Impact of Marriage on Birth Outcomes: Pregnancy Risk Assessment Monitoring System, 2012–2014

The Linacre Quarterly
2019, Vol. 86(2-3) 225-230
© Catholic Medical Association 2019
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/0024363919843019
journals.sagepub.com/home/lqr

Jennifer J. Barr, MD, FACOG¹ and Lindsey Marugg, MD¹

Abstract

Marriage has been associated with improved pregnancy outcomes. However, as Americans become increasingly accepting of pregnancy and childbearing outside of marriage, many believe the father can support the mother without the parents being married. Some question whether the present normalization of childbearing outside of marriage will negate the protective effect of marriage on pregnancy outcomes. Data from the Centers for Disease Control and Prevention Pregnancy Risk Assessment Monitoring System were used to obtain data from a sample of 138,118 live singleton deliveries from 2012 to 2014. Odds ratios were compared between married and unmarried mothers for outcomes of preterm delivery, a small for gestational age infant, neonatal intensive care unit admission, vaginal delivery, and breastfeeding initiation. Logistic regression analyses were used to adjust for maternal age, maternal and paternal race, maternal medical comorbidities, maternal smoking status, and receipt of Medicaid. Adjusted odds ratios (AOR) showed married women had a lower risk of preterm delivery (AOR = .877, 95% confidence interval [CI; .811–.948]), a small for gestational age baby (AOR = .838, 95% CI [.726–.967]), and a neonatal intensive care admission (AOR = .808, 95% CI [.754–.866]). Women who were married were more likely to have a vaginal delivery (AOR = 1.144, 95% CI [1.085–1.211]) and to initiate breastfeeding (AOR = 1.601, 95% CI [1.490–1.719]). These data demonstrate that despite a normalization in society of childbearing outside of marriage, there continues to be an association of marriage with improved birth outcomes.

Nontechnical Summary: Marriage is associated with a lower risk of preterm delivery, small for gestational age infants, and neonatal intensive care unit admission. These differences persist even after correcting for potentially confounding socioeconomic factors.

Keywords

Birth outcomes, Marriage, PRAMS

There has long been documented a relationship between marriage and improved birth outcomes (Shah, Zao, and Ali 2011; Young and Declercq 2010). Women who are married are less likely to have a preterm delivery or a low birth weight infant (Abrevaya and Dahl 2008; Shah, Zao, and Ali 2011; Young and Declercq 2010). Infants who do not have a father listed on their birth certificate have a higher infant mortality rate (Alio et al. 2011). This difference persists across many races and ethnicities (Alio et al. 2011; Leslie et al. 2003; Sullivan et al. 2012).

The association between marriage and birth outcomes is fluid throughout a woman's reproductive years. If an unmarried woman becomes married

¹ The State University of New York at Buffalo, Buffalo, NY, USA

Corresponding Author:

Jennifer J. Barr, The State University of New York at Buffalo, 2157 Main Street, Buffalo, NY 14214, USA.
Email: jbarr10@uthsc.edu

before conceiving her second child, her risk of having a preterm delivery or a low birth weight infant is reduced (Holt et al. 1997). Conversely, women with broken marriages are at increased risk of low birth weight infants compared to their counterparts with healthy marriages (McIntosh, Roumayah, and Bottoms 1995). Relationship quality has also been linked to postpartum depression risk (Akincigil, Munch, and Niemczyk 2010).

Some have tried to explain the relationship between marriage and birth outcome based on socioeconomic factors (Letamo and Majelantle 2001). They assert that socioeconomic status and relationship characteristics are more important than marital status (Bird et al. 2000). There is a growing belief that cohabitation and marriage should both afford the same pregnancy benefits (Kane 2016). Some argue that the stigma society assigns to unwed mothers is more damaging than the marital status itself (Bennett 1992).

The changing culture in the United States has led to an increase in births outside of marriage (Ventura and Bachrach 2000). A culture that supports childbearing within the context of marriage has been criticized as being biased and outdated (Bennett 1992). Social scientists have asserted that a conscious decision to reproduce outside of marriage is consistent with self-determination (Bennett 1992). National surveys show Americans now largely support normalization of childbearing outside of marriage (Daugherty and Copen 2016).

In this era of increasing popularity of childbearing outside of marriage, researchers in other countries have tried to re-characterize the relationship between marriage and birth outcomes. Existing studies have had mixed results. Many countries have demonstrated consistent improvement in preterm delivery rates and delivery weight for women who are legally married compared to those who are cohabitating (Frimmel and Pruckner 2014; Luo, Wilkins, and Kramer 2004; Raatikainen, Heiskanen, and Heinonen 2005). Others have argued that the protective effects of marriage persist only in countries where cohabitation is not accepted (Zeitlin et al. 2002). There are very few recent publications exploring this relationship within the United States.

This study seeks to update data in the United States regarding the impact of marriage on birth outcomes. Given the increasing acceptability of childbearing outside of marriage, it is important to understand the impact this may have on birth outcomes. By using a large national database that contains information about socioeconomic and demographic factors, we are able to adjust for many

confounding factors and more accurately assess the impact of marriage specifically on birth outcomes.

Method

We used the Centers for Disease Control and Prevention's (CDC) Pregnancy Risk Assessment Monitoring System (PRAMS) data from 2012 to 2014. PRAMS is an ongoing national surveillance system designed to identify and monitor maternal behaviors and experiences before, during, and after pregnancy. Women who delivered a live infant are randomly selected from state birth certificate data. Each month 100–250 women from each state receive a questionnaire in the mail inviting them to participate. Those who do not respond via mail are then followed up with a standardized telephone interview. Informed consent is obtained from all participants. The sample is weighted to oversample data from pregnancies with adverse outcomes such as low birth weight and then adjusted to provide population-based estimates. Nonresponse adjustment factors are incorporated to address the increased likelihood of nonresponse from certain groups of women such as those who are unmarried. Additional details about the PRAMS protocol have been described elsewhere (Shulman, Gilbert, and Lanksy 2006). The response threshold for each state's data to be included was 60% for this period; 34 states met this reporting threshold for at least one of the years being studied. The CDC Institutional Review Board approved the PRAMS protocol. The CDC and PRAMS states approved this research protocol.

To account for the stratified and weighted sample, we analyzed data using the complex samples procedure in SPSS 25.0 (IBM SPSS, Inc., Armonk, NY). Analysis was restricted to women who had delivered a singleton infant. Descriptive statistics were used to summarize baseline sample characteristics by marital status. Characteristics included were maternal age, maternal and paternal race, maternal and paternal education level, maternal medical complications, maternal smoking status, and receipt of Medicaid funds. The outcomes of interest were delivery of a preterm infant (less than 37 weeks gestation), delivery of a small for gestational age infant (more than 2 standard deviations below the mean for gestational age), delivery of a large for gestational age infant (greater than 90th percentile), vaginal delivery of the infant, admission at time of delivery to the neonatal intensive care unit, and maternal initiation of breastfeeding.

For each of the outcomes of interest, we compared the odds ratio with 95% confidence interval of the outcome between women who were married and women

Table 1. Demographic Data.

Variable		Married (%)	Unmarried (%)	p Value ^a
Maternal age (years)	<18	0.1	4.3	<.001
	18–19	1.0	9.7	
	20–24	11.8	35.1	
	25–29	31.2	26.8	
	30–34	35.7	14.9	
	35–39	16.7	7.3	
	>39	0.1	0.1	
Maternal race	White	78.4	58.5	<.001
	Black	6.3	26.0	
	Other	15.3	15.5	
Paternal race	White	70.7	36.4	<.001
	Black	6.1	15.1	
	Other	23.2	48.4	
Maternal education (years)	<9	2.8	4.2	<.001
	9–11	4.9	19.1	
	12	16.5	36.7	
	13–15	25.7	31.4	
	>15	50.0	8.6	
Paternal education (years)	<9	3.3	5.8	<.001
	9–11	5.8	18.9	
	12	20.2	43.8	
	13–15	26.9	24.7	
	>15	43.8	6.9	
Maternal smoking	Yes	4.2	17.4	<.001
	No	95.8	82.6	
Maternal medical risk factors	Yes	18.5	19.4	.012
	No	81.5	80.6	
Receiving Medicaid support	Yes	21.7	62.4	<.001
	No	78.3	37.6	

^aValues compared by χ^2 tests.

who were not. Logistic regression analyses adjusted for maternal age, maternal and paternal race, maternal and paternal education, maternal smoking status, maternal medical comorbidities, and receipt of Medicaid services. These models were used to create adjusted odds ratios (AORs) for the outcomes of interest.

Results

From 2012 to 2014, there were 147,747 women who participated in PRAMS. Of these, 138,118 delivered a singleton infant and were eligible for our analysis. Demographic differences between married and unmarried couples are shown in Table 1. Women who were married tended to be older, were more likely to be Caucasian, and had more years of education. The women who were married were less likely to smoke during pregnancy, have medical comorbidities, or receive Medicaid support. The partners of

women who were married were more likely to be Caucasian and had more years of education.

The crude odds ratios of our observed pregnancy health indicators are shown in Table 2. Women who were married had a lower risk of a preterm delivery, a small for gestational age infant, or a neonatal intensive care admission at delivery. Women who were married were more likely to have a large for gestational age infant. They were also more likely to deliver vaginally and to breastfeed their infants.

The AORs after performing logistic regression analysis are shown in Table 3. After correcting for maternal age, maternal and paternal race, maternal and paternal education, maternal smoking status, maternal medical comorbidities, and receipt of Medicaid services, married mothers were still less likely to have a preterm delivery, a small for gestational age infant, or a neonatal intensive care admission. There was no longer a significant difference in odds of a large for gestational age. Married

Table 2. Univariate Analysis of Marital Status Relationship to Birth Outcomes.

Outcome	Odds Ratio for Married Women Compared to Unmarried Women	95% Confidence Interval	p Value
Preterm delivery	0.698	[.661–.738]	<.001
Small for gestational age	0.601	[.544–.664]	<.001
Large for gestational age	1.267	[1.188–1.351]	<.001
Newborn admitted to intensive care	0.711	[.677–.747]	<.001
Vaginal delivery	1.045	[1.005–1.085]	.026
Infant breastfed	2.874	[2.724–3.020]	<.001

Table 3. Multivariate Analysis of Marital Status Relationship to Birth Outcomes.

Outcome	Adjusted Odds Ratio for Married Women Compared to Unmarried Women ^a	95% Confidence Interval	p Value
Preterm delivery	.877	[.811–.948]	.001
Small for gestational age	.838	[.726–.967]	.016
Large for gestational age	1.011	[.926–1.102]	.804
Newborn admitted to intensive care	.808	[.754–.866]	<.001
Vaginal delivery	1.144	[1.085–1.211]	<.001
Infant breastfed	1.601	[1.490–1.719]	<.001

^aModel adjusted for maternal age, maternal and paternal race, maternal and paternal education, maternal medical comorbidities, maternal smoking, and Medicaid status. Modeled using logistic regression analysis.

women continued to be more likely to deliver vaginally and to breastfeed.

Discussion

Our results demonstrate that the benefit of marriage to birth outcomes persists in an updated U.S. sample, despite a cultural shift toward greater childbearing outside of marriage (Daugherty and Copen 2016; Ventura and Bachrach 2000). By using a large, national sample with associated sociodemographic data, we were able to adjust for many potential confounding factors such as race and education (Bird et al. 2000; Kane 2016). We adjusted our analysis for maternal smoking status, which has previously been thought to mediate the association between being unmarried and low birth weight (Kiernan and Pickett 2006). We also adjusted for receipt of Medicaid funds as a surrogate for socioeconomic status.

We found that the protective effect of marriage persists beyond socioeconomic differences. One explanation for this is the increased degree of commitment that marriage requires from the father of the baby. Sociologists have asserted that marriage is a social institution that formalizes a commitment of the well-being of the spouse and child. People who are married have a greater sense of responsibility to engage in health

activities (Kane 2016). This is important for the mother who may modify her diet and activities for the sake of her child. It also may influence the husband and how he offers support to the mother.

Olmstead and colleagues (2013) surveyed college men about how they would respond if they fathered an unexpected pregnancy in an unmarried relationship. Less than half of the respondents described a sense of duty and a commitment to marry the mother. Others felt that they could maintain a relationship with the child without marrying the mother. Many respondents emphasized that a pregnancy would necessitate that they become committed to a relationship to which they might not otherwise have been committed. It is therefore understandable how unmarried women might not have the benefits or support that a marital commitment would offer.

Further, societal expectations may be different for unmarried fathers. There is significant sociodemographic variation in partner involvement in pregnancy (Redshaw and Henderson 2013). Alio and colleagues (2013) conducted focus groups with mothers and fathers. Participating fathers felt that society downplays their role in childrearing. Many felt that the societal expectation was simply to financially support any children they fathered. They expressed much lower expectations to be physically

and emotionally supportive of their partner and the children. Fathers who are married may have a more clearly defined role in their relationships with their wife and children.

The major limitation to our study is our inability to differentiate between different degrees of paternal involvement. Previous studies have showed that among unmarried couples, a stronger relationship with the father of the baby does mediate some of the adverse pregnancy risks (Kiernan and Pickett 2006; Young and Declercq 2010). Currently, the CDC PRAMS data set does not collect data to differentiate between unwed women who are cohabitating, romantically involved, or separated from the father of the baby. In the future, collecting these data may allow us a more complete understanding of the impact of marriage on birth outcomes.

Our study does support an ongoing protective effect of marriage on birth outcomes. Clinicians will find this useful when providing preconception counseling. Couples considering options for delivery timing should be advised of the decreased risk of low birth weight and preterm deliveries among women who are married. Our study supports the decision to defer childbearing until after marriage.

Authors' Note

Statements made in this article represent the views of the authors and not the State University of New York at Buffalo or the Centers for Disease Control and Prevention.

Acknowledgments

The authors thank the Centers for Disease Control and Prevention and members of the PRAMS Working Group: Alabama—Izza Afgan, MPH; Alaska—Kathy Perham-Hester, MS, MPH; Arkansas—Mary McGehee, PhD; Colorado—Rickey Tolliver, MPH; Connecticut—Jennifer Morin, MPH; Delaware—George Yocher, MS; Florida—Elizabeth C. Stewart, MSPH; Georgia—Florence A. Kanu, MPH; Hawaii—Matt Shim, PhD, MPH; Illinois—Patricia Kloppenburg, MT (ASCP), MPH; Iowa—Jessica Egan; Kentucky—Tracey D. Jewell, MPH; Louisiana—Rosaria Trichilo, MPH; Maine—Tom Patenaude, MPH; Maryland—Laurie Kettinger, MS; Massachusetts—Emily Lu, MPH; Michigan—Peterson Haak; Minnesota—Mira Grice Sheff, PhD, MS; Mississippi—Brenda Hughes, MPPA; Missouri—David McBride, PhD; Montana—Emily Healy, MS; Nebraska—Jessica Seberger; New Hampshire—David J. Laflamme, PhD,

MPH; New Jersey—Sharon Smith Cooley, MPH; New Mexico—Oralia Flores; New York State—Anne Radigan; New York City—Pricila Mullachery, MPH; North Carolina—Kathleen Jones-Vessey, MS; North Dakota—Grace Njau, MPH; Ohio—Connie Geidenberger, PhD; Oklahoma—Ayesha Lampkins, MPH, CHES; Oregon—Claudia W. Bingham, MPH; Pennsylvania—Tony Norwood; Rhode Island—Karine Tolentino Monteiro, MPH; South Carolina—Kristin Simpson, MSW, MPA; Texas—Tanya Guthrie, PhD; Tennessee—Ramona Lainhart, PhD; Utah—Nicole Stone; Vermont—Peggy Brozicevic; Virginia—Sara Varner, MPH; Washington—Linda Lohdefinck; West Virginia—Melissa Baker, MA; Wisconsin—Christopher Huard; Wyoming—Lorie Chesnut, PhD.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Jennifer J. Barr, MD, FACOG <https://orcid.org/0000-0002-7263-9650>

References

- Abrevaya, Jason, and Christian M. Dahl. 2008. "The Effects of Birth Inputs on Birthweight: Evidence from Quantile Estimation on Panel Data." *Journal of Business & Economic Statistics* 26:379–97.
- Akincigil, A., Shari Munch, and Kristen C. Niemczyk. 2010. "Predictors of Maternal Depression in the First Year Postpartum: Marital Status and Mediation Role of Relationship Quality." *Social Work in Health Care* 49:227–44.
- Alio, Amina P., Cindi A. Lewis, Kenneth Scarborough, Kenn Harris, and Kevin Fiscella. 2013. "A Community Perspective on the Role of Fathers during Pregnancy: A Qualitative Study." *BMC Pregnancy and Childbirth* 13: 60–71.
- Alio, Amina P., Alfred K. Mbah, Jennifer L. Kornosky, Deanna Wathington, Phillip J. Marty, and Hamisu M. Salihu. 2011. "Assessing the Impact of Paternal Involvement on Racial/Ethnic Disparities in Infant Mortality Rates." *Journal of Community Health* 36:63–68.
- Bennett, Trude. 1992. "Marital Status and Infant Health Outcomes." *Social Science & Med* 35:1179–87.

- Bird, Sheryl Thorburn, Anjani Chandra, Trude Bennett, and S. Marie Harvey. 2000. "Beyond Marital Status: Relationship Type and Duration and the Risk of Low Birth Weight." *Family Planning Perspectives* 32:281–87.
- Daugherty, Jill, and Casey Copen. 2016. "Trends in Attitudes about Marriage, Childbearing, and Sexual Behavior." *National Health Statistics Report* 17:1–10.
- Frimmel, Wolfgang, and Gerald J. Pruckner. 2014. "Birth Weight and Family Status Revisited: Evidence from Austrian Register Data." *Health Economics* 23:426–45.
- Holt, Victoria L., Nancy L. Danoff, Beth A. Mueller, and Marcia W. Swanson. 1997. "The Association of Change in Maternal Marital Status between Births and Outcomes in the Second Birth." *Paediatric and Perinatal Epidemiology* 11(Suppl. 1):31–40.
- Kane, Jennifer B. 2016. "Marriage Advantages in Perinatal Health: Evidence of Marriage Selection or Marriage Protection?" *Journal of Marriage and Family* 78: 212–29.
- Kiernan, Kathleen, and Kate E. Pickett. 2006. "Marital Status Disparities in Maternal Smoking during Pregnancy, Breastfeeding and Maternal Depression." *Social Science & Medicine* 63:335–46.
- Leslie, Jennie C., Shelley L. Galvin, Sandra J. Diehl, Trude A. Bennett, and Paul A. Buescher. 2003. "Infant Mortality, Low Birth Weight, and Prematurity among Hispanic, White, and African American Women in North Carolina." *American Journal of Obstetrics & Gynecology* 188:1238–40.
- Letamo, Gobopamang, and Rolang G. Majelantle. 2001. "Factors Influencing Low Birth Weight and Prematurity in Botswana." *Journal of Biosocial Science* 33: 391–403.
- Luo, Zhong-Cheng, Russell Wilkins, and Michael S. Kramer. 2004. "Disparities in Pregnancy Outcomes According to Marital and Cohabitation Status." *Obstetrics & Gynecology* 103:1300–13307.
- McIntosh, Lisa J., Nabil E. Roumayah, and Sidney F. Bottoms. 1995. "Perinatal Outcome of Broken Marriage in the Inner City." *Obstetrics & Gynecology* 85:233–36.
- Olmstead, Spencer B., Justin T. Koon, Daniel J. Puhlman, Kay Pasley, and Frank D. Fincham. 2013. "College Men, Unplanned Pregnancy, and Marriage: What Do They Expect?" *Journal of Sex Research* 50:808–19.
- Raatikainen, Kaisa, Nonna Heiskanen, and Seppo Heinonen. 2005. "Marriage Still Protects Pregnancy." *BJOG: An International Journal of Obstetrics & Gynecology* 112:1411–16.
- Redshaw, Maggie, and Jane Henderson. 2013. "Fathers' Engagement in Pregnancy and Childbirth: Evidence from a National Survey." *BMC Pregnancy and Childbirth* 13:70–85.
- Shah, Prakesh S., Jamie Zao, and Samana Ali. 2011. "Maternal Marital Status and Birth Outcomes: A Systematic Review and Meta-analyses." *Maternal and Child Health Journal* 15:1097–1109.
- Shulman, Holly B., Brenda Colley Gilbert, and Amy Lanksy. 2006. "The Pregnancy Risk Assessment Monitoring System (PRAMS): Current Methods and Evaluation of 2001 Response Rates." *Public Health Reports* 121:74–83.
- Sullivan, Kate, R. Kelly Raley, Robert A. Hummer, and Emily Scheifelbein. 2012. "The Potential Contribution of Marital-Cohabitation Status to Racial, Ethnic, and Nativity Differentials in Birth Outcomes in Texas." *Maternal and Child Health Journal* 16:775–84.
- Ventura, Stephanie J., and Christine A. Bachrach. 2000. "Nonmarital Childbearing in the United States, 1940–99." *National Vital Statistics Reports* 48:1–15.
- Young, Robin L., and Eugene Declercq. 2010. "Implications of Subdividing Marital Status: Are Unmarried Mothers with Partners Different from Unmarried Mothers without Partners? An Exploratory Analysis." *Maternal and Child Health Journal* 14: 209–14.
- Zeitlin, Jennifer A., Marie-Joséphine Saurel-Cubizolles, and Pierre-Yves Ancel, and EUROPOP Group. 2002. "Marital Status, Cohabitation, and the Risk of Preterm Birth in Europe: Where Births Outside Marriage Are Common and Uncommon." *Paediatric and Perinatal Epidemiology* 16:124–30.

Biographical Notes

Jennifer J. Barr, MD, MPH, FACOG, completed this work as a staff physician in the Department of Obstetrics and Gynecology at Sisters of Charity Hospital and an associate clinical professor with the State University of New York at Buffalo. Her interests include high-risk pregnancies and psychosocial determinants of health.

Lindsey Marugg, MD, is a second-year resident in the Department of Obstetrics and Gynecology at the State University of New York at Buffalo—Sisters of Charity Program.