

8-1-2018

KNOWLEDGE, INTENTIONS, AND BELIEFS ABOUT FERTILITY AND ASSISTED REPRODUCTIVE TECHNOLOGY AMONG ILLINOIS COLLEGE STUDENTS

Akilah Morris

Southern Illinois University Carbondale, akilahmorris@yahoo.com

Follow this and additional works at: <https://opensiuc.lib.siu.edu/dissertations>

Recommended Citation

Morris, Akilah, "KNOWLEDGE, INTENTIONS, AND BELIEFS ABOUT FERTILITY AND ASSISTED REPRODUCTIVE TECHNOLOGY AMONG ILLINOIS COLLEGE STUDENTS" (2018). *Dissertations*. 1595.
<https://opensiuc.lib.siu.edu/dissertations/1595>

This Open Access Dissertation is brought to you for free and open access by the Theses and Dissertations at OpenSIUC. It has been accepted for inclusion in Dissertations by an authorized administrator of OpenSIUC. For more information, please contact opensiuc@lib.siu.edu.

KNOWLEDGE, INTENTIONS, AND BELIEFS ABOUT FERTILITY AND ASSISTED
REPRODUCTIVE TECHNOLOGY AMONG ILLINOIS COLLEGE STUDENTS

by

Akilah Morris Smith

B.S., Illinois State University, 2006

M.S., Illinois State University, 2008

A Dissertation

Submitted in Partial Fulfillment of the Requirements for the
Doctor of Philosophy

Department of Public Health and Recreation Professions
in the Graduate School
Southern Illinois University Carbondale
August 2018

Copyright by Akilah Morris Smith, 2018
All Rights Reserved

DISSERTATION APPROVAL

KNOWLEDGE, INTENTIONS, AND BELIEFS ABOUT FERTILITY AND ASSISTED
REPRODUCTIVE TECHNOLOGY AMONG ILLINOIS COLLEGE STUDENTS

by

Akilah Morris Smith

A Dissertation Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Doctor of Philosophy

in the field of Public Health and Recreation Professions

Approved by:

Juliane P. Wallace, Co-Chair

Roberta J. Ogletree, Co-Chair

Aaron Diehr

Melodi Ewing

Crystal Shelby Caffey

Graduate School
Southern Illinois University Carbondale
April 11, 2018

AN ABSTRACT OF THE DISSERTATION OF

AKILAH MORRIS SMITH, for the Doctor of Philosophy degree in Public Health, presented on April 11, 2018, at Southern Illinois University Carbondale.

TITLE: KNOWLEDGE, INTENTIONS, AND BELIEFS ABOUT FERTILITY AND ASSISTED REPRODUCTIVE TECHNOLOGY AMONG ILLINOIS COLLEGE STUDENTS

MAJOR PROFESSOR: Roberta J. Ogletree HSD and Julianne P. Wallace PhD

The purpose of this quantitative cross sectional study was to examine knowledge, beliefs, and intentions about fertility and assisted reproductive technology among college students. This study differs from previous studies in that it examines knowledge, beliefs, and intentions about fertility and assisted reproductive technology among Illinois college students. A convenience sample of 536 undergraduate students from six Illinois universities taking foundational health courses participated in this convenience sample study. Participants included 305 females, 225 males, and five transgender students. Their ages ranged from 18-60. Five hundred and twenty seven students were childless. Three hundred and eleven students were single, 195 were in a committed relationship, and 16 were married.

An Analysis of Variance (ANOVA) detected the differences among college students' knowledge, beliefs, and intentions, based on race, sexual orientation, age, parental status, relationship status, and gender. Additionally Multiple Linear Regression analysis determined variations among race, sexual orientation, age, parental status, relationship status, and gender based on intentions, beliefs, and knowledge of fertility and ART treatment options. Findings indicated that age, race and relationship status variables strongly impacted fertility intentions. Findings also revealed that gender and race impact beliefs influencing fertility and ART treatment options. None of the variables significantly affected knowledge, a finding which does not correlate

with literature. Students reported that they were not informed about women's fertility or ART treatment options. Caucasians and older students' intended on delaying parenthood which supports the current literature. According to Martinez, Daniels, and Chandra (2012), Caucasians are more likely to delay parenthood, which this research study supports. The results of this study indicate that students have average to low fertility knowledge and ART treatment options scores.

DEDICATION

I want to thank My Heavenly Father for all his guidance, support, and love during this time. Thanks for challenging and blessing me. I have learned that you are authentic and real in my life. I also want to thank my mother and father Olivia and Arthur Morris for loving and supporting me unconditionally through this time. I am grateful for the best brother in the world Oheni Morris, thank you for your light heartedness, positivity, and love. Thanks to my husband Wayon Smith III, son Wayon Smith IV (KJ) and in laws Mr. Wayon Smith Jr. and Mrs. Faye Freeman Smith for helping me during graduate school.

PREFACE

After a diagnosis of polycystic ovarian syndrome (PCOS) in 2004, I experienced a struggle with the syndrome, which leads to acne, hair growth on the stomach and chest, weight gain, and hormonal imbalance. PCOS involves multiple cysts in a woman's ovaries that affect the hormone balance in the woman's system and may lead to infertility and conception difficulties. Fortunately, our family conceived in our mid-30s and welcomed our first child on October 24th, 2016.

For my husband and myself, like many college students and young professionals, delaying parenthood seemed as though it would be the best choice for our family even though we knew there might be a risk of infertility. Like some couples our age, we chose to delay parenthood in the hopes of establishing careers and purchasing a home for our new family. As a result, I decided to conduct a study on fertility and Assisted Reproductive Technology (ART) treatment options because I was concerned that I might suffer from infertility and would have had to utilize ART. I specifically chose to conduct a study similar to one conducted by Daniluk and Koert (2012) because I felt that it was more inclusive of fertility concerns, which include PCOS and other infertility challenges.

Daniluk and Koert (2012) reported that more women and men are delaying parenthood or waiting until advanced ages to enter into parenthood (for this study *delayed parenthood* and *advanced aged parenthood* are classified as including one parent being past 35). Reasons for delaying parenthood include growing social trends that encourage delayed parenthood, changing norms regarding the best age for parenthood, the desire to establish careers, desire for greater financial stability, and an inability to find a suitable partner (Daniluk & Koert, 2013; Lampic, Skoog-Svanberg, Karlstrom, & Tyden, 2006; Peterson, Pirritano, Tucker, & Lampic, 2012).

Studies have shown that both men and women are less aware that age, not physical fitness, is a more influential factor for infertility (Daniluk & Koert, 2013; Lampic et al., 2006). Daniluk and Koert (2013) noted that men and women were not aware that some women might struggle with infertility, even with assisted reproductive technology (ART). ART can aid couples in conception, but often the cost (about \$5000) and the number of rounds of treatment required for successful conception can be prohibitive (Peterson et al., 2012).

Daniluk and Koert (2013) found that men were influential in determining if and when a couple decided to have a family, even though men had less fertility and ART knowledge than women. They noted that men, regardless of education and age, were less knowledgeable than women regarding the potential consequences of delayed parenthood, the effects older parental age may have on the formation of fetus, the fertility availability window, and the cost of ART (Daniluk & Koert, 2013). Daniluk and Koert also noted that educating both men and women about fertility and ART treatment options is warranted and essential if couples want to make informed decisions to become parents. The demonstrated lack of awareness about fertility and ART treatment options, and fertility issues in general, among college students provides a rationale for continued research in this field (Daniluk & Koert, 2013; Daniluk, Koert, & Cheung, 2012; Chan, Chan, Peterson, Lampic, & Tam, 2015). Due to a gap of information about college students' beliefs, intentions, and knowledge about fertility and ART treatment options, the current study investigated the intentions, beliefs, and knowledge among a specific population of students attending college in Illinois. This introductory chapter defines terms and provides a background for the study, justifies and describes the purpose of the research, and lays out the research problem and questions.

TABLE OF CONTENTS

<u>CHAPTER</u>	<u>PAGE</u>
ABSTRACT.....	i
DEDICATION.....	iii
PREFACE.....	iv
LIST OF TABLES	viii
LIST OF FIGURES	x
CHAPTERS	
CHAPTER 1 Indroduction.....	1
CHAPTER 2 Review of Literature	15
CHAPTER 3 Methods and Procedures.....	32
CHAPTER 4 Results.....	43
CHAPTER 5 Summary, Conclusions, & Recommendations	70
REFERENCES	81
APPENDICES	
APPENDIX A-- Amended Survey Instrument.....	117
APPENDIX B-- Email Solication to Department Chair.....	122
APPENDIX C-- Email Solication to Health Education and Science Faculty	123
APPENDIX D--Survey Consent Form	124
APPENDIX E--Eastern Illinois Univeristy Email Solication to Department Chair	125

APPENDIX F--Eastern Illinois University Email Solicitation to Health Education Science Faculty.....	126
APPENDIX G--Eastern Illinois University Survey Consent Form.....	127
APPENDIX H-- Old Survey Instrument.....	128
APPENDIX I--Permission to modify and use survey	133
APPENDIX J--Human Subjects from Universities	135
VITA.....	144

LIST OF TABLES

<u>TABLE</u>	<u>PAGE</u>
Table 1. Fertility by Race and Ethnicity per 1000 Births	19
Table 2. Participating University and Introductory Health Courses	34
Table 3. Modified and Adapted Fertility Survey Questions	37
Table 4. Instrument Constructs and Measurement Scales	37
Table 5. Summary of Research Questions, Instrument Items, and Data-Analysis Methods	41
Table 6. Number and Percentages of Participants from Illinois Universities	44
Table 7. Number and Percentages of Race, Sexual Orientation and Age	45
Table 8. Number and Percentages of Parental, Children and Relationship Status	47
Table 9. Results of Reliability Analysis	48
Table 10. Frequencies and Percentages for Intentions to Have Children	48
Table 11. Ranges, Means, and Standard Deviations for Intentions Items	49
Table 12. Descriptive Statistics for Beliefs Items 6 through 11	50
Table 13. Means and Standard Deviations for Belief Items 12 through 15	51
Table 14. Means and Standard Deviations for Knowledge Items 17 and 18	52
Table 15. Means and Standard Deviations for Knowledge Items 19 through 33	53
Table 16. Results of the Analysis of Variance for Intentions	54
Table 17. Tukey HSD Comparisons for Intentions by Age	56
Table 18. Results of the Analysis of Variance for Beliefs	57
Table 19. Tukey HSD Comparisons for the Mean Ranks of Beliefs by Gender	58
Table 20. Results of the Analysis of Variance Test for Knowledge	60
Table 21. Variance Inflation Factor Values for the Regression Predicting Intentions	61
Table 22. Results of the Multiple Linear Regression Predicting Intentions	63

Table 23. Variance Inflation Factor Values for the Regression Predicting Beliefs.....	64
Table 24. Results of the Multiple Linear Regression Predicting Beliefs.....	66
Table 25. Variance Inflation Factor Values for the Regression Predicting Knowledge.....	67
Table 26. Results of the Multiple Linear Regression Predicting Intentions.....	68

LIST OF FIGURES

<u>FIGURE</u>	<u>PAGE</u>
Figure 1. Theory of Planned Behavior.....	29

CHAPTER 1

INTRODUCTION

Background

Fertility, the ability to produce offspring and known as fecundity (American Society for Reproductive Medicine [ASRM], 2013). ASRM (2013) has stated that women under the age of 35 who engaged in unprotected intercourse and had not conceived during a period of 12 months were infertile. Women older than 35 years who engaged in unprotected intercourse over the course of 6 months and did not get pregnant were considered infertile.

Knowledge of fertility can be used to both prevent pregnancy by couples who do not want children (ASRM, 2013) and empower couples regarding the various types of ART treatment options. Daniluk and Koert (2013) concluded that both male and female participants in their study had little knowledge regarding delayed parenthood choices and overestimated the success rates of ART, and both men and women were misinformed about chances of pregnancy at the time of ovulation and had little awareness of when women are most fertile. Their study participants were unable to recognize the relationship between sexually transmitted infections and subsequent infertility. Generally, women were aware that reproduction at an older age might increase the chances of conception and complications difficulties (Daniluk et al., 2012). As Daniluk et al. (2012) reported, women know the most opportune time to have a family, but younger women are less aware that sexually transmitted infections and increased age (not fitness or health) can increase a woman's chances of infertility.

Assisted Reproductive Technology (ART) is described by the Centers for Disease Control and Prevention (CDC, 2014) as including all fertility treatments in which clinicians handle both eggs and sperm. Some ART treatments involve removing eggs from the ovary,

combining them with sperm in the laboratory, and then returning the fertilized egg into the woman (CDC, 2014). One example of ART is in vitro fertilization (IVF), which is the process of fertilization by extracting eggs, retrieving a sperm sample, and then manually combining an egg and sperm in a laboratory dish. The embryo(s) is then transferred to the uterus. Another procedure called zygote intrafallopian transfer is an assisted reproductive procedure similar to IVF and embryo transfer, with the difference being that the fertilized embryo is transferred into a fallopian tube instead of the uterus. Gamete intrafallopian transfer is a similar assisted reproductive procedure that involves removing a woman's eggs, mixing them with sperm, and immediately placing them into a fallopian tube. Intracytoplasmic sperm injection refers to a laboratory procedure in which a single sperm is picked up with a fine glass needle and injected directly into an egg. These treatments are designed to help couples conceive (CDC, 2014).

More couples use ART because they believe the technology it may aid them in conceiving, but Daniluk and Koert (2013) showed that not all couples who use ART conceive successfully. Chan et al. (2015) and Sabarre et al. (2013) noted a general lack of fertility knowledge and information about how truly effective ART can be. Some women believe that ART can cure infertility at any age, which is not accurate. Maheshwari, Porter, Shetty, and Bhattacharya (2008) found that 85% of infertile women and 77% of expectant mothers believe that IVF could overcome the effects of age. In a qualitative study, Benzies, Tough, Tofflemire, Frick, Faber, & Newburn-Cook (2006) found that all 45 participants in their study were confident that ART would aid in conception. Celebrities like Celine Dion have shown that, with IVF, having children at a later age is possible, which might mislead women into thinking that they can also get pregnant later in life.

Physicians agree that the most physically opportune time for a woman to have children is between the ages of 20 and 24 (American Reproductive Society of Medicine, 2012). However, many women choose to delay motherhood beyond this ideal timeframe in order to continue their education or enter the workforce (Herr & Wolfram, 2012; Lightbody, 2011; Pew Social Trends, 2010). Among college graduates, delaying parenthood is a growing trend (Chan et al., 2015). According to Lightbody (2011), although some begin to have families, many college graduates pursue their careers or continue their education with graduate school rather than have children.

Lampic et al. (2006) stated that people delay parenthood for myriad reasons, including pursuing careers or working on advanced degrees, lack of financial stability or job prospects, and not finding a suitable partner. Sometimes delaying parenthood can result in infertility, which may be a concern for couples who would like to have biological children. Some college students do not know that infertility can be difficult to treat, even with the assistance of ART. This challenge can be painful for couples who desire children. Knowledge of fertility, per Daniluk and Koert (2013), is necessary for both men and women so that they can make informed decisions regarding their family planning. Some college students may not fully understand that behaviors such as unprotected sex, having repeated effective abortions, or delaying parenthood until advanced age (35+) can result in infertility. On-campus programs can help college students understand the consequences of delaying parenthood until advanced ages.

Statement of the Problem

The issues surrounding fertility and ART support the need for continued research as the problem difficulty of infertility persists for a higher proportion of educated people who delay parenthood (Hampton, Mazza, & Newton, 2013; Lundsberg et al., 2014). The specific problem is that some college students underestimate age-related fertility decline and have insufficient

fertility and ART knowledge, which lead them to postpone parenthood into their late 30s, which can result in infertility (Chan et al., 2015; Peterson et al., 2012). More women are delaying parenthood, due in part to men influencing or encouraging women to delay parenthood (Lampic et al., 2006; Peterson et al., 2012). Unfortunately, some women are not aware that aging may cause a rapid decline in fertility and are not mindful of the fact that ART may not be successful (Daniluk et al., 2012; Lampic et al., 2006). Men have a strong influence on their partners because men tend to be financially stronger and traditionally lead the home (Schwartz, Brindis, Ralph, & Biggs, 2011). Similarly, little is known about the intentions of students in regard to planning parenthood and family (Daniluk & Koert, 2012). This study has been designed to investigate the specific problem of fertility and ART treatment options intentions, beliefs, and knowledge of Illinois college students and explore differences based on race, sexual orientation, age, parental status, relationship status, and gender.

Need for the Study

Women are most fertile between the ages of 20 and 24 (ASRM, 2003; Lampic et al., 2006). Researchers have noted these ages are also the time when some women decide to delay childbirth to complete their college education. Lampic et al. (2006) found that college students are aware that complications can occur after 35 years of age, but they lack knowledge about age-related concerns and ART treatment types. College students may have some knowledge of fertility but when questioned showed little understanding of age-related fertility issues and ART (Lampic et al., 2006; Peterson et al., 2012). Similarly, some college students may have knowledge about fertility but lack knowledge regarding IVF and other ART options (Chan et al., 2015).

Maheshwari et al. (2008) reported that college students need to know about the risks and benefits of delaying parenthood from women who have suffered age related infertility. Daniluk and Koert (2013) and Lampic et al. (2006) also emphasized the need for students to learn at what ages a woman is most and least fertile. Some women, especially those who pursue postgraduate education, tend to delay parenthood, which in some cases leads to infertility or biologic childlessness (Chamie & Mirkin, 2012; Livingston & Cohn, 2010; Schmidt, Sobotka, Bentzen, & Andersen, 2011).

There is, therefore, a justification for further research on the intentions, beliefs, and knowledge of Illinois college students regarding fertility and ART treatment options, so that health professionals, counselors, and other caregivers can become better informed about ways of educating them. The conclusions and recommendations derived from this study could be used to help college students make informed decisions and perhaps avoid the fate of men and women who make choices about family planning that they later regret.

Purpose of the Study

The purpose of this quantitative cross-sectional comparative study was to identify differences and relationships among Illinois college students' intentions, beliefs, and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

Research Questions

1. Do Illinois college students' fertility and ART *intentions* differ by race, sexual orientation, age, parental status, relationship status, or gender?
2. Do Illinois college students' *beliefs* about fertility and ART differ by race, sexual orientation, age, parental status, relationship status, or gender?

3. Do Illinois college students' *knowledge* of fertility and ART differ by race, sexual orientation, age, parental status, relationship status, or gender?
4. What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, and gender) regarding college students' fertility and assisted reproductive technology *intentions*?
5. What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, and gender) regarding college students' fertility and assisted reproductive technology *beliefs*?
6. What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, and gender) regarding college students' fertility and assisted reproductive technology *knowledge*?

Significance to Health Education

The results of this research may contribute to the limited existing research on college students' knowledge, intentions, and beliefs about fertility and ART treatment options. Students' intentions, beliefs, and knowledge about fertility and ART are examined because newly acquired findings from this study on fertility and ART could guide health educators when disseminating information on fertility and ART in classrooms and other educational settings.

The findings may also affect how workers at campus health services share information with men and women, further highlighting woman's fertility rates, even with ART. The results of the three independent variables of race, sexual orientation, and gender may contribute to or affect cultural competency, whereas age, parental status, and relationship status may contribute to existing literature, and more information on knowledge, intentions, and beliefs about fertility and ART will add to the prevailing literature.

Theoretical Framework

Intentions, beliefs, and knowledge are the only constructs from the Theory of Reason Action (TRA) and Theory of Planned Behavior (TPB) utilized in this study. The TRA and TPB are not tested, but the intention, beliefs, and knowledge constructs developed the survey. The constructs Intentions, Beliefs, and Knowledge from the theory of Planned Behavior (TPB) developed by Ajzen (1985) was used to develop the survey. TPB is a modified version of the theory of reasoned action (TRA; Ajzen & Fishbein, 1980), originally designed to help predict changes in behavior. TPB and TRA differ only by the construct of perceived behavioral control because, as Ajzen found, individuals did not have complete voluntary control over their behavior. Evaluating participants' intentions is the main component to predicting behavior in TPB. Additionally, a person's attitudes and beliefs greatly impact intentions. This study utilized knowledge, beliefs, and intentions constructs (Ajzen, 1985, 1988).

Ajzen and Klobas (2013) and Dommermuth, Klobas, and Lappegard (2011) noted that beliefs, including subjective norms, greatly affect when couples decided to have children. Ajzen and Klobas also pointed out that the construct of belief can strongly influence a couple's decision to have children. Likewise, Daniluk and Koert (2013) noted there was a growing trend to delay parenthood, and couples' subjective norms greatly affect their intentions to have children. Couples' beliefs about when is an acceptable time to have children greatly impacted when and if they decide to have children (Dommermuth et al., 2011).

The survey in this dissertation, one modified from the Fertility Awareness Survey created by Daniluk et al (2012), included a 5-point Likert-type scale to assess the three constructs of knowledge, intentions, and beliefs found in the TPB as adapted from the original survey creator (Daniluk & Koert, 2013). The three constructs of this study focus on the six research questions to

examine differences in fertility and ART intentions, beliefs, and knowledge of the demographic characteristics of race, sexual orientation, age, parental status, relationship status, and gender. Ajzen's (1985) constructs postulate that a person's behavior may be influenced by beliefs and their¹ knowledge of fertility (Daniluk & Koert, 2013).

Study Sample

Participants in the study were students enrolled in introductory health education courses in the fall semester of 2017 at six 4-year public universities in Illinois: Eastern Illinois University, Illinois State University, Northern Illinois University, Northeastern Illinois University, Southern Illinois University Carbondale, and Southern Illinois University Edwardsville. A power analysis estimated that a minimum sample size of 287 students ($\alpha = .05$; power = .95; margin of error = 5%) was needed in this study (Field, 2009). All six of the participating universities are public institutions of higher education. A nonrandom convenient sampling was used, in the introductory health courses among students who agreed to participate. The goal was to recruit male and female students from diverse backgrounds, aged 18 years and older, enrolled in introductory health education courses offered as general education at the selected universities (see Tables 2 and 3).

Data was collected using nonrandom convenience sampling of students attending the identified six universities. The survey was appropriate for this research because it was the most convenient for the participants (Nulty, 2008). The survey option was the most appropriate because of the low cost and convenience, and respondents were able to answer questions at their own pace in a private setting (Dillman, Smyth, & Christian, 2009). Positive aspects of using

¹ In this dissertation I use singular *they*, *their*, and *themselves* to recognize the concept of the gender spectrum in accordance with the American Psychological Association's (2015) "Guidelines for Psychological Practice With Transgender and Gender Nonconforming People."

surveys are that an examiner does not have to administer the survey (Nulty, 2008), and respondents may feel less judged when completing their surveys privately.

Data collection involved asking introductory health science/health education instructors at the participating universities to distribute the surveys. Surveys were mailed so that the instructors could distribute them to students in their classes and students could complete the survey after giving consent to participate in the study; students who did not give their consent to participate not take the survey. Each professor or instructor received a \$5 gift card for mailing back their students' completed responses. After a period of a month, data was collected from all universities.

Data Analysis

The statistical package for the social sciences (SPSS) program Version 23 was used to evaluate the results descriptive statistics, Analysis of Variance (ANOVA), and Multiple Linear Regression to evaluate the results of this study. In this study descriptive statistics were used to measure central tendency, ANOVA to test differences between variables and Multiple Linear Regression to determine the relationship between the variables. Demographic information on race, sexual orientation, and gender were analyzed using frequencies and percentages. Six independent demographic variables (race, sexual orientation, age, parental status, relationship status, and gender) were tested using ANOVA to assess differences in the three dependent variables of intentions, beliefs, and knowledge of fertility and ART treatment options. Multiple Linear Regressions analyzed the interactions between race, sexual orientation, age, parental status, relationship status, and gender to determine the relationship and predictive value of intentions, beliefs, and knowledge. Post-hoc analyses were conducted to differentiate the significant results between three or more means.

Assumptions

Assumptions are preliminary beliefs about the sample, instruments, parameters, and limitations. The following assumptions were made:

1. The survey instrument is reliable and valid.
2. Participants understood the survey.
3. Participants responded honestly to the questions on the survey.
4. Participants aged 18 and older were representative of other such persons attending other Midwestern universities or colleges.
5. Male and female college students' intentions, beliefs, and knowledge regarding fertility and ART emerged.
6. The collected data will remain confidential, thereby protecting participants' identity.

Limitations

Limitations are circumstances of a study that researchers do not have control over during a study. The following limitations or factors that cannot be controlled applied to this study:

1. Students who chose to answer may have been more interested in participating compared to students who did not participate.
2. Expect that that respondents self-disclose and are honest.
3. Some respondents may have reported answers they felt were socially desirable.
4. This study had nonrandom convenient sampling limitations.

Delimitations

Delimitations are situations or factors that researchers restrict during a study. The following delimitations or researcher-imposed factors applied to this study:

1. This study included college students in introductory health classes at multiple institutions in Illinois.
2. Participants were Illinois college students aged 18 and older.
3. The study analyzed participants' knowledge, intentions, and beliefs of fertility and ART.
4. Data collection lasted over one month.
5. The study included students taking introductory health education/health science courses.

Definition of Terms

American Society for Reproductive Medicine: A nonprofit, professional medical organization of more than 9,000 health care specialists interested in reproductive medicine.

Assisted reproductive technology: All fertility treatments in which both eggs and sperm are handled. In general, ART procedures involve surgically removing eggs from a woman's ovaries, combining them with sperm in the laboratory, and returning them to the woman's body or donating them to another woman (CDC, 2016).

Beliefs: In the Intentions, Beliefs, and Knowledge Survey of Fertility and Assisted Reproductive Technology Survey Questions 6–17 address the beliefs construct. According to the TPB, human behavior is guided by three kinds of considerations. The first belief is about the likely consequences of the behavior (behavioral beliefs), the second belief is about the normative expectations of others (normative beliefs), and the third belief is about the presence of factors that may facilitate or impede the performance of the behavior (control beliefs). This survey includes constructs of behavioral beliefs, normative and control beliefs. Questions 6–9, 12, and

13 are considered behavioral beliefs items, and Questions 10, 11, 14, and 16 are considered control beliefs items. Only Question 15 is considered a normative belief questions.

Delayed parenthood: Postponing parenthood until the advanced maternal and paternal ages of 35 and older.

Fecundity: The quality or power of producing abundantly, fruitfulness, or fertility (ASRM, 2016).

Fertility: The condition, quality, or degree of being able to have children (ASRM, 2016).

Infertility: The result of a disease or injury (an interruption, cessation, or disorder of body functions, systems, or organs) of the male or female reproductive tract that prevents the conception of a child or the ability to carry a pregnancy to delivery. The duration of unprotected intercourse with failure to conceive should be about 12 months before an infertility evaluation is undertaken, unless medical history, age, or physical findings dictate earlier evaluation and treatment (ASRM, 2016).

Intentions: A combination of attitudes toward a behavior, subjective norms, and perceived behavioral control influence behavioral intention. Generally, the more favorable the attitude and subjective norm, and the greater the perceived control, the stronger a person's intention to perform a behavior. The Intentions, Beliefs, and Knowledge on Fertility and Assisted Reproductive Technology Survey intention construct is made up of five questions that ask participants their intentions toward parenting.

In vitro fertilization: A method of assisted reproduction that involves combining an egg with sperm in a laboratory dish. If the egg is fertilized and cell division begins, the resulting embryo is transferred into the woman's uterus, where it may implant in the uterine lining and

develop further. IVF bypasses the fallopian tubes and is usually the treatment choice for women who have badly damaged or missing fallopian tubes (CDC, 2016).

Knowledge: According to Ajzen (1985), the construct of knowledge is a background factor that influences beliefs. Questions 17 through 34 from the Intentions, Beliefs, and Knowledge of Fertility and ART instrument were created from the knowledge construct.

Sexual minority: Used to reference gay, lesbian, transgender, bisexual, intersex, queer, and asexual sexual orientations (Du Toit, 2010).

Stable relationships: When two people are in a committed, monogamous relationship not threatened by a breakup or divorce.

Third-party assisted ART: In this form of ART, the egg, sperm, or uterus of persons other than the couple attempting to conceive are used. Third party assisted ART procedures include surrogates and gestational carriers. A surrogate parent includes the third-party woman using her egg and the male's sperm to carry the child. The gestational carrier usually agrees to carry the fertilized egg of the couple for a fee.

Summary

The chapter presented an introduction to the study of the intentions, beliefs, and knowledge of Illinois college students regarding fertility and ART. The problem that provided the rationale for the study was stated, followed by the research questions, and an overview of the research methodology. In this comparative study, a quantitative research design was used to examine students' intentions, beliefs, and knowledge about fertility and ART. Descriptive statistics, ANOVA, and Multiple Linear Regression analysis were used to analyze the results of the survey, and a minimum study sample of 287 was determined to be satisfactory for this study based on a power analysis (Field, 2009). This chapter provided assumptions, limitations,

delimitations, and definitions of terms. Chapter 2 reviews literature relevant to the study. Chapter 3 explains the methodology, including the collection and analysis of data. Chapter 4 presents the findings, and Chapter 5 presents conclusions and recommendations based on the research.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Overview

Chapter 2 summarizes and synthesizes relevant literature on fertility, advanced delayed parenthood, infertility, and Assisted Reproductive Technology (ART) as they relate to gender, race, sexual orientation, and partner influence on delayed advanced parenthood, marital status, and parental status. It also outlines the theoretical framework and constructs that provide the foundation for this study. Through a comprehensive review of the literature on these subjects, it was possible to identify foundations for the present study and gaps in the literature that the current study sought to fill.

Fertility Knowledge and Assisted Reproductive Technology

Both *Fertility knowledge* and *ART* may have an impact on couples who delay parenthood or struggle with infertility. Some couples may have to utilize their fertility knowledge and may possibly consider using ART to treat age related infertility.

Prior to discussing fertility knowledge and ART, the following information regarding fertility is relevant. The American Society of Reproductive Medicine (2008) defines fertility as being able to produce offspring. According to ASRM (2012), ages 20 through 24 is a woman's optimal age range for having children. Also, women's fertility is expected to cease five to ten years prior to menopause. Fertility decreases by fifty percent for women in their late thirties compared to women in their early twenties (ASRM, 2012). Lampic et al, (2006) found lack of fertility knowledge about advanced maternal age is the primary reason that women may delay trying to conceive and thereby become infertile.

Fertility knowledge or fertility awareness is defined as having knowledge and information about fertility (Lampic, Skoog-Svanberg, Karlstrom, & Tyden, 2006). It encompasses how topics such as fertility timeline or spectrum, being over- or underweight, diabetes, and engaging in unprotected sex may affect one's fertility, and how various fertility treatments can help men and women conceive (Lampic et al., 2006). Fortunately, in some cases, ART can help couples conceive by using various methods and procedures in a clinic. According to the Centers of Disease Control and Prevention [CDC] (2017) ART includes all fertility treatments in which clinicians handle both eggs and sperm. In general, ART procedures involve surgically removing eggs from a woman's ovaries, combining them with sperm in the laboratory, and returning them to the woman's body or donating them to another woman.

Some researchers found that due to a lack of knowledge regarding fertility and ART, college students were not aware of the most opportune time to have children, which may lead to medical concerns or age related infertility. Lampic et al.'s, Skoog-Svanberg, Karlstrom & Tyden's, (2006) findings indicated that university students plan to have children at ages when female fertility is decreased without sufficient awareness of the age-related decline in fertility. This sort of plan increases the risk of involuntary infertility in this group, which is alarming in view of the great importance they put on parenthood. Similarly, Paterson et al. (2012) revealed that delaying childbearing based on incorrect perceptions of female fertility could lead to involuntary childlessness. Education regarding fertility issues is necessary to help men and women make informed reproductive decisions that are based on accurate information rather than incorrect perceptions (Paterson et al., 2012).

Some researchers indicated that men have less fertility knowledge than women. According to Daniluk and Koert (2013), childless men have no coherent body of knowledge

regarding age-related fertility and ART treatment and family-building options, and men may be contributing to the trend of delaying childbearing. If men are to be effective in supporting informed fertility and childbearing decisions, education programs must target both men and women (Daniluk & Koert, 2013). Also, Daniluk, Koert, and Chueng (2012) found that women had no coherent body of knowledge regarding age-related fertility and ART treatment options. On the other hand, Maheshwari, Porter, Shetty, and Bhattacharya (2008) found that women were largely aware of the risks and complications of delaying childbirth but erroneously believed that IVF could mitigate the effects of age.

Women may have more knowledge about fertility awareness compared to men but not by much. A study focused on professional women by Lundsberg, Pal, Garipey, Xu, Chu, and Illuzzi (2013) found that people often lack fertility awareness and even if they are aware they do not utilize their knowledge when challenged to analyze fertility. Their quantitative study assessed knowledge, attitudes, and practices related to conception and fertility among 1,000 reproductive age women. They found that the female participant's knowledge about ovulation, fertility, and conception was narrow. Lundsberg et al.'s main recommendation was more initiatives or programs should focus on health care professionals, distributing correct information in offices and using web-based sites to provide more information on conception and fertility for patients. Littleton (2014) reported similar findings that students who had fertility knowledge do did not know how to apply that knowledge to their lives.

Educating students on fertility and ART can help them make more informed choices regarding their fertility and ART options. Daniluk and Koert (2015) found that exposure to fertility awareness online can change fertility beliefs and increase knowledge, but the research shows that effects of the exposure may not be long term. Trent, Millstein, and Ellen's (2006)

study included 302 African American adolescents; they found that more health education programs including sexually transmitted infection screenings are needed to help this group of students to be knowledgeable so they can avoid being infertile because they lack understanding about fertility (Trent, Millstein, and Ellen, 2006).

Fertility and ART in race, ethnicity, gender, age, and education. Hispanic and Black men and women have higher rates of fertility than White, Asian, and American Indian men and women (Amuedo-Dorantes & Kimmel, 2008). These higher rates may be due in part to poverty, lack of knowledge regarding fertility, religious views, and views on abortion, failure to complete high school, or lack of access to healthcare. Similarly, Monte and Ellis (2014) found that Hispanic women had the highest fertility rate compared to women of other races. National health data show that Hispanic and Black women are the most fertile. The National Center for Health Statistics (CDC, 2015) found that in 1980 fertility rates for Hispanic women aged 15 to 44 was 95.4 births per 1,000; the following decade showed that fertility rose to 107.7 births per 1,000, Hispanic women in that age group which was the highest in all documented decades. In 2000, rates were 95.9 births per 1,000 women, and in 2013, 72.9 (see Table 1).

In 1980, Black fertility rates were 84.9 per 1,000 women; in the following decade rates increased to 86.8; in 2000, fertility rates were 70; and in 2013, fertility rates were 64.7 per 1,000 women (see Table 1). Likewise, fertility rates in White women during the same period were 65.6, and in 1990, 68.3, whereas in 2000 fertility rates were 65.3 per 1,000 women and in 2013, 62.7 per 1,000 births (see Table 1). In 1980, Asian women's fertility rates were 73.2 per 1,000 women; in 1990, the rates were 69.6; in 2000, fertility rates were 65.8, and in 2013, fertility rates were 59.2 (see Table 1). In 1980, fertility rates for Native Americans were 82.7 births per 1,000 women, whereas in 1990, the rate was 76.2 and in 2000, 58.7 (see Table 1). In 2013, fertility

rates were 46.4 per 1,000 births for Native Americans. For the first time, in 2013 Native American women had the lowest fertility rates, whereas before 2000 they had the third highest fertility rates after African Americans.

Table 1.

Fertility by Race and Ethnicity Births Per 1000

Race and ethnicity	Years			
	1980	1990	2000	2013
Hispanic	95.4	107.7	95.9	72.9
Black	84.9	86.8	70.0	64.7
White	65.6	68.3	65.3	62.7
Asian	73.2	69.6	65.8	59.2
Native American	82.7	76.2	58.7	46.4

In a literature review, Westoff and Marshall (2010) examined how religion influenced Hispanic female fertility rates, finding that Mexican women were more religious, which influenced childbearing. They noted that American-born Hispanics were more religious than non-Hispanic groups of women, but this difference explained only some of the higher fertility of Hispanics. A greater portion of the fertility difference aligned with the higher rates of poverty among Hispanics and their higher proportion of unintended births. Hispanic women who were poor and less educated focused more on religion and tended to have more children. Hispanic women who were educated tended to have fewer children. Westoff and Marshall (2010) revealed that research on religion and fertility was limited within the Hispanic community. While Bachu (1996) revealed that Black and Hispanic men have higher rates of fertility compared to other groups. Fertility was higher among Black married men (2.6 children each) than it was for White men and Asian and Pacific Islander men (2.2 children each). Similarly, fertility rates were also higher for married Black women than for White women or Asian and Pacific Islander

women. Among men and women, Hispanics had higher levels of children ever born than non-Hispanics. Married-couple families with Hispanic husbands had 2.6 children per husband compared to 2.2 children for non-Hispanic husbands. A notable difference emerged when Hispanic men married non-Hispanic (White, Black, Asian, or Native American) women; couples with both spouses of Hispanic origin averaged 2.8 children each compared with 1.8 children each when the wife was not of Hispanic descent.

Martinez, Daniels, and Chandra (2012) also noted that minorities were more likely to have more children. Martinez et al. analyzed birth rate data from the National Survey of Family Growth (NSFG) with a sample of 22,682 respondents (10,403 men and 12,279 women). The goal of the report was to analyze and compare earlier data from the NSFG from 2006 through 2010. Results showed that the average age for a woman's first birth was 23 and 25 for men. Hispanic women and men had more children than White and Black women and men in part because Hispanic women tend to start having families at an earlier age compared to their counterparts. Half of births to Hispanic women were non-marital, and about half of these were within cohabiting unions. White women had the fewest number of children and the highest average age of at first birth compared with Hispanic and Black women. In addition, White men and White women had the lowest percentage of non-marital first births and about half of them are within a cohabiting union. Black women had fewer children than Hispanic female participants but more than White female participants. The mean age at first birth for Black women is the youngest of the three groups. Some first births to Black women are non-marital, and the majority are also outside of the cohabiting union (Martinez, Daniels, & Chandra, 2012).

Some research shows that the more education a person has, the more their likelihood of having more children decreases. Yan and Morgan (2003) found that less-educated African

Americans have higher fertility rates, educated Whites and Blacks have the lowest fertility, and less-educated Whites have fertility levels between these two groups. They showed that education is a greater predictor for fertility than race. Similarly, Brand and Davis (2011) found that fertility rates are decreasing more among college-educated women who grew up poor than women who do not have a first degree and are poor. Women with more education from poor backgrounds have lower fertility rates compared to women from the same background with less education.

Wellons et al. (2008) reported Black female participants were more likely to have experienced age related infertility. This disparity was not explained by common risk factors for infertility such as smoking and obesity; and among nonsurgical sterile female participants, it was not explained by gynecologic risk factors such as fibroids and ovarian issues. Educated Black women tend to be career focused and are less likely to find a partner with similar qualifications, and so are less likely to become pregnant (Wellons et al., 2008).

Different age groups have various perceptions, beliefs, and intentions regarding fertility and ART Knowledge. Previous studies have shown that the women who are 35 or older or men who are 45 or older take a longer time to conceive (Hassan & Killick, 2001). Hassan and Killick (2001) found that, it takes men 45 or older over a year to get their partner pregnant, whereas, 35-year-old women take twice as long to get pregnant as 25-year-old women. Younger couples conceive more quickly than older couples (ASRM, 2008).

Younger persons, have less knowledge about fertility compared to their older persons who have experienced age related infertility. In 2012, some studies done by the Government of Australia documented that maternal and paternal ages both impact the chance of having a healthy baby, and that women over the age of 30 have increased chances of chromosomal abnormalities. Additionally, still birth and premature births are also more prominent in this age group, and male

fertility starts to decline at about age 45, and chances of developmental problems like autism spectrum disorder increases after age 40.

In a literature review, Bretherick, Fairbrother, Avila, Harbord, and Robinson (2010) concluded that more education is needed to inform female academics and professionals about the rate at which reproductive capacity declines with age to avoid unintended childlessness. In this study, 360 female undergraduate women did not clearly comprehend the steep rate of fertility decline with age and did not identify age as the strongest risk factor for miscarriages. An all-male study by Holton et al. (2016) found that men lack knowledge of female reproductive life span and recommended that because of this lack there should be campaigns focused on men and their awareness of age-related fertility decline. It may also be beneficial for health care providers to incorporate reproductive health care and education with primary care health consultation. In another age-related study, Liu and Case (2017) recommended the following: First, young women should be counseled about age-related infertility risk and the realities of ART. Second, women should learn about the risk of spontaneous pregnancy loss and chromosomal abnormalities increases with age. Third, advanced paternal age appears to be associated with an increased risk of spontaneous abortion and increased frequency of some autosomal dominant conditions, autism spectrum disorders, and schizophrenia. To minimize, potential birth risk counseling is a great option for men over 40 and their partners who are pursuing pregnancy.

Fertility and ART knowledge in the LGBT communities. There is little literature on ART intentions or beliefs and fewer studies of members of the lesbian, gay, bisexual and transgender (LGBT) community. LGBT persons may have a desire to have children but face greater challenges because of discrimination based on sexual orientation. Baiocco and Laghi (2013) suggested that although some Italian lesbians and gay men want to become parents, their

intentions flounder as a result of the difficulty of accessing adoption, donor insemination, or surrogate maternity (Italy recognized same-sex civil unions in 2016 but to date has not recognized same-sex marriage). Similarly, Riskind and Patterson (2010) completed a literature review and found that some gay and lesbian adults are parents; that many childless gay and lesbian adults report desires, expectations, and intentions for parenthood. More gay and lesbian couples are open to adoption and ART treatment opportunities in order to help them attain parenthood. There are barriers or policies that hinder members of the LGBT community from adopting, using IVF, or having children. Lack of access to reproductive health care such as ART may be significant for many gay men and lesbians (Riskind & Patterson 2010).

Results of ART treatment of members of the LGBT community differ very little from their heterosexual counterparts. Nordqvist, Ter Keurst, Boivin, and Gameiro (2016) found there was no difference between the conception rates of heterosexual and lesbian women. Moreover, their findings revealed that sexual orientation of women does not affect the outcome of fertility treatment with donated sperm. In addition, they reported that lesbian women undergoing treatment with donated sperm are equally fertile as women attempting to get pregnant without donated sperm, regardless of sexual orientation.

Delayed Parenthood

Lampic et al. (2006) defined *advanced delayed parenthood* as purposefully waiting to have children until the mid-30s or older. Lampic also reported that people delayed parenthood for myriad reasons, such as pursuing careers or working on advanced degrees, lack of financial stability or job prospects, or not finding a suitable partner. However, such delays can cause fertility issues. Lampic et al. reported that university students planned to have children at ages when female fertility decreased without being sufficiently aware of the age-related decline in

fertility. Women delayed parenthood without understanding the impact of advanced maternal age motherhood (age 35+).

Delaying parenthood carries consequences. According to Kemkes-Grottenhaler (2003), many of those who merely intended to postpone children may end up involuntarily childless. Kemkes-Grottenhaler surveyed 193 childless female academics to analyze if they decided to pass on the opportunity of having children in favor of pursuing other choices or if the decision was just deferred for a later time. They claimed, “As this trend of postponing parenthood is most likely to increase shortly, the resolution of this conflict will be a major milestone in the development of modern industrialized countries” (p. 435). Kemkes-Grottenhaler’s analysis revealed that financial benefits alone will not entice women into motherhood, but societal and infrastructure changes may encourage women to start a family. Many couples, especially the main caretaker, struggle with balancing work and personal life (Kemkes-Grottenhaler, 2003). Mills, Rindfuss, McDonald, and Velde (2011) found a conflict between work and family life for those who desired more children. Parents who want more offspring often perceive a conflict between work and family (Mills et al., 2011). On the other hand, Guedes and Canavarro (2015) found that after having children couples are often disappointed that they did not start earlier. Notably, Guedes and Canavarro examined 105 older parents (maternal age >35) and 93 younger parents (maternal age range 20–34) from a clinic before the obstetrical appointment. Both groups believed having a suitable partner was the key to becoming a parent. Many of the older parents were disappointed that they delayed parenthood, and older maternal age was the main predictor of women being less satisfied with child timing. Mothers, more than fathers, struggled with age related infertility concerns and were more likely to regret the timing of first childbirth (Guedes & Canavarro, 2015). On the other hand, Camberis, McMahon, Gibson, and Boivin (2014) found

that women who had their first child in their 30s or 40s were adapted better or more mature in entering motherhood, had less satisfaction with mothering, and the adjustment of being a mother was the equivalent to that of a younger mother's.

Partner influences on becoming a parent. Research shows that some men who may be educated influence women to have children at a later age. The more financially dominant spouse determines when the couple has children, (Schwartz, Brindis, Ralph, & Biggs, 2011). More men than women influence their spouses regarding when to have children. Though societal roles are becoming more, inclusive of women as leaders, men typically earn more money and therefore may influence when and what actions to take if a woman is to become pregnant (Daniluk & Koert 2012). According to Schwartz et al. (2011), in Mexican-American culture men typically decide how and when their family evolves. Schwartz et al. interviewed 31 individuals (age ranges 15–35) and found that Mexican-American women are more influenced by the men in their culture than other American women. The findings reveal that men who are strongly influenced by Mexican culture are more likely to want their pregnant wife to stay home, and men more influenced by mainstream US culture are more likely to encourage their wife to work and pursue an education. Male partners can influence pregnancy intentions, which may strengthen or weaken the relationship (Schwartz et al., 2011).

When women find a suitable and responsible partner they take on their partner's desires to increase or choose not to enlarge the family size. Zabin, Huggins, Emerson, and Cullins (2000) found that women who had children and found a new spouse to be "a suitable partner" assimilated their spouse's ideas of keeping the family at the current size or to expanding the family. Zabin et al. also found that the couples may want to expand their family but they delay having more children until they are emotionally or financially prepared.

As an example, Dudgeon and Inhorn (2004) found women who are poor or lack support are strongly influence by men whether to have children. Dudgeon and Inhorn investigated men's influence on their partner's reproductive health and reported that young women without a stable partner are more likely to use contraceptives to prevent pregnancy. Also, male partners encourage women to use oral contraceptives, injections, implants, spermicides, diaphragms, or female condoms, and men could influence when and if female participants had abortions by withholding economic or emotional support (Dudgeon & Inhorn, 2004). Some men who are more financially stable than women influence the time to have children.

Lack of a suitable partner is a major reason why women delay parenthood. Proudfoot, Wellings, and Glasier (2009) concluded that most women were aware of the risks of delaying childbirth; however, the most common reason for delay concerned lack of the 'right' partner, which does not lend itself to intervention. Most women were more accurate in their assumption about the time it may take to conceive, and 74% of women who definitely or might want children gave reasons for not finding a suitable partner or unfulfilled relationship/s as the most common reason for the delay (Proudfoot et al., 2009). Proudfoot et al. also showed that finding a suitable partner influences women's intention on when to have children. Daniluk and Koert (2012) found that women may choose to delay parenthood because it might affect their careers or if they had not found suitable partners.

How age and earnings impact parental status. Many older first time parents experience an increased enjoyment from parenting compared to younger first time parents due to established careers, stronger support systems, and access to health care. According to Criado, (2014), some younger parents experience depression because they are unsure about financial provision, lack support, lack maturity to deal with the drastic changes of parenthood, or lack

education or access to health care, whereas older parents (female >35, male >45) are happy because they may be educated, have established careers, and have access to health care. There are studies that examine the impact of enjoyment of having children on older parents because they are satisfied in other areas of their lives (Criado 2014; Amuedo-Dorantes and Kimmel (2004)). Criado (2014) found that some women may face challenges at the workplace if they want to expand their family size.

People who delay parenthood for a time or permanently may have higher earnings in the long run. Men and woman have varying experiences of having multiple children during their careers. Some women who postpone parenthood have flourishing careers, whereas others who have children during their career may not have the same wage potential as their counterparts without children (Amuedo-Dorantes, 2004). Amuedo-Dorantes (2004) found that college-educated mothers do not experience a motherhood wage penalty at all. In fact, they enjoy a wage boost when compared to college-educated childless women. Second, fertility delay enhances this wage boost even further. Their results provide an explanation for the observed postponement of maternity for educated women. Amuedo-Dorantes and Kimmel (2004) argued that the wage boost experienced by college-educated mothers may be the result of their search for family-friendly work environments, which, in turn, yields job matches with more female-friendly firms offering greater opportunities for advancement.

Women may have more challenges in their careers than men who would like to have multiple children. At some workplace environments, women who are able to manage or balance work and life seem to obtain promotions. However, Cools, Markussen, and Strom (2017) found that having additional children reduced college educated womens' earnings, their ability to be employed by higher paying firms, and their probability of being a top earner at the workplace.

There is less or no effect on family size for men in the labor market, in either the short or long run. These findings are in line with Lundborg et al. (2014), who found that after 10 years there was a 13 % reduction in women's hourly wages due to having a first child.

Infertility. Infertility is defined as not being able to conceive in less than a year for couples under 35 and less than 6 months in couples over 35 (ASRM, 2012). Physicians at the ASRM (2012) reported that a third of men, a third of women, and a third of couples are infertile for some period of time. Sometimes it can be treated; for example, some couples use ART to treat infertility whereas others accept the condition. Delayed parenthood is the leading cause of age related infertility, and other biological reasons come second (Jose-Miller, Boyden, & Frey, 2007). The leading biomedical causes of infertility in women are interrupted ovulation, problems with fallopian tubes, unknown causes, and menstrual issues (Jose-Miller et al. 2007; Roupia et al., 2009). According to Jose-Miller et al. (2007) infertility causes in men were low sperm count, poor sperm motility, and abnormal sperm shape. Men who believe they are infertile typically go to their doctor's office so that the fertility specialist can run a series of tests, examining the men by giving them a physical examination, looking at their body mass, and evaluating hormonal levels by testing blood samples for hormone deficiency. Men and women may choose to delay parenthood until age 35 and older, which increases the possibility of fertility hindrances (Jose-Miller et al., 2007). Some other causes of infertility are sexually transmitted diseases such as chlamydia or gonorrhea, infections like pelvic inflammatory disease, poor oral health care, and poor lifestyle choices such as smoking or excessively drinking. Jose-Miller et al., (2007) poor lifestyle choices and health behavior choices can increase the chance for infertility in men and women. In the next section intentions, beliefs and knowledge which are all part of the TPB was used explain behavior and to develop the survey.

Theoretical Constructs

Although this study does not seek to prove or test any specific theory, Malecarini, Vignoli, and Gottard (2015) indicated that for fertility studies the theoretical constructs of knowledge, belief, and intentions from the TRA and TBD are best suited for fertility studies and were used in this study (Dommermuth et al., 2011; Malecarini et al., 2015). People's knowledge and beliefs affect their intentions and then their behavior, about fertility and ART and having children. According to Ajzen (1985), the construct of knowledge is implied and influences beliefs. TRA and TPB are behavioral constructs that can be used to predict a person's behavior (Figure 1). In this brief section articles including fertility intentions and fertility beliefs are analyzed, presenting evidence supporting the theoretical constructs of TRA and TPB are best used to support fertility studies.

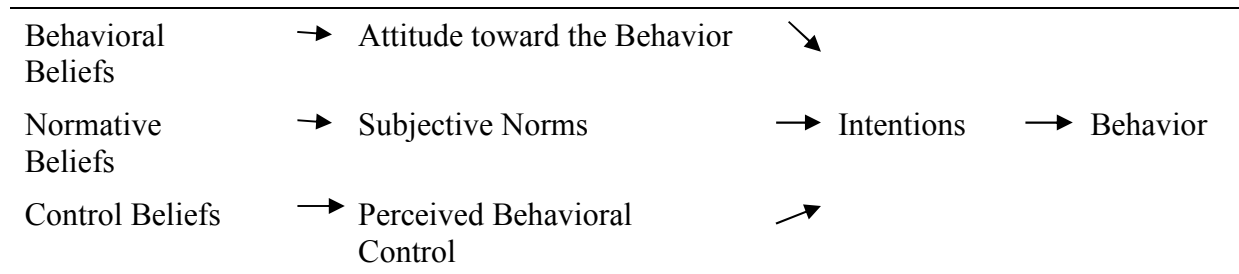


Figure 1. Theory of planned behavior. *Note.* The fertility, knowledge, and beliefs of colleges students instrument was modified using portions of Fishbein and Ajzen's (1985) theoretical constructs.

Fertility beliefs and intentions. Ajzen and Fishbein (1980) suggested that belief constructs impact the attitudes, perceived norms, and perceived control, which then influences the intentions of participants (University of Twente, 2010). Of the three types of beliefs, behavioral beliefs are those associated with behavioral performance linked to one's attributes or performance (Glanz, Rimer, & Viswanath (2008). Normative beliefs follow what others believe is the appropriate choice or option, and control beliefs are one's thoughts that may help or stop the performance of the behavior (Glanz et al., 2008). There is not a lot of literature on fertility

beliefs, but there is information on how demographers use TPB to support fertility. Studies like Bunting, Tsibulksy, and Boivin (2013) used TPB and TRA to examine fertility and population growth. Ajzen and Klobas (2013) found that fertility information may influence a persons' beliefs and perceptions regarding fertility choices.

Fertility Intentions are the most important construct affecting the behaviors because when people form an intention, most of them plan to follow through with it. Malecarini, Vignoli, and Gottard (2015) proved that TPB and constructs of intention can effectively be used to support fertility research. According to Glanz et al. (2008), some precursors' ideas, opinions, or settings like that of education, parental influences, and knowledge in one's life that have been found to impact the level of fertility intentions, determining impacting fertility intentions and fertility behaviors.

Dommermuth, Klobas, and Lappegård (2015) found that childless people were less likely to focus on fertility intentions and were unaware of the most opportune time to have children compared to people who already had children. In accordance with the TPB, childless people may underestimate the difficulty of acting on their intentions and therefore have more difficulty realizing their intentions, versus parents who consider their ability to manage another child. Dommermuth et al. also showed that childless couples with an immediate fertility intention are more likely to succeed than those with a longer-term intention. Likewise, parents with an immediate fertility intention are more likely to realize their intention during the first two years after the interview, but after four years the childbearing rate was higher among those with longer-term fertility intentions. In addition, Dommermuth et al. (2011) found that subjective norms, have a significant effect on the timing of intentions to have a child for both childless people and parents. Dommermuth et al. (2011) also found the more both groups feel that their

intention to have a child is supported by their families and friends, the more likely they are to want a child immediately compared to within the next three years. This finding also shows that positive attitudes have a significant effect on intending to have a child sooner rather than later for parents but not for childless people. Perceived behavioral control is a significant determinant for both groups: people who consider themselves better able to cope with having child are more likely to intend to have a child in the near term rather than within the next three years.

Summary

This chapter examined the literature that covers fertility knowledge and ART among college students. Chapter 2 also covered delayed parenthood, race (ethnicity), and education as they relate to fertility knowledge and ART, as well as articles on gender, age, parental status, relationship status, sexual orientation, and theoretical constructs within fertility and ART. Overall, this review of literature confirms that education, race (ethnicity), age, relationship status, and sexual orientation can be pertinent factors impacting students' beliefs, intentions, and behaviors towards fertility. This literature review highlights the lack of research examining knowledge, beliefs, and intentions in the LGBTQ community.

CHAPTER 3

METHODS

Chapter 3 summarizes the purpose of the study and the research questions and details the participants, procedures, research design, and method of data analysis. Illinois college students' intentions, beliefs, and knowledge were analyzed to determine differences among six independent variables of race, sexual orientation, age, parental status, relationship status, and gender.

Purpose of the Study

The purpose of this quantitative cross-sectional comparative study was to identify differences and relationships among Illinois college students' intentions, beliefs, and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

Research Questions

1. Do Illinois college students' fertility and ART *intentions* differ by race, sexual orientation, age, parental status, relationship status, or gender?
2. Do Illinois college students' *beliefs* about fertility and ART differ by race, sexual orientation, age, parental status, relationship status, or gender?
3. Do Illinois college students' *knowledge* of fertility and ART differ by race, sexual orientation, age, parental status, relationship status, or gender?
4. What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, and/or gender) regarding college students' fertility and assisted reproductive technology *intentions*?

5. What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, or and gender) regarding college students' fertility and assisted reproductive technology *beliefs*?
6. What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, or and gender) regarding college students' fertility and assisted reproductive technology *knowledge*?

Research Methodology and Design

This study utilized a quantitative comparative, cross-sectional approach to examine intentions, beliefs, and knowledge about fertility and ART treatment options. Quantitative research emphasizes objective measurements and collecting numerical data in the form of surveys or polls, or by manipulating existing data (Babbie, 2010; Field, 2009). The theoretical framework of this study was based on Aizen's (1985) Theory of Planned Behavior which included (TPB) in which the constructs of Intentions, Beliefs and Knowledge were used to develop the survey. A comparative design was chosen because college students were compared for differences based on demographic characteristics specifically race, sexual orientation, age, parental status, relationship status, and gender for their intentions, beliefs, and knowledge of fertility and ART (Daniluk & Koert, 2013). Numerical survey data were collected from the participants at a single point in time; thus, this study design allows for comparison of different variables at the same time (Field, 2009; Johnson, 2001).

Description of the Participants

Data were gathered using nonrandom convenient sampling of Illinois college students, 18 years of age and older, enrolled in introductory health education courses during the fall of 2017 at six 4-year public universities in Illinois (see Table 2). The universities include Northeastern

Illinois University, Eastern Illinois University, Illinois State University, Northern Illinois University, Southern Illinois University Carbondale, and Southern Illinois University Edwardsville. Except for Illinois State University, these universities have been referenced as “directional” schools (because one university is in the northern region, one is in the northeastern region, one is in the southern region, one is in the eastern region, and one is in the western region) in Illinois (Illinois State University, 2013).

Table 2.

Participating University and Introductory Health Courses

University	Introductory health course
Southern Illinois University Carbondale	Foundations of Health Education
Illinois State University	Foundations of Health
Northern Illinois University	Contemporary Health Concepts
Northeastern Illinois University	Community Health
Eastern Illinois University	Principles of Human Health
Southern Illinois University Edwardsville	Principles and Foundation of Health

Students from introductory health education courses were sampled, as it was likely the classes would be composed of different ages, races, genders, persons of various relationship statuses, sexual orientation, varied parental statuses. Such students were also more likely to have been exposed to fertility and ART information compared to students in other courses. There was an assumption that having a larger sample of students attending various universities would lead to a representative sample of the population with respect to race, sexual orientation, age, parental status, relationship status, and gender. A minimum sample size of 287 was needed for a rigorous sample, based on a power analysis (Field, 2009).

A nonrandom sample was appropriate as different universities have a different number of classes. Surveys were mailed to each available foundational health class. This method was

selected because only foundational health courses were available and participants were present in the classroom.

Data Collection

Permission to conduct the study was obtained from the Human Subjects Committees at Southern Illinois University Carbondale, Southern Illinois University Edwardsville, Illinois State University, Northern Illinois University, Northeastern Illinois University, and Eastern Illinois University (See Appendix I). Chairpersons from each health education or health science department were contacted to obtain permission to survey introduction health education courses (See Appendix B). After the instructors agreed to administer the survey in their classes, they asked students in their courses to participate (See Appendix C).

Nonrandom sampling was appropriate because the universities have different numbers of classes. Paper surveys are preferred to an electronic instrument because the response rate is usually higher with paper compared to electronic surveys (Rasinger, 2013). The Health Science departments' websites helped to determine which basic health education courses satisfies each university's introductory health course or general education requirement. After determining the course titles, the Fall 2017 schedules were then used to identify the faculty members assigned to teach the introductory courses (see Table 2). Faculty members were contacted by email and surveys were sent to those who agreed to allow their students to complete the surveys. The professor or instructors who administered and returned the surveys in the provided preaddressed postage paid manila envelope received a \$5 Visa gift card.

The survey took 10 to 15 minutes to complete and responses were locked in a secure area. Potential participants were informed about the purpose of the investigation through a consent form attached to the survey. Therefore, students who completed the survey were

presumed to have given their consent. The data were collected over a one -month period and will be kept on the password-protected computer at the examiner's home for a minimum of three years. All data were transferred to Statistical Software Predictive Systems (SPSS) version 23 for data analysis. Data were entered manually. To ensure that the data were accurately entered, 10% of the entered data was rechecked.

Instrumentation

The instrument, Intentions, Beliefs, and Knowledge on Fertility and Assisted Reproductive Technology Survey was adapted for this study. Daniluk and Koert (2013) provided permission to use and adapt the survey (see Appendix K). The survey instrument contained questions on intentions, beliefs, and knowledge about fertility and ART. The modified survey has 34 items, not including the demographic items (see Appendix A). The items include adapted Questions 1 and 5 in the fertility intentions section, and Items 35–38 in the fertility and ART beliefs section (see Table 3). Changes also included the addition of Demographic Questions 39, 41, 44 and 46; therefore, the survey includes five open-ended fertility intention questions, 12 questions on beliefs about fertility and ART, 21 questions on knowledge of fertility and ART, and eight demographic questions (see Tables 3 and 4).

Table 3.

Modified and Adapted Fertility Survey Questions

Fertility Intentions	
1. Do you plan to have children in the future?	
5. About how many months do you expect it to take for you or your spouse to get pregnant once you start trying? _____	
Fertility and ART Knowledge	
32. There is a significant decline in the quality of a man's sperm before the age of 50 years of age?	
33. Smoking cigarettes or marijuana can reduce the quality of a man's sperm.	
34. Children born to fathers >45 years of have higher rates of learning disabilities, autism, schizophrenia and some forms of cancer.	
Demographics Section	
35. What is your gender?	
37. What is your race? _____	
40. Do you have children?	
42. How many children do you have?	

Table 4.

Instrument Constructs and Measurement Scales

Scales	Number of Items	Survey Items	Study Constructs
Intentions	5	(1–5)	Intentions
Fertility and ART beliefs	11	(6–16)	Beliefs
Fertility and ART knowledge	18	(17–34)	Knowledge
Demographic characteristics	8	(35–42)	Not Applicable

The original survey, created by Daniluk and Koert (2013), included separate male and female surveys. The modified survey included gender-neutral questions (see Table 4, Questions 17–34; See Appendix A). This study utilized open-ended questions as well as primarily Likert-type response categories to collect data from college students. Also, the survey provided an opportunity to gather numerical data from a representative sample of a larger population (McMillan & Schumacher, 2010).

A 5-point Likert-type scale response was used for the beliefs construct in the Fertility and Assisted Reproductive Technology Survey. That section has three answer options. The first section, the intentions section, contains five ratio-level questions whose values are measured in whole numbers. The second section, the beliefs section, contains 11 questions. The first six questions produced ratio-level values measured in whole numbers, and the remaining six questions produced ordinal values measured on 5-point Likert-type scales (5 = Very satisfied/1 = Very Dissatisfied; 5 = Very Likely/1 = Very Unlikely). The third section, the knowledge section, contains 18 questions that produced values measured on 5-point Likert scales (5 = Very Informed/1 = Very Uninformed; 5 = Strongly Agree/1 Strongly Disagree), and the demographic section has seven questions. The original Fertility and Assisted Reproductive Technology Survey demonstrated an acceptable level of reliability (.743; Gliem & Gliem, 2003; George & Mallery, 2010).

Validity and Reliability

Daniluk and Koert (2013) reported the instrument demonstrated internal and construct validity as evaluated through an oblique factor analysis for psychometric properties of the instrument and the internal structure of the knowledge scale was found to be adequate. Factor analysis helped to assess validity (Daniluk & Koert, 2013). They also reported adequate reliability and internal consistency of the scales through a Cronbach's alpha assessment ($\alpha = 7.43$; Daniluk & Koert, 2013). A factor analysis and content validity was repeated to determine internal validity.

In the summer and fall of 2016, there was a pilot study of Women and Men in Contemporary Society (WGSS 223-201) and Human Genetics (BIO 202-201) at Southern Illinois University Carbondale. The pilot study sample consisted of 50 students. Results of

Cronbach's alpha indicated a high level of reliability for the Beliefs Scale (.802) and an acceptable level of reliability for the Knowledge Scale (.505). Gliem and Gliem (2003) and George and Mallery (2010) noted anything under .5 is an unacceptable level of reliability, but the pilot study results showed coefficients ranging from .5 and higher. Items 12, 31, 35, and 39 with reliability coefficients less than .5 were excluded from the final survey to increase the reliability of the Knowledge Scale and to improve the overall reliability of the survey (see Appendix A). All scales were retested in aggregate with Cronbach's alpha and demonstrated an acceptable level of reliability ($\alpha = .675$) prior to collecting data. Cronbach's alpha assessment of reliability was repeated with the final study data set prior to collecting data.

Data Analyses

In this study descriptive statistics measured was used to report central tendency, followed by Analysis of Variance (ANOVA) were used to analyze fertility intentions, beliefs, and knowledge. Multiple Linear Regressions were performed to determine which variables explain the variability in ART and fertility intentions, beliefs, and knowledge for the nine variables (six independent and three dependent). Data were inspected for missing values from the intentions, beliefs, and knowledge sections of the survey. Missing data were replaced with the mean scores for that item. However, if a survey was missing more than 20% of survey items, it was discarded because substituting the mean for large portions of the sample would reduce the variance of the variable (McKenzie et al., 2009).

To answer the first research question, "Do Illinois college students' fertility and ART intentions differ by race, sexual orientation, age, parental status, relationship status, and gender?" descriptive statistics were utilized on the open-ended sections before transforming the data into categories that could be analyzed using ANOVA statistics (Table 5).

For the second research question, “Do Illinois college students’ beliefs about fertility and ART differ by race, sexual orientation, age, parental status, relationship status, or gender?” descriptive analysis were used because some of the questions in the section are open-ended. Analysis of variance (ANOVA) was conducted to determine difference in beliefs in each of the six independent variables: race, sexual orientation, age, parental status, relationship status, and gender. For the third research question, “Do Illinois college students’ knowledge of fertility and ART differ by race, sexual orientation, age, parental status, relationship status, and gender?”, ANOVA analysis was used to determine differences between six independent variables on the continuous dependent variable of knowledge (McMillan & Schumacher, 2010). Post hoc tests are designed for situations in which a significant omnibus F test with a factor that consists of three or more means, and additional exploration of the differences among means is needed to provide specific information on which means are significantly different from each other. If any of the first three research questions was found to be significant, a post hoc test was conducted. Tukey’s HSD was the post hoc analysis used in this study.

For Research Questions 4, 5, and 6, a Multiple Linear Regression tests will be conducted to establish and predict the strongest independent variables impacting each of the three dependent variables. Multiple Linear Regressions test will be used to analyze the interactions between race, sexual orientation, age, parental status, relationship status, and gender to determine the relationship and predictive value of intentions, beliefs, and knowledge among Research Questions 4, 5, and 6 (see Table 5).

Table 5.

Summary of Research Questions, Instrument Items, and Data-Analysis Methods

Research questions	Survey Items	Variables	Analysis Methods
RQ1: Do Illinois college students' fertility and ART <i>intentions</i> differ by race, sexual orientation, age, parental status, relationship status, and gender?	Intentions Subscale: 1–5 Demographic Subscale: 35–42	Race, Sexual orientation, Age, Parental status, Relationship status, and gender IV: Race, Sexual orientation, Age, Parental status, Relationship status, and gender DV: Intentions	Descriptive statistics and ANOVA for all IV
RQ2: Do Illinois college students' <i>beliefs</i> about fertility and ART differ by race, sexual orientation, age, parental status, relationship status, and gender?	Beliefs Subscale: 6–11 & 12–16 Demographic Subscale: 35–42	Race, Sexual orientation, Age, Parental status, Relationship status, and gender IV: Race, Sexual orientation, Age, Parental status, Relationship status, and gender DV: Beliefs	Descriptive statistics and ANOVA for all IV
RQ3: Do Illinois college students' knowledge of fertility and ART differ by race, sexual orientation, age, parental status, relationship status, and gender?	Knowledge Subscale: 17–34 Demographics Subscale: 35–42	Race, Sexual orientation, Age, Parental status, Relationship status, and gender IV: Race, Sexual orientation, Age, Parental status, Relationship status, and gender DV: Knowledge	ANOVA for all IV
RQ4: Which variables (race, sexual orientation, age, parental status, relationship status, and gender) are the strongest predictors of college students' fertility and assisted reproductive technology <i>intentions</i> ?	Intentions Subscale: 1–5 Demographic Subscale: 35–42	Race, Sexual orientation, Age, Parental status, Relationship status, and gender IV: Race, Sexual orientation, Age, Parental status, Relationship status, and gender DV: Intentions	Descriptive and Multiple Linear Regression
RQ5: Which variables (race, sexual orientation, age, parental status, relationship status, and gender) are the strongest predictors of college students' fertility and assisted reproductive technology <i>beliefs</i> ?	Beliefs Subscale: 12–16 Demographic Subscale: 35–42	Race, Sexual orientation, Age, Parental status, Relationship status, and gender IV: Race, Sexual orientation, Age, Parental status, Relationship status, and gender DV: Beliefs	Descriptive and Multiple Linear Regression
RQ6: Which variables (race, sexual orientation, age, parental status, relationship status, and gender) are the strongest predictors of college students' fertility and assisted reproductive technology <i>knowledge</i> ?	Knowledge Subscale: 17–34 Demographics Subscale: 35–42	Race, Sexual orientation, Age, Parental status, Relationship status, and gender IV: Race, Sexual orientation, Age, Parental status, Relationship status, and gender DV: Knowledge	Multiple Linear Regression

Summary

A quantitative comparative design was used to analyze Illinois college students' knowledge, intentions, and beliefs about fertility and ART based on demographic characteristics of race, sexual orientation, age, parental status, relationship status, and gender. This chapter discusses the data collection, research design, sample size, survey instrument, and data analysis. Data were collected from students in foundational health courses at six universities in the state of Illinois using a modified fertility survey. A pilot study of the survey instrument with 50 participants resulted in an acceptable level of reliability of ($\alpha = .675$; George & Mallery, 2010; Gliem & Gliem, 2003). A minimum sample size of 287 participants was needed for the research (Field, 2009). The three constructs of fertility and ART beliefs, intentions, and knowledge using an adapted pre-validated survey after obtaining permission from the original authors, Daniluk and Koert (2013). In this study descriptive statistics, ANOVA, and Multiple Linear Regression were used to answer the research questions.

CHAPTER 4

RESULTS

This chapter presents the survey results from this study based on the research questions and demographics of the participants. Five hundred and thirty-six students attending six selected institutions participated in this study of intentions, beliefs, and knowledge about fertility and Assisted Reproductive Technology (ART). The purpose of this quantitative cross-sectional comparative study was to identify differences and relationships among Illinois college students' dependent variables of intentions, beliefs and knowledge toward fertility and ART based on six independent variables of race, sexual orientation, age, parental status, relationship status, and gender.

Gaining Access to the Six Universities

In Fall 2017, instructors from the various universities gave permission to survey their students from September through October. All universities contacted participated in the study except for Western Illinois University. Unfortunately, the instructors at Western Illinois University were unable to participate due to lack of time availability.

Sample Demographics

Southern Illinois University Carbondale Human Subjects committee members gave permission to conduct the study in June 2016 and extended the approval in March 2017 (See Appendix J). Fifty participants completed the pilot study in June 2016. In September 2017, six department chairs including Southern Illinois University Carbondale, Southern Illinois Edwardsville, Eastern Illinois University, Illinois State University, Northern Eastern Illinois University, and Northern Illinois University granted permission to conduct the study at their schools (See Appendix J). Participants were students enrolled in classes from the following six

Illinois universities: Southern Illinois University Carbondale ($n = 144$), Southern Illinois Edwardsville ($n = 206$), Eastern Illinois University ($n = 30$), Illinois State University ($n = 28$), Northern Illinois University ($n = 73$) and Northern Eastern Illinois University ($n = 55$) (See Table 6). Five hundred and forty-three students answered 42 survey questions. Seven surveys had more than 20% of responses missing from the intentions, beliefs, and knowledge scales. As a result, only 536 surveys were valid.

The dataset had imputed values of 136 cases. Missing value imputation involves substituting missing values in a dataset (Graham, 2009). The mean value for the item replaced missing values in the dataset. Table 6 presents the total number of students who completed surveys from the six institutions. The software G*Power 3.1.9.2 provided a post hoc power analysis. Power helps in establishing if a null hypothesis is false. The higher power values indicate higher likelihood of rejecting a null hypothesis that is false (Cohen, 1988). Based on the final sample size ($N = 536$) the achieved power for the regression analysis was 1.00. The achieved power for the one-way Analysis of Variance (ANOVA) analysis was 0.99. In the inferential analyses, the power values indicate a high probability of rejection of the false null hypotheses.

Table 6

Number and Percentages of Participants from Illinois Universities ($n = 536$)

Institution	<i>n</i>	%
1. Southern Illinois Carbondale	144	26.87
2. Southern Illinois Edwardsville	206	38.43
3. Eastern Illinois University	30	5.60
4. Illinois State University	28	5.22
5. Northern Illinois University	73	13.62
6. Northeastern Illinois University	55	10.26
Total	536	100

The majority of respondents were European/Caucasian ($n = 327$, 61.0%) followed by African/African American ($n = 128$, 23.69%). Native Hawaiian or Pacific Islander comprised the smallest portion of the sample ($n = 1$, 0.19%). The majority of students in the sample reported their sexual orientation as heterosexual ($n = 471$, 87.87%). Forty-one participants (7.65%) indicated bisexual orientation. Female students comprised the majority of the sample ($n = 305$, 57%) while males comprised 42% ($n = 225$). Five participants (1%) self-identified as transgender. Of the responses retained in the dataset, one student did not indicate their gender. The mean age of participants in the sample was 20.49 ($SD = 3.21$), after recoding the age responses into the following age ranges: 18-22, 23-26, and 27 and over. Recoding of the age responses allowed for comparisons of younger students to older students to specifically examine their intentions, beliefs, and knowledge. The majority of participants indicated they were between 18 and 22 years of age ($n = 471$, 88%). Table 7 presents descriptive statistics for participants, race, sexual orientation, and gender and age category.

Table 7

Number and Percentages of Participants' Race, Sexual Orientation, Gender, and Age Category

Variable	<i>N</i>	%
Race		
African American	127	23.69
American Indian or Alaskan Native	7	1.31
Asian American	19	3.54
European or Caucasian	327	61.01
Native Hawaiian or Pacific Islander	1	0.19
Other	36	6.72
Missing	19	3.54
Total	536	100

Continued

Table 7 Continued Number and Percentage of Participants' Race, Sexual Orientation, Gender, and Age Category

Sexual Orientation		
Bisexual	41	7.65
Gay/Lesbian	11	2.05
Heterosexual	471	87.87
Missing	13	2.43
Total	536	100
Gender		
Female	305	56.90
Male	225	41.98
Transgender	5	0.93
No response	1	0.23
Total	536	100
Age Range		
18-22	471	87.87
23-26	47	8.77
27-30	15	2.80
31-60	3	0.56
Total	536	100

The majority of students in the sample were not parents ($n = 520$, 97%) and did not have children ($n = 527$, 98%). Of those who had children ($n = 15$, 3%), the most frequent response for number of children was one ($n = 5$, 1%). Finally, the majority of participants indicated they were single ($n = 311$, 58%). One hundred and ninety-five 195 (36%) indicated they were in a committed relationship and only 16 (3%) were married. Three participants failed to respond to the item (1%). Table 8 presents descriptive statistics for parental status, number of children, and relationship status.

Table 8

Number and Percentages for Parental Status, Children, and Relationship Status

Survey item	<i>n</i>	%
Are you a parent?		
Yes	9	1.68
No	527	98.32
Total	536	100
How many children do you have?		
0	527	98.32
1	5	0.93
2	3	0.56
3 or more	1	0.19
Total	536	100
Relationship Status		
Single	311	58.02
Committed	195	36.38
Married	16	3.67
Other	11	2.05
No response	3	0.69
Total	536	100

Reliability Analysis

The Intentions, Beliefs and Knowledge on Fertility and Assisted Reproductive Technology Survey, created by Daniluk and Koert (2012), had four sections, three Likert scale and a demographics section. The first section of the survey comprised the intentions scale, the second section comprised the beliefs scale, the third section comprised the knowledge scale, and the last section included demographics. The intentions scale comprised questions 1-5, the belief questions covered questions 6-16, the knowledge questions ranged from 17-34, and lastly demographics questions were 35-42. All data were analyzed using SPSS statistical software version 23.0.

A reliability analysis was conducted for the beliefs, and knowledge scales. Cronbach alpha coefficients were calculated and evaluated according to the guidelines set by George and Mallery (2016). Gliem and Gliem (2003) and George and Mallery (2010) noted anything under .5 is an unacceptable level of reliability, but the study results showed coefficients ranging from .5 and higher. The reliability analysis indicated that the beliefs scale ($\alpha = 0.673$) and knowledge scale ($\alpha = 0.64$) had fair reliability and an aggregate reliability of .640. Table 9 presents the results of the reliability analysis.

Table 9

Results of the Reliability Analysis

Scale	No. of items	α
Beliefs 6-11	6	0.74
Beliefs 12-20	9	0.78
Beliefs 6-20	15	0.67
Knowledge	18	0.64

Descriptive Statistics for Intentions, Beliefs, and Knowledge Items

Descriptive statistics showed the results for the intentions, beliefs, and knowledge sections of the survey. Ranges, means, and standard deviations are presented for the open-ended intentions and beliefs items. Descriptive statistics are presented for Intentions items two through five in Table 10. Most participants in the sample indicated that they intended to have children ($n = 475$, 87.5%). While sixty-seven or 12.3% of the overall population did not want children.

Table 10

Frequencies and Percentages for Intention to Have Children

Variables	n	Percent
Yes to having children	475	87.5
No to having children	67	12.3
Not sure	1	.2

Participants' responses for how many children they intended to have ranged from one child to seven children, with an average of 2.67. The average age participants expected to conceive their first child was 27 with an age range of 19-40 in Table 11. The average age they intended to conceive their last child was 31, with the ages ranges from 21-50. The maximum number of months participants intended to take to conceive was 24 months (responses range from one to twenty four months).

Table 11

Ranges, Means, and Standard Deviations for Intentions Items 2 through 5

Survey Item	Range	M	SD
2. How many children do you hope to have?	1-7	2.67	0.99
3. About how old you expect to be when you become a parent with your first child?	19-40	26.92	3.87
4. If you intend to have more than one child, about how old do you expect to be when you have your last child?	21-50	31.11	5.87
5. About how many months do you expect it to take for you or your spouse to get pregnant once you start trying?	1-24	3.96	3.17

Descriptive statistics for belief items 6 through 11 are reported in Table 12. Students in this study believed that the ideal age for women to have their first child is at 25 years old and 26 years old for males. While the latest age for having children for women and using ART treatment options is 38 years old. The students in this study felt the latest age a man can become a father and use ART treatment options is 41 years old.

Table 12

Descriptive Statistics for Belief Items 6 through 11

Survey Item	Ranges	M	SD
6. What do you consider to be the ideal age for a woman to give birth to a child for the first time?	16-35	25.34	3.03
7. What do you consider to be the ideal age for a man to father a child for the first time?	16-40	26.16	3.28
8. What would you consider to be the latest age a woman should consider bearing a child?	16-60	38.59	5.57
9. What would you consider to be the latest age a man should consider fathering a child?	16-80	41.40	7.09
10. What do you believe the upper age limit should be for a woman to be assisted in becoming pregnant at a fertility clinic?	16-70	38.72	8.46
11. What do you believe the upper age limit should be for a man to be treated at a fertility clinic?	16-99	40.79	9.83

Means and standard deviations for belief items 12 through 15 are reported in Table 13. A mean response of 1.94 was noted for becoming a parent without a spouse through the use of donated sperm or eggs. Students choose “neither likely nor unlikely” and “likely” responses to using IVF in efforts to conceive (M=3.29). Students responded “likely to very likely” that all genders, relationship statuses, and couples had the right to utilize ART treatment options (M=4.08-4.48)

Table 13

Means and Standard Deviations for Belief Items 12 through 15

Survey Item	M	SD
12. How likely is it that you would consider becoming a parent without a spouse through the use of donated sperm or eggs?	1.94	1.08
13. If you and your partner had difficulties conceiving, how likely is it that you would consider using In Vitro fertilization (IVF)- a procedure whereby the sperm and eggs are fertilized in a laboratory and a few days later the resulting embryo is transferred to the uterus?	3.29	1.21
14. If your spouse was unable to produce a child using his/her own sperm/eggs, how likely is it that you would consider using the sperm/eggs of another person, to produce an embryo?	2.52	1.16
15. Who do you believe has the right to use assisted reproductive technology in their attempts to produce a child?		
a. Heterosexual Couples	4.48	0.87
b. Same Sex Female Couples	4.29	1.06
c. Same Sex Male Couples	4.20	1.14
d. Single Women	4.25	0.99
e. Single Men	4.08	1.40
16. How likely it is that you would consider having your eggs/sperm frozen and stored at the fertility clinic so they could be used when you are ready to become a parent?	2.84	1.26

Note. Very Likely=5, Likely=4, Neither Likely nor UnLikely =3, UnLikely=2 and Very UnLikely=1 was the coding scale that was used to determine the means and standard deviations

Means and standard deviations for knowledge items 17 and 18 are reported in Table 14. Most students' responses fell between "informed" or "neither informed nor uninformed" (M=3.29) about their knowledge of women's fertility. Most students' responses fell between "uninformed and "neither informed nor uninformed" (M=2.86) regarding their overall knowledge of ART and fertility treatment

Table 14

Means and Standard Deviations for Knowledge items 17 and 18

Survey Item	M	SD
17. Overall how do you rate your current women's fertility knowledge?	3.29	0.94
18. Overall, how would you rate current knowledge of Assisted Reproductive Technology procedures and fertility treatments (e.g., In Vitro Fertilization and Intracytoplasmic Sperm Injections)?	2.86	1.00

Note. Very Informed=5, Informed=4, Neither Informed nor Uninformed =3, Uninformed=2 and Very Uninformed=1 were the coded responses used to determine the means and standard deviations.

Means and standard deviations for knowledge items 19 through 33 are reported in Table 15.

Students selected “disagree to neither agree” nor “disagree” (M=2.93) in response to the statement “a woman’s eggs are as old as she is’ (this statement is true). The mean score response for the total cost of IVF was 2.85. Students selected “neither agree nor disagree” and “agree” (M=3.79) in response to a biological decline in conception for women age 35. Students selected “neither agree nor disagree” and “agree” (M=3.89) when addressing if there were higher cases of miscarriages in the 40s compared to the 30s. Most students selected “neither agree nor disagree” and “agree” in the role that a man’s age plays in a couple’s chances of becoming pregnant. Students selected “disagree” and “neither agree nor disagree” (M=2.99) in response to whether the majority of infertility problems are due to women’s causes. Students reported that they neither agree nor disagree” and “agree” that there was a significant decline in the quality of a man’s sperm after the age of 50.

Table 15.

Means and Standard Deviations for Knowledge Items 19 through 33

Survey Item	M	SD
19. For women over 30, overall health and fitness level is better indicator of fertility than age.-	3.55	0.88
20. Taking birth control pills for more than 5 years negatively affects a woman's fertility.-	3.23	0.89
21. A woman/s eggs are as old as she is.*	2.93	1.07
22. Prior to a woman-reaching menopause, the assisted reproductive technologies (e.g. In Vitro Fertilization, also known as IVF) can help most women to have a baby using their own eggs.	3.54	0.75
23. The total cost of one cycle of In-Vitro Fertilization is under \$5,000.00.-	2.85	0.75
24. There is a progressive decrease in a woman's ability to become pregnant after the age of 35.*	3.79	0.84
25. The rates of miscarriage are significantly higher for women in their 40s than for women in their 30s, even for physically fit women in excellent health. *	3.89	0.83
26. Egg freezing before the age of 35 can significantly prolong a woman's fertility.*	3.36	0.78
27. Sexually transmitted infections (e.g. Chlamydia, Gonorrhea) significantly increase the risk of later infertility.*	3.76	0.88
28. A man's age is an important factor in a couple's chances of becoming pregnant. *	3.22	1.03
29. The majority of fertility conditions are caused by problems with the woman's fertility.-	2.99	0.86
30. Most couples have to go through IVF more than once to have a baby.*	3.21	0.81
31. A woman's weight affects her chances of conceiving a child.*	3.18	1.00
32. There is a significant decline in the quality of a man's sperm after the age of 50.*	3.14	0.92
33. Smoking cigarettes or marijuana can reduce the quality of a man's sperm. *	3.78	0.84
34. Children born to fathers over the age of 45 have higher rates of learning disabilities, autism, Schizophrenia and some forms of cancer.*	3.29	0.89

Note. Strongly Agree=5, Agree=4, Neither Agree nor Disagree =3, Disagree=2 and Strongly Disagree=1 were the answer scale responses use to calculate the means. The asterisks denotes a () correct response while the minus sign denotes (-) incorrect response.*

Analysis of Research Questions

Intentions

RQ #1- Do Illinois college students' fertility and ART intentions differ by race, sexual orientation, age, parental status, relationship status, or gender? One-way Analysis of Variance (ANOVA) were conducted to determine if participants' intentions scores differed by race, sexual orientation, age, parental status, relationship status, or gender. Questions 1-5 of the survey specifically asked participants questions about their intentions regarding fertility and ART. Post-hoc Tukey HSD tests were conducted when statistical significance was assessed. Six one-way ANOVAs determined if intention scores were influenced by race, sexual orientation, age, parental status, relationship status, or gender. Table 16 presented results of the one-way ANOVAs test for intentions scales.

Table 16

Results of the ANOVAs for Intentions by Race, Sexual Orientation, Age, Parental Status, Relationship Status, and Gender

Variable		Sum of Squares	df	Mean Square	F	p
Race	Between Groups	17.96	4	2.99	0.90	.493
	Within Groups	1703.39	513	3.32		
	Total	1721.35	517			
Sexual Orientation	Between Groups	21.28	3	7.09	2.03	.109
	Within Groups	1825.05	521	3.50		
	Total	1846.33	524			
Age	Between Groups	32.39	2.00	16.19	4.70	.010
	Within Groups	1827.22	530.00	3.45		
	Total	1859.61	532.00			
Parental Status	Between Groups	7.26	2	3.63	1.04	.353
	Within Groups					

Continued

Table 16 *Continued Results of the ANOVAs for Intentions by Race, Sexual Orientation, Age, Parental Status, Relationship Status, and Gender*

Variable		Sum of Squares	df	Mean Square	F	p
Relationship Status	Within Groups	1853.11	533	3.48		
	Total	1860.37	535			
	Between Groups	10.47	4.00	2.62	0.75	.558
Gender	Within Groups	1848.32	530.00	3.49		
	Total	1858.79	534.00			
	Between Groups	3.68	2	1.84	0.53	.590
	Within Groups	1851.58	532	3.48		
	Total	1855.27	534			

Note: Age indicates significance at the $p < .05$ level, also the * shows significance.

Race, sexual orientation, parental status, relationship status, and gender did not significantly influence college students intentions regarding fertility and ART. This suggests that students' scores on intentions were similar across groups for each of these variables. Since the results were statistically significant for age ($F = 4.70$, $p = .010$) post hoc pairwise comparisons for intentions were conducted by age. The pairwise comparisons for the age comparison indicated significant differences between participants aged 18-22 and those aged 27-30 (Table 17). Scores for the dependent variable, intentions, are displayed on the y-axis while categories of the independent variable, age, are on the x-axis. The figure indicates that the mean intentions score was higher for students who were 27-30 years of age than they were for other age groups.

Table 17

Tukey HSD Comparisons for Intentions by Age

	(I) Age	(J) Age	Mean	Std.	<i>p</i>	95% C.I.	
			Difference	Error		Lower	Upper
Intentions	18-22	23-26	-0.36	0.21	.205	-0.86	0.14
		27 and over	-1.14*	0.42	.020	-2.14	-0.15
	23-26	18-22	0.36	0.21	.205	-0.14	0.86
		27 and over	-0.78	0.46	.201	-1.86	0.29
	27 and over	18-22	1.14*	0.42	.020	0.15	2.14
		23-26	0.78	0.46	.201	-0.29	1.86

Note. * denotes the mean difference is significant at the 0.05 level.

Beliefs

RQ #2- Do Illinois college students' fertility and ART beliefs differ by race, sexual orientation, age, parental status, relationship status, or gender? One-way ANOVAs were conducted to determine if participants' belief scores differed by race, sexual orientation, age, parental status, relationship status, or gender. The six one-way ANOVAs helped with determining whether the belief scores were influenced by race, sexual orientation, age, parental status, relationship status, or gender. Results of the one-way ANOVA tests for beliefs are in Table 18.

Table 18

Results of the ANOVAs for Beliefs by Race, Sexual Orientation, Age Category, Parental Status, Relationship Status, and Gender

Variable		Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
Race	Between Groups	30.50	4	5.08	1.51	.171
	Within Groups	1722.87	513	3.36		
	Total	1753.37	517			
Sexual Orientation	Between Groups	7.06	2	2.35	0.68	.568
	Within Groups	1815.83	521	3.49		
	Total	1822.89	523			
Age	Between Groups	14.20	2.00	7.10	2.04	.131
	Within Groups	1844.95	530	3.48		
	Total	1859.15	532			
Parental Status	Between Groups	3.63	2	1.82	0.52	.595
	Within Groups	1858.77	533	3.49		
	Total	1862.40	535			
Relationship Status	Between Groups	11.10	3	2.77	0.80	.528
	Within Groups	1844.96	530	3.48		
	Total	1856.06	533			

Continued

Table 18 *Continued Results of the ANOVAs for Beliefs by Race, Sexual Orientation, Age, Category, Parental Status, Relationship Status, and Gender*

Variable		Sum of Square	df	Mean Square	F	p
Gender	Between Groups	26.72	2	13.36	3.88	.021
	Within Groups	1832.38	532	3.44		
	Total	1859.10	534			

Note: Gender indicates significance at the $p < .05$ level, also the * shows significance.

The results of the one-way ANOVA test were not significant for race, sexual orientation, age, parental status, and relationship status. This results suggested that students' scores on beliefs were similar across groups for each of these variables. Because the results were statistically significant for gender ($F = 3.88, p = .021$) post hoc pairwise comparisons for gender were conducted. The pairwise comparisons for gender indicated the presence of significant differences between male and female students (Table 19).

Table 19

Tukey HSD Comparisons for the Mean Ranks of Beliefs by Gender

Dependent Variable	(I) Gender	(J) Gender	Mean Difference	Std. Error	p	95% C.I.	
Beliefs	Male	Female	0.43*	0.16	.024	0.05	0.81
		Transgender	-0.53	0.84	.805	-2.50	1.44
	Female	Male	-0.43*	0.16	.024	-0.81	-0.05
		Transgender	-0.96	0.84	.489	-2.92	1.01
	Transgender	Male	0.53	0.84	.805	-1.44	2.50
		Female	0.96	0.84	.489	-1.01	2.92

Note. * denotes the mean difference is significant at the 0.05 level.

Knowledge

RQ #3- Do Illinois college students' fertility and ART knowledge differ by race, sexual orientation, age, parental status, relationship status, or gender? Six one-way ANOVA tests were conducted to determine if knowledge scores were influenced by race, sexual orientation, age, parental status, relationship status, or gender. Results of the one-way ANOVA tests for intentions are presented in Table 20. The results indicated that there were no statistically significant differences in knowledge scores for any of the independent variables. The findings indicated that knowledge scores for students were similar across all groups for race, sexual orientation, age, parental status, relationship status, and gender.

Table 20

Results of the ANOVA Tests for Knowledge by Race, Sexual Orientation, Age Category, Parental Status, Relationship Status, and Gender

Variables		Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
Race	Between Groups	1.07	4	0.18	1.59	.148
	Within Groups	57.71	513	0.11		
	Total	58.78	517			
Sexual Orientation	Between Groups	0.09	2	0.03	0.26	.856
	Within Groups	58.89	521	0.11		
	Total	58.98	523			
Age	Between Groups	.03	2	0.02	0.15	.863
	Within Groups	59.78	530	0.11		
	Total	59.81	532			
Parental Status	Between Groups	0.37	2	0.19	1.65	.193
	Within Groups	59.66	533	0.11		
	Total	60.03	535			
Relationship Status	Between Groups	0.11	3	0.03	0.25	.909
	Within Groups	59.86	530	0.11		
	Total	59.97	533			
Gender	Between Groups	0.33	2	0.16	1.47	.231
	Within Groups	59.38	532	0.11		
	Total	59.71	534			

Predicting Intentions

RQ # 4 What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status, and gender) regarding college students' fertility and assisted reproductive technology intentions? Multiple linear regression assessed the predictive relationship between race, sexual orientation, age, parental status, relationship status, gender, and college students' fertility and assisted reproductive technology intentions. The absence of

multicollinearity was assessed using variance inflation factors (VIFs). Multicollinearity refers to high intercorrelation among the independent variables (Stevens, 2009). VIF values greater than 10 showed evidence of increased multicollinearity in the regression model (Stevens). Table 21 presents the VIF values for the independent variables.

Table 21

Variance Inflation Factor Values for the Regression Predicting Intentions

Variable	VIF
Race	1.05
Sexual orientation	1.02
Age	1.43
Relationship status	1.69
Parental status	1.36
Gender	1.05

The results of the multiple linear regression analysis predicting intention were statistically significant, $F(9,502) = 2.91, p = .002, R^2 = 0.05$. This result indicated that the regression model containing race, sexual orientation, age, relationship status, parental status, and gender contributed to the variation in intentions score among college students. However, the model only accounted for approximately 5% of the variance in intentions, which may be considered evidence of poor model fit. Table 22 displayed the results of the multiple linear regression analysis predicting intentions.

Race, relationship status, and age were statistically significant predictors in the model. For race, the findings indicated that European/Caucasian students' intentions scores were on average 0.50 units higher than African/African-American students' average intentions score, $B = 0.50, t(502) = 2.72, p = .007$. There was no statistically significant effect for the Other Minority group. For relationship status, the findings indicated that students in a committed relationship

scored on average 0.36 points on the intentions scale less than single students, $B = -0.36$, $t(502) = -2.26$, $p = .024$. Age was also a statistically significant predictor of intentions, $B = 0.09$, $t(502) = 3.37$, $p < .001$. The results indicated that as age responses increased from one category to the next, intentions score also increased by 0.09 units on average. Table 22 summarizes the results of the regression model.

Table 22

Results of the Multiple Linear Regression Predicting Intentions

Variable	<i>B</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>P</i>
(Intercept)	11.13	0.89	[9.38, 12.88]	0.00	12.49	< .001
Gender – Female (ref: Male)	0.13	0.16	[-0.18, 0.43]	0.04	0.82	.411
Parental status – No (ref: Yes)	0.19	0.55	[-0.90, 1.28]	0.02	0.35	.729
Relationship status – Committed (ref: Single)	-0.36	0.16	[-0.68, -0.05]	-0.10	-2.26	.024
Relationship status – Married (ref: Single)	-0.61	0.57	[-1.73, 0.50]	-0.06	-1.08	.281
Relationship status – Other (ref: Single)	-0.94	0.52	[-1.97, 0.09]	-0.08	-1.80	.072
Age	0.09	0.03	[0.04, 0.15]	0.18	3.37	< .001
Race – European/Caucasian (ref: African/African-American)	0.50	0.18	[0.14, 0.86]	0.14	2.72	.007
Race – Other minority (ref: African/African-American)	0.16	0.25	[-0.33, 0.65]	0.03	0.63	.528
Sexual orientation – LGBTQ (ref: Heterosexual)	-0.32	0.26	[-0.83, 0.19]	-0.05	-1.23	.220

Note. Results: $F(9,502) = 2.91, p = .002, R^2 = 0.05$

Unstandardized Regression Equation: Intentions = 11.13 + 0.13*Gender. Female + 0.19*Child. No - 0.36*Relationship. Committed - 0.61*Relationship. Married - 0.94*Relationship. Other + 0.09*Age + 0.50*Race. European Caucasian + 0.16*Race. Other minority - 0.32*Sexual orientation. LGBTQ

Predicting Beliefs

RQ # 5 What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status and gender) regarding college students' fertility and assisted reproductive technology beliefs? To address the fifth research question, a multiple linear regression was conducted to assess the predictive relationship between race, sexual orientation, age, parental status, relationship status, gender, and college students' fertility and assisted reproductive technology beliefs. Again, before conducting the analysis, the assumptions of homoscedasticity and multicollinearity were assessed. Homoscedasticity was assessed using a plot of the regression residuals versus the predicted values (Field, 2013). The absence of multicollinearity was assessed using variance inflation factors (VIFs). Multicollinearity refers to high intercorrelation among the independent variables (Stevens, 2009). VIF values greater than 10 showed evidence of increased multicollinearity in the regression model (Stevens). Table 23 presents the VIF values for the independent variables.

Table 23

VIF Values for the Regression Predicting Beliefs

Variable	VIF
Race	1.05
Sexual orientation	1.02
Age	1.43
Relationship status	1.69
Parental status	1.36
Gender	1.05

The results of the multiple linear regression analysis predicting beliefs were statistically significant, $F(9,502) = 2.13$, $p = .026$, $R^2 = 0.04$. This result indicated that the regression model containing race, sexual orientation, age, relationship status, parental status, and gender

contributed to the variation in beliefs score among college students. However, the model only accounted for approximately 4% of the variance in beliefs score, which may be considered evidence of poor model fit. The results of the multiple linear regression predicting beliefs are presented in Table 24.

The individual predictor variables were examined to determine their contribution to the variation in beliefs score. Analysis of the contribution of the individual predictor variables indicated that parental status, relationship status, age, and sexual orientation were not statistically significant predictors of beliefs.

Race and gender were statistically significant predictors in the model. For race, the findings indicated that European/Caucasian students' mean beliefs score was 0.53 units higher than African/African-American students' average beliefs score, $B = 0.53$, $t(502) = 2.64$, $p = .009$. There was no statistically significant effect for the other minority group. For gender, the findings indicated that the mean beliefs score for female students was 0.41 units lower than male students, $B = -0.41$, $t(502) = -2.41$, $p = .016$. This finding indicated that female students reported lower responses for the items related to their fertility and ART beliefs, such as the ideal age for giving birth the first time or likelihood of becoming a parent without a spouse through sperm or egg donation. Table 24 summarizes the results of the regression model.

Table 24

Results of the Multiple Linear Regression Predicting Beliefs

Variable	<i>B</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	15.37	0.98	[13.45, 17.30]	0.00	15.70	< .001
Gender – Female (ref: Male)	-0.41	0.17	[-0.75, -0.08]	-0.11	-2.41	.016
Parental status – No (ref: Yes)	0.29	0.61	[-0.91, 1.49]	0.02	0.48	.635
Relationship status – Committed (ref: Single)	-0.24	0.18	[-0.59, 0.11]	-0.06	-1.37	.171
Relationship status – Married (ref: Single)	-0.14	0.62	[-1.37, 1.09]	-0.01	-0.22	.823
Relationship status – Other (ref: Single)	-0.25	0.57	[-1.38, 0.87]	-0.02	-0.44	.658
Age	0.04	0.03	[-0.02, 0.10]	0.07	1.32	.187
Race – European/Caucasian (ref: African/African-American)	0.53	0.20	[0.13, 0.92]	0.14	2.64	.009
Race – Other minority (ref: African/African-American)	0.32	0.27	[-0.22, 0.85]	0.06	1.15	.250
Sexual orientation – LGBTQ (ref: Heterosexual)	-0.34	0.28	[-0.90, 0.22]	-0.05	-1.20	.232

Note. Results: $F(9,502) = 2.13, p = .026, R^2 = 0.04$

Unstandardized Regression Equation: Beliefs = 15.37 - 0.41*Gender. Female + 0.29*Child. No - 0.24*Relationship. Committed - 0.14*Relationship. Married - 0.25*Relationship. Other + 0.04*Age + 0.53*Race. European Caucasian + 0.32*Race. Other minority - 0.34*Sexual orientation. LGBTQ

Predicting Knowledge

RQ # 6 What is the relationship among the variables (race, sexual orientation, age, parental status, relationship status and gender) regarding college students' fertility and assisted reproductive technology knowledge? To address the sixth research question, a multiple linear regression gave values to assess the predictive relationship between race, sexual orientation, age, parental status, relationship status, gender, and college students' fertility and assisted reproductive technology knowledge. The VIF values explained the lack of high correlations among predictor variables and multicollinearity (Stevens, 2009). VIF values greater than 10 gave evidence of increased multicollinearity among predictors (Stevens). There were no VIF values exceeding 10. Table 25 presents the VIF values for the independent variables.

Table 25

VIF Values for the Regression Predicting Knowledge

Variable	VIF
Race	1.05
Sexual orientation	1.02
Age	1.43
Relationship status	1.69
Parental status	1.36
Gender	1.05

The results of the multiple linear regression analysis predicting knowledge were not statistically significant, $F(9,502) = 0.57$, $p = .823$, $R^2 = 0.01$. This result indicated that the regression model containing race, sexual orientation, age, relationship status, parental status, and gender did not contribute significantly to the variation in knowledge score among college students. Because the regression model was not statistically significant, the individual predictors were not examined further. The results of the multiple linear regression predicting knowledge are presented in Table 26.

Table 26

Results of the Multiple Linear Regression Predicting Knowledge

Variable	<i>B</i>	<i>SE</i>	95% CI	β	<i>t</i>	<i>p</i>
(Intercept)	3.17	0.18	[2.82, 3.52]	0.00	17.95	< .001
Gender – Female (ref: Male)	0.05	0.03	[-0.01, 0.11]	0.07	1.61	.109
Parental status – No (ref: Yes)	0.00	0.11	[-0.21, 0.22]	0.00	0.02	.988
Relationship status – Committed (ref: Single)	0.00	0.03	[-0.06, 0.06]	0.00	0.06	.953
Relationship status – Married (ref: Single)	0.05	0.11	[-0.17, 0.27]	0.02	0.44	.661
Relationship status – Other (ref: Single)	0.04	0.10	[-0.16, 0.25]	0.02	0.42	.672
Age	0.00	0.01	[-0.01, 0.01]	0.02	0.46	.649
Race – European/Caucasian (ref: African/African-American)	0.03	0.04	[-0.04, 0.10]	0.05	0.90	.368
Race – Other minority (ref: African/African-American)	0.02	0.05	[-0.08, 0.12]	0.02	0.42	.676
Sexual orientation – LGBTQ (ref: Heterosexual)	0.05	0.05	[-0.05, 0.15]	0.04	0.96	.336

Note. Results: $F(9,502) = 0.57, p = .823, R^2 = 0.01$

Unstandardized Regression Equation: Knowledge = 3.17 + 0.05*Gender. Female + 0.00*Child. No + 0.00*Relationship. Committed + 0.05*Relationship. Married + 0.04*Relationship. Other + 0.00*Age + 0.03*Race. European Caucasian + 0.02*Race. Other minority + 0.05*Sexual orientation. LGBTQ

Summary

This chapter presented the results of Illinois college students' intentions, beliefs, and knowledge regarding fertility and ART. The statistically significant results for the intentions section indicated that students in the age category 27 and older had higher intention scores compared to students age 18-22. For beliefs regarding fertility and ART, the findings indicated that male students had higher beliefs scores than female students. There were no statistically significant results amongst the variables, race, gender, sexual orientation, age, relationship status, and parental status when examined against knowledge.

Race, gender and relationship status were statistically significant variables in predicting students' intentions toward having children. Caucasian students had higher scores compared to African Americans, while men had higher intentions scores compared to women, and persons in a committed relationship status had lower intentions scores compared to single students. Race and gender were statistically significant variables in predicting fertility and ART beliefs. Regarding fertility and ART knowledge when examined against the variables of race, gender, sexual orientation, age, parental status, and relationship status, the results yielded that there were no statistically significant findings.

CHAPTER 5

DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

The purpose of this quantitative cross-sectional comparative study was to identify differences and relationships among Illinois college students' intentions, beliefs, and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender. This chapter consists of the summary of study, findings, discussion, limitations, recommendations, and conclusions based on the results presented in Chapter 4 of this study.

Summary of Study

In the Fall 2017 semester, 543 students in foundational health educational courses from six universities in Illinois were surveyed to assess their intentions, beliefs, and knowledge about fertility and ART treatment options. The instrument entitled *Intentions, Beliefs and Knowledge on Fertility and Assisted Reproductive Technology Survey*, created by Daniluk and Koert (2012), was modified to include gender neutral questions. After discarding incomplete surveys, data from 536 acceptable surveys were analyzed.

The demographic variables assessed were race, age, gender, sexual orientation, parental status, and relationship status. One-way analysis of variance were conducted to determine statistically significant differences among the dependent variables. Multiple linear regressions were used to determine the variation among age, gender, race, sexual orientation relationship status, and parental status on intentions, beliefs, and knowledge regarding fertility and ART treatment options.

Findings

The two major findings regarding Illinois college students' fertility and ART intentions were that (a) intentions differed based on age and (b) age, race, and relationship status were factors predicting fertility intentions. Most (87.5%) students want children, and on average most thought it would take almost 4 months to conceive. The average age at which the students intended to become parents was 27 and the average number of children desired was 2.67. The average ages at which students wanted their last child was 32

The major findings regarding Illinois college student's fertility and ART beliefs were that (a) intentions differed based on gender and (b) race, gender and relationship status were factors predicting fertility and ART treatment options beliefs. Students reported that the latest age a woman should consider bearing a child and the upper age limit for getting help with assisted reproductive technology was age 39 and for males age 41. Most students felt that they would not use donated eggs or sperm without a spouse. Students were more likely to use IVF if either they or their spouse could not conceive. Students in this study were "unlikely" to use donor sperm or eggs even if they had problems conceiving. Most students selected "very likely" or "likely" as responses to having heterosexual couples, same sex female couples, same sex male couples, single women and single men utilize ART or IVF in their attempts to conceive a child. Also regarding ART and IVF students were unlikely to store sperm or eggs at a fertility clinic for future use. This study found that female students responses differed compared to the male and transgender students because they wanted children at an early age.

Lastly age, race, gender, sexual orientation, parental status, or relationship status had no considerable influence on knowledge of fertility and ART treatment options. There were no significant differences in the knowledge scores by age, race, gender, sexual orientation, parental

status, or relationship status among Illinois college students. Also this study found no relationship among Illinois college students based on race, sexual orientation, age, parental status, or gender. The findings of the knowledge items indicate that students had low-to-average knowledge regarding fertility awareness. So the average score responses indicate that students rated their knowledge of women's fertility knowledge as average and their knowledge of ART as below average. This may indicate little overall knowledge.

Discussion

Fertility Intentions

In this study, age was the most significant variable impacting intentions compared to race, gender, sexual orientation, parental status, and relationship status. The average age at which participants intend to have children was 27 years old. This tendency conflicts with the findings of Paterson et al. (2012), which revealed that delaying childbearing based on incorrect perceptions of female fertility could lead to involuntary childlessness. Peterson et al. (2012) study differs in that the students in that study demonstrated a lack of fertility awareness by vastly overestimating the age at which women experience declines in fertility. Students in the present investigation seemed to understand that they should avoid waiting until 35 years of age and older. One reason for increased knowledge among students studied in 2017 compared to students surveyed in 2012 maybe that health educators are focusing more on educating students on fertility knowledge now compared to 2012. Most participants in this study plan to have children, and of all the age categories students 27 and older wanted to delay parenthood at higher levels compared to age category 18–22. The results of this study confirmed the results of previous studies conducted by Lampic et al. (2006) and Skoog-Svanberg, Karlstrom and Tyden (2006). Findings from those studies indicated that university students plan to have children at ages when female fertility has

decreased without being sufficiently aware of the age-related decline in fertility. Students' scores implied that most participants did not feel confident regarding their knowledge of women's fertility and were even less confident regarding knowledge of ART treatment options. Results of the current study show that students plan to delay parenthood, even if older than 27.

In this current Illinois fertility study all age groups but especially students 27 years of age and older have a stronger interest in delaying parenthood compared to younger students. This interest may mean that in this study persons in this particular age group have not established their careers, built a strong financial background, or found a partner. This finding is supported by Criado (2014), who found that some younger parents experience depression because they are unsure about financial provision, lack of support, lack of maturity to deal with the drastic changes of parenthood, lack education, or problems with access to health care compared to parents 35 and older. The results imply that even at age 27, parenthood may be delayed because students may not be ready or that such participants could have children and not want any more. Couples who want to have children should have clear expectations of the responsibilities of raising a child. According to the American Society of Reproductive Medicine (2012), the ideal biological age for having children is between 22–24 years. Similarly, in the present study, participants held the belief that the ideal age for having children was age 27 which is not far off far from ages 22-24. Students ages 22 to 24 are likely to still be in college or graduate school or starting their careers. Regardless of when a person has children, it is important to note delayed parenthood carries increased chances of miscarriages, stillbirths, chromosomal issues like trisomy 23, and autism and schizophrenia. IVF may not always work or may take several rounds of to achieve successful conception. Although there is no perfect time to have children, there are more favorable times, which include ages 35 and younger for women and before age 45 for men.

What stands out about this Illinois fertility study is that regardless of the age group the delay of parenthood was apparent and even more obvious at age 27 and older. Bretherick, Fairbrother, Avila, Harbord and Robinson (2010) found that 360 female undergraduate women did not clearly comprehend the steep rate of fertility decline with age and did not identify age as the strongest risk factor for miscarriages. Hassan and Killick (2001) found that younger couples conceived more quickly than older couples.

Race, age, and relationship status variables better predicted intentions compared to gender, sexual orientation, and parental status. Results from this study confirmed that Caucasian students had higher average intention scores than African American students. Caucasian students wanted a higher number of children, wanted their first and last child later than African Americans, and felt it took longer to get pregnant compared to African Americans. According to Martinez, Daniels, and Chandra (2012), minorities were more likely to have more children than Caucasians and intended on having children sooner than Caucasian students, which the findings of this study paralleled. Yan and Morgan (2003) found that educated African Americans and Caucasians tended to have fewer children than less educated African Americans and Caucasians but that even at an undergraduate level African Americans still want children earlier than Caucasians students. Caucasian students typically have children later compared to other groups. Caucasians are more likely to utilize IVF compared to other groups because college-educated Caucasians are more likely to have the medical coverage to use IVF. Missmer, Seifer, and Jain (2006) found that access to medical care and financial resources are some of the factors causing more Caucasians to utilize IVF. Regardless of race, participants indicated that they would use IVF, but Caucasians had the highest percentage of agreeing to utilize IVF. It takes several rounds of IVF to conceive, and even if one conceives, miscarriage or still birth may result. In Missmer et

al.'s (2006) study the age variable ranged from 21 to 51 years of age strongly predicted intentions. For every year increment starting from age 18 there is a delay in having children. Generally college students intend to delay parenthood. Lastly, persons in committed relationships had a lower intention score compared to persons who are single. This intention score could mean that persons in a committed relationship felt that they wanted children sooner than persons who were single. According to Lampic et al. (2006) persons who have found a suitable partner felt that they were more likely to start a family. Further, research showed that male partners strongly influence female partners regarding when couples should start having children (Schwartz, Brindis, Ralph, & Biggs, 2011).

Beliefs of Fertility and ART treatment options

The present study supports the findings of Maheshwari, Porter, Shetty, and Bhattacharya (2008), who found that women were largely aware of the risks and complications of delaying childbirth but erroneously believed that IVF could mitigate the effects of age. Gender, compared to the other variables of race, sexual orientation, parental status, and relationship status, was most impactful in the beliefs section. Women's' beliefs scores were lower than male and transgender participants: Women wanted children at younger ages compared to male and transgender students. More women were concerned that if they waited too late to have children, the opportunity to conceive would decrease. The number one reason for infertility in women is age related infertility, which means attempting to have children after peak fertility (Ter Keurst, Boivin & Gameiro, 2016). The Centers for Disease Control and Prevention (2012) reported that Caucasian women tended to delay parenthood longer than women of other races, a finding supported by the current investigation. Some researchers also pointed out that educated women were more likely to have fewer children because they start having children at later ages (Brand &

Davis, 2011; Wellons et al., 2008). According to the American Society of Reproductive Medicine (2012), some older women have trouble conceiving, and women typically stop having children in the mid-40s.

Race and gender were significant in predicting beliefs. Caucasians had higher beliefs scores than African Americans. These scores indicate that more Caucasians were more likely to use IVF if they or their partner did not get pregnant. Caucasian students believed that sexual orientation or relationship status should not limit ART treatment options. African Americans and other minorities had similar beliefs regarding who could utilize ART. Missmer, Seifer, and Jain (2011) found that African Americans as well as other minorities are less likely to utilize ART treatment options due to higher trouble affording it and lower levels of medical coverage. Gender variables were mostly effective in predicting beliefs. Women do not want to wait too long to have children, and they strongly believed that sexual orientation and relationship should not limit had the right to use ART treatment options.

Knowledge of fertility and ART treatment options. Most studies show that women have more knowledge regarding fertility than men (Daniluk & Koert 2012; Lampic et al., 2006), but in the present study, gender influenced beliefs but did not appear to influence knowledge. The results showed no significant differences in knowledge of fertility and ART treatment options in any of the six variables. Knowledge did not differ by race, gender, age, sexual orientation, parental status, and relationship status in this study, this may be due to the small sample sizes of gay and lesbian participants (sexual orientation variable); Asian, American Indian, and other racial categories (race variable); transgender students (gender variable). This study found that Illinois college students felt they were not informed about women's fertility and felt even less knowledgeable about ART treatment options. Similarly Daniluk, Koert, and

Cheung (2012) found data suggesting that women have no coherent body of knowledge regarding age-related fertility and ART treatment options. Likewise in another study conducted by Daniluk and Koert (2012) that men also do not have coherent knowledge supports that overall college student lack knowledge.

Limitations

The major limitation that should be considered when interpreting the results of the present investigation is the lower reliability scores of the belief ($\alpha = 0.67$) and knowledge scale ($\alpha = 0.64$). Typically researchers aim to get a reliability score of .7. The piloted survey conducted in the fall of 2016 had a belief scale reliability of $\alpha = .802$, a knowledge scale of $\alpha = .505$, and a combined reliability score of $\alpha = .675$. The low reliability in the belief section was likely due to the open-ended questions along with the Likert scale formatted questions, which did not produce cohesive means.

Recommendations for Health Educators

When discussing sexual health with students, health educators should emphasize the importance of age-related infertility and the effectiveness of ART options. In a class setting instructors can encourage a discussion between students on what affects their knowledge of fertility and ART treatment options. This results of this Illinois fertility study indicate that students lack confidence in their knowledge pertaining to fertility and ART treatment options. Doing so could build knowledge because the results of this study indicate that males and females have varying beliefs about family planning. Additionally, health educators should encourage discussions in their human sexuality classes about fertility and ART treatment options relating to age and infertility. They could give students homework to record how they feel about parenthood and then share their perceptions with other students. Health educators can inform all students

who want to have children of the benefits and disadvantages of delaying parenthood, especially in the context of furthering their education. When health educators present information to college students, they should refer to studies about fertility and provide examples of persons who delayed parenthood to further their careers and later struggled with infertility. Public health educators can discuss the growing trend of delayed parenthood when presenting sexual health topics in the community. Also health educators can present that Caucasians, younger students, and men are more likely to delay parenthood compared to other minorities, African Americans, older students, and women. Public health educators who teach about family planning topics, which include anything that deals with sexual health, may also inform students that age-related infertility is the number one cause of infertility. This study found that 80% of students surveyed felt that sexual orientation did not affect the right to utilize IVF or other ART options in order to have children. Therefore, more information regarding ART and IVF should become available for members of the LGBTQ community.

Recommendation for Future Research

A higher reliability score in the beliefs section could be developed. The beliefs section had both open-ended and Likert scale items; combining them became problematic in regard to reporting reliability. Knowledge of fertility and ART treatment options of college students should be retested in another study. Based on the study results and limitations of this study, future research should include a larger sample of participants, more participants of various sexual orientation, more minorities, religious affiliation, and parents' income. Including religion and parents' income may strengthen the knowledge model, leading to a stronger correlation.

Conclusions

Age, gender, race, and relationship status were found to impact intentions, beliefs, and knowledge of fertility and ART treatment options. Students 27 years of age and older felt that they should delay parenthood, which may be a result of this group not being ready for parenthood or already having children. College students, whether older or younger, felt that they should delay parenthood. Female students wanted children sooner than their counterparts because typically women feel greater pressure to have children earlier due to social constructions of their “biological clock” compared to the pressure men feel. Similar studies have found that women feel that they should have children sooner than men and believe it is fine to utilize ART (Liu & Case 2017; Schwartz, Brindis, Ralph, & Biggs, 2011). Caucasian students in this study wanted to delay parenthood compared to African Americans, which supports previous research. In this study African Americans and other minorities expressed a desire to have children sooner compared to Caucasians. Participants in committed relationships were more likely to want children sooner than those who were single. Students in this study felt as though they lacked knowledge of women’s fertility and ART treatment options, which ties in with previous research by Daniluk and Koert (2012), who found that men more than women lacked fertility knowledge and ART treatment options.

As a result of the findings from this study, health educators should continue to inform their students about the growing trend of delayed fertility among educated persons. Also students responded that they were not confident on the knowledge level of fertility and ART treatment options. Continued discussion of family planning could further educate and inform participants about fertility and various choices that are available to persons wanting children. More research

on gay, lesbians, transgender, and minority people and their perceptions of ART treatment options would be interesting to study.

REFERENCES

- Advanced Fertility Center of Chicago. (2016). *GIFT*. Retrieved from <http://www.advancedfertility.com/gift.htm>
- Agarwal, A., Mulgund, A., Hamada, A., & Chyatte, M. R. (2015). A unique view on male infertility around the globe. *Reproductive Biology and Endocrinology : RB&E*, 13, 37. <http://doi.org/10.1186/s12958-015-0032-1>
- Ajzen, I. (1985). Intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11–39). Berlin, Germany: Springer-Verlag. doi:10.1007/978-3-642-69746-3
- Ajzen, I. (2013). *Constructing a Theory of Planned Behavior Questionnaire*. Amherst: University of Massachusetts.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood, NJ: Prentice Hall.
- Ajzen, I., & Klobas, J. (2013). Fertility intentions: An approach based on the theory of planned behavior. *Demographic Research*, 29, 203-232. doi:10.4054/DemRes.2013.29.8
- Allen, K. R., & Demo, D. H. (1995). The families and lesbians and gay men: A new frontier in family research. *Journal of Marriage and the Family*, 57, 111–127. doi:10.2307/353821
- Allen, M. J., & Yen, W. M. (2002). *Introduction to measurement theory* (2nd ed.). Long Grove, IL: Waveland Press.
- American Pregnancy Association. (2015). *Trying to conceive after age 35*. Retrieved from <http://americanpregnancy.org/getting-pregnant/trying-to-conceive-after-age-35/>

- American Pregnancy Association. (2016). *What are some of the challenges when trying to conceive after age 35*. Retrieved from <http://americanpregnancy.org/getting-pregnant/trying-to-conceive-after-age-35/>
- American Psychological Association. (2008). *Answers to your questions for a better understanding of sexual orientation and homosexuality*. Retrieved from <http://www.apa.org/topics/lgbt/orientation.pdf>
- American Psychological Association. (2015). Guidelines for psychological practice with transgender and gender nonconforming people. *American Psychologist*, 70, 832–864. doi:10.1037/a0039906
- American Society for Reproductive Medicine. (2012a). *Age and fertility*. Retrieved from https://www.asrm.org/uploadedFiles/ASRM_Content/Resources/Patient_Resources/Factsheets_and_Info_Booklets/agefertility.pdf
- American Society for Reproductive Medicine. (2012b). *Intrauterine insemination*. Retrieved from https://www.asrm.org/FACTSHEET_Intrauterine_Insemination_IUI/
- American Society for Reproductive Medicine. (2013a). *Age and fertility: A guide for patients*. Retrieved from <http://www.asrm.org/awards/detail.aspx?id=10601>
- American Society for Reproductive Medicine. (2013b). *History and purpose of American Society for Reproductive Medicine*. Retrieved from <http://www.asrm.org/about>
- American Society for Reproductive Medicine. (2013c). *Mature oocyte cryopreservation a guideline*. Retrieved from [https://www.asrm.org/uploadedFiles/ASRM_Content/News_and_Publications/Practice_Guidelines/Committee_Opinions/Ovarian_tissue_and_oocyte\(1\).pdf](https://www.asrm.org/uploadedFiles/ASRM_Content/News_and_Publications/Practice_Guidelines/Committee_Opinions/Ovarian_tissue_and_oocyte(1).pdf)

- American Society for Reproductive Medicine. (2015). *Male infertility evaluation; what do I need to know?* Retrieved from http://www.reproductivefacts.org/uploadedFiles/ASRM_Content/Resources/Patient_Resources/Fact_Sheets_and_Info_Booklets/Male_infertility_evaluation_BFRHR_CS_7-30-15.pdf
- American Society for Reproductive Medicine. (2016). *Male infertility*. Retrieved from <https://www.asrm.org/topics/detail.aspx?id=1331>
- American Urological Association. (2012). *a basic guide to male infertility: How to find out what's wrong*. Retrieved from https://urology2008-2012.ucsf.edu/patientGuides/pdf/maleInf/A_Basic_Guide_to_Male_Infertility.pdf
- Amiralis, K., Alarcao, D., Barrilero, R., Johnson, C., & Morelli, M. (2013). *The impact of the financial crisis on employment in Greece, Spain, Portugal and Italy*. Retrieved from http://www.mercer.com/content/dam/mercer/attachments/global/Talent/human-capital-agenda/Anthology_2013/the-impact-of-the-financial-crisis-on-employment-in-greece-spain-portugal-and-italy-europe-2013-mercer.pdf
- Amuedo-Dorantes, C., & Kimmel, J. (2008, August). *The motherhood wage gap for women in the United States: The importance of college and fertility delay*. Retrieved from <http://ftp.iza.org/dp3662.pdf>
- Amuedo-Dorantes, C., & Kimmel, J. (2008). *New evidence on the motherhood wage gap* (Discussion Paper No. 3662). doi:10.1111/j.0042-7092.2007.00700.x
- Andrology Australia. (2016) *Male infertility*. Australian Department of Public Health. Retrieved from <https://www.andrologyaustralia.org/your-health/male-infertility/>

- Araujo, A., Mohr, B., & McKinlay, J. (2004). Changes in sexual function in middle-age and older men: Longitudinal data from the Massachusetts male aging study. *Journal of the American Geriatrics Society*, 52, 1502–1509. doi:10.1111/j.0002-8614.2004.52413.x
- Arranz-Becker, O., & Lois, D. (2010). Selection, alignment, and their interplay: Origins of lifestyle homogamy in couple relationships. *Journal of Marriage and Family*, 72, 1234–1248. doi:10.1111/j.1741-3737.2010.00761.x
- Augood, C., Duckitt, K., & Templeton, A.A., (1998). Smoking and female infertility: A systematic review and meta-analysis. *Human Reproduction*, 13(6), 1532-1539.
- Babbie, E. (2010). *The practice of social research*. Belmont, CA: Wadsworth Cengage.
- BabyCenter. (2016). *Fertility treatment: Gamete intrafallopian transfer (GIFT)*. Retrieved from http://www.babycenter.com/0_fertility-treatment-gamete-intrafallopian-transfer-gift_4095.bc
- Bachu, A. (1996). *Fertility of American men*. Retrieved from <https://www.census.gov/population/documentation/twps0014.pdf>
- Baiocco L. R., & Laghi, F. (2013). Sexual orientation and the desires and intentions to become parents. *Journal of Family Studies*, 19, 90–98. doi:10.517/jfs.2013.19.190
- Barr, A. B., & Simons, R. L. (2012). Marriage expectations among African American couples in early adulthood: A dyadic analysis. *Journal of Marriage and Family*, 74, 726–742. doi:10.1111/j.1741-3737.2012.00985.x
- Beaujot, R., & Kerr, D. (2004). *Population change in Canada* (2nd ed.). Toronto, Canada: Oxford University Press Canada.

- Belloc, S., Hazout, A., Zini, A., Merviel, P., Cabry, R., Chahine, H.,..... & Benkhalifa, M. (2014). How to overcome male infertility after 40. Influence of paternal age on fertility. *Maturitas*, 78(1), 22-29. Doi:10.1019.j.maturitas.2014.02.011
- Benzies, K.M. (2008) Advanced maternal age: are decision about the timing of child-bearing a failure to understand the risks? *Canadian Medical Association Journal* (178)183-187
- Benzies, K., Tough, S., Tofflemire, K., Frick, C., Faber, A., & Newburn-Cook, C. (2006). Factors influencing womens's decisions about timing of motherhood. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 35, 625–633. doi:10.1111/j.1552-6909.2006.00079.x
- Bergman, L., Pe'er, G., Carmeli, D., & Dirnfeld, M. (n.d). Attitudes towards motherhood, assisted reproductive technologies and fertility preservation among health professionals. *Human Reproduction*, 28258-259.
- Berrington, A., & Pattaro, S. (2014). Educational differences in fertility desires, intentions and behavior: A life course perspective. *Advances in Life Course Research*, 21, 10–27. doi: 10.1016/j.alcr.2013.12.003
- Better Health & Victorian Assisted Reproductive Treatment Authority. (2016). *Age and fertility*. Retrieved April 10, 2016, from <https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/age-and-fertility?viewAsPdf=true>
- Billar, F. C., Philipov, D., & Testa, M. R. (2009). Attitudes, norms and perceived behavioral control: Explaining fertility intentions in Bulgaria. *European Journal of Population*, 25, 439–465. doi:10.1007/s10680-009-9187-9

- Bjerk, D. (2009). Beauty vs. earnings: Gender differences in earnings and priorities over spousal characteristics in a matching model. *Journal of Economic Behavior & Organization*, 69, 248–259. doi:10.1016/j.jebo.2008.10.008
- Boston, T. (2011). How does the European financial crisis affect us? Retrieved from <http://www.bet.com/news/national/2011/11/07/how-does-the-european-debt-crisis-affect-you-.html>
- Bram, L. L. (Ed.). (2016). Brown, Sherrod Campbell. *Funk & Wagnalls New World Encyclopedia*. Retrieved from
- Brand, J. E., & Davis, D. (2011). The Impact of College Education on Fertility: Evidence for Heterogeneous Effects. *Demography*, 48(3) 863-887 doi: [10.1007/s13524-011-0034-3](https://doi.org/10.1007/s13524-011-0034-3)
- Bretherick, K. L., Fairbrother, N., Avila, L. Harbord, S., & Robinson W. (2010). Fertility and aging: Do reproductive-aged Canadian women know what they need to know? *Fertility and Sterility*, 93, 2162–2168. doi:10.1016/j.fertnstert.2009.01.064
- Brewster, K. L., Tillman, K. H., & Jokinen-Gordon, H. (2012). Demographic characteristics of lesbian parents in the United States. *Population Research and Policy Review*, 33, 503–526. doi:10.1007/s11113-013-9296-3
- Broder, M. S., & Goldman, A. (2013). The role of maturity in the cognitions that govern love relationships and sexual satisfaction. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 31, 75–83. doi:10.1007/s10942-013-0159
- Brosen, I., Gordts, S., Puttenmans, P., Campo, R., Gordts, S., & Brosens, J. (2006). Managing infertility with fertility awareness methods. *Sexuality, Reproduction & Menopause*, 413-16. doi:10.1016/j.sram.2006.03.001
- Bumpass, L., & Westoff, C. (1970). The later years of childbearing. Princeton, NJ Princeton University

- Bunting, L., Tsibulsky, I., & Boivin, J. (2013). Fertility knowledge and beliefs about fertility treatment: Findings from the International Fertility Decision-making Study. *Human Reproduction*, 28(2), 385–339. doi:10.1093/humrep/des40
- Burton, L. M., & Tucker, M. B. (2009). Romantic unions in an era of uncertainty: A post-Moynihan perspective on African American women and marriage. *Annals of the American Academy of Political and Social Science*, 621, 132–148. doi:10.1177/0002716208324852
- California State University, Long Beach. (n.d.). *696 research methods: Instrumentation: Questionnaires*. Retrieved from
- Camberis, A., McMahon, C. A., Gibson, F. L., & Boivin, J. (2014). Age, psychological maturity, and the transition to motherhood among English-speaking Australian women in a metropolitan area. *Developmental Psychology*, 50, 2154–2164. doi:10.1037/a0037301
- Camilleri, P., & Ryan, M., (2006). Social work students’ attitudes toward homosexuality and their knowledge and attitudes toward homosexual parenting as an alternative family unit: An Australian study. *Social Work Education*, 25, 288–304. doi:10.1300/J082v53n03_05
- Carroll, J. (2007). *Americans: 2.5 Children Is “Ideal” Family Size*. Retrieved from <http://www.gallup.com/poll/27973/americans-25-children-ideal-family-size.aspx>
- Casson, Lionel (1998). *Everyday Life in Ancient Rome*. Baltimore: Johns Hopkins University Press, Womenintheancientworld (2017). Pregnancy and Childbirth. <http://www.womenintheancientworld.com/pregnancy%20and%20childbirth.htm>
- Centers for Disease Control and Prevention. (2009). *Infertility FAQs*. Retrieved from <http://www.cdc.gov/reproductivehealth/infertility>

- Centers for Disease Control and Prevention. (2013). *Infertility*. Retrieved from <http://www.cdc.gov/nchs/fastats/fertile.htm>.
- Centers for Disease Control and Prevention. (2014). *What is assisted reproductive technology?* Retrieved from <http://www.cdc.gov/art/whatis.html>.
- Centers of Disease Control and Prevention. (2015a). *Reproductive health infertility*. Retrieved from <http://www.cdc.gov/reproductivehealth/Infertility/index.htm>
- Centers for Disease Control and Prevention. (2015b). *Sexually transmitted diseases and infertility?* Retrieved from <http://www.cdc.gov/std/infertility/default.htm>
- Center for Disease Control and Prevention, (2015c) National Center for Health Statistics. Appendix 1-Fertility Rates (per 1,000 Women, Ages 15-44) by Race and Hispanic Origin and Birth Rates by Age group: Selected Years, 1950-2014 Retrieved from <https://www.childtrends.org/indicators/fertility-and-birth-rates/>
- Centers for Disease Control and Prevention. (2016a). *Infertility*. Retrieved from <http://www.cdc.gov/nchs/fastats/fertile.htm>.
- Centers for Disease Control and Prevention. (2016b). *Preconception health and health care: alcohol, tobacco, illicit substances*. Retrieved from <http://www.cdc.gov/std/infertility/default.htm>.
- Chalmers, B., & Meyer D., (1996). What men say about pregnancy, birth and parenthood? *Journal of Psychosomatic Obstetrics and Gynecology* 17 47-52.
- Chamie, J., & Mirkin, B. (2012). *Childless by choice: More people decide against having children, presenting quandaries for government and elderly*. Retrieved from <http://yaleglobal.yale.edu/content/childless-choice>.

- Chan, C., Chan, T., Peterson, B., Lampic, C., & Tam, M. (2015). Intentions and attitudes towards parenthood and fertility awareness among Chinese university students in Hong Kong: A comparison with Western samples. *Human Reproduction*, 30, 364–372. doi:10.1093/humrep/deu324
- Cherlin, A., Cross-Barnet, C., Burton, L. M., & Garrett-Peters, R. (2008). Promises they can keep: Low-income women's attitudes toward motherhood, marriage, and divorce. *Journal of Marriage and Family*, 70, 919–933. doi:10.1111/j.1741-3737.2008.00536.x
- Child Trends Databank. (2016). *Fertility and birth rates*. Retrieved March 25, 2015, from <http://www.childtrends.org/?indicators=fertility-and-birth-rates>
- Christiano, D. (2011). *Fertility treatment options*. Retrieved July 15, 2016, from <http://www.parents.com/getting-pregnant/infertility/treatments/guide-to-fertility-methods/>
- Columbia University, Mailman School of Public Health. (n.d.). *Measure of the total population structure and size*. Retrieved from <http://www.columbia.edu/itc/hs/pubhealth/modules/demography/populationRates.html>
- Connolly, M. P., Hoorens, S., & Chambers, G. M. (2010). The costs and consequences of assisted reproductive technology: An economic perspective. *Human Reproduction Update*, 16, 603–613. doi:10.1093/humupd/dmq013
- Cooper, H. (2012). Plan for a healthy baby. *Alive*, 357, 20–23.
- Cool, S., Markussen, S. & Strom, M. (2017). Children and Careers: How Family Size Affects Parent's Labor Market Outcomes in the Long Run. *Demography* 51(5) 1773-1793. doi: 10.1007/s13524-017-0612-0.
- Creative Research Systems. (2012). *Sample size calculator*. Retrieved from <http://www.surveysystem.com/sscalc.htm>

- Creswell, J. W. (2005). *Educational research—Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Education.
- Criado, E (2014). Postponing Parenthood: Greater happiness for older parents may explain the tendency to wait. *Independent*. <https://www.independent.co.uk/life-style/health-and-families/health-news/postponing-parenthood-greater-happiness-for-older-parents-may-explain-the-tendency-to-wait-9824405.html>
- Crouch, S. R., Waters, E., McNair, R., & Power, J. (2015). The health perspectives of Australian adolescents from same-sex parent families: A mixed methods study. *Child: Care, Health and Development*, 41, 356–364. doi:10.1111/cch.12180
- Cutrona, C. E., Russell, D. W., Burzette, R. G., Wesner, K. A., & Bryant, C. M. (2011). Predicting relationship stability among midlife African American couples. *Journal of Consulting and Clinical Psychology*, 79, 814–825. doi:10.1037/a0025874
- Daniluk, J. C., & Koert, E. (2013). The other side of fertility coin: A comparison of childless men's and women's knowledge of fertility and assisted reproductive technology. *Fertility and Sterility*, 99, 839–846. doi:10.1016/j.fertnstert.2012.10.033
- Daniluk, J. C., Koert, E., & Cheung, A. (2012). Childless women's knowledge of fertility and assisted human reproduction; identifying the gaps. *Fertility and Sterility*, 97, 420–426. doi:10.1016/j.fertnstert.2011.11.046.
- Daniluk, J. C., & Koert, E. (2015). Fertility awareness online: the efficacy of a fertility education website in increasing knowledge and changing fertility beliefs. *Human Reproduction*. 30(2) 353-363. doi: 10.1093/humrep/deu328.

- Daulmer, D., Chan, P., Lo, K. C., Takefman, J., & Zelkowitz, P. (2016). Men's knowledge of their own fertility: a population-based survey examining the awareness of factors that are associated with male infertility. *Human Reproduction (Oxford, England)* 31(12), 2781-2790.
- D'Augelli, A. R., Rendina, H. J., Grossman, A. H., & Sinclair, K. O. (2006/07). Lesbian and gay youths' aspirations for marriage and raising children. *Journal of LGBT Issues in Counseling*, 1(4), 77–98.
- De La Rochebrochard, E., de Mouzon, J., Thepot, F., Thonneau, P., & French National IVF Registry Association. (2006). Fathers over 40 and increased failure to conceive: The lessons of in vitro fertilization in France. *Fertility and Sterility*, 85, 1420–1424. doi:10.1016/j.fertnstert.2005.11.040
- Dempsey D, (2013). *Same-sex parented families in Australia* (CFCA Paper No. 18 2013). Retrieved from <https://aifs.gov.au/cfca/sites/default/files/cfca/pubs/papers/a145197/cfca18.pdf>
- Dignan M. B. (1995). *Measurement and evaluation of health education* (3rd ed.). Springfield, I: Charles C. Thomas.
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail, and mixed mode survey the tailored design method* (3rd ed.). Hoboken, NJ: John Wiley & Sons.
- Ding, K. (2016). *Fertility treatment: Your options at a glance*. Retrieved from http://www.babycenter.com/0_fertility-treatment-your-options-at-a-glance_1228997.bc?page=2
- Dommermuth, L., Klobas, J., & Lappegård, T. (2011). Now or later? The theory of planned behavior and timing of fertility intentions. *Advances in Life Course Research*, 16, 42–53. doi:10.1016/j.alcr.2011.01.002

- Du Toit, N. C. (2013). *Fertility intentions and attitudes towards children among unmarried men and women: Do sexual orientation and union status matter?* (Doctoral dissertation). Bowling Green State University, Bowling Green, OH.
- Dudgeon, M.R., & Inhorn, C.M., (2004). Men's influence on women's reproductive health: medical anthropological perspectives. *Social Science & Medicine* 59 1379-1395
- Duvander, A. Z. (1999). The transition from cohabitation to marriage. A longitudinal study of the propensity to marry in Sweden in the early 1990s. *Journal of Family Issues*, 20, 698–717. doi:10.1177/019251399020005007
- Eagleson, H. (2013). *Up your chances of getting pregnant at every age*. Retrieved from <http://www.parents.com/getting-pregnant/trying-to-conceive/getting-pregnant-at-every-pregnancy-age/>
- Eisenberg, E. (2012). *Endometriosis fact sheet*. Retrieved from <http://womenshealth.gov/publications/our-publications/fact-sheet/endometriosis.html>
- Eisenberg, M. L., Li, S., Cullen M. R., & Baker, L. C. (2016). Increased risk of incident chronic medical conditions in infertile men: Analysis of United States claims data. *Fertility and Sterility*, 105, 629–636. doi:10.1016/j.fertnstert.2015.11.011
- Elbel, F. (2016). *U.S. birth rates and population growth*. Retrieved from <http://www.susps.org/overview/birthrates.html>
- Elster, N. (2005). ART for the masses: Racial and ethnic inequality in assisted reproductive technologies. *DePaul Health Law Journal*, 9(1), 719–733. Retrieved from <http://via.library.depaul.edu/cgi/viewcontent.cgi?article=1131&context=jhcl>

- EMD Serono. (2011). *In the know: Fertility IQ 2011 survey fertility knowledge among US women aged 25–35: Insights from a new generation*. Retrieved from http://www.npr.org/assets/news/2011/11/FertilityWhitePaper_Final.pdf
- Erera, P. I., & Segal-Engelchin, D. (2014). Gay men choosing to co-parent with heterosexual women. *Journal of GLBT Family Studies*, 10, 449–474. doi:10.1080/1550428X.2013.858611
- Eunice Kennedy Shriver National Institute of Child Health and Human Development. (2014). *How many people are affected by or at risk of uterine fibroids?* Retrieved from <http://www.nichd.nih.gov/health/topics/uterine/conditioninfo/pages/people-affected.aspx>
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Thousand Oaks, CA: Sage.
- Fielding R. (n.d.) *Health knowledge, attitude and behaviour*. Retrieved from <https://www.google.com/#q=Health+Knowledge%2C+attitude+and+behavior+power+point+www.bibalex.org%2FsupercoursePPT>
- Fisch, H. (2009). The aging male and his biological clock. *Geriatrics*, 64(1), 14–17. Retrieved from www.geri.com
- Flemming, R. (2013). The Invention of Infertility in the Classical Greek World: Medicine, Divinity, and Gender. *Bulletin of the History of Medicine* 87(4), 565-590. The Johns Hopkins University Press. Retrieved March 20, 2017, from Project MUSE database.
- Fortin, C., & Abele, S. (2016). Increased Length of Awareness of Assisted Reproductive Technologies Fosters Positive Attitudes and Acceptance among Women. *International Journal of Fertility & Sterility*, 9(4), 452-464.
- Furstenberg, F. F. (2010). On a new schedule: Transitions to adulthood and family change. *The Future of Children*, 20, 67–87.

- Gannon, J. R., & Walsh, T. J. (2015). The epidemiology of male infertility. IN D. T. Carrell, P. N. Schlegel, C. Racowsky, & L. Gianaroli (Eds.), *Biennial review of infertility* (Vol. 4). Dordrecht, The Netherlands: Springer International. doi:10.1007/978-3-319-17849-3_1
- Gao, G. (2015). *Americans' ideal family size is smaller than it used to be*. Retrieved from <http://www.pewresearch.org/fact-tank/2015/05/08/ideal-size-of-the-american-family>
- Garcia, D., Vassena, R., Prat, A., & Vernaeeve, V. (2016). Increasing fertility knowledge and awareness by tailored education: A randomized controlled trial. *Reproductive BioMedicine Online*, 32, 113–120. doi:10.1016/j.rbmo.2015.10.008
- Gardner DK, Maybach J and Iane M. (2001) Hyaluronan and RHSA increase blastocyst cryosurvival. Proc 17th World Congress on Fertility and Sterility; 2001; Melbourne. P.226
- Gates, G. J., Badgett, M. V., Macomber, J. E., & Chambers, K. (2007). *Adoption and foster care by gay and lesbian parents in the United States*. Retrieved from <http://escholarship.org/uc/item/2v4528cx>
- George, D., & Mallery, P. (2010). *SPSS for Windows step by step: A simple guide and reference* (10th ed.). Boston, MA: Allyn & Bacon.
- Gerhard, R.S. Ritenour, C.W. Goodman, M., Vashi, D., Hsiao, W., (2014). Awareness of attitudes towards infertility and its treatment and its treatment: a cross-sectional survey of men in a United States primary care population. *Asian J Androlology* 16(6) 858-863. Doi: 10.
- Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2008). *Theory of reasoned action. Health behavior and health education theory, research and practice* (4th ed.). San Francisco, CA: John Wiley and Sons.

- Gliem, J. A., & Gliem, R. R. (2003). *Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales*. Paper presented at the Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, The Ohio State University, Columbus, OH.
- Goldstein, J. R., & Kenney C. T. (2001): Marriage delayed or marriage forgone? New cohort forecast of first marriage for US women. *American Sociological Review*. Retrieved from http://user.demogr.mpg.de/goldstein/publications/goldstein_asa.pdf
- Groves, R. M., Fowler, F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau R., (2009). *Survey methodology* (2nd ed.). Hoboken, NJ: John Wiley & Son.
- Guedes, M., & Canavarro, M. C. (2015). Perceptions of influencing factors and satisfaction with the timing of first childbirth among women of advanced age and their partners. *Journal of Family Issues*, 37, 1797–1816. doi:10.1177/0192513X14566621
- Gungor, I, Rathfisch, G., Kizilkaya Beji N., Yazar M., Karamanoglu F. (2013) Risk-Taking behaviours and beliefs about fertility in university students. *Journal of Clinical Nursing* 22(23-24):3418-27. doi: 10.1111/jocn.12097.
- Hammarberg, K, Fisher, J.R., & Wynter K., H., (2008). Psychological and social aspects of pregnancy, childbirth and early parenting after assisted conception: a systematic review. *Journal of Human Reproduction* 15(5):395-414 doi: 10.1093/humupd/dmn030
- Hampton, K. D., Mazza, D., & Newton, J. M. (2013). Fertility-awareness knowledge, attitudes, and practices of women seeking fertility assistance. *Journal of Advanced Nursing*, 69, 1076–1084. doi:10.1111/j.1365-2648.2012.06095.x

- Harris, I. D., Fronczak, C., Roth, L., & Meacham, R. (2011). Fertility and the aging male. *Reviews in Urology*, 13(4), 184–190. Retrieved March 25, 2016, from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3253726/>
- Harvard Health. (2014). *Treating blocked fallopian tubes*. Retrieved from <http://www.health.harvard.edu/diseases-and-conditions/treating-blocked-fallopian-tubes>
- Hasanpoor-Azghdy, S.B., Simbar, M., & Vedadhir, A., (2014). The emotional-psychological consequences of infertility among infertile women seeking treatment: Results of qualitative study. *Iran Journal of Reproductive Medicine*, 12, 131-138.
- Hassan, M. A. M., & Killick, S. R., (2003). Effect on male age on fertility: evidence for the decline in male fertility with increasing age. *Fertility and Sterility* 79(3) 1520-1527. DOI: [https://doi.org/10.1016/S0015-0282\(03\)00366-2](https://doi.org/10.1016/S0015-0282(03)00366-2)
- Hefner, A. G. (2004). *Baal*. Retrieved from <http://www.pantheon.org/articles/b/baal.html>
- Heller, D., Watson, D., & Ilies, R. (2006). The dynamic process of life satisfaction. *Journal of Personality*, 74, 1421–1450. doi:10.1111/j.1467-6494.2006.00415.x
- Herr J. L., & Wolfram, C. D. (2012). Work environment and opt-out rates at motherhood across high-education career paths. *ILR Review*, 65, 928–950. doi:10.1177/001979391206500407
- Hillier, L., Jones T., Monagle M., Overton N., Gahan, L., Blackman, J., & Mitchell, A. (2010). Writing themselves in 3 (WTi3): The third national study on the sexual health and wellbeing of same sex attracted and gender questioning young people. Australian Research Centre in Sex, Health and Society, La Trobe University, Melbourne.

- Hirshfeld-Cytron, J., Grobman, W., & Milad, M. (2012). Fertility preservation for social indications: A cost-based decision analysis. *Fertility and Sterility*, 97, 665–670. doi:10.1016/j.fertnstert.2011.12.029
- Holton, S., Hammarberg, K., Rowe, H., Kirkman, L., Jordan, L., McNamee, K., Bayly, C., McBain, J., Sinnot, V., & Fisher J. (2016). Men’s Fertility-Related Knowledge and Attitudes, and Childbearing Desires, Expectations and Outcomes: Findings from the Understanding Fertility Management in Contemporary Australia Survey. *International Journal of Men’s Health*. 15(3) 315-328.
- Honig, S. C., Lipshultz, J. J., & Jarow, J. (1994). Significant medical pathology uncovered by a comprehensive male infertility evaluation. *Fertility and Sterility*, 62, 1028–1034. doi:10.1016/S0015-0282(16)57069-1
- Human Fertilisation & Embryology Authority. (2009). *What is GIFT and how does it work?* Retrieved from <http://www.hfea.gov.uk/GIFT.html>
- Illinois State University. (2013a). *For alums, ISU’s rising graduation rates worth bragging about*. Retrieved March 8, 2016, from <https://news.illinoisstate.edu/2013/10/alums-isu-rising-graduation-rates-worth-bragging/>
- Illinois State University. (2013b). *University Fact Book*. Retrieved from http://prpa.illinoisstate.edu/data_center/university/BookFinal.pdf
- Infertility Center of St. Louis. (2015). *GIFT (Gamete Intra Fallopian Transfer)*. Retrieved from <http://www.infertile.com/gift-gamete-intra-fallopian-transfer>
- International Monetary Fund. (2013). *Factsheet: The IMF and Europe*. Retrieved from <https://www.imf.org/external/np/exr/facts/europe.htm>.

- Ishaq, I. (1955). *The life of Muhammad* (A. Guillaume, Trans, p. 38). Oxford, England: Oxford University Press.
- Johnson, B. (2001) Toward a new classification of nonexperimental quantitative examiner. *Educational Examiner*, 30(2), 3–13. doi:10.3120/0013189X030002003
- Johnson, S. M., & O'Connor, E. (2002). *The gay baby boom: The psychology of gay parenthood*. New York: New York University Press.
- Johnson and O'Connor, (2002). *The Gay Baby Boom: The Psychology of Gay Parenthood*. New York Press, New York.
- Jose-Miller, A. B., Boyden J. W., & Frey, K. A. (2007). Infertility. *American Family Physician*, 75, 849–856.
- Kamel, R. M. (2013). Assisted reproductive technology after the birth of Louise Brown. *Journal of Reproduction and Infertility*, 14, 96–109. doi:10.4172/2161-0932.1000156
- Kearney, M.S., & Levine P.B. (2012). Why is the teen birth rate in the United States so high and why does it matter? *Journal of Economical Perspective* 26(2):141-66
- Kellesarian, S. V., Yunker, M., Malmstrom, H., Almas, K., Romanos, G. E., & Javed, F. (2016). Male infertility and dental health status: A systematic review. *American Journal of Men's Health*, 10, 1–9. doi:10.1177/1557988316655529
- Kemkes-Grottenhaler, A. (2003). Postponing or rejection parenthood? Results of a survey among female academic professionals. *Journal of Biosocial Science*, 35, 213–226. doi:10.1017/S002193200300213X
- KidsHealth. (2012). *Effects of cancer treatment on fertility*. Retrieved from http://kidshealth.org/parent/medical/cancer/cancer_fertility.html#

- Knowledge. (2017). *Merriam Webster*. Retrieved from <http://www.merriam-webster.com/dictionary/knowledge>.
- Kovacs, G.T., Morgan, G., Levine, M., McCrann, J. (2012). The Australian community overwhelmingly approves IVF to treat subfertility, with increasing support over three decades. *Australian New Zealand Journal Obstetricians and Gynecology* 52(3) 302-4. Doi:10.1111/j.1479-828X.2012.01444.x.
- Kreyenfeld, M., & Leek, S. (2013). *Economic crisis lowers birth rates*. Retrieved from <https://www.mpg.de/7446276/birth-rate-economic-crisis>
- Kuhnt, A. K., & Trappe, H. (2016). Channels of social influence on the realization of short-term fertility intentions in Germany. *Advances in Life Course Research*, 27, 16–29. doi:10.1016/j.alcr.2015.10.002
- Kurdek, L. A. (2004). Are gay and lesbian cohabiting couples really different from heterosexual married couples? *Journal of Marriage and the Family*, 66, 880–900. doi:10.1111/j.0022-2445.2004.00060.x
- Laird, J. (1993). Lesbian and gay families. In F. Walsh (Ed.), *Normal family processes* (2nd ed., pp. 282–328). New York, NY: Guilford.
- Lampic, C., Skoog-Svanberg, A., Karlstrom P., & Tyden, T. (2006). Fertility awareness, intentions concerning childbearing, and attitudes towards parenthood among female and male academics. *Human Reproduction*, 21, 558–564. doi:10.1093/humrep/dei367
- Lawrence R.E., Rasinski K.A., Yoon J.D., Curlin F.A., (2011). Factors influencing physicians' advice about female sterilization in USA: a national survey. *Human Reproductive* 26(1) doi:10.1093/humrep/dep289.

- Lemos, E., Zhang, D., Van Voorhis, B. J., & Hu, H. (2013, November 11). Multiple birth pregnancies can cost nearly 20 times more than singleton pregnancies. *American Journal of Obstetrics & Gynecology*. doi:10.1016/j.ajog.2013.10.005
- Lightbody, T. K. (2011). Implications of delayed parenthood for individuals and families. *Canadian Social Work, 13*(1) 56–73.
- Littleton, F. (2014). How teen girls think about fertility and the reproductive lifespan. Possible implications for curriculum reform and public health policy. *Human Fertility, 17*, 180–187. doi:10.3109/14647273.2014.942389
- Liu, K., & Case, A. (2011). *Advance reproductive age and fertility*. Retrieved from <http://sogc.org/guidelines/advanced-reproductive-age-and-fertility/>
- Livingston, G., & Cohn, D. (2010a). *Childlessness up among all women; Down among women with advanced degrees*. Retrieved from <http://www.pewsocialtrends.org/2010/06/25/childlessness-up-among-all-women-down-among-women-with-advanced-degrees/>.
- Livingston, G., & Cohn, D. (2010b). *The new demography of American motherhood*. Retrieved from <http://www.pewsocialtrends.org/2010/05/06/the-new-demography-of-american-motherhood>.
- Lo, I. P., Chan, C. H., & Chan, T. H. (2016). Original article: Perceived importance of childbearing and attitudes toward assisted reproductive technology among Chinese lesbians in Hong Kong: implications for psychological well-being. *Fertility and Sterility, 106*1221-1229. doi:10.1016/j.fertnstert.2016.06.042

- Luke, B., Brown, M. B., Stern, J. E., Missmer, S. A., Fujimoto, V. Y., Leach, (2011) Racial and ethnic disparities in assisted reproductive technology pregnancy and live birth rates within body mass index categories. *Fertility and Sterility*, 95, 1661–1666. doi:10.1016/j.fertnstert.2010.12.035
- Lundsberg, L., Pal, L., Gariepy, A., Xu, X., Chu, M., & Illuzzi, J. (2013). Knowledge, attitudes, and practices regarding conception and fertility: A population-based survey among reproductive-age United States women. *Fertility and Sterility*, 101, 767–774. doi:10.1016/j.fertnstert.2013.12.006
- Luscombe, B. (2010). Marriage: What's it good for? *Time*, 176(22), 48–56.
- Maeda, E., Sugimori, H., Nakamura, F., Kobayashi, Y., Green, J., Suka, M., ... Saito, H. (2015). A cross sectional study on fertility knowledge in Japan, measured with the Japanese version of cardiff fertility knowledge scale (CFKS-J). *Reproductive Health*, 12, 133–142. doi:10.1186/1742-4755-12-10
- Maheshwari, A., Porter, M., Shetty, A., & Bhattacharya, S. (2008). Women's awareness and perceptions of delay childbearing. *Fertility and Sterility*, 90, 1036–1042. doi:10.1016/j.fertnstert.2007.07.1338
- Maney, D., & Cain R., (1997). Preservice elementary teachers' attitudes toward gay and lesbian parenting. *Journal of School Health*, 67, 236–241. doi:10.1111/j.1746-1561.1997.tb06313.x
- Martin, J., Hamilton, B., Ostarman, M., Curtin, S., & Mathews T., J. (2015). Births: Final Data for 2013. *National Vital Statistics Reports*, 64(1), 1–65. Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr64/nvsr64_01.pdf

- Martin, J., Hamilton, B., Sutton, P., Ventura, S., Menacker, F., Kirmeyer, S., & Mathews, T. (2009). Births: Final data for 2006. *National Vital Statistics Reports*, 57(7), 1–102. Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_07.pdf
- Martin, S. (2002). Delayed marriage and childbearing: Implications and measurement of diverging trends in family timing. Department of Sociology and Maryland population research center. University of Maryland, College Park.
- Martinez, G., Daniels, K., & Chandra, A. (2012). *Fertility of men and women aged 15–44 years in the United States: National Survey of Family Growth 2006–2016*. Retrieved from <http://www.cdc.gov/nchs/data/nhsr/nhsr051.pdf>
- Mathews, T., & Hamilton, B. (2009). *Delayed childbearing: More women are having their first child later in life* (NCHS Data Brief). Hyattsville, MD: National Center for Health Statistics.
- Matthiesen, S.M.S., Frederiksen, Y., Ingerslev, H.J., Zachariae, R., (2001). Stress, distress and outcome of assisted reproductive technology (ART): a meta-analysis. *Human reproduction* 26(10), 2763-2776.
- Mayo Clinic. (2013). *In vitro fertilization*. Retrieved from <http://www.mayoclinic.org/tests-procedures/in-vitro-fertilization/basics/definition/prc-20018905>
- Mayo Clinic. (2014). *Symptoms and causes*. Retrieved from <http://www.mayoclinic.org/diseases-conditions/infertility/basics/causes/con-20034770>
- McDonald, P., & Kippen, R. (2009). *Fertility in South Australia: An overview of trends and socio-economic differences, 2009*. Adelaide, Australia: Government of South Australia.
- McKenzie, J., Neiger, B., & Thackeray, R. (2009). *Planning, implementing, and evaluating health promotion programs: A primer* (5th ed.). Upper Saddle River, NJ: Pearson.

- McMahon, C., Bovin J., Gibson, F., Fisher, J. R., W., Hammarberg, K., Wynter K., Saunders, Douglas (2011). Older first-time mothers and early postpartum depression: a prospective cohort study of women conceiving spontaneously or with assisted reproductive technologies. *Fertility and Sterility* 96(5) 1218-1224 DOI: <http://dx.doi.org/10.1016/j.fertnstert.2011.08.037>
- McMillan, J. H., & Schumacher, S. (2010). *Research in education: Evidence based inquiry* (7th ed.). Boston, MA: Pearson.
- Mehta, A., Nangia, A. K., Dupree, J. M., & Smith, J. F. (2016). Limitations and barriers in access to care for male factor infertility. *Fertility and Sterility*, 105, 1128–1137. doi:10.1016/j.fertnstert.2016.03.023
- Meisenhelder, J. B., & Meservey, P. M. (1987). Childbearing over thirty: Description and satisfaction with mothering. *Western Journal of Nursing Research*, 9, 527–541. doi:10.1177/019394598700900407
- Mencarini, L., Vignoli, D., & Gottard, A. (2015). Fertility intentions and outcomes: Implementing the theory of planned behavior with graphical models. *Advances in Life Course Research*, 23, 14–28. doi:10.1016/j.alcr.2014.12.004
- Mesen, T., Mersereau, J., Kane, J., & Steiner, A. (2015). Optimal timing for elective egg freezing. *Fertility and Sterility*, 103, 1551–1556. doi:10.1016/j.fertnstert.2015.03.002
- Mills, M., Rindfuss, R. R., McDonald, P., & Velde, E. (2011). Why do people postpone parenthood? Reasons and social policy incentives. *Human Reproduction Update*, 17, 848–860. doi:10.1093/humupd/dmr026

- Missmer, S., Seifer, D., & Jain, T. (2011). Cultural factors contributing to health care disparities among patients with infertility in Midwestern United States. *Fertility and Sterility*, 95, 1943–1949. doi:10.1016/j.fertnstert.2011.02.039
- Monte, L. M., & Ellis, R. R. (2014). *Fertility of women in the United States: 2012*. Retrieved from <https://www.census.gov/content/dam/Census/library/publications/2014/demo/p20-575.pdf>
- Mosher, W.D., Jones, J., Abma, J.C., (2012). Intended and unintended births in the United States: 1982-2010. National health statistics reports (55).
- Mutsaerts, M. A. Q., Groen, H., Huiting, H. G., Kuchenbecker, W. K. H., Sauer, P. J. J., Land, J. A., ... Hoek, A. (2012). The influence of maternal and paternal factors on time to pregnancy—a Dutch population-based birth-cohort study: The GECKO Drenthe study *Human. Reproduction*, 27, 583–593. doi:10.1093/humrep/der429
- National Infertility Association. (2012). *Male factor infertility: How varicocele repair can be an effective treatment*. Retrieved from <http://www.resolve.org/about-infertility/medical-conditions/male-factor-infertility-how-varicocele-repair-can-be-an-effective-treatment.html>
- National Infertility Association. (2014a). *Fast facts about infertility*. Retrieved from <http://www.resolve.org/about/fast-facts-about-fertility.html>
- National Infertility Association. (2014b). *Ovulatory disorders*. Retrieved from <http://www.resolve.org/diagnosis-managment/infertility- diagnosis/ovulatory-disorders.html>
- National Institutes of Health. (2012). *How common is male infertility, and what are its causes?* Retrieved from <https://www.nichd.nih.gov/health/topics/menshealth/conditioninfo/Pages/infertility.aspx>

National Institutes of Health. (2013). *Assisted reproductive technology*. Retrieved from <https://www.nichd.nih.gov/health/topics/infertility/conditioninfo/Pages/art.aspx>

National Institutes of Health. (2014). *Assisted reproductive technology*. Retrieved from <http://www.nichd.nih.gov/health/topics/infertility/conditioninfo/pages/art.aspx>

National Institutes of Health. (2015). *Female infertility*. Retrieved from <http://www.nlm.nih.gov/medlineplus/femaleinfertility.html>

National Institutes of Health. (2016). *How common is male infertility and what are its causes?* Retrieved from <http://www.nichd.nih.gov/health/topics/menshealth/conditioninfo/Pages/infertility.aspx>

National Institutes of Health (2017). How is infertility diagnosed? US Department of Health and Human Services. Retrieved from: <https://www.nichd.nih.gov/health/topics/infertility/conditioninfo/Pages/diagnosed.aspx>

National Latina Institute for Reproductive Health. (2014). *Who we are?* Retrieved from <http://latinainstitute.org/en/issues/contraceptive-equity>

National Vital Statistics System birth data (2016). Appendix 1-Fertility Rates (per 1,000 Women, Ages 15-44) by Race & Hispanic Origin, and Birth Rates by Age Group: Selected Years, 1950-2014. Retrieved from <http://www.cdc.gov/nchs/births.htm>.

Nettleman, M.D., Chung, H., Brewer, J., Ayoola, A., Reed, P.L., (2007). Reasons for unprotected intercourse: analysis of the PRAMS survey. *Contraception* (75), 361-366.

New York State Department of Health. (2013). *Uterine fibroids*. Retrieved from https://www.health.ny.gov/community/adults/women/uterine_fibroids/

- Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment & Evaluation in Higher Education*, 33, 301–314. doi:10.1080/02602930701293231
- Nybo-Andersen, A. M., Wohlfahrt, J., Christens, P., Olsen, J., & Melbye, M. (2000). Maternal age and fetal loss: Population based register linkage study. *British Medical Journal*, 320, 1708–1712. doi:10.1136/bmj.320.7251.1708.
- Nordqvist, S., Sydsjö, G., Lampic, C., Åkerud, H., Elenis, E., & Skoog Svanberg, A. (2014). Sexual orientation of women does not affect outcome of fertility treatment with donated sperm. *Human Reproduction (Oxford, England)*, 29(4), 704–711.
<http://doi.org/10.1093/humrep/det445>
- Nouri, K., Huber, D., Walch, K., Promberger, R., Buerkle, B., Ott, J., & Tempfer, C. (n.d). Fertility awareness among medical and non-medical students: a case-control study. *Reproductive Biology and Endocrinology*, 12
- Passel, J., Livingston, G., & Cohn, D. (2012). *Explaining why minority births now outnumber White births*. Retrieved from <http://www.pewsocialtrends.org/2012/05/17/explaining-why-minority-births-now-outnumber-white-births/>.
- Patterson, C. J. (2000). Family relationships of lesbians and gay men. *Journal of Marriage and Family*, 62, 1052–1069. doi:10.1111/j.1741-3737.2000.01052.x
- Patterson, C. J., & Riskind, R. G. (2010). To Be a Parent: Issues in Family Formation among Gay and Lesbian Adults. *Journal of GLBT Family Studies*, 6(3), 326.
doi:10.1080/1550428X.2010.490902

- Peterson, B. D., Pirritano M., Tucker L., & Lampic, C. (2012). Fertility awareness and parenting attitudes among American male and female undergraduate university students. *Human Reproduction*, 27, 1375–1382. doi:10.1093/humrep/des011
- Planned Parenthood. (2016). *Birth control*. Retrieved from https://www.plannedparenthood.org/learn/birth-control?_gas=1.257219587.965355678.1457461612
- Plastira, K., Msaouel, P., Angelopoulou, R., Zanioti, K., Plastiras, A., Pothos, A., ... Mantas, D. (2007). The effects of age on DNA fragmentation, chromatin packaging and conventional semen parameters in spermatozoa of oligasthenoteratozoospermic patients. *Journal of Assisted Reproduction and Genetics*, 24, 437–443. doi:10.1007/s10815-007-9162-5
- Proudfoot S., Wellings K., & Glasier A. (2009). Analysis why nulliparous women over age 33 wish to use contraception. *Contraception*, 79, 98–104. doi:10.1016/j.contraception.2008.09.005
- Quach, S., & Librach, C. (2008). Infertility knowledge and attitudes in urban high school students. *Fertility and Sterility*, 90, 2009–2106. doi:10.1016/j.fertnstert.2007.10.024
- Rahn, M. (2016). *Factor analysis: A short introduction, Part 2—Rotations*. Retrieved from <http://www.theanalysisfactor.com/rotations-factor-analysis/>
- Raosoft. (2017). *Sample size calculator*. <http://www.raosoft.com/samplesize.html>
- Rasinger, S. (2013). *Quantitative research in linguistics: An introduction*. New York, NY: Bloomsbury Academic.
- Reed, C. (2015). *UNO study: Fertility rate gap between races, ethnicities is shrinking*. Retrieved from <http://www.unomaha.edu/news/2015/01/fertility.php>
- Reidmann, G. L. (2008). *Preparing for parenthood*. doi:10.3843/GLOWM.10110

- Resource Center for Adolescent Pregnancy Prevention (RECAPP) (2017). Theories and approaches: key concepts of theory of reasoned action. Education Training and Research (ETR). Retrieved from:
<http://recapp.etr.org/recapp/index.cfm?fuseaction=pages.TheoriesDetail&PageID=518>
- Rice, E. (May 1978). *Eastern definitions: A short encyclopedia of religions of the Orient*. New York, NY: Doubleday.
- Riskind, R. G., & Patterson, C. J. (2010). Parenting intentions and desires among childless lesbian, gay, and heterosexual individuals. *Journal of Family Psychology*, 24, 78–81.
doi:10.1037/a0017941
- Rith, K. A., & Diamond, L. M. (2013). Same-sex relationships. In M. Fine & F. Fincham (Eds.), *Family theories: A contextual approach* (pp. 125–148). New York, NY: Routledge.
- Roupa Z., Polikandrioti M., Sotiropoulou P., Faros E., Koulour A., Wozniakkk G., Gourni M. (2009). Causes of infertility in women at reproductive age. *Health Science Journal* 3(2)
- Saad, L. (2013). *Americans see 25 as ideal age for women to have first child*. Retrieved from
<http://www.gallup.com/poll/165770/americans-ideal-age-women-first-child.aspx>
- Sabarre, K. A., Khan, Z., Whitten, A. N., Remes, O., & Phillips, K. P. (2013). A qualitative study of Ottawa university student's awareness, knowledge and perceptions of infertility, infertility risk factors and assisted reproductive technologies (ART). *Journal of Reproductive Health*, 10(41). doi:10.1186/1742-4755-10-41
- Scarpa, B., Dunson, D., & Giacchi, E. (n.d.). Bayesian selection of optimal rules for timing intercourse to conceive by using calendar and mucus. *Fertility and Sterility*, 88, 915–924.
doi:10.1016/j.fertnstert.2006.12.017

- Schmidt, L., Sobotka, T., Bentzen J. G., Andersen, N., & ESHRE Reproduction and Society Task Force. (2011). Demographic and medical consequences of postponement of parenthood. *Human Reproduction Update*, 18, 29–43. doi:10.1093/humupd/dmr040
- Schoephoerster, E., & Aamlid, C. (2016). College students' attitudes toward same-sex parenting. *College Student Journal*, 50, 102–106.
- Schwartz, S. L., Brindis, C. D., Ralph L. J., & Biggs M. A. (2011). Latina adolescents' perceptions of their male partners' influences on childbearing: findings from a qualitative study in California. *Journal of Culture, Health & Sexuality* 13(8) 873-86. doi: 10.1080/13691058.2011.585405
- Shalev, C. (1998, March 18). *Rights to sexual and reproductive health—The ICPD and the Convention on the Elimination of All Forms of Discrimination against Women*. Retrieved from <http://www.un.org/womenwatch/daw/csw/shalev.htm>
- Shapiro, A. J., Darmon, S.K., Barad, D.H., Albertini, D.F., Gleicher, N., & Kushnir, V.A., (2017). Effect of race and ethnicity on utilization and outcomes of assisted reproductive technology in the USA. *Reproductive Biology and Endocrinology* 15-44 <https://doi.org/10.1186/s12958-017-0262-5>
- Sharlip, I., Jarro, J., Belker, A., Lipshultz, L., Sigman, M., Thomas, A., ... Sadovsky, R. (2002). Best practice policies for male infertility. *Fertility and Sterility*, 77, 873–882. doi:10.1016/S0015-0282(02)03105-9
- Sherrod, R. A., & DeCoster, J. (2011). Male infertility: An exploratory comparison of African American and White men. *Journal of Cultural Diversity*, 18(1), 29–35.

- Shin, D. (2015). *Metabolic syndrome and male infertility*. Retrieved from <http://www.ssmr.org/Patient-Education-Forum/Metabolic-Syndrome-and-Male-Infertility.aspx>
- Sloter, E., Schmid, T.E., Marchetti, F., Eskenazi, B., Nath, J., Wyrobek, A.J. (2006) Quantitative effects on male age on sperm motion. *Human Reproductive* 21(11). 2868-2875
doi.org/10.1093/humrep/del250
- Smock, P. J., Manning, W. D., & Porter, M. (2005). Everything's there except money: How money shapes decisions to marry among cohabiters. *Journal of Marriage and Family*, 67, 680–696. doi:10.1111/j.1741-3737.2005.00162.x
- Snipp, C. M. (1966). Changing numbers, changing needs: American Indian demography and public health. Retrieved from <http://www.ncbi.nlm.nih.gov/books/NBK233098/>
- Society of American Reproductive Technology. (n.d.). *Number of clinics, treatments & births*. Retrieved from http://www.sart.org/uploadedFiles/Affiliates/SART/Patients/History_of_IVF/Sart_Graphics02_Page_5.png
- Sohr-Preston, S. L., Rohner, A. K., & Lott, B. H. (2016). Southern American University Undergraduates' Attitudes toward Intrauterine Insemination Undertaken by Women of Differing Age, Marital Status and Sexual Orientation. *Journal of International Women's Studies*, 17(4), 49-66.
- Southern Illinois University, Carbondale (2012). *Factbook: 2011–2012*. Retrieved from http://www.irs.siu.edu/quickfacts/pdf_factbooks/factbook12.pdf
- Stacey, J. (2011). *Unhitched: Love, sex, and family values from West Hollywood to western China*. New York: New York University Press.

- Stanford, J., White, G., & Hatasaka, H. (2002). Timing intercourse to achieve pregnancy: Current evidence. *Obstetrics and Gynecology*, 100, 1333–1341. doi:10.1016/S0029-7844(02)02382-7
- Stewart, A. F., & Kim, E. D. (2011). Fertility concerns for the aging male. *Urology*, 78, 496–499. doi:10.1016/j.urology.2011.06.010Support United States Population Stabilization (2016). <http://www.susps.org/>
- Support United States Population Stabilization (2016). <http://www.susps.org/>
- Taylor, P., Funk C., & Clark, A. (2007). Generation gap in values, behaviors: As marriage and parenthood drift apart, public is concerned about social impact. Retrieved from <http://www.pewsocialtrends.org/files/2007/07/Pew-Marriage-report-6-28-for-web-display.pdf>
- Ter Keurst, A., Boivin, J., & Gameiro, S. (2016). Women’s intention to use fertility preservation to prevent age related fertility decline. *Reproductive BioMedicine Online*, 32, 121–131. doi:10.1016/j.rbmo.2015.10.007
- Theory of Reasoned Action and Planned Behavior (2017). Retrieved from: <https://phe512.files.wordpress.com/2010/11/tpb.pdf>
- The Fertility Society of Australia (2007). Age, fertility and assisted reproductive technology. <https://yourfertility.org.au/Age-fertility-and-reproductive-technology.pdf>
- Thomson, E., (1989) Dyadic Models of Contraceptive Choice 1957 and 1975 D. Brinberg et al (eds) Dyadic Decision Making Spring-Verlag New York Inc.
- Thonneau, P., Bujan, L., Multigner, L., & Mieusset, R. (1998). Occupational heat exposure and male fertility: A review. *Human Reproduction*, 13, 2122–2125. doi:10.1093/humrep/13.8.2122

- Tietze, C. (1957). Reproductive span and rate of reproduction among Hutterite women. *Fertility and Sterility*, 8, 89–97. doi:10.1016/S0015-0282(16)32587-0
- Tough, S., Tofflemire, K., Benzies, K., Fraser-Lee, N., & Newburn-Cook, C. (2013). Factors Influencing Childbearing Decisions and Knowledge of Perinatal Risks among Canadian Men and Women. *Maternal & Child Health Journal*, 17(9), 1736. doi:10.1007/s10995-007-0210-7
- University of North Carolina Department of Obstetrics & Gynecology (2016). *Pelvic adhesions*. Retrieved from https://www.med.unc.edu/obgyn/Patient_Care/specialty-services/MIGS/pelvic-adhesions-scar-tissue
- Trent, M., Millstein, S. G., & Ellen, J. M. (2006). Gender-based differences in fertility beliefs and knowledge among adolescents from high sexually transmitted disease-prevalence communities. *Adolescent Health*, 38(3), 282-287. Retrieved February 3, 2017, from <https://www.ncbi.nlm.nih.gov/pubmed/16488827>. doi:10.1016/j.jadohealth.2005.02.012
- University of Nebraska Omaha (2015). UNO Study: Fertility Rate Gap between Races, Ethnicities is shrinking. Retrieved from <https://www.unomaha.edu/news/2015/01/fertility.php>
- University of Twente. (2010). *Theory of planned behavior/Reasoned action*. Retrieved from https://www.utwente.nl/cw/theorieenoverzicht/Theory Clusters/HealthCommunication/theory_planned_behavior/
- U.S. Census Bureau. (2012). *Quick facts*. Retrieved from <https://www.census.gov/quickfacts/table/PST045215/00>
- U.S. Census Bureau. (2014). *Quick facts*. Retrieved from <https://www.census.gov/quickfacts/table/PST045215/00>

- U.S. Census Bureau. (2015). *Quick facts*. Retrieved from <https://www.census.gov/quickfacts/table/PST045215/00>
- U.S. National Library of Medicine, National Institutes of Health. (2016). *Male infertility*. Retrieved from <https://medlineplus.gov/maleinfertility.html>
- U.S. National Library of Science. (2014). *Uterine fibroids*. Retrieved from <http://www.nlm.nih.gov/medlineplus/uterinefibroids.html>
- Virtala, A., Vilska, S., Huttunen, T., & Kunttu, K. (2011). Childbearing, the desire to have children, and awareness about the impact of age on female fertility among Finnish university students. *European Journal of Contraceptive and Reproductive Health Care*, 16, 108–115. doi:10.3109/13625187.2011.553295
- Walter, C. Intano, G., McCarrey, J., McMahan, C. A., & Walter, R. B. (1998). Mutation frequency declines during spermatogenesis in young mice but increases in old mice. *Proceedings of the National Academy of Sciences of the United States of America*, 95, 10015–10019. doi:10.1073/pnas.95.17.10015
- Wellons, M. F., Fujimoto, V. Y., Baker, V. L., Barrington, D. S., Broomfield, D., Catherino, W. H., ... Armstrong, A. Y. (2012). Race matters: A systematic review of racial/ethnic disparity in Society for Assisted Reproductive Technology reported outcomes. *Fertility and Sterility*, 98, 406–409. doi:10.1016/j.fertnstert.2012.05.012
- Wellons, M. F., Lewis, C. E., Schwartz, S. M., Gunderson, E. P., Schreiner, P. J., Sternfeld, B., ... Siscovick, D. S. (2008). Racial Differences in Self-Reported Infertility and Risk Factors for Infertility in a Cohort of Black and White Women: The CARDIA Women's Study. *Fertility and Sterility*, 90(5), 1640–1648. <http://doi.org/10.1016/j.fertnstert.2007.09.056>

- Wennberg A.L., Rodriguez-Wallberg K.A., Milsom I, Brannstrom M (2015). Attitudes towards new assisted reproductive technologies in Sweden: a survey in women 30-39 years of age. *Acta obstetrica et gynecologica Scandinavica*.
- Werner, P. (2004) Reasoned action and planned behavior. In S. J. Peterson & T. S. Bredow (Eds.), *Middle range theories: Application to nursing research* (pp. 125–147). Philadelphia, PA: Lippincott Williams & Wilkins.
- Westoff, C. F., & Marshall, E. A. (2010). Hispanic fertility, religion and religiousness in the US. *Population Research and Policy Review*, 29, 441–452. doi:10.1007/s11113-009-9156-3
- Westoff, C., Mishler, E., & Kelly, E. (1957). Preferences in size of family and eventual fertility twenty years after. *American Journal of Sociology*, 62, 491–497. doi:10.1086/222079
- Wilcox, A. J., Weinberg, C. R., & Baird, D. D. (1995). Timing of sexual intercourse in relation to ovulation—Effects on the probability of conception, survival of the pregnancy, and sex of the baby. *New England Journal of Medicine*, 333, 1517–1521. doi:10.1056/NEJM199512073332301
- Williamson, L. E., & Lawson, K. L. (2015). Young women’s intentions to delay childbearing: A test of the theory of planned behaviour. *Journal of Reproductive and Infant Psychology*, 33, 205–213. doi:10.1080/02646838.2015.1008439
- Wiltz, T. (2015). *Racial and ethnic disparities persist in teen pregnancy rates*. Retrieved from <http://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2015/3/03/racial-and-ethnic-disparities-persist-in-teen-pregnancy-rates>
- Wojcieszek, A., & Thompson, R. (2013). Conceiving of change: A brief intervention increases young adults’ knowledge of fertility and the effectiveness of in vitro fertilization. *Fertility and Sterility*, 100, 523–529. doi:10.1016/j.fertnstert.2013.03.050

- Womens Health.gov (2014). *Hysterectomy*. Retrieved from <https://www.womenshealth.gov/publications/our-publications/fact-sheet/hysterectomy.html>
- Yan, Y., & Morgan, S. P. (2003). How Big Are Educational and Racial Fertility Differential in the U.S.? *Social Biology*, 50(3-4), 167-187.
- Zabin, L. S., Huggins, G. R., Emerson, M. R., & Cullins, V. E. (2000). Partner effects on a woman's intention to conceive: 'Not with this partner.' *Family Planning Perspectives*, 32, 39–45. doi:10.2307/2648147.
- Ziller, V., Heilmajer, C., & Kostev, K. (2015). Time to pregnancy in subfertile women in German gynecological practices: analysis of a representative cohort of more than 60,000 patients. *Archives of Gynecology & Obstetrics*, 29(3), 657. doi:10.1007/s00404-014-3449-4.
- Zitzmann, M. (2013). Effects of age on male fertility. *Best Practice & Research Clinical Endocrinology & Metabolism*, 27, 617–628. doi:10.1016/j.beem.2013.07.004

APPENDICES

APPENDIX A

Amended Survey Instrument

Intentions, Beliefs and Knowledge on Fertility and Assisted Reproductive Technology Survey

This survey includes Fertility and Assisted Reproductive Technology questions for college students. It was modified from the Canadian Fertility Survey by Daniluk and Koert (2013). The survey focuses on fertility intentions, beliefs and knowledge. Thank you for taking your time to participate in the survey.

Directions: Please circle the answer below or write your best answer

PART I: FERTILITY INTENTIONS

1. Do you plan to have children in the future? (Circle one)
YES or NO (If no skip to question 6)

2. How many children do you hope to have? (Fill in the blank with a number) _____

3. About how old you expect to be when you become a parent with your first child? (Please write a number) If you already have had your first child please skip to question 4. _____

4. If you intend to have more than one child, about how old do you expect to be when you have your last child? (Fill in the blank with a number) _____

5. About how many months do you expect it to take for you or your spouse to get pregnant once you start trying? (Fill in the blank with a number) _____

PART II: BELIEFS ABOUT FERTILITY AND ASSISTED REPRODUCTIVE TECHNOLOGY (ART)

6. What do you consider to be the ideal age for a woman to give birth to a child for the first time? (Please write a number) _____

7. What do you consider to be the ideal age for a man to father a child for the first time? (Please write a number) _____

8. What would you consider to be the latest age a woman should consider bearing a child? (Please write a number) _____

9. What would you consider to be the latest age a man should consider fathering a child? (Please write a number) _____

10. What do you believe the upper age limit should be for a woman to be assisted in becoming pregnant at a fertility clinic? (Please write a number) _____

11. What do you believe the upper age limit should be for a man to be treated at a fertility clinic? (Please write a number) _____

Please circle the best answer

12. How likely is it that you would consider becoming a parent without a spouse through the use of donated sperm or eggs?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
13. If you and your partner had difficulties conceiving, how likely is it that you would consider using In-Vitro fertilization (IVF) – a procedure whereby the sperm and eggs are fertilized in a laboratory and a few days later the resulting embryo is transferred to the uterus?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
14. If your spouse was unable to produce a child using his/her own sperm/eggs, how likely is it that you would consider using the sperm/eggs of another person, to produce an embryo?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
15. Who do you believe has the rights to use assisted reproductive technology in their attempts to produce a child?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
a. Heterosexual Couples	VL	L	NL nor UL	UL	VUL
b. Same Sex Female Couples	VL	L	NL nor UL	UL	VUL
c. Same Sex Male Couples	VL	L	NL nor UL	UL	VUL
d. Single Women	VL	L	NL nor UL	UL	VUL
e. Single Men	VL	L	NL nor UL	UL	VUL
16. How likely it is that you would consider having your eggs/sperm frozen and stored at the fertility clinic so they could be used when you are ready to become a parent?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
PART III: FERTILITY AND ART KNOWLEDGE (Please circle the best answer)					
17. Overall how do you rate your current women's fertility knowledge?	Very Informed	Informed	Neither Informed nor Uninformed	Uninformed	Very Uninformed
18. Overall, how would you rate current knowledge of Assisted Reproductive Technology procedures and fertility treatments (e.g., In Vitro	Very Informed	Informed	Neither Informed nor Uninformed	Uninformed	Very Uninformed

Fertilization and Intracytoplasmic Sperm Injections)?					
19. For women over 30, overall health and fitness level is a better indicator of fertility than age.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
20. Taking birth control pills for more than 5 years negatively affects a woman's fertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
21. A woman's eggs are as old as she is.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
22. Prior to a woman reaching menopause, the assisted reproductive technologies (e.g., In Vitro Fertilization, also known as IVF) can help most women to have a baby using their own eggs.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
23. The total cost of one cycle of In-Vitro Fertilization (IVF) is under \$5,000.00.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
24. There is a progressive decrease in a woman's ability to become pregnant after the age of 35.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
25. The rates of miscarriage are significantly higher for women in their 40s than for women in their 30s, even for physically fit women in excellent health.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
26. Egg freezing before the age of 35 can significantly prolong a woman's fertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
27. Sexually transmitted Infections (e.g. Chlamydia, Gonorrhea) significantly increase the risk of later infertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
28. A man's age is an important factor in a couple's chances of becoming pregnant.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

29. The majority of fertility conditions are caused by problems with the woman's fertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
30. Most couples have to go through IVF more than once to have a baby.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
31. A woman's weight affects her chances of conceiving a child.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
32. There is a significant decline in the quality of a man's sperm before the age of 50.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Agree
33. Smoking cigarettes or marijuana can reduce the quality of a man's sperm.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
34. Children born to fathers over the age of 45 have higher rates of learning disabilities, autism, Schizophrenia and some forms of cancer.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

PART IV: DEMOGRAPHICS Please provide the requested information and circle the best answer

35. What is your gender? (Circle one)

a. Male b. Female c. Transgender/Gender-Nonconforming

36. In what year were you born? _____

37. Which racial or ethnic group do you most identify with (Circle the best answer)

a. African/African American b. Asian/Asian American c. Native Hawaiian or Pacific Islander d. American Indian or Alaskan Native e. European/Caucasian f. Other _____

38. What is your ethnicity?

a. Hispanic or Latino OR b. Not Hispanic or Latino

39. With what sexual orientation do you most identify?

a. Gay/Lesbian b. Bisexual c. Heterosexual

40. Do you have children?

a. Yes or b. No

41. What is your current relationship status?

a. Single b. In a committed relationship c. Married d. Other

42. How many children do you have? _____

APPENDIX B

Email Solicitation to Department Chair

Dear Chairperson,

My name is Akilah Morris and I am a Doctoral Candidate in the Health Education and Recreation Department at Southern Illinois University Carbondale. I am conducting a study on awareness of fertility among university students in Illinois.

The purpose of the quantitative comparative study is to identify differences in Illinois college students' intentions, beliefs and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

I would like your permission to contact the instructors in the Health Education or Health Science Department who teach introductory health education courses. If you grant permission, then I will contact the instructors and request to mail survey booklets so that the instructors can administer the Intentions, Beliefs and Knowledge on Fertility and Assisted Reproductive Technology Survey to the students in their classes. The survey booklet will contain a consent form and the survey. The survey will only take 10-15 minutes. When students are finished they will place the completed surveys in a pre-address postage paid manila envelope located in front of the class and the Instructor will then seal and mail back envelope to the examiner. There is a \$5 gift card given to each participating teacher who mails back the completed surveys.

I will follow up by contacting you via email at the end of each week for two weeks. Should I not get a response after two weeks, I will try another couple weeks to contact you by phone. If I don't hear from you by that time I will then contact the office secretary to speak with you or leave a message.

Please reply to ammorri@siu.edu or call 217-766-8313 informing me if you agree or decline to have the health education or health science instructors participate in the study. If you do agree to give me permission to contact the health education or health science instructors the next step would be me contacting the instructors asking them to distribute and collect the surveys in their class for their participation in the research.

If there are any questions please contact me Akilah Morris (217) 766-8313, ammorri@siu.edu or my supervising professor Dr. Julianne Wallace (juliane@siu.edu) or Aaron Diehr (aaron@siu.edu) Department of Health Education and Recreation, SIUC, Carbondale, IL 62901-4632, phone number (618) 453-2777.

Thank you Akilah Morris

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX C

Email Solicitation to Health Education and Science Faculty

Dear Health Faculty,

My name is Akilah Morris and I am a Doctoral Candidate in the Health Education and Recreation Department at Southern Illinois University Carbondale. I am conducting a study on the Intentions, Beliefs and Knowledge on Fertility and Assisted Reproductive Technology. I would like to request your assistance in administering my survey instrument in your classes.

The purpose of the quantitative comparative study is to identify differences in Illinois college students' intentions, beliefs and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

I will mail the survey booklet which contains a consent form and a survey. I will also include some pencils for the students to use. The survey will only take approximately 10-15 minutes. After the students have completed the survey please direct them to place completed surveys in the pre-addressed postage-paid manila envelope provided then seal and mail back the envelope to examiner. Once I receive the completed surveys in the manila envelope, a \$5 gift card will be mailed to you for your assistance in administering the survey.

I will follow up by contacting you via email at the end of each week for two weeks. Should I not get a response after two weeks, I will try for another couple of weeks to contact you by phone. If I don't hear from you by that time I will then contact the office secretary to speak with your or leave a message.

Please send an email to ammorri@siu.edu or call 217-766-8313 let me know if you would be willing to administer the survey to your class.

If there are any questions please contact me Akilah Morris (217) 766-8313, ammorri@siu.edu or my supervising professors Dr. Julianne Wallace (juliane@siu.edu) or Aaron Diehr (aaron@siu.edu) Department of Health Education and Recreation, SIUC, Carbondale, IL 62901-4632, phone number (618) 453-2777.

Thank you
Akilah Morris

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX D

Survey Consent Form

My name is Akilah Morris. I am a graduate student at Southern Illinois University Carbondale and I need your assistance with help with my research study. I am asking you as a fellow student to participate in my doctoral research study.

The purpose of the quantitative comparative study is to identify differences in Illinois college students' intentions, beliefs and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

If you choose to take part in the study, you will be asked to complete a short survey about your knowledge, attitudes, beliefs about fertility and Assisted Reproductive Technology. The survey will take approximately 10-15 minutes of your time. All your responses will be kept confidential. Since I am the only examiner who will have access to the questionnaire all the answers will be confidential. Please do not put your name anywhere on the survey. When you are finished place your completed survey in the pre-addressed postage-paid manila envelope located in front of the class. Your instructor will then seal and mail back to me the manila envelope containing your survey.

Completion of the survey indicates your voluntary consent to participate in this study. **Although there are no risks anticipated from participation, students are encouraged to seat themselves spaced which increases the chances of you being comfortable answering the questions confidentially. Participation is limited to adults aged 18 and older.**

If you have any questions about the study, please contact me or my advisors, Juliane Wallace (juliane@siu.edu) or Aaron Diehr (aaron@siu.edu).

Akilah Morris
Graduate Student
(217)-766-8313
ammorri@siu.edu

Juliane Wallace, PhD
Dept. Chair of Public Health and Recreation or
Aaron Diehr
Associate Professor
Dept. of Health Education and Recreation
(618) 453-2777
Juliane@siu.edu

Thank you for taking the time to assist me in this research.

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX E

Eastern Illinois University

Email Solicitation to Department Chair

Dear Chairperson,

My name is Akilah Morris and I am a Doctoral Candidate in the Health Education and Recreation Department at Southern Illinois University Carbondale. I am conducting a study on fertility awareness among university students in Illinois. The purpose of the quantitative comparative study is to identify differences in Illinois college students' intentions, beliefs and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

I would like your permission to contact the instructors in the Health Education or Health Science Department who teach introductory health education courses. If you grant permission, then I will contact the instructors and request to mail survey booklets so that the instructors can administer the Fertility Awareness Survey to the students in their classes. Human Subjects at Eastern Illinois University would like the instructors to make the surveys available to students outside of the class time. The students can pick up the survey, but then complete the survey outside of the class, then return it to an envelope in the classroom at the next class session.

The survey booklet will contain a consent form and the survey. The survey will only take 10-15 minutes. There is a \$5 gift card given to each participating teacher who mails back the completed surveys. When students are finished they will place the completed surveys in a pre-address postage paid manila envelope located outside of the class and the Instructor will then seal and mail back envelope to the examiner. I will follow up by contacting you via email at the end of each week for two weeks. Should I not get a response after two weeks, I will try another couple weeks to contact you by phone. If I don't hear from you by that time I will then contact the office secretary to speak with you or leave a message.

Please reply to ammorri@siu.edu or call 217-766-8313 informing me if you agree or decline to have the health education or health science instructors participate in the study. If you do agree to give me permission to contact the health education or health science instructors the next step would be me contacting the instructors asking them to distribute and collect the surveys in their class for their participation in the research.

If there are any questions please contact me Akilah Morris (217) 766-8313, ammorri@siu.edu or my supervising professors Dr. Julianne Wallace (juliane@siu.edu) or Aaron Diehr (aaron@siu.edu) Department of Health Education and Recreation, SIUC, Carbondale, IL 62901-4632, phone number (618) 453-2777.

Thank you
Akilah Morris

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX F

Eastern Illinois University

Email Solicitation to Health Education and Science Faculty

Dear Health Faculty,

My name is Akilah Morris and I am a Doctoral Candidate in the Health Education and Recreation Department at Southern Illinois University Carbondale. I am conducting a study on fertility awareness among university students in Illinois. I would like to request your assistance in administering my survey instrument in your classes. The purpose of the quantitative comparative study is to identify differences in Illinois college students' intentions, beliefs and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

I will mail the survey booklet which contains a consent form and a survey. I will also include some pencils for the students to use. The survey will only take approximately 10-15 minutes. Human Subjects at Eastern Illinois University would like the instructors to make the surveys available to students outside of the class time. The students can pick up the survey, but then complete the survey outside of the class, then return it to an envelope in the classroom at the next class session. After the students have completed the survey please direct them to place completed surveys in the pre-addressed postage-paid manila envelope located outside of class. The instructor will then seal and mail back the envelope to examiner. Once I receive the completed surveys in the manila envelope, a \$5 gift card will be mailed to you for your assistance in administering the survey.

I will follow up by contacting you via email at the end of each week for two weeks. Should I not get a response after two weeks, I will try for another couple of weeks to contact you by phone. If I don't hear from you by that time I will then contact the office secretary to speak with your or leave a message.

Please send an email to ammorri@siu.edu or call 217-766-8313 let me know if you would be willing to administer the survey to your class.

If there are any questions please contact me Akilah Morris (217) 766-8313, ammorri@siu.edu or my supervising professors Dr. Julianne Wallace (juliane@siu.edu) or Aaron Diehr (aaron@siu.edu) Department of Health Education and Recreation, SIUC, Carbondale, IL 62901-4632, phone number (618) 453-2777.

Thank you
Akilah Morris

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX G

Eastern Illinois University

Survey Consent Form

My name is Akilah Morris. I am a graduate student at Southern Illinois University Carbondale and I need your assistance with help with my research study. I am asking you as a fellow student to participate in my doctoral research study.

The purpose of the quantitative comparative study is to identify differences in Illinois college students' intentions, beliefs and knowledge toward fertility and ART based on race, sexual orientation, age, parental status, relationship status, and gender.

If you choose to take part in the study, you will be asked to complete a short survey about your knowledge, attitudes, beliefs about fertility and Assisted Reproductive Technology. Human Subjects at Eastern Illinois University would like the instructors to make the surveys available to students outside of the class time. The students can pick up the survey, but then complete the survey outside of the class, then return it to an envelope in the classroom at the next class session. The survey will take approximately 10-15 minutes of your time. All your responses will be kept confidential. Since I am the only examiner who will have access to the questionnaire all the answers will be confidential. Please do not put your name anywhere on the survey. When you are finished place your completed survey in the pre-addressed postage-paid manila envelope located in outside of the class. Your instructor will then seal and mail back to me the manila envelope containing your survey.

Completion of the survey indicates your voluntary consent to participate in this study. Although there are no risks anticipated from participation, students are encouraged to seat themselves spaced which increases the chances of you being comfortable answering the questions confidentially. Participation is limited to adults aged 18 and older.

If you have any questions about the study, please contact me or my advisor, Julianne Wallace.

Akilah Morris
Graduate Student
(217)-766-8313
ammorri@siu.edu

Juliane Wallace, PhD
Dept. Chair of Public Health and Recreation
(618) 453-2777
juliane@siu.edu

Thank you for taking the time to assist me in this research.

This project has been reviewed and approved by the SIUC Human Subjects Committee. Questions concerning your rights as a participant in this research may be addressed to the Committee Chairperson, Office of Sponsored Projects Administration, SIUC, Carbondale, IL 62901-4709. Phone (618) 453-4533. E-mail: siuhsc@siu.edu

APPENDIX H

Old Survey Instrument

Intentions, Beliefs and Knowledge on Fertility and Assisted Reproductive Technology Survey

This survey includes Fertility and Assisted Reproductive Technology questions for college students. It was modified from the Canadian Fertility Survey by Daniluk and Koert (2013). The survey focuses on fertility intentions, beliefs and knowledge. Thank you for taking your time to participate in the survey.

Directions: Please circle the answer below or write your best answer

PART I: FERTILITY INTENTIONS

1. Do you plan to have children in the future? (Circle one)
YES or NO (If no skip to question 6)
2. How many children do you hope to have? (Fill in the blank with a number) _____
3. About how old you expect to be when you become a parent with your first child? (Please write a number) If you already have had your first child please skip to question 4. _____
4. If you intend to have more than one child, about how old do you expect to be when you have your last child? (Fill in the blank with a number) _____
5. About how many months do you expect it to take for you or your spouse to get pregnant once you start trying? (Fill in the blank with a number) _____

PART II: BELIEFS ABOUT FERTILITY AND ASSISTED REPRODUCTIVE TECHNOLOGY (ART)

6. What do you consider to be the ideal age for a woman to give birth to a child for the first time? (Please write a number) _____
7. What do you consider to be the ideal age for a man to father a child for the first time? (Please write a number) _____
8. What would you consider to be the latest age a woman should consider bearing a child? (Please write a number) _____
9. What would you consider to be the latest age a man should consider fathering a child? (Please write a number) _____
10. What do you believe the upper age limit should be for a woman to be assisted in becoming pregnant at a fertility clinic? (Please write a number) _____
11. What do you believe the upper age limit should be for a man to be treated at a fertility clinic? (Please write a number) _____

Please circle the best answer

12. How would you feel if you were never able to have children?	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
13. How likely is it that you would consider becoming a parent without a spouse through the use of donated sperm or eggs?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
14. If you and your partner had difficulties conceiving, how likely is it that you would consider using In-Vitro fertilization (IVF) – a procedure whereby the sperm and eggs are fertilized in a laboratory and a few days later the resulting embryo is transferred to the uterus?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
15. If your spouse was unable to produce a child using his/her own sperm/eggs, how likely is it that you would consider using the sperm/eggs of another person, to produce an embryo?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
16. Who do you believe has the rights to use assisted reproductive technology in their attempts to produce a child?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
f. Heterosexual Couples	VL	L	NL nor UL	UL	VUL
g. Same Sex Female Couples	VL	L	NL nor UL	UL	VUL
h. Same Sex Male Couples	VL	L	NL nor UL	UL	VUL
i. Single Women	VL	L	NL nor UL	UL	VUL
j. Single Men	VL	L	NL nor UL	UL	VUL
17. How likely it is that you would consider having your eggs/sperm frozen and stored at the fertility clinic so they could be used when you are ready to become a parent?	Very Likely	Likely	Neither Likely nor Unlikely	Unlikely	Very Unlikely
PART III: FERTILITY AND ART KNOWLEDGE (Please circle the best answer)					
18. Overall how do you rate your current women's fertility knowledge?	Very Informed	Informed	Neither Informed nor Uninformed	Uninformed	Very Uninformed

19. Overall, how would you rate current knowledge of Assisted Reproductive Technology procedures and fertility treatments (e.g., In Vitro Fertilization and Intracytoplasmic Sperm Injections)?	Very Informed	Informed	Neither Informed nor Uninformed	Uninformed	Very Uninformed
20. For women over 30, overall health and fitness level is a better indicator of fertility than age.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
21. Taking birth control pills for more than 5 years negatively affects a woman's fertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
22. A woman's eggs are as old as she is.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
23. Prior to a woman reaching menopause, the assisted reproductive technologies (e.g., In Vitro Fertilization, also known as IVF) can help most women to have a baby using their own eggs.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
24. The total cost of one cycle of In-Vitro Fertilization (IVF) is under \$5,000.00.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
25. There is a progressive decrease in a woman's ability to become pregnant after the age of 35.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
26. The rates of miscarriage are significantly higher for women in their 40s than for women in their 30s, even for physically fit women in excellent health.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
27. Most fertility clinics will not provide treatment to women over the age of 45.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

28. Egg freezing before the age of 35 can significantly prolong a woman's fertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
29. Sexually transmitted Infections (e.g. Chlamydia, Gonorrhea) significantly increase the risk of later infertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
30. A man's age is an important factor in a couple's chances of becoming pregnant.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
31. Children conceived through the use of assisted reproductive technologies such as IVF and ICSI have more long-term health problems than children conceived without the use of these fertility treatments.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
32. The majority of fertility conditions are caused by problems with the woman's fertility.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
33. Most couples have to go through IVF more than once to have a baby.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
34. A woman's weight affects her chances of conceiving a child.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
35. The upper age limit for a man to be treated at most clinics is 55 years of age.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
36. There is a significant decline in the quality of a man's sperm before the age of 50.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Agree

37. Smoking cigarettes or marijuana can reduce the quality of a man's sperm.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
--	----------------	-------	----------------------------	----------	-------------------

38. Children born to fathers over the age of 45 have higher rates of learning disabilities, autism, Schizophrenia and some forms of cancer.	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
---	----------------	-------	----------------------------	----------	-------------------

PART IV: DEMOGRAPHICS Please provide the requested information and circle the best answer

39. What is your gender? (Circle one)

a. Male b. Female c. Transgender/Gender-Nonconforming

40. In what year were you born? _____

41. Which racial or ethnic group do you most identify with (Circle the best answer)

a. African/African American b. Asian/Asian American c. Native Hawaiian or Pacific Islander
d. American Indian or Alaskan Native e. European/Caucasian f. Other _____

42. What is your ethnicity?

a. Hispanic or Latino OR b. Not Hispanic or Latino

43. With what sexual orientation do you most identify?

a. Gay/Lesbian b. Bisexual c. Heterosexual

44. Do you have children?

a. Yes or b. No

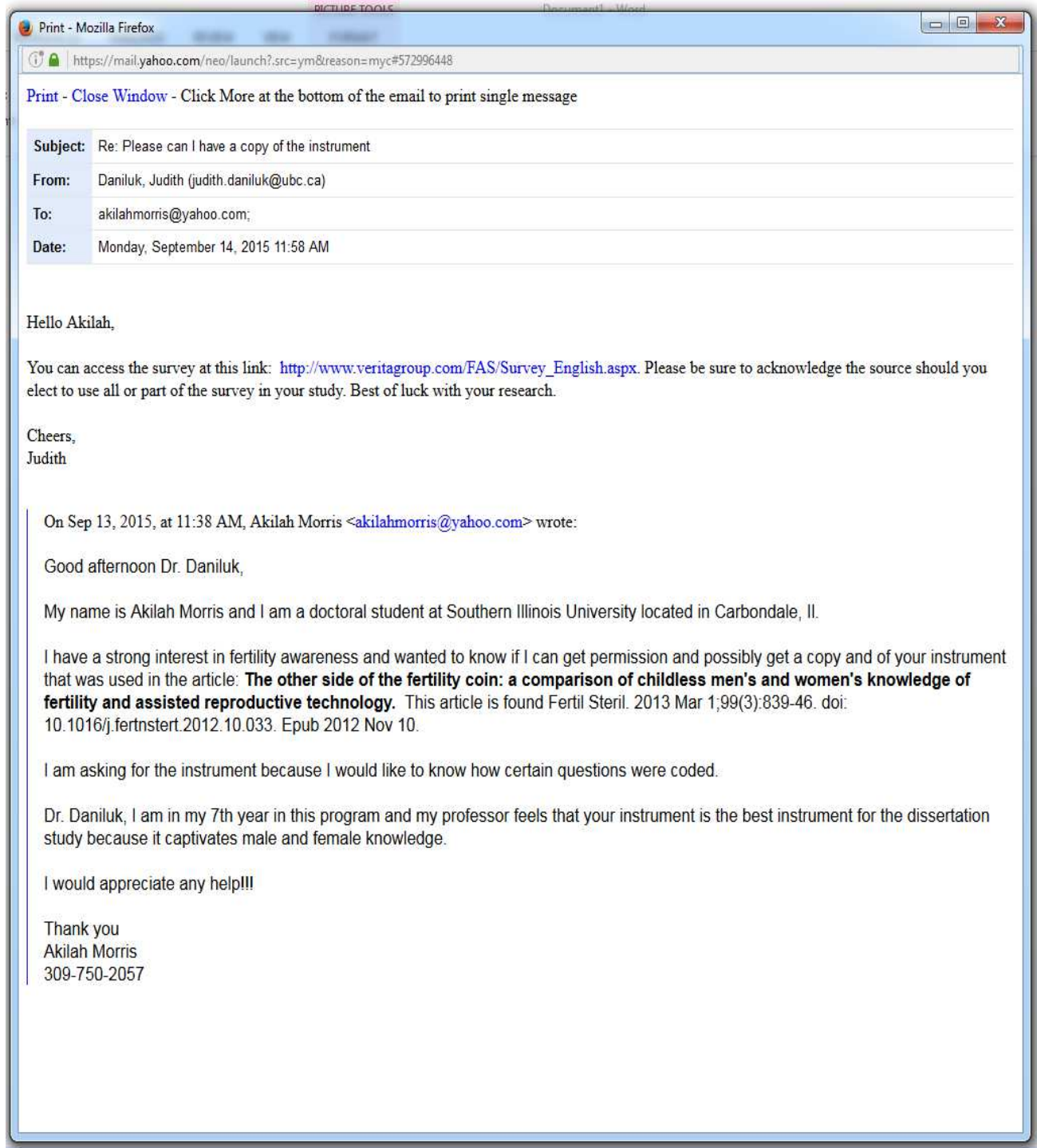
45. What is your current relationship status?

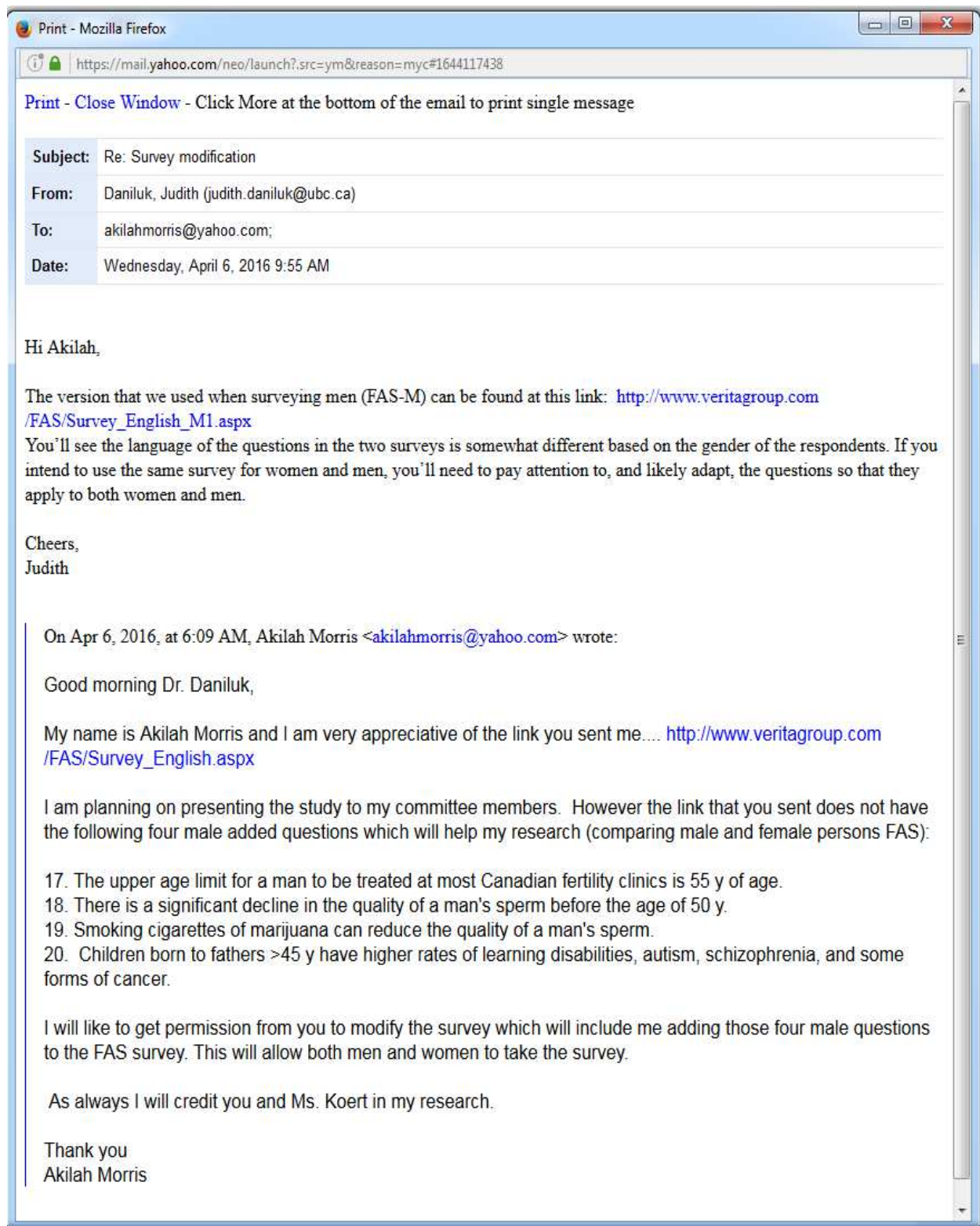
a. Single b. In a committed relationship c. Married d. Other

46. How many children do you have? _____

APPENDIX I

Permission to modify and use survey





APPENDIX J

Human Subjects Approval from Universities

SIUC HSC FORM A

REQUEST FOR APPROVAL TO CONDUCT RESEARCH ACTIVITIES INVOLVING HUMAN SUBJECTS

Project Title

Fertility Awareness among Illinois University Students

CERTIFICATION STATEMENT

By making this application, I certify that I have read and understand the University's policies and procedures governing research activities involving human subjects. I agree to comply with the letter and spirit of those policies. I acknowledge my obligation to:

1. Accept responsibility for the research described, including work by students under my direction.
2. Obtain written approval from the Human Subjects Committee of any changes from the originally approved protocol **BEFORE** implementing those changes.
3. Retain signed consent forms in a secure location separate from the data for at least **three** years after the completion of the research.
4. Immediately report any adverse effects of the study on the subjects to the Chairperson of the Human Subjects Committee, SIUC, Carbondale, Illinois - 618-453-4533 and to the Director of the Office of Sponsored Projects Administration, SIUC. Phone 618-453-4540. E-mail: siuhsc@siu.edu

Akilah Morris

Researcher(s) or Project Director(s)
Please print or type name below signature.

07/26/16

Date

RESEARCH ADVISOR/PROJECT DIRECTOR'S ASSURANCE: My signature on this application certifies that the student is knowledgeable about the regulations and policies governing research with human subjects and that I have thoroughly reviewed the student's protocol for compliance with university policy. I am aware of my obligations stated on Form A and will be available to supervise the research. When on sabbatical leave or vacation, I will arrange for an alternate faculty sponsor to assume responsibility during my absence. I will advise the Human Subjects Committee by letter of such arrangements.

Dr. Wendi Middleton



7-26-16

Researcher's Advisor or Faculty Sponsor (required for all student projects) 07/26/16
Please print or type name below signature.

Date

The request submitted by the above-named researcher(s) was approved by the SIUC Human Subjects Committee.

This approval is valid for one year from the review date for non-exempt research. Unless the protocol is approved as exempt, researchers must request an extension to continue the research after that date. This approval form must be included in all Master's theses/research papers and Doctoral dissertations involving human subjects that are submitted to the Graduate School.



7-28-16

Interim Chairperson, Southern Illinois University Human Subjects Committee

Date

SIUC HSC FORM A

REQUEST FOR APPROVAL TO CONDUCT RESEARCH ACTIVITIES
INVOLVING HUMAN SUBJECTS

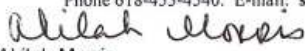
Project Title

Knowledge, Intentions, and Beliefs about Fertility and Assisted Reproductive Technology among
Midwestern US College Students

CERTIFICATION STATEMENT

By making this application, I certify that I have read and understand the University's policies and procedures governing research activities involving human subjects. I agree to comply with the letter and spirit of those policies. I acknowledge my obligation to:

1. Accept responsibility for the research described, including work by students under my direction.
2. Obtain written approval from the Human Subjects Committee of any changes from the originally approved protocol **BEFORE** implementing those changes.
3. Retain signed consent forms in a secure location separate from the data for at least **three** years after the completion of the research.
4. Immediately report any adverse effects of the study on the subjects to the Chairperson of the Human Subjects Committee, SIUC, Carbondale, Illinois - 618-453-4533 and to the Director of the Office of Sponsored Projects Administration, SIUC. Phone 618-453-4540. E-mail: siuhsc@siu.edu


Akilah Morris

Researcher(s) or Project Director(s)

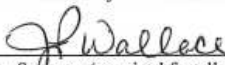
2/28/2017

Date

Please print or type name below signature.

RESEARCH ADVISOR/PROJECT DIRECTOR'S ASSURANCE: My signature on this application certifies that the student is knowledgeable about the regulations and policies governing research with human subjects and that I have thoroughly reviewed the student's protocol for compliance with university policy. I am aware of my obligations stated on Form A and will be available to supervise the research. When on sabbatical leave or vacation, I will arrange for an alternate faculty sponsor to assume responsibility during my absence. I will advise the Human Subjects Committee by letter of such arrangements.

Dr. Julian^e Poock Wallace



Researcher's Advisor or Faculty Sponsor (required for all student projects) 2/28/2017

Date

Please print or type name below signature.

The request submitted by the above-named researcher(s) was approved by the SIUC Human Subjects Committee.

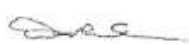
This approval is valid for one year from the review date for non-exempt research. Unless the protocol is approved as exempt, researchers must request an extension to continue the research after that date. This approval form must be included in all Master's theses/research papers and Doctoral dissertations involving human subjects that are submitted to the Graduate School.

Interim Chairperson, Southern Illinois University Human Subjects Committee

Date

HSC Approval letter (exempt)

To: Akilah Morris

From: Wayne R. Glass, CRA 
Interim Chair, Human Subjects Committee

Date: July 29, 2016

Subject: *Fertility Awareness among Illinois University Students*

Protocol Number: 16241

The revisions to the above referenced study have been approved by the SIUC Human Subjects Committee. The study is determined to be exempt according to 45 CFR 46.101(b)2. This approval does not have an expiration date; however, any future modifications to your protocol must be submitted to the Committee for review and approval prior to their implementation.

Your Form A approval is enclosed.

This institution has an Assurance on file with the USDHHS Office of Human Research Protection. The Assurance number is FWA00005334.

WG:kr

cc: Wendi Middleton

HSC modification approval letter (exempt)

To: Akilah Morris

From: Wayne R. Glass, CRA
Interim Chair, Human Subjects Committee

Date: March 6, 2017

Subject: *Knowledge, Intentions, and Beliefs about Fertility and Assisted Reproductive Technology among Midwestern US College Students*

Protocol Number: 16241

The SIUC Human Subjects Committee has approved the modification request to the above referenced project submitted on 3/2/2017 and you may proceed.

NOTE: Your study is determined to be exempt according to 45 CFR 46.101(b)2. Your project does not have an expiration date; however, any future modifications to your protocol must be submitted to the Committee for review and approval prior to their implementation.

Thank you for helping us keep your file up-to-date.

WG:kr

cc: Juliane Wallace



Research and Sponsored Programs

600 Lincoln Avenue
Charleston, Illinois 61920-5099

Office: (217) 581-2125
Fax: (217) 581-7181
<http://www.eiu.edu/grants>

Institutional Review Board

March 28, 2017

Akilah Morris
Health Education and Recreation
Southern Illinois University Carbondale

Dear Ms. Morris:

I have reviewed your request to recruit participants and perform data collection at Eastern Illinois University for your study titled, "Knowledge, Intentions, and Beliefs about Fertility and Assisted Reproductive Technology among Midwestern US College Students".
You may proceed with your study at EIU.

Sincerely,

A handwritten signature in black ink, appearing to read "JB", written over a horizontal line.

John Bickford, PhD
Chair, EIU Institutional Review Board





WESTERN
ILLINOIS
UNIVERSITY

March 28, 2017

Akilah Morris
Southern Illinois University Carbondale

Dear Akilah Morris:

The Institutional Review Board (IRB) at Western Illinois University (WIU) has reviewed your request to conduct research and recruit participants from our campus in order to complete your dissertation at **Southern Illinois University Carbondale**. Your research project is entitled *Fertility Awareness among Illinois University Students*, which has approval from SIUC IRB# 16241.

Per the OHRP *Guidance on Engagement of Institutions in Human Subject Research*, October 2008, WIU is not engaged in research. The WIU IRB understands that WIU will be used only as a recruitment site and there will not be any agents of WIU obtaining the informed consent of participants or the collection of data. No one associated with WIU will have access to individual responses, all data will be confidential and securely stored, and participation in the study will be voluntary.

WIU is pleased to support your research project. Your request to use WIU as a recruitment site is granted, however, the Department Chair and Health Faculty are free to decide whether they want to share your study with their students. We look forward to working with you.

Sincerely,

Rebecca Van Tine, M.S.
Institutional Review Board // Compliance Specialist

Office of Sponsored Projects
Sherman Hall 320, 1 University Circle, Macomb, IL 61455-1390
Tel 309.298.1191 Fax 309.298.2091

SEP 21 2017

Institutional Review Board

Memorandum

TO: Akilah Morris
Public Health and Recreation Profession / SIUC
James Ball, PhD
Health Sciences and Physical Education / NEIU

FROM: Saba Ayman-Nolley, PhD
IRB Chair *SN*

DATE: September 21, 2017

SUBJECT: **IRB #18-010 (SIUC #16241) "Knowledge, Intentions, and Beliefs about Fertility and Assisted Reproductive Technology among Illinois College Students"**

The IRB has reviewed the above referenced study and determined that it meets the criteria for **exemption** as defined in 45 CFR 46.101(b), category 2: *"Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation."*

You may conduct this research without annual IRB review; however, any modification to this research that may affect its exempt status must be reviewed by the IRB prior to implementation.

RESEARCHER RESPONSIBILITIES AND INFORMATION

It is the responsibility of the investigator(s) to maintain valid CITI training certification. Valid certification lasts for 3 years from your last completion date. Please log in to your account on the CITI training website, <https://www.citiprogram.org/>, to monitor your certification.

For questions or instructions about IRB related matters, please go to <http://www.neiu.edu/academics/research/institutional-review-board/irb-resources> or email irb@neiu.edu. If you have questions or concerns, please contact me at ext. 5844 or the Office of Research and Sponsored Projects at ext. 4675.



GRADUATE SCHOOL/OFFICE OF RESEARCH AND PROJECTS

Office of Research & Projects
Campus Box 1046,
Phone: 618-650-2958
Fax: 618-650-3523
e-mail: lskelto@siue.edu

SIUE Institutional
Review Board
Assurance No: FWA 00001703

July 7, 2016

Akilah Morris
Education (Health Education)
SIU Carbondale

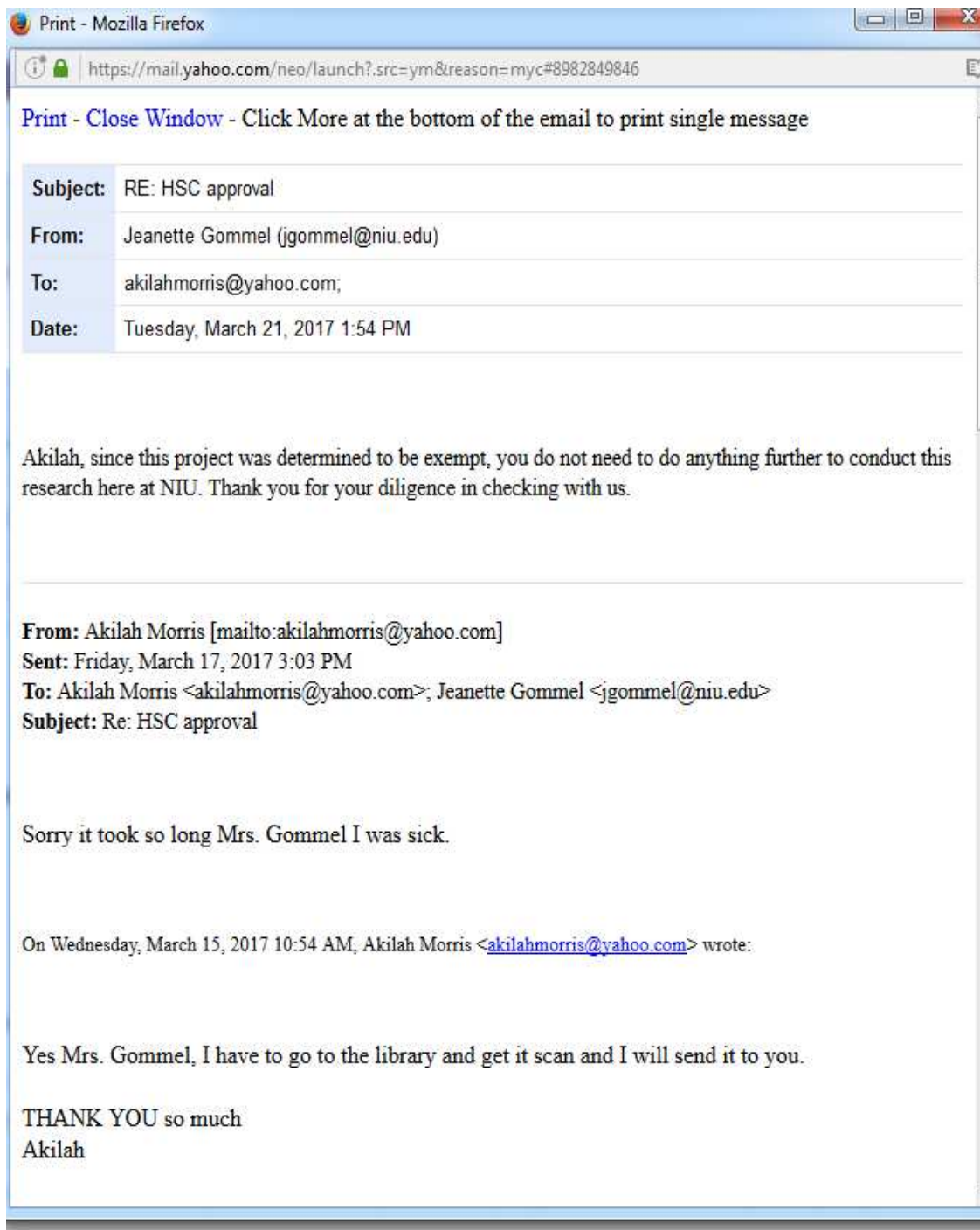
Dear Akilah:

This letter of support is to inform you that you may ask SIUE instructors to distribute a survey for your research project involving the use of human subjects once you have completed the required IRB training for human subject research and have received approval from your IRB. It is the decision of each instructor to determine if and when they will distribute your survey. The SIUE IRB recommends that you contact the instructor(s) as soon as possible once you have received approval from your IRB.

Sincerely,

A handwritten signature in blue ink, appearing to read "Linda L. Skelton".

Linda L. Skelton
Research Administrator/Ethical Compliance Coordinator



VITA

AKILAH MORRIS SMITH

1743 Independence Ave, Urbana, IL 61802| akilahmorris@yahoo.com

EDUCATION

Southern Illinois University, Carbondale, IL May 2018
Doctoral Candidate, Health Education
Dissertation: Fertility Awareness among College Students

Illinois State University-Normal, IL 2008
Masters of Science, College Student Personnel Administration
Capstone: Completed a project at the Career Center

Illinois State University-Normal, IL 2006
Bachelors of Science, Health Education
Community Health

PUBLICATIONS

“THE STUDENT MONOGRAPH: 26 YEARS AT A GLANCE” 2011
STUDENT MONOGRAPH JOURNAL
A content analysis that included information on Health Education leadership styles.

PRESENTATIONS

“SINGLE MOTHERS COPING WITH COLLEGE” 2012
TOWN HALL MEETING CARBONDALE, IL
Presented research on single mothers and their undergraduate experiences.

“US VS INTERNATIONAL STUDENTS DIETS” 2012
TOWN HALL MEETING CARBONDALE, IL
Presented research findings, comparing diets and dieting behaviors of US and International students.

“LEADERSHIP IN HEALTH EDUCATION ROUNDTABLE” 2010
Presented at the AMERICAN SCHOOL HEALTH ASSOCIATION conference
A roundtable presentation conducted by four students and a professor on Health Education leadership.

“GLOBAL HEALTH THAILAND” 2010
SOUTHERN ILLINOIS UNIVERSITY CARBONDALE-MORRIS LIBRARY CARBONDALE, IL
Presented information about Thailand and the countries health disparities

“STUDENTS INVOLVED IN ATHLETICS” 2007
ILLINOIS STATE UNIVERSITY COLLEGE STUDENT PERSONNEL
Presented to the College Student Personnel board of advisors on a project involving student and athletics.

MAJOR DISSERTATION PROFESSORS: Roberta Ogletree & Julianne Wallace