MISSOURI SOUTHERN STATE UNIVERSITY

Characteristics and Outcomes of WIC and MCB Patients

Senior Thesis

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The research conducted characterized patients from the Joplin Women's and Infants Clinic and investigated relationships between different variables at the facility. The same data was collected and evaluated at McCune Brooks Physicians for Women's Clinic. A total of 56 participant's data was assessed and an average patient description was generated. Additionally, comparisons between variables at each facility found a correlation at WIC and MCB between the number of pregnancies and the mother's age (r=0.7089 and r=0.5316, respectively). At MCB a positive correlation was found between gestation week and infants birth weight (r=0.6193), the number of visits and mothers weight change (r=0.4727, and the number of weeks receiving prenatal care and mothers weight change (r=0.4895.)

1. Background

The importance of prenatal healthcare has been explored since the beginning of the 20th century. As early as 1907 Dr. Josephine Baker developed a prenatal care system for her patients in New York City. In 1915 J. Whitbridge Willliams found that educating pregnant women on personal hygiene, rest, diet, and the importance of having knowledgeable obstetrical examinations reduced the risk of dystocia (abnormal/difficult childbirth), toxemia, and pre-term birth. [1] Initially the focus of prenatal care was to prevent pre-term labor and birth, over the years though it has evolved into a much broader practice. The focus is no longer just on the prevention of problems but has expanded to include the promotion of the healthiest infants and mothers possible.[2]

Through monitoring how a pregnancy progresses, prenatal care allows the health care provider to identify any potential health problems as well as promote the fetus and mother's overall health. Proper prenatal care has been found to improve the mother and fetus quality of life as well as reduce the number or preterm, underweight, and general complications during pregnancy and birth. Prenatal care can be provided by obstetrician, family practice physician, certified nurse midwife, family nurse practitioner, or women's health nurse practitioner.[3]

The most specific guidelines for routine prenatal care were published in 1989 by the US Public Health Service. They include all of the procedures and tests recommended by the American College of Obstetrics and Gynecology with the exception of routine ultrasounds (no correlation between routine ultrasounds has show to improve birth outcomes).[4] During routine visits the patient's weight, blood, and urine are monitored, necessary vaccines are given, and fetal growth is measured. The healthcare provider is also determines the fetuses due date and typically recommends an assortment of pre-natal tests to ensure proper fetal development.[5] Such tests include: amniocentesis to test for certain birth defects, chorionic villus sampling (CVS) to test for certain birth defects, glucose screening to monitor

blood sugar levels, cystic fibrosis carrier screening to check for cystic fibrosis gene, and maternal blood screening to search for neural tube defects. It is also standard during prenatal checkups for the healthcare provider to measure the mother's stomach to monitor fetal growth, check the fetal heart rate after the 12th week of pregnancy, use an ultrasound to determine gender, and to palpate the fetal position later.[6] The majority of the providers also use this time to educate mothers on their condition and what expectations they should have throughout their pregnancy, they should also answer any questions or concerns that the patient is having.[3] A typical prenatal care schedule is shown in Table 1.1 below:

Stage of Pregnancy	Prenatal Checkups
Weeks 4 to 28	Every four weeks (once a month)
Weeks 28 to 36	Every two weeks (twice a month)
Weeks 36 to Birth	Every week

Table 1.1 - This schedule is tentative and dependent on the health of the mother. If the patient has a health problem then their healthcare provider may recommend more frequent visits.[2]

With more than 4 million live births in the United States every year the need for prenatal care in all populations cannot be understated. According to the Centers for Disease Control and Prevention in 2009, 8.2% of all live births were underweight and 12.2% were born pre-term. While the percentages seem reasonable the actual number of infants, 336,747 and 502,306 respectively, are discouraging when hospital stays, complications, and costs are taken into considerations.[7] Pre-term births alone cost the United States over $26 billion dollars annually. The infants who survive these births typically face a variety of lifelong health issues such as cerebral palsy, blindness, hearing loss, learning disabilities, and other chronic conditions. Even infants born "late-preterm" 34-36 weeks experience greater rates of re-hospitalization, breathing and feeding problems, temperature instability, jaundice, and developmental issues.[8]

Pre-term birth is defined as live birth before 37 complete weeks of gestation. Babies who are born pre-term are more than twice as likely to have birth defects compared to full term infants.

Furthermore, birth defects and pre-term births are the leading cause of infant deaths.[9] According to Margaret Honein, PhD, MPH of the CDC's National Center on Birth Defects and Developmental Disabilities, "The causes of most birth defects are still not known. While it is likely that the most common defects are caused by a combination of genetic and environmental factors, the identification of specific risk factors continues to be a major research and public health priority." [9]

It is because of these identified risks that an emphasis on prenatal has been stressed in the recent years.[2] In addition to standard care offered by obstetricians and the providers mentioned previously other organization such as the Women and Infant's Clinic (WIC) have been developed to promote proper pre-natal care. WIC is a federally funded health and nutrition program for pregnant women, new mothers, infants, and children under the age of five. The organization provides nutritious food supplementation, nutrition education, health screening and referral to other health and social services as needed. The objective of the program is to "improve fetal growth and development, improve the health and development of infants and young children, and increase access to needed services." [10]

WIC was initially developed in 1972 and has grown steadily since its foundation. In 1974 participation in the program was 88,000; as of 2010 though those numbers have risen to more than 9.2 million monthly. Children make up the largest percentage of participants; each month approximately 4.9 million receive benefits. Additionally, 2.2 million participants are infants and 2.1 million are women. [10] The program is available in all 50 states, 34 Indian tribal organizations, and several commonwealths outside of the continental United States. There are 90 WIC state agencies, approximately 1890 local agencies, and more than 9,000 clinic locations. In Jasper (2), Barry (4), Lawrence (2) and McDonald counties (3) there are 11 different WIC agencies available to provide the needed services.[11] To be eligible for assistance participants must meet income guidelines, state residency requirements, and found to be at "nutritional risk" by a health care provider. A nutritional risk as defined by WIC can either

be a medically based risk (anemia, underweight, overweight, history of pregnancy complications or poor pregnancy outcomes) or a dietary risk.[10]

When this study was initiated there was limited information published from the last ten years characterizing the standard pregnant WIC patient. In January however, the *Effects of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC): A Review of Recent Research* was published. The comprehensive study was performed by the U.S. Department of Agriculture Food and Nutrition Service and examined all aspects of WIC. One of which is the "Impact on Pregnancy and Birth Outcomes" which uncovered 15 separate studies that evaluated an association between WIC participation and pregnancy outcomes. Fourteen studies looked at one or more birth outcomes and three studies examined other pregnancy related mediated factors. Recent studies consistently find a positive correlation between WIC participation and both gestational age and mean birth weight and a negative correlation with low and very low birth weight when estimates are not adjusted for gestation age bias. However, the magnitude of the impacts is substantially smaller when adjusted for gestational age bias. Of the three studies that looked at other pregnancy related mediating factors the results are mixed and there is no clear evidence of a positive or negative WIC effect for either smoking or weight gain.[12]

McCune-Brooks Physicians for Women's Health is an all-female physician group associated with McCune-Brooks Regional Hospital located in Carthage, Missouri. The practice "promotes women's health and wellness in every stage of life" and specializes in obstetrics and gynecology.[11] The mission of Physicians for Women's Health is to provide safe, compassionate services that are customized to best assist each individual woman and her family. There are three physicians on staff, Lydia Keisler, MD; Elizabeth Barlet, MD; and Maritza Manrique-Kiniry, MD. Each physician is board certified or board eligible by the American Board of Obstetrics and Gynecology. The practice is particularly experienced with: prenatal care, obstetrics, contraception, family planning, adolescent gynecology, women's health

care and wellness including osteoporosis screening and treatment, menopause management, general gynecology, gynecologic surgery, and pelvic surgery for urinary incontinence.[13]

2. Methodology

Data for the study was collected from both Joplin's Women and Infants Clinic (WIC) as well as McCune-Brooks Physicians for Women's Health (MCB). A total of 60 individuals were considered for the study and 56 were eligible to participate. Twenty-seven patient files from MCB and twenty-nine patient files from WIC were analyzed as part of the study. Each participant file was randomly assigned a number to protect the patient's privacy and the assigned number correlates to the data files used. Records were organized using two separate spread sheets, one for WIC and another for MCB. Variables being recorded from both MCB and WIC are shown in Figure 2.1. Characteristics considered separately for patients of MCB and WIC due to difference in available recorded information are outlined in Figure 2.2.

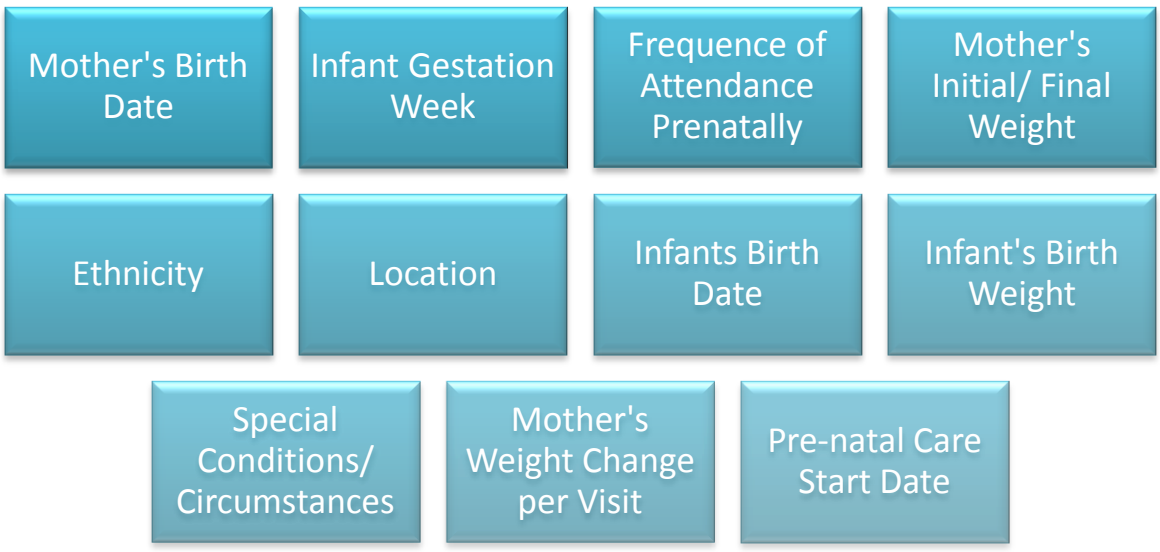

Figure 2.1 - Variables recorded from MCB and WIC.

MCB	WIC
Planned	Monthly, Bi-monthly, or Tri-monthly attendance
Married	Breastfeeding
Smoking	
Expected Due Date	

Figure 2.2 – Variables for MCB and for WIC considered separately for both locations.

Mean gestational week, attendance, weight change, birth weights, and prenatal care start dates were calculated for both facilities. This will be used to characterize the average patient at each location and then allow comparisons between the two to be made. Additionally, regression and correlation statistics were performed between the different variables to identify any possible relationship. The different variables being compared can be found in Figure 2.3.

Variable I	Variable 2
Number of Visits to Clinic	Infant Birth Weight
Gestation Week	Infant's Birth Weight
Number of Visits to Clinic	Mother's Weight Change
Number of Pregnancies	Gestation Week
Number of Pregnancies	Infant's Birth Weight
Mother's Age	Number of Visits to Clinic
Mother's Age	Infants Birth Weight
Mother's Age	Gestation Week
Mother's Age	Mother's Weight Change
Mother's Age	Number of Pregnancies
Time Receiving Prenatal Care	Birth Weight
Time Receiving Prenatal Care	Gestation Week
Time Receiving Prenatal Care	Mother's Age
Time Receiving Prenatal Care	Mother's Weight Change
Time Receiving Prenatal Care*	Planned or Unplanned Pregnancy

Figure 2.3 - Comparison between variables * *WIC only*

Initially the data collected was to be used to test for inverse relationship between the number of pre-natal visits to the clinic and the birth weight and gestation period. It was hypothesized that there would be a direct correlation to the number of visits and assistance received and the fetus's gestation period and birth weight. An ANOVA and T-test were to have been performed to determine the significance of the mother's attendance. This was to have performed separately at both MCB and WIC and then used to make a comparison between the two. However, because of the different services

offered at each facility and the manner in which the data is recorded it was not possible to statistically compare the two.

Instead, a characterization of the average patient was developed that considered many of the aforementioned variables listed above. An in-depth description of each patient from either MCB or WIC was merged to create a description of the "standard" MCB patient as well as the "standard" WIC patient. The standard descriptions are included below in Figure 2.4.

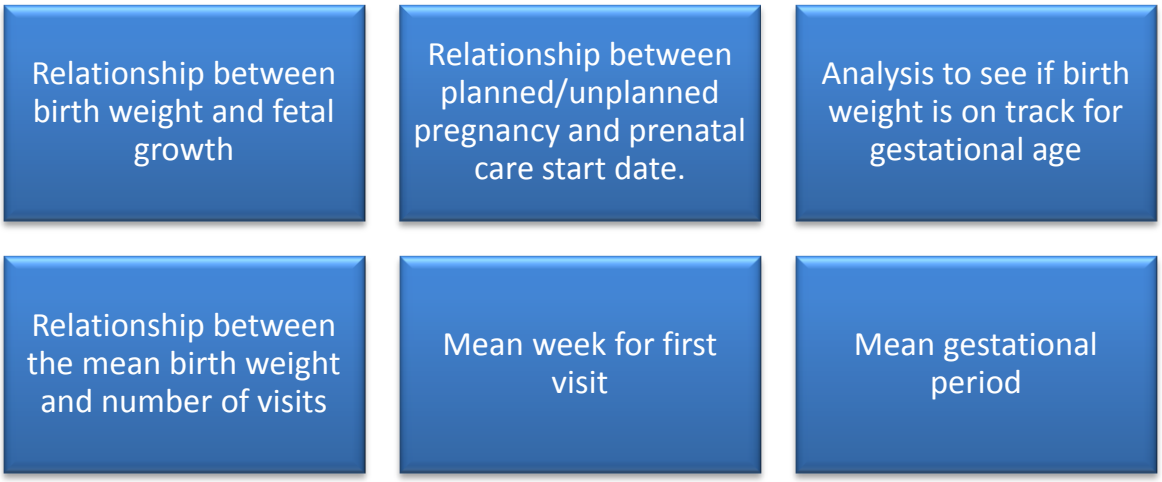

Figure 2.4 – Variables considered when describing the typical WIC patient versus the typical MCB patient.

Additionally, a T-test to compare birth weight and gestation period was performed. The standard deviation was considered for all necessary data and bar graphs were developed to clarify results. In order to avoid bias the best possible attempts were made to maintain similarities in age, ethnicity, and location. To avoid overlap between the patients at the two facilities, participants from WIC had all completed their pregnancy before those as MCB had begun pre-natal care for theirs.

Results

Of the 29 women surveyed from Joplin's Women's and Infants Clinic the average participant was found to be 27.2 years of age. Typically she has experienced 2.67 pregnancies, began her prenatal care at 2.86 months along, and attended the clinic 3.03 times before delivering. In addition she will gain 24.59 lbs during her pregnancy and deliver at 39.52 weeks. These infants have a mean birth weight of 116.79 ounces (7 lbs 4.79 ounces.) Of those treated at WIC who participated in the experiment 76.67% were Hispanic and 16.67% intended on breast feeding. Data was unable to be obtained as to whether they were married, smokers, or if the pregnancies were planned.

Several comparisons were made between the aforementioned variables and the correlation coefficient (r value) as well as the standard deviation was recorded. If the results were significant than the p value was also recorded. Table 3.1 below shows the comparisons as well as their corresponding values.

Variables Compared	Correlation Coefficient	Standard Deviation
Number of Visits and Infants Birth Weight	0.3382	13.445
Gestation Week and Infants Birth Weight	0.07337	14.248
Number of Visits and Mothers Weight Change	-0.02316	13.48
Number of Pregnancies and Gestation Week	-0.0996	0.9063
Number of Pregnancies and Infant Birth Weight	-0.159	13.968
Mother's Age and Number of Visits	-0.16546	1.355
Mother's Age and Infants Birth Weight	0.01171	14.285
Mothers Age and Gestation Weeks	-0.1412	1.82
Mother's Age and Mothers Weight Change	-0.2711	12.979
Mothers Age and Number of Pregnancies*	0.7089	1.037
Number of Months Receiving Prenatal Care and Birth Weight	-0.1282	14.168
Number of Months Receiving Prenatal Care and Gestation Weeks	-0.3884	0.8173
Number of Months Receiving Prenatal Care and Mother's Age	0.1442	7.284
Number of Months Receiving Prenatal Care and Mother's Weight Change	-0.01555	13.482

Figure 3.1 – Variables Compared at WIC and their corresponding r value and standard deviation
* indicates some degree of significance

For the comparison between the mother's age and the number of pregnancies p <0.0001. The p value is considered very significant and the correlation coefficient is considered mildly significant.

The average patient from McCune Brook's Physicians for Women's Health, out of the 27 patients surveyed, is 23.8 years of age. Typically she has experienced 1.78 pregnancies, began her prenatal care at 9.70 weeks along, and she will see the physician 12.4 times before delivering. On average she will receive prenatal care for 28.89 weeks before delivering. In addition she will gain 28.35 lbs during her pregnancy and deliver at 38.59 weeks. These infants have a mean birth weight of 111 ounces (6 lbs 15 ounces). Of those treated at MCB who participated in the experiment only 7.41% were Hispanic, 44.44% were married, 29.63% were smokers, and 30.77% of the pregnancies were planned. The comparison between the week beginning prenatal care and whether or not the pregnancy was planned indicated that there was a slight difference between the two. Planned pregnancies began receiving prenatal care at 8.13 weeks while unplanned begin at 10.17 weeks. The graph 3.1 listed below illustrates this difference between the week prenatal care was started and whether or not the pregnancy was intended.

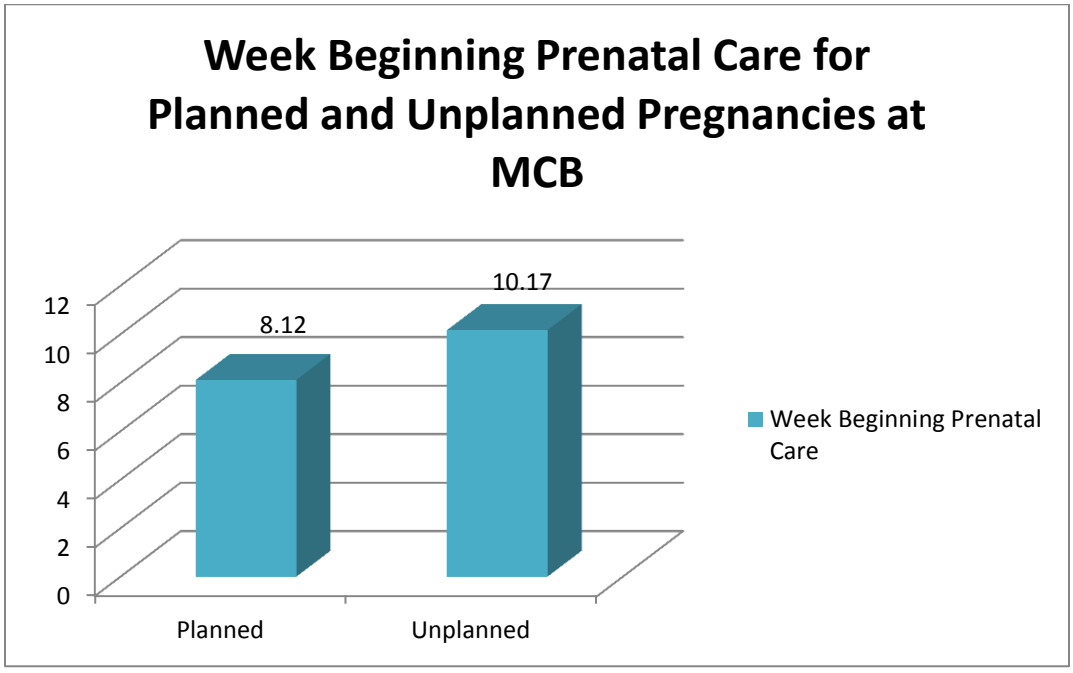

Figure 3.2 – Week beginning prenatal care for both planned and unplanned pregnancies at MCB

Several comparisons were made between the aforementioned variables and the correlation coefficient (r value) as well as the standard deviation was recorded. If the results were significant than the p value was also recorded. Table 3.2 below shows the comparisons as well as their corresponding values.

Variables Compared	Correlation Coefficient	Standard Deviation
Number of Visits and Infants Birth Weight	0.01354	21.883
Gestation Week and Infants Birth Weight*	0.6193	17.183
Number of Visits and Mothers Weight Change*	0.4727	9.467
Number of Pregnancies and Gestation Week	0.05383	1.836
Number of Pregnancies and Infant Birth Weight	0.2849	20.978
Mother's Age and Number of Visits	-0.1346	2.542
Mother's Age and Infants Birth Weight	0.1238	21.717
Mothers Age and Gestation Weeks	-0.1412	1.82
Mother's Age and Mothers Weight Change	-0.03814	10.735
Mothers Age and Number of Pregnancies*	0.5316	0.8748
Number of Weeks Receiving Prenatal Care and Birth Weight	-0.0447	21.863
Number of Weeks Receiving Prenatal Care and Gestation Weeks	0.3251	1.739
Number of Weeks Receiving Prenatal Care and Mother's Age	0.07507	5.077
Number of Weeks Receiving Prenatal Care and Mother's Weight Change*	0.4895	9.2396

Figure 3.3 – Variables Compared at MCB and their corresponding r value and standard deviation
* indicates some degree of significance

The asterisks indicated that there was some significance in the results and therefore the p value was obtained. For the comparison between the number of visits and the mother's weight change p = 0.0148. For the comparison between the mother's age and the number of pregnancies p = 0.0043. For the comparison between gestation week and the infants birth weight p = 0.0006. And for the comparison between the number of weeks receiving prenatal care and the mother's weight change p = 0.0111. The actual correlation coefficients in these cases though suggest that the significance was only very slight.

The Joplin Women and Infant's Clinic and McCune Brooks Physicians for Women's health operate very different facilities and track their records in very different manners as noted in the introduction. Because WIC focuses on the nutritional aspects while MCB focuses on physical and

diagnostic variables the resulting data from each individual location cannot be compared to the other location. Because the variables are not statically parallel only more error would be created in testing them against one another. However, the average patient from each facility can be compared to one another since they were both receiving prenatal care during their pregnancy.

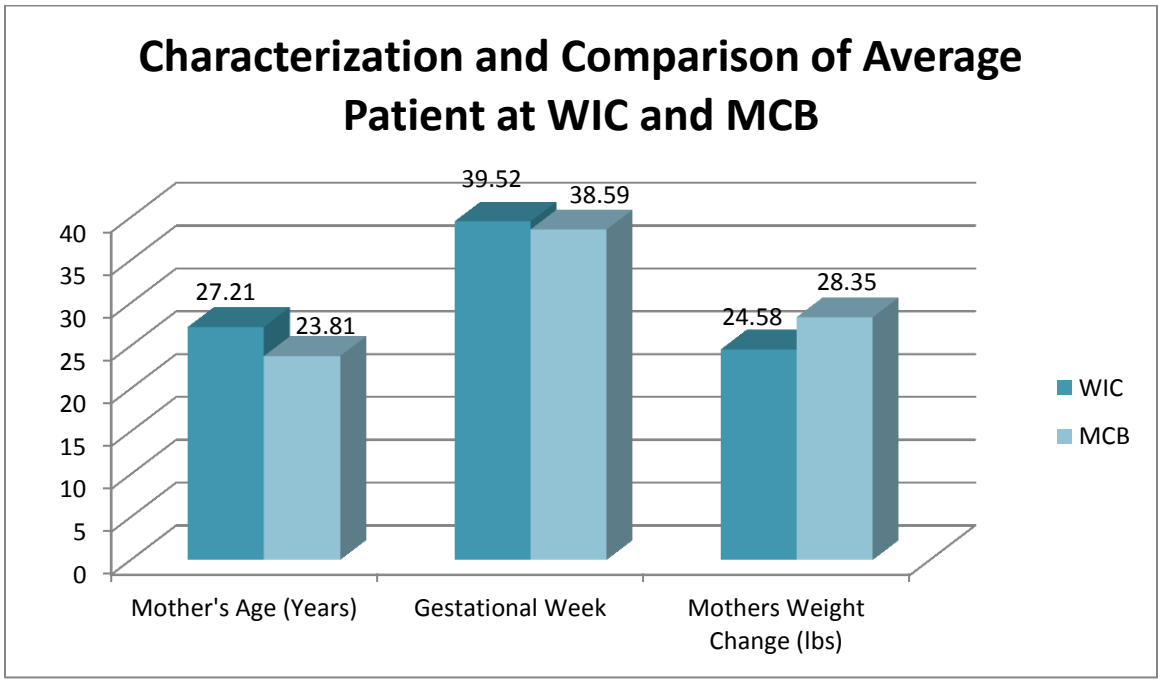

Figure 3.4 – Characterization and Comparison of Mother's Age, Gestational Week, and Mother's Weight Change at WIC and MCB

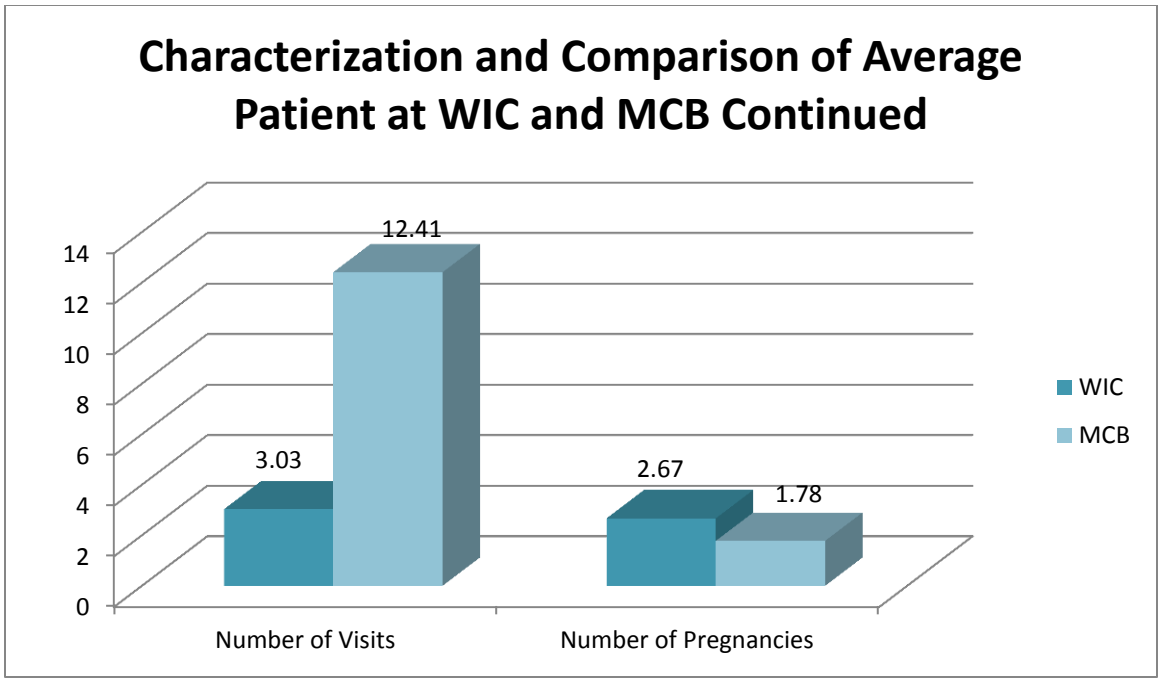

Figure 3.5 – Characterization and Comparison of Number of Visits and Number of Pregnancies at WIC and MCB

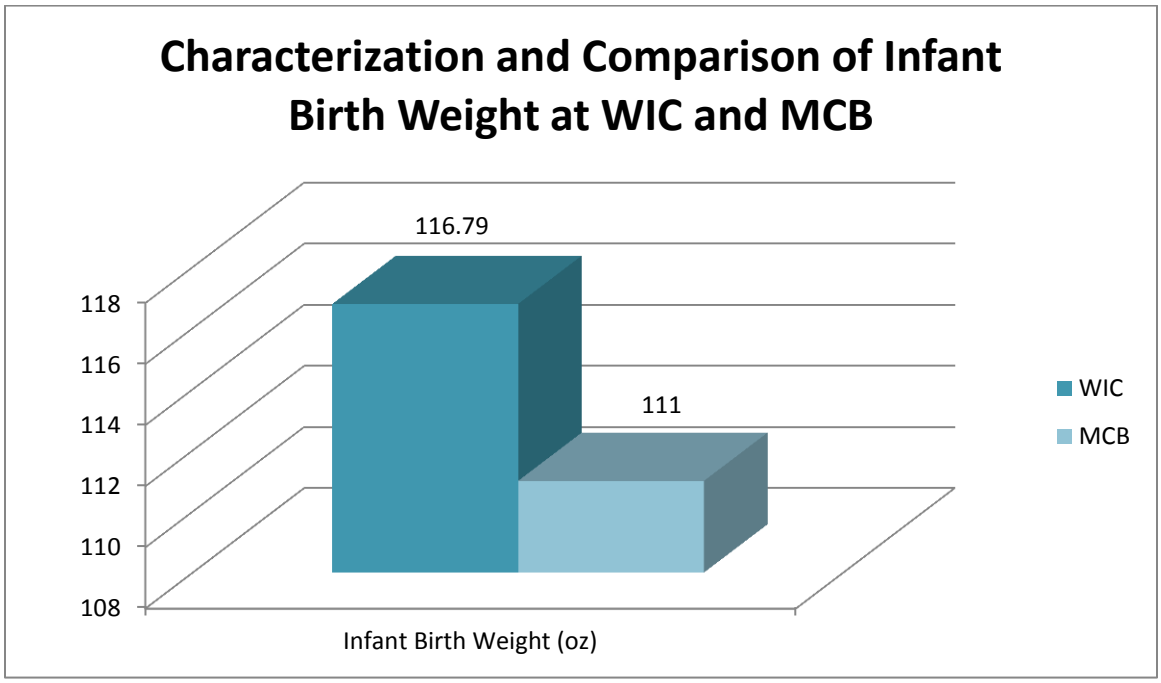

Figure 3.6 – Characterization and Comparison of Infant Birth Weight at WIC and MCB

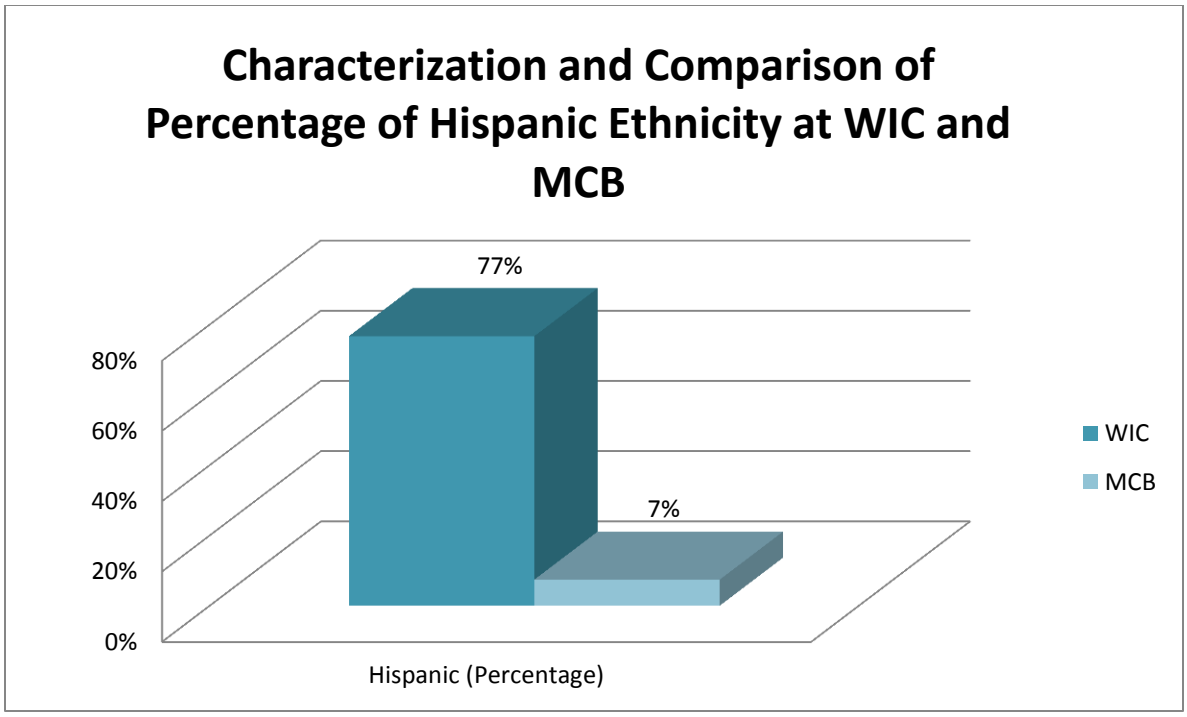

Figure 3.7 – Characterization and Comparison of the percentage of those of Hispanic origin at WIC and MCB

Variables characterizing the average patient at both facilities that were unable to be compared included: planned verses unplanned pregnancy, smoking habits, monthly or weekly prenatal care was initiated, and whether or not the individual was married.

Conclusion

The normal birth weight for infants is between 91 ounces and 140.8 ounces with an average being birth weight being around 120.00 ounces for both males and females.[14] From both facilities studied the average infant birth weight did fall within the normal healthy range. However, at both locations infant birth weights were slightly lower than the national average. What was unexpected was the fact that infants from the Joplin Women and Infant's Clinic had a slightly greater birth weight than those attending McCune Brooks Physicians for Women's Health in spite of the fact they attended the Clinic significantly fewer times. The comparison between the two only goes so far because of the facilities different approaches to health care and the fact that many of the patients from WIC also reported seeing a standard Obstetrician for prenatal care this still suggests a few interesting concepts.

The first is that the nutritional program that WIC promotes is successful in encouraging mothers to eat and maintain a healthy diet during their pregnancy so that their neonate is also within a healthy range. The second is that the greater birth weight at WIC coincides with fact that statistically people from lower income families tend to weight more than those from high income brackets.[15] Patients eligible for assistance from WIC must come from these lower income levels.

The average mother's weight change during the pregnancy does little to support this theory when considering the fact that at WIC the average change was 24.57 lbs. and at MCB it was 28.35 lbs. In both cases the average initial reported pre-pregnancy weight was between 144 lbs. and 148 lbs., respectively. The Mayo Clinic suggests that a person within the normal BMI range should gain between 25 to 35 lbs. during her pregnancy.[16] While both facilities fell on the slightly lower side of the suggest weight range, it is still a positive reflection on their programs because they were in healthy range. Even with WIC being marginally under for the suggested weight gain the data again suggests that their nutrition program is successful.

Further support for both clinics also comes from the fact that the mean gestational week falls in the full term range (37+weeks). In fact WIC had no reports of preterm birth in the participants I studied and MCB only had one case (31 weeks). Because the narrow margin of gestational weeks the regression analysis between gestational age and birth weight yielded weak results. At WIC no correlation between the two was found but at MCB a minor one was implied. With a correlation coefficient (r value) of 0.6193 and a p value = 0.0006 a slight significance was suggested but it is difficult to discern what exactly it means. In the bigger picture birth weight is positively correlated to the gestation week over the course of the pregnancy. However, in the final weeks though it appears to be of less consequence.

At both WIC and MCB there was a positive correlation between the number of pregnancies a woman experienced and her age. At WIC the relationship was stronger with an r value = 0.7098 and a p

value <0.0001. The r value does not suggest a strong correlation between the two variables (0.8 is strong) but the p value suggests that the data is very significant. The correlation coefficient at MCB was not nearly as strong though, r = 0.5316, and the p value only equaled 0.0043. This data suggests a very weak relationship. The difference between the two clinics data may stem from the difference in the average number of pregnancies at the two facilities. At WIC the average patient had experienced 2.67 pregnancies to delivery while at MCB the patient had only underwent 1.78 pregnancies. A more accurate assessment of this relationship would involve a much large sample size all around.

At MCB there was also a very slight correlation between the number of visits and the mother's weight change. Here the r value = 0.4727 and the p value = 0.0148. It is the p value that suggests a very minor significance. A greater significance between the two variables was actually expected; however, we do know that it is not the case with all pregnancies for dramatic weight gain to be desirable. It is also possible that if the average number of visits at WIC had been greater, than a correlation between the variables would have been found there as well. Additionally the data gathered from MCB suggested another slight correlation between the number of weeks receiving prenatal care and the mother's weight change. This is possibly related to the aforementioned compared variables and is again somewhat expected. Theoretically the longer and more frequently prenatal care is provided the healthier the fetus's outcome. Again though, this is not always the case because high risk patients or those with complications will actually see the physician more but can still have undesirable outcomes.[2] A possible correlation may have also been found at WIC if the number of weeks receiving prenatal care data had been available to compare.

As a whole there is very little additional information that needs to be said about the effectiveness of either clinic's program. The data that suggested that in many aspects both sets of patients are receiving proper prenatal care and that the infants are being delivered at both optimal

gestation week and within healthy birth weight guidelines. This also implies that WIC's nutrition program is at least somewhat effective in it endeavors although this study did little in the way of examining that relationship. The remaining data and analyses yielded little to interpret though and found nothing conclusive.

None of the other variables compared at either WIC or MCB yielded any significance. Internally at each location there were a few that were expected to show some correlation but did not, number of visits and infant birth weight and the number of weeks receiving prenatal care and infant birth weight specifically. It should be noted that a significant amount of the data obtained from WIC is self-reported which leaves a wide margin for error. Initially, this resulted in an additional 10 participants being excluded from the study because of inconsistencies in their charts so it is possible that a few minor inconsistencies were missed. If the data between the two clinics had been more statistically parallel other analyses could have been performed to look for other relationships that this study did not examine.

Future studies like this one should significantly expand their participant pool. By including more participants and ensuring that their data is consistent (all in weeks not a mix of weeks and months for example) then the results would reflect a broader and more accurate representation of the population. It would also be wise to watch for any bias and to try and minimize any differences in the participants other than those being specifically tested. Also it could potentially be beneficial to better examine the relationship between birth weight and fetal growth as well as the mother's weight gain on a weekly/ visit basis and then compare that to the overall birth weight. Other relationships that could potentially be examined involve how smoking, at either facility, affects the mother and fetus over the course of the pregnancy. One area that has particular opportunity is whether or not the pregnancy was planned and how other variables relate, both long and short term, that were not examined in this study. Because

prenatal care is such an important topic there are multiple studies that could be devised to improve the overall care provided.

In the way of an actual application, this study was too small to yield many conclusive results to suggest change to either facility. The only suggestion for improvement was that WIC had some opportunity involving the accuracy of their records as far as self-reported material and that it would be beneficial for them to double check this information with their patients.

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