

Exploring The JJ Way®: A Model of Care for Reducing Disparities and Improving Perinatal
Health

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Abstract

Extreme racial disparities exist in birth outcomes in the U.S. “The JJ Way®” is a model of prenatal care designed by midwife Jennie Joseph to reduce health disparities and adverse birth outcomes, such as preterm birth and low birth weight infants. This study compared the outcomes of patients who participated in The JJ Way® to outcomes in a matched comparison group from Florida Vital Statistics of women who took part in standard prenatal care. A historical comparison group was created by matching age, race, and zip code; outcome measures included gestational age at birth and infant birth weight. The results show that the women who had The JJ Way® model of care had marginally statistically significantly higher gestational age (38.9 weeks versus 37.9 weeks, $p=0.07$) than the women who went through standard prenatal care, but their infants’ birth weights were not significantly higher (3359.4 grams versus 3265.9 grams, $p=0.41$). The JJ Way® women also had fewer preterm infants (4.5% overall) than the women who had standard prenatal care (14.9%, $p=0.04$). When outcomes were analyzed by race, there were no statistically significant differences between White women in the two groups in gestational age (38.7 weeks in The JJ Way® group versus 38.5 weeks in the standard care group, $p=0.60$) or birth weight (3373.6 grams in The JJ Way® group versus 3419.0 grams in the standard care group, $p=0.20$). There were statistically significant differences for Women of Color for mean gestational age and preterm birth rate. The JJ Way® Women of Color group had higher gestational age than their counterparts who had standard prenatal care: 39.0 weeks versus 37.4 weeks, $p=0.03$. They also had no preterm births versus 17.1% in the standard care group ($p=0.01$). A secondary analysis was conducted comparing White women to African American women only. The sample size was small, although the magnitude of differences were striking,

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none of them were statistically significant. In the group receiving standard prenatal care, rates of preterm birth were 12.5% for White women versus 15.0% for African American women ($p=0.10$), and rates of low birth weight were 3.1% for White women versus 5.0% for African American women ($p=1.00$). In the group receiving The JJ Way® model of prenatal care, differences were also non-significant but in the opposite direction: rates of preterm birth and low birth weight were both 9.4% for White women and 0% for African American women, ($p=0.28$). According to the results of the primary study, the care that Women of Color, in particular, are receiving in The JJ Way® model results in outcomes that are superior to those of their counterparts who are experiencing standard prenatal care. Given the decades of unsuccessful progress on reducing rates of preterm birth, low birth weight, and infant mortality in the U.S., The JJ Way® model's success is noteworthy. It should be supported, funded, and larger studies should be conducted.

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The United States ranks 131st out of 184 countries in preterm birth (March of Dimes, 2011), placing it behind Canada, the UK, and France, as well as Afghanistan, Mali, and the Democratic Republic of the Congo. Despite spending a higher percentage of its gross domestic product (GDP) on healthcare than any other country in the world (World Health Organization, 2011), the U.S.'s infant mortality rate remains higher than most other developed countries (Central Intelligence Agency, 2012).

Infant mortality is an important public health metric used widely to assess the overall health and well-being of a population. Preterm birth (PTB), defined as birth prior to 37 weeks gestation, is the world's leading cause of infant mortality (Sowards, 1999), and the second leading cause of child mortality after pneumonia (World Health Organization, 2012). Furthermore, preterm birth carries long-term health consequences and confers increased risk for significant lifetime morbidities, including chronic lung disease, vision, hearing, and neurosensory impairment, cerebral palsy, and reduced cognitive and motor performance (Gabbe, 2009). In addition to the health consequences for these vulnerable infants, preterm birth presents a major societal cost. The Institute of Medicine (IOM) estimates the economic burden of preterm birth in the U.S. to be at least \$26 billion per year (Butler, Santa & Cox, 2006). Approximately two-thirds of this amount is for the medical treatment required at birth and in early infancy.

Another critical health indicator at the beginning of life is birth weight. Prematurity and low birth weight often co-present, but full term infants can also be of low birth weight. Low

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birth weight (LBW), defined as less than 2500 grams or 5.5lbs, is associated with increased rates of diabetes, coronary heart disease, respiratory illness, and hypertension in adult life (Nazroo, 2003). Even infants who make it to full term gestation can be born at LBW and are susceptible to these health challenges.

This vulnerable start to life does not afflict all populations equally in the U.S., however. Racial and economic disparities in the rates of preterm birth and low birth weight have been documented for decades. African American women have higher rates of PTB and LBW infants than any other racial group in the U.S. According to the Center for Disease Control (CDC), in 2010, the PTB and LBW rates for non-Hispanic Black women were 17.2% and 13.5% respectively, compared to 10.8% and 7.1% for non-Hispanic White women, the most common referent group. This amounts to a 59.3% higher preterm birth rate and a 90.1% higher rate of low birth weight in the Black population over the White population (Hamilton, Martin & Ventura, 2011). Rates of low birth weight and preterm birth also vary by socioeconomic status (SES), with disadvantaged SES placing women at higher risk to deliver preterm and low-birth weight infants (Committee on Understanding Premature Birth...2007; Reichman, 2005). Closing the racial and economic gap in these critical health indicators is imperative, as is lowering the overall rates of PTB and LBW for all infants.

While economic disparities are fairly straightforward given the well-documented economic gradient in health (Braveman, 2012), there is debate over the explanation for the racial disparities. Despite the fact that race as a genetic conceptualization has been refuted by a wealth of research in molecular biology over the past thirty years (David & Collins, 2007), some researchers still maintain a genetic explanation with reasoning such as, “African American women suffer twice the rate of preterm birth compared with Caucasians even when confounding

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social and economic variables are controlled for” (Dizon-Townson, 2001, p. 1). Black immigrants have better outcomes than African Americans, but their outcomes become worse with increased time in the U.S. and across subsequent U.S.-born generations (David and Collins, 1997.) This evidence of an association between Black immigrants’ duration of stay in the United States and their progressively worse reproductive outcomes points to factors related to the psychosocial experiences of Black women living in America (Dominguez, 2010). In their 2007 article, David and Collins pose this question, “Can all or even most of the multifaceted social, economic, political, and historical effects of racial discrimination be adequately ‘controlled for’ with the variables commonly measured” (p. 3)? Having little concrete evidence to consistently account for these race-based disparities, suggesting a genetic predisposition is easier than attempting to quantify the complex social mechanisms at play.

Arline Geronimus argues that race-based health disparities are a product of longstanding social and economic inequalities, which manifest over time in differential health outcomes (Geronimus, 2006). This framework for understanding the reproductive disadvantage of the African-American population has been referred to as the “weathering hypothesis” (Geronimus, 1992). The stress of racism and discrimination, living in under-resourced communities, inadequate health care or inadequate access to it, and structural inequalities that limit upward mobility act in concert over an individual’s lifetime to produce a “weathering” effect on African Americans’ overall and reproductive health. A robust body of research exists linking chronic stress to adverse pregnancy outcomes, (Jaffee & Perloff, 2003; Ruiz, Fullerton, & Dudley, 2003; Loomans, van Dijk, Vrijkotte, van Eijsden, Stronks, Gemke, & Van den Burgh, 2012; Wadhwa, Culhane, Rauh, Barve, Hogan, Sandman...& Glynn, 2001) and specifically to preterm birth and low birth weight infants. Research investigating racism as a predictor of cortisol levels (the

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stress hormone) and its subsequent and deleterious impact on birth outcomes is growing (Huizink, Robles de Medina, Mulder, Visser & Buitelaar, 2003; Bolten, Wurmser, Buske-Kirschbaum, Papoušek, Pirke & Hellhammer, 2011). Findings from numerous studies in the last decade authenticate the theory that African Americans' self-reported experiences of racism are independent predictors of this population's birth outcomes (Collins, David, Symons, Handler, Wall, & Dwyer, 2000; Dominguez, Dunkel-Schetter, Glynn, Hobel, & Sandman, 2008; Giscombé & Lobel, 2005; Mustillo, Krieger, Gunderson, Sidney, McCreath, & Kiefe, 2004). Specifically, experiences of racism are consistently associated with preterm birth and low birth weight infants (Mustillo, Krieger, Gunderson, Sidney, McCreath, & Kiefe, 2004). In this paradigm, race is viewed as a marker for differential social privilege rather than for genetic vulnerability.

The March of Dimes describes reducing preterm birth rates as “an urgent priority” which is essential in order to reach the United Nations' (2011) Millennium Development Goal of reducing child deaths by two thirds by 2015. The CDC cites preterm birth as a “growing public health concern.” Preterm birth, low birth weight, and the economic and racial disparities found in these health problems have been on the national public health agenda, *Healthy People*, for decades (March of Dimes, 2011). Despite this prioritization, there has been no appreciable change in the birth outcome disparities between Black and White groups (Ananth, Misra, Demissie, & Smulian, 2001). Figure 1 illustrates the disparity in preterm birth rates between groups over the last decade. The data is from National Vital Statistics (NVSS) and organized into groups that NVSS calls “non-Hispanic Whites” and “non-Hispanic Blacks.”

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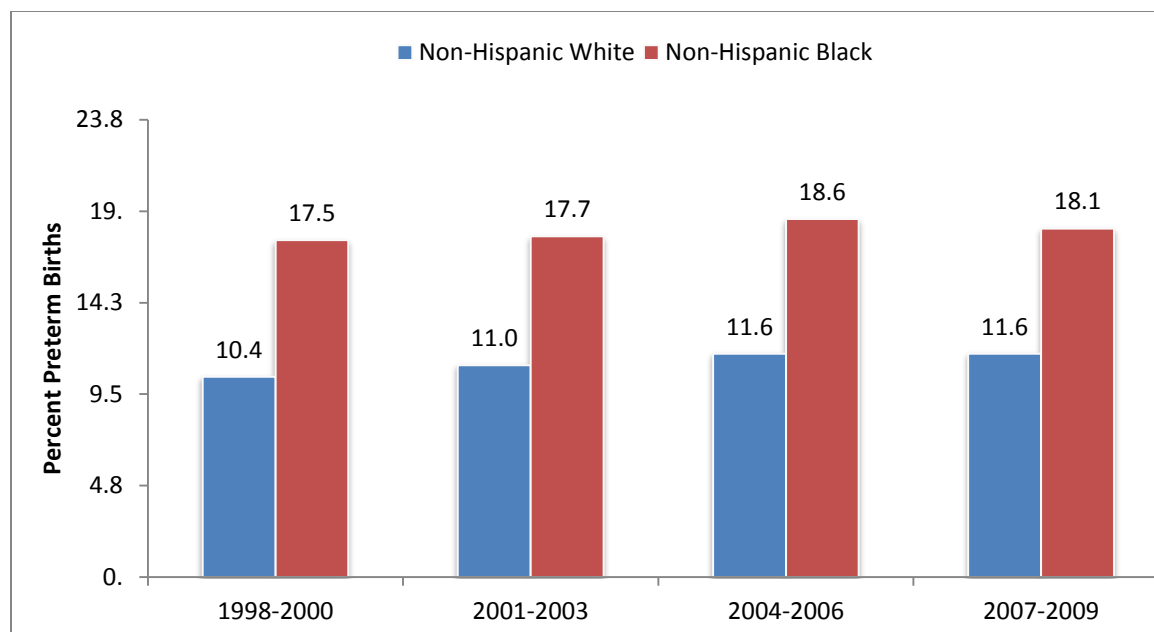


Figure 1. Comparison of preterm birth rates in the U.S. between non-Hispanic white women and non-Hispanic black women, 1998-2009. (National Vital Statistics, 2009).

The disparities are similarly stark for low birth weight rates between groups. To address the disparities and improve maternal and child health, attention has been focused largely on increasing the rates of women who receive adequate prenatal care and improving adherence to prescribed health behaviors during pregnancy (Kogan, Martin, Alexander, Kotelchuck, Ventura, & Frigoletto, 1998). This strategy makes sense, as prenatal care has been widely accepted as a critical component of achieving healthy pregnancy outcomes (National Institute of Health, 1989). However, research is demonstrating that the model and components of prenatal care make a significant difference in birth outcomes (Hatem, Sandall, Devane, Soltani, & Gates, 2009; Ickovics, Kershaw, Westdahl, Rising, Klima, Reynolds, & Magriples, 2003) and that the U.S. must evaluate the efficacy of its care, and a woman's ability to access care. There is also a growing recognition of the limits of prenatal care to achieve improved birth outcomes and attention is being turned to preconception and internatal (between pregnancies) care, with focus

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on wellness promotion and risk reduction (Lu et. al., 2006). Moreover, if the goal of health equity and eliminating disparities is to be realized, substantial change needs to take place in the way maternal and child health is delivered.

Alternative prenatal care models have emerged in response. Some programs are showing potential; they are taking multidimensional approaches and are incorporating health education, community support, and increased access to care. Because pregnancy and birth require immense psychological and emotional adaptation, some models have expanded the scope of care beyond the traditional medical components to include the psychosocial well-being of the mother and baby. Nurse-Family Partnership® and CenteringPregnancy® are examples of these alternative models and are discussed further later.

The results from a preliminary evaluation of one program in particular, The JJ Way®, are promising and worthy of further exploration. The program is a holistic, empowerment-based intervention strategy developed by Jennie Joseph, a UK-trained midwife. The JJ Way® program incorporates prenatal health care with education, group support, and, perhaps most critically, free access to care for all those who are uninsured or underinsured. Jennie Joseph (2007) describes the key methodological components of the The JJ Way® health care delivery system: “prenatal bonding through respect, support, education, encouragement and empowerment” (p.1).

Specific Aims

The objective of this Master’s thesis was to analyze and compare the birth outcomes of patients who participated in The JJ Way® with a matched comparison group of women from vital statistics records with the same zip codes, age, and race, who received standard prenatal care.

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The birth outcomes that were measured were gestational age at birth and birth weight of the infant.

The researcher hypothesized that The JJ Way® is a more effective model of care than traditional prenatal services for reducing adverse birth outcomes in at-risk populations such as African American women and low-income women.

After completion and approval of this thesis, the researcher, along with her committee, intends to prepare the data to present for review and publication in a peer-reviewed journal.

Literature Review

In this century, prenatal care has been widely accepted as a critical component of achieving healthy pregnancy outcomes (Partridge, Balayla, Holcroft, & Abenheim, 2012). One eight-year study of nearly 30 million women found that inadequate prenatal care was associated with increased rates of preterm birth (Partridge, et.al., 2012). Another study reported that compared to those with health insurance, African American women who were uninsured and therefore who had a lack of access to adequate prenatal care were considerably more likely to give birth to a low birth weight infant (Jaffee & Perloff, 2003). For these reasons, some programs aim to facilitate increased access to care.

Healthy Start is a federally funded national association that provides an array of community-based maternal and child health services aimed at reducing infant mortality and improving perinatal outcomes (National Healthy Start Association, 2011). Healthy Start disburses grants for the delivery of perinatal public health services in areas of the U.S. that have high infant mortality rates. Pregnant low-income (at or below 200% of the federal poverty level) uninsured women are eligible for the program and are covered for standard prenatal and postpartum care. A recent assessment of Arizona's division of the program revealed that

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Healthy Start participants were twice as likely to have a normal birth weight infant (>2500g or 5.5lbs) than those not participating in the program (Hussaini, Holley, & Ritenour, 2011). While Healthy Start appears to be targeted correctly and has the right aims and processes in place, there are still barriers to many women freely accessing the needed medical services. In order to be enrolled in Healthy Start in some counties, a woman needs to be referred by her obstetrician (OB) or Primary Care Provider (PCP) (Healthy Start Coalition of Orange County, n.d.), which, given the uninsured and low-income status of the women who qualify for the program, many of them do not have an OB or PCP and therefore cannot be referred and enrolled. This loop hole limits access for many at-risk women.

In order to provide nurturing care that addresses both the psychosocial and health care needs of pregnant women, models of care that include health education and community support have been developed. One such model is CenteringPregnancy®, which combines the standard prenatal care exam with group support and health education (Centering Healthcare Institute, 2009). Eight to twelve women with similar gestational ages meet together to learn care skills, participate in a facilitated discussion, and develop a support network with the other group members. The practitioner performs physical health assessments on each participant during the group time. Research and program evaluations are revealing high satisfaction rates, excellent compliance with care, and lower rates of preterm birth, particularly among pregnant adolescents (Grady & Bloom, 2004). CenteringPregnancy® has also had positive perinatal outcomes from their work in busy public health clinics that serve predominantly low-income African-American women (Klima, Norr, Vonderheid, & Handler, 2009). These results speak to the potential for more comprehensive models to play a critical role in improving maternal and child health.

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Nurse-Family Partnership® is another care model that is producing positive outcomes in at-risk populations. The program has not been evaluated for its success with racially marginalized groups specifically; it was designed to reduce the risk of health problems in children born to nulliparous (first-time) women who are teenagers, single mothers, or of low socio-economic status. The program utilizes public health nurses to conduct supplemental home visits during the prenatal period and up to two years postpartum. Nurse-Family Partnership® relies on three core beliefs to deliver better health outcomes. First, self-efficacy – the nurses help the new moms set realistic goals and then boost their confidence in their ability to accomplish those goals. Second, human ecology – each patient is seen in the broader social and environmental context of their family, neighborhood, community, and culture and coached on negotiating and regulating their environment. Third, attachment theory – the nurses promote sensitive and nurturing parenting through direct teaching and modeling. The program has had positive impacts on both birth weight and gestation length (Olds, Henderson, Tatelbaum, & Chamberlin, 1986).

The JJ Way® is a holistic prenatal care model that was developed in response to the poor perinatal outcomes and health disparities in Orange County, Florida. Jennie Joseph, a UK-trained midwife practicing in Florida, is the founder of The JJ Way® and director of The Birth Place, a free-standing birth center. The Birth Place houses the Easy Access Clinic, which operates under The JJ Way® model of care and runs two days each week. The Easy Access Clinic provides prenatal care, birth support, and postpartum care in addition to extended educational and support services to women regardless of their insurance status, choice of delivery site or practitioner, or ability to pay.

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It is the goal of The JJ Way® to achieve positive pregnancy outcomes for low-income and marginalized women who are uninsured or underinsured. The JJ Way® achieves this goal through its four main tenets: access, connection, knowledge, and empowerment (J. Joseph, personal communication, June 22, 2012). No woman is ever turned away from care. The JJ Way® is team-oriented in its approach; the administrative staff and health educators are viewed as critical members of the care team for the patient, who together with the midwives and nurses, are invested in achieving healthy reproductive outcomes. The patient's family is invited to participate in the prenatal care process and is viewed as essential to helping achieve the goal of a full-term, normal birth weight infant. Joseph's clinic is brightly colored and artfully decorated. The waiting room is full of engaging educational materials, a video corner that plays relevant educational films and a play area for children. Because of the high volume of patients that Joseph and her team see in a day, women often have to wait for some time for their appointment. This time is intentionally used by Joseph's health educator and lactation consultant, who mingle with the women and their families in the waiting room and discuss common discomforts in pregnancy, parenting issues, breastfeeding successes or challenges, and respond to questions the women or their families have. Joseph and her team recognize that a pregnant woman should not be isolated but should have the support of her family and community in the monumental life event of childbearing. They invite family members to come to prenatal visits and be active supporters of the mother throughout her pregnancy and birth. Joseph and her team work at creating connection with and between the patients and their families, empowering them through personalized education, and connecting them with community resources.

Preliminary Research on The JJ Way®

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During 2006 and 2007, the Health Council of East Central Florida conducted a program evaluation of The JJ Way®. One hundred patients from Joseph's Easy Access Clinic (which adheres to The JJ Way® model and is part of Jennie Joseph's non-profit "Commonsense Childbirth") were enrolled in the evaluation study and followed throughout their pregnancy and delivery. Every patient at the Easy Access Clinic was solicited for participation in the study; the first 100 women that opted to participate were given consent forms and enrolled in the study. Of the 100 women, 46 self-identified as White, 29 as African American, 17 as Hispanic, and 8 as Asian, Haitian, or West Indian. Though Hispanic is considered an ethnic group, rather than a racial group, in this discussion it is referred to that way since the Health Council coded it as a race in their evaluation. The Health Council staff created data collection tools for the Easy Access Clinic staff to use to collect the outcomes data. Demographic and health history data were collected prospectively from the patients' medical records. Infant birth weight and gestational age were recorded directly from the women by calling them at the hospital after their delivery. After their discharge from the hospital, many of the women returned to the Easy Access Clinic for postpartum maternal and newborn care (Health Council of East Central Florida, 2008).

The results of the evaluation were notable; the patients who participated in The JJ Way® had extremely low rates of preterm birth and low birth weight infants, and the racial disparities that are typical in these outcomes were not present. The program evaluation compared The JJ Way® outcomes with Orange County and Florida State vital statistics; see Figure 2 for preterm birth rates and Figure 3 for low birth weight rates (Health Council of East Central Florida, 2008).

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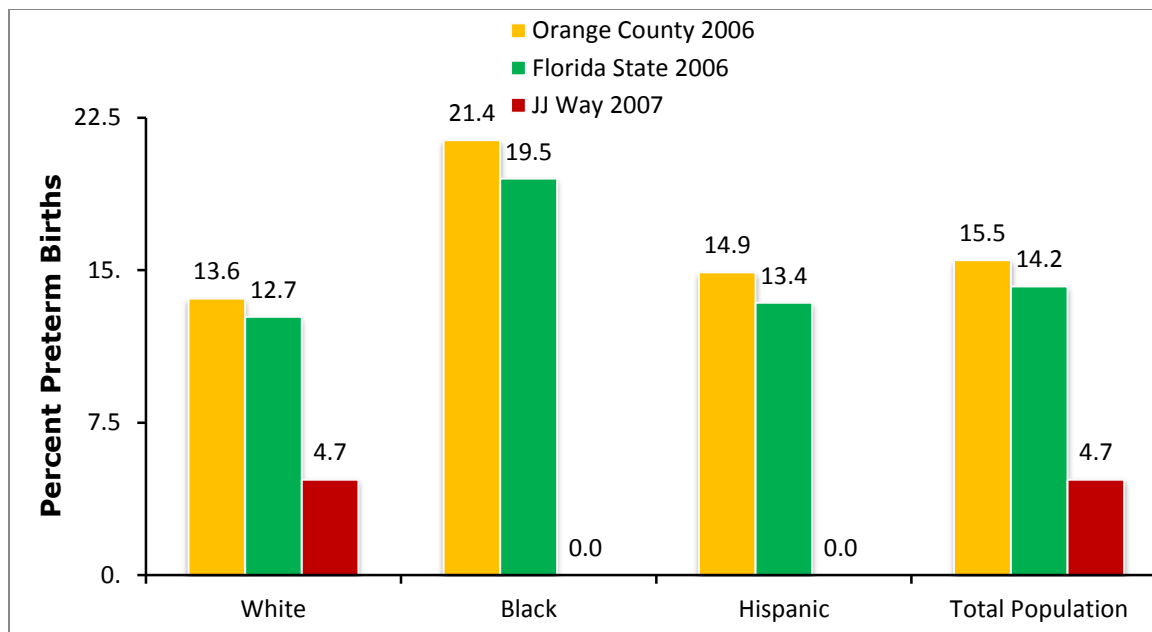


Figure 2. Comparison of preterm birth rates of JJ Way® versus Orange County and Florida State, 2006-2007.

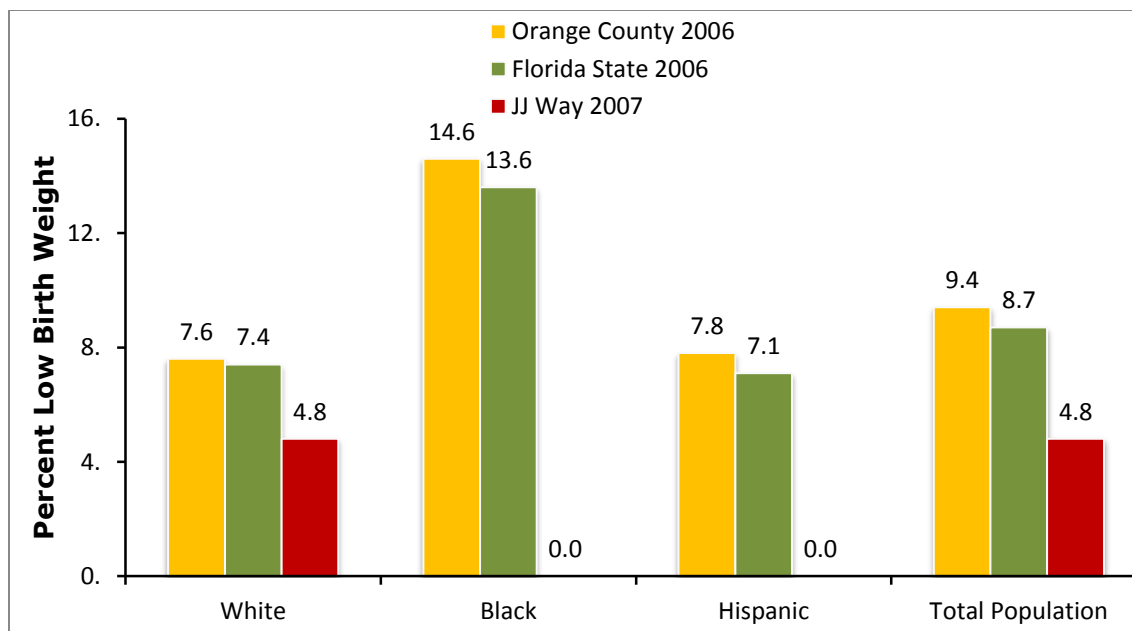


Figure 3. Comparison of low birth weight rates of JJ Way® versus Orange County and Florida State, 2006-2007.

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These outcomes are not the result of caring for a low-risk population that is typical of midwifery care; Joseph provides prenatal care for low-income and racially marginalized women with medical issues that would often be deemed “high risk.” Most of the women at the Easy Access Clinic choose to deliver in the hospital, not Joseph’s birth center, and then return to Joseph’s clinic for their postnatal care.

This preliminary evaluation suggested that The JJ Way® is a potentially viable model for reducing or eliminating disparities and improving birth outcomes in populations at highest risk. Further research with a more rigorous, matched comparison group design was necessary in order to better test the efficacy of the program model by controlling for potential confounders. That was the aim of this Master’s thesis.

Methods & Procedures

The design of a retrospective matched comparison group study was chosen as the best way to further analyze the existing data from the initial program evaluation of The JJ Way®, given the time and budgetary constraints of this Master’s thesis. A research proposal was developed to compare the rates of preterm birth and low birth weight from patients receiving The JJ Way® model of care to similar data from Florida Vital Statistics for women not receiving JJ Way® care. Women served in the zip code areas served by The JJ Way® typically receive standard prenatal care services from nurse practitioners at the local health department. There is a CenteringPregnancy® program on the other side of town, but it does not usually serve the women in The JJ Way® the other [J. Joseph, personal communication, April 30, 2014]. Women were matched for care in the same year, matching subjects one-to-one on maternal age, race/ethnicity and zip code (as a proxy for socioeconomic status). After the research proposal was approved by the student subject and committee members, it was approved by the

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Department Chair of Midwifery at Bastyr University. Institutional Review Board approval at Bastyr University was applied for and granted in October of 2012 with approval number 12A-1327. The data from The JJ Way® initial evaluation was applied for and received. Variables requested included maternal age, race/ethnicity, and zip code, as well as the infant's birth weight and gestational age. The researcher received de-identified data for all 100 patients that were enrolled in the preliminary JJ Way® study. However, because only 70 cases had complete information on age, race/ethnicity and zip code, only those 70 records were used as the group to be matched.

A historical comparison group was created from the Florida Vital Statistics live birth records for the same time period (2006-2007). The same variables were requested for live births between 2006-2007 for women living in the same zip codes as those enrolled in The JJ Way® program evaluation. The data was received in April of 2013. Prenatal care information in the Florida Vital Statistics dataset was recorded as "yes" or "unknown," with "yes" meaning the patient had had at least some prenatal care (although the total number of prenatal visits was not given), and "unknown" meaning the patient may or may not have had any prenatal care. The records with "unknown" prenatal care status were removed from the analysis in order to attenuate potential bias in comparing some prenatal care with no prenatal care. With the remaining records, matches using all the variables were only found with 67 of the 70 JJ Way® cases. The comparison group was created by randomly selecting a record from the pool of records that matched each JJ Way® subject on age, race/ethnicity, and zip code. A first round analysis was done by coding subjects in each prenatal care group as either "White," which included women who self-identified as White and non-Hispanic, or as "Women of Color," which included women who self-identified as African American, Haitian, and/or Hispanic. The

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subjects were grouped this way in an attempt to maintain a sample size large enough for meaningful analysis. However, since research indicates that Hispanic White women and Black women who recently immigrated to the U.S. have better birth outcomes than African American women ((MacDorman, 2011; Howard, Marshall, Kaufman & Savitz, 2006)), a secondary analysis was performed excluding Hispanic White and Haitian women and comparing only the outcomes of non-Hispanic White women with non-Hispanic African American women. The results from this analysis were not statistically significant, but that may have been due to the small sample size which could have precluded the ability to detect any differences.

The two primary outcomes examined and compared across the two prenatal care groups were gestational age at birth and birth weight. Both outcomes were analyzed as continuous variables (in weeks and in grams, respectively) and as categorical variables [preterm gestation (<37 weeks) versus full term; and low birth weight (<2500 grams) versus normal birth weight]. Differences in continuously measured gestational age and birth weights were tested for significance with T-tests. Differences in categories of preterm and low birth weight infants were examined using Fisher's exact two-sided tests. All tests of statistical significance were calculated using SPSS.

Outcomes were compared by prenatal care group using the entire sample. Potential racial disparities in the outcome variables within each group were also examined [non-Hispanic White versus Women of Color (in the primary analysis) or African American (in the secondary analysis)].

Results

The demographics of the study population were as follows: 64 (~47%) non-Hispanic White, 40 (30%) African American, 22 (~16%) Hispanic, and eight (~6%) Haitian. The women

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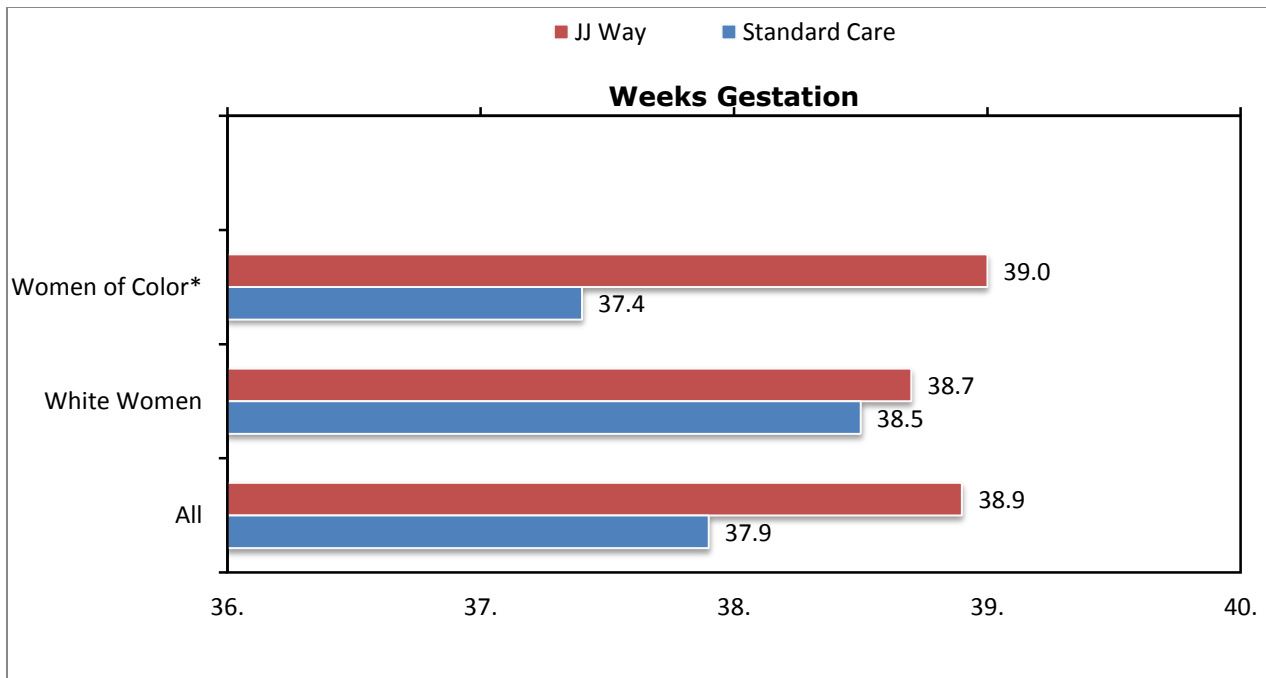
ranged in age from 15 to 37 and the mean age was 23. For the primary analysis, the African American, Hispanic, and Haitian women were combined together as “Women of Color” in each prenatal care group, since the numbers of each were small. Women of Color, therefore, represented 70 (52%) of the cases and White women 64 (48%) cases. For the secondary analysis, only White women and African American women were compared and the rest removed.

Comparisons Between Prenatal Care Groups

As a whole prenatal care group (White women and Women of Color together), The JJ Way® group showed a trend toward higher gestational age at birth that did not quite reach statistical significance (38.9 weeks versus 37.9 weeks, $p=0.07$) and a non-statistically significant higher birth weight (3359.4 grams versus 3265.9 grams, $p=0.41$) than the standard care group. When comparing by race, there were no statistically significant differences between White women in the two prenatal care groups in gestational age (38.7 weeks in The JJ Way® group versus 38.5 weeks in the standard care group, $p=0.60$) or birth weight (3373.6 grams in The JJ Way® group versus 3419.0 grams in the standard care group, $p=0.20$). However, there was a statistically significant difference in mean gestational age among Women of Color. Women of Color in The JJ Way® model gave birth to babies at higher gestational ages than Women of Color in the standard care group (39.0 weeks versus 37.4 weeks, $p=0.03$; see Figures 4 and 5).

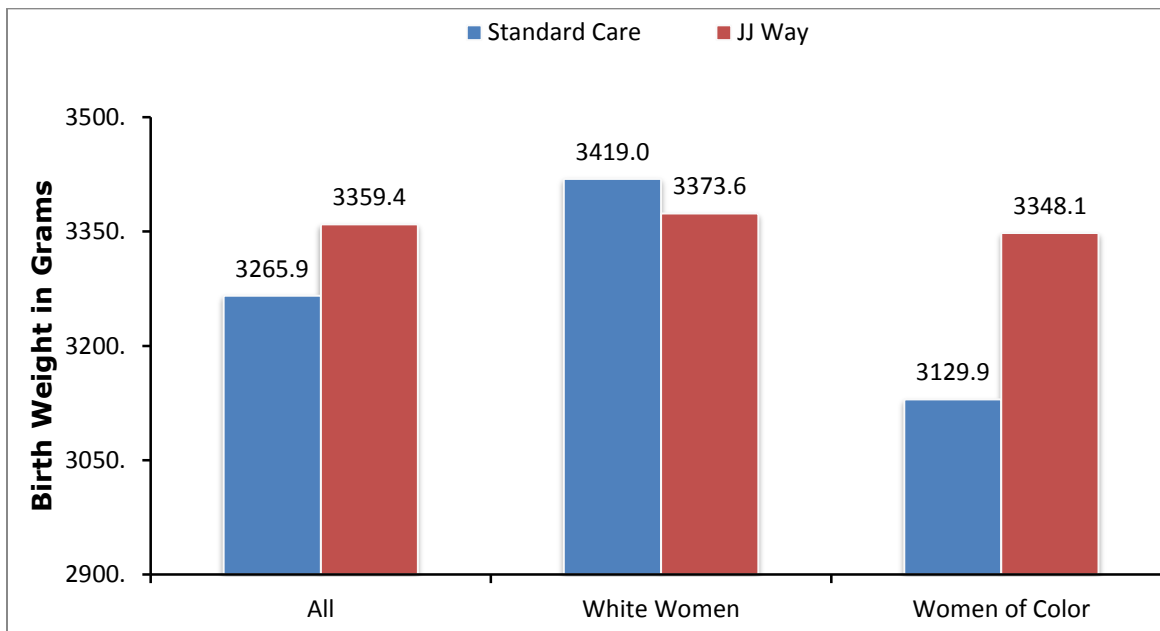
The JJ Way® Women of Color had higher average birth weights than the standard care Women of Color but the difference was not statistically significant. (3348.1 grams versus 3129.9 grams, $p=0.30$).

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*p=0.03

Figure 4. Comparison of gestational age in weeks between JJ Way® patients versus standard care patients, 2006-2007.

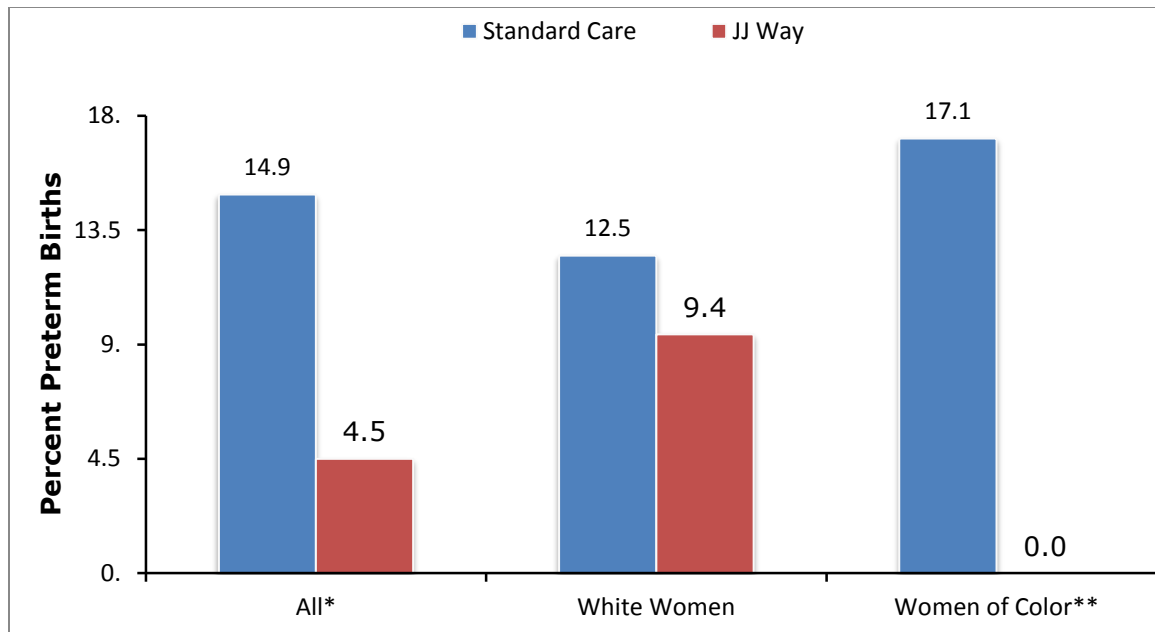


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Figure 5. Comparison of birth weight in grams between JJ Way® patients versus standard care patients, 2006-2007.

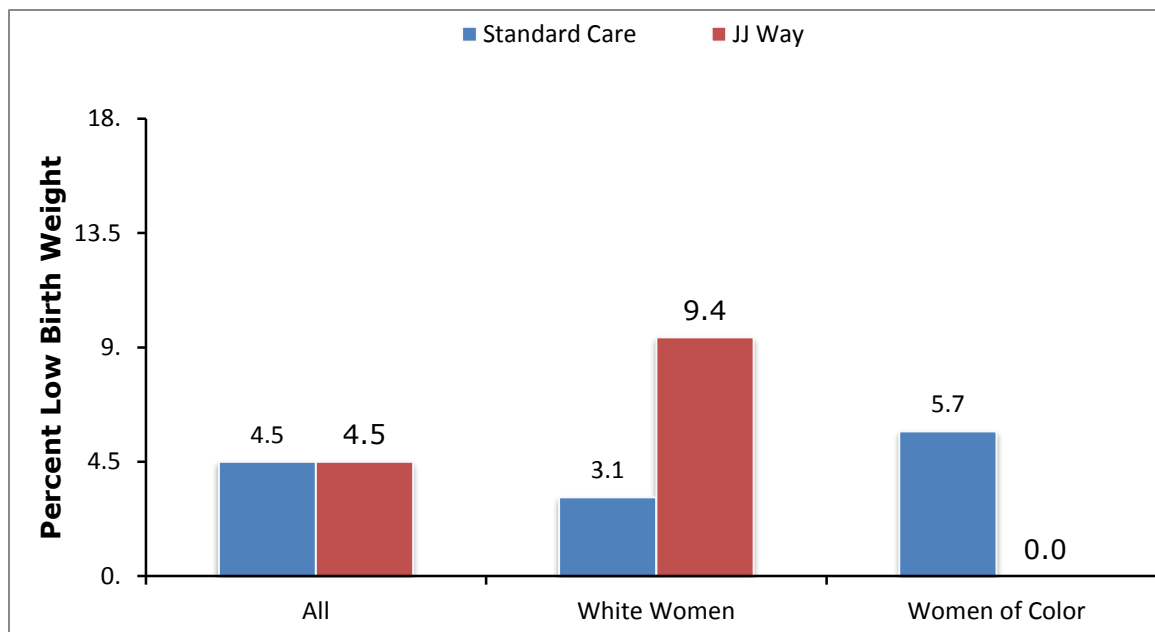
The outcome measures were also analyzed as dichotomous variables instead of continuous, i.e., preterm (<37 weeks) versus full term, and low birth weight (<2500g) versus normal birth weight. The overall preterm birth rates were 4.5% and 14.9% for patients of The JJ Way® and the standard care group, respectively ($p=0.04$). The overall rates of low birth weight in each prenatal care group were the same: 4.5%. Examining by racial groupings, the differences were not statistically significant for White women in rates of preterm birth (9.4% in The JJ Way® group vs. 12.5% in the standard care group, $p=0.69$) or low birth weight (9.4% in The JJ Way® group vs. 3.1% in the standard care group, $p=0.30$). For the Women of Color grouping, there was also no significant difference in low birth weight between groups (0% in The JJ Way® group versus 5.7% in the standard care group, $p=0.49$). However, the difference in preterm birth rates for the Women of Color classification between groups was prominent. The JJ Way® group had no preterm births (0%) among Women of Color, whereas Women of Color in the standard care group had a preterm birth rate of 17.1% ($p=0.01$). See Figures 6 and 7.

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*p=0.04, **p=0.01

Figure 6. Comparison of preterm birth rates in percent between JJ Way® patients versus standard care patients, 2006-2007.



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Figure 7. Comparison of low birth weight rates in percent between JJ Way® patients versus standard care patients, 2006-2007.

Secondary Analysis Comparing White Women and African American Women

Because perinatal outcomes vary between racial groups (for example, Hispanic women have different outcomes than non-Hispanic African American or Haitian women) and disparities are well-documented for African American communities, a secondary analysis was conducted to compare the outcomes of non-Hispanic White women and non-Hispanic African American women across the two prenatal care groups. The sample size was 104 (52 matched cases) for this secondary analysis; there were 32 White women and 20 African American women in each group, matched for race, age and zip code. The following differences were observed between prenatal care groups. For White women, the mean gestational age was 38.7 weeks in The JJ Way® group versus 38.5 weeks in the standard care group ($p=0.78$); the mean birth weight was 3373.6 grams in The JJ Way® group versus 3419.0 grams in the standard care group ($p=0.80$). For African American women, the mean gestational age was 39.0 weeks in The JJ Way® group versus 37.4 weeks in the standard care group ($p=0.16$); the mean birth weight was 3351.0 grams in The JJ Way® group versus 3141.1 grams in the standard care group ($p=0.30$). See figures 8 and 9.

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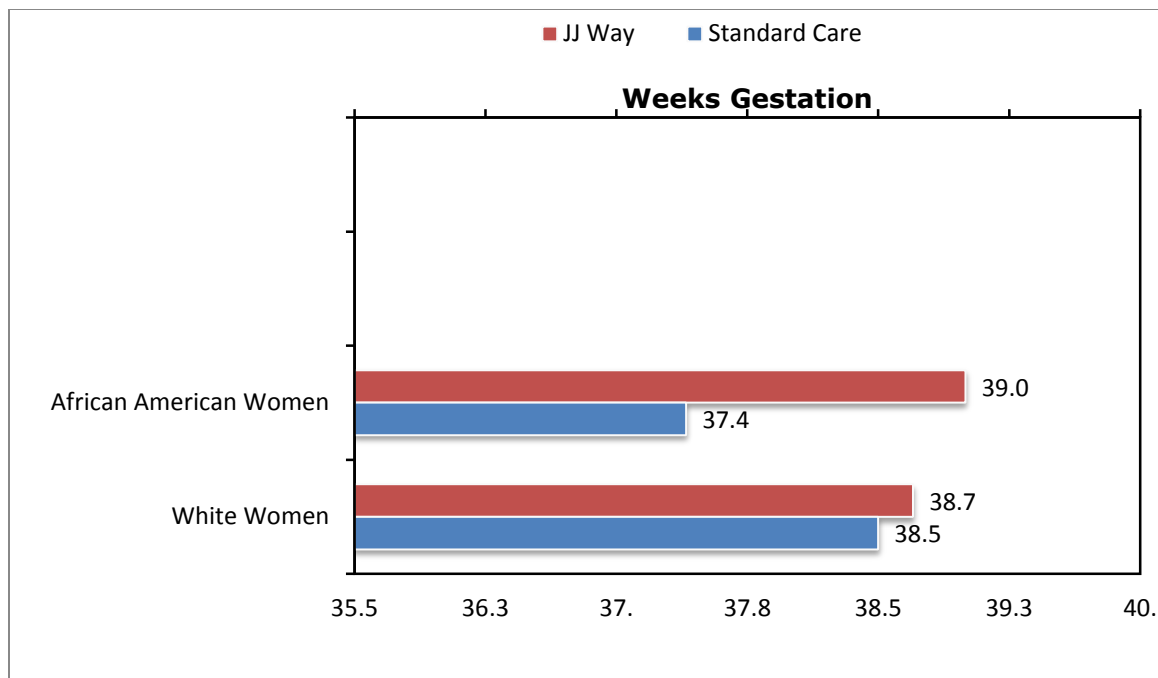


Figure 8. Comparison of gestational age in weeks between JJ Way® patients versus standard care patients, 2006-2007.

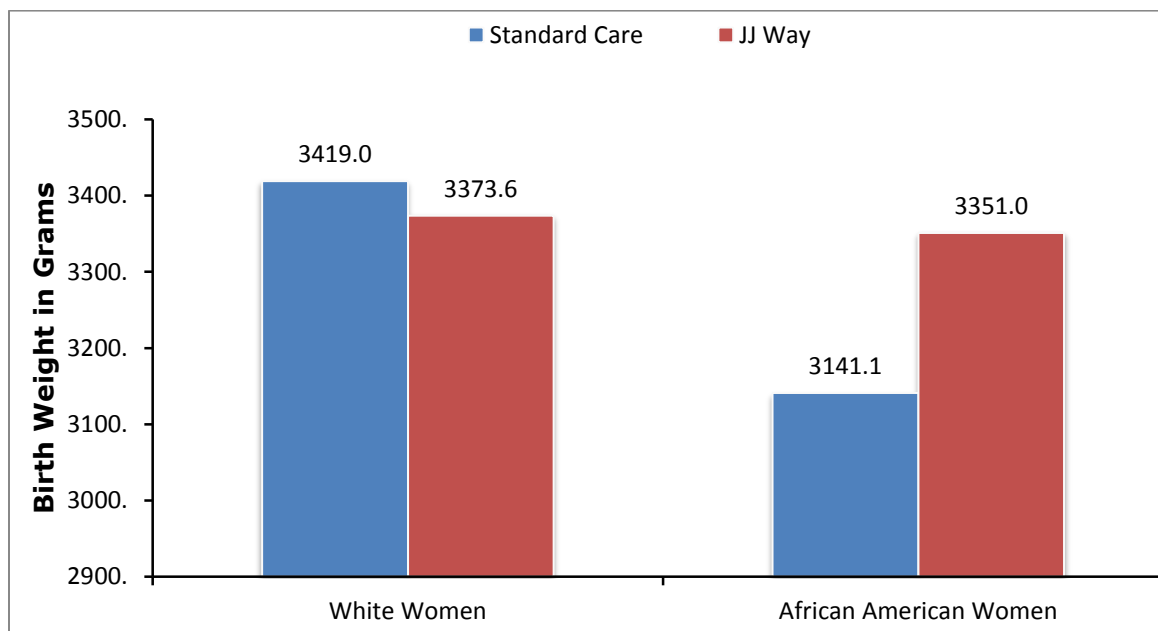


Figure 9. Comparison of birth weight in grams between JJ Way® patients versus standard care patients, 2006-2007.

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While the differences observed were consistent in the direction of the first analysis, none reached statistical significance.

When comparisons were made between White and African American women within each prenatal care group, differences were not statistically significant. In the group receiving standard prenatal care, rates of preterm birth were 12.5% for White women versus 15.0% for African American women ($p=0.10$), and rates of low birth weight were 3.1% for White women versus 5.0% for African American women ($p=1.00$). In the group receiving The JJ Way® model of prenatal care, differences were also non-significant but in the opposite direction: rates of preterm birth and low birth weight were both 9.4% for White women and 0% for African American women, ($p=0.28$). See Figures 10 and 11.

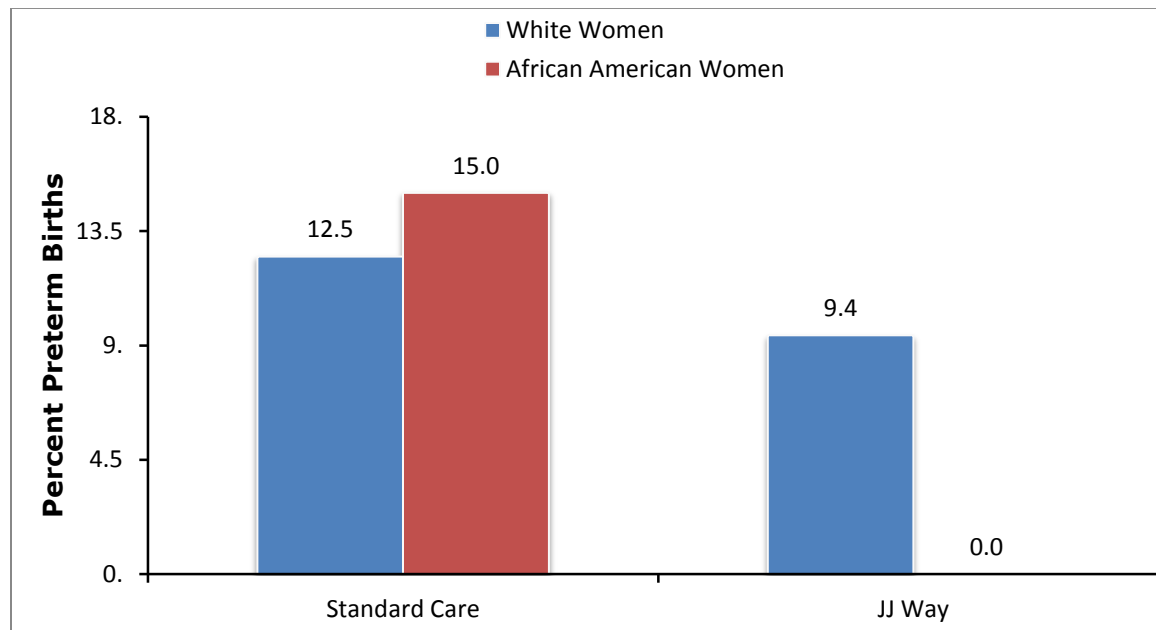


Figure 10. Comparison of preterm birth rate in percent between White women and African American women in the standard care and JJ Way® groups respectively, 2006-2007.

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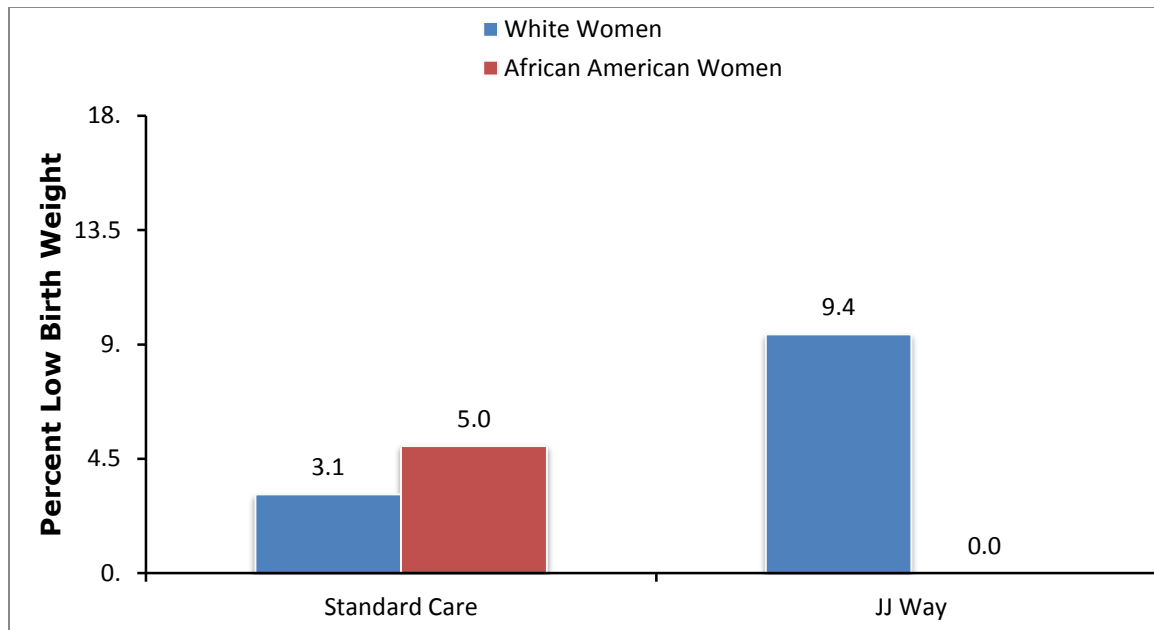


Figure 11. Comparison of low birth weight rate in percent between White women and African American women in the standard care and JJ Way® groups respectively, 2006-2007.

Discussion

As a group, Women of Color receiving prenatal care in The JJ Way® model kept their babies inside more than a week longer and exhibited a trend toward higher infant birth weights than Women of Color in the standard care sample. The JJ Way® model of holistic and empowering prenatal care is raising the bar for Women of Color. The secondary analysis with only White women versus African American women is noteworthy in that the differences observed are consistent and in the same direction as the differences shown in the primary analysis. We cannot conclude that the differences are statistically significant, but given the magnitude of the differences, non-statistically significant results may be due to the small sample size.

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The findings of this study are relevant not only to the profession of midwifery but to any health care profession. Health care providers have the ethical mandate of beneficence—to have the patient’s welfare as the goal of the treatment or course of care given. When faced with poor or differential health outcomes based on characteristics such as race and socioeconomic status, it is an ethical responsibility to consider how to improve these outcomes. This study provides further evidence to support The JJ Way®’s effectiveness using a more stringent methodology than the preliminary research conducted. It confirms that The JJ Way® model of prenatal care is creating a statistically significant impact in the critical health indicator of gestational age at delivery. Results for the other outcomes were mixed and further research with stronger methodologies and larger sample sizes is needed.

Strengths & Limitations

The strengths of this research were that the standard care comparison group was matched randomly for age, race, and zip code with each patient in The JJ Way® group. Since these three factors are some of the most prominent risk markers for adverse birth outcomes (with zip code acting as a proxy for socioeconomic status), controlling for these by matching them across groups strengthens the conclusion that The JJ Way® is, in itself, a mitigating factor.

The most significant limitation of this study was the lack of stringent control of prenatal care exposure. For The JJ Way® group, the women were only included in the study if they were considered “compliant” with care. Compliance was a qualitative assessment made by the staff of The JJ Way® team. If a woman was present for her appointments and adhered to the recommended health behaviors or risk reduction advice, she was considered compliant. For the standard care group, the only prenatal care information available in the vital statistics data set was “yes”— had prenatal care, or “unknown”— may or may not have had any. Those who had

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“unknown” prenatal care status were removed. The data did not contain number of visits or type of prenatal care. It is typical for women in the same zip codes as The JJ Way® women to receive traditional prenatal care services from nurse practitioners through the local health department. It cannot be verified that all the women received this particular form of care, however, nor can it be ascertained whether they were compliant with this care. A second limitation was the small sample size; only 134 women were included in the final sample. Only 70 of the 100 women from the original JJ Way® evaluation could be included as the criteria for matching was only complete for 70. After those with “unknown” prenatal care status were removed from the Florida Vital Statistics sample, only 67 cases had matches between the two prenatal care groups. Although statistical significance was reached for some of the outcome measures with this small sample size, having a larger sample would provide greater power for detecting statistically significant differences, if any, in other analyses. Another limitation was that patients were matched only by age, race, and zip code. While other variables might also be considered potential confounders, such as gravidity, parity, and precise number of prenatal visits, the study was based on secondary analysis of existing data sets, and, thus, the analysis was constrained by the data that was originally collected. Another limitation is that the study was partially retrospective; the data from the original JJ Way® evaluation was collected prospectively, while the vital statistics data comprising the comparison group was collected retrospectively. Both sets of data were extracted from medical records as well as some of The JJ Way® data from the women’s own report (e.g. report of infant birth weight over the phone while at the hospital to the staff of The JJ Way®). There may be inaccuracies in the data given that both sets involve the potential for human error. The data was not validated in either group by the researcher.

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Recommendations for Future Research

Recommendations for future research are to compare a larger sample size of women experiencing The JJ Way® model of care and match by more variables such as gravidity, parity, and number of prenatal visits. A large, prospective, matched cohort study would be optimal. A randomized controlled trial may not be feasible given the potential ethical problems with randomizing women to models of care (Onn, n.d.) Another area for research is to compare rates of breastfeeding initiation and duration between patients in The JJ Way® model and a matched comparison group, as breastfeeding is an important correlate of infant health (Ip, et. al., 2007).

Going Forward

Though Joseph herself is a midwife, she developed The JJ Way® to be an applicable model for any maternity care setting. In several phone conversations with Joseph, she has commented that her model is not about midwifery, but is a service delivery system that any type of care provider can reproduce and implement. “It’s not rocket science,” Joseph says. “Anyone can employ the concepts of The JJ Way® starting tomorrow—family-centered care, woman-centered care, community involvement, education, and empowerment” (J. Joseph, personal communication, May 22, 2013). It might be natural to assume that it takes a large budget and a trained team to implement The JJ Way®, but Joseph says this isn’t the case either. They began on a shoestring budget in response to a community need. Pregnant and at-risk women in Orange County, Florida, were falling through the cracks of the system and struggling to get adequate prenatal care because of bureaucratic hurdles. Those on Medicaid often couldn’t find care providers that would take them, since Medicaid reimbursement to providers is lower than private insurance reimbursement. Those just above the eligibility requirements for Medicaid, but who

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are not financially able to pay for private insurance, also found themselves in the gap and unable to pay out-of-pocket for the necessary medical care. One critical element of the The JJ Way® is that no woman is turned away, regardless of her ability to pay for services. Joseph's administrative team helps each woman to apply for medical benefits, but her care starts immediately and without conditions. Even if she never gets covered by insurance, she still receives care. According to the results of this study, the care that Women of Color, in particular, are receiving in The JJ Way® model results in outcomes that are superior to those of their counterparts who are experiencing standard prenatal care. Given the decades of unsuccessful progress on reducing rates of preterm birth, low birth weight, and infant mortality in the U.S., The JJ Way® model's success is noteworthy. It should be supported, funded generously, and larger studies should be conducted.

Conclusion

The United States ranks poorly in two critical health indicators – preterm birth and low birth weight babies. The burden of these infant health challenges falls disproportionately on Women of Color and low-income women. A preliminary evaluation of The JJ Way® model of prenatal care showed reductions in preterm birth and low birth weight babies in at-risk populations. The findings of this study, which matched women from The JJ Way® with those of the same age, race, and zip code from the Florida Vital Statistics data base, revealed statistically significant longer gestational periods and lower preterm birth rates for Women of Color who were cared for within The JJ Way® model. These results speak to the success of The JJ Way® in improving the chronic and widespread adverse outcome of preterm birth for Women of Color.

References

- Ananth, C. V., Misra, D. P., Demissie, K., & Smulian, J. C. (2001). Rates of preterm delivery among black women and White women in the United States over two decades: An age-period-cohort analysis. *American Journal of Epidemiology*, *154*(7), 657-65. doi: 10.1093/aje/154.7.657
- Braveman, P. (2012). Health inequalities by class and race in the US: What can we learn from the patterns? *Social Science & Medicine*, *74*(5), 665-667. doi: j.socscimed.2011.12.009
- Bolten, M. I., Wurmser, H., Buske-Kirschbaum, A., Papoušek, M., Pirke, K., & Hellhammer, D. (2011). Cortisol levels in pregnancy as a psychobiological predictor for birth weight. *Archives of Women's Mental Health*, *14*(1), 33-41. doi: 10.1007/s00737-010-0183-1
- Butler, A. D., Santa, A. J., & Cox, T. L. (2006). Preterm birth: Causes, consequences, and prevention. Retrieved from <http://www.iom.edu/~media/Files/ReportFiles/2006/Preterm-Birth-Causes-Consequences-and-Prevention/Preterm Birth 2006 Report Brief.pdf>
- Centering Healthcare Institute. (2009). Centering pregnancy overview. Retrieved from <https://www.centeringhealthcare.org/pages/centering-model/pregnancy-overview.php>
- Central Intelligence Agency. (2012). The world factbook: country comparison: infant mortality rate. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2091rank.html>
- Collins, J. W. J., David, R. J., Symons, R., Handler, A., Wall, S. N., & Dwyer, L. (2000). Low-income African-American mothers' perception of exposure to racial discrimination and infant birth weight. *Epidemiology*, *11*(3), 337-9. doi: pubmed/ 10784254

THE JJ WAY@:REDUCING PERINATAL OUTCOME DISPARITIES

Committee on Understanding Premature Birth and Assuring Healthy Outcomes. (2007).

"Summary." *Preterm Birth: Causes, Consequences, and Prevention*. Washington, DC:

The National Academies Press..

David, R.J, & Collins, J. W. (1997). Differing Birth Weight among Infants of U.S.-Born Blacks, African-Born Blacks, and U.S.-Born Whites. *New England Journal of Medicine*, 337, 1209-1214.

David, R., & Collins, J. (2007). Disparities in infant mortality: Whatf U.S.-Born Blacks, African-BorAmerican *Journal of Public Health*, 97(7), 1191J1197. doi: 10.2105/AJPH.2005.068387

Dizon-Townson, D. S. (2001). Preterm labour and delivery: a genetic predisposition. *Paediatric and Perinatal Epidemiology*, 15(2):57e62. doi: pubmed/11520400

Dominguez, T. P. (2010). Adverse birth outcomes in African American women: The social context of persistent reproductive disadvantage. *Social Work in Public Health*, 26(1) 3-16. doi: 10.1080/10911350902986880

Dominguez, T. P., Dunkel-Schetter, C., Glynn, L. M., Hobel, C., & Sandman, C. A. (2008). Racial differences in birth outcomes: The role of general, pregnancy, and racism stress. *Health Psychology*, 27(2), 194-203. doi: pubmed/18377138

Gabbe, S. G., Niebyl, J. R., & Simpson, J. L. (2009). *Obstetrics: Normal and Problem pregnancies*, 5th ed. Churchill Livingstone.

Geronimus, A. T. (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethnicity and Disease*, 2(3), 207-21. doi: pubmed/1467758

THE JJ WAY®:REDUCING PERINATAL OUTCOME DISPARITIES

- Geronimus, A. T. (2006). "Weathering" and age patterns of allostatic load scores among blacks and whites in the United States. *American Journal of Public Health, 96*(5), 826-33. doi: 10.2105/AJPH.2004.060749
- Giscombé & Lobel, M. (2005). Explaining disproportionately high rates of adverse birth outcomes among African Americans: the impact of stress, racism, and related factors in pregnancy. *Psychological Bulletin, 131*(5), 662-83. doi: pubmed/16187853
- Grady, M. A., & Bloom, K. C. (2004). Pregnancy outcomes of adolescents enrolled in a CenteringPregnancy program. *Journal of Midwifery and Women's Health, 49*(5), 412-20. doi: 15351331
- Hamilton, B. E., Martin, J. A., & Ventura, S. J. (2011). Births: preliminary data for 2010. *National Vital Statistics Reports 60*(2). Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_02.pdf
- Hatem, M., Sandall, J., Devane, D., Soltani, H., & Gates, S. (2009). Midwife-led versus other models of care for childbearing. *Cochrane Database of Systematic Reviews, (3)*. Retrieved from <http://apps.who.int/rhl/reviews/CD004667.pdf>
- Health Council of East Central Florida, (2008). Commonsense Childbirth, Inc. program evaluation. Retrieved from Jennie Joseph, personal communication.
- Healthy Start Coalition of Orange County. (n.d.). Frequently asked questions. Retrieved from <http://www.healthystartorange.org/faqs.html>
- Howard, D. L., Marshall, S. S., Kaufman, J. S., & Savitz, D. A. (2006). Variations in low birth weight and preterm delivery among blacks in relation to ancestry and nativity: New York city, 1998-2002. *Pediatrics, 118*(5), 1399-405. doi: pubmed/17079541

THE JJ WAY®:REDUCING PERINATAL OUTCOME DISPARITIES

Huizink, A., Robles de Medina, P., Mulder, E. J. H., Visser, G. H. A., & Buitelaar, J. K. (2003).

Stress during pregnancy is associated with developmental outcome in infancy. *Journal of Child Psychology and Psychiatry*, 44(6), 810-818. doi: 10.1111/1469-7610.00166

Hussaini, S. K., Holley, P., & Ritenour, D. (2011). Reducing low birth weight infancy: assessing the effectiveness of the Healthy Start program in Arizona. *Maternal and Child Health Journal*, 15(2), 225-33. doi: pubmed/20054627

Ickovics, J., Kershaw, T., Westdahl, C., Rising, S., Klima, C., Reynolds, H., & Magriples, U. (2003). Group prenatal care and preterm birth weight: Results from a matched cohort study at public clinics. *Obstetrics & Gynecology*, 102(5), 1051-1057. Retrieved from [http://journals.lww.com/greenjournal/Abstract/2003/11000/Group Prenatal Care and Preterm Birth Weight .30.aspx](http://journals.lww.com/greenjournal/Abstract/2003/11000/Group_Prenatal_Care_and_Preterm_Birth_Weight_.30.aspx)

Ip S., Chung M., Raman G., Chew P., Magula N., DeVine D., Trikalinos T., Lau J. (2007).

Breastfeeding and maternal and infant health outcomes in developed countries. *Evidence Report Technology Assessment*, (153), 1-186.

Jaffee, K. D., & Perloff, J. D. (2003). An ecological analysis of racial differences in low birthweight: Implications for maternal and child health social work. *Health & Social Work*, 28, 9022. doi: pubmed/12621929

Joseph, J. (2007). The JJ Way (Retrieved from <http://jenniejoseph.com/node/16>

Klima, C., Norr, K., Vonderheid, S., & Handler, A. (2009). Introduction of Centering Pregnancy in a public health clinic. *Journal of Midwifery and Women's Health*, 54(1), 27-34. doi: pubmed/19114236

THE JJ WAY®:REDUCING PERINATAL OUTCOME DISPARITIES

Kogan, M. D., Martin, J. A., Alexander, G. R., Kotelchuck, M., Ventura, S. J., & Frigoletto, F.

D. (1998). The changing pattern of prenatal care utilization in the United States, 1981-1995, using different prenatal care indices. *The Journal of the American Medical Association*, 279(20), 1623-1628. doi: 10.1001/jama.279.20.1623

Loomans, E. M., van Dijk, A. E., Vrijkotte, T. G., van Eijsden, M., Stronks, K., Gemke, R. J., &

Van den Burgh, B. R. (2012). Psychosocial stress during pregnancy is related to adverse birth outcomes: results from a large multi-ethnic community-based birth cohort. *European Journal of Public Health*, 23(3):485-91. doi: pubmed/22850187

Lu, Kotelchuk, Culhane, Hobel, Klerman, & Thorp, Jr (2006). Preconception care between pregnancies: The content of prenatal care. *Maternal & Child Health Journal*, 10, S107-S122.

MacDorman, M. (2011). Race and ethnic disparities in fetal mortality, preterm birth, and infant mortality in the United States: An overview. *Seminars in Perinatology*, 35(4), 200-208. doi: S0146000511000462

March of Dimes. (2011). Born too soon. Retrieved from

<http://www.marchofdimes.com/mission/globalpreterm.html>

Mustillo, S., Krieger, N., Gunderson, E. P., Sidney, S., McCreath, H., & Kiefe, C. (2004). Self-reported experiences of racial discrimination and black-white differences in preterm and low-birthweight deliveries: the CARDIA study. *American Journal of Public Health*, 94(12), 2125-31. doi: pubmed/15569964

National Healthy Start Association. (2011). Overview. Retrieved from

http://www.nationalhealthystart.org/about_us

THE JJ WAY@:REDUCING PERINATAL OUTCOME DISPARITIES

National Institute of Health. (1989). *Caring For Our Future: The Content of Prenatal Care*.

Retrieved from

http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED334018&ERICExtSearch_SearchType_0=no&accno=ED334018

Nazroo, J. Y. (2003). The structure of ethnic inequalities in health: economic position, racial discrimination, and racism. *American Journal of Public Health, 93*(2), 277-84. doi: PMC1447729

Olds, D. L., Henderson, C. R. J., Tatelbaum, R., & Chamberlin, R. (1986). Improving the delivery of prenatal care and outcomes of pregnancy: a randomized trial of nurse home visitation. *Pediatrics, 77*(1), 16-28. doi: pubmed/3510017

Onn, T. L. (n.d.). Ethical Problems with Randomized Control Trial (RCT). *Clinical Research Center, Kuala Lumpur Hospital*. Retrieved from http://www.crc.gov.my/documents/GCP/d_Ethical%20Issues%20wth%20Randomized%20Controlled%20Trial-Dr.Lim.pdf

Partridge, S., Balayla, J., Holcroft, C. A., & Abenhaim, H. A. (2012). Inadequate prenatal care utilization and risks of infant mortality and poor birth outcome: A retrospective analysis of 28,729,765 U.S. deliveries over 8 years. *American Journal of Perinatology, 29*(10):787-93. doi: 10.1055/s-0032-1316439

Reichman, N. E. (2005). Low birth weight and school readiness. *School Readiness: Closing Racial and Ethnic Gaps, 15*(1). Retrieved from <http://futureofchildren.org/publications/journals/article/index.xml?journalid=38&articleid=118&ionid=776>

THE JJ WAY®:REDUCING PERINATAL OUTCOME DISPARITIES

Ruiz, R. J., Fullerton, J., & Dudley, D. J. (2003). The interrelationship of maternal stress,

endocrine factors and inflammation on gestational length. *Obstetrical and Gynecological Survey*, 58(6), 415-28. doi: pubmed/12775946

Sowards, K. A. (1999). What is the leading cause of infant mortality? A note on the

interpretation of official statistics. *American Journal of Public Health*, 89(11), 1752-53.
doi: AJP.89.11.1752

Wadhwa, P. D., Culhane, J. F., Rauh, V., Barve, S. S., Hogan, V., Sandman, C. A., Hobel, C. J.,

Chicz-DeMet, A., Dunkel-Schetter, C., Garite, T. J. and Glynn, L. (2001). Stress,
infection and preterm birth: a biobehavioural perspective. *Paediatric and Perinatal
Epidemiology*, 15:and 29. doi: oi:doi:inatal Epidemiology, 15ir

World Health Organization. (2011). *World Health Statistics 2011*. Geneva: WHO Press.

Retrieved from http://www.who.int/whosis/whostat/EN_WHS2011_Full.pdf

World Health Organization. (2012). *Born Too Soon: The Global Action Report on Preterm Birth*.

Geneva: WHO Press. Retrieved from

http://www.who.int/pmnch/media/news/2012/201204_borntoosoon-report.pdf