDWIVES, PATIENT CENTERED CARE AND HEALTH REFORM: AN ANALYSIS OF PRIVATE PAYER CLAIMS DATA

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By

Allison M. Johnson, M.A.

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ABSTRACT

As health reform proceeds, provider payment structures will undergo potentially significant changes. One area particularly ripe for investigation is maternity care and the role Certified Nurse-Midwives (CNMs) may play in improving outcomes and reducing costs. The current effort examines a national collection of private payer claims data for differences in reimbursement rates between certified nurse-midwives and obstetricians. Through the use of two different dependent variables and quartile regressions I find unexpected results for payments between CNMs and obstetricians. When estimating the reimbursement amount for a single billing code (the “global” code that covers prenatal, delivery and postpartum care for uncomplicated vaginal births) midwives are predicted to collect more than their physician counterparts across all quartiles. These findings are statistically significant at the .01 level. However, in the second model that measures all claims submitted for a particular delivery obstetricians are predicted to collect more than midwives in the sample. Future research may require investigating potential self-selection biases inherent in the provider choice and what policy tools may be available to encourage patients to select lower-cost providers that achieve similar or better outcomes.
The research and writing of this thesis is dedicated to my son Tyler and my husband Michael. Without their love and encouragement I would have never taken this leap. To my parents, thank you for providing the inspiration and support that has made my journey possible. Thank you also to Bill Encinosa for his invaluable guidance and patience, Emily Kayser for her unflagging patience with my endless Stata questions, Mona Dave for her organized writing sessions and the professors that have encouraged me along the way including Joan Clinefelter, Dave Damore and Judy Feder.

This thesis honors the work of all midwives over the centuries that have helped so many mothers guide their babies into the world. “Peace on Earth Begins with Birth.”

Many thanks, Allison
Washington, DC
2013
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INTRODUCTION

Healthcare costs in the U.S. have been on the rise for the past few decades, outpacing inflation and consuming an ever-greater share of gross domestic product (GDP). According to the Organization for Economic Cooperation and Development (OECD), spending on healthcare in the U.S. accounted for 17.8% of GDP in 2010 with trends suggesting this number will continue to rise. The OECD data also show that on average, the U.S. spent $8233 per person on health expenses in 2010, more than two and a half times the OECD average (OECD, 2012). While government-sponsored programs like Medicare, Medicaid and SCHIP cover everyone over the age of 65, the poorest citizens, pregnant women and children respectively; most Americans currently receive health insurance coverage through their (or their spouse/family member’s) employer. The employer-sponsored system of health insurance coverage is incentivized through the tax code and predominately operates in a fee-for-service model (with a few notable exceptions). The fee-for-service model is frequently pointed to as a main driver of rising healthcare costs as providers and insurers play a cat and mouse game with payments (Schroeder and Frist, 2013). Escalating healthcare costs were a primary rationale for passage of the Patient Protection and Affordable Care Act (ACA) in 2010. The ACA has as a central goal bringing down healthcare spending through payment reform, reducing the number of uninsured and encouraging innovation in models of care.

One area especially ripe for both payment reform and innovation in care delivery is maternal-child health, particularly care during pregnancy and childbirth. The top reason for admission to the hospital in the U.S. is for childbirth or pregnancy related conditions. Likewise, the most frequently performed operation in the U.S. today is the cesarean section (Pfuntner, Wier and Stocks, 2013). The cost of care during pregnancy and childbirth is increasingly more
expensive and is in part driven by the increased use of medical technology during pregnancy and childbirth. The climbing cesarean section rate, which in 2010 stood at 32.8%, is an increase of 60% between 1996 and 2009 (Martin, et al., 2012). According to data analyzed in 2011 by Childbirth Connection, a century-old non-profit research and advocacy organization, the facility charge alone for an uncomplicated hospital vaginal birth in 2010 was $10,166 while an uncomplicated cesarean birth was $17,052. A complicated cesarean birth in 2010 averaged $23,311 (Childbirth Connection, 2011). Even uncomplicated births can involve the use of expensive technology or procedures of varying effectiveness (i.e. continuous electronic fetal monitoring, epidural analgesia, episiotomy). Incredibly, these figures don’t reflect the additional fees charged by the birth attendant, generally a midwife or obstetrician, charges from additional providers like anesthesiologists or any extra care for the mother or newborn (e.g., additional observation in the nursery or NICU). Childbirth Connection notes that while uncomplicated vaginal births accounted for 61% of total hospital discharges in 2010, they represented only 47% of total hospital birth charges. C-sections, both complicated and uncomplicated were 29% of hospital discharges but accounted for 43% of all hospital birth charges (Ibid.).

Similarly, a report released in March 2013 by Childbirth Connection and prepared by Truven Health Analytics found that “commercial and Medicaid payers paid approximately 50% more for cesarean than vaginal births...[and for] both types of birth, Commercial payers paid approximately 100% more than Medicaid” (Truven Health Analytics, 2013). Further, this analysis found that between 2004 when a similar study was conducted on claims data, “Commercial payments for maternal care with both vaginal and cesarean births increased by over 50%” (Ibid.)
The following effort will begin with a brief discussion of what a midwife is, how the midwifery model of care is distinct from other models, and why this issue is ripe for exploration. A comprehensive literature review will follow describing the state of current research on midwives as providers and their role in the U.S. health care system. The remainder of the paper will concentrate on the results from two statistical models that attempt to find out what, if any, payment disparities exist between midwives and physicians in the U.S. A detailed discussion of the findings as well as policy implications and suggested avenues for future research will conclude the paper.

**Background**

While familiar in most of the world, midwives are relatively unknown and still uncommon in many parts of the U.S. In most western nations, midwives form the core of providers of maternity services reserving more highly skilled physicians to provide consultation to midwives and caring for women with complicated or risky pregnancies (Hatem, et al., 2009). The International Confederation of Midwives recognizes several key concepts that define the midwifery model of care:

- “Partnership with women to promote self-care and the health of mothers, infants, and families;
- Respect for human dignity and for women as persons with full human rights;
- Advocacy for women so that their voices are heard;
- Cultural sensitivity, including working with women and health care providers to overcome those cultural practices that harm women and babies; and
- A focus on health promotion and disease prevention that views pregnancy as a normal life event” (International Confederation of Midwives, 2013).
The primary type of midwife practicing in the United States is the Certified Nurse-Midwife (CNM). Presently, CNMs are licensed to practice medicine and are eligible for Medicaid payment in all fifty states plus the District of Columbia. CNMs are advanced nurse practitioners who generally train first as nurses and then complete graduate level training in nurse-midwifery. CNM’s primarily practice in hospital and clinic settings though some also attend births and provide care in out-of-hospital settings. Additional types of midwives practice in the United States including the Certified Professional Midwife (CPM) and other types of direct-entry birth attendants. These midwives almost exclusively practice in out-of-hospital settings and are informally or apprenticeship trained. The current effort will concentrate on the role of CNMs alone but it is important to recognize that in the U.S. there are multiple types of care provider credentials that fall under the category of midwife.

The use of midwives for providing care during childbirth and pregnancy has been on the rise in the United States in the past two decades. According to data collected and analyzed by the National Center for Health Statistics and Dr. Eugene Declerq, between 1990 and 2004 the percentage of births attended by Certified Nurse-Midwives (CNM’s), the primary type of practicing midwife in the U.S. rose from 4.7 percent to 10.6 percent. The American College of Nurse-Midwives, the professional organization for nurse-midwives in the U.S. reports that in 2010 (the most recent year available), nurse-midwives attended 312,129 births which “represents 11.6% of all vaginal births, or 7.8% of total US births” (American College of Nurse-Midwives, 2012). 95.7% of these births occurred in hospitals, with 2.2% of births occurring in freestanding birth centers and 2.0% in patient homes (Ibid.). Every state Medicaid program covers the services of Certified Nurse-Midwives, and a growing number of private plans do as well.

1 These figures also include births attended by Certified Midwives, a classification similar to Certified Nurse-Midwives present in five states, New York, New Jersey, Rhode Island, Delaware, and Missouri (American College of Nurse Midwives, 2013).
MO TIVATION AND J USTIFICATION

The implementation of a number of important reforms contained in the Patient Protection and Affordable Care Act may present a policy window for midwives to gain additional market share and contribute to the law’s goal of reducing healthcare costs while improving maternal and perinatal outcomes. Arguments for the increased role of midwives in the U.S. maternity care system centers on their ability to provide lower cost services with equally good or better outcomes relative to physicians. With over 4 million births in the United States in 2010, the potential cost-savings from a shift to a midwife-led model of care could be substantial.

Implementation of the Affordable Care Act over the next several years will dramatically alter payment incentives and health insurance markets in the United States. Because most Americans will continue to receive coverage through their own or their spouse’s employer, a look at how private, employer-sponsored insurance is paying for maternity care is essential. Additionally, the push towards patient-centered models of care is gaining traction in the broader medical community and is in part spurred on by health reform. Midwifery is frequently held up as a leading example of a patient-centered model of care and represents a dramatic break from the current, physician-centered model in maternity care.

Improvement in the maternity care system in the U.S. is a recognized priority by the nation’s public health agencies. The Healthy People 2020 Goals established by a consortium of federal government agencies including Health and Human Services and the Centers for Disease Control and Prevention single out a number of necessary improvements to the U.S. maternity care system including reducing the maternal and neonatal mortality rates, reducing the national C-section rate and increasing the percentage of women receiving pre-natal care in their first trimester. But midwives will need to demonstrate their capacity to help achieve these goals and
expand their numbers in the healthcare system. Finally, healthcare costs are central to debates about not only the nation’s health system and the population’s well being, but also to the U.S. economy more broadly. As healthcare costs rise and consume a greater share of GDP, serious efforts must be undertaken to determine what services are most cost-effective and efficacious.

To achieve these goals, policy makers tasked with addressing rising healthcare costs require information on what alternatives truly are cost effective. The study that follows will attempt to determine, through the use of private claims data collected from a number of major employers and their insurance carriers, if the cost savings touted by advocates for the expansion of midwifery services is really there.

**Literature Review**

On the whole, much of the research on certified nurse-midwives and their role in the nation’s health system is out of date. The majority of studies and assessments date to the mid-1990’s and earlier, and are in part a reflection of the political struggles that were ongoing during this time to extend official recognition of CNMs across the country. Now that CNMs are recognized providers in all 50 states and the District of Columbia, attention has turned to analyzing their impact in terms of both cost and maternal-child outcomes. The literature examining the role of midwives in the U.S. medical system has centered on four areas: reimbursement rates, legislative/professional barriers, outcomes and midwifery as a model of patient-centered care.

**Reimbursement Rates**

Studies on reimbursement rates for certified nurse-midwives have largely focused on how they compare to rates for obstetricians and in some cases, family practitioners that still provide maternity care (largely in rural and less populated areas of the country). As noted throughout the
healthcare financing literature, significant gaps exist between reimbursement rates from private insurers and public programs (Ginsburg, 2010). However, much of the literature on provider payments has focused on Medicaid payment rates, and not what is prevalent in the private, non-group and employer sponsored health insurance markets.

Most relevant to the current effort are studies that have looked at the pay differential between physician and non-physician providers (in this case, nurse-midwives). Hoffman (1994) examined Medicaid payments for non-physician practitioners including nurse-midwives and found wide variation in state Medicaid coverage of nurse-midwife services (i.e. maternity services, family planning or both). The author also noted that for 1992, twenty-six states paid CNM’s at the same Medicaid rate as physicians but in states that paid the two providers differently, “the differential varies considerably, ranging from 65 percent to 90 percent of the physician level.” Hoffman concludes that the payment policies enacted by many state Medicaid programs to encourage use of non-physician providers have expanded coverage but makes no mention of whether or not other costs (i.e. re-hospitalization, related complications, etc.) are changed related to the type of care provided by CNM’s. This study is of limited use in assessing payments of CNM’s for privately insured individuals but it does point to a fundamental question of how much leverage insurers, both public and private, have to alter consumer decisions and address practice variation.

**Legislative and Professional Barriers**

Research on increasing the number of midwives in U.S. has generally focused on the historical, legislative and professional barriers to practice for midwives. Medical Anthropologist Robbie Davis-Floyd and Sociologist Christine Barbara Johnson edited a definitive collection of essays on the history of midwives in the United States ranging from the professional
marginalization of midwives at the hands of a new physician specialist, the obstetrician, in the first half of the 20th-century to more recent state level battles to expand credentialing, scope of practice and reimbursement rates for midwives. More recently, public debates have arisen between professional and advocacy groups like the American College of Nurse-Midwives and the Midwives Alliance of North America that seek to expand patient access to midwives and professional organizations, notably the American College of Obstetricians and Gynecologists and the American Medical Association that promote maintenance of the physician-led model of maternity care.

The majority of the literature on professional and legislative barriers was produced in the 1980’s and 1990’s as Certified Nurse-Midwives were conducting organized (and ultimately successful) advocacy campaigns to earn professional status across the U.S. However, because certification requirements are governed at the state level there are often large disparities between states regarding scope of practice for midwives. Further, health systems and individual hospitals are free to set their own scope of practice definitions for providers. The result is often that many localities may CNM’s providing care in medical practices, but barred from attending births in hospitals (Mason, 2004).

Declerq, Paine, Simmes and DeJoseph (1998) examined how state regulation of nurse-midwives varies widely. They examine three areas related to professional oversight of CNM’s including input on regulatory boards, the authority to write certain prescriptions, and reimbursement rates. They note that many states regulate CNM’s via state nursing boards despite their advanced practitioner status, and in only a handful of states included in the survey did the authors find that CNM’s actually had a seat on these boards. The authors note, “This lack of control of their own regulatory boards is in sharp contrast to the traditional physician dominance
on the boards that regulate medical practice.” The lack of CNM representation on some boards raises important policy questions regarding the potential mechanisms available to increase the range and number of CNMs as a possible solution to rising healthcare costs.

Other studies concerned with practice barriers have utilized qualitative analysis and documentation (through interviews) of obstetrician resistance to expanding practice rights to midwives (Langton, 1994), the marginalization of midwives within the medical community in the United States (Goodman, 2007), surveys following removal of hospital privileges for CNMs (Mason, 2004) and used economic theory to explain the regulation of midwives (Adams, et al. 2003). In sum, the literature suggests that continued barriers to practice combined with state regulatory structures and institutions (i.e. hospitals and hospital systems) that control the rules and regulations governing the practice of CNM’s are major hurdles to increasing the professional position and range of CNM’s in the medical system.

**Health Outcomes**

The majority of the literature on midwives has concentrated on the quality of their pre-, peri-, and post-natal outcomes relative to physician-led care. In a large, well-designed study MacDorman and Singh (1998) conducted a logistic regression to determine if important outcomes differed between women in the U.S. attended by CNM’s versus physicians during pregnancy and childbirth. The authors controlled for social and medical risk factors like age, race, education, marital status, and commonly recognized medical risks like unusual fetal presentation, placental abnormalities, and rapid labor. The authors found that overall, women attended by midwives in the study had lower rates of risk for “experiencing infant death,” neonatal mortality was 33% lower, and average birth weight was 37 grams heavier in the
midwife group. The authors concluded that based on national data, CNM’s have “excellent birth outcomes” and provide “a safe and viable alternative to maternity care in the United States.”

Similarly, in a retrospective cohort analysis by Blanchette in 1995, the author compared outcomes between women who received care at a clinic staffed by Certified Nurse-Midwives against a group of women that received care from a private OB/GYN group. His key finding was that among the CNM attended women, the Cesarean section rate was significantly lower. Other studies do similar comparisons including nurse-midwives and family practitioners (Hueston and Rudy, 1993), between nurse-midwives and physicians including OB/GYN’s and family practitioners (Mayes, et al., 1987) and care provided by midwives for both Medicaid and non-Medicaid low-risk populations (Hangsleben, et al., 1995). Rooks, et al. (1989) looked specifically at outcomes of births in free-standing birth centers which are generally staffed by nurse-midwives with physician oversight and backup. The authors found that outcomes of planned births in birth centers had significantly lower rates of C-sections and other complications. The findings all seem to suggest that pregnancies and births attended by midwives have equally good or better outcomes (i.e. lower rates of maternal morbidity and healthier newborns) than the physician led model of care.

**Patient-Centered Care Movement and the Affordable Care Act**

The patient-centered care movement is a recent and growing innovation in healthcare. In the late 1980’s private foundations and some academic centers began a process of defining the core elements of “patient-centered care” through focus groups that included “recently discharged patients, family members, physicians, and non-physician hospital staff” (Picker Institute, 1993). The insights derived from these focus groups were distilled into seven and then eight principles of patient-centered care: “Respect for patients’ values, preferences and expressed needs;
coordination and integration of care; information, communication and education; physical comfort; emotional support and alleviation of fear and anxiety; involvement of family and friends; and access to care” (Ibid.). In 2001, the Institute of Medicine released a report calling for a sea change in the U.S. healthcare delivery system arguing “that this higher level of quality cannot be achieved by further stressing current systems of care. The current care systems cannot do the job. Trying harder will not work. Changing systems of care will” (Institute of Medicine, 2001). It identified patient-centered care and a related concept, integrated medicine (including midwifery), as a potentially powerful antidote to the “broken U.S. health care system” (Maizes, Rakel and Niemiec, 2009).

The Affordable Care Act sets out a number of goals to improve the U.S. health care system including measuring the quality of care, better public reporting and payment structures based on performance (i.e., reducing hospital readmission rates). In pursuit of these goals the law makes repeated reference to concepts of “patient-centeredness, patient satisfaction, patient experience of care, patient engagement, and shared decision-making in its provisions” (Millenson and Macri, 2012). One of the most talked about proposals is the creation of Accountable Care Organizations (ACO’s) that would function as a sort of medical “home” for the coordination and integration of care for patients with more chronic conditions. Pregnancy, birth and the postpartum experience may fall into this category as providers as diverse as dietitians, physical therapists, psychologists, lactation counselors as well as midwives and obstetricians could coordinate treatments and care for each woman in a practice.

**Summary of the Literature**

On balance, the literature on nurse-midwives and their role in the current U.S. health care system seems to suggest that nurse-midwives are effective at promoting a patient centered model
of care that simultaneously produces better outcomes while costing less. Expanding the number
of midwives appears has been promoted as a sort of silver bullet for the maternity care system in
the U.S. Yet, the discussion on payment rates and outcomes is colored by the variation in state
laws governing the practice of nurse-midwives suggesting that national transformation is
unlikely until states achieve parity in their treatment of nurse-midwives. This still may not
address the issue of variation between hospitals because of idiosyncratic scope of practice rules
and practice cultures. Finally and importantly, the literature hints that insurers have the potential
to influence not only payment rates but also promote practices and models of care that are judged
to be evidence based and cost effective (Ginsburg, 2012; Ginsburg, 2010). But in order to do so,
a better understanding of what the payments for CNMs versus OB’s looks like is needed. It is to
this task that we now turn.

**Methodological Approach and Conceptual Model**

The present effort will conduct two multivariate log-linear quartile regressions using
cross-sectional data with two different dependent variables. The first dependent variable,
“Payments” measures the gross total of a reimbursement to the physician or midwife for a single
billing code (CPT code 59400 – the global charge for pre-natal, delivery, and post-partum care
for an uncomplicated vaginal birth). The second dependent variable, “All Payments” is a slightly
different measure of payment and includes the total reimbursement related to a vaginal delivery
and include charges from a number of providers like physicians, midwives, hospitals, or other
birth facilities instead of being restricted to a single, provider based billing code. Additionally,
each measure of reimbursement is indexed to account for wage variation across the U.S. and
logged (using a base of e) to account for an assumed non-linear distribution of payments. On the
right hand side of the equation, the key variable of interest is an indicator variable for provider
type: midwife or OB/GYN. Other variables will be included as controls including: an indicator for location of birth (1 for hospital, 0 for all others), age (and a squared age term), four region dummies, four insurance plan types (Comprehensive, PPO, HMO, High Deductible), if the provider was in-network or out-of-network, and a measure of out-of-pocket spending that is the sum of any co-pay or deductible. The formal models are specified as follows:

**MODEL 1: Predicted Reimbursement at Delivery (CPT 59400)**

\[
\text{Log}(\text{Pay}) = \beta_0 + \beta_1(\text{Midwife}) + \beta_2(\text{Hospital}) + \beta_3(\text{Age}) + \beta_4(\text{Age}^2) + \beta_5-7(\text{Region Dummies}) + \\
\beta_8-10(\text{Insurance Plan Type}) + \beta_{11}(\text{In-network}) + \beta_{12}(\text{Out of Pocket}) + \epsilon
\]

**MODEL 2: Predicted Total Reimbursement for All Services at Delivery**

\[
\text{Log}(\text{AllPay}) = \beta_0 + \beta_1(\text{Midwife}) + \beta_2(\text{Hospital}) + \beta_3(\text{Age}) + \beta_4(\text{Age}^2) + \beta_5-7(\text{Region Dummies}) + \\
\beta_8-10(\text{Insurance Plan Type}) + \beta_{11}(\text{In-network}) + \beta_{12}(\text{Out of Pocket}) + \epsilon
\]

Both of these models will be run as “quartile regressions” that parse the data into three ranges: the bottom 25% of reimbursements, the median reimbursement level, and reimbursements made at the 75% level. Using this method will help determine if there is variation between lower, middle and higher end payments and higher amounts. Results will be reported for each level for both dependent variables.

Significant concern exists regarding the presence of omitted variables. As is usual for medical data, privacy concerns are paramount. Therefore, demographic information such as race, education, and income is not available. There is little doubt that these variables exert some influence on access to and the selection of a provider and in turn, the total amount billed to an insurer. For example, the omission of education likely upwardly biases the estimates because of the link between education and health literacy. It is theorized that women with higher levels of
education are more likely to understand their healthcare choices and may be more inclined to opt for fewer interventions if the rewards are not commensurate with the risk. Conversely, a woman with more education is likely to be older and may have a higher risk level due to advanced maternal age that would risk her out of care by a CNM. Other concerns include an inability to determine what pregnancy and birth this is for a given woman in the sample. It is plausible to think that women may modify their provider choice based on past experience with labor and birth, but this element is not captured in the current models.

Finally, it should be noted that the experience of childbirth is a unique medical experience in that medical decisions concern not one, but two patients. These decisions frequently carry more emotional weight for a woman, her partner and family relative to many other healthcare decisions. What this means for the present effort and its attempt to better understand provider selection and payment is that a woman’s decision of what provider to choose is almost certainly driven by factors other than price alone. This self-selection to midwives creates a not insignificant omitted variable bias problem, so results from the proceeding analyses should be interpreted with caution. These factors are impossible to measure using retrospective claims data and the author defers to other scholars to generate insight into the psychology and sociology of selecting a care provider during pregnancy and childbirth.

**DESCRIPTION OF DATA**

The data for the present analysis comes from the Thomson-Reuters MarketScan database, a nationally recognized collection of claims data (both public and private coverage) for over 170 million individuals (Thomson Reuters, 2010). The dataset used here is restricted to private payer claims from several large Fortune 700 companies. Many of these firms likely self-fund their plans (versus purchasing a plan from a carrier) and as such, are particularly sensitive to health
costs for their employees. The claims range in date from January 2010 to March 2011. Procedure codes (ICD-9) were limited to those dealing directly with pregnancy and vaginal childbirth (i.e. no cesarean births are included in this sample because there would be zero observations for midwives). In particular, CPT 59400 (“Routine obstetric care including antepartum care, vaginal delivery (with or without episiotomy, and/or forceps) and postpartum care”) is used in the first model. This code is considered the “global” billing for services provided during pregnancy, childbirth and the postpartum period.

While large in size, there are several known limitations of this dataset. First, the sample is a “convenience sample” which means it is not random and may thus contain biases that are difficult to tease out. Second, the data come from large employers only. Small and medium sized businesses are not represented in the dataset. This fact may induce some selection bias as it is reasonable to think that employees in large firms may somehow differ systematically from individuals employed in small and medium sized businesses. These factors are important to bear in mind when extrapolating findings to the broader population (ibid.).

**Descriptive Statistics**

The key variable of interest in this model is provider type. In the dataset, providers are coded as either midwives or obstetricians. Obstetricians are the preponderant provider type in this sample (n= 90,363). Midwives in the sample number 3828. This distribution roughly mirrors the healthcare system on the whole. In the general population, CNM’s total 17.7 per 100,000 women age 17-44 while OB’s are approximately 55 per 100,000 women (Thomson Reuters, 2010).

Table 1 lists the average reimbursement for providers for each dependent variable for hospital births in the sample. The average reimbursement for midwives in the sample as
measured by “Payments,” (which only uses CPT code 59400) is $2618.56, while for OB’s the average amount is $2458.87; a difference of $159.69 *in favor of midwives*. This difference is also statistically significant at beyond the 0.01 level. The second measurement of payment, “All Payments” generates an average reimbursement estimate of $7901.93 for midwives and $8642.18 for physicians. The difference between these is $741.25 and is statistically significant at beyond the 0.01 level.

Table 1 – Descriptive Statistics for “Payments” and “All Payments” by Provider Type for Hospital Births, 2010

<table>
<thead>
<tr>
<th></th>
<th>Midwives (n = 4753)</th>
<th>OB/GYNs (n = 179,328)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Payments”</td>
<td>$2618.56 ($13.55)</td>
<td>$2458.87 ($1.73)</td>
<td>-$159.69***</td>
</tr>
<tr>
<td>“All Payments”</td>
<td>$7901.93 ($3635.80)</td>
<td>$8642.18 ($4683.42)</td>
<td>$741.25***</td>
</tr>
</tbody>
</table>

***Significant at the .00001 level

Control variables include age, region, insurance plan type (e.g., HMO, PPO, High-Deductible), in-network status and the presence of cost-sharing requirements. Descriptive statistics including means, number of observations, proportion of the sample, standard deviation, and range for these variables are reported below in Table 2.
Table 2 - Summary Statistics for Control Variables

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Obs.</th>
<th>% of Sample</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>236,100</td>
<td>--</td>
<td>29.76</td>
<td>5.27</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Northeast</td>
<td>34,986</td>
<td>14.85%</td>
<td>.148</td>
<td>.355</td>
</tr>
<tr>
<td>-North Central</td>
<td>63,663</td>
<td>27.01%</td>
<td>.270</td>
<td>.444</td>
</tr>
<tr>
<td>-South</td>
<td>94,124</td>
<td>39.94%</td>
<td>.399</td>
<td>.499</td>
</tr>
<tr>
<td>-West</td>
<td>42,894</td>
<td>18.20%</td>
<td>.182</td>
<td>.386</td>
</tr>
<tr>
<td>Ins. Plan Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehensive</td>
<td>1299</td>
<td>.55%</td>
<td>.005</td>
<td>.074</td>
</tr>
<tr>
<td>PPO</td>
<td>159,798</td>
<td>67.81%</td>
<td>.678</td>
<td>.467</td>
</tr>
<tr>
<td>HMO</td>
<td>27,238</td>
<td>11.56%</td>
<td>.116</td>
<td>.320</td>
</tr>
<tr>
<td>HDHP</td>
<td>6762</td>
<td>2.83%</td>
<td>.028</td>
<td>.166</td>
</tr>
<tr>
<td>Other</td>
<td>41,110</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-network</td>
<td>226,162</td>
<td>90.24%</td>
<td>.902</td>
<td>.297</td>
</tr>
<tr>
<td>Out-of-Pocket</td>
<td>57,502</td>
<td>24.40%</td>
<td>136.22</td>
<td>402.96</td>
</tr>
</tbody>
</table>

1 This figure reflects the number of observations in the sample that had an out-of-pocket expense of greater than $0. “Out-of-Pocket” is defined as the sum of any co-pay or deductible.

The average age of women in the sample is roughly 30 years old. A regional bias is present with over half of the observations located in either the “North Central” or “South” region. In place of evaluating all the types of insurance plans in the sample, I opted to concentrate on the most familiar plans – Comprehensive medical, Health Maintenance Organizations (HMOs), Preferred Provider Organizations (PPOs), and High Deductible Health Plans (HDHPs). The plans not included in the model are Point of Service (POS; n=16,491), Point...
of Service plans with capitation (POS+; n=3212), Consumer Driven Health Plans (CDHP; n=12,375) and Exclusive Provider Organizations (EPOs; n=8582). The vast majority of observations in this sample had in-network benefits claims and consumer out-of-pocket expenditures (co-pay + deductible) are present in just less than 25% of the sample.

**STATEMENT OF EXPECTED REGRESSION FINDINGS**

Table 3 breaks down the predicted relationship of each independent variable with both dependent variables (“Payment” and “All Payments”). On the key variable of interest, provider type, it is anticipated based on both previous research and conventional wisdom that reimbursement rates for midwives in this sample will be less than physicians after controlling for age, region, insurance plan type, network status and the presence of a cost-sharing mechanism (co-pays and deductibles). I anticipate the coefficient on “Midwife” to be negative, relatively large in magnitude, and substantively important.

**Table 3: Expected Direction of Relationship with Payments**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1 – Single Code</th>
<th>Model 2 – All Charges</th>
<th>Expect Variation Across Quartiles?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife</td>
<td>Negative</td>
<td>Negative</td>
<td>Possibly</td>
</tr>
<tr>
<td>Hospital</td>
<td>Large Positive</td>
<td>Large Positive</td>
<td>Yes</td>
</tr>
<tr>
<td>Age</td>
<td>Slight Positive</td>
<td>Slight Positive</td>
<td>No</td>
</tr>
<tr>
<td>Age²</td>
<td>Slight Positive</td>
<td>Slight Positive</td>
<td>No</td>
</tr>
<tr>
<td>North Central Region</td>
<td>Negative</td>
<td>Negative</td>
<td>No</td>
</tr>
<tr>
<td>South Region</td>
<td>Negative</td>
<td>Negative</td>
<td>No</td>
</tr>
<tr>
<td>West Region</td>
<td>Negative</td>
<td>Negative</td>
<td>No</td>
</tr>
<tr>
<td>PPO</td>
<td>Slight Positive</td>
<td>Slight Positive</td>
<td>Yes</td>
</tr>
<tr>
<td>HMO</td>
<td>Negative</td>
<td>Negative</td>
<td>Yes</td>
</tr>
<tr>
<td>High Deductible Health Plan</td>
<td>Negative</td>
<td>Negative</td>
<td>Yes</td>
</tr>
<tr>
<td>In-Network</td>
<td>Large Positive</td>
<td>Large Positive</td>
<td>No</td>
</tr>
<tr>
<td>Out-of-Pocket</td>
<td>Slight Negative</td>
<td>Slight Negative</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Similar to the reasoning behind the direction of the coefficient on midwife, it is anticipated that the coefficient on “hospital” in both models will be positive, and relatively large in magnitude. Age (and a squared age term) is expected to have slightly positive relationships with predicted reimbursement amounts, but little substantive relevance. Regional differences are expected, with higher predicted amounts expected in the “Northeast” region and the lowest amounts in the “South.” This will likely translate into negative coefficients on the “North Central,” “South” and “West” regional dummies since “Northeast” is the omitted (reference) category.

Insurance plans will be particularly interesting to watch. Comprehensive plans are the reference category. It is anticipated that the dummy variable for “HMO” will have a medium to large negative coefficient, possibly reflecting the pressure of price negotiation with providers. PPO plans are expected to have a slightly positive relationship to price because they generally offer greater choice of providers that will be picked up in reimbursement rates. Finally, the coefficient on High Deductible Health Plans (“HDHP”) is expected to be negative in both models.

**Regression Results**

**Model 1 Results: Predicted Provider Reimbursement for Delivery Under CPT 59400**

Table 4 displays the results of the quartile regression on the first dependent variable, “Payments” defined as all charges stemming from a single CPT code, 59400, the “global” pregnancy, birth and postpartum billing code.
Table 4: Quartile Regression Results for Delivery 59400 Payment

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) Bottom 25%</th>
<th>(2) Median</th>
<th>(3) Top 25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife</td>
<td>0.00154</td>
<td>0.121***</td>
<td>0.121***</td>
</tr>
<tr>
<td></td>
<td>(0.00547)</td>
<td>(0.00612)</td>
<td>(0.00432)</td>
</tr>
<tr>
<td>Hospital</td>
<td>-0.0186</td>
<td>-0.187***</td>
<td>-0.185***</td>
</tr>
<tr>
<td></td>
<td>(0.0236)</td>
<td>(0.0266)</td>
<td>(0.0187)</td>
</tr>
<tr>
<td>Age of Patient</td>
<td>0.00122</td>
<td>0.00398***</td>
<td>0.00531***</td>
</tr>
<tr>
<td></td>
<td>(0.00113)</td>
<td>(0.00126)</td>
<td>(0.000904)</td>
</tr>
<tr>
<td>Age Squared</td>
<td>-2.78e-05</td>
<td>-6.11e-05**</td>
<td>-7.02e-05**</td>
</tr>
<tr>
<td></td>
<td>(1.90e-05)</td>
<td>(2.12e-05)</td>
<td>(1.52e-05)</td>
</tr>
<tr>
<td>North Central Region</td>
<td>-0.0563***</td>
<td>-0.0656***</td>
<td>-0.0649***</td>
</tr>
<tr>
<td></td>
<td>(0.00249)</td>
<td>(0.00279)</td>
<td>(0.00197)</td>
</tr>
<tr>
<td>South Region</td>
<td>-0.0752***</td>
<td>-0.107***</td>
<td>-0.0999***</td>
</tr>
<tr>
<td></td>
<td>(0.00221)</td>
<td>(0.00248)</td>
<td>(0.00175)</td>
</tr>
<tr>
<td>West Region</td>
<td>-0.279***</td>
<td>-0.307***</td>
<td>-0.232***</td>
</tr>
<tr>
<td></td>
<td>(0.00260)</td>
<td>(0.00290)</td>
<td>(0.00204)</td>
</tr>
<tr>
<td>PPO</td>
<td>0.0238***</td>
<td>0.0120***</td>
<td>-0.00183</td>
</tr>
<tr>
<td></td>
<td>(0.00188)</td>
<td>(0.00211)</td>
<td>(0.00148)</td>
</tr>
<tr>
<td>HMO</td>
<td>-0.0101***</td>
<td>-0.0343***</td>
<td>-0.0505***</td>
</tr>
<tr>
<td></td>
<td>(0.00264)</td>
<td>(0.00298)</td>
<td>(0.00214)</td>
</tr>
<tr>
<td>HDHP</td>
<td>0.0201***</td>
<td>0.00536</td>
<td>0.000252</td>
</tr>
<tr>
<td></td>
<td>(0.00488)</td>
<td>(0.00547)</td>
<td>(0.00388)</td>
</tr>
<tr>
<td>In-network</td>
<td>-0.0644***</td>
<td>-0.0426***</td>
<td>-0.0697***</td>
</tr>
<tr>
<td></td>
<td>(0.00378)</td>
<td>(0.00424)</td>
<td>(0.00306)</td>
</tr>
<tr>
<td>Out-of-Pocket</td>
<td>1.75e-05***</td>
<td>2.44e-05***</td>
<td>9.60e-06***</td>
</tr>
<tr>
<td></td>
<td>(2.43e-06)</td>
<td>(2.79e-06)</td>
<td>(2.94e-06)</td>
</tr>
<tr>
<td>Constant</td>
<td>7.791***</td>
<td>8.040***</td>
<td>8.201***</td>
</tr>
<tr>
<td></td>
<td>(0.0293)</td>
<td>(0.0328)</td>
<td>(0.0232)</td>
</tr>
</tbody>
</table>

Observations 179,322 179,322 179,322

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The quartile regression results on “Payments” yield unexpected results, particularly relating to the direction and size of the coefficient on “Midwife.” At the lowest quartile, “Midwife” performs as expected with a very slightly positive, though statistically insignificant coefficient of 0.00154 suggesting that on average, reimbursements to midwives in this sample
are around 0.1% more than those made to physicians. However, looking at the results for the median and top quartile (columns 2 and 3 above), the sign on “Midwife” flips positive and becomes statistically significant at beyond the .01 level. These findings can be interpreted that on average in this sample and holding the other independent variables constant, at the median and 75% level, reimbursement for CPT Code 59400 for midwives is approximately 12.1% more than physicians, a surprising finding. Similarly, the sign on “Hospital” at all quartiles is negative and at the median and top quartile, highly statistically significant. This suggests that at the lowest quartile, holding other factors in the model constant, reimbursements are approximately 1.8% less for hospital births, although this finding is not statistically significant at the conventional level. However, at the median and top quartile for “Hospital,” reimbursements are estimated to be an amazing 18.7% and 18.5% less, respectively, holding the other variables in the model constant.

The other coefficients in the first model, “Payments” generally behave as expected. “Age” is slightly positive and highly significant (p<0.01) at the median and top quartiles suggesting that for each additional year of age, the reimbursement for CPT 59400 rises by approximately .12% (25%), 0.4% (median) and 0.53% (75%) holding the other variables in the model constant. “Age Squared” is very slightly negative and highly significant at the median and top quartiles suggesting a few possibilities. One is that there are a number of outliers in the sample exerting enough influence to flip the sign or more likely, reimbursements by age increase, but at a decreasing rate. However, because the substantive value of these coefficients is relatively small, it can be suggested that age is less a potential driver of reimbursements for CPT 59400 than other variables in the model.
Turning to the coefficients on region, they are all in the direction predicted and across quartiles, all statistically significant at beyond the 0.01 level. “Northeast” is the omitted category so for the three regions included in the model – “North Central,” “South,” and “West” – estimates are that on average, holding the other variables in the model constant, reimbursements in the North Central region relative to “Northeast” are 5.6% less at the 25% level, 6.6% less at the median and 6.5% less at the 75% level. Similarly, in the other two regions, reimbursements are 7.5% (25%), 10.7% (median), and approximately 10.0% (75%) less in the “South” and a remarkable 27.9% less (25%), 30.7% less (median) and 23.2% less (75%) in the “West” region. Substantively speaking, this means that based on this sample, providers submitting claims in the “West” region at the median level are recouping almost a third less than their counterparts in the “Northeast.” Regional disparities have been well documented in other areas of health care and these findings add to this complex regional picture of health care financing in the U.S.

Insurance plan type yields similarly interesting results. Comprehensive health insurance plans are the omitted variable so interpreting results for the other plan types is in reference to their being relatively more or less than a comprehensive plan, holding the other variables in the model constant. For example, reimbursements under PPO plans in this sample are on average, about 2.4% more than comprehensive plans at the bottom quartile (p<0.01), but by the top quartile, are very slightly less, only about 0.18% compared to comprehensive plans and not statistically significant. HMO’s in this sample, perform as anticipated. Across the board the coefficients on “HMO” are negative and highly significant (p<0.01). At the 25% level HMO’s reimburse approximately 1% less relative to comprehensive plans and at the top level (75%) reimburse about 5% less, holding the other variables in the model constant. The coefficients on High-Deductible plans (“HDHP”) are positive but only significant at the 25% level. Further, at
the top quartile the difference between comprehensive and high deductible plans is substantively small at .02%.

The two other independent variables, “In-network” and “Out-of-Pocket” produce unanticipated results. It was initially predicted that “In-network” would yield large positive coefficients, but instead, at all levels it is negative and highly significant. At the 25% level, “In-network” reimbursements for CPT 59400 are approximately 6.4% less relative to “out of network” reimbursements, approximately 4.2% less at the median and about 7% less at the 75% level, holding the other variables in the model constant. It might be possible to account for this relationship by thinking of in-network providers getting a “preferred discount” from insurers because they agree to participate in a particular plan in exchange for access to additional consumers. Managed care plans in particular often have wide provider networks (especially in larger communities with more providers per capita) and are characterized by strong financial incentives for patients to choose in-network providers by charging large co-pays or providing little or no coverage for out-of-network providers. Finally, the results on “Out-of-Pocket,” while highly significant at all levels (p<0.01), are tiny and therefore substantively meaningless. In real terms, the results on “Out-of-Pocket” suggest that the presence of cost-sharing arrangements does not have much of an impact on reimbursement rates for this billing code 59400.

To help illustrate in dollar amounts what this first model is predicting the following examples are provided. Consider the predicted reimbursement amount generated by the following scenario: An in hospital birth, with an in-network midwife and a patient at the median age of 30 in the Northeast region who has no out-of-pocket liability. The model predicts that in this case, a midwife would expect to recover approximately $2448.37 for her services billed under CPT 59400 at the lowest quartile. An Obstetrician caring for a woman under the exact
same circumstances would receive $2435.06 - a difference of $13.31 in favor of the midwife. Jumping to the top quartile under this same scenario, the reimbursement for a midwife would be $3350.64 while an OB could expect only $3000.02 – a difference of $350.62 in favor of the midwife.

If this same scenario (a 30 year old woman with no out-of-pocket liability using an in-network provider) is applied to the “West” region, the following predicted reimbursement amounts are generated. At the bottom quartile, a midwife would expect to collect $1741.38 while an obstetrician would get $1731.92 – a difference of less than $10. However, at the top quartile a midwife is predicted to receive $2853.48 for providing care under CPT code 59400 and an obstetrician only $2554.88. The difference in this scenario is $298.60. This helps confirm the regional disparity in provider payments. A midwife in the Northeast region in the top quartile is predicted to collect $497.16 more than her counterpart in the West region. At first glance these differences may not appear to be particularly meaningful, but scaled up to the hundreds or even thousands of births that occur each year in a given hospital, the healthcare dollars really begin to add up.

This first model of provider reimbursements yielded some surprising and in substantive terms, incredible results. Turning now to the second model and its different measurement of reimbursements, we look to see if these results hold or if different, provide any insight into what may be behind the unexpected finding of higher reimbursement rates for midwives at the median and 75% levels.

Model 2 Results – “All Payments”

The regression results for the second measurement of payment, “All Payments” are provided in Table 5. Recall that “All Payments” is a measure of all the reimbursable charges
related to an individual patient, not just to a specific medical billing code as in the previous model. These charges could potentially include bills from more specialized providers (i.e. neonatologists) or complementary medicine like physical therapy or dietitians.

**Table 5: Quartile Regression Results for “Total Payments”**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) Bottom 25%</th>
<th>(2) Median</th>
<th>(3) Top 25%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife</td>
<td>-0.183***</td>
<td>-0.152***</td>
<td>-0.0907***</td>
</tr>
<tr>
<td></td>
<td>(0.00694)</td>
<td>(0.00589)</td>
<td>(0.00607)</td>
</tr>
<tr>
<td>Hospital</td>
<td>0.374***</td>
<td>0.245***</td>
<td>0.148***</td>
</tr>
<tr>
<td></td>
<td>(0.0310)</td>
<td>(0.0261)</td>
<td>(0.0268)</td>
</tr>
<tr>
<td>Age of Patient</td>
<td>0.0212***</td>
<td>0.00973***</td>
<td>0.00172</td>
</tr>
<tr>
<td></td>
<td>(0.00157)</td>
<td>(0.00130)</td>
<td>(0.00133)</td>
</tr>
<tr>
<td>Age Squared</td>
<td>-0.000280***</td>
<td>-9.48e-05***</td>
<td>2.95e-05</td>
</tr>
<tr>
<td></td>
<td>(2.63e-05)</td>
<td>(2.18e-05)</td>
<td>(2.23e-05)</td>
</tr>
<tr>
<td>North Central Region</td>
<td>-0.186***</td>
<td>-0.223***</td>
<td>-0.239***</td>
</tr>
<tr>
<td></td>
<td>(0.00343)</td>
<td>(0.00288)</td>
<td>(0.00293)</td>
</tr>
<tr>
<td>South Region</td>
<td>-0.230***</td>
<td>-0.270***</td>
<td>-0.291***</td>
</tr>
<tr>
<td></td>
<td>(0.00316)</td>
<td>(0.00265)</td>
<td>(0.00269)</td>
</tr>
<tr>
<td>West Region</td>
<td>-0.156***</td>
<td>-0.137***</td>
<td>-0.0636***</td>
</tr>
<tr>
<td></td>
<td>(0.00365)</td>
<td>(0.00308)</td>
<td>(0.00316)</td>
</tr>
<tr>
<td>PPO</td>
<td>-0.0212***</td>
<td>-0.00584***</td>
<td>-0.00361</td>
</tr>
<tr>
<td></td>
<td>(0.00266)</td>
<td>(0.00224)</td>
<td>(0.00228)</td>
</tr>
<tr>
<td>HMO</td>
<td>-0.0205***</td>
<td>-0.0180***</td>
<td>-0.0198***</td>
</tr>
<tr>
<td></td>
<td>(0.00399)</td>
<td>(0.00335)</td>
<td>(0.00342)</td>
</tr>
<tr>
<td>HDHP</td>
<td>0.0415***</td>
<td>0.0432***</td>
<td>0.0317***</td>
</tr>
<tr>
<td></td>
<td>(0.00633)</td>
<td>(0.00533)</td>
<td>(0.00543)</td>
</tr>
<tr>
<td>In-network</td>
<td>0.0318***</td>
<td>0.0305***</td>
<td>0.0172***</td>
</tr>
<tr>
<td></td>
<td>(0.00332)</td>
<td>(0.00281)</td>
<td>(0.00289)</td>
</tr>
<tr>
<td>Out-of-Pocket</td>
<td>-3.59e-05***</td>
<td>-2.98e-05***</td>
<td>-2.16e-05***</td>
</tr>
<tr>
<td></td>
<td>(2.47e-06)</td>
<td>(2.15e-06)</td>
<td>(2.26e-06)</td>
</tr>
<tr>
<td>Constant</td>
<td>8.253***</td>
<td>8.762***</td>
<td>9.181***</td>
</tr>
<tr>
<td></td>
<td>(0.0389)</td>
<td>(0.0327)</td>
<td>(0.0335)</td>
</tr>
<tr>
<td>Observations</td>
<td>179,322</td>
<td>179,322</td>
<td>179,322</td>
</tr>
</tbody>
</table>

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
DISCUSSION OF MODEL 2 – “ALL PAYMENTS” RESULTS

In general, the results produced by the second model fall more in line with original expectations. The number of observations in the second model is slightly larger, but statistically speaking this will have little bearing on the final results. Across all quartiles, the coefficient on “Midwife” is both negative and statistically significant in the median and upper quartile columns at the 0.01 level. This suggests that in terms of total reimbursements for care related to a pregnancy and birth for an individual patient, insurers reimbursed 18.3% less at the bottom quartile, 15.2% less at the median and 9.1% less at the top quartile. Likewise, “Hospital” is positive and highly significant at all quartiles. Recall that “Hospital” is an indicator variable, so these predicted values are relative to out-of-hospital payments (i.e. payments at a birth center or for a birth in a patient’s home). Accordingly, reimbursements at the bottom, median and top quartile for “Hospital” are 37.4%, 24.5% and 14.8% higher for hospital births, respectively.

Looking at the coefficients on “Age” and “Age Squared” there is an indication that older women potentially generate higher costs, but at a decreasing rate, although the change in sign on “Age Squared” may be an artifact and substantively meaningless. For each additional year of age the total reimbursement for a delivery increases by approximately 2.1% at the bottom quartile, approximately 1% at the median, and only .1% at the top quartile. One potential reason for this relationship is that risk adjustment of claims is occurring for older women.

Looking at region, some unexpected results emerge. The “North Central” region has a moderately sized, positive and significant (p<0.01) at all quartiles. This suggests that relative to the “North East” region reimbursements in the “North Central” region are 18.6% less for the bottom quartile, 22.3% at the median and 23.9% for the top quartile. The “South” region behaves similarly, staying negative and highly significant across all quartiles. The “West” region is also
negative relative to the “Northeast” region and highly significant across all quartiles. Insurance plans in the second model produce generally small substantive effects, holding the other variables in the model constant, ranging from -.2% for a PPO at the bottom quartile of reimbursements to a slight rise of 4% for high deductible plans in the bottom quartile. If a provider is in-network, the predicted reimbursement by the second model suggests that at the bottom quartile the reimbursement would be approximately 3.2% more (p<0.1), while at the top quartile a provider would expect approximately 1.7% less, however this finding is not statistically significant. Like the first model, out-of-pocket produces substantively small results and only one quartile is significant at the 0.05 level.

Taking the scenario from the first model and applying it here, estimates can be generated for expected average reimbursements from all charges related to a delivery. Recall that the first scenario was for a woman of the median age (30), in a PPO in the Northeast, seeing an in-network provider with no out-of-pocket expenses. Under the second model’s measure of payment (all charges related to a delivery), at the bottom quartile a delivery under a midwife would expect to be reimbursed $6607.64 while one under a physician would expect to cost $7333.10 - a difference of $725.46 in favor of the obstetrician. At the top quartile the predicted total reimbursements under midwives would be $9765.94, and under obstetricians $10,369.69 - a difference of $603.75, again higher under the physician. Examining the regional differences yields similar results to the first model. Under the same scenario but in the “West” region at the bottom quartile, a delivery under midwife would expect to see a total reimbursement of $5887.94 and an OB $6534.38, for a difference in additional costs of $646.44 under the obstetrician. At the top quartile a delivery under a midwife could anticipate a total reimbursement of
approximately $9337.78 while a delivery under an OB would cost $9915.06, an additional fee of $577.28.

**Comparison of regression results**

The preceding two models have two different measures of reimbursements for childbirth. The first model captures the amount reimbursed to a provider (midwife or physician) for a single billing code, CPT 59400 which is the so-called “global birth charge” that covers pre-natal, childbirth and post-partum care for uncomplicated vaginal births. The second model includes all charges related to a birth, which could include visits from other hospital providers or additional diagnostic tests or procedures. The most striking result is the difference between the coefficients on “Midwife” in the two models. The first measure of reimbursement (“Payments”) only picks up the charges associated with a single CPT code, 59400, the “global” birth charge for care during the pre-natal period, birth and post-partum. The unusual finding that midwives, on average holding the other variables in the model constant are predicted to collect more in reimbursements is both surprising and puzzling.

It is unclear using the present analysis why this might be the case, but one potential reason is that women are somehow sorted into two groups. One group self-selects into the care of a midwife and also appears more likely to either generate higher reimbursable costs or their plans pay a premium for the services of the midwife. The other group may not actively seek the care of a midwife but instead end up having the majority of their care handled by a midwife who also submits the final bill to the insurance company.

**Policy Implications**

As health reform moves forward employers, insurers, and consumers will be looking for additional solutions to stem increasing costs of healthcare. To uncover possible solutions to help
address rising healthcare costs, additional work needs to be done to determine what services, treatments and models of care provide the best outcomes at the best price. With childbirth being the number one reason for admission to the hospital in the U.S., and over 4 million births in 2010, the potential for savings in the maternity care system is enormous. The expansion of midwives provides an opportunity to generate substantial cost savings to the U.S. healthcare system but a fundamental problem remains: midwives are an unevenly distributed resource and don’t compete on an even playing field with OB’s for healthcare dollars. Further, the results of the preceding analysis suggest that in some respects, midwives are potentially more expensive than their physician counterparts under certain conditions. These findings present a fundamental difficulty for advocates of midwifery that claim midwives are a lower cost alternative to the current physician-led model of maternity care. As noted in the previous section however, it may be that midwives, being small in number, serve a niche clientele and particularly at the high end, attract a certain type of consumer of maternity care.

A number of interesting policy considerations emerge from this analysis. The first the regional variation, that while expected, differed between the two models. This may suggest that certain regions of the country experience higher or lower reimbursement and usage rates for procedures and treatments related to maternity care. As Atul Gawande (2009) notes, provider culture including fear of malpractice litigation and physician ownership of diagnostic facilities in a community is often a significant driver of costs. Similarly, an effort within the maternity care community to simply document state- and even city-wide disparities in C-section rates illustrates these pressures.

The website www.cesareanrates.com has documented that hospitals located fewer than five miles apart can have wildly different C-section rates on the order of 5 to 10 percentage...
points. For example, data collected by the website from state health departments and CDC records shows the statewide C-section rate in Nevada in 2010 was 34.8% while neighboring Utah was just 23.1% (CesareanRates.com, January 2013). The national average in 2010 was 32.8%. Even with a single city like Las Vegas, Nevada C-section rates differ substantially – Spring Valley Medical Center posted a 45.2% C-section rate in 2010 (out of 2549 total births) while the teaching hospital nine miles away, University Medical Center saw a 28.4% rate (out of 3615 total births) (Ibid.). Even hospitals within the same system can have different rates. Staying in Las Vegas, Catholic Healthcare West operates two hospitals that provide maternity services. One, the San Martin campus had a 2010 C-section rate of 34.0% while the other, the Siena Campus saw a 40.1% rate (Ibid.).

These numbers help illustrate the fact that provider culture is a major force in healthcare costs, but one that is particularly difficult for policymakers to address. Financial incentives are one mechanism and have been used in public programs like Medicare and Medicaid to mixed success. One option would be for private insurers to develop additional performance measures that highlight the outcomes of midwives and increase incentives for both consumers and providers to utilize this model of care. Similarly, a collaborative model of care between obstetricians and CNM’s shows promise. In a study published in Obstetrics & Gynecology in 2011, Jenna Shaw-Bautista and colleagues examined a collaborative model of care between physicians and midwives among low income, ethnically diverse first time moms in northern California. The authors were particularly interested in maternal and newborn outcomes. 74.4% of women in the study received pre-natal care from a nurse-midwife practicing in concert with obstetricians. These providers followed “high touch, low tech care practices” including “extensive pre-natal education, shared decision making and judicious use of obstetric
interventions” (Shaw-Bautista, et al., 2011). Even though the study tracked participants in different clinics and there was “significant variation in demographic and clinical characteristics” the collaborative model of care produced excellent outcomes including fewer than a quarter of participants used narcotic or epidural pain relief and the group achieved a Cesarean rate of only 12.5%, far below the national average. This type of shared responsibility model (between patients, midwives and obstetricians) holds promise but depends on both increased consumer demand and enterprising providers willing to engage in this type of partnership. Further, billing practices would need reform to reward this type of approach and discourage more expensive approaches to care.

A final policy avenue that is generating attention is reforming payment solutions to improve prenatal care, and subsequently, birth and postpartum experiences. One proposal put forward by Harold Miller, Executive Director of the Center for Healthcare Quality and Payment Reform would “remove prenatal care from (the) physician global fee and pay fee-for-service for each prenatal care visit” (Miller, 2012). He further suggests instituting a system of “pay for performance” bonuses to providers “based on either adequacy of prenatal care or pregnancy outcomes or both” (Ibid.). The policy justification of making such drastic alterations to the current systems is that in changing how provider payments are made creates new (and better) incentives to both increase efficiency and simultaneously reduce the overutilization of costly treatments and services.

Of course the catch with any reform to how physicians are paid is that it often takes experimentation to find the right amount where payments aren’t too high (and therefore savings aren’t realized and incentives to change practices disappear) or aren’t too low (and providers offer lower-quality care and are threatened financially) (Ibid.). To that end, the ACA promotes
the development of Accountable Care Organizations (ACO’s) that are designed to integrate and manage care for many types of chronic or complicated conditions deliver higher quality care and achieve significant cost savings. In the case of maternity care, an ACO could fully integrate and coordinate care throughout the childbearing year, with an emphasis on midwifery-led care teams. As implementation of the ACA goes forward, the development of ACO’s will merit further study for their applicability in maternal-child health.

RECOMMENDATIONS FOR FUTURE RESEARCH

The opportunity to examine private claims data gives researchers the unprecedented ability to ferret out how providers are actually being paid in the private market. Because the majority of Americans still receive their health insurance through their employer (and will continue to do so even after full implementation of health reform), there is a pressing need to understand this part of the healthcare financing system. Although there are likely many avenues that need pursuing, three primary suggestions are made here: determining where the cost savings between midwives and OB’s is going, and how can this data be translated into the drive for encouraging consumer use (and insurer support) of lower-cost, higher value services and care models.

If it is indeed the case that midwives are being reimbursed more than physicians as the results of the first model suggest, the first action to take will be to figure out why this is. This question is one that can be addressed with future quantitative analysis: we know there are cost-savings occurring between midwives and OB’s but it is as yet unclear where these savings are going. Three potential sources include the insurer, providers, or consumers. It seems most likely that either the insurer or OB’s are capturing the difference in payments between midwives and obstetricians. The use of a Heckman correction model that requires an instrumental variable that
can predict the use of a midwife which might help deal with the self-selection that is almost certainly occurring.

Related to this question of where cost-savings are going if not to consumers, is how to then incentivize consumers to select lower cost options if they won’t personally realize any financial benefit from this choice. Midwifery advocacy groups have long relied on promoting the better outcomes and more individualized care provided by midwives to encourage consumers to select this model of care for pregnancy and childbirth. However, midwives are an unevenly distributed resource in the United States and for many women, they may not have access to a midwife for their care. Health reform will begin to address some of this problem by promoting an increase in the primary care workforce, including certified nurse-midwives, but so long as regional and plan type disparities exist, midwives may have a difficult time entering certain markets and generating cost savings to local, regional and national healthcare systems. Private insurers (like the ones analyzed in the present study) and policymakers alike may need to continue to refine their incentive structures and payment mechanisms to encourage this shift.

**Conclusion**

Health reform presents a unique opportunity for midwives in the U.S. to expand their numbers and scope of practice. Concerns over growing health care costs and a shift to patient-centered and evidence-based models of care favor the growth of midwives in the maternity care system yet a number of constraints still exist. First, the frequent claim that midwives are less expensive has been primarily based on the assumption that because midwives tend to practice more low-tech, low intervention maternal medicine and that this results in automatic cost savings. While it is true that additional treatments and procedures can add significantly to costs as Model 2 seems to suggest, the evidence from the practice variation literature suggests that all
providers, including midwives, may be susceptible to community pressures to provide more expensive, involved care. This issue is also coupled with the fact that nurse-midwives have varying scopes of practice in the U.S. because these are regulated at the state and hospital level. In some communities they are fully (or nearly so) integrated into the healthcare system, while in others they are compartmentalized and provide only well woman and/or pre-natal care, but do not attend births.

The preceding effort has attempted to establish a baseline of what private insurers are spending for the most common procedure code for childbirth. The overall findings paint a more complicated picture than advocates of expanding nurse-midwifery argue and a number of questions are left unresolved. The greatest and most pressing of these is determining the practice or payment mechanism that is reimbursing midwives more than physicians at the higher end of the claims scale. Further, where there is evidence of cost savings, it is unclear who is collecting it – providers (midwives, physicians), insurers, or patients. Future research will ideally help untangle where the dollars are going when midwives attend childbearing women.

The proverbial policy window is open right now for midwives to expand their presence in the maternity care system in the U.S. but like other complementary medical providers, they will need to persuasively document that their model of care does in fact generate cost savings to the system. Unfortunately, the results of the current effort do not on their surface support claims of greater cost-effectiveness for midwives. It is difficult to ascertain in retrospect how much might be saved were more women attended by midwives. Calculating how many cesarean sections or other high cost, high tech treatments and procedures might be prevented by having more midwives providing care is difficult at best and could require reviewing charts and second-
guessing clinical decisions made by physicians to generate an estimate of how much
“unnecessary” care is currently being provided.

Despite these challenges, the need to reform the maternity care system in the U.S. is self-evident. Additional research on the specific ways midwives can (or cannot) save the health care system is as necessary as increasing public awareness. Policy entrepreneurs, including both physicians and CNM’s, will need to effectively collaborate to bring coherent, organized change to an insurance and healthcare system that is anything but.
Glossary of Abbreviations

ACNM – American College of Nurse-Midwives
ACOG – American College of Obstetricians and Gynecologists
CNM – Certified Nurse-Midwife
HDHP – High Deductible Health Plan
HMO – Health Maintenance Organization
IOM – Institute of Medicine
Ob-Gyn – Obstetrician/Gynecologist
OECD – Organization for Economic Cooperation and Development
PPO – Preferred Provider Organization
WHO – World Health Organization
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