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Knowledge of Behaviors that Contribute to a Healthy Pregnancy in Women Aged 18-25

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KNOWLEDGE OF BEHAVIORS THAT CONTRIBUTE TO A HEALTHY PREGNANCY IN WOMEN AGED 18-25

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ABSTRACT

Knowledge of behaviors that contribute to a healthy pregnancy may enhance the overall pregnancy experience. However, there are currently no studies that evaluate where discrepancies exist between current recommendations of behaviors contributing to healthy pregnancies and knowledge of those behaviors in women ages 18-25. The objective of this study was to determine where those discrepancies exist. Survey data of women's knowledge was compared to current recommendations set forth by the American College of Obstetricians and Gynecologists (ACOG). The behaviors assessed included alcohol consumption, cigarette smoking, sleeping, caloric intake, exercise, caffeine intake, weight gain, and folic acid intake. This knowledge was assessed using a survey taken either on a printed-paper copy or online using secure Qualtrics software. The survey also assessed which learning method(s) was most preferred by women aged 18-25. Surveys were distributed to women visiting Metro Women's Center in Crystal, Minnesota, and to students at Bethel University. The students at Bethel University included students from Dr. Timothy Shaw's Anatomy courses and the Physician Assistant Program Class of 2017.

The data revealed multiple areas in which further education is needed regarding these behaviors. Of these areas, most notable was the need for further education regarding folic acid intake (both before and during pregnancy). Questions regarding areas such as alcohol consumption and cigarette smoking were more frequently answered correctly. Overall, this study demonstrated an urgent need for further education regarding behaviors that contribute to a healthy pregnancy.

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Preface

This dissertation is the original, unpublished, work by the authors, S. Coffey and R. Jennings.

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Chapter 1: Introduction

Background of The Problem

Planned and unplanned pregnancies happen in every community. Whether the pregnancy was planned or not, significant education is required to help women achieve healthy pregnancies, and ultimately, healthy babies. To that end, many clinics provide numerous pamphlets regarding pregnancy, babies, and general health. However, many women may not ever read these pamphlets. Pregnancy in young women aged 18-25 is common and there may exist a lack of knowledge about behaviors leading to a healthy pregnancy. This may be caused by either a lack of access to, or a lack of utilization of, available information.

In the 21st century, technology is becoming a bigger part of daily life in the United States. Some young women may not even consider reading a pamphlet at a clinic, but rather look online for information. Many reliable websites, such as WebMD and Mayo Clinic's website, exist to help women seek out information regarding their health. A Google search for "healthy pregnancy behaviors" will also result in a number of websites and blogs that may not be as reliable.

Other newer technology includes utilization of smart phones, both via applications and text messaging. Some educational groups have begun to send mass text messages in order to try and educate a greater number of women (Meehan, J., & Paxton, S., 2011; Devine, Sharon, D.D., Ph.D; Bull, Sheana, Ph.D, M.P.H.; Dreisbach, Susal, Ph.D; and Shlay, Judth, M.D., M.P.H 2014). A search of a smartphone app store will return many applications related to pregnancy. Searches of iTunes and Google Play returned 1059 and 497 applications related to pregnancy education respectively (Tripp, N., Hainey, K., Liu, A., Poulton, A., Peek, M., Kim, J., & Nanan, R. 2014). With so many different sources of information, it can be difficult for young women to

know which information is coming from trustworthy authors and whether the information they are reading is correct.

Education may not always change a woman's behavior (Wise, N., & Arcamone, A. 2011). Nevertheless, being educated is important because when women engage in unhealthy behaviors during pregnancy, the consequences can be detrimental and sometimes even fatal to mother or offspring. Smoking tobacco during pregnancy has been linked to an increased risk of offspring being antisocial or autistic when compared to children whose mothers did not smoke during pregnancy (Maughan, Barbara, et al. 2001). Women who consume alcohol during pregnancy are 33% more likely to suffer from a placental abruption, increasing the risk for fetal distress or stillbirth (Muktar, Aliyu H.; Lynch, O'neal; Nana, hllp N.; ALio, Amina P.; Wilson, Ronee E.; Marty, Phillip J.; Zoorob, Roger; and Salihu, Hamishu M. 2010).

Expectant mothers who seek out information regarding exercise and implement that knowledge during pregnancy can possibly improve the process of labor and delivery. For example, research shows that engaging in 30 minutes a day of moderate physical activity during the third trimester of pregnancy may lead to women experiencing a shorter second phase of labor, 88 minutes versus 134 minutes, compared to inactive women. Additionally, women who participate in the recommended 30 minutes per day of physical activity are more likely to have fewer complications, such as Cesarean section, compared to those who engage in little or no physical activity (Melzer, K.; Schutz, Y.; Soehnchen, N.; Othenin-Girard, V.; Martinez de Tejada, B.; Irion, O., 2010). Research has also shown that a healthy diet during pregnancy, i.e. both an adequate nutritional and caloric intake, will more likely result in a baby of an appropriate birth weight which can also lead to fewer complications during labor and delivery (Abu-Saad, Kathleen; Fraser, Drora 2010).

Statement of the Problem

Valuable educational information exists in the form of pamphlets, handouts, and the internet regarding healthy pregnancy behaviors. However, there is no data which quantifies whether this information is being translated into long-term knowledge.

While a variety of printouts are available that contain valuable and reliable information, women may not read the pamphlets or printouts they are given, favoring instead electronic technology. The medical provider, leaving the woman to read and educate herself, may not reiterate the pamphlet information. In the researchers' opinion, this could lead women to seek out information on the internet or through smartphone applications, which the authors hypothesize, might cause them to feel discouraged and lost in the sea of information.

There have not been any studies evaluating how women aged 18-25 prefer to learn about pregnancy. Therefore, the best way to educate women in this age group is not yet identified. There are steps that can be taken to help identify the predominant discrepancies between current knowledge regarding behaviors that contribute to a healthy pregnancy and the recommendations from ACOG. With this information, it may be possible to have a greater impact on educating women regarding healthy pregnancy behaviors by addressing those deficits.

While some young women may possess general knowledge about healthy pregnancy behaviors, they may not know specific information that could increase their likelihood of having a healthy pregnancy. Our research concentrated on where the largest discrepancies exist between current recommendations of healthy pregnancy behaviors set forth by American College of Obstetricians and Gynecologists (ACOG) and the knowledge of women ages 18-25 regarding these same behaviors.

Purpose

The purpose of this study was to evaluate the knowledge among women aged 18-25 with regard to behaviors that contribute to having a healthy pregnancy. This information was compared to the standard guidelines recommended by ACOG. Several specific behaviors that contribute to a healthy pregnancy were studied. These behaviors included the intake of certain substances (tobacco, alcohol, and caffeine), the level and length of physical activity, amount of sleep, nutritional intake during pregnancy, weight gain associated with pregnancy, and folic acid intake before and during pregnancy.

Surveys were given to women aged 18-25 visiting the Metro Women's Center in Crystal, Minnesota. The same survey was distributed to Bethel undergraduate students in Dr. Timothy Shaw's anatomy course, and students in the Bethel University Physician Assistant Program Class of 2017 via email. The survey questioned women aged 18-25 about their knowledge of behaviors that contribute to a healthy pregnancy. The survey results were used to assess discrepancies in the women's knowledge when compared to ACOG recommendations. In assessing the population's current knowledge of behaviors contributing to a healthy pregnancy, this study intended to make a significant and specific impact in the lives of both the young women and their providers by providing specific areas in which to increase educational efforts.

This study may enlighten not only the researchers, but also the medical community as a whole. Areas of educational deficit were clearly identified and defined. Assessing knowledge of behaviors that contribute to a healthy pregnancy and how women aged 18-25 would prefer to learn about these behaviors may assist in creating future educational tools and effective services to young women in the community. Yet, using preferred methods of education still does not guarantee increased knowledge regarding behaviors that contribute to a healthy pregnancy.

Significance of the Problem

This problem is significant because women who are not educated on the behaviors contributing to a healthy pregnancy may have greater complications and require more medical care (Maughan, Barbara, et al. 2001). Based upon the researcher's past knowledge combined with extensive research, it is known that women who smoke tobacco and drink alcohol during pregnancy are more likely to have children born with birth defects. Children with birth defects, such as fetal alcohol syndrome, are more likely to need significantly more medical care throughout their lives. Increased medical care will increase costs. Not only does this place stress on mothers, but some may not have sufficient funds to pay for these costs beyond insurance. If a woman is not able to pay, then greater financial burden is placed on our government and taxpayers through the use of public assistance programs and government health care.

Physician Assistants (PAs) are directly impacted, as they will often be caring for women and their babies during prenatal and postnatal clinic appointments. It is during these appointments that the educational piece of healthcare is essential. It is critical that providers spend time educating women on behaviors that contribute to a healthy pregnancy. While knowing how to live a healthy lifestyle during pregnancy may seem like innate knowledge to PAs and other medical professionals, some women may need extra guidance on discovering and understanding behaviors that can aid them in having a healthy pregnancy.

Many clinics have several pamphlets that contain information about healthy pregnancy. However, some women may read these without retaining any long-term knowledge, or some women may prefer to get information using a different method and may not read them at all. Newer methods of education are becoming available and more popular, such as text messages, smartphone apps, and the internet. These methods may be preferred by women aged 18-25.

However, the authors believe many health care practices have not adopted these forms of technology for educating their patients, potentiating a knowledge gap in this population. It is unknown if young women learn better through newer methods of education.

Research Questions

We looked at current knowledge of behaviors that contribute to a healthy pregnancy. These behaviors included tobacco use, alcohol intake, caffeine intake, folic acid supplementation, amount of sleep, nutritional and physical activity recommendations, and appropriate weight gain. We used the survey results to identify which areas have the largest discrepancy between women's knowledge and ACOG recommendations. We also collected information about how women aged 18-25 prefer to learn in hopes of educating medical providers on how to best educate their patients.

Summary

Pregnancy is a major life occurrence. Women may face a steep learning curve on how best to have a healthy pregnancy and baby. This study aimed to evaluate the knowledge of women aged 18-25 regarding behaviors that contribute to a healthy pregnancy. It intended to find specific areas of educational deficit in order to help medical professionals better understand which educational needs may require more emphasis.

Chapter 2: Literature Review

Introduction

There has been research conducted about healthy pregnancy behaviors in women across the age spectrum, immigrant women in the United States, and women in foreign countries. However, there has been no research specifically evaluating the knowledge of women aged 18-25 in regard to behaviors that contribute to a healthy pregnancy. There are also no studies surrounding how women aged 18-25 would prefer to learn about pregnancy.

Accessibility to Information for Young Women

To date there has been no research conducted in regard to how women aged 18-25 are actually accessing information about healthy behaviors during pregnancy. Likewise, there has been no research exploring where women would prefer to get information about healthy pregnancy behaviors. Some women aged 18-25 may be getting information from multiple sources, leading to possible confusion as to what healthy pregnancy behaviors really are.

Women in all age groups report that the educational information given during their prenatal visits has not consistently been answering their specific questions. This often causes them to turn to other sources, such as internet search engines, smart phone applications, chat boards, or forums for real-experience answers. Women have expressed concern that while the internet was very helpful in answering questions, it had many limitations. Common limitations included multiple sources stating different answers, information presentations that are difficult to comprehend, and the sheer quantity of information. These limitations cause women to view the internet as a somewhat unreliable source for pregnancy-related topics (Kraschnewski, J. L., Chuang, C. H., Poole, E. S., Peyton, T., Blubaugh, I., Pauli, J., Feher J., Reddy, M., 2014).

In a survey looking at internet search histories of young mothers, it was found that the most commonly searched topics were pregnancy and birth control (Logsdon, M.C., et al. 2014). This suggests that there are young women interested in learning about pregnancy, and that the internet and social media are frequently utilized as potential educational sources. However, when specifically looking at alcohol consumption, women of all ages preferred that the message come from a healthcare professional or other reputable source (Anderson, A. E., Hure, A. J., Kay-Lambkin, F. J., & Loxton, D. J., 2014).

A problem women are facing in the age of the internet is knowing which source to trust. In a study conducted by Hämeen-Anttila, K., Nordeng, H., Kokki, E., Jyrkkä, J., Lupattelli, A., Vainio, K., & Enlund, H. (2014), it was found that women would often seek multiple sources when looking for information related to pregnancy. These women often found sources that were contradicting each other. Additional anxiety is further perpetuated in expectant mothers by watching births online, on TV, or in movies. Many mothers have unrealistic expectations for their labor and birth, either expecting their birth to be more difficult or even faster, from watching a 15 minute video of a birth or a traumatic dramatization on television or in movies (Fleming, S. E., Vandermause, R., & Shaw, M., 2014). There is evidence that women are receptive to technology but there needs to be a more reliable, well-known, and easily attainable source than what currently exists.

Lucas, C., Charlton, K. E., & Yeatman, H. (2014) found that many women do not receive enough education about healthy pregnancy from providers for multiple reasons. These reasons include the provider's lack of time, lack of resources, and lack of relevant training. However, providers do find the topic of behaviors contributing to a healthy pregnancy to be important. Unfortunately, this did not change their behaviors in educating their patients.

Research regarding this issue of knowledge and preferred methods of learning in women ages 18-25 is lacking. This thesis focused on areas of deficit in knowledge regarding healthy pregnancy behaviors, and gathered information about how women aged 18-25 would prefer to learn about pregnancy. Such information may help providers decrease preventable complications during pregnancy through focused and more accessible education.

Knowledge Gap

Research shows that women who have higher education levels are more likely to be better educated in regards to the behaviors that contribute to a healthy pregnancy (Fingerhut, L., Kleinman, J., and Kendrick J., 1990). However, Kennedy, E. C., et al. (2014) found that 95% of pregnant women aged 18-24 felt that they needed more information on pregnancy. This percentage was increased even further if their pregnancy was unplanned. From this we can infer that there is very likely a knowledge gap in women aged 18-25, which could be used to direct further education.

According to the literature, alcohol use during pregnancy is a topic in particular where there is a significant lack of knowledge in women of all ages (Anderson, A. E., Hure, A. J., Kay-Lambkin, F. J., & Loxton, D. J., 2014). Women report that there are significant inconsistencies in the information regarding alcohol use during pregnancy. There are mixed messages about identifying a safe level of consumption. This leads to confusion about whether or not it is safe to drink alcohol during pregnancy (Anderson, A. E., Hure, A. J., Kay-Lambkin, F. J., & Loxton, D. J., 2014).

The decision to drink alcohol during pregnancy may lead to serious consequences. The child may be born with fetal alcohol syndrome, impacting life-long physical and mental health. For example, a study published in the *Maternal Child Health Journal* found that women who

consume alcohol during pregnancy are more likely to suffer from a placental abruption, a medical and possibly fatal emergency (Muktar, Aliyu H.; Lynch, O'neal; Nana, hllp N.; ALio, Amina P.; Wilson, Ronee E.; Marty, Phillip J.; Zoorob, Roger; and Salihu, Hamishu M. 2010).

Another unhealthy behavior that might become less frequent with proper education is smoking tobacco during pregnancy. A study specifically looking at smoking's effects found that children born to mothers who used tobacco had a higher incidence of cognitive-behavioral disorders. There is also a much higher incidence of placental abruption with smoking (90% increased risk) than alcohol use (33% increased risk), as well as intrauterine growth restriction and premature delivery (Maughan, Barbara; Taylor, Colin; Taylor, Alan; Butler, Neville; and Bynner, John. 2001).

In addition to tobacco and alcohol use, another area investigated in this research was information regarding physical activity during pregnancy. Some expectant mothers have run marathons. Others may personally believe that bed rest, even if not physician-ordered, is most beneficial to the health of the baby. While 30 minutes of moderate activity a day is what is recommended by ACOG for the average woman, special cases exist and individualized recommendations are necessary depending upon the woman's history and comorbidities. For instance, if a woman has never run in her life, starting during pregnancy is often not recommended. However, an anxious expectant mother may think that radically changing her level of physical activity will benefit both her and the baby. This drastic change in behavior, in the area of physical activity, is often not the solution to a healthier pregnancy (Melzer, K.; Schutz, Y.; Soehnchen, N.; Othenin-Girard, V.; Martinez de Tejada, B.; Irion, O., 2010).

Folic acid (also known as Vitamin B9) is a synthetic form of naturally occurring folate found in various foods. It is important to get adequate amounts of folic acid once a woman is

sexually active, even before becoming pregnant. Consistent intake of folic acid before and during pregnancy can reduce the incidence of babies born with neural tube defects. The two most common types of neural tube defects are anencephaly, and spina bifida. In spina bifida, the spinal column does not fully close. This can cause partial or full paralysis of the lower limbs. In anencephaly, the skull and brain fail to develop, often resulting in stillbirth or death soon after delivery. Taking in an adequate amount (400 micrograms) of folic acid aids in avoiding these devastating neural tube defects. Since fetal neural tube defects occur in the first few weeks of pregnancy (often before the woman knows she is pregnant), the CDC recommends that even women who do not plan to get pregnant take daily folic acid. This can be achieved through taking a daily multivitamin. According to the CDC, 400 micrograms per day is sufficient in preventing neural tube defects by 60% (CDC, 2014). During pregnancy, ACOG recommends 400-600 mcg of daily folic acid intake.

While many young women have some knowledge regarding healthy behaviors, there may still remain a knowledge gap. While is important to individualize recommendations of some behaviors, such as sleep, caloric intake, exercise, and weight gain, it is also important to teach the behaviors that remain consistent from woman to woman such as alcohol consumption, cigarette smoking, and folic acid intake.

Importance of Education and Counseling in Pregnancy

Despite best attempts, some women still feel that prenatal visits are not structured with patient education in mind. One study found that the most important reason for this frustration was due to the fact that the first prenatal appointment occurs 2 months after conception, which many women feel is not early enough (Kraschnewski, J. L., et al., 2014). Women reported frustration that follow-up appointments are too infrequent in the early stages of pregnancy. Early

pregnancy is when women commonly have the most questions, and are looking for the most information. Some women who feel that they are not getting the information desired from their prenatal visits may turn to the internet for answers, and as mentioned earlier, that may provide these women with conflicting and confusing information.

Education about behaviors contributing to a healthy pregnancy can be very serious matters. Some high-risk behaviors, such as high intake of alcohol, increase the risk of a mother suffering a miscarriage or choosing an abortion (Lassi, Z. S., Imam, A. M., Dean, S. V., & Bhutta, Z. A., 2014). Further procedures often follow a miscarriage, such as a dilation and curettage, which has its own set of risks for the mother. If risky behaviors can be avoided during pregnancy through previous education and knowledge, the risk of mother or fetus suffering a serious injury, or death, may be able to be reduced.

Aspects of a Healthy Pregnancy

Upon review of current literature, outcomes of pregnancy can vary greatly based upon perinatal behaviors (Lassi, Z. S., Imam, A. M., Dean, S. V., & Bhutta, Z. A., 2014). Women who participate in high-risk behaviors may be more likely to have pregnancy-related complications such as spontaneous abortion, cesarean section, preeclampsia, preterm birth, and low birth weight. Occasionally these complications can lead to further health complications such as infections, blood loss, and death of the child, mother, or both. Women not familiar with healthy pregnancy behaviors may find implementing these healthy behaviors daunting. These behaviors include cessation of smoking and alcohol consumption, exercising at a moderate physical rate for 30 minutes a day, limiting caffeine intake, and eating a healthy and well-balanced diet (including adequate folic acid intake).

As previously discussed, the risk of neural tube defects in the fetus can be reduced by 60% simply through a woman taking a multivitamin every day since most OTC multivitamins contain 100% of this recommended value (CDC, 2014). Women should begin taking the recommended amount of folic acid once they become sexually active. When pregnancy commences, the amount should be increased to 600 micrograms per day as recommended by ACOG. While folic acid reduces the risk of complications early in pregnancy, there are other behaviors that can decrease the risk of complications during later stages of pregnancy.

Participation in an adequate amount of physical activity can decrease the risks of pregnancy complications. A study by the *American Journal of Obstetrics and Gynecology* found that engaging in 30 minutes a day of moderate physical activity leads to a shorter second phase of labor birth compared to women who engage in little or no physical activity (Melzer, K., Schutz, Y., Soehnchen, N., Othenin-Girard, V., Martinez de Tejada, B., Irion, O., 2010). Along with a shorter and easier birth, children of mothers who exercise during pregnancy have been found to have a higher IQ at 48 months, and perform better on development cognitive ability tests at 12 months (Domingues, M. R., Matijasevich, A., Barros, A. J. D., Santos, I. S., Horta, B. L., & Hallal, P. C., 2014). While there may be other reasons for these outcomes, physical activity may be, at least in part, responsible.

In addition to physical activity, eating a balanced diet filled with vegetables, fruit, whole grains, fish, and increased water intake has been associated with a lower risk of complications, such as preterm delivery. Recommendations from ACOG suggest following the dietary guidelines set forth by the United States Department of Agriculture (USDA) such as using MyPlate, an online tool to determine correct portion sizes. It was also found that eating a diet rich in fruits, vegetables, whole grains, and fish improved pregnancy outcomes, i.e., fewer health

complications, even if foods low in nutrient density are not totally removed from the diet (Englund-Ögge, L., Brantsæter, A. L., Sengpiel, V., Haugen, M., Birgisdottir, B. E., Myhre, R., Jacobsson, B., 2014). Beyond delivering a full term child, children of mothers who eat a balanced diet during pregnancy were less likely to become obese during childhood than mothers who ate high fat diets (Parlee, S. D., & MacDougald, O. A., 2014). This in turn lowers the child's potential for future health care risks and costs associated with obesity.

A behavior that increases the likelihood of complications is consuming alcohol while pregnant. Women who abstain from alcohol consumption during pregnancy are 67% less likely to suffer from placental abruption (Muktar, Aliyo H. et al., 2010). Additionally, children of mothers who consume alcohol during pregnancy may suffer from fetal alcohol spectrum disorders (FASD) including being born with a cleft palate, developmental delay, or Tetralogy of Fallot. In 2002, it was estimated that the average cost of one individual with FASD was roughly $2 million throughout their lifetime. Also noteworthy, FASD costs the United States an estimated $4 billion annually (CDC, 2016).

Tobacco use during pregnancy is another behavior that increases the risk of pregnancy-related complications. Smoking tobacco during pregnancy has been found to decrease the placental vessel size in the mothers, leading to decreased blood flow to the growing fetus (Milnerowicz-Nabzdyk, E., and Bizoń, A., 2014). According to a study published in *The Journal of Affective Disorders*, decreased blood flow leads to an increased risk of neurodevelopmental disorders in these children (Chudal, R., Brown, A. S., Gissler, M., Suominen, A., & Sourander, A., 2014). Children whose mothers smoked during pregnancy are more likely to be more antisocial or higher on the autism spectrum than children whose mothers did not smoke during pregnancy. Other common complications seen with smoking mothers include premature

delivery, higher rates of miscarriage and placental abruption, low birth weight infants, and an increased risk of Sudden Infant Death Syndrome (SIDS) (Maughan, Barbara, et al. 2001).

Summary of Literature Review

While there exists extensive data about outcomes related to specific behaviors during pregnancy, we found none addressing where discrepancies exist between current ACOG recommendation of behaviors that contribute to a healthy pregnancy and knowledge of those behaviors in women aged 18-25. This study looked at current knowledge levels of women aged 18-25 regarding several behaviors that contribute to a healthy pregnancy. Since studies assessing specific areas of educational deficits have not been previously conducted, this is a point of interest that is unique to this thesis project. There has also not been research looking at how women aged 18-25 would prefer to learn, which again may be unique and helpful.

The researchers hope that many complications for mothers and babies could be avoided with adequate education leading to long-term knowledge. Review of the literature pertaining to the outcome of various behaviors during pregnancy and the sometimes grave consequences of educational deficiencies, highlights the seriousness of this thesis topic. Proper pregnancy education may help to save lives.

Chapter 3: Methodology

Introduction

The purpose of this study was to evaluate the knowledge of women aged 18-25 regarding behaviors that contribute to a healthy pregnancy. This is a pilot, observational study that intended to address and analyze the following questions:

1. Where is there a discrepancy between current ACOG recommendations regarding behaviors that contribute to a healthy pregnancy and knowledge of those behaviors in women aged 18-25?
2. Which source(s) do women aged 18-25 prefer to use to learn about behaviors that contribute to a healthy pregnancy?

Study Design

This research project is a quantitative prospective nonrandomized survey. It included women between the ages of 18 and 25 in the Twin Cities metro area. Upon completion of informed consent (see Appendix E for the informed consent statement), subjects were sequentially enrolled into the study. Information was gathered concerning background demographics, socioeconomic status, marital status, education level, previous education regarding pregnancy and sex education, current pregnancy status and beliefs on specific habits during pregnancy (see Appendix D for the survey instrument). In this study, a survey tool was developed and participants had the option to take the survey either on a printed questionnaire or online via the Bethel Qualtrics survey instrument.

The sites used for survey distribution were both located in Minnesota; Metro Women's Center in Crystal, Minnesota and Bethel University in Arden Hills, Minnesota. Names were not

collected on the surveys to ensure confidentiality. Participants were enrolled into the study once they read and accepted the informed consent page. At Metro Women's Center, surveys were offered to clients visiting the center in-person. At Bethel University, the survey was distributed to the participants through a web page link in an email. The first page of the online survey was the informed consent. Upon agreeing to this, Bethel students were allowed to begin the survey.

Methods

This study attempted to assess the discrepancies between current recommendations regarding healthy pregnancy behaviors and knowledge of the same in women aged 18-25. The study also attempted to gather information about how women aged 18-25 would most like to learn about healthy pregnancy behaviors.

In order to ensure the validity of the questionnaire, a pilot survey was deployed. Fellow students in the Bethel University Physician Assistant Program Class of 2016 and program faculty reviewed this tool. The survey was revised based upon their input and comments. Before the survey was distributed at the clinic and to the students at Bethel University, the Institutional Review Board (IRB) reviewed the research proposal and survey instrument and gave approval.

The survey was sent to the director at Metro Women's Center and administered through an office assistant to women visiting the center during regular business hours. Each participant verbally consented after reading the informed consent, understanding that participation in the survey was not mandatory to receive further care at the center. Upon consenting, women were considered enrolled into the study and allowed to fill out the survey.

Surveys were also accessed via an email to undergraduate students at Bethel University in Dr. Timothy Shaw's anatomy classes as well as students in the Bethel University Physician Assistant Program Class of 2017. The online survey was created using secure Bethel Qualtrics

software. Rebecca Jennings was the only person able to view survey responses through the software. The surveys were distributed to participants via an email with a link to the survey webpage. The online surveys were collected anonymously; no identifying information was collected through the survey tool. The informed consent was the first question of the survey. Participants had to first agree to the informed consent, allowing them to then be enrolled into the study and able to fill out the remainder of the survey.

Women participating in this study remained anonymous to the researchers. A staff member collected the completed surveys from Metro Women's Center and notified the researchers to pick up the surveys in March 2016. The completed surveys were stored using the secure Qualtrics software, and the paper copies of the surveys destroyed. The data was further analyzed using the Qualtrics software as well as Microsoft Excel to find trends and correlations, as well as determining statistical significance.

Study Site and Subject Variables

There were no variables that could be adjusted in the study since it was an observational study. However, individual variables that could be manipulated by the nature of the study include participation in the study and the research analysis. Although this study did not have a control group, the population was controlled by means of survey distribution location and age parameters (18-25).

The survey was distributed from September 2015-March 2016. Women who were aged 18-25 during this time period were eligible to complete the survey. The surveys belonging to women outside the targeted research group age were discarded upon collection. There was no contact made between the researchers and the survey participants regarding this research project and confidentiality of the participants' names will remain intact.

Procedures

Between September 2015 and March 2016 surveys were distributed to women visiting Metro Women's Center seeking pregnancy counseling or care. Upon arriving to the center, women were asked by the clinic staff if they would like to voluntarily enroll in the study. Women who answered "yes" were given the informed consent to read and upon agreeing were given the survey to fill out. The researchers collected the surveys in March 2016.

Surveys were distributed to female students at Bethel University who were either in Dr. Timothy Shaw's anatomy courses or were members of the Physician Assistant Program Class of 2017 via an email link to the survey webpage. The informed consent was the first question of the survey. Participants had to agree to the informed consent. They were then considered enrolled into the study and were able to fill out the remainder of the survey. The second survey question asks the participant's gender. Students who answered 'Male' were directed to the end of the survey. Students who answered 'Female' were allowed to continue the survey. The third question of the survey asked the participant's age, and women who answered '<18' or '>26' were directed to the end of the survey. All women who answered between 18 and 25 were allowed to complete the survey. Survey responses were collected and stored using the secure Qualtrics software.

Validity and Reliability

The research review panel at Bethel University approved the survey before distribution. The researchers performing this study compiled the survey used in this study. The questions were tailored to answering the overarching research questions and were determined to be reproducible. Initially, a group of both Bethel Physician Assistant students and faculty members

examined and gave revision recommendations for the survey to improve its validity and reliability and to critique its content.

Data Analysis

Responses from the completed surveys were compared against the recommendations developed by The American College of Obstetricians and Gynecologists (ACOG). The data received from the surveys was compiled into graphs, tables, and charts using the Qualtrics software and Microsoft Excel. Correlations, trends, and percentages are included in the data analysis along with statistical analysis. In addition to quantitative data analysis, descriptive statistics were utilized using the collected survey responses.

Limitations and Delimitations

The following are limitations outside the researchers' control and have potential to be weaknesses of the study:

1. Due to the time constraints, the sample size is smaller than initially hoped.
2. The data is self-reported answers, which has the potential to get unwanted and untrue results (such as participants choosing what they believe the researchers might want to hear).

The following are delimitations of the study:

1. There was a lack of personal contact between the researchers and the survey population. This was done to ensure confidentiality, however it may lead to a lower response rates if the survey distributors do not remember to discuss the survey opportunity with potential participants.
2. The survey was only distributed to three populations, two of which were both Bethel University students. This was done due to the nature of the time constraints of the survey

and the difficulty finding a site willing to distribute surveys. This has the potential to create skewed results.

3. The age range of study participants was limited to ages 18-25. This was done to prevent the necessity of parental consent in women under the age of 18. However, collecting data from women younger than age 18 may have expanded our findings and allowed for future studies to make conclusions about the importance of early intervention.
4. No educational tool was developed nor was there a pretest/posttest. We determined that this would have been beyond the range of this particular study, and will have to await future studies. Doing so may show the effectiveness of a given educational tool upon retained knowledge.

Conclusion

The surveys were distributed at Metro Women's Center and to Bethel University students between September 2015 and March 2016. The data was collected on printed surveys and in electronic form using the secure Bethel Qualtrics software. The data was then analyzed using the Qualtrics software and Microsoft Excel to identify trends and knowledge deficits. A summary of the analyzed data will be sent to the Metro Women's Center to provide insight as to where to focus educational efforts in the future.

Chapter 4: Results

Introduction

The following chapter presents data from the 43 surveys collected from women aged 18-25. The survey tool used can be reviewed in Appendix D. The data for this thesis was collected by the use of either a paper or online survey tool. The survey was distributed in multiple locations, including Dr. Timothy Shaw's Bethel University Anatomy course (both fall and spring semesters), the Bethel University Physician Assistant Program Class of 2017, as well as the Metro Women's Center in Crystal, Minnesota. Surveys were collected between September 2015 and March 2016. There were a total of 6 surveys received from the Metro Women's Center; the remaining 37 surveys were collected from Bethel University students (identification of which class was not collected, so it cannot be differentiated).

The purpose of this study was to identify the specific area(s) of greatest discrepancy between current knowledge of healthy pregnancy behaviors and the recommendations published by American College of Obstetricians and Gynecologists (ACOG). The areas surveyed included alcohol consumption, cigarette smoking, exercise, weight gain, folic acid intake, caffeine, amount of sleep, and caloric intake. During data analysis it was noted that the survey questions about caffeine, sleep, and caloric intake were not consistent with the current recommendations, which hindered the analysis.

Summary of Personal (Biographical) Data

The first section of the survey collected personal information from the participants including age, highest level of schooling completed, yearly income, marital status, and sexual activity status. Though this information was not central to our study, the data allowed us to look

at the responses in relation to participant's information to try to identify any correlations. The question regarding the participant's level of education was of particular interest since many schools are no longer teaching pregnancy-centered health education.

Participants were asked their age on the date they filled out the survey. The age range of women who completed the survey was 18-25. Of the 43 completed surveys, 21 (or 49%)of respondents were aged 18-20, and 22 (or 51%) of respondents were aged 21-25. Age was collected to determine if a higher age would appear to influence knowledge on the current recommendations of healthy pregnancy behaviors.

Age	Responses	Percentage
18-20	21	49%
21-25	22	51%
Total	43	

Table 1: Distribution of age of study participants

The women surveyed came from a variety of educational backgrounds. Responses ranged from completing a high school degree to completing a master's degree. Of the women surveyed, 19 (or 44%) had some college experience, 15 (or 34%) had obtained a bachelor's degree, and 4 (or 9%) had obtained a high school diploma.

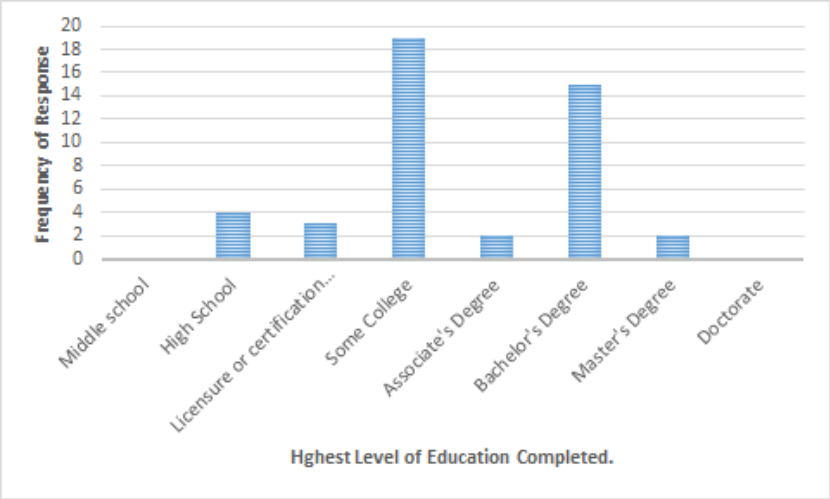

Figure 1: Responses to Question "What is your highest level of education completed?"

Yearly individual income data was collected (using the 2015 federal tax brackets) from the women surveyed to see if knowledge of healthy behaviors correlated with income, and therefore, possible access (or lack thereof) to accurate and up-to-date information. Of the 43 responses collected, 37 women (or 84%) reported less than $9,075 annual income. Five women (or 11%) reported that they had a yearly income of $9,076-36,900. Finally, only 2 women (or 5%) reported that they made between $36,901-$89,305.

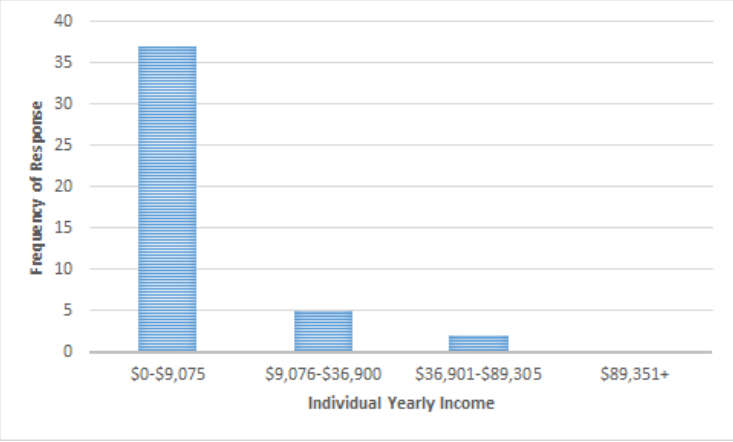

Figure 2: Responses to Question "What is your individual yearly income?"

Relationship status was collected to determine if any of the women surveyed might be in a relationship where they are more likely to try to become pregnant. Of the women surveyed 41 (or 93%) reported that they were single. Only 2 women (7%) reported that they were married. The survey did not account for women in non-married relationships. Seventeen (or 40%) of the women surveyed reported being sexually active, and all 17 of these women reported being in a monogamous sexual relationship.

Sexual Education and Pregnancy Education

The survey also questioned women as to whether they received education in school, as well as whether they received education regarding healthy pregnancy behaviors. Thirty-five women (or 81%) reported that they received sex education during school; however, only 32% reported they received education on a healthy pregnancy in school. Only 39% of those with school-based sex education were specifically taught about healthy behaviors during pregnancy.

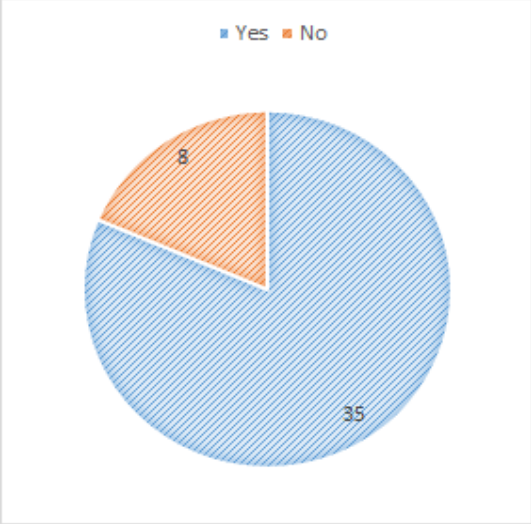

Figure 3: Responses to Question “Did you receive sex education in school?”

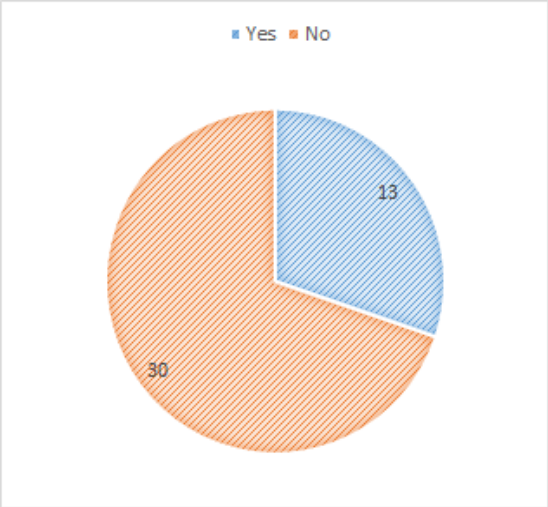

Figure 4: Responses to Question "Did you receive pregnancy education in school?"

Current Pregnancy Status

Women were asked if they were pregnant at the time they filled out the survey. A total of 4 women (or 9%) reported that they were pregnant at the time of survey. Three of those women were in their 1st trimester, while one woman was in her third trimester. All 4 women reported that their pregnancy was unplanned. These questions were asked to determine if being pregnant had any impact on knowledge of healthy pregnancy behaviors.

Healthy Pregnancy Behaviors

The second section of the survey questioned women on their knowledge surrounding healthy behaviors before and during pregnancy. The survey inquired regarding knowledge of the following topics: alcohol intake during pregnancy, cigarette smoking during pregnancy, exercise during pregnancy, weight gain during pregnancy, and folic acid before and during pregnancy.

Question 1 on the survey asked about how many ounces of alcohol are safe to consume per week during pregnancy. ACOG currently recommends that zero alcohol intake is safe during any part of pregnancy. Of the 43 women surveyed, 32 women (or 74%) answered correctly that

no alcohol is recommended during pregnancy. Eight women (or 19%) selected that 5 oz of alcohol weekly are safe during pregnancy. Two women (or 5%) reported that 12 oz of alcohol per week are safe, and 1 person (or 2%) reported that they were unsure how much alcohol is safe during pregnancy. Overall age did not yield a significant difference in answering correctly, with 78% of those aged 21-25 answering correctly as opposed to 75% of those aged 18-20. A t-test analysis confirmed this, showing there was no statistical significance.

Chi square analysis was used to determine if results from Question 1 were statistically significant. From the sample size of 43 respondents, 32 respondents answered this question correctly, indicating statistical significance where $p < 0.05$ ($p = 0.0008$). We also determined, using t-test analysis, that there was no statistical significance between the age categories 18-20 and 21-25 in regards to the frequency with which the correct answer was chosen, where $p < 0.05$ ($p = 0.910$).

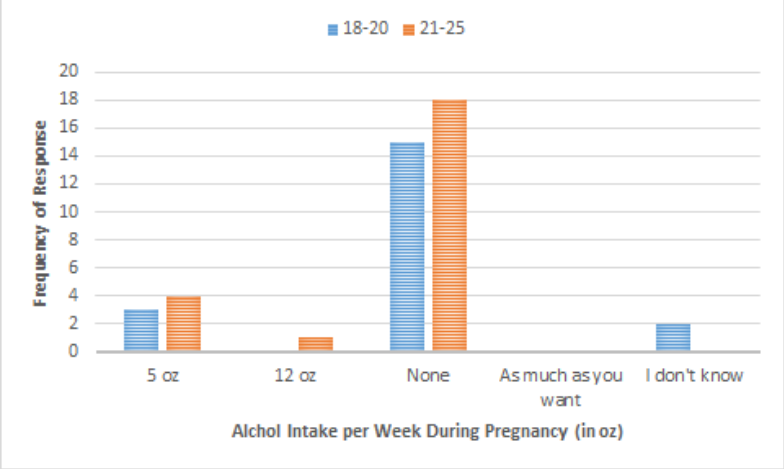

Figure 5: Responses from Question #1, "How many ounces of alcohol are safe to consume during one week of pregnancy"

Question 2 of the survey asked how many cigarettes are safe to smoke per week during pregnancy. ACOG's current recommendations are that pregnant women should not smoke any

tobacco products at any point throughout their pregnancy. Forty one (or 93%) of women surveyed answered correctly that no cigarette smoking during pregnancy is safe. Two women (or 7%) were unsure of how much cigarette smoking is safe during pregnancy. Women aged 21-25 more frequently chose the correct response, with 100% of women in this age group choosing no cigarettes. Two women aged 18-20 reported they were unsure how many cigarettes were safe to smoke during pregnancy.

Forty out of 43 women answered Question 2 correctly. Using chi square analysis, we determined that there was statistical significance of these results where $p < 0.05$ ($p = 0.0001$). We also determined, using t-test analysis, that there was no statistical significance between the age categories 18-20 and 21-25 in regards to the frequency in which the correct answer was chosen, where $p < 0.05$ ($p = 0.881$).

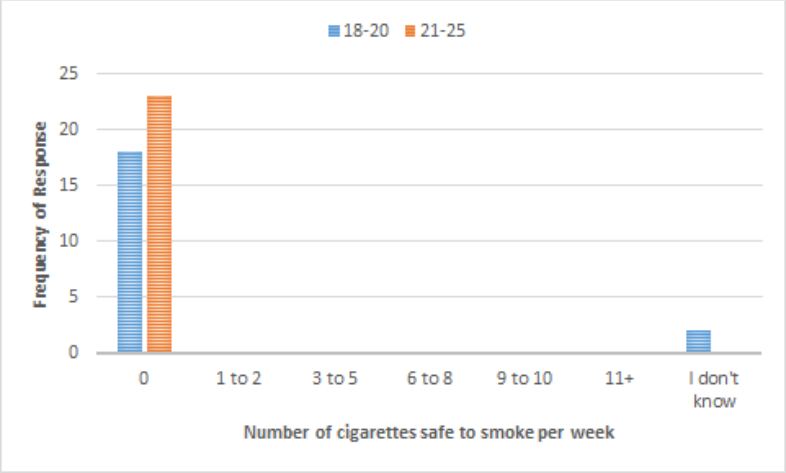

Figure 6: Responses from Question #2, "How many cigarettes are safe to smoke per week during pregnancy?"

Question 3 of the survey asked how many hours of sleep per night a woman should be getting while pregnant. ACOG does not have recommendations regarding the number of hours of sleep a woman should be getting per night during pregnancy. Rather they suggest that women

should aim for quality sleep. This means there is not a “right” or “wrong” answer for this question on our survey. The response ‘8-10 hours’ had the highest frequency of responses from both age groups.

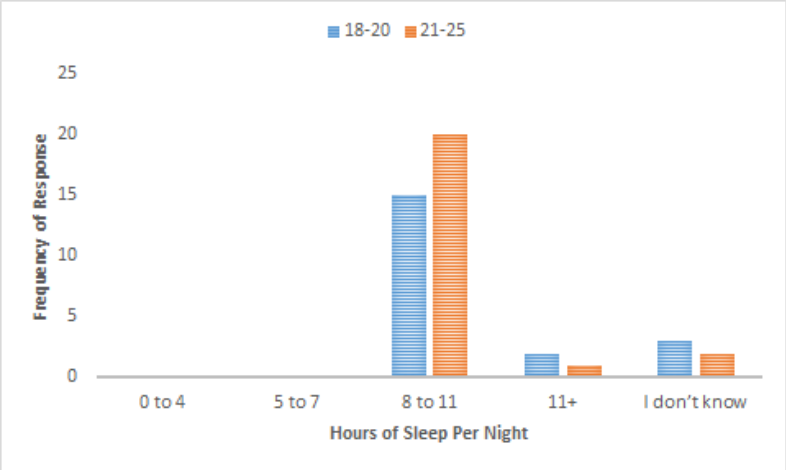

Figure 7: Responses from Question #3, “How many hours of sleep should a woman get during pregnancy?”

Question 4 of the survey asked how many calories a woman should be consuming per day while pregnant. ACOG does not have definitive recommendations of the number of calories a woman should be consuming per day. Rather they suggest that women should eat a well-balanced diet, following the recommendations from The United States Department of Agriculture using MyPlate. This again means there is no “right” or “wrong” answer to this question in our survey. Most respondents answered that 1800-2000+ calories per day would be right.

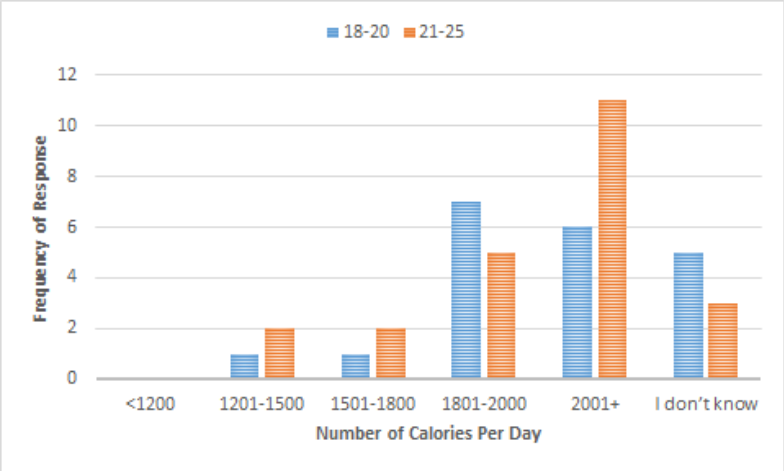

Figure 8: Responses from Question #4, "How many calories should a woman be consuming per day during pregnancy?"

Question 5 of the survey asked how many hours of exercise a woman should be participating in per week during pregnancy. ACOG currently recommends that pregnant women should participate in 30 minutes of exercise per day or on most days, (about 3-4 hours of exercise per week). However, they also note that exercise during pregnancy should be similar to the exercise participated in before pregnancy. Of the women surveyed, 25 (or 58%), correctly answered that women should participate in 3-4 hours of exercise per week. One woman (or 2%) answered that women should participate in no exercise during pregnancy, 5 women (or 12%) answered that women should participate in 1-2 hours of exercise per week, and 12 women (or 28%) answered that they were unsure how much exercise is recommended during pregnancy. Overall, the respondents aged 18-20 had a higher percentage of women choosing the correct answer, with 60% selecting that women should be getting 3-4 hours of exercise per week during pregnancy. There is no statistically significant difference between the age groups; this was determined using t-test analysis, where $p < 0.05$ ($p = 0.960$).

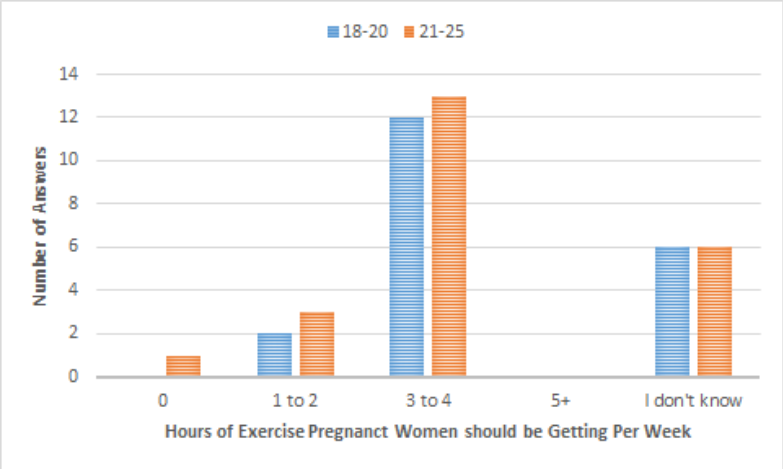

Figure 9: Responses from Question #5, "How many hours of exercise should a woman be getting per week during pregnancy?"

Question 6 of the survey asked how many caffeinated beverages are safe to consume daily during pregnancy. ACOG recommends that women should consume less than 200 mcg of caffeine per day. That is roughly one 12-ounce cup of coffee. The survey did not specify how many mcg were in a "beverage" making analysis of a "right" or "wrong" answer impossible. However, a look at the data shows that women are unsure of the correct answer. Fifteen (or 35%) of the women surveyed responded that no caffeine is safe during pregnancy. Seventeen (or 40%) responded that 1-2 caffeinated beverages are safe during pregnancy and 9 (or 21%) responded that they were unsure how much caffeine is safe during pregnancy. This shows that despite there being no "right" or "wrong" answer to the survey question, there is more education needed with regards to caffeine intake during pregnancy.

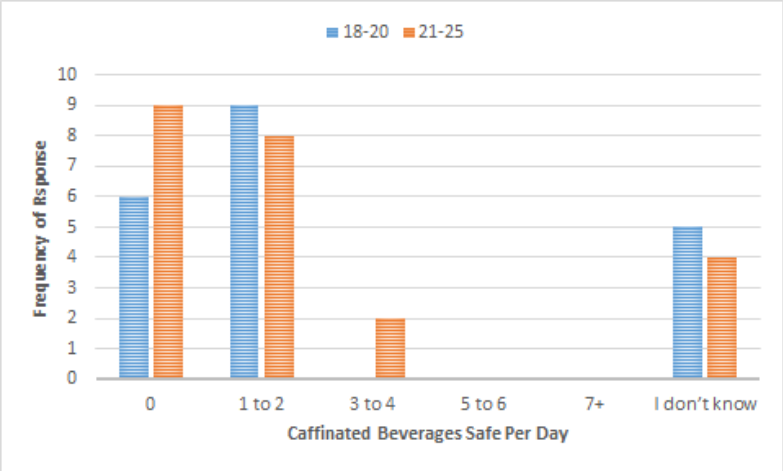

Figure 10: Responses from Question #6, "How many caffeinated beverages are safe to consume per day during pregnancy?"

Question 7 asked how much weight gain is considered healthy in an average woman during pregnancy. Healthy weight gain recommendations vary based upon pre-pregnancy BMI. For women with a healthy BMI before pregnancy, ACOG recommends on-average a weight gain of 25-30 pounds. Of the 43 women surveyed, 19 women (or 44%) were correct when answering how much weight a woman should gain during pregnancy. Six women (or 14%) were unsure how much weight a woman should gain during pregnancy. The women aged 21-25 again had a higher percentage of correct answers (48%; as opposed to 40% for the 18-20 age group). However, in both age categories, the percent of incorrect answers outweighed the correct answers, with age 18-20 having 60% incorrect and age 21-25 having 52% incorrect. This shows that there are still greater than 50% of women aged 18-25 who are unsure of how much weight gain is considered healthy during pregnancy.

Using chi square analysis, we determined that the results to Question 6 had no statistical significance, where $p < 0.05$ ($p = 0.3601$). We also determined, using t-test analysis, that there

was no statistical significance between the age categories 18-20 and 21-25 in regards to the frequency which the correct answer was chosen, where $p < 0.05$ ($p = 0.848$).

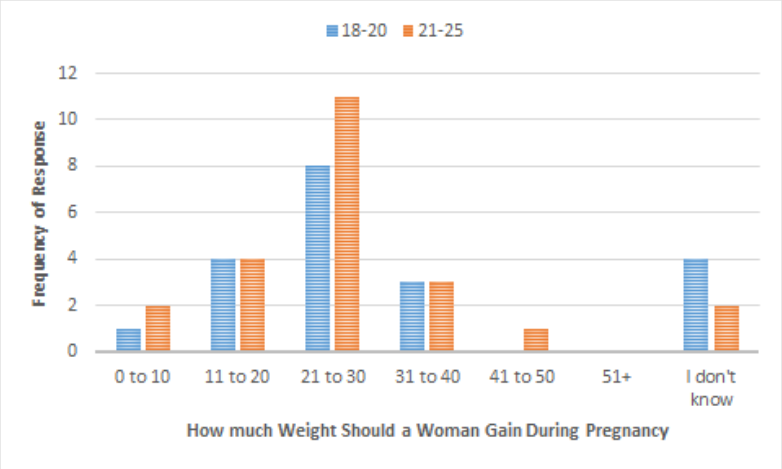

Figure 11: Responses from Question #7, "How much weight gain (in pounds) is considered healthy during your pregnancy?"

Questions 8 and 9 of the survey each asked about folic acid intake, before pregnancy and during pregnancy respectively. Folic acid is an essential vitamin both before and during pregnancy. One of its known benefits is to decrease the risk of neural tube defects. Before becoming pregnant, ACOG recommends that women should be consuming at least 400 mcg of folic acid daily. During the 40 weeks of pregnancy, ACOG recommends that women should be consuming 400-600 mcg of folic acid daily, with a stronger recommendation of 600 mcg daily. Of the 43 women, 31 women (or 72%) stated that they didn't know how much folic acid women should be consuming before pregnancy. Similarly, 30 women (or 70%) said that they were unsure how much folic acid women should be taking during the 40 weeks of pregnancy. Only 5 women (or 11%) knew the correct dosage of folic acid women should be consuming before pregnancy. Only 4 women (or 9%) knew the correct dosage of folic acid intake during pregnancy.

Over 90% of the women surveyed answered each of these questions incorrectly. In both questions, the women aged 21-25 answered correctly more frequently than the women ages 18-21. However, in both age groups, women answered greater than 50% of the time with "I don't know" in both questions. This shows that there is an urgent need for education regarding the intake of folic acid recommendations in women aged 18-25.

Using chi square analysis, we determined that there is statistical significance of the results from Question 8 (i.e. 11% of women aged 18-26 correctly answered how much folic acid women should be taking before pregnancy), where $p < 0.05$ ($p < 0.0001$). We also determined, using t-test analysis, there was no statistical significance between the age categories 18-20 and 21-25 in regards to the frequency which the correct answer was chosen, where $p < 0.05$ ($p = 0.910$).

Again using chi square analysis, we determined that there is statistical significance of the results from Question 9 (i.e. nine percent of women aged 18-26 correctly answered how much folic acid women should be taking during pregnancy), where $p < 0.05$ ($p < 0.0001$). We also determined, using t-test analysis, that there was no statistical significance between the age categories 18-20 and 21-25 in regards to the frequency which the correct answer was chosen, where $p < 0.05$ ($p = 0.625$).

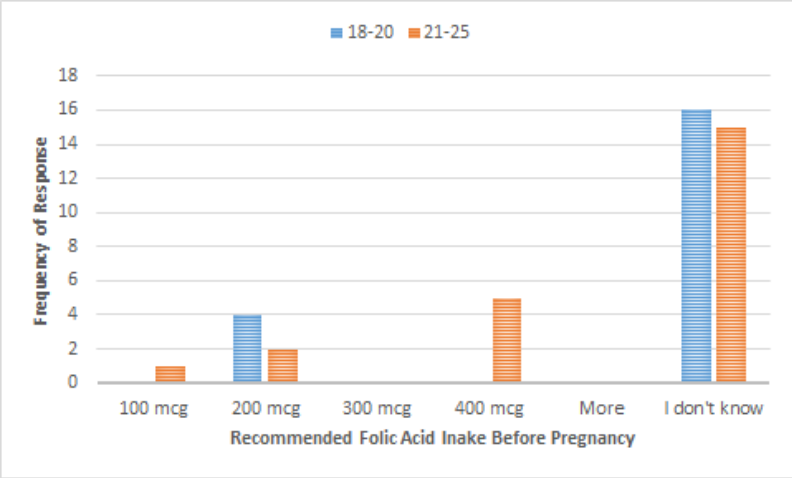

Figure 12: Responses from Question #8, "How much folic acid (in mcg) is recommended before pregnancy?"

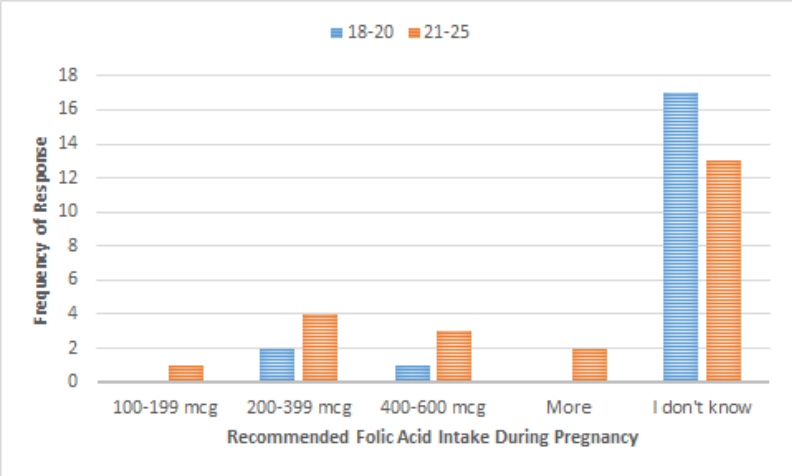

Figure 13: Responses from Question #9, "How much folic acid (in mcg) is recommended during pregnancy?"

How Women Prefer to Learn

With so many different methods of obtaining information, including handouts, pamphlets, teachers, the internet, phone applications, and text messaging, understanding how women would prefer to learn about healthy pregnancy behaviors was an important part of the study. The sources women had to choose from on the survey included internet, text messaging,

pamphlets, handouts, and other. Nineteen women (or 44%), reported that they would like to learn about healthy pregnancy through use of the internet. Pamphlets and handouts followed this, each selected by 10 women (or 23%). No women reported they would like text message education. The survey could have included more options including direct teaching and smartphone applications. The data suggests that most 18-25 year old women will turn to the internet to educate themselves about healthy pregnancy behaviors. This likewise suggests that women will need to be referred to reliable and easily understandable internet sites.

This survey did not look at which method of education was the most effective in teaching women aged 18-25. It also did not look at which method of education delivery would be the most effective in terms of changing behaviors. These are both areas that could be investigated in future studies.

Impact of Pregnancy on Knowledge of Healthy Pregnancy Behaviors

Women were asked in the beginning of the survey if they were pregnant. The answers from the women who responded they were pregnant were then compiled to see if being pregnant had any impact on the knowledge of healthy pregnancy behaviors. The responses from pregnant women were similar overall to the responses from the population as a whole. Surprising, 0% of pregnant women answered correctly regarding how much folic acid women should take daily during pregnancy. This result suggests the need for further education about folic acid is even more urgent.

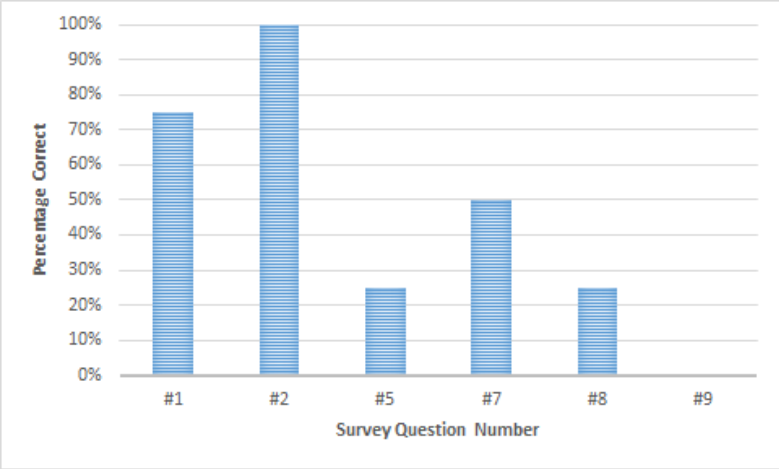

Figure 14: Percentage of Correct Responses to Survey Questions 1, 2, 5, 7, 8, and 9 from Pregnant Women.

Survey questions 3,4, and 6 were analyzed separately from the above as they are the questions that do not have the typical "right" or "wrong" answer. When questioned about sleep, 75% of the pregnant women answered 8-10 hours, with only one woman answering that they were unsure how many hours of sleep a pregnant woman should get per night. This result was similar to the response of the overall population with regards to this question, in that the majority of respondents answered 8-10 hours.

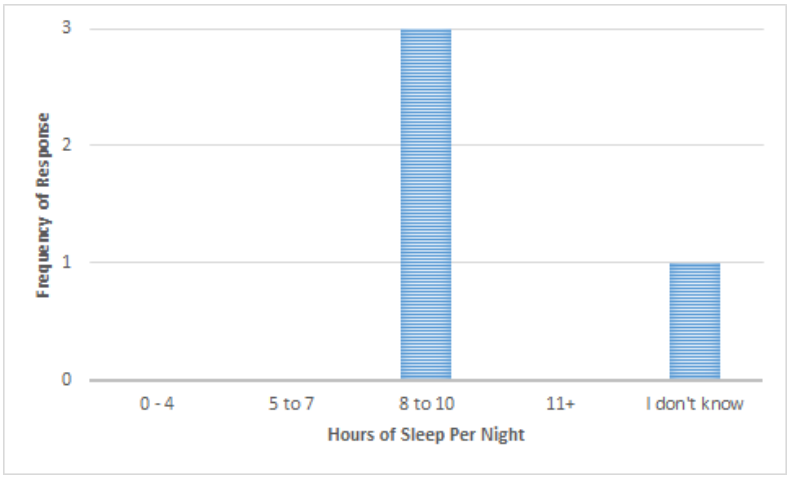

Figure 15: Responses to Question #3, "How many hours of sleep should a pregnant woman be getting per night?" from pregnant women

Question 9 asked how many calories a woman should be consuming per day during pregnancy. As mentioned above, ACOG does not has a specific number recommendation as to how many calories a woman should be consuming, but rather suggests women eat a well-balanced diet following the USDA MyPlate Guidelines. Similar to the results of the overall survey population, the majority of pregnant women selected that women should be consuming at least 2,001 calories per day. One woman responded with 1,801-2000 calories per day and one woman reported she was unsure how many calories women should be consuming per day while pregnant.

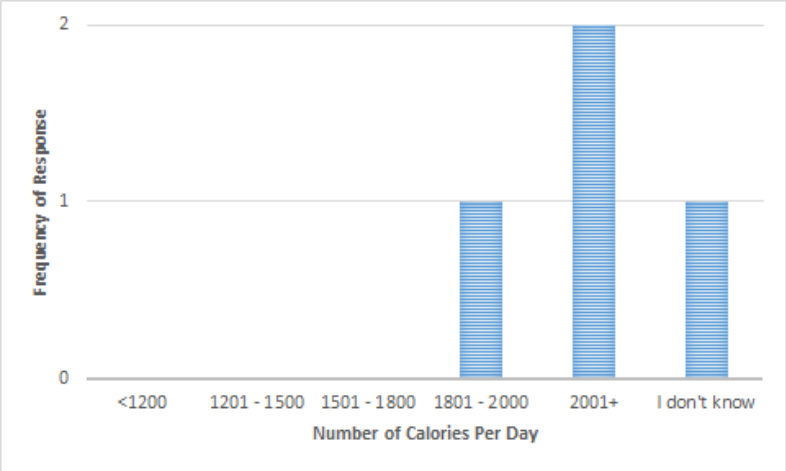

Figure 16: Responses to Question #4, "How many calories should a woman consume daily during pregnancy?" from pregnant women

Survey question 6 asked how many caffeinated beverages are safe to consume in one day during pregnancy. While ACOG recommends consuming less than 200 mcg of caffeine per day, which is about one 12-ounce cup of regular coffee, the survey did not specify what a "beverage" was making this question impossible to quantify as "right" or "wrong". Again, the largest percentage of responses, 50%, was 1-2 beverages per day, which was consistent with the results

of the overall survey population. One woman selected no caffeine and one woman selected that 3 to 4 caffeinated beverages are safe to consume per day.

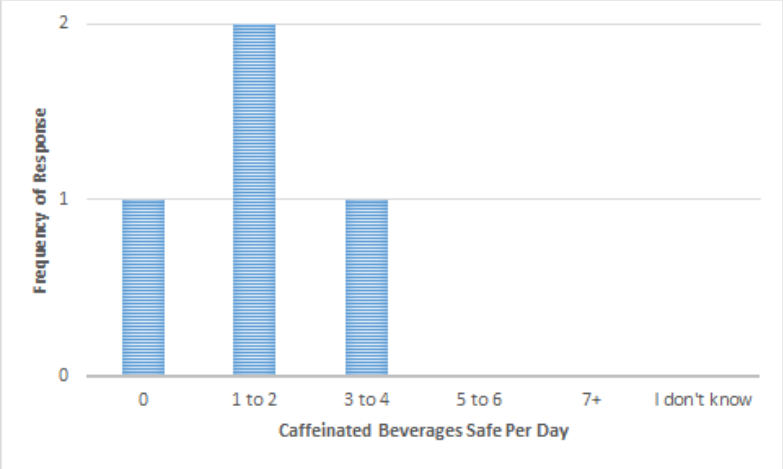

Figure 17: Responses to Question #6, "How many caffeinated beverages are safe to consume per day during pregnancy?".

Overall, pregnancy did not seem to have a big impact on knowledge of healthy pregnancy behaviors. The responses were similar to the responses of the survey population as a whole. Most surprisingly, women who were already pregnant were unsure how many mcg of folic acid pregnant women should consume per day. If women are able to be educated before becoming pregnant, this may have an impact on the knowledge of healthy pregnancy behaviors in women who are pregnant. Pregnancy providers might possibly need to improve their educational methods.

An unpaired t-test was used to compare the percentage of correct answers in pregnant women to the percentage of correct answers in the survey population as a whole. Based on the percent of correct responses we found that there was no statistically significant difference of healthy pregnancy behaviors between pregnant and non-pregnant women aged 18-25, where $p < 0.05$ is significant ($p = 0.920$).

Impact of Sex Education & Pregnancy Education in School on Current Knowledge

The relationship between correct answers to the survey was also compared to whether women had received sex education and/or pregnancy education in school. We found that there was no statistically significant difference in knowledge of healthy pregnancy behaviors between women who had and had not received sex education, where $p < 0.05$ is significant ($p = 0.773$). We also found that there was no statistically significant difference in knowledge of healthy pregnancy behaviors between those who had received pregnancy education in school and those who had not, where $p < 0.05$ is significant ($p = 0.973$).

Chapter 5: Discussion

Summary

Pregnancy education plays an essential role in women of childbearing age, specifically those women between the ages of 18 and 25. Not only does pregnancy education potentially affect the health of the woman, but it may also affect the health of the child. The main purpose of this study was to analyze the knowledge of women ages 18-25 with regard to specific behaviors and habits that contribute to a healthy pregnancy, and compare their knowledge to the recommendations set forth by the American College of Obstetricians and Gynecologists (ACOG). The second purpose of the study was to determine how women aged 18-25 prefer to learn regarding healthy pregnancy behaviors.

Forty-three women aged 18-25 were surveyed regarding their personal knowledge of healthy pregnancy behaviors. The study identified multiple areas of discrepancy between the current ACOG recommendations and the participants' actual knowledge. In fact, there were no questions where all women answered correctly. Discrepancies as outlined in Chapter 4 include the following: alcohol consumption, cigarette use, amount of exercise, amount of weight gain, and folic acid intake both before and during pregnancy. The area of greatest discrepancy was regarding folic acid. This discrepancy was noted both when questioning intake before and during pregnancy.

Importance of the Study

The collected data is important because it shows there are specific gaps in knowledge in women aged 18-25 regarding behaviors that contribute to a healthy pregnancy. Where there is a gap in knowledge, there is likely a gap in appropriate behavior. In addition, even where there is

accurate knowledge, the possibility certainly exists that appropriate behaviors do not follow. The issue of behaviors was beyond the scope of this paper. The questions that had the largest variance in answers were in regard to folic acid intake before and during pregnancy. This inconsistency demonstrates the lack of mainstreamed knowledge among our surveyed population. While "I do not know" was a valid and available response option for questions within the survey tool, many participants chose another answer they believed to be correct, but was erroneous. Not knowing the correct amount of folic acid a woman should be getting daily both before and during pregnancy may lead to potentially serious and even fatal outcomes due to neural tube defects.

Those within the medical community can use this collected information to counsel women who are of childbearing age and are sexually active. From our results, there appears to be a need for clear and consistent education in multiple areas of healthy pregnancy behaviors. Our results can hopefully help those educating these women to initially focus their teaching in areas that appear to have the greatest discrepancy between knowledge and recommendations.

Regarding the question of how respondents would prefer to learn about healthy pregnancy behaviors, the most frequently selected answer was the internet, followed by pamphlets and hand-outs. The researchers were surprised that no women responded that they would like to use text messaging for educational purposes. Four women responded "other", but unfortunately did not specify what method they would like to use. The survey did not include the use of smartphone applications, which would be important to include in a future study. Information regarding learning preferences may help those involved in pregnancy education to know which methods of education to focus on for this age group in order to maximize the

efficacy of their educational efforts. This study did not take into account the effectiveness of this preferred learning method, which would be something to address in future studies.

Limitations

There were multiple limitations to this study. The first major limitation is that the study was completed with time restraints, which caused the population sample to be smaller than originally intended. Although several facilities were contacted, only three populations (at 2 locations) were used in data collection due to circumstantial setbacks of medical clinic logistics and staffing. We struggled to find a facility that served women within our targeted age range that was willing to administer our survey. If a larger population had been surveyed, perhaps more of the results could have had statistical significance. A larger response pool would have likely decreased the standard deviation or possible margin of error. A greater sample size typically leads to greater accuracy of the reported results and more reliable data.

The population was also limited in terms of diversity, in that only three populations at two locations were used, Bethel University and Metro Women's Center. Eighty-six percent of results were from respondents at Bethel University, which has the potential to skew the data. While 84% of respondents said their individual annual income was less than $9,750, this did not take into account their household income. Since 86% of the women surveyed were college students, it is likely that they are not currently working, and therefore would have a low individual income. It would be important in the future to look at household income to try to determine if socioeconomic status has any effect on knowledge of healthy pregnancy behaviors.

Future Research

If this study were to be repeated, there are multiple ways in which the research could be expanded. First, it would be beneficial to sample a larger and more diverse population.

Expanding the survey population beyond the Twin Cities Metro could aid in accomplishing this goal. This would increase the overall significance of the study. While some of our results proved to be significant, because of the population size, some results were not. Another method to increase population size would be to obtain a greater response rate. To do this, it would be beneficial to visit the locations in person to distribute the surveys. While this may interfere with keeping respondents anonymous to the researchers, the stored data would still remain anonymous. This was not done in this study due to the desire to keep survey participants anonymous to the researchers as well as due to budget and time limitations.

Further research on the topic of pregnancy education could be completed to test the effectiveness of an educational tool. It would be interesting to see if women who received proper education retained this knowledge long term and whether they applied this knowledge to their personal behaviors. Since our study indicated that women aged 18-25 would prefer to learn about pregnancy education through the internet, further studies could look at how effective the internet is in educating these women, and how effective it is at changing their behaviors. Another area of interest would be to study the utilization and effectiveness of newer methods of technology for the purpose of pregnancy education, such as smartphone applications and social media. If these newer educational methods are used, it would be important to determine if women actually learn better and whether their behaviors truly change.

Future research might also address additional areas of health during pregnancy, such as psychological and emotional well-being. Pregnancy can be a stressful experience for those with and without a good support system. This and other emotional factors may play a role in the overall health of mother and child. While ACOG does not have specific recommendations with regard to emotional well-being and mental health during pregnancy, it may be interesting to look

at how women viewed their pregnancy overall with relation to the amount of stress they were dealing with during pregnancy, including stressful events that happened during pregnancy.

Our study focused on those above the age of 18 due to privacy laws involving minors. However, it would be interesting to broaden the scope of research by looking at young women in the high-school age range (14-18 year olds). It would be equally interesting to look at the differences in knowledge and behaviors at schools that offer sex education and pregnancy education compared to those who have cut it from their curriculum. Our data did show that there was no statistical significance in knowledge between women who did receive sex education and those who did not, and women who received pregnancy education versus those who did not. However, we did not look at whether having either of these options in high school changed behaviors.

Conclusion

The findings discussed above suggest that there is a significant and urgent need for further education about the behaviors that contribute to a healthy pregnancy in women aged 18-25. Women between the ages of 18-25 especially need more education about adequate folic acid intake. This is a crucial topic since insufficient folic acid intake can result in neural tube defects that can have devastating, sometimes fatal, outcomes; some of these can be prevented. Our study looked at respondents' knowledge of healthy behaviors during pregnancy including alcohol consumption, cigarette use, caffeine intake, caloric intake, hours of sleep per night, amount of exercise per week, amount of weight gain, and folic acid intake before and during pregnancy. Hopefully our results can aid in correcting current knowledge deficits so that young women may have safer and healthier pregnancies and children.

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Appendix A- Metro Women's Center Approval

Hi Sarah,

We don't see very many each day, but we can certainly fine 50 women from our client base to fill out the survey, How long do we have to get it done.

By the way we are not a "clinic" I don't know if that matters for your project or not.

Send me a sample and I can start having women complete it. No need for you to be at the office.

Thanks!

Colleen
--
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6418 Bass Lake Rd
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Office 763-533-8642
Cell 763-377-3955
Fax 763-533-5307
www.metrowomenscenter.org

APPENDIX B - Bethel Undergraduate Student Approval

I would be willing to help you gather this data.

Dr. Shaw

Timothy Shaw, PhD.
Bethel University
Professor of Biology
Pre-Medical and Pre-Health Professional Adviser
Biology Department Co-Chair

APPENDIX C - Bethel Physician Assistant Program Approval

Sarah & Rebecca;

As PA program director, I write this email as approval at a Bethel University Level 3 for your IRB addendum change to your survey population (see attached IRB revised form). We will keep this email and updated IRB application in your research file in Prof. Lisa Naser's office. If you have any additional questions, please work with your research committee and let me know.

Sincerely;

Wallace Boeve, EdD, PA-C
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Appendix D- Survey Instrument

Thank you for volunteering to take our survey. Your input will help us further understand education practices in pregnancy. Please be sure to fill out both sides of this survey and answer all questions.

Remember you can stop taking the survey and remove yourself at any time.

BACKGROUND QUESTIONS

Please honestly answer the following questions about your background. No identifying information will be stored and/or collected from you.

1. How old are you?
   <18 / 18-20 / 21-25 / 26+
2. What is your relationship status?
   Single / Married / Widow
3. Are you Sexually Active?
   Yes / No
4. If yes, are you monogamous (single partner)?
   Yes / No / NA
5. What is your highest (completed) level of education?
   Middle school/ High school graduate / Licensure or certification program / Some college / Associate's Degree / Bachelor's Degree / Master's Degree / Doctorate
6. Did you receive sex education as part of your school curriculum?
   Yes / No
7. Did you receive information on having a healthy pregnancy in school?
   Yes / No
8. What is your (individual) yearly income?
   $0 - $9,075 / $9,076 - $36,900 / $36,901 - $89,350 / $89,351+
9. Are you pregnant currently?
   Yes / No
10. If you are pregnant, how far along are you? If not pregnant please circle NA.
    1st trimester / 2nd trimester / 3rd trimester / NA
11. If you are pregnant, was it planned or unplanned? If not pregnant please circle NA.
    Planned / Unplanned / NA

QUESTIONS ON PREGNANCY

The following questions are about your current understanding of pregnancy behaviors. Please answer the following questions honestly.

1. How many ounces of alcohol are safe to consume in one week during pregnancy?
   standard can of beer = 12 ounces; 1 standard glass of wine = 5 ounces)
   5 ounces / 12 ounces / none / as much as you want / I don't know
2. How many cigarettes are safe to smoke in one week during pregnancy?
   0 / 1-2 / 3-5 / 6-8 / 9-10 / 11+ / I don't know
3. How many hours of sleep should one be getting a night during pregnancy?
   0-4 / 5-7 / 8-10 / 11+ / I don't know
4. How many calories (on average) should a woman be eating daily during pregnancy?
   <1200 / 1201-1500 / 1501-1800 / 1801-2000 / 2001+ / I don't know
5. How many hours of exercise should one participate in per week during pregnancy?
   0 / 1-2 / 3-4 / 5+ / I don't know
6. How many caffeinated beverages is safe to drink per day during pregnancy?
   0 / 1-2 / 3-4 / 5-6 / 7+ / I don't know
7. How much weight gain (in pounds) is considered healthy during your pregnancy?
   0-10 / 11-20 / 21-30 / 31-40 / 41-50 / 51+ / I don't know
8. How much daily folic acid is generally recommended for sexually active women before they become pregnant?

100 mcg / 200 mcg / 300 mcg / 400 mcg / More / I don't know

9. How much daily folic acid is recommended during pregnancy?
   100-199 mcg / 200-399 mcg / 400-600 mcg / More / I don't know

<u>QUESTIONS ON TEACHING</u>

The following question is how you would most like to learn about pregnancy in the future.

18. How would you most prefer to learn about pregnancy?

Pamphlets / Handouts / Internet / Text message / Other: _____

Thank you so much for taking the time to complete our survey. Please return the completed survey to the front desk.

Appendix E- Informed Consent

INTRODUCTION

You are invited to join a research study to look at pregnancy education. The decision to join, or not to join, is up to you.

In this research study, we are investigating/testing/comparing/evaluating education of a healthy pregnancy.

WHAT IS INVOLVED IN THE STUDY?

If you decide to participate you will be asked to complete an anonymous short survey. This should take you less than 10 minutes.

The investigators may stop the study or take you out of the study at any time they judge it is in your best interest. They may also remove you from the study for various other reasons. They can do this without your consent.

You can stop participating at any time. If you stop you will not lose any benefits.

RISKS

This study involves no risks because the study is anonymous.

BENEFITS TO TAKING PART IN THE STUDY?

It is reasonable to expect the following benefits from this research: assessing your level of pregnancy education. We can't guarantee that you will personally experience benefits from participating in this study. However, others in your community will benefit in the future from the information we find in this study.

CONFIDENTIALITY

We will take the following steps to keep information about you confidential, and to protect it from unauthorized disclosure, tampering, or damage: keeping surveys strictly anonymous as well as protecting them in a protected binder at Bethel University. Upon the completion of data analysis, the surveys will be destroyed. The results of this study will be given back to the community. However the results will have no personal information published. There will be no way to identify you as a participant in the study.

APPENDIX F - IRB Approval

Initial IRB Approval

September 23, 2015

Rebecca & Sarah;

As granted by the Bethel University Human Subjects committee as the program director, I write this letter to you in approval of Level 3 Bethel IRB of your project entitled: "Education about Healthy Pregnancy Behaviors in Women Ages 18-25." This approval is good for one year from today's date. *Before you may proceed with data collection and analysis,* please update your informed consent to include, "If as a participant you have any questions, please feel free to contact (put your names and email or phone number, as well as your Faculty Research Chair's name and email or office phone)". Send me that updated informed consent for your file. Please let me know if you have any questions.

Sincerely;

Wallace Boeve, EdD, PA-C
Program Director
Physician Assistant Program
Bethel University
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651 308-1398 cell
651 635-1013 office
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http://gs.bethel.edu/academics/masters/physician-assistant

IRB Addendum Approval

Sarah & Rebecca;

As PA program director, I write this email as approval at a Bethel University Level 3 for your IRB addendum change to your survey population (see attached IRB revised form). We will keep this email and updated IRB application in your research file in Prof. Lisa Naser's office. If you have any additional questions, please work with your research committee and let me know.

Sincerely;

Wallace Boeve, EdD, PA-C
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APPENDIX G - Definition of Terms

First trimester: In pregnancy, the first trimester refers to the time period from the first day of the last menstrual period (LMP) to the end of week 12.

Second trimester: In pregnancy, the second trimester refers to the time period from week 13 to the end of week 27.

Third trimester: In pregnancy, the third trimester refers to the time period from week 28 to the time of birth.

Fetal alcohol syndrome: A condition in a child that results from alcohol exposure during the mother's pregnancy. Fetal alcohol syndrome causes brain damage and growth problems. The problems caused by fetal alcohol syndrome vary from child to child, but defects caused by fetal alcohol syndrome are irreversible (Mayo Clinic, 2014).

Low birth weight: Defined as weight at birth <2500 grams or <5.5 pounds (Center for Disease Control, 2009).