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Alicia Edwards Date

The Impact of Insurance Type on Method of Delivery
in Westchester County, NY, 2011 – 2017

By

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Master of Public Health

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The Impact of Insurance Type on Method of Delivery in Westchester County, NY, 2011 – 2017

By

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Bachelor of Science
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An abstract of
A thesis submitted to the Faculty of the Rollins School of Public Health of Emory University in partial fulfillment of the requirements for the degree of Master of Public Health in Epidemiology
2022

Abstract

The Impact of Insurance Type on Method of Delivery
in Westchester County, NY, 2011 – 2017
By Alicia Edwards

Objective: Medicaid insures over 40% of the deliveries in the United States, and many of the insureds are at higher risk of poor pregnancy outcomes.[1] To determine whether this population is also at greater risk for cesarean delivery, we explore whether insurance type is associated with method of delivery. Since delivery practices vary by location and hospital, it is important to explore this association on a smaller scale. Thus, the objective of this study was to look at the association between insurer and method of delivery among individuals who delivered their babies at hospitals within the county Westchester County, New York.

Methods: Data for births occurring in Westchester County, New York, from 2011-2017 were obtained from the New York State Statewide Planning and Research Cooperative System (SPARCS). The primary exposure, Medicaid insurance, was considered for its impact on the primary outcome of cesarean delivery. Prevalence ratios were estimated using log binomial regression. We assessed whether the association between insurer and delivery method was modified by race, age, and delivery hospital, and controlled for confounding by mortality risk.

Results: Westchester County births for the period totaled 68,719, with 40 percent delivered by cesarean section, and 42 percent covered by Medicaid. For all cesarean deliveries, 98 percent were of minor mortality risk, the lowest risk category. There was no effect modification by age of the association between Medicaid and cesarean deliveries. Black, Other and White race categories showed a small inverse association between Medicaid and cesarean delivery. There was moderate inverse association between Medicaid and cesarean delivery for six hospitals. One hospital had a small positive association between Medicaid and cesarean section.

Conclusion: Since the prevalence of cesarean deliveries is greater in marginalized populations, which includes those more likely to be insured by Medicaid, we expected results to show a positive association between Medicaid and cesarean section. However, in some racial groups and some hospitals, we found a small to moderate negative association between Medicaid and cesarean section. Further exploration of this topic should include identified data to adequately analyze age and race and to examine whether any common comorbidities impact this association.

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~ Acknowledgements ~

First and foremost, I would like to extend gratitude to my Faculty Chair, Lauren Christiansen-Lindquist, PhD, Research Assistant Professor in the Epidemiology Department of Emory University's Rollins School of Public Health, for being a incredible support and providing invaluable guidance throughout this process. My utmost appreciation is also extended to my Field Advisor, Cheryl Hunter-Grant, LMSW, Retired Inaugural Executive Director of The Lower Hudson Valley Perinatal Network, a tremendous resource as a subject matter expert on the NYS maternal health arena. The thoughtful, challenging, wide-ranging feedback and input from this team of professionals enabled me to surpass my learning expectations, stretch as a writer, improve as an analyst, and grow as a person. Thank you, both. I am also grateful to the Thesis Advisor, Nicole Luisi, MPH, MS, Director, Data Analytics & Informatics Projects of Emory University's Rollins School of Public Health, for her respectful, thorough, and timely guidance regarding thesis procedures and requirements.

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I'd also like to extend thanks to Catrina Moye of West Hartford's Housing Authority who has extensive experience as a social worker and provided technical details regarding Medicaid and CHIP. Further, my appreciation is extended to Heather Brumberg, MD, MPH, FAAP and Christine Janeczko, both from the Regional Perinatal Center, Maria Fareri Children's Hospital at Westchester Medial Center for providing efficient and thorough information on the perinatal center's affiliate composition.

***

Finally, I'd like to thank my friends and family for their understanding, support, encouragement, laughter, kind words, and food: Owen, Ali, Ruby, Ethel, Dorothy, Andreas, Naomi, Charlotte, Cheryl B, Bianca, Cheryl F, Kenny, Denise, Trina, John, Angela, Rich, Clemon, Baldeh, Lynn, Benjamin, Kelechi.

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Chapter 1

Background and Literature Review

Cesarean Section History, World & National Public Health Significance

Maternal health is a global public health concern. The term maternal health refers to the state of a woman in the time-period spanning pregnancy, during childbirth, as well as postpartum. Cesarean section, C-section, or Cesarean births (also spelled Caesarean) are terms referring to the procedure where birth occurs via a surgical procedure through which the abdomen and womb is incised to remove the fetus and it dates back to ancient times.[2,3] The Egyptians, Greeks, Hindus, and Romans have referred to this method in folklore and Chinese etchings reflect the procedure performed on living women. It had been performed in Africa by native healers for several years prior to the first documented cesarean delivery in South Africa by a British military physician.[4] There are also historical accounts which tie the procedure to Julius Caesar and attribute the name to this historical figure, however, other accounts attribute the name to the Latin word 'caedere' meaning 'to cut'. [4–6] The earliest recorded procedures were often performed on dying women in an effort to save the fetus. The uterine walls were not sutured, and as a result, hemorrhage or infection would often lead to death. The procedure was often performed without anesthesia and considered an absolute last resort given that the maternal mortality rate ranged from 52 to 100 percent in the seventeenth and eighteenth centuries.[7 4]

Historically, the principal profession administering childbirth was midwifery, dominated by females who were perceived as uneducated.[8] Although both males and females performed such duties, there were far fewer men than women who practiced midwifery and the term 'man-midwife' was viewed as a disparaging term. Many men assumed the preferred French title 'accoucher'.[9] Eventually, man-midwifery took on the term 'obstetrics' coincident with patriarchy and paternalism influencing the childbirth experience. In Europe, childbirth evolved from a social ceremony where women gathered to manage the natural birth process to a medical event categorized as an 'illness' or 'disease', thereby steering care towards that which is rendered by

physicians and surgeons.[10] The Chamberlen brothers were leaders in transitioning the scope of midwifery by designing and introducing the first obstetrical forceps, guarding the design and usage of the implement as a family trade secret.[9] In the United States, a transition from midwifery to the obstetrical specialty was also facilitated in part by gender hierarchy. Male doctors typically entered the medical field working under an experienced physician as an apprentice. There were very few medical schools, and none of them allowed females to matriculate until the year 1847.[11] Male physicians used obstetrics as an avenue to solidify future business. The mantra '*deliver babies and you will have the family for life*' was the guiding principle for many male physicians.[12] Some obstetricians wanted to avoid competition from trained midwives who were predominantly female. Male physicians were able to differentiate themselves from midwives through their employment of surgical procedures such as extraction by forceps and cesarean section. In addition, Black midwives in particular, also known as granny midwives first arriving in the southern part of the United States in 1619 as enslaved Africans, had been facilitating the birthing process for centuries.[13,14] These women passed down their repository of skill and knowledge, cultivating expertise from grandmothers to mothers, daughters, and even neighbors. During the aforementioned transitional phase, medical journals reflected male physicians' vigorous support for the eradication of granny midwives, ultimately rendering the health services performed by Black midwives illegitimate. Another factor which aided the departure from midwifery in the birthing process involved White pregnant women themselves; wealthy pregnant women often sought out the higher level of expertise by male physicians often touted as superior due to their education and expertise with instruments, and the deliveries they facilitated were perceived to be for the elite class.[15] This distinction in expertise coupled with the concerted efforts to vanquish midwifery are key factors which spurred the

increase of the cesarean method of delivery in the United States. Surgical intervention increased in prevalence also as a result of larger fetuses and when modern monitoring device indicators for the mother or fetus warranted assisted delivery.[16] The pioneers of the cesarean method of delivery on living women in the United States were Dr. Jesse Bennet and Dr. Francois Marie Prevost. Dr. Bennett performed the procedure on his wife who agreed to the procedure as an alternative to a crainiotomy.[17] Beginning in 1830, Dr. Prevost honed his craft by performing 30 experimental, non-consensual cesarean section procedures on enslaved women in Louisiana. [18,19]

Global and National Statistics

Though the exact evolution and catalysts of the procedure have been debated, the prevalence of the cesarean method of delivery has realized a steep upward trajectory in recent years both domestically and internationally, and especially in wealthy countries. While cesarean deliveries do not have a positive or negative impact on infant mortality in affluent countries, maternal and infant morbidity increased in cesarean deliveries.[20] In addition, cesarean rates below 15 percent are associated with improving health outcomes. In 2016, the global rate for cesarean deliveries reached 24.5 percent.[21] It is estimated that by 2030, the global rate of births via cesarean section will be approximately 30 percent.[22] Domestically, the procedure has advanced from occurring in only 5 percent of deliveries in 1940 to a transitional point in the mid-1960s where the prevalence realized a marked increase which continues to current day. From 1965 to 1985, cesarean deliveries increased in the United States from 4.5 per 100 deliveries to 22.7 per 100 deliveries, an increase of over 500 percent, and by 1985, the annual total of live cesarean births reached 851,000.[23] While cesarean deliveries can be life-saving in situations where vaginal delivery poses grave risks, they can be detrimental to the health of both the mother and infant.[22]

Maternal Morbidity

Although in the US cesarean deliveries have grown significantly in prevalence since the first procedure was performed in the 1800s, they are perceived as routine procedures yet still categorized as major surgery. Cesarean sections are the most common surgical procedure for all hospital patients in the United States.[24,25] Evidence has shown that cesarean deliveries pose greater risks than vaginal births. Studies show the procedure is associated with a three to six times greater risk of severe complications compared to vaginal deliveries, with a more than two fold increase in bowel obstruction and incisional hernia.[26,27] Gynecological complications include chronic pain, pelvic adhesions from repeat procedures and organ injury.[7] Cesarean deliveries carry an increased risk of infection, hemorrhage, blood clots, injury to the intestines or bladder, uterine rupture, abnormal placentation, ectopic pregnancy, stillbirth and preterm birth.[27,28] Uterine rupture, in particular, can occur during labor or even prior to labor, and although rare, it can result in a fatal outcome for the mother.[7] Obesity, smoking and a prior cesarean delivery increase the risk of most complications.[27] Further, compared with vaginal deliveries, cesarean births are associated with increased long-term gynecological morbidity for birthing mothers.[26] While there is great risk for the mother after a cesarean delivery, the newborn can also experience health issues. When elective cesarean births occur in advance of labor, the infant can be premature and endure other health risks.[24] During cesarean deliveries, the fetus is not exposed to the beneficial hormones typically released by the mother during vaginal delivery. Short term risks for the infant include compromised immune development, increased probability of allergy, atopy, and asthma, and lowered intestinal gut microbiome diversity. Later life consequences include increased risk of adolescent obesity and asthma.[24,28]. These risks, when realized, can translate directly into economic consequences. Public and private health insurers

can incur significant financial implications for negative outcomes and postpartum complications which materialize in the form of claims payments to physicians and hospitals. The forecasted maternal morbidity cost for births occurring in 2019 through the fifth year of life total $32.3 billion (74 percent of which is connected to care for the child).[29] This figure encompasses healthcare as well as non-medical expenses such as loss of economic productivity, and increased use of social services. Maternal morbidity can have intergenerational health and economic impact. These facts and figures highlight the importance of examining the prevalence of cesarean births in the vein of insurance carrier, which will be explained in depth later in this section.

While patients and insurers incur financial consequences of these risks, health delivery systems could realize economic gains resulting from both cesarean deliveries and subsequent short and long-term complications for both the mother and child(ren). The reality of grave risks has implored researchers to explore the conditions which have led to the heightened prevalence of cesarean deliveries. The prevalence of cesarean deliveries varies based on the birth hospital. Studies have shown that the variation in prevalence of cesarean births among hospitals results from several factors which are not attributable to the health risks associated with women in their childbearing years, nor due to factors such as location, teaching status or hospital bed size.[25,30] Instead, the increase in cesarean deliveries is attributed to hospital unit culture, and clinician attitudes.[30] Further, studies have shown that cesarean deliveries are more common in for-profit hospitals compared to non-profit hospitals, suggesting that high prevalence for this procedure may, in part, be due to financial incentives.[31] A 2017 analysis of service costs showed that an increase in costs reimbursed by commercial insurers by one standard deviation was associated with a 31 percent increase in the likelihood of a cesarean delivery.[32] A 2020 study of 12.2 million deliveries found profits for cesarean sections ranged from approximately $5,000 to

$26,000. Those who delivered at hospitals ranked in the highest two quartiles of profit were more likely to have a cesarean delivery compared to those who delivered at hospitals ranked in the lowest quartile of profit.[32] While it is possible that profit margins drive childbirth delivery method, it is also possible that specific hospitals have higher prevalence due to the preference of mothers in the locale serviced by a given hospital.[32]

Medicaid and Private Insurance

The Center for Medicaid and CHIP services (CMCS) is the umbrella organization which governs the Medicaid and CHIP federal programs for healthcare. Medicaid was signed into law in 1965 and is funded on both the federal and state levels, providing health coverage to eligible low-income adults, disabled persons, children, and pregnant women.[1] Although CMCS outlines standard programmatic features, each state has unique differences in the offerings and administration of Medicaid.[33] CHIP, Children's Health Insurance Program, was established in 1997 and provides health coverage to children and families whose income exceeds the maximum limits for Medicaid eligibility and often cannot afford private insurance. In conjunction with CHIP, Medicaid is especially important because in addition to providing coverage for persons with very low-income, it also fills a coverage gap specifically for low-income women who would not meet the standard eligibility requirements for Medicaid coverage if they were not pregnant.

In 2018, Medicaid was the payer for the majority of maternity care claims, covering 42.3 percent of all United States' births.[1,34] In 2020, Medicaid and CHIP provided health insurance coverage for approximately 58 million persons or 17.8 percent of the U.S. population, with the majority of enrollees being female and 53 percent of enrollees aged 21 years or younger.[35,36] In 2019, 38.8 percent of enrollees were White, 30.4 percent Hispanic, 21.3 percent Black and 9.5 percent other races and ethnicities.[37] Those with Medicaid coverage have disproportionately low

educational attainment; in 2018, 62.6 percent of mothers covered by Medicaid had a maximum educational attainment of high school diploma or GED, substantially higher than the general population of 35.5 percent. In 2015, severe maternal morbidity rates for Medicaid recipients were substantially higher than those for privately insured women (175 and 120.8 per 10,000 hospital births, respectively).[38,39]

In New York State (NYS), Medicaid provides a multitude of benefits for eligible pregnant women including routine pregnancy medical check-ups, lab work, access to specialists, hospital care during pregnancy and delivery. In May 2022, the state passed legislation extending full health care from a duration of 60 days postpartum to a full year after delivery, coincident with the existent duration of health care for the infant.[40] In NYS, demographics for nonelderly Medicaid recipients differ from statewide demographics: 35.9 percent versus 61.6 percent White, 20 percent versus 12.4 percent Black, 30.3 percent versus 18.7 percent Hispanic 13.9 percent versus 7.3 percent other racial and ethnic groups.[41] [42] Notably, Black, Hispanic, and patients of other non-White races or ethnicities are overrepresented among Medicaid recipients.

Studies have shown that the type of insurance someone has impacts how much input mothers have in decisions around their own birth experiences.[43] After controlling for demographics and comorbidities, Medicaid-insured mothers in California were three times less likely to feel that they had the option to choose a vaginal or cesarean delivery than those with private insurance.

Previous Studies

Over the past decade, studies regarding maternal health and Medicaid have covered the impact of insurer on infant mortality, racial disparities in maternal morbidity and mortality, characteristics of outcomes for women with coronavirus SARS-CoV-2, Medicaid fee

differentials on the use of cesarean method of delivery between 1988 and 1992,[44] geographic variation in cesarean delivery rates by insurer,[45] the variation in cesarean delivery rates in private nonteaching hospitals compared to other hospital ypes,[46] and the source of payment for deliveries in a subset of US states.[45] A study published in 2005 used SPARCS, NYS Statewide Planning and Research Cooperative System, as a source for 1993 – 1996 data, and one component examined whether Medicaid increased the likelihood of cesarean deliveries, deemed an elective procedure.[47] The study found that the effect of insurance type varies between elective and non-elective procedure, and the effect is greater for elective procedures.[48] A study of cesarean rates in New England using data from 1990 to 1992 found that the cesarean prevalence for privately insured women was higher than that for women insured via Medicaid, at 15.71 percent and 14.35 percent respectively[49]. Lastly, a study examining New York City hospitals between 1996 and 2003 compared the cesarean delivery rates for privately insured women delivering at private hospitals compared to Medicaid insured women delivering at public hospitals[50]. While there has been research on the impact of insurer type and cesarean section, studies have not investigated cesarean rates by insurer, regardless of hospital type or considered rate variations by hospital.

Westchester County, New York

Westchester County, New York is the suburban region just north of the New York City boroughs. Census data for 2016-2020 report that Westchester County has just over 1 million residents, 51 percent of whom are female.[51] Racially, the community consisted of 73.2 percent White, 16.7 percent Black or African American, 6.5 percent Asian, and 3.6 percent other races. Ethnically, Westchester County had 25.5 persons of Hispanic or Latino origin. Of those aged 25 years or older, 86 percent were at least high school graduates and 49.7 percent attained a bachelor's or higher degree. Only 5.7 percent of residents under age 65 were without health insurance compared to the national level of 8.6 percent. Median household income was about

$99,500, and 7.6 percent of the population was in poverty. In 2016, 37.4 percent of births were cesarean delivery, an increase of 3.7 percent from 2015.[52] Also in 2016, Black women had the highest prevalence for cesarean deliveries with a rate of 40.7 percent compared to a prevalence of 37.6 percent among White women.

The hospitals in New York State operate on a system of regionalized perinatal services whereby each hospital is assigned to one of four categories which represent differing levels of perinatal care for pregnant women and infants: levels 1, 2, and 3, and the Regional Perinatal Center (RPC).[53] Level 1 Perinatal Centers service normal and low-risk patients. It is the only level which does not provide neonatal intensive care. Level 2 centers service moderate risk patients and level 3 centers provide care to those with complexities requiring higher level services. Each birthing hospital in NYS is mapped to one of 16 RPCs. These RPCs offer patients the most sophisticated level of care within each region,[54] and also provide education to support the hospitals designated to that region including24-hour consultation services and coordination of transfers for high-risk patients. The RPC located in Westchester County is Westchester Medical Center. Since complex cases are transferred to the RPC for higher level care, the volume of births occurring at the RPC is often noticeably larger in comparison to that of other hospitals in the designated region.[53] An important note is that NYS hospitals' affiliation with an RPC can be viewed as a business agreement, rather than an affiliation based on locale; this agreement can but does not necessarily conform to county lines. Hence, some birthing hospitals physically located in Westchester County may not be affiliated with Westchester Medical Center; conversely, some birthing hospitals physically located outside of Westchester County may have business agreements which link them to the Westchester Medical Center RPC.

The prevalence of cesarean deliveries has been a concern in Westchester County for some time. According to a 2010 report published by non-profit consumer advocacy group Public Citizen, even when comparing hospitals with the same designated RPC level of care, there is considerable variation between hospitals.[55] For example, Westchester Medical Center in Valhalla, NY, had a cesarean rate of 47.5 percent, more than twice that of Maimonides Medical Center, an RPC located in Brooklyn, NY, which had a rate of 20.9 percent. NYS had an overall cesarean delivery rate of 33.6 percent in 2019.[56] Considering all birthing hospitals in Westchester county, 75 percent had a 2019 cesarean delivery rate above the NYS rate.[57–64]

Efforts are underway to address maternal health, including high cesarean rates at the federal level. In July 2021, Majority Leader of the 117th Congress,[65] NYS Senator Charles Schumer, announced a three-part-plan to address maternal health which includes permanent Medicaid coverage for pregnant women and new mothers, postpartum coverage lasting for one year after birth, and expanding Medicaid to cover services from doulas and midwives.[66] The expansion to include midwifery is expected to have a direct impact on cesarean delivery rates since studies have shown that nurse-midwife managed deliveries had a significantly lower rate of cesarean sections compared to physician assisted deliveries.[67,68]

The city of Yonkers, NY, has recently received federal level focus for improvement of maternal health outcomes. Yonkers is located in lower Westchester County with a population of 209,500.[69] Demographically, it is much more racially and ethnically diverse than the county at large, and has only one birthing hospital.[69,70] In July 2021, Senate Majority Leader Schumer, supported by NYS Senate Leader Andrea Stewart Cousins presented a $990,000 grant award to St. John's Riverside Hospital to support its strategic plan for maternal health.[70] The plan was developed in conjunction with community partner Sister to Sister International, Inc. for several

maternal health outcomes, including cesarean delivery rates. In addition, Senator Schumer is an avid supporter of the proposed Black Maternal Health Momnibus Act of 2021 stating "*it's troublesome enough that the U.S. is falling behind the rest of the developed world when it comes to maternal health outcomes, but right here in New York, it's far worse than national statistics indicate…it's time to invest in our moms, pass life-saving legislation to improve national maternal health outcomes, support local maternal health organizations, and eliminate the unconscionable racial and ethnic disparities in outcomes that hurt minority women and families*".[71] Within one year after its passage, the legislation mandates oversight by the Government Accountability Office to ensure that funds are used to address maternal health outcomes, which includes specific language for recommendations and progress towards reducing the prevalence of cesarean deliveries.[72]

Given the global and national focus on achieving better health outcomes for women during pregnancy and delivery, and the role that Medicaid plays in insuring individuals at higher risk of poor pregnancy outcomes, it is important to understand whether there are differences in the delivery methods for those receiving Medicaid compared to those with alternate types of coverage. This is particularly important given that Medicaid has reimbursement differentials of 2 to 1 comparing cesarean to vaginal deliveries.[73] To explore the relationship between insurer and cesarean delivery at a granular level, we will analyze New York State SPARCS data for births occurring in Westchester County, New York from 2011-2017. Our objective is to investigate the association of Medicaid insurance with cesarean delivery.

Chapter 2

Journal Article

Abstract

Objective: Medicaid insures over 40% of the deliveries in the United States, and many of the insureds are at higher risk of poor pregnancy outcomes.1 To determine whether this population is also at greater risk for cesarean delivery, we explore whether insurance type is associated with method of delivery. Since delivery practices vary by location and hospital, it is important to explore this association on a smaller scale. Thus, the objective of this study was to look at the association between insurer and method of delivery among individuals who delivered their babies at hospitals within the county Westchester County, New York.

Methods: Data for births occurring in Westchester County, New York, from 2011-2017 were obtained from the New York State Statewide Planning and Research Cooperative System (SPARCS). The primary exposure, Medicaid insurance, was considered for its impact on the primary outcome of cesarean delivery. Prevalence ratios were estimated using log binomial regression. We assessed whether the association between insurer and delivery method was modified by race, age, and delivery hospital, and controlled for confounding by mortality risk.

Results: Westchester County births for the period totaled 68,719, with 40 percent delivered by cesarean section, and 42 percent covered by Medicaid. For all cesarean deliveries, 98 percent were of minor mortality risk, the lowest risk category. There was no effect modification by age of the association between Medicaid and cesarean deliveries. Black, Other and White race categories showed a small inverse association between Medicaid and cesarean delivery. There was moderate inverse association between Medicaid and cesarean delivery for six hospitals. One hospital had a small positive association between Medicaid and cesarean section.

Conclusion: Since the prevalence of cesarean deliveries is greater in marginalized populations, which includes those more likely to be insured by Medicaid, we expected results to show a

positive association between Medicaid and cesarean section. However, in some racial groups and some hospitals, we found a small to moderate negative association between Medicaid and cesarean section. Further exploration of this topic should include identified data to adequately analyze age and race and to examine whether any common comorbidities impact this association.

Introduction

The prevalence of the cesarean method of delivery has realized a steep upward trajectory in recent years both domestically and internationally, and especially in wealthy countries. While cesarean deliveries do not have a positive or negative impact on infant mortality in affluent countries, maternal and infant morbidity does increase in cesarean deliveries.[20] In addition, cesarean rates below 15 percent are associated with improving health outcomes. In 2016, the global rate for cesarean deliveries reached 24.5 percent.[21] It is estimated that by 2030, the global rate of births via cesarean section will be approximately 30 percent.[22] Domestically, the procedure has advanced from occurring in only 5 percent of deliveries in 1940 to a transitional point in the mid-1960s where the prevalence realized a marked increase which continues to current day. From 1965 to 1985, cesarean deliveries increased in the United States from 4.5 per 100 deliveries to 22.7 per 100 deliveries, an increase of over 500 percent, and by 1985, the annual total of live cesarean births reached 851,000.[23] While cesarean deliveries can be life-saving in situations where vaginal delivery poses grave risks, they can be detrimental to the health of both the mother and infant.[22] Cesarean sections are the most common surgical procedure for all hospital patients in the United States.[24,25] Evidence has shown that cesarean deliveries pose greater risks than vaginal births. Studies show the procedure is associated with a three to six times greater risk of severe complications compared to vaginal deliveries, with a more than two fold increase in bowel obstruction and incisional hernia.[26,27] Gynecological complications include chronic pain, pelvic adhesions from repeat procedures and organ injury.[7]

While there is great risk for the mother after a cesarean delivery, the newborn can also experience health issues. When elective cesarean births occur in advance of labor, the infant can be premature and endure other health risks.[24]

While patients and insurers incur financial consequences of these risks, health delivery systems could realize economic gains resulting from both cesarean deliveries and subsequent short and long-term complications for both the mother and child(ren). Studies have shown that cesarean deliveries are more common in for-profit hospitals compared to non-profit hospitals, suggesting that high prevalence for this procedure may, in part, be due to financial incentives.[31] A 2017 analysis of service costs showed that an increase in costs reimbursed by commercial insurers by one standard deviation was associated with a 31 percent increase in the likelihood of a cesarean delivery.[32]

In 2018, Medicaid was the payer for the majority of maternity care claims, covering 42.3 percent of all United States' births.[1,34] In 2020, Medicaid and CHIP provided health insurance coverage for approximately 58 million persons or 17.8 percent of the U.S. population, with the majority of enrollees being female and 53 percent of enrollees aged 21 years or younger.[35,36] In 2019, 38.8 percent of enrollees were White, 30.4 percent Hispanic, 21.3 percent Black and 9.5 percent other races and ethnicities.[37] Those with Medicaid coverage have disproportionately low educational attainment; in 2018, 62.6 percent of mothers covered by Medicaid had a maximum educational attainment of high school diploma or GED, substantially higher than the general population of 35.5 percent. In 2015, severe maternal morbidity rates for Medicaid recipients were substantially higher than those for privately insured women (175 and 120.8 per 10,000 hospital births, respectively).[38,39]

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Given the global and national focus on achieving better health outcomes for women during pregnancy and delivery, and the role that Medicaid plays in insuring individuals at higher risk of poor pregnancy outcomes, it is important to understand whether there are differences in the delivery methods for those receiving Medicaid compared to those with alternate types of payment. This is particularly important given that Medicaid has reimbursement differentials of 2 to 1 comparing cesarean to vaginal deliveries.[73] Further, studies have shown that the type of

insurance someone has impacts how much input mothers have in decisions around their own birth experiences.[43] To explore the relationship between insurer and cesarean delivery at a granular level, we will analyze New York State SPARCS data for births occurring in Westchester County, New York from 2011-2017. Our objective is to investigate the association of Medicaid insurance with cesarean delivery.

Methods

This study is an analysis of New York State Statewide Planning and Research Cooperative System (SPARCS) data from 2011-2017. This publicly available data source contains de-identified discharge data on patient characteristics, diagnoses, treatments, services, charges, and costs. Only records for Westchester County, NY were included in this analysis. Since these data are de-identified, this study is not categorized as human subjects' research. We received a determination that these data were exempt from IRB review by Emory University on May 24, 2022.

Individuals included in this study were patients whose discharge record was coded as pregnancy, childbirth, and the puerperium, and had a Patient Refined Major Diagnostic Category Description of: cesarean delivery, vaginal delivery, vaginal delivery w complicating procedure, vaginal delivery w sterilization &/or D&C, vaginal delivery w complicating procedures exc sterilization &/or D&C. Of the 10 birthing hospitals affiliated with the Westchester Medical Center RPC, only 2 are physically located in Westchester County, NY. Therefore, any mother whose care was initiated by non-affiliates and whose physical condition was designated as requiring the most sophisticated level of care was transferred to an RPC outside of Westchester County to manage the delivery. Discharge records for deliveries occurring in counties other than Westchester County, NY, were excluded from the analysis.

The primary exposure of interest in this study was primary payer, defined as Medicaid or a payer other than Medicaid. The outcome of interest in this study was method of delivery, defined as the birth of a child by either cesarean section or vaginal delivery. Factors considered for effect modification included age, race and hospital. The four age groupings used in this study were pre-defined in the de-identified data set: 0-17, 18-29, 30-49, and 50-69. Race groupings included Black, Multi, Other, Unknown, and White. Eleven unique hospital names were resultant upon refining the statewide data set to Westchester County. Hospital consolidations which occurred during the study period were identified, and hence, the final analysis reviews 9 hospitals, reflecting these consolidations. Additionally, we considered potential confounding by mortality risk, a standard field in the SPARCS file layout, which comprised of four categories: *minor, moderate, major*, and *extreme*. This variable was consolidated into two categories for analysis since the overwhelming majority of patients were categorized as having 'minor' level risk of mortality. Log binomial regression analyses was employed to estimate prevalence ratios and 95% confidence intervals using SAS® 9.4.

Results

Our overall descriptive statistics are provided in Table 1 in the Appendix of Tables and Charts. Notably, patients of black race comprised 21.08 percent of Medicaid insureds and 12.81 percent of all other payment types. The 18-29 age group made up 56.20 percent of Medicaid insureds versus 26.11 percent of those without Medicaid. The saturation of Medicaid insureds for 3 of the 9 hospitals (Montefiore New Rochelle Hospital, SJRH – St John's Division, and Westchester Medical Center) were markedly greater than the concentration of their patients in the non-Medicaid segment. Medicaid was the majority payer for the study population (Figure 1), and 40% of the deliveries occurring during the study period were cesarean (Figure 2). Considering patient age, the 0-17 age group had the largest percentage of Medicaid insureds

(Figure 3), and the 50-69 age group had the largest percentage of cesarean deliveries (Figure 4). For race, the Multi race category had the largest percentage of Medicaid insureds (Figure 5), and the Black race had the largest percentage of cesarean deliveries (Figure 6). Westchester Medical Center had the largest percentage of Medicaid insureds (Figure 7), and New York Presbyterian/Lawrence had the largest percentage of cesarean deliveries (Figure 8).

The interaction between age and Medicaid insurance was statistically significant, however, the prevalence ratios were nearly identical (Table 2). The prevalence ratios with 95 percent confidence intervals for the interaction between Medicaid and the 0-17, 18-29, 20-49, and 50-69 age groups with Medicaid were 1.01 (0.87, 1.18), 0.99 (0.97, 1.01), 0.98 (0.96, 0.99), and 1.01 (0.64, 1.61), respectively. There was a small inverse association between Medicaid and cesarean section for the Black, Other, and White racial groups. Results for 6 of the 9 hospitals showed a moderate protective effect for Medicaid on the outcome of cesarean delivery. One hospital, White Plains Hospital, had a small positive association between Medicaid and cesarean method of delivery.

Conclusion

This study was conducted to examine whether 2011-2017 deliveries in Westchester County, NY paid for by Medicaid were more likely to be delivered by cesarean than deliveries with other payers. We found that in some racial groups and some hospitals, there was a small to moderate negative association between Medicaid and cesarean section. This means that those patients whose deliveries were covered by Medicaid for some of the race groups and in some hospitals were *less* likely to have a cesarean section than those with alternate types of payment. In addition, our results showed that there was a small positive association between Medicaid and one of the hospitals, meaning that in that those delivering in that hospital were slightly more

likely to have a cesarean section. There was no evidence of effect modification of Medicaid by age.

This study is not without limitations. The first is that we did not have access to comorbidity data such as diabetes or preeclampsia status. Comorbidities such as these are known to have an impact on physicians' decision to choose the cesarean method of delivery. Controlling for these variables would provide more robust analysis results. The predetermined age categories do not align with maternal health age markers. The 30 – 49 age group is particularly limiting because it does not allow for separate analysis of prevalence ratios before and after a key turning point in maternal health, age 35. Women age 35 and older have greater odds of adverse maternal perinatal outcomes which can often result in cesarean deliveries.[74] Although county-level data indicate that only 3.6 percent of Westchester County residents are of other races, this category made up 43.1 percent of our study population. This suggests that we may have misclassification of race which may be masking disparities in cesarean deliveries.

A strength for this study is that the data are likely to be complete since NYS requires all hospitals to report discharge records to the state. In addition, these data were publicly available, and therefore, it was a very cost-effective research initiative. While there are many studies on cesarean deliveries, this is the first study that we are aware of that has explored how delivery payer, a social determinant of health, impacts this outcome. The population size was large, reducing the risk of random error and allowing for more precise estimates in this study.

Social determinants of health play a key role in health outcomes. Examining the impact of determinants such as Medicaid on maternal health outcomes is an important part of providing a foundation for developing policies which work toward maternal health equity. This study offers insight into the potential for this safety net program, which insures a vulnerable segment of the

population (lower socioeconomic status, lower educational attainment, disparate racial groups), and plays a role in maternal health outcomes. While our study results hint at a protective effect for women insured by Medicaid with respect to cesarean deliveries when considering race and birthing hospital, more in-depth analysis which considers key health factors not available in the data used for this study is needed to more completely assess the impact.

Chapter 3

Future Directions and Public Health Implications

Future Study

Further exploration of this topic should include identified data to adequately analyze age and race and to examine whether any of the common comorbidities impact the outcome. In addition, the inclusion of linked infant data would help to develop a more comprehensive assessment of effect modification by factors such as birth weight and gestational age. An analysis with access to information about whether a provider accepts Medicaid insurance would be useful for future studies as patients cared for by those providers would never have the opportunity to be "exposed," and thus should be excluded from the analyses.

Public Health Implications

Across New York State and in Westchester County, in particular, legislative leaders, health departments, birthing hospitals as well as local community groups are collectively working to combat maternal morbidity, mortality, and disparities. As hospitals in the county heed recommendations from the State Department of Health's Maternal Mortality Review Board (MMRB) and Maternal Mortality & Morbidity Advisory Council (MMMAC) to incorporate AIM bundle (the Alliance for Innovation on Maternal Health's structured care improvement process) as a standard in effort to reduce cesarean delivery rates, information gleaned from this study serves to inform procedural enhancements to ensure insurance provider does not impact the delivery method chosen for the birth of a child.

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Appendix of Tables and Charts

Table 1

N = 68,719

	Medicaid		Non-Medicaid*		Total
	N	*Percent*	*N*	*Percent*	*N*
Race					
Black	6,093	21.08	5,099	12.81	11,192
Multi	42	0.15	28	0.07	70
Other	13,767	47.64	15,863	39.84	29,630
Unknown	170	0.59	473	1.19	643
White	8,827	30.54	18,357	46.10	27,184
Age					
0 to 17	517	1.79	108	0.27	625
18 to 29	16,240	56.20	10,397	26.11	26,637
30 to 49	12,138	42.00	29,295	73.57	41,433
50 to 69	4	0.01	20	0.05	24
Hospital					
Hudson Valley Hospital Center	977	3.38	1448	3.64	2,425
NY-Presbyterian/Lawrence Hospital Center*	2,844	9.84	7714	19.37	10,558
Montefiore New Rochelle Hospital*	5,343	18.49	2,128	5.35	7,471
New York-Presbyterian/Hudson	1345	4.65	1736	4.36	3,081
Northern Westchester Hospital	2,360	8.17	8,436	21.19	10,796
Phelps Memorial Hospital Assn	3,703	12.81	3,155	7.92	6,858
SJRH - St Johns Division	6,304	21.81	3,104	7.80	9,408
Westchester Medical Center	4,354	15.07	1,514	3.80	5,868
White Plains Hospital Center	1,669	5.78	10,585	26.58	12,254
Discharge Year					
2011	4,085	14.14	6,367	15.99	10,452
2012	4,045	14.00	5,991	15.05	10,036
2013	4,147	14.35	6,093	15.30	10,240
2014	4,333	14.99	5,485	13.77	9,818
2015	4,347	15.04	5,234	13.14	9,581
2016	3,902	13.50	5,329	13.38	9,231
2017	4,040	13.98	5,321	13.36	9,361
Mortality Risk					
Extreme	18	0.06	14	0.04	32
Major	49	0.17	56	0.14	105
Moderate	254	0.88	240	0.60	494
Minor	28,578	98.89	39,510	99.22	68,088

** Non-Medicaid includes any payer other than Medicaid, including self-pay*

*** Consolidated category based on matching Facility ID*

Figure 1: Method of payment

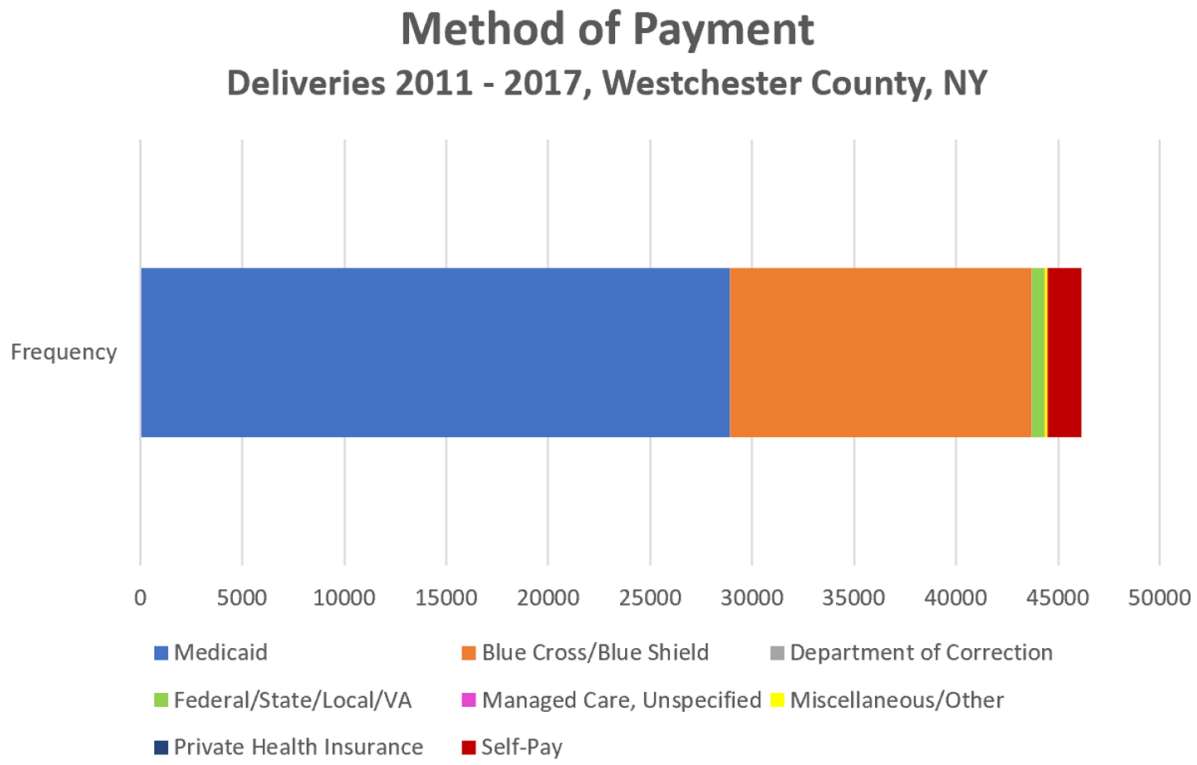

Figure 2: Comparison of Frequency Cesarean to Vaginal Deliveries

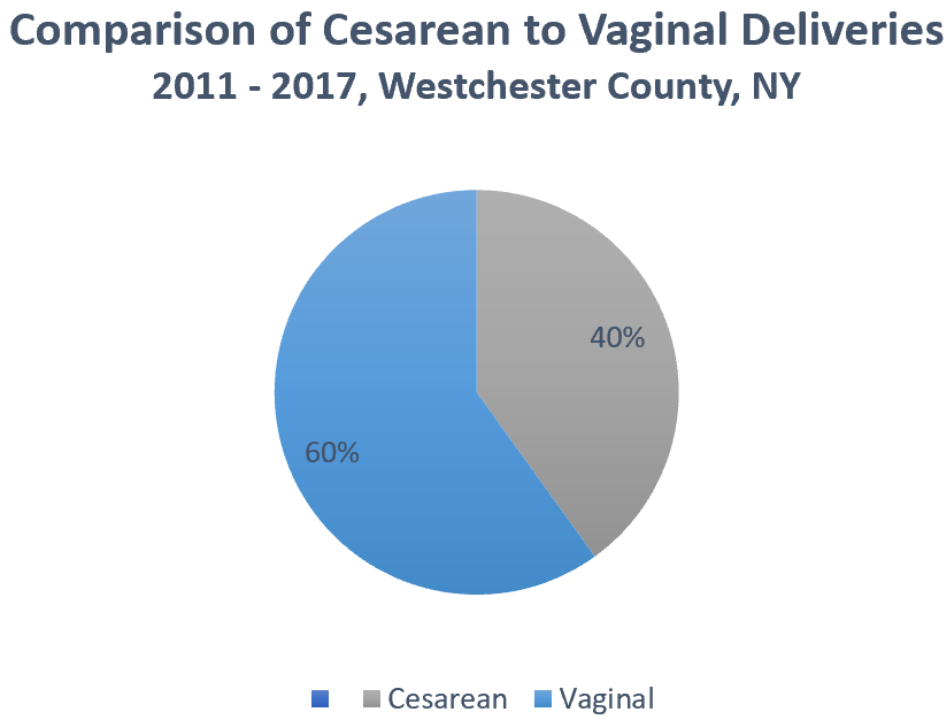

Figure 3: Medicaid Insured Deliveries by Age

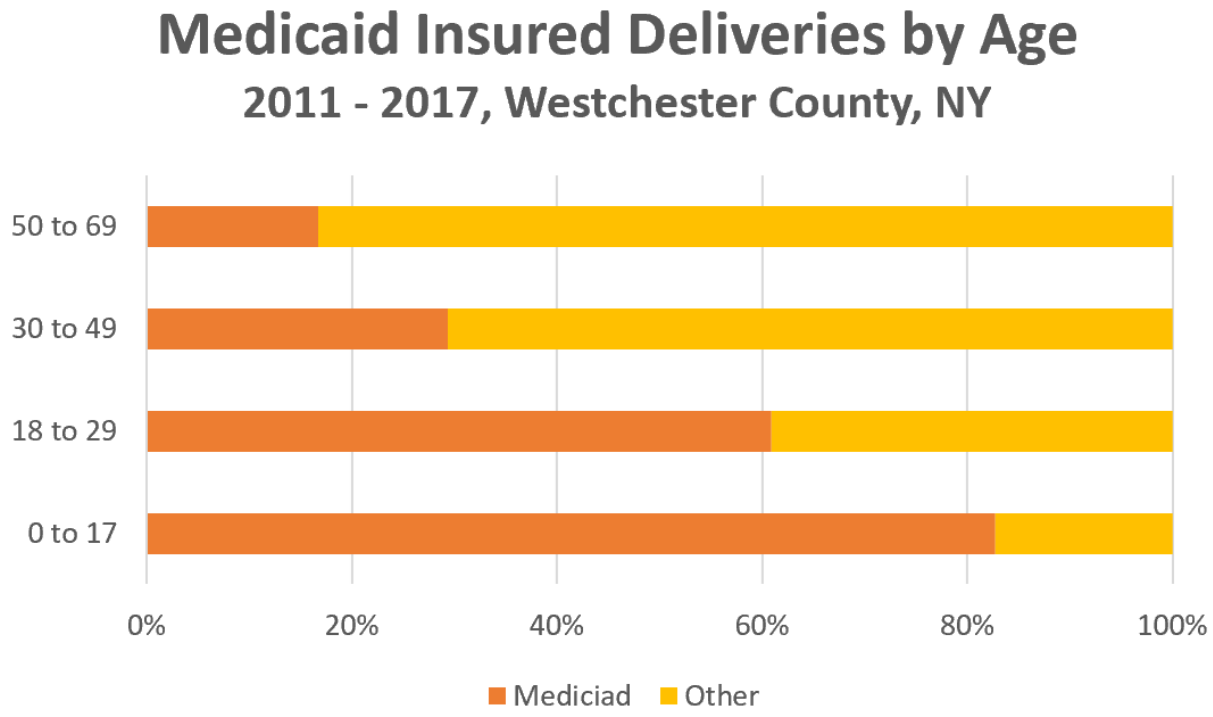

Figure 4: Cesarean Deliveries by Age

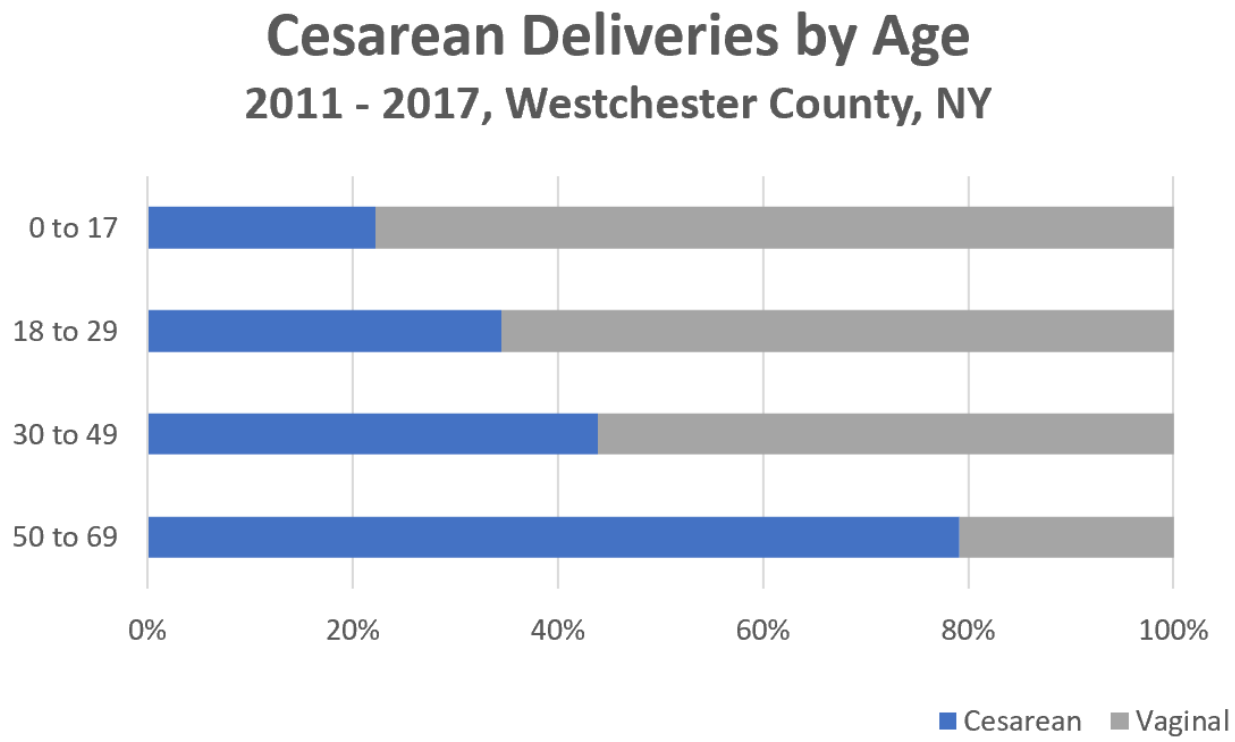

Figure 5: Medicaid Insured Deliveries by Race

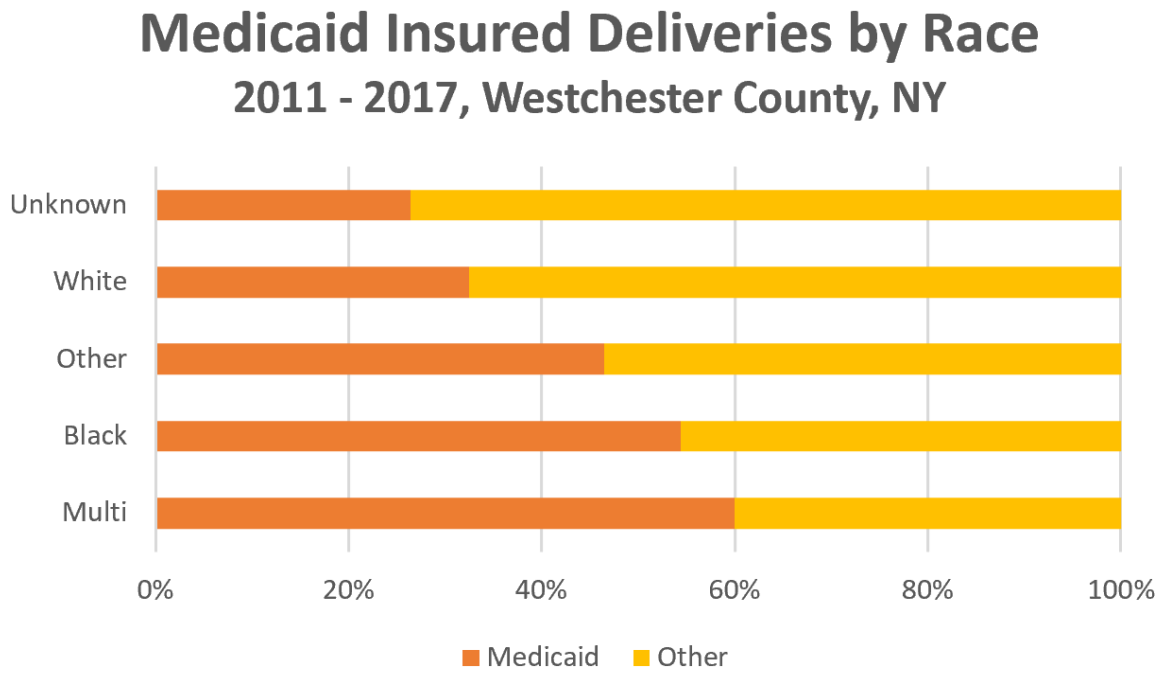

Figure 6: Cesarean Deliveries by Race

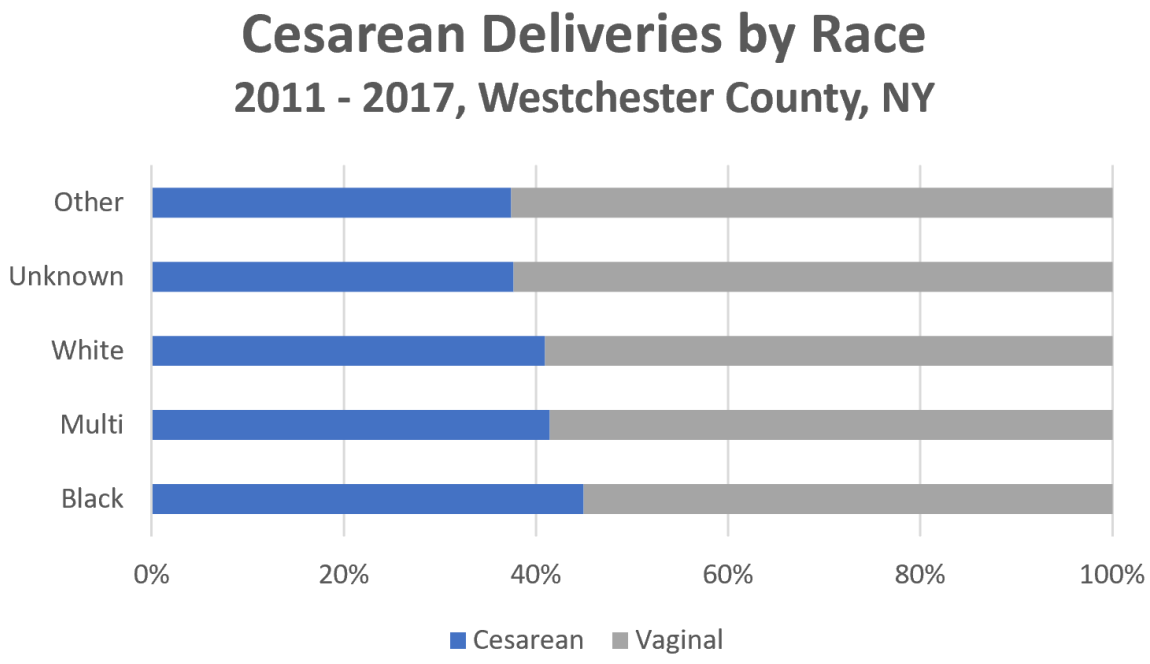

Figure 7: Medicaid Insured Deliveries by Hospital

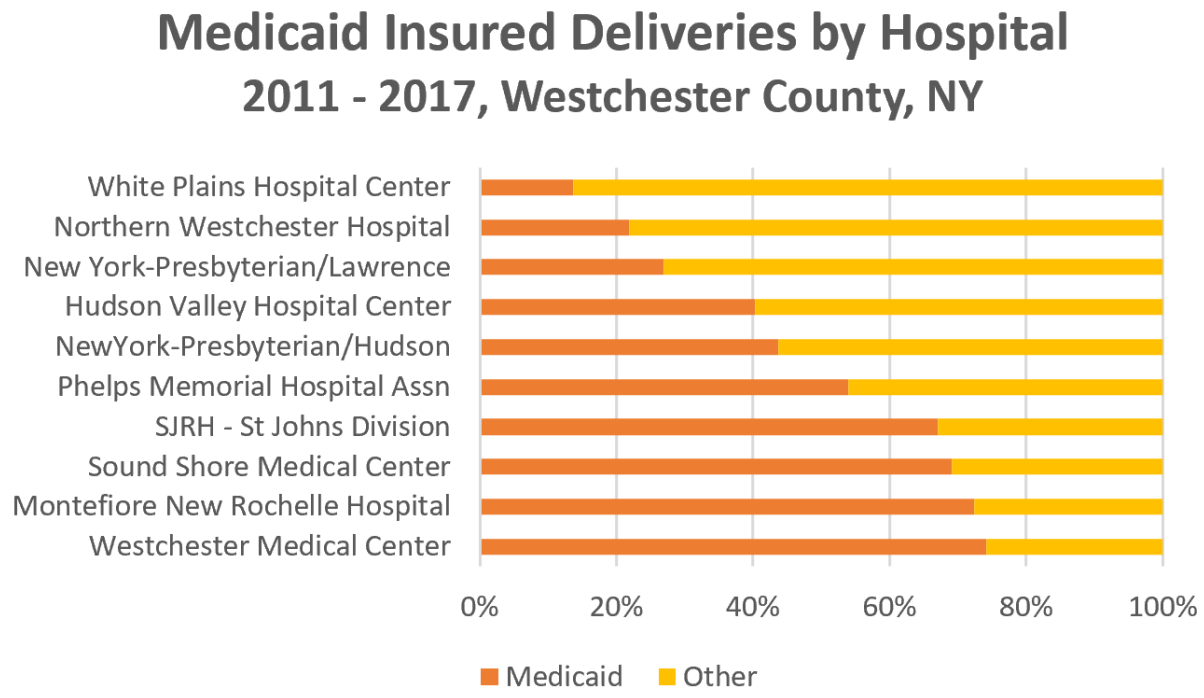

Figure 8: Cesarean Deliveries by Hospital

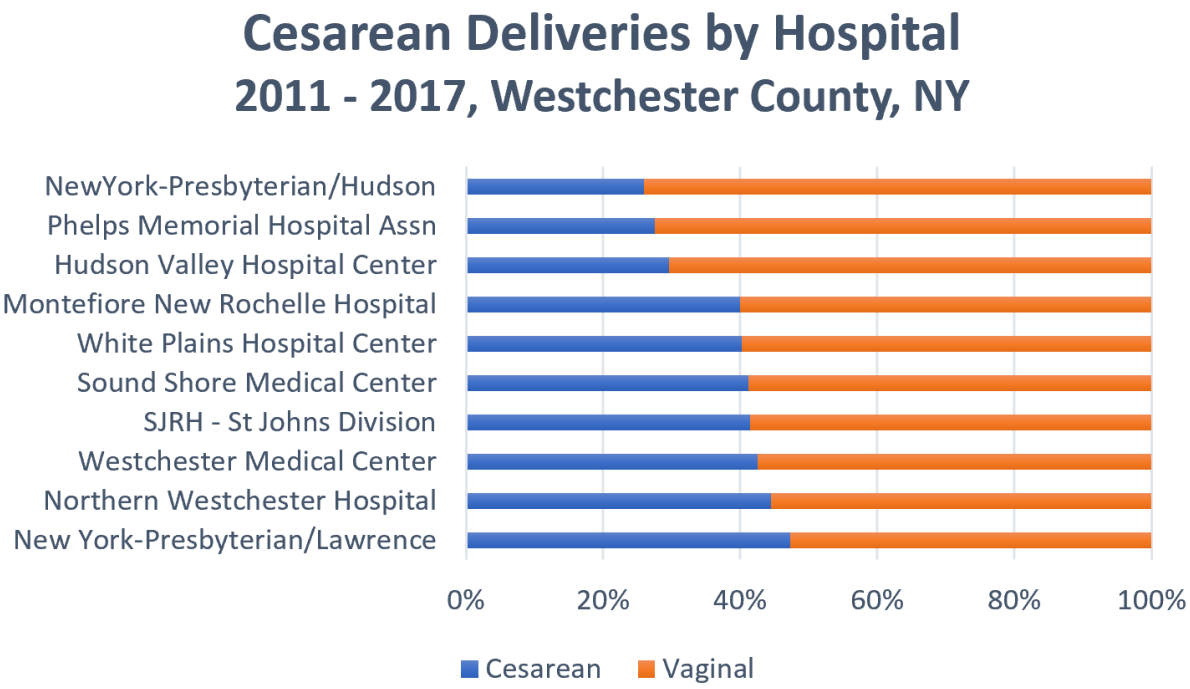

Table 2: Interaction Assessment

	Interaction Assessment	
	PR (95% CI)	**P-value for Interaction**
Age**		**<.0001**
0-17 years	1.01 (0.87, 1.18)	
18-29 years	0.99 (0.97, 1.01)	
30-49 years	0.98 (0.96, 0.99)	
50+ years	1.01 (0.64, 1.61)	
Race**		**0.0812**
Black	0.89 (0.85, 0.92)	
Multi	1.27 (0.70, 2.30)	
Other	0.87 (0.85, 0.90)	
Unknown	1.16 (0.93, 1.43)	
White	0.87 (0.84, 0.89)	
Delivery Hospital***		**<.0001**
Hudson Valley Hospital Center	0.77 (0.67, 0.87)	
New York-Presbyterian/Lawrence	0.88 (0.84, 0.92)	
Montefiore New Rochelle Hospital	0.98 (0.92, 1.04)	
New York-Presbyterian/Hudson	0.75 (0.66, 0.85)	
Northern Westchester Hospital	0.77 (0.73, 0.82)	
Phelps Memorial Hospital Assn	0.88 (0.82, 0.96)	
SJRH - St Johns Division	0.86 (0.82, 0.90)	
White Plains Hospital Center	1.08 (1.02, 1.15)	
Westchester Medical Center	0.95 (0.89, 1.01)	

** controlling for hospital, race, and mortality risk*
*** controlling for age, hospital, and mortality risk*
**** controlling for race, age, and mortality risk*