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Policy Matters

State Scope of Practice Laws, Nurse-Midwifery Workforce, and Childbirth Procedures and Outcomes

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A B S T R A C T

Background: Despite research indicating that health, cost, and quality of care outcomes in midwife-led maternity care are comparable with and in some case preferable to those for patients with physician-led care, midwifery plays a more important role in some U.S. states than in others. However, this variability is not well-understood.
Objectives: This study estimates the association between state scope of practice laws related to the autonomy of midwifery practice with the certified nurse-midwifery (CNM) workforce, access to midwife-attended births, and childbirth-related procedures and outcomes.
Methods: Using multivariate regression models, we analyzed Natality Detail File data from births occurring from 2009 to 2011. Each state was classified regarding autonomous midwifery practice (not requiring supervision or contractual agreements) based on Lexis legal search.
Results: States with autonomous practice laws had an average of 4.85 CNMs per 1,000 births, compared with 2.17 in states where CNM practice is subject to collaborative agreement. In states with autonomous CNM practice, women had higher odds of having a CNM-attended birth (adjusted odds ratio [AOR], 1.59; $p = .004$), compared with women in states where midwifery is subject to collaborative agreement. In addition, women in states with autonomous practice had lower odds of cesarean delivery (AOR, 0.87; $p = .016$), preterm birth (AOR, 0.87; $p < .001$), and low birth weight (AOR, 0.89; $p = .001$), compared with women in states without such practice.
Conclusions: States with regulations that support autonomous midwifery practice have a larger nurse-midwifery workforce, and a greater proportion of CNM-attended births. Correlations between autonomous practice laws and better birth outcomes suggest future policy efforts to enhance access to midwifery services may be beneficial to pregnancy outcomes and infant health.

In 2014, certified nurse-midwives (CNMs) and direct-entry midwives attended about 9% of births (CDC, 2015a); in the beginning of the 20th century, midwives attended nearly one-half of all births in the country (Davis-Floyd, 2006; Declercq, 1992). Academic analyses attribute the decline of midwifery practice in the United States to the perceived threat to physicians of economic competition from midwives at a time when physicians were consolidating professional power, increased technological intervention during childbirth, the emergence of the private medical practices, and increased use of pain medication (Renfrew et al., 2014). The move to obstetrician-led care in the vast majority births has coincided with improvements in infant survival, but it has not been entirely positive—detractors cite increases in the rate of cesarean births, as well as overuse of procedures that are not evidence based (Renfrew et al., 2014).

The U.S. paradigm of physician-led childbirth has persisted despite research indicating that health, cost, and quality of care outcomes in midwife-led maternity care are comparable with and in some case preferable to those for patients with physician-led care (Sandall, Soltani, Gates, Shennan, & Devane, 2013). Recent studies indicate that midwife-led models of care produce,

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for example, fewer instances of antenatal hospitalization, perinatal death, instrumental birth, and cesarean delivery (Sandall et al., 2013). Additionally, births with midwife-led care result in shorter hospital stays, higher patient satisfaction, and significantly lower costs of care (Sandall et al., 2013). The *Lancet* devoted a special issue to the topic of midwifery in June 2014 (Lancet, 2014), and in December 2014, Britain's National Institute for Health and Care Excellence (NICE) recommended that healthy women with uncomplicated pregnancies give birth under the supervision of midwives rather than physicians (NICE, 2014). Their reasoning was based on research showing that obstetricians are much more likely than midwives to use interventions like labor induction, epidural pain management, and cesarean deliveries—procedures that may carry additional maternal and neonatal risks when performed without definitive medical need. In the wake of the NICE recommendation, a *New York Times* Editorial called for greater use of midwifery care in the United States, specifically lending support to federal legislation to recognize Maternity Care Shortage Areas (New York Times, 2014).

Trained and licensed in both nursing and midwifery, CNMs possess at least a bachelor's degree from an accredited institution of higher education and are certified by the American College of Nurse Midwives. Direct-entry midwives are trained in midwifery through a variety of sources that can include self-study, apprenticeship, a midwifery school, or a college/university program. Midwifery plays a more prominent role in some U.S. states than in others: the percentage of total births attended by midwives varies substantially from state to state (from 0.8% in Arkansas to 23.9% in New Mexico in 2009; Declercq, 2012). However, this variability is poorly understood. Patient characteristics and clinical complexity as well as differences in racial, ethnic, geographic, and political landscapes across states likely impact the practice of midwifery as well as women's access to midwifery care.

It seems likely that jurisdictions that restrict the practice of midwifery will experience fewer midwife-led deliveries. Variability in regulations could result in differences in access to midwifery care, and to the potential health, cost, and quality-of-care benefits attributable to midwifery. Surprisingly limited empirical evidence, however, documents such a relationship. In a notable exception, Declercq, Paine, Simmes, & DeJoseph (1998) used surveys conducted in 1991 and 1995 and found that the degree to which state policies facilitated or restricted CNM practice predicted the distribution and practice activities of CNMs. This study extends Declercq study by using recent vital statistics birth data. We hypothesize that states with autonomous midwifery practice laws have larger midwifery workforce, more midwife-attended births, and better birth outcomes. We focus on laws relevant to CNMs rather than direct-entry midwives because CNMs represent the majority of U.S. midwives and attended more than 92% of midwife-attended births (American College of Nurse-Midwives, 2013).

Materials and Methods

Data

The main source of data for this analysis was the 2009 through 2011 Natality Detail File (NDF; National Center for Health Statistics, 2009–2011). The NDF is based on the information reported on birth certificates filed for all babies born in the United States. The information is transmitted by all states in the United States to the Centers for Disease Control and Prevention, National Center for Health Statistics through the Vital Statistics Cooperative Program. An estimated 99% of all births occurring in the United States are registered, and most items on birth certificates are completed. The demographic and medical and health items collected are consistently shown with a high degree of completeness and accuracy (Martin et al., 2013). Because geographic information is not available in the public use file, we obtained restricted files with state identifiers. The study population consists of 12,106,161 births across all state jurisdictions during the time period examined. The American Midwifery Certification Board supplied us with workforce data from 2013. The dataset included both CNMs and Certified Midwives (CMs), and it was not possible to separate the two for analysis. As of May 2015, there were 11,194 CNMs and 97 CMs nationally (American College of Nurse-Midwives, 2016). Statements about the CNM workforce in this paper refer to both CNMs and CMs. We used information on the number of births per state in 2013 from the published National Vital Statistics Report (CDC, 2015b).

Measures

Independent variable

Our independent variable was based on state laws related to scope of practice for CNMs. In the birth data files, we used the state where the birth occurred to classify exposure to state policy. As shown in Table 1, each state and the District of Columbia was classified as having autonomous practice for CNMs or not based on Lexis legal search (available: www.lexis.com). The classification was reviewed and verified by the American College of Nurse-midwives Government Affairs staff. None of the states changed their midwifery scope of practice laws during the study period.

Table 1
Certified Nurse-Midwives (CNMs) Scope of Practice Policy Type and States

Policy Type	Autonomous Midwifery Practice	Subject to Supervision or Collaborative Agreement			
Meaning and subtype	States not requiring CNMs to have physician supervision or contractual practice agreements for overall practice	States requiring physician supervision or contractual practice agreements for CNMs only for exercise of prescriptive authority	States requiring CNMs to have contractual practice agreements with physicians for some practice	States requiring CNMs to have signed contractual practice agreements with physicians for overall practice	States requiring physician supervision of overall practice of CNMs
States	AK, AZ, CO, CT, DC, HI, IA, ID, MD, ME, MN, MT, NH, NJ, NM, NY, ND, OR, RI, UT, VT, WA, WY	KY, MI, OK, TN, TX, WV	AR, DE, GA, IL, IN, MO, SD	AL, KS, LA, MS, OH, PA, WI	CA, FL, MA, NC, NE, NV, SC, VA

Table 2
Percent of Certified Nurse-Midwife (CNM)-attended Births by Policy Type and Unadjusted Relationship between State Policy Type and Supply of CNMs

State Policy Type	Percent of CNM-Attended Births*	Mean No. of CNMs per 1,000 Births†
Autonomous midwifery practice	9.71	4.85
Subject to supervision or collaborative agreement	7.01	2.17

* Percent of CNM-attended births by policy type and state. Data are from Natality Detail File, 2009–2011. (N = 12,010,330).

† The difference between these two means is statistically significant ($p < .001$). The p-value is from a t test. Data are from published tables of 2013 births by state (number of births) and American Midwifery Certification Board (number of CNMs and CMs in each state). Unit of analysis is state.

States that do not require CNMs to have physician supervision or contractual practice agreements for overall practice are classified as having autonomous practice. For example, in Maine, CNMs practice "on the basis of specialized education and experience" and are authorized to "deliver expanded professional health care" (ME. Code R. § 02-380-8 et. seq). CNMs can provide those health care services for which they are "educationally and clinically prepared and for which competency has been maintained" (ME. Code R. § 02-380). According to these guidelines, CNMs are primary health care providers; they were classified as licensed independent practitioners (ME. Code R. § 02-373).

States with regulations that were not consistent with autonomous practice as described were classified as subject to collaborative agreement. These states had regulations requiring physician supervision or contractual practice agreements for CNMs. For instance, in Nebraska, the statute expressly states that nothing in it may be "interpreted to permit independent practice" (Neb. Rev. Stat. § 38-618). CNMs must practice under the terms of a written practice agreement with a collaborating physician whose practice includes obstetrics and with whom the CNM "is associated." Both parties must jointly author and sign the practice agreement, which identifies authorized practice settings, names the collaborating physician(s), and defines and describes the "medical functions" to be performed by the CNM (Neb. Rev. Stat. § 38-607; 38-609). A CNM works in "collaboration" with a physician in respect to services within the authorized scope of practice and under the "supervision" of a physician with respect to "medical functions." "Supervision" is defined as "the ready availability of a collaborating licensed practitioner for consultation and direction of the activities of the CNM related to the delegated medical functions as outlined in the practice agreement" (Neb. Rev. Stat. § 38-610). Each practice agreement must be reviewed and approved by Nebraska Board of Nursing, and a copy is maintained on file with the Board as a condition of the CNMs practice.

Dependent variables

We created a measure of the number of CNMs per birth in each state based on the 2013 National Vital Statistics Report (CDC, 2015b; number of births in each state) and workforce data (number of CNMs per state). In the NDF, dependent variables included whether the record indicated that a CNM was the delivery attendant, labor induction, cesarean delivery, preterm birth (birth <37 weeks completed gestation), and low birth weight (<2,500 g).

Covariates

We also included several covariates in our analyses to control for demographic and health risk characteristics that are related to the outcomes of interest and may vary by state, consistent with prior studies of maternity care using birth certificate records (Yang, Mello, Subramanian, & Studdert, 2009). Sociodemographic covariates were maternal age (Jolly, Sebire Harris, Robinson, & Regan, 2000), education (less than high school, some high school or high school grad, some college but <4 years, 4 years of college; Luo, Sebire N., Harris, Robinson, & Regan, 2006), race/ethnicity (non-Hispanic White, non-Hispanic Black, Mexican, Central/South American, Other/unknown Hispanic, non-Hispanic other race, race unknown; Kabir, Pridjian, Steinmann, Herrera, & Khan, 2005), marital status (Shah, Zao, & Ali, 2011), and parity (Aliyu, Jolly, Ehiri, & Salihu, 2005). We included potential risk factors including timing of initiation of prenatal care (no prenatal care, 1st to 3rd month, 4th to 6th month, 7th to final month; Reichman & Teitler, 2005), number of prenatal visits (Liu, 1998), and whether there was any cigarette use during pregnancy (Pollack, Lantz, & Frohna, 2000). We also created an indicator variable for the year in which the birth took place.

Missing data

For all covariates, we preserved missing/unknown as a separate category. There were 95,831 cases that had a missing value on one or more of the outcomes. In our primary analysis, we restricted the sample to cases with no missing values for any of the outcomes (n = 12,010,330). We also ran sensitivity analyses where we allowed cases to drop from the model based on missing values for each individual outcome, and the results were substantively unchanged.

Analysis

Our first sets of analyses were conducted at the state level. We used t tests to compare the mean number of CNMs per 1,000 births in 2013 in states with autonomous CNM practice and in states where CNM practice is subject to collaborative agreement. We also examined the percent of births attended by midwives in each state in 2009 through 2011 by state policy type. A second set of analyses were conducted at the individual level; we used multivariate logistic regression to estimate the associations between state laws and odds of having a CNM as the delivery attendant, and between state laws and odds of other outcomes (labor induction, cesarean delivery, preterm birth, and low birth weight).

Although we hypothesized that having a midwife-attended birth may mediate the relationship between state laws and cesarean delivery, we were unable to directly test this because midwives would not be recorded as the birth attendant at cesarean births, even though they may have provided prenatal care and care during labor. As a sensitivity analysis, we included an indicator variable for whether a CNM was the delivery provider for the outcomes of labor induction and low birth weight and found that births with a CNM as the delivery provider had lower odds of labor induction (odds ratio [OR], 0.86; $p < .001$) and low birthweight (OR, 0.39; $p < .001$), but the inclusion of this variable did not change the relationship between autonomous midwifery practice and the outcomes.

All analyses were conducted using Stata v.12. We used clustered standard errors in the multivariate analyses to account for non-independence of births occurring within the same state. We did not use state-fixed effects because they were collinear with state scope of practice laws variables.

Results

Table 2 shows states with regulations that support autonomous midwifery practice have a greater proportion of CNM-attended births (9.71% vs. 7.01%). The unadjusted relationship between state policy type and CNM supply is also shown in Table 2. States with autonomous midwifery practice have a mean of 4.85 CNMs per 1,000 births, compared with 2.17 CNMs per 1,000 births in states where CNM practice is subject to supervision or collaborative agreement ($p < .01$).

Table 3
Adjusted Odds of Outcomes, Natality Detail File, 2009–2011 (N = 12,010,330)

	CNM-attended Birth*		Labor Induction		Cesarean Delivery		Preterm Birth		Low Birthweight	
	AOR	*p* Value	AOR	*p* Value	AOR	*p* Value	AOR	*p* Value	AOR	*p* Value
Policy type										
Subject to collaborative agreement	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Autonomous midwifery practice	1.59	.004	0.94	.583	0.87	.016	0.87	<.001	0.89	.001
Maternal age	0.97	.000	0.99	.000	1.06	.000	1.02	.000	1.02	.000
Race/ethnicity										
Non-Hispanic White	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Non-Hispanic Black	0.83	.004	0.77	.000	1.28	.000	1.40	.000	1.73	.000
Mexican	0.94	.577	0.59	.000	1.02	.610	0.94	.049	0.87	.000
Central or South American	1.13	.198	0.59	.000	1.04	.477	0.98	.518	0.88	.001
Other/unknown Hispanic	0.94	.688	0.71	.000	1.27	.000	1.11	.001	1.15	.000
Non-Hispanic other race	1.06	.639	0.64	.000	0.94	.021	0.98	.390	1.13	.000
Race unknown	0.98	.876	0.71	.000	0.99	.781	1.15	.000	1.29	.000
Maternal education										
Less than HS	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Some HS/HS grad	0.75	.001	1.23	.000	1.23	.000	1.07	.007	1.21	.000
Some college, <4 y	0.72	.004	1.39	.000	1.24	.000	1.00	.859	1.12	.000
≥4 y of college	0.72	.006	1.20	.000	1.10	.037	0.90	.000	1.06	.004
Unknown	0.52	.001	1.28	.006	1.19	.017	0.97	.428	1.12	.002
Marital status										
Married	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Not married	0.97	.392	1.01	.441	1.06	.000	1.17	.000	1.16	.000
Parity										
1	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
2	1.07	.000	0.72	.000	1.00	.588	0.98	.161	0.83	.000
3	1.11	.001	0.74	.000	0.91	.000	1.03	.052	0.81	.000
4	1.17	.000	0.78	.000	0.81	.000	1.11	.000	0.84	.000
5	1.22	.000	0.81	.000	0.73	.000	1.18	.000	0.88	.000
6	1.29	.000	0.83	.000	0.66	.000	1.23	.000	0.91	.000
7	1.34	.000	0.85	.000	0.62	.000	1.25	.000	0.93	.003
≥8	1.50	.000	0.83	.000	0.55	.000	1.26	.000	0.95	.083
Unknown	1.51	.002	0.88	.016	0.85	.000	1.02	.647	0.91	.002
Any cigarette use										
No	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
Yes	0.93	.072	1.12	.009	1.15	.000	1.10	.000	1.54	.000
Missing	1.68	.022	0.97	.766	1.06	.243	0.99	.864	0.97	.440
Prenatal care initiation										
No prenatal care (mo)	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
1–3	0.97	.862	0.82	.287	0.79	.002	1.33	.020	1.16	.170
4–6	1.13	.500	0.96	.815	0.74	.000	0.78	.039	0.76	.011
7–final	1.25	.205	1.16	.410	0.70	.000	0.31	.000	0.30	.000
Missing	0.72	.125	0.71	.061	0.79	.001	1.30	.020	1.19	.090
No. of prenatal visits										
None	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
1–2	1.35	.042	1.58	.009	1.57	.000	1.76	.000	1.78	.000
3–4	1.40	.023	1.85	.000	1.64	.000	1.57	.000	1.67	.000
5–6	1.52	.006	2.20	.000	1.69	.000	1.15	.160	1.25	.038
7–8	1.77	.000	2.57	.000	1.57	.000	0.73	.001	0.74	.003
9–10	1.76	.001	2.95	.000	1.53	.000	0.42	.000	0.41	.000
11–12	1.80	.001	3.45	.000	1.51	.000	0.25	.000	0.26	.000
13–14	1.87	.000	3.98	.000	1.51	.000	0.20	.000	0.22	.000
15–16	1.68	.011	3.91	.000	1.67	.000	0.25	.000	0.28	.000
17–18	1.80	.001	4.66	.000	1.89	.000	0.27	.000	0.32	.000
≥19	1.36	.117	4.18	.000	2.39	.000	0.46	.000	0.58	.000
Missing	2.02	.029	2.91	.000	1.61	.000	0.52	.000	0.61	.000
Year of birth										
2009	1.00	–	1.00	–	1.00	–	1.00	–	1.00	–
2010	1.04	.000	1.00	.635	0.99	.000	0.99	.162	1.01	.387
2011	1.10	.020	1.02	.271	0.97	.006	0.96	.000	0.99	.217

Abbreviations: AOR, adjusted odds ratio; CNM, certified nurse-midwife.
Note: Standard errors are adjusted for clustering by state.
* The figures include births attended by both CNMs and CMs in some states.

Table 3 presents the adjusted odds of a CNM-attended birth by whether the state where the birth occurs had regulation allowing autonomous practice by CNMs versus regulation requiring supervision or collaborative agreement. In states with autonomous midwifery practice, women had higher odds of having a CNM-attended birth compared with women in states where CNM practice was subject to supervision or collaborative agreement (adjusted OR [AOR], 1.59; $p = .004$). Delivery in a state with autonomous midwifery practice laws was also associated with lower odds of cesarean delivery (AOR, 0.87; $p = .016$), preterm birth (AOR, 0.87; $p < .001$), and low birthweight (AOR, 0.89; $p = .001$), after adjusting for maternal characteristics. There was no association between autonomous midwifery practice and odds of labor induction.

Discussion

This analysis highlights the positive association between state-level policies that support autonomous midwifery practice and a larger midwifery workforce as well as more midwife-attended deliveries. States with regulations allowing autonomous practice had approximately double the supply of midwives per 1,000 births than did states where CNM practice is subject to physician supervision or requires a collaborative practice agreement. In addition, women giving birth in states with autonomous midwifery practice had a nearly 60% greater chance of having a CNM as the delivery attendant. We also found that, at a population level, women giving birth in states with regulations allowing autonomous midwifery practice had 13% lower odds of cesarean delivery, 13% lower odds of preterm birth, and 11% lower odds of delivering a low birth weight baby compared with women giving birth in states with more restrictive policies on midwifery practice. Although these effects were modest in magnitude, they could have important implications at the population level because there are approximately 4 million births in the U.S. each year.

These findings are consistent with prior research on the effects of midwifery-led care on birth outcomes (Renfrew et al., 2014), and extend the existing literature to encompass the broader state policy environment. Although these relationships are not causal, they are suggestive of the potential role that scope of practice laws, and other aspects of state policy and regulation, may play in shaping the maternity care workforce and access to services as well as maternal and infant health more broadly. Our findings suggest that it may be in states' interests to consider or study efforts to reduce restrictions on midwifery practice to increase use of CNM services for prenatal, intranatal, and postnatal care. We show that states that do not require that physicians supervise midwives and do not require contractual practice agreements have a greater supply of midwives per capita and a higher percentage of midwife-attended births. The relationships between state-level policy and midwifery care may differ across settings, based on geography, rurality, and other factors. Yet, in the plainest terms, where state policies support midwifery, patients have greater access to midwives as an alternative to physician-led birth, and a greater percent of women have midwives attend their births.

Our results also suggest that states with less restrictive requirements for midwife access have births with fewer medical procedures and better outcomes, which can lead to lower costs. In particular, our results show that states with regulations that support autonomous midwifery practice had a lower percentage of cesarean deliveries, a resource-intensive procedure that has been a target of professional efforts to reduce unnecessary overuse (American College of Obstetricians and Gynecologists and the Society for Maternal-Fetal Medicine, 2014). The cost of a cesarean delivery is approximately 50% greater than a vaginal delivery, for both public and private payers. For a commercially insured birth, for example, the average cost of a cesarean delivery is $27,866 compared with $18,329 for a vaginal delivery (National Partnership for Women & Families, 2013). Cesarean births are more costly because they require a surgical procedure necessitating additional staff and medical treatment as well as longer hospital stays after delivery to recover (Geller, Wu, Jannelli, Nguyen, & Visco, 2010). Moreover, our analysis indicates that, in states allowing autonomous midwife practice, there are fewer infants born low birth weight or preterm. Costs of infant medical care in the first year of life are approximately 10 to 12 times greater for preterm newborns, compared with full term infants (March of Dimes, 2013). In addition to potential financial benefits, greater access to midwifery services may also support better communication, consistent with patient-centered care (Kozhimannil, Attanasio, Yang, Avery, & Declercq, 2015).

Although the NDF is the most complete and authoritative source of information on the nation's births, it has several limitations that influenced this analysis. For example, detailed clinical information is not available to determine which women would be eligible for midwifery care, and no information was available regarding midwifery care during pregnancy. These challenges are not unique to birth certificate data; there are many known limitations to using administrative data to study midwifery (Diers, 2007). In addition, labor induction is poorly measured in birth certificate data, which is one reason that outcome is not a major focus of our analysis. Also, although the link between scope of practice and number of midwives and CNM deliveries is relatively straightforward, linking practice laws to cesarean deliveries and other measures of intervention becomes much more complicated because those outcomes are influenced by various factors that are not included as covariates (Yang et al., 2009). Future research should include prospective, longitudinal studies of policy changes to assess whether there is a causal link between midwifery policies and various outcomes.

Implications for Practice and/or Policy

Today's health care policy climate demands that clinicians and health care delivery systems continue to press to find ways to increase positive patient outcomes while simultaneously cutting costs. In addition, the need for expanded access to healthcare has been forefront in the legislative agenda and continues to dominate discussion at state and federal levels (Congress, 2014). Although the federal government has pushed for expanded healthcare access with measures like the Affordable Care Act, it is still incumbent on the states to determine the scope and availability of medical professionals and the roles they can play in providing needed health care. States with regulations that support autonomous midwifery practice have a larger midwifery workforce, and a greater proportion of midwife-attended births. Correlations between autonomous practice laws and better birth outcomes suggest future policy efforts to enhance access to midwifery services may be beneficial to pregnancy outcomes and infant health.

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