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COMPARING FAMILY PLANNING KNOWLEDGE AMONG FEMALES AND MALES RECEIVING OPIOID AGONIST TREATMENT OR SEEKING PRIMARY CARE SERVICES

A Thesis Presented

by

Heidi S. Melbostad, MS

to

The Faculty of the Graduate College

of

The University of Vermont

In Partial Fulfilment of the Requirements
For the Degree of Master of Arts
Specializing in Psychology

October, 2019

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Thesis Committee Members:

Sarah H. Heil, Ph.D., Advisor
Lauren MacAfee, M.D., Chairperson
Allison N. Kurti, Ph.D.
Donna Toufexis, Ph.D.
Cynthia J. Forehand, Ph.D., Dean of the Graduate College

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Heidi S. Melbostad, MS
October, 2019

Abstract

Background: Approximately 70% of US adults currently receiving opioid agonist treatment (OAT) for opioid use disorder are of reproductive age. Among women receiving OAT at risk of having an unintended pregnancy, typically less than half report any current contraceptive use compared to 90% in the general population. In addition, the rate of unintended pregnancy among women receiving OAT is disproportionately higher than the general population (~80% vs. 45%, respectively). Lack of knowledge about family planning may be contributing to decreased rates of contraceptive use and increased rates of unintended pregnancy among women receiving OAT.

Method: Participants were a convenience sample of women and men receiving OAT or a comparison group receiving primary care (PC) services. Family planning knowledge was assessed with the recently validated Contraceptive Knowledge Assessment (CKA), a self-administered 25-question multiple-choice survey. A two-way ANOVA, with fixed factors (i.e. patient sample and sex), compared the total number of correct responses for all questions and five more specific content areas ($p<.05$).

Results: Overall, 332 participants completed this survey. The mean percent of total correct responses was significantly lower in the OAT sample (n=167) compared to the PC sample (n=165), 47% vs. 53% correct, respectively ($p<.001$) or approximately 1.5 questions less. The mean percent of correct responses in four of the five content areas was also lower among the OAT sample compared to the PC sample (ps<.01). The mean percent of total correct responses was significantly higher among women (n=169) than men (n=163), 56% vs. 44% correct, respectively ($p<.0001$) or approximately 3 questions more. The percent of correct responses in four of the five content areas was also higher among women than men (ps<.01).

Conclusion: Given the substantial discrepancy in rates of contraceptive use and unintended pregnancy between individuals receiving OAT and the general population, it is somewhat unexpected that individuals receiving OAT did not have lower levels of family planning knowledge, although patients in both samples only answered approximately 50% of the questions correctly. Results from the present study suggest deficits in family planning knowledge, while statistically significant, may be less clinically so. Overall, lack of family planning knowledge is likely only playing a small role in population differences in contraceptive use and unintended pregnancy and interventions aimed at decreasing these differences will need to address other barriers to accessing family planning services and utilizing contraception in this population.

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Introduction

During the past several decades, significant advances in pharmacology and the classification of pain as the "5th" vital sign have led to the exponential growth in the use of prescription opioid medications (e.g. oxycodone, fentanyl) to treat and manage pain. This proliferation has contributed to alarming rates of misuse of opioid medications, heroin use, and the prevalence of overdose deaths which preempted the US Department of Health and Human Services to declare the opioid crisis a nationwide Public Health Emergency in 2017 (Center for Behavioral Health Statistics and Quality, 2018; Hedegaard, Warner, & Minino, 2017; Martins et al., 2017; US Department of Health and Human Services, 2017). Approximately 66% of the more than 11 million individuals who reported misuse of opioids (i.e. misuse of prescription opioid medication and/or heroin use) during the past year are women and men of reproductive age (15-45 years old; Center for Behavioral Health Statistics and Quality, 2018). Most alarmingly, between 1999 and 2017, the rate of opioid-related overdose deaths increased more than 500% for individuals of reproductive age (Centers for Disease Control and Prevention, 2019a).

A Note about Terminology and Classification

Before continuing, it is important to briefly review terminology associated with descriptions of opioid misuse and treatment, as there have been many changes in recent years. Prior to 2013, the Diagnostic and Statistical Manual of Mental Disorders (DSM) described maladaptive patterns of opioid use, both nonmedical use of prescription opioid medication and heroin use, in terms of abuse and dependence. When the newest version of

the DSM was published in 2013 (DSM-5), substance use-related diagnostic criteria, including opioid use, changed significantly. The DSM-5 combined abuse and dependence into a single category and measures severity of use on a continuum (American Psychiatric Association, 2013). These changes represent a major paradigm shift in how opioid and other substance use disorders are conceptualized (i.e. a chronic, relapsing disease). This diagnostic reclassification has also resulted in ongoing changes to the terminology used to describe opioid misuse. Professional organizations including the American Medical Association and the American Society of Addiction Medicine have endorsed the use of phrases such as nonmedical use of opioids, individuals with opioid use disorder (OUD), medication treatment for OUD (i.e. methadone, buprenorphine, naloxone), and opioid agonist treatment (OAT; i.e. methadone or buprenorphine) and recommend the abandonment of terms like addict, abuse, replacement therapy, and substitution treatment (American Society of Addiction Medicine, 2015; Olsen & Sharfstein, 2014; Substance Abuse and Mental Health Services Administration, 2015). Using appropriate language to describe opioid misuse supports reduction of stigma, prejudice, and judgment. However, from a research perspective, variations in language and classification criteria over the years create methodological issues in terms of comparing studies and making inferences about study outcomes. For the purposes of this study, contemporary language will be used as much as possible to describe this population and prior research outcomes.

Opioid Misuse and Unintended Pregnancy

Approximately 70% of US adults currently receiving OAT are of reproductive age (Substance Abuse and Mental Health Services Administration, 2017). Although opioid

misuse negatively impacts both women and men (Rudd, Aleshire, Zibbell, & Matthew Gladden, 2016; Seth, Rudd, Noonan, & Haegerich, 2018; Whiteman et al., 2014; Winkelman, Chang, & Binswanger, 2018), reproductive-age women can be affected in unique ways (see review by Back, Lawson, Singleton, & Brady, 2011; Jarlenski et al., 2017; Jones, Tuten, Keyser-Marcus, & Svikis, 2006; Kozhimannil, Graves, Jarlenski, et al., 2017). One way that has historically received relatively little attention is the high rate of unintended pregnancy in this population. Unintended pregnancy is a broader term that collectively refers to pregnancies that are mistimed (i.e. occurring earlier than the woman desired) or unwanted (i.e. occurring even though the woman did not desire it) (Santelli et al., 2003).

The health implications of planning a pregnancy are significant. Women who do not plan their pregnancies are less likely to engage in health-promoting behaviors during the preconception and perinatal periods compared to women with intended pregnancies (Cheng et al., 2016; Dott et al., 2010; Orr, James, & Reiter, 2008; Rassi, Wattimena, & Black, 2013). For example, unintended pregnancies are associated with delayed prenatal care (Cheng, Schwarz, Douglas, & Horon, 2009; Lindberg, Maddow-Zimet, Kost, & Lincoln, 2015) and decreased use of prenatal vitamins (Dott et al., 2010). Women who report having an unintended pregnancy are also less likely to initiate and continue breastfeeding compared to women who plan their pregnancies (Lindberg et al., 2015) and prenatal and postpartum maternal depression are more prevalent (Abajobir, Maravilla, Alati, & Najman, 2016; Cheng et al., 2009; Fellenzer & Cibula, 2014; McCrory & McNally, 2013).

In the first large-scale estimate of the prevalence of unintended pregnancy among pregnant women reporting recent opioid misuse, pregnancy intention was assessed in approximately 1000 pregnant women screened for enrollment in the MOTHER study, a multi-site randomized, controlled trial comparing OAT (i.e. methadone versus buprenorphine) for the treatment of opioid misuse during pregnancy (Heil et al., 2011). Results indicated that almost 9 of every 10 pregnancies were unintended (86%). This is in striking contrast to women in the general population who report 45% of their pregnancies are unintended (Finer & Zolna, 2016). Subsequent studies with women receiving OAT have consistently reported results similar to the Heil et al. (2011) study, with the rate of unintended pregnancy averaging nearly 80% across reports (Black, Stephens, Haber, & Lintzeris, 2012; Fischbein et al., 2018; Kreitinger et al., 2016; Meschke, McNeely, Brown, & Prather, 2018; Smith, Morse, & Busby, 2019; Welle-Strand et al., 2013, 2015).

Opioid Misuse and Pregnancy

Prevalence. Increasing rates of opioid misuse among women of reproductive age coupled with high rates of unintended pregnancy have inevitably led to increases in opioid misuse by pregnant women. Rates of opioid misuse have, not surprisingly, also contributed to the high prevalence of OUD during pregnancy and the subsequent need for treatment (Kozhimannil, Graves, Levy, & Patrick, 2017; see review by Krans & Patrick, 2016; Metz, Brown, Martins, & Palamar, 2018; Pan & Yi, 2013). Nationally, it is estimated that the prevalence of maternal OUD at hospital delivery has more than quadrupled from 1999 to 2014 (Haight, Ko, Tong, Bohm, & Callaghan, 2018).

Consequences. Opioid misuse during pregnancy even among women receiving OAT, is often compounded by a multitude of factors, such as other drug use (Davie-Gray, Moor, Spencer, & Woodward, 2013), poor prenatal care (Parlier, Fagan, Ramage, & Galvin, 2014; Roberts & Pies, 2011), psychiatric symptoms (Benningfield et al., 2012; Whiteman et al., 2014), and low socioeconomic status (SES; Corr & Hollenbeak, 2017; Hand, Short, & Abatemarco, 2017; Martin, Longinaker, & Terplan, 2015), that collectively contribute to adverse consequences for the infant, including premature delivery and low infant birth weight (Metz et al., 2018; Patrick et al., 2015; Saia et al., 2017; Yazdy, Desai, & Brogly, 2015). In addition, infants exposed to opioids in utero may develop neonatal abstinence syndrome (NAS), a generalized disorder characterized by signs of central nervous system hyperirritability, gastrointestinal dysfunction, respiratory distress, and autonomic dysregulation (Finnegan, Connaughton, Kron, & Emich, 1975), that often requires extended hospitalization (typically 4 days) for monitoring and treatment (see review by Bagley, Wachman, Holland, & Brogly, 2014; Jones et al., 2010; Kelty & Hulse, 2017; Patrick, Kaplan, Passarella, Davis, & Lorch, 2014; Patrick et al., 2016; Substance Abuse and Mental Health Services Administration, 2018; Tolia et al., 2015). Not surprisingly, as maternal OUD has increased, so has the number of infants diagnosed with NAS. For example, between 2004 to 2014, the national incidence of NAS increased more than five-fold, from 1.5 to 8.0 per 1000 hospital births (Winkelman, Villapiano, Kozhimannil, Davis, & Patrick, 2018). In addition, poor birth outcomes and prolonged monitoring and treatment add significantly to acute medical costs. It is estimated that aggregate hospital charges for NAS treatment were approximately $1.5 billion/year in 2012 dollars, with the majority of costs covered by Medicaid (Patrick, Davis, Lehman, &

Cooper, 2015). The most recent estimates suggest the costs of hospital admission for an infant with NAS are more than 2.5 times greater than that for an infant without NAS (Corr & Hollenbeak, 2017).

More generally and longer term, bearing a child in disadvantaged circumstances like those of many women receiving OAT significantly diminishes the future wellbeing of both the mother and the child. For a woman growing up in circumstances of lower SES, the frequent occurrence of early motherhood and single motherhood increase the risk of persistent disadvantage for her but also for her children, while a woman from a higher SES background is more likely to postpone cohabitation and parenthood and thereby maintain a higher SES (Tough, Vekved, & Newburn-Cook, 2012). Overall, unintended pregnancy among women receiving OAT is associated with significant short- and long-term consequences of extraordinary cost for both mother and child.

Family Planning

The purpose of family planning is to support women and their male partners in achieving the number and spacing of children they desire (Gavin & Moskosky, 2014). Family planning includes information about fertility awareness, contraceptive services, pregnancy testing and counseling, basic infertility services, sexually transmitted infection (STI) services and other preconception and preventive health services (Gavin et al., 2014). As the average woman spends about three decades of her life trying to avoid unintended pregnancy (Sonfield, Hasstedt, & Gold, 2014), the overwhelming majority of family planning services are in the areas of fertility awareness and contraception.

Fertility awareness. Recognizing and understanding a woman's fertility is an important component of family planning because it maximizes a woman's (or couple's) control of whether and when to have children (Gavin et al., 2014). The only time a woman can become pregnant is during ovulation, colloquially referred to as the "fertile window" of the menstrual cycle. Consequently, many women/couples time intercourse and determine whether or not to use contraception based on the status of the woman's menstrual cycle (Lundsberg et al., 2014; Mosher, Jones, & Abma, 2015; Nettleman, Chung, Brewer, Ayoola, & Reed, 2007; Pallone & Bergus, 2009; Righarts, Dickson, Parkin, & Gillett, 2017; Smoley & Robinson, 2012). However, these strategies can be problematic if fertility awareness and other knowledge about the biological processes of conception (e.g. how long sperm survive) are inaccurate. Women with OUD, even those receiving OAT, often report lower perceived risk of becoming pregnant because of opioid use (Harding & Ritchie, 2003; Olsen, Banwell, & Madden, 2014), but little is known about their fertility awareness or whether it is associated with their contraceptive use.

Contraceptive services. Contraceptive services revolve primarily around contraceptive methods. There are many different contraceptive methods with varying levels of effectiveness currently available in the US, the majority of which need to be prescribed by qualified healthcare providers. Most contraceptive methods are for use by women, but at least two methods (i.e. male sterilization and male condoms) are for men (Curtis, Tepper, et al., 2016). Female and male sterilization are highly effective methods (Figure 1, Tier 1, tubal occlusion and vasectomy), with greater than 99% pregnancy

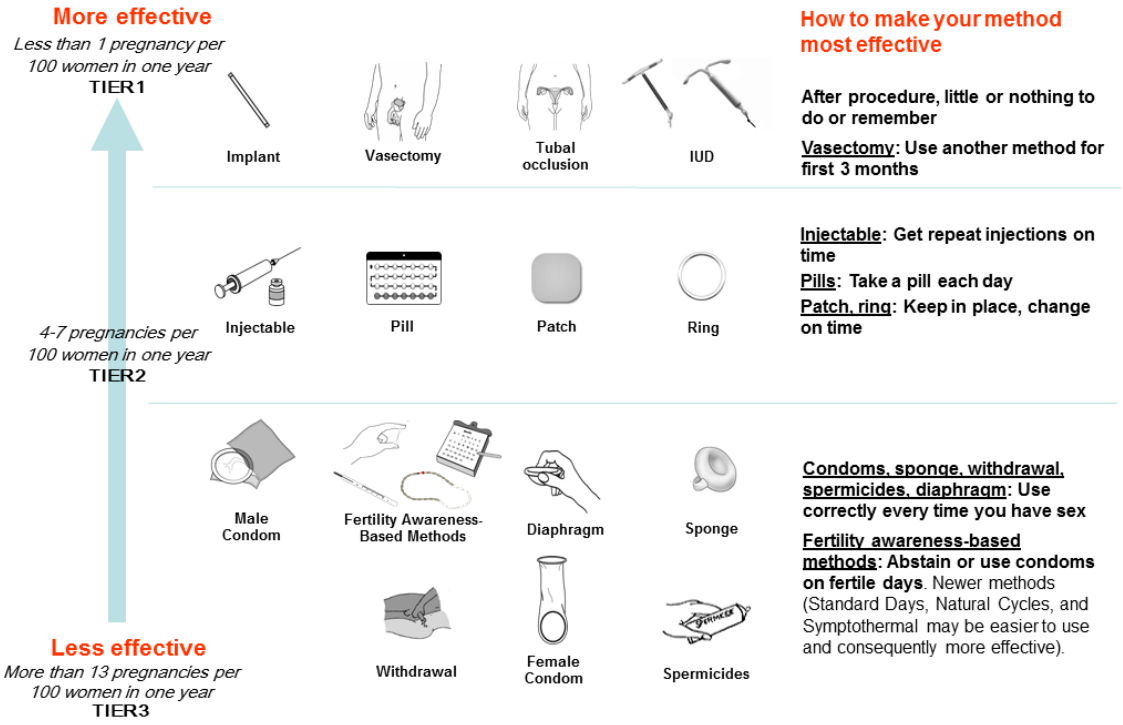

***Figure 1*. Contraceptive Method Effectiveness**. Reprinted from *Efficacy, Safety, and Personal Considerations.* In: Hatcher R.A. Hatcher, eds. Contraceptive Technology. 21st ed. New York, NY: Ayer Company Publishers, Inc.

prevention within the first year of typical use, but these methods are not reversible. The most effective, reversible contraceptive methods are implants and intrauterine devices (IUDs; Figure 1, Tier 1) often collectively referred to as long-acting reversible contraception (LARC) because they are effective for a minimum of three years and fertility is rapidly restored upon removal. Their <1% failure rate is due in part to the fact that after placement, they require virtually no effort on the woman's part. Despite different types of LARCs being available for many years, use of these methods has historically been very low due to early design flaws, undesirable side effect profiles, and complications associated with placement and removal (Shoupe, 2016). Fortunately, newer models have improved

significantly in recent years. The levonorgestrel IUD was approved for use in 2000 and the single-rod implant was approved in 2006. In addition, availability of the copper IUD increased after 2005 due to labeling revisions that removed several major contraindications of use (Waknine, 2005). Other reversible contraceptive methods, including pills, patch, ring, and injectables (Figure 1, Tier 2), are less effective than LARCs or sterilization, but more effective than male condoms and withdrawal, two of the least effective methods for preventing pregnancy (Figure 1, Tier 3). It is important to note that, when used correctly, male condoms can provide dual protection against both pregnancy and STIs. For example, male condoms reduce the risk of HIV transmission by approximately 90% (USAID, 2015). However, specific to pregnancy prevention, male condoms and other non-LARC methods (e.g. pills) are more prone to user error and imperfect adherence, both of which decrease their overall effectiveness, leading to estimated pregnancy rates of 13% for male condoms and 7% for pills in the first year of typical use (Trussell & Aiken, 2018).

Finally, although not typically described as a method of birth control, emergency contraception pills, sometimes referred to as Plan B or colloquially as the "morning after pill," are a post-coital method used to avoid an unintended pregnancy. The majority of emergency contraception pills currently available are effective if a woman uses them within 72 hours of unprotected intercourse; it does not have an effect on an established pregnancy (Haeger, Lamme, & Cleland, 2018; Trussell, Cleland, & Schwarz, 2018).

Prevalence of family planning methods.

General population. Approximately 65% of all women of reproductive age in the general population report they or their partner are currently using contraception; this rises to 90% among the subset of women at highest risk of unintended pregnancy (i.e. women

currently having intercourse, not pregnant or trying to conceive, and not sterile for non-contraceptive reasons; Kavanaugh & Jerman, 2018). Most women are medically eligible for 10 or more contraceptive method options (Trussell, Aiken, Micks, & Guthrie, 2018) and therefore typically have many choices. The most common contraceptive methods women report currently using are pills (25%), female sterilization (22%), male condoms (15%), LARCs (14%), and male sterilization (7%; Kavanaugh & Jerman, 2018). Only 8% of women report use of multiple contraceptive methods, most often male condoms combined with another method (Guttmacher Institute, 2016). Approximately 20% of women report ever using emergency contraception (Centers for Disease Control and Prevention, 2019b).

Turning to men, the most common contraceptive methods men report they or their partner used at last intercourse are male condoms (35%), male sterilization (22%), and pills (21%; Stewart, Ritter, Bateson, McGeechan, & Weisberg, 2017). While most contraceptive methods are for use by women and there is a tendency to think of contraception solely as a woman's responsibility (Brown, 2015; Fennell, 2011; Forste, 2003; Green & Biddlecom, 2000; Hamm et al., 2019; Oudshoorn, 2004), research suggests that both men and women influence couple method choice and consistency of use (Grady, Klepinger, Billy, & Cubbins, 2010; Grady, Tanfer, Billy, & Lincoln-Hanson, 1996; Nguyen & Zaller, 2009; Wigginton, Harris, Loxton, & Lucke, 2018; Zolna, Lindberg, & Frost, 2011). Indeed, the majority of men report they want to participate in decisions related to contraception to address prevention of both pregnancy and STIs and believe men and women share this responsibility (Forste & Morgan, 1998; Grady et al., 1996; James-Hawkins, Dalessandro, & Sennott, 2019; Landry & Camelo, 1994; Richards, Peters, Sheeder, & Kaul, 2016;

Stewart et al., 2017). Furthermore, there is some research to suggest that contraceptive use may increase when male partners are involved in decision making about contraception (Widman, Welsh, McNulty, & Little, 2006).

Individuals receiving OAT. Contraceptive use is not contraindicated for women receiving OAT (Curtis, Jatlaoui, et al., 2016), although a systematic review of contraceptive use among women with opioid and other substance use disorders suggests that only about half report current contraceptive use (Terplan, Hand, Hutchinson, Salisbury-Afshar, & Heil, 2015). The overall prevalence of current contraceptive use among women receiving OAT has been reported to range between 25-56% (Black et al., 2012; Cornford, Close, Bray, Beere, & Mason, 2015; Harding & Ritchie, 2003; Krans et al., 2018; Morrison, Ruben, & Beeching, 1995; Poulton, Parlier, Scott, Fagan, & Shelley, 2015; Ralph & Spigner, 1986). These rates are 2-2.5 times lower than rates reported by comparison groups of the general population (49-75%) (Cornford et al., 2015; Krans et al., 2018; Ralph & Spigner, 1986). Furthermore, only approximately 50% of women receiving OAT who are at risk of unintended pregnancy (i.e. women currently having intercourse, not pregnant or trying to conceive, and not sterile for non-contraceptive reasons) report current contraceptive use, which is almost half the rate of contraceptive use reported by women at risk in the general population (90%; Black et al., 2012; Kavanaugh & Jerman, 2018; Poulton et al., 2015).

The method women receiving OAT most commonly report using are male condoms (Black et al., 2012; Cornford et al., 2015; Fischbein et al., 2018; Harding & Ritchie, 2003; Morrison et al., 1995), although the high rate of unintended pregnancy among individuals with OUD suggests a general lack of effective condom use in this population (Bradshaw,

Pierce, Tabrizi, Fairley, & Garland, 2005; Edelman, Patel, Glasper, & Bogen-Johnston, 2014) as do high rates of STIs (Feaster et al., 2016; Lewis, Wu, & Ethelyn Strong, 2017; Novak, Ball, Winstock, & Peiper, 2016). There is very little information in the literature about the rates of current use of other contraceptive methods. The best estimate to date may be a large study by Cornford et al. (2015) where methods included female sterilization (23%), combined pills/patch/ring (22%), injectables (19%), and LARCs (18%). Although the data regarding the types of contraceptive methods women receiving OAT report using is extremely limited, these percentages suggest that when women receiving OAT do use contraception, they are using it at rates similar to the general population.

In the one study we are aware of regarding contraceptive use reported by men receiving OAT, approximately a third of the men reported consistently using male condoms (Gilbert, El-Bassel, Wu, & Chang, 2007), similar to estimates of men in the general population (Reece et al., 2010). To our knowledge, there are no studies that assess female partner contraceptive use reported by men receiving OAT. Overall, these results suggest a large percentage of women and men receiving OAT do not use contraception at all, or use it inconsistently and/or ineffectively, thereby greatly increasing their risk of unintended pregnancy and STIs.

Barriers to Contraceptive Use

There are multiple barriers that interfere with women obtaining and effectively using contraception including barriers to accessing services, poor fertility awareness, lack of knowledge about contraception (i.e. efficacy, mechanisms of action, safety), and partner-related factors (Ayoola, Nettleman, & Brewer, 2007; Beckman & Harvey, 1996;

Biggs, Karasek, & Foster, 2012; Frank, Poindexter, & Bateman, 1993; Frost & Darroch, 2008; Frost, Lindberg, & Finer, 2012; Goodman, Onwumere, Milam, & Peipert, 2017; Johnston & Howie, 1985; Kakaiya, Lopez, & Nelson, 2017; Leeman, 2007; Marshall, Kandahari, & Raine-Bennett, 2018; Matteson & Hawkins, 1997; Maxwell, Devries, Zionts, Alhusen, & Campbell, 2015; Moreau, Cleland, & Trussell, 2007; Mosher et al., 2015; Nettleman et al., 2007; Pritt, Norris, & Berlan, 2017; Rosenberg, Waugh, & Meehan, 1995; Silverman, Torres, & Forrest, 1987; Stewart et al., 2017; Tanfer, 1994; Trussell, Stewart, Guest, & Hatcher, 1992; Widman et al., 2006; Zelnik & Kantner, 1979). Although more research is necessary to determine why individuals receiving OAT report low rates of contraceptive use overall, the data we do have suggests that barriers of contraceptive use reported by women receiving OAT are very similar to those reported by women in the general population (Bornstein, Gipson, Bleck, Sridhar, & Berger, 2019; Matusiewicz, Melbostad, & Heil, 2017; Meschke et al., 2018; Poulton et al., 2015; Smith et al., 2019).

Our group's initial foray into research to reduce unintended pregnancy among women receiving OAT focused on reducing access barriers. We devised a novel, intensive experimental family planning intervention informed by behavioral economic theory aimed at increasing both contraception initiation and continuation primarily by co-locating free family planning services with an OAT clinic. Results from both the initial Phase Ib trial (Heil et al., 2016) and an ongoing Phase II trial suggest eliminating access barriers greatly increases the use of contraception in this population. Nevertheless, results from the ongoing trial indicate that approximately 40% of women are not using contraception effectively at the end of the intensive intervention. As a result, we have been considering various modifications to the intervention in an effort to increase efficacy. Our anecdotal experience

with more than 175 participants in our trials to date suggests that poor fertility awareness and deficits in contraceptive knowledge among both the female participants and their male partners may be a contributing factor to the lower rates of contraceptive use in this population. Indeed, the scientific literature confirms that there is a dependable relationship between fertility awareness and contraceptive knowledge (hereafter referred to collectively as family planning knowledge) and contraceptive use.

General population. Poor family planning knowledge, including misperceptions and/or lack of awareness about the efficacy, mechanisms of action, safety, and potential side effects associated with contemporary contraceptive methods, is reliably associated with incorrect or inconsistent use and method discontinuation among women and men (Ayoola et al., 2007; Biggs & Foster, 2013; Callegari, Aiken, Dehlendorf, Cason, & Borrero, 2017; Carter, Bergdall, Henry-Moss, Hatfield-Timajchy, & Hock-Long, 2012; Dempsey, Billingsley, Savage, & Korte, 2012; Eisenberg et al., 2012; Foster et al., 2004; Foster, Ralph, Arons, Brindis, & Harper, 2007; Gilliam, Warden, Goldstein, & Tapia, 2004; Grimes & Schulz, 2010; Hauck & Costescu, 2015; Hladky, Allsworth, Madden, Secura, & Peipert, 2011; Jaccard, Helbig, Wan, Gutman, & Kritz-Silverstein, 1996; Johnston & Howie, 1985; Jones, Darroch, & Henshaw, 2002; Kakaiya et al., 2017; Kollar, Biro, Boehner, & Rosenthal, 2000; Levinson, 1995; Lundsberg et al., 2014; Mackin, Clark, McCarthy, & Farris, 2015; Merchant et al., 2007; Mosher et al., 2015; Rosenberg et al., 1995; Schrager et al., 2015; Tanfer, 1994). For example, in a study of contraceptive knowledge among a nationally representative sample of young adults, each additional correct response on a contraceptive knowledge scale was associated with a 17% increase in women using prescription contraception at their next sexual encounter; among men, the

likelihood of them having a partner who was using a prescription method was associated with an 11% increase (Frost et al., 2012). In addition, women in this study who underestimated the effectiveness of oral contraception (i.e. birth control pills) were more than twice as likely to report expecting to have unprotected intercourse in the next three months compared to women who accurately estimated the effectiveness of oral contraception. As another example, among a large convenience sample of women seeking primary care services, women who had never used an IUD were five times more likely to possess inaccurate knowledge about IUD effectiveness compared to current IUD users (Callegari, Parisi, & Schwarz, 2013).

Individuals receiving OAT. Information about family planning knowledge among women receiving OAT is very limited and to our knowledge there are no data available with respect to men. In one qualitative study that investigated knowledge, attitudes, and beliefs about family planning among women enrolled in three substance abuse treatment programs in Baltimore, MD, at least one of which provided OAT, women demonstrated some knowledge about various methods, but also numerous misconceptions and inaccuracies (Robinowitz, Muqueeth, Scheibler, Salisbury-Afshar, & Terplan, 2016). For example, one woman accurately recalled information about different types of LARCs and described several benefits of using these methods, but other women reported inaccurate information about the efficacy of birth control pills and injectables and expressed uncertainty about using these methods. These results suggest that misinformation may be contributing to low rates of contraceptive use among women in treatment for OUD.

Two quantitative studies, one of which we published, both utilized items from an earlier survey (i.e. the National Campaign to Prevent Teen and Unplanned Pregnancy's

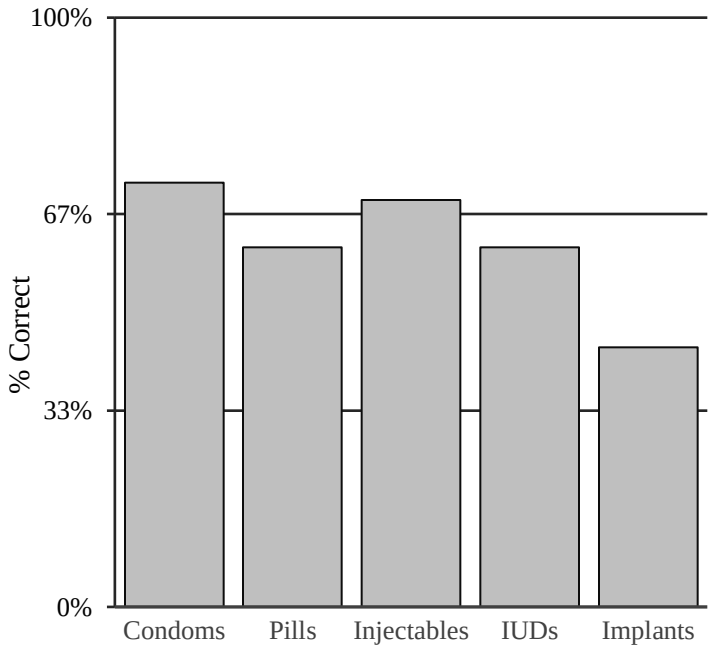

Figure 2. **Correct Responses to Contraceptive Knowledge Questions as a Function of Method Type.** Reprinted from "Knowledge of and concerns about long-acting reversible contraception among women in medication-assisted treatment for opioid use disorder," by A. Matusiewicz, 2017, *Contraception, 96*, 365-369.

Survey of Reproductive and Contraceptive Knowledge; Kaye, Suellentrop, & Sloup, 2009) to assess knowledge about contraception among reproductive age women receiving OAT. Participants in our study (Matusiewicz et al., 2017) were women, 18-49 years old, who were patients at the Chittenden Clinic, a large, outpatient OAT facility in Burlington, VT and who completed an eligibility screening for our ongoing randomized clinical trial described earlier. Overall, women receiving OAT knew as much about IUDs as short-acting methods and male condoms, but knowledge about implants was consistently lower than all other methods assessed (Figure 2). Knowledge about male condoms, pills, injectables, and IUDs appeared very similar to that reported by women in the National Campaign sample (Kaye, Suellentrop, & Sloup, 2009), although the National Campaign sample was limited to unmarried women between the ages of 18 and 29.

Utilizing some of the same survey items, Meschke et al. (2018) recently published results generally consistent with our findings. Women 18-45 years old receiving OAT

services from two different clinics in eastern Tennessee were invited to participate. Responses to items assessing knowledge about specific contraceptive methods were aggregated to form an overall knowledge score, although they did include a subset of questions specifically about IUDs. Women in this study answered approximately 60% of the questions about overall knowledge correctly and 42% of the IUD questions correctly.

While these studies provide important preliminary information about levels of contraceptive knowledge among women receiving OAT, there are several limitations that should be noted. First, differences in methodology between the two quantitative studies prevent a direct comparison of results. For example, Matusiewicz et al. (2017) published data about knowledge of individual methods compared to the emphasis on overall knowledge by Meschke et al. (2018). Second, women in both studies were only asked about some methods (e.g. there are no questions about emergency contraception) and there were no questions about fertility awareness. Third, no data were collected from men in either study. Finally, neither study included a comparison group, which compromises the ability to place results in a larger context.

Assessment of Family Planning Knowledge

While many studies have found a positive association between family planning knowledge and contraceptive use, it is interesting to note that there is no commonly-used tool to assess fertility awareness or to measure contraceptive knowledge. For example, results from a systematic review of 21 studies that assessed measurement of knowledge about oral contraception could not identify a gold-standard tool or best practices measure,

in part due to an almost complete lack of validity and reliability testing (Hall, Castaño, Stone, & Westhoff, 2010).

Recently, Haynes and colleagues published the Contraceptive Knowledge Assessment (CKA; Appendix; Haynes, Ryan, Saleh, Winkel, & Ades, 2017). Although the title of the CKA specifies "contraceptive knowledge," this 25-item, multiple-choice measure assesses family planning knowledge more broadly, including fertility awareness, contraceptive method knowledge (including all contemporary methods), and pregnancy prevention self-efficacy. Validity of this novel assessment tool was established primarily by expert review (Haynes et al., 2017). Among study participants, test-retest analysis revealed no significant difference in total mean score and the high correlation between initial and follow-up administration of the CKA (R=0.79, p=.667) demonstrates good reliability for the assessment of family planning knowledge (Haynes et al., 2017).

In addition to providing a total CKA score, our examination of CKA questions suggests that many could be grouped together to provide information about knowledge in particular content areas that may help identify specific deficits in knowledge. Independent expert review by two board certified obstetrician/gynecologists identified five categories: 1) fertility awareness, 2) general contraceptive knowledge, 3) short-acting contraception knowledge, 4) long-acting reversible contraception knowledge, and 5) other contraceptive methods knowledge (Table 1).

***Table 1*. Distribution of Contraceptive Knowledge Assessment (CKA) Questions into Content Areas**

Content Area	CKA Questions in the Content Area
Fertility Awareness	1, 2, 3
General Contraceptive Knowledge	5, 6, 15, 18, 19, 21
Short-acting Contraception Knowledge	8, 9, 10, 11, 12, 13, 14, 16, 17
Long-acting Reversible Contraception Knowledge	20, 22, 23
Other Contraceptive Methods Knowledge	4, 7, 24, 25

The "fertility awareness" category consists of three questions related to factors that affect conception, such as when during a woman's cycle is she most likely to get pregnant. The "general contraceptive knowledge" category consists of six questions broadly related to contraceptive method attributes such as which method of birth control is most effective. The "short-acting reversible contraception knowledge" category consists of nine questions about pills, patch, ring, and injections. The "long-acting reversible contraception knowledge" category consists of three questions about IUDs and implants. The "other contraceptive methods knowledge" category consists of four questions about male condoms, withdrawal, or emergency contraception.

Role of Family Planning Knowledge in Interventions

As described previously, there is a reliable association between family planning knowledge and contraceptive use evident in at least two dozen studies. It has often been assumed that this association is causal and as a result, one of the most common approaches of efforts to change this and many other health behaviors has been education or information-based approaches in which knowledge is provided to prompt individuals to change their behavior (Bandura, 2004; Bettinghaus, 1986; Glanz, Rimer, & Viswanath, 2008; Marteau, Hollands, & Kelly, 2015; Michie, West, Campbell, Brown, & Gainforth, 2014; Rosenstock, Strecher, & Becker, 1988; Ryan, 2009). However, these interventions have often not been effective. Specific to family planning, a recent systematic review of the effect of contraceptive education on knowledge, contraceptive use, and incidence of pregnancy underscores this disconnect. Pazol et al. (2018) identified 31 studies that tested 36 interventions that provided contraceptive education. Ninety percent of these studies (28/31) reported a significant increase in knowledge after receipt of education about contraception. However, among the nine studies that also examined the effect of contraceptive education on a variety of measures of contraceptive use (e.g., contraceptive initiation; correct, consistent, or continued use of contraception), only five reported significant improvements in contraceptive use. The one study that examined incidence of pregnancy reported a positive effect of the intervention on decreasing rates of pregnancy at the time of follow-up, although this result was only marginally significant.

While it now appears overly simplistic to believe that increasing knowledge alone will lead directly and reliably to healthier behavior, there is little question that knowledge has a role in healthier behaviors. As the Centers for Disease Control and Prevention

recently stated, "What people know and what they do with what they know has a major impact on their life chances." (Centers for Disease Control and Prevention, 2016). As a result, many major theories of and approaches to changing health behavior include knowledge, implicitly or explicitly, in one or more components of these models.

Behavioral economics. As noted previously, we are interested in the application of behavioral economics theory to contraceptive use among women receiving OAT who are at risk of unintended pregnancy. The field of behavioral economics, which began in the 1990s, integrates psychological science with economic principles and has identified a number of cognitive biases that often lead people to make health and other decisions that are not consistent with their stated health goals. Ashton et al. (2015) recently published a framework for applying behavioral economics to reproductive health outcomes. The framework groups many of the cognitive biases identified by behavioral economics under four sets of competing forces that each exist on a continuum (Table 2).

***Table 2*. Behavioral Factors That Influence Decision Making About Reproductive Health**

Illusion ↔ Reality	***Thinking Fast ↔ Thinking Slow***	***Today ↔ Tomorrow***	***Self ↔ Other***
• Beliefs about facts • Beliefs about probability • Beliefs about preferences	• Mental shortcuts • Limited attention • Intuition	• Present bias • Emotions, visceral drives • Sensation seeking	• Persuasion • Social norms, pressure • Perceptions of social norms • Altruism, reciprocal fairness • Identity

Note. Adapted from "A review of behavioral economics in reproductive health," by L. Ashton et al., 2015, *UC Berkeley: Center for Effective Global Action White Papers, 44, pp.16-25*.

While knowledge about family planning per se is not an explicit part of the framework, it is easy to see how knowledge plays a role in a number of biases in the framework. For example, *Illusion ↔ Reality: Beliefs about probability* may apply to

assessments about fertility and pregnancy risk. As previously discussed, many women, including women receiving OAT, assess their risk of pregnancy based on menstrual cycle functioning (i.e. fertility awareness) and inaccurately assume menstrual cycle irregularities reduce their fertility and subsequent risk of pregnancy. These inaccurate beliefs about the low perceived probability of getting pregnant may increase pregnancy risk and contribute to low rates of contraceptive use. Consequently, increasing fertility awareness may contribute to decreasing the risk of unintended pregnancy by helping women and couples more accurately assess the probability of getting pregnant and may promote increased use of contraception during the "fertile window."

The *Thinking Fast ↔ Thinking Slow: Mental shortcuts* continuum also implicitly addresses how people use knowledge and information to make decisions. Mental shortcuts refer to rules of thumb that individuals utilize to make decisions (Tversky & Kahneman, 1974). These shortcuts, sometimes referred to as heuristics, are useful because they make the complex task of assessing decisions in terms of probability, benefits/risk, and outcomes manageable by creating a mental shortcut. However, heuristics based on inaccurate information could lead to less optimal decisions. For example, as noted previously, the majority of emergency contraception pills currently available are effective if women use them within 72 hours of unprotected intercourse. However, if an individual has developed a heuristic for emergency contraception pills that includes the "morning after pill" colloquialism, she/he may limit use of this method to the first 24 hours after unprotected intercourse, even though it would still be effective for 72 hours. There is research that suggests individuals in the general population are misinformed about emergency contraception, although to our knowledge there is no data available regarding individuals

receiving OAT. In a study of young adults in the general population, 80% of participants were aware of the emergency contraception pill, but only 44% correctly reported that this method can be typically be used up to three days after unprotected intercourse (Yen, Parmar, Lin, & Ammerman, 2015), suggesting many are not maximizing the use of emergency contraception pills to decrease the risk of an unintended pregnancy. Consequently, increasing knowledge about family planning methods may decrease the risk of unintended pregnancy by modifying mental short cuts individuals rely on to inform their contraceptive behavior.

Another example is found in the *Today ↔ Tomorrow*: *Present bias* continuum. Present bias is the tendency to over-value immediate rewards at the expense of long-term intentions. Applied to contraceptive behavior, individuals may be more likely to choose not to use contraception, which does not have any upfront costs in terms of money, time,

***Table 3*. Present Bias as it Applies to Different Types of Contraception**

	Initiation Costs/Efforts	Continuation Costs/Efforts	Gains
No Contraception	• No planning ahead • No cost	• No planning ahead • No cost	• 85% chance of pregnancy
Condoms	• Available over the counter at various locations • Relatively inexpensive	• Remember to use method	• 13% chance of pregnancy
Prescription Contraception	• Visit with a qualified healthcare provider • Relatively expensive prescription (pills, patch, ring) and somewhat uncomfortable procedure (injection, IUD, implant)	• Tolerate bothersome, but rarely, medically serious, side effects • Remember to use method (pills, patch, ring, injection)	• Average 3% chance of pregnancy

or effort (Table 3, top row), instead of going through the costly process of obtaining contraception, with the more effective methods requiring additional upfront costs (Table 3, bottom row). While everyone has this bias to some degree or another, calculation of the

literal and figurative costs will be influenced by an individual's knowledge. For example, as Table 3 indicates, continuation costs for the more effective methods (i.e. prescription contraceptives) include tolerating bothersome but rarely medically serious side effects. If an individual mistakenly believes that IUDs can cause infections that lead to infertility, she/he is likely to inaccurately assess the figurative costs of that method, thereby decreasing the likelihood of choosing this highly effective methods. We recently asked women receiving OAT who reported they were unlikely to use an IUD why they were unlikely to choose this method; nearly half (45%) reported it was because they were concerned about getting an infection (Matusiewicz et al., 2017). This misperception may be adversely impacting calculation of the costs of IUDs despite their near-perfect rate of effectively preventing pregnancy. Therefore, increasing knowledge about contraception may contribute to decreasing the risk of unintended pregnancy by modifying the value individuals place on the immediate versus long-term costs and benefits of using contraception.

Other theoretical models. While we approach the issue of contraceptive decision-making among women and men receiving OAT from a behavioral economics perspective, there are of course other theoretical models that address health behaviors like contraceptive decision-making. A recent review by Lopez et al. (2016) reported on 25 theory-based interventions for contraception. The authors grouped interventions by theory and found that the majority of the studies reviewed were based on one of two theories or approaches. Most common was a social cognitive approach like the Health Belief Model (HBM). Social cognitive approaches suggest that decisions about health behavior are made deliberately by weighing the perceived costs and benefits of engaging in a particular behavior.

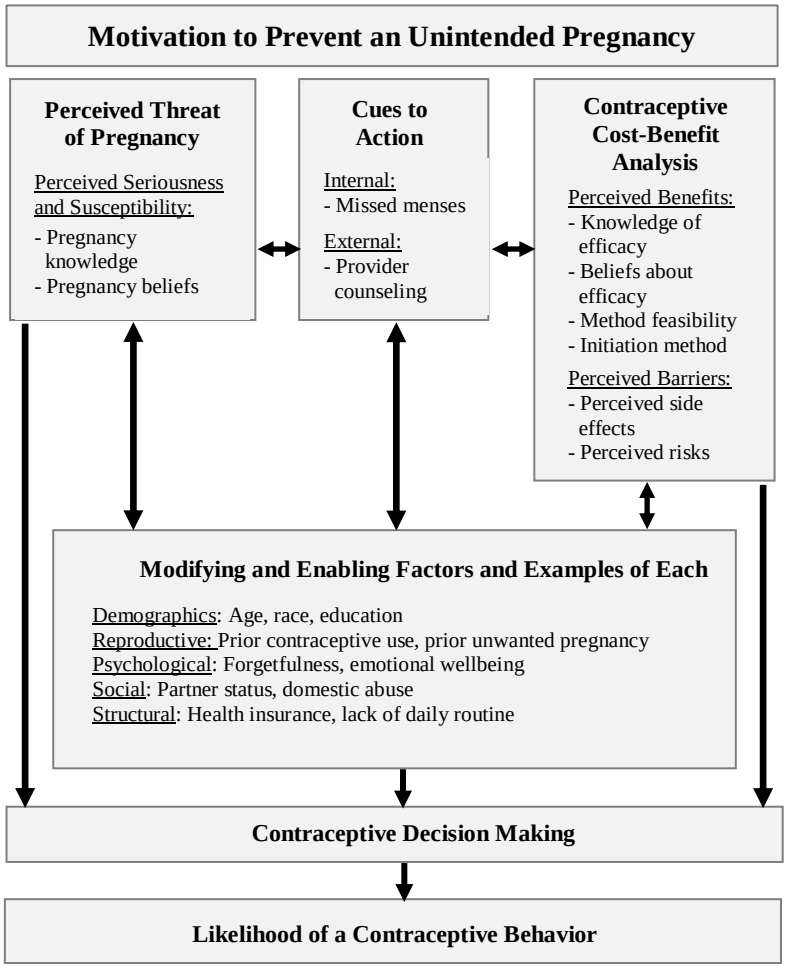

Figure 3. **Contraceptive Behavior Health Belief Model.** Adapted from "The Health Belief Model can guide modern contraceptive behavior research and practice," by K. Hall, 2012, *Journal of Midwifery & Women's Health, 57*(1), 79.

Consequently, changes in behavior are achieved by targeting components of the interaction between individuals, their environment and behavior (Glanz et al., 2008; Rosenstock et al., 1988; Sallis & Owen, 2015). The second grouping of interventions combined those using Motivational Interviewing (MI) with those that were rooted in the Information-Motivation-Behavior Skills (IMB) Model. MI also presumes changes in health behavior are defined by an assessment of the costs and benefits associated with engaging in a particular behavior (Prochaska & DiClemente, 1982, 1986). As a clinical technique, the goal of MI is for providers to engage their patients, elicit change talk, and evoke patient motivation to support positive behavioral changes. The IMB Model suggests that information and motivation influence health behavior change by activating skills

necessary to reduce risky behaviors and maintain behavioral change (Fisher & Fisher, 1992).

While all three of these approaches have somewhat different perspectives, knowledge is included in components of all three frameworks. In a revised version of the HBM that focused on contraception (Hall, 2012), pregnancy knowledge and knowledge of the efficacy of contraceptives are included in two different components (Figure 3, upper left and right boxes). In MI, one of the primary motivational techniques is "Advice/Feedback", wherein practitioners use neutral and non-judgmental questions (e.g., "Are you interested in learning more about …?" or "What do you know about the benefits of …?") to introduce factual information into sessions or correct misinformation in an effort to help patients identify advantages and disadvantages of initiating a specific health behavior (Rollnick, Butler, Kinnersley, Gregory, & Mash, 2010; Sobell & Sobell, 2013). Finally, as the title and description of the IMB model indicates, information (or knowledge) about risk reduction is an explicit component of this model (Figure 4; Boyer et al., 2005; Fisher & Fisher, 1992).

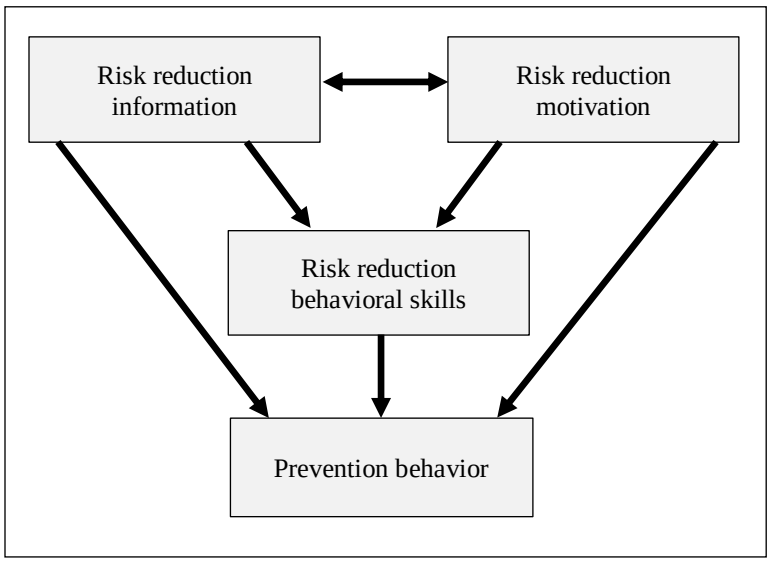

Figure 4. Information-Motivation-Behavioral Skills Model. Adapted from "Changing AIDS-risk behavior," by J. Fisher, 1992, *Psychological Bulletin, III*(3), p.465.

Summary

Consistently low rates of contraceptive use and high rates of unintended pregnancy suggests an unmet need for effective contraceptive use among women and men receiving OAT. As described earlier, there is a reliable, but rarely causal, relationship between family planning knowledge and contraceptive behavior. The complexity of the theoretical models reviewed suggests that knowledge plays a role in behavior, although on its own, knowledge will seldom be sufficient to elicit substantial behavior change. There are limited data about family planning knowledge among women and men receiving OAT, which has implications for how best to proceed with efforts to increase contraceptive use and reduce unintended pregnancy in this population. If there is a deficit in family planning knowledge, the literature reviewed earlier suggests that increasing knowledge alone is unlikely to cause substantive behavior change. However, as one example, the HBM suggests that accurate knowledge of pregnancy risk and contraceptive efficacy, when combined with other components of the model like effective provider counseling, could lead to significant changes in behavior. As another example, an MI approach suggests that clinical feedback that includes accurate information about contraceptive method side effects, when combined with MI techniques like open-ended questions that assess patient responses to the information and efforts to elicit change talk, could lead to significant changes in behavior. If there is not a substantive deficit in family planning knowledge, then interventions should focus on additional factors that influence behavior. For example, behavioral economics might suggest an intervention that reduces literal and figurative costs of accessing contraception, while interventions based on the HBM might focus on the quality of the

patient-provider relationship and explore how the health care provider might influence contraceptive decision-making (e.g. cues to actions). Thus, characterizing family planning knowledge among women and men receiving OAT will help provide direction to efforts to increase contraceptive use and decrease unintended pregnancy in this high-risk population.

The aims of this study were:

Aim 1 (Primary). Examine family planning knowledge among women and men receiving OAT as compared to women and men receiving PC services. The latter sample was selected as the comparison group because these individuals are also receiving an outpatient medical service and can serve as a proxy for the general population.

Hypothesis 1a. Consistent with observations of low rates of contraceptive use and high rates of unintended pregnancy among individuals receiving OAT, the mean percent of correct responses on the CKA will be lower (i.e. less knowledge about family planning) among the OAT sample compared to the PC sample.

Hypothesis 1b. Consistent with the tendency for society to see pregnancy prevention and contraceptive use as primarily women's issues, women in both samples (i.e. receiving OAT or PC) will have a higher mean percent of correct responses on the CKA (i.e. more family planning knowledge) than men.

Aim 2 (Exploratory). Evaluate specific content areas of family planning knowledge among women and men receiving OAT compared to women and men receiving PC. We will compare the mean percent of correct responses on the CKA in the areas of 1) fertility awareness, 2) general contraceptive knowledge, and knowledge of 3) short-acting contraception, 4) long-acting reversible contraception, and 5) other contraceptive methods

between patient samples and between sexes but are not proposing specific hypotheses for these outcomes.

Aim 3 (Exploratory). Examine the potential interaction of patient sample and sex on family planning knowledge. If main effects of patient sample and sex are significant for the mean percent of correct responses on the CKA and/or among the five content areas (i.e. fertility awareness, general contraceptive knowledge and knowledge of short-acting, long-acting, and other contraceptive methods) we will look at their interaction, but are not proposing specific hypotheses for these outcomes.

Method

Patient Samples and Settings

Patients receiving OAT. A cross-sectional survey of women and men receiving OAT was conducted. Research staff recruited patients receiving either methadone or buprenorphine from the Chittenden Clinic, a large (~1,000 patients), outpatient treatment facility in Burlington, VT. Due to federal regulations, this OAT facility cannot treat individuals less than 18 years old, so all patients were at least 18 years old. All women and men receiving OAT were eligible to participate in this study, although final analysis was restricted to women and men of reproductive age (18-45 years old) because family planning is most relevant to this age group.

Family planning services are very limited in this setting. According to Chittenden Clinic protocol, both women and men are asked about current contraceptive use at intake and women are administered pregnancy tests once a month during treatment. A positive urine pregnancy test results in a referral to a University of Vermont Medical Center (UVMMC) obstetrics practice that manages pregnant women receiving OAT. Women may also receive additional reproductive health referrals (e.g. gynecological care). Male condoms are available free of charge to all patients onsite at the Chittenden Clinic. No other family planning services are provided.

Patients receiving PC. For comparison, a cross-sectional survey of women and men receiving PC from two UVMMC-affiliated practices in Burlington, VT was conducted. Research staff recruited patients from UVMMC Adult Primary Care and Appletree Bay Primary Care; all reproductive-age women and men (18-45 years old) were

eligible to participate. To be consistent with the OAT sample, patients less than 18 years old were not eligible to participate. Patients in these practices receive a wide range of health care services related to health promotion, disease prevention, diagnosis and treatment of acute and chronic illnesses, and education and counseling about various health issues. Family planning services can be integrated into primary care, although the breadth and depth of such services vary by provider. Women and men are typically asked about their current contraceptive use at annual exams and may be provided sexual and reproductive health counseling where indicated. A positive pregnancy test results in a referral to a local obstetrics practice.

All practice administrators (i.e. Chittenden Clinic, UVMMC Primary Care and Appletree Bay Primary Care) approved all study procedures. The Institutional Review Board of the University of Vermont also approved this study.

Measures

Family planning knowledge was measured with the previously-described Contraceptive Knowledge Assessment (CKA; Appendix). All 25 questions are multiple choice, with five answer choices, except for one question (Question 21) that has six possible responses. "I don't know" is the final possible answer for all 25 questions. Consistent with the recommendations of others (Trussell, 2017), we modified the wording of one of the responses for three different CKA questions to be more accurate. First, on Question 4, we changed "semen" to "sperm" because pre-ejaculate does not contain semen (Killick, Leary, Trussell, & Guthrie, 2011). Second, on Question 10, we changed the response "one month" to "three months" because the vaginal ring can technically be used

continuously for one month, with no hormone-free days (Zieman, Hatcher, Allen, Lathrop, & Haddad, 2016). Third, on Question 24, we replaced the response "five days" with "three days" to reflect U.S. Food & Drug Administration packaging on levonorgestrel emergency contraception (U.S. Food & Drug Administration, 2016). We also changed "doctor" to "provider" on Questions 20 and 23 to be more inclusive of all health care providers.

Procedures

Study recruitment occurred in designated areas of the OAT and PC office waiting rooms at various times throughout a given week (3-4 hours a day, 2-3 times per week). Interested patients had the opportunity to discuss study participation with research staff either before or after their appointments. Participants were asked to provide very basic demographic information and then completed a paper copy of the CKA. The average time to complete the questionnaire was approximately 10 minutes; total study participation time was less than 15 minutes. Upon completion of the CKA, participants were offered a copy of the correct answers to take home. Participants were compensated with a $20 gift card for their time.

Analysis

The percentage of correct responses for all CKA questions for each participant was calculated. Primary and exploratory hypotheses were tested using two-way analysis of variance (ANOVA) with fixed factors, patient sample (i.e. receiving OAT or PC) and sex (i.e. female or male) along with their interaction. Analyses of the five content areas (i.e. fertility awareness, general contraceptive knowledge, and knowledge about short-acting,

long-acting, or other contraceptive methods) paralleled those conducted to calculate the percentage of correct responses for all CKA questions. The normality and homogeneity of variance assumptions associated with two-way ANOVAs were examined based on normal probability plots of residuals and Levene's test, respectively. Participant age was examined as a potential covariate because there was a significant difference in age between the OAT and PC patients samples and between women and men. Unadjusted values for mean percent correct are presented for the total CKA score and the five content areas because controlling for age did not have a significant effect on results.

A sample size of 320 participants (n=80/group) was estimated to have power (1-β) = .80 using α=.05 to detect an effect size (Cohen's d) = 0.28 for main effects of patient sample and sex on our primary outcome of total correct responses on the CKA. This effect size represents a small to medium effect size. This power and estimated effect size also applies to analyses of the five content areas of family planning knowledge.

Analyses were conducted using StataSE version 15 (Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC) and SAS statistical software version 9.4 (SAS Institute, Cary, NC). Statistical significance was determined based on α=.05.

Results

Sample Characteristics

Overall, 332 participants completed this survey. There was a total of 167 patients receiving OAT (women: n=85, men: n=82) and 165 patients receiving PC (women: n=84, men: n=81; Table 4). Overall, the mean age of participants was 32.1 years. On average, patients receiving OAT were significantly older compared to PC patients, 32.9 vs. 31.3 years, respectively, $F(1,328) = 6.02$ $p<.05$. On average, females were significantly younger compared to males, 31.2 vs. 33.0 years, respectively, $F(1,328) = 6.87$ $p<.01$. There was no significant interaction effect between patient sample and sex for age, $F(1,328) = 0.02$, $p< .89$. The overwhelming majority of participants were white (86%) and there were no differences by patient sample or sex.

CKA Responses

CKA total. Overall, the mean percent of correct responses on the 25 CKA questions was 50% (mean=12.5), with a range of 4% to 88%. On average, patients receiving OAT answered 47% (mean=11.8) of the 25 CKA questions correctly compared to 53% (mean=13.3) for patients receiving PC (Figure 5, top left panel). Simple main effects analysis of patient sample showed patients receiving OAT had a significantly lower mean percentage of correct responses compared to patients receiving PC, $F(1,328) = 11.6$ $p<.001$. On average, women answered 56% (mean=13.9) of the 25 CKA questions correctly compared to 44% (mean=11.1) for men (Figure 5, top right panel). Simple main effects analysis of sex showed that women had a significantly higher mean percentage of

correct responses than men, $F(1,328) = 38.47$, $p < .0001$. The interaction effect between patient sample and sex was not significant, $F(1,328) = 0.12$, $p = .73$ (Figure 5, bottom panel).

CKA content areas.

Fertility awareness. Overall, the mean percent of correct responses on the three fertility awareness questions was 53% (mean=1.6; Table 5). On average, patients receiving OAT answered 49% (mean=1.5) of the three questions correctly compared to 58% (mean=1.7) for patients receiving PC. Simple main effects analysis of patient sample showed that patients receiving OAT knew significantly less about fertility awareness compared to patients receiving PC, $F(1,327) = 10.33$, $p < .01$. On average, women answered 58% (mean=1.7) of the three questions correctly compared to 48% (mean=1.5) for men. Simple main effects analysis of sex showed that women knew significantly more about fertility awareness than men, $F(1,327) = 10.90$, $p < .01$. The interaction effect between patient sample and sex was not significant, $F(1,327) = 0.00$, $p = .97$.

***General contraceptive knowledge*.** Overall, the mean percent of correct responses on the six questions about general contraceptive knowledge was 66% (mean=4.0; Table 5). On average, patients receiving OAT answered 62% (mean=3.7) of the six questions correctly compared to 70% (mean=4.2) for patients receiving PC. Simple main effects analysis of patient sample showed that patients receiving OAT knew significantly less about general family planning compared to patients receiving PC, $F(1,327) = 11.47$, $p < .001$. On average, women answered 70% (mean=4.2) of the six general contraceptive knowledge questions correctly compared to 62% (mean=3.7) for men. Simple main effects analysis of sex showed that women knew significantly more about general family planning

compared to men, $F(1,327) = 7.92$, $p<.01$. The interaction effect between patient sample and sex was not significant, $F(1,327) = 1.42$, $p=.23$.

Short-acting contraception knowledge. Overall, the mean percent of correct responses on the nine questions about short-acting contraception (i.e. pills, patch, ring, and injectables) knowledge was 37% (mean=3.4; Table 5). On average, patients receiving OAT answered 37% (mean=3.3) of these nine questions correctly, similar to 38% (mean=3.4) for patients receiving PC. There was no significant difference in knowledge about short-acting contraception between the patient samples, $F(1,327) = 0.14$, $p=.66$. On average, women answered 45% (mean=4.0) of the nine questions about short-acting contraception correctly compared to 30% (mean=2.7) for men. Simple main effects analysis of sex showed that women knew significantly more about short-acting contraception compared to men, $F(1,327) = 45.00$, $p<.001$. The interaction effect between patient sample and sex was not significant, $F(1,327) = 0.50$, $p=.48$.

Long-acting reversible contraception knowledge. Overall, the mean percent of correct responses on the three questions about long-acting reversible contraception (i.e. implants and IUDs) knowledge was 43% (mean=1.3; Table 5). On average, patients receiving OAT answered 38% (mean=1.1) of the three questions correctly compared to 48% (mean=1.4) for patients receiving PC. Simple main effects analysis of patient sample showed that patients receiving OAT knew significantly less about long-acting contraception compared to patients receiving PC, $F(1,327) = 9.20$, $p<.01$. On average, women answered 53% (mean=1.6) of the three questions correctly compared to 33% (mean=1.0) for men. Simple main effects analysis of sex showed that women knew significantly more about long-acting reversible contraception compared to men, $F(1,327)$

= 39.71, $p<.001$. The interaction effect between patient sample and sex was not significant, $F(1,327) = 0.51$, $p=.47$.

Other contraceptive methods knowledge. Overall, the mean percent of correct responses on the four questions about other contraceptive methods (i.e. withdrawal, condoms, and emergency contraception) knowledge was 58% (mean=2.3; Table 5). On average, patients receiving OAT answered 53% (mean=2.1) of these four questions correctly compared to 62% (mean=2.5) for patients receiving PC. Simple main effects analysis of patient sample showed that patients receiving OAT had significantly less knowledge about other methods compared to patients receiving PC, $F(1,327) = 9.99$, $p<.01$. On average, women answered 59% (mean=2.4) of the four questions about other contraceptive methods correctly compared to 56% (mean=2.2) for men. There was no significant difference in knowledge of other methods between women and men, $F(1,327) = 1.17$, $p=.28$. The interaction effect between patient sample and sex was also not significant, $F(1,327) = 0.14$, $p=.71$.

Discussion

To continue efforts to understand why rates of unintended pregnancy are approximately two-fold higher among women receiving OAT than women in the general population, this study compared knowledge about family planning among women and men receiving OAT to a sample of women and men receiving PC. Overall, our findings indicate that there are significant effects of both patient sample (i.e. OAT vs. PC) and sex (i.e. females vs. males) on the total score on the CKA as well as most of the content areas. Differences in family planning knowledge (or lack thereof) as a function of patient sample will be discussed first, followed by those as a function of sex.

Patient Sample

Total score. The mean percent of correct responses on the CKA among individuals receiving OAT was approximately 10% lower than individuals receiving PC. However, patients in both samples answered only approximately 50% of the CKA questions correctly, indicating significant gaps in family planning knowledge for all participants. While the difference between patient samples was statistically significant, it is less clear how clinically important a difference of around 5%, or 1.5 questions, is. Given that the rate of unintended pregnancy among women receiving OAT is almost double that of the general population (Black et al., 2012; Finer & Zolna, 2016; Fischbein et al., 2018; Kreitinger et al., 2016; Meschke et al., 2018; Smith et al., 2019; Welle-Strand et al., 2015), it is somewhat surprising that individuals receiving OAT did not have substantially lower levels of family planning knowledge. The theoretical approaches described in the Introduction make clear that no one factor explains contraceptive behavior: rather,

decisions about contraceptive behavior are the compound result of a multitude of factors. The present results suggest that deficits in knowledge, by themselves, are likely only playing a small role in the large discrepancy in rates of contraceptive use and unintended pregnancy among women receiving OAT and women in the general population, although improving knowledge in combination with other approaches may have a larger effect.

Interestingly, the mean percent of correct responses on the CKA for both patient samples was at least 25% higher than the patient sample reported by Haynes et al. (2017) in the original report on the CKA. These differences may be a function of characteristics of their patient sample, which they described as an ethnically diverse group of medically underserved and underinsured patients, 15 to 45 years old, attending an urban ambulatory care center. Research consistently demonstrates ethnic and racial disparities in contraceptive knowledge, effective use of contraception, and pregnancy intention in the general population (Borrero, Farkas, Dehlendorf, & Rocca, 2013; Craig, Dehlendorf, Borrero, Harper, & Rocca, 2014; Finer & Zolna, 2016; Grady, Dehlendorf, Cohen, Bimla Schwarz, & Borrero, 2015; Rosenfeld et al., 2017; Stidham Hall et al., 2016). These disparities appear to be driven by psychosocial and economic differences, such as age, US nativity, education, and income (Dehlendorf et al., 2014; C. D. Grady et al., 2015; Jackson, Wang, & Morse, 2017; Kim, Dagher, & Chen, 2016). While neither the Haynes et al. study nor the present study collected more than basic demographic information from participants, a possible difference in age and likely differences in US nativity between these samples may have contributed to the higher mean percent of correct responses in the present study compared to the Haynes et al. sample.

With regard to age, the Haynes et al. study team purposefully included adolescents ages 15 to 17 in their eligible age range because this age group has a high risk of unintended pregnancy (72%; Finer & Zolna, 2016). While we agree with this rationale, federal regulations require that patients who receive OAT from adult, outpatient treatment facilities must be at least 18 years old; thus, the Chittenden Clinic population does not represent the full reproductive age range. Adolescents may have less knowledge about family planning because they have had less time to be exposed to this information in school, at home, and in other settings. It is unclear what percentage of the Haynes et al. sample is adolescents; if the proportion was substantial, this may have contributed to the overall lower scores of that sample.

With regard to US nativity, conversations with the Haynes et al. study team revealed that they recruited all of their participants from Bellevue Hospital in New York City, NY, whose patient population is estimated to have a high rate of foreign-born patients (personal communication, 7/13/2018). By contrast, the overwhelming majority of Vermont residents are non-Hispanic and only 5% of the population is foreign-born (US Census Bureau, 2018), making it very likely that there were few patients in either the OAT or PC samples in the present study that were not born in the US. Foreign-born women living in the US are less likely to have access to healthcare compared to US-born women which has been shown to contribute to lower rates of family planning service utilization, thereby decreasing opportunities to receive education and counseling about contraception (Tapales, Douglas-Hall, & Whitehead, 2018). This may in turn have contributed to lower levels of knowledge in the Haynes et al. sample.

CKA content areas.

Fertility awareness. Examination of CKA questions by specific content provides useful information about the similarities and differences in five areas of family planning knowledge between these two patient samples. The percent of correct responses about fertility awareness was approximately 16% lower among individuals receiving OAT compared to the individuals receiving PC. As discussed in the Introduction, cognitive biases such as inaccurate beliefs about the perceived probability of a health risk can contribute to less optimal decision-making about health. Consistent with this, studies have shown that poor fertility awareness contributes to an increased likelihood that women/couples will incorrectly assess their risk of pregnancy (Lundsberg et al., 2014) and a decreased likelihood of contraceptive use (Mosher et al., 2015; Nettleman et al., 2007). Poor fertility awareness may be exacerbated among individuals receiving OAT because women receiving OAT report high rates of menstrual irregularities (Dürsteler-MacFarland et al., 2010; Haber et al., 2017; Santen, Sofsky, Bilic, & Lippert, 1975; Schmittner, Schroeder, Epstein, & Preston, 2005). In the largest and most detailed study of menstrual cycle function among women receiving OAT, only 28% of more than 100 women had regular menstrual cycles, defined as 20-40 days in length (Schmittner et al., 2005). Menstrual irregularities make it more difficult to predict fertility status (i.e. when a woman is most likely to become pregnant) and may contribute to misperceptions about the probability of becoming pregnant. Inaccurate assessments about pregnancy risk may in turn interfere with effective use of contraception, thereby increasing the risk of unintended pregnancy.

Given the increased frequency of cycle-length irregularities among women receiving OAT, there is a greater likelihood of incorrectly identifying a woman's fertile

window. Incorporating information about fertility awareness into family planning interventions for individuals receiving OAT, with an emphasis on the potential side effects of agonist medication and other substance use on menstruation, may contribute to decreasing the risk of unintended pregnancy by clarifying that menstrual irregularities are not synonymous with infertility, thereby helping women/couples to more accurately assess pregnancy risk.

General contraceptive knowledge. There was a significant difference in general knowledge about contraception between patient samples: patients receiving OAT scored approximately 10% lower than patients receiving PC. However, patients in both samples answered two thirds of these questions correctly, suggesting that both groups are fairly well-informed with regard to general information regarding contraception. Given this, efforts to improve contraceptive knowledge may be more impactful if they target the larger knowledge deficits in fertility awareness and method-specific content areas (i.e. short- and long-acting contraception, and other contraceptive methods) rather than allocating resources to improve general knowledge about contraception.

Short-acting contraception knowledge. Although there were no differences in knowledge about short-acting contraception between patient samples, the overall low level of knowledge about short-acting methods is clinically concerning and may help explain why there is a 7% discrepancy in the rate of pregnancy between perfect use and typical use of pills, the most commonly used short-acting contraceptive method among women in the general population (Kavanaugh & Jerman, 2018; Trussell et al., 2018). In addition, the user demands associated with short-acting methods (e.g. remembering to take a pill every day), may increase user error which contributes to increased risk of pregnancy overall.

Therefore, incorporating information about mechanisms of action and attributes of short-acting methods into family planning interventions may increase knowledge about these methods and promote more effective use.

Long-acting reversible contraception knowledge. Examination of the long-acting reversible contraception knowledge content area identified there was a significant difference in LARC knowledge between patient samples. Individuals receiving OAT scored approximately 20% lower than individuals receiving PC in this content area. This discrepancy is somewhat surprising given the similarities in the estimated prevalence of current LARC use among women receiving OAT and the general population (18% and 14%, respectively). If women receiving OAT are managing to use LARCs at a rate similar to the general population despite significant deficits in knowledge about these methods, one strategy to increase LARC use among women receiving OAT is to promote greater knowledge about LARC attributes, efficacy, and use among this population in an effort to further increase rates of LARC use. In fact, a recent study by Kotha et al. (2019) reported that increasing knowledge about LARCs via contraceptive counseling increased intention to use LARCs postpartum among a large sample of pregnant women receiving OAT. Although there are of course discrepancies between LARC intent and subsequent use (Ogburn et al., 2005; Engin-Ustun et al., 2007; Chen et al., 2010; Kotha et al., 2019), increasing knowledge about LARCs is a first step in promoting their use and should be incorporated into family planning interventions in general and may be particularly influential in increasing uptake among women receiving OAT.

Other contraceptive methods knowledge. There was a significant difference between patient samples in the percent of correct responses on questions in this content

area (i.e. knowledge about the withdrawal method, male condoms, and emergency contraception pills). Patients receiving OAT only answered approximately half of these questions correctly, about 15% less than patients receiving PC. This has implications clinically. For example, poor knowledge about emergency contraception pills may interfere with correct use of this method. Given the overall low rates of contraceptive use among individuals receiving OAT (Black et al., 2012; Cornford et al., 2015; Krans et al., 2018), use of emergency contraception provides a unique opportunity to prevent pregnancy after unprotected intercourse (Trussell et al., 2018). As discussed in the Introduction, the colloquial name for emergency contraception, "morning after pill," may be misleading, thereby interfering with optimal use. Misperceptions about the use of emergency contraception pills may arise from inaccurate portrayals by various sources, including the media and pharmacists, about how emergency contraception pills work and/or their availability (Moore, Ryan, & Stamm, 2018; Nelson & Jaime, 2009; Pruitt & Mullen, 2005). Consequently, increasing individual knowledge about emergency contraception pills may decrease risk of unintended pregnancy by modifying mental short cuts (i.e. heuristics) or misinformation individuals reference to inform their contraceptive behavior.

Sex

In addition to differences between patient samples in the percent of correct responses overall and among most of the CKA content areas, the percent of correct responses overall and among four of the five CKA content areas also differed by sex. With the exception of the "other contraceptive methods knowledge" content area, women demonstrate more knowledge about family planning than men. Given that family planning

has historically been focused on women and the majority of contraceptive methods available are for use by women, these results were not unexpected. Historically, family planning services were focused on the needs of women and failed to incorporate education and interventions for men. However, beginning in the mid-1990s, there was an international effort by family planning and reproductive health organizations to provide a framework for addressing men's unique reproductive needs and inclusion in family planning services (Bustamante-Forest & Giarratano, 2004; Cornwall & White, 2000; Drennan, 1998; Sternberg & Hubley, 2004). There is evidence that these efforts are starting to have some impact. For example, the federal Office of Population Affairs and the CDC recommend "women *and* men of childbearing age should have high reproductive awareness (i.e. understand factors related to childbearing) and a reproductive life plan" and receive family planning services (emphasis added; Gavin et al., 2014). To this end, more recent research has demonstrated that male partners believe they should participate in decision-making about contraception (Grady et al., 1996; Richards et al., 2016; Stewart et al., 2017). Therefore, one strategy to optimize reproductive awareness for men is to increase knowledge about ways to prevent unintended pregnancy in general (e.g. knowledge about effective use of contraception and fertility awareness) and not just focus on contraceptive methods available for men.

The revised Health Belief Model proposed by Hall et al. (2012) is the only model to our knowledge that explicitly includes men as a modifying/enabling factor that can influence decisions about contraceptive use. In fact, there is some research that suggests among women receiving OAT, a woman's familiarity with her partner is an important factor in whether or not she uses contraception (Fischbein et al., 2018). Given that the

majority of men in the US are in need of family planning services (Marcell et al., 2016), increasing men's individual knowledge about contraception and fertility awareness may be an important preliminary step to increase contraceptive use and decrease rates of unintended pregnancy.

Comparison to Existing Literature

It was noted in the Introduction that methodological differences made it difficult to directly compare the results of the two published quantitative studies of which we are aware on contraceptive knowledge among women receiving OAT to each other (Matusiewicz et al., 2017; Meschke et al., 2018). Unfortunately, methodological differences also limit comparisons between the present results and these two studies. More specifically, differences in sample population (i.e. a convenience sample of women receiving OAT in the present study and the Meschke et al., 2018 study compared to a more restricted sample in the Matusiewicz et al., 2017 study), question response format (i.e. five response choices vs. true/false), question content, and presentation of results (i.e. overall knowledge vs. information about specific content areas), make specific comparisons and contrasts exceedingly difficult and are likely not very meaningful. However, it can be said that the three studies overall provide consistent evidence of generally moderate levels of knowledge about family planning among women receiving OAT.

Study Limitations

There are some limitations of this study. First, prior contraceptive use and other demographic, sexual, and family planning characteristics were not examined. Although

participant age was examined as a potential covariate and found not to play a role, it is unclear if there are other confounding factors associated with patient sample or sex that may be influencing family planning knowledge. Thus, future research should examine whether these characteristics impact family planning knowledge and behavior. Second, this study was not powered to analyze individual items on the CKA. Given the relatively high levels of general knowledge about contraception and low levels of knowledge about different types of contraception, additional research is necessary to identify the specific knowledge deficits of different contraceptive methods. Third, although the five CKA content areas were established by expert review, no psychometric evaluation of these areas was conducted. Additional analyses (e.g. factor analysis, inter-item correlations) are necessary to confirm the construct validity of the content areas to further expand the utility of this measure. Finally, it is unclear how generalizable these results are to other populations of individuals diagnosed with OUD. Within-group studies are necessary to identify family planning knowledge and contraceptive use among different groups of individuals with OUD. For example, is family planning knowledge similar among various groups of individuals with OUD, or are differences in age, education, treatment status, or geographic location associated with different levels of family planning knowledge?

Conclusion

Contraceptive use is low (~50%) and unintended pregnancy rates are high (~80%) among women receiving OAT. In the absence of basic knowledge about family planning it is unreasonable to expect effective use of contraception. The results of this study indicate that there are statistically significant differences in family planning knowledge between individuals receiving OAT and a comparison sample, but the absolute differences were generally small. Therefore, in settings where resources are limited, providing women and men receiving OAT with accurate information about family planning may lead to small increases in effective use of contraception and small decreases in unintended pregnancy. However, to make significant gains in this area, interventions will have to include additional components.

Comprehensive Bibliography

Abajobir, A. A., Maravilla, J. C., Alati, R., & Najman, J. M. (2016). A systematic review and meta-analysis of the association between unintended pregnancy and perinatal depression. *Journal of Affective Disorders*, *192*, 56–63. https://doi.org/10.1016/j.jad.2015.12.008

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.

American Society of Addiction Medicine. (2015). Patients with addiction need treatment - not stigma. Retrieved March 10, 2018, from https://www.asam.org/resources/publications/magazine/read/article/2015/12/15/patients-with-a-substance-use-disorder-need-treatment---not-stigma

Ashton, L., Giridhar, N., Holcombe, S. J., Madon, T., & Turner, E. (2015). *A review of behavioral economics in reproductive health*. *UC Berkeley: Center for Effective Global Action White Papers*. Retrieved from https://escholarship.org/uc/item/3m51m11s

Ayoola, A., Nettleman, M., & Brewer, J. (2007). Reasons for unprotected intercourse in adult women. *Journal of Women's Health*, *16*(3), 302–310. https://doi.org/10.1016/j.jmwh.2006.10.019

Back, S. E., Lawson, K. M., Singleton, L. M., & Brady, K. T. (2011). Characteristics and correlates of men and women with prescription opioid dependence. *Addictive Behaviors*, *36*(8), 829–834. https://doi.org/10.1016/j.addbeh.2011.03.013

Bagley, S., Wachman, E. M., Holland, E., & Brogly, S. B. (2014). Review of the assessment and management of neonatal abstinence syndrome. *Addiction Science & Clinical Practice*, *9*(1), 19. https://doi.org/10.1186/1940-0640-9-19

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior*, *31*(2), 143–164. https://doi.org/10.1177/1090198104263660

Beckman, L. J., & Harvey, S. M. (1996). Factors affecting the consistent use of barrier methods of contraception. *Obstetrics and Gynecology*, *88*(3 Supplemental), 65S-71S. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8752230

Benningfield, M. M., Dietrich, M. S., Jones, H. E., Kaltenbach, K., Heil, S. H., Stine, S. M., … Martin, P. R. (2012). Opioid dependence during pregnancy: Relationships of anxiety and depression symptoms to treatment outcomes. *Addiction*, *107*, 74–82. https://doi.org/10.1111/j.1360-0443.2012.04041.x

Bettinghaus, E. P. (1986). Health promotion and the knowledge-attitude-behavior continuum. *Preventative Medicine*, *15*, 475–491. Retrieved from https://ac.els-cdn.com/0091743586900253/1-s2.0-0091743586900253-main.pdf?_tid=74eabc81-c363-4a3a-8d7f-287ac379ecef&acdnat=1520970433_87a1e290063305f0047ea8e7e852863f

Biggs, M. A., & Foster, D. G. (2013). Misunderstanding the risk of conception from unprotected and protected sex. *Women's Health Issues*, *23*(1), e47–e53. https://doi.org/10.1016/j.whi.2012.10.001

Biggs, M. A., Karasek, D., & Foster, D. G. (2012). Unprotected intercourse among women wanting to avoid pregnancy: Attitudes, behaviors, and beliefs. *Women's*

Health Issues, *22*(3), e311–e318. https://doi.org/10.1016/j.whi.2012.03.003
Black, K. I., Stephens, C., Haber, P. S., & Lintzeris, N. (2012). Unplanned pregnancy and contraceptive use in women attending drug treatment services. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, *52*(2), 146–150. https://doi.org/10.1111/j.1479-828X.2012.01413.x
Bornstein, M., Gipson, J. D., Bleck, R., Sridhar, A., & Berger, A. (2019). Perceptions of pregnancy and contraceptive use: An in-depth study of women in Los Angeles methadone clinics. *Women's Health Issues*, *29*(2), 176–181. https://doi.org/10.1016/j.whi.2018.10.004
Borrero, S., Farkas, A., Dehlendorf, C., & Rocca, C. H. (2013). Racial and ethnic differences in men's knowledge and attitudes about contraception. *Contraception*, *88*(4), 532–538. https://doi.org/10.1016/j.contraception.2013.04.002
Boyer, C. B., Shafer, M.-A., Shaffer, R. A., Brodine, S. K., Pollack, L. M., Betsinger, K., … Schachter, J. (2005). Evaluation of a cognitive–behavioral, group, randomized controlled intervention trial to prevent sexually transmitted infections and unintended pregnancies in young women. *Preventive Medicine*, *40*(4), 420–431. https://doi.org/10.1016/J.YPMED.2004.07.004
Bradshaw, C., Pierce, L. I., Tabrizi, S. N., Fairley, C. K., & Garland, S. M. (2005). Screening injecting drug users for sexually transmitted infections and blood borne viruses using street outreach and self collected sampling. *Sexually Transmitted Infection*, *81*, 53–58. https://doi.org/10.1136/sti.2004.009423
Brown, S. (2015). 'They think it's all up to the girls': Gender, risk and responsibility for contraception. *Culture, Health and Sexuality*, *17*(3), 312–325. https://doi.org/10.1080/13691058.2014.950983
Bustamante-Forest, R., & Giarratano, G. (2004). Bustamante-Forest & Giarratano. *Nursing Clinics of North America2*, *39*, 301–318.
Callegari, L. S., Aiken, A. R. A., Dehlendorf, C., Cason, P., & Borrero, S. (2017). Addressing potential pitfalls of reproductive life planning with patient-centered counseling. *American Journal of Obstetrics and Gynecology*, *216*(2), 129–134. https://doi.org/10.1016/j.ajog.2016.10.004
Callegari, L. S., Parisi, S. M., & Schwarz, E. B. (2013). Perceptions of intrauterine contraception among women seeking primary care. *Contraception*, *88*(2), 269–274. https://doi.org/10.1016/j.contraception.2013.02.004
Carter, M. W., Bergdall, A. R., Henry-Moss, D., Hatfield-Timajchy, K., & Hock-Long, L. (2012). A qualitative study of contraceptive understanding among young adults. *Contraception*, *86*(5), 543–550. https://doi.org/10.1016/j.contraception.2012.02.017
Center for Behavioral Health Statistics and Quality. (2018). 2017 National Survey on Drug Use and Health: Detailed tables. *Substance Abuse and Mental Health Services Administration*. Retrieved from https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHDetailedTabs2017/NSDUHDetailedTabs2017.pdf
Centers for Disease Control and Prevention. (2016). Understanding literacy & numeracy. Retrieved September 7, 2018, from https://www.cdc.gov/healthliteracy/learn/UnderstandingLiteracy.html
Centers for Disease Control and Prevention. (2019a). Analysis of the National Vital

Statistics System Multiple Cause of Death data, Wide-ranging OnLine Data for Epidemiologic Research (WONDER). Retrieved from https://wonder.cdc.gov/
Centers for Disease Control and Prevention. (2019b). Key statistics from the National Survey of Family Growth - C listing. Retrieved May 17, 2019, from https://www.cdc.gov/nchs/nsfg/key_statistics/c.htm#everused
Cheng, D., Schwarz, E. B., Douglas, E., & Horon, I. (2009). Unintended pregnancy and associated maternal preconception, prenatal and postpartum behaviors. *Contraception*, *79*(3), 194–198. https://doi.org/10.1016/j.contraception.2008.09.009
Cheng, T. S., Loy, S. L., Cheung, Y. B., Godfrey, K. M., Gluckman, P. D., Kwek, K., … Lek, N. (2016). Demographic characteristics, health behaviors before and during pregnancy, and pregnancy and birth outcomes in mothers with different pregnancy planning status. *Prevention Science*, *17*(8), 960–969. https://doi.org/10.1007/s11121-016-0694-8
Cornford, C. S., Close, H. J., Bray, R., Beere, D., & Mason, J. M. (2015). Contraceptive use and pregnancy outcomes among opioid drug-using women: A retrospective cohort study. *PLoS ONE*, *10*(3), 1–13. https://doi.org/10.1371/journal.pone.0116231
Cornwall, A., & White, S. C. (2000). Men , masculinities and development. *IDS Bulletin*, *31*(2), 1–6. https://doi.org/10.1111/j.1759-5436.2000.mp31002001.x
Corr, T. E., & Hollenbeak, C. S. (2017). The economic burden of neonatal abstinence syndrome in the United States. *Addiction*, *112*(9), 1590–1599. https://doi.org/10.1111/add.13842
Craig, A. D., Dehlendorf, C., Borrero, S., Harper, C. C., & Rocca, C. H. (2014). Exploring young adults' contraceptive knowledge and attitudes: Disparities by race/ethnicity and age. *Women's Health Issues*, *24*(3), e281–e289. https://doi.org/10.1016/J.WHI.2014.02.003
Curtis, K. M., Jatlaoui, T. C., Tepper, N. K., Zapata, L. B., Horton, L. G., Jamieson, D. J., & Whiteman, M. K. (2016). U.S. selected practice recommendations for contraceptive use, 2016. *MMWR Recommendations and Reports*, *65*(4), 1–66. https://doi.org/10.15585/mmwr.rr6504a1
Curtis, K. M., Tepper, N. K., Jatlaoui, T. C., Berry-Bibee, E., Horton, L. G., Zapata, L. B., … Whiteman, M. K. (2016). U.S. medical eligibility criteria for contraceptive use, 2016. *MMWR Recommendations and Reports*, *65*(3), 1–103. https://doi.org/10.15585/mmwr.rr6503a1
Davie-Gray, A., Moor, S., Spencer, C., & Woodward, L. J. (2013). Psychosocial characteristics and poly-drug use of pregnant women enrolled in methadone maintenance treatment. *Neurotoxicology and Teratology*, *38*, 46–52. https://doi.org/10.1016/j.ntt.2013.04.006
Dehlendorf, C., Park, S. Y., Emeremni, C. A., Comer, D., Vincett, K., & Borrero, S. (2014). Racial/ethnic disparities in contraceptive use: Variation by age and women's reproductive experiences. *American Journal of Obstetrics and Gynecology*, *210*(6), 1–9. https://doi.org/10.1016/j.ajog.2014.01.037
Dempsey, A. R., Billingsley, C. C., Savage, A. H., & Korte, J. E. (2012). Predictors of long-acting reversible contraception use among unmarried young adults. *American Journal of Obstetrics and Gynecology*, *206*(6), 526.e1-526.e5. https://doi.org/10.1016/j.ajog.2012.02.014

Dott, M., Rasmussen, S. A., Hogue, C. J., & Reefhuis, J. (2010). Association between pregnancy intention and reproductive health related behaviors before and after pregnancy recognition, National Birth Defects Prevention Study, 1997-2002. *Maternal and Child Health Journal*, *14*(3), 373–381. https://doi.org/10.1007/s10995-009-0458-1

Drennan, M. (1998). *Reproductive health: New perspectives on men's participation*. *Population Reports* (Vol. J). Baltimore, MD.

Dürsteler-MacFarland, K. M., Fischer, D. A., Mueller, S., Schmid, O., Moldovanyi, A., & Wiesbeck, G. A. (2010). Symptom complaints of patients prescribed either oral methadone or injectable heroin. *Journal of Substance Abuse Treatment*, *38*(4), 328–337. https://doi.org/10.1016/j.jsat.2010.01.008

Edelman, N. L., Patel, H., Glasper, A., & Bogen-Johnston, L. (2014). Sexual health risks and health-seeking behaviours among substance-misusing women. *Journal of Advanced Nursing*, *70*(12), 2861–2870. https://doi.org/10.1111/jan.12442

Eisenberg, D. L., Secura, G. M., Madden, T. E., Allsworth, J. E., Zhao, Q., & Peipert, J. F. (2012). Knowledge of contraceptive effectiveness. *American Journal of Obstetrics and Gynecology*, *206*(6), 1–16. https://doi.org/10.1016/j.ajog.2012.04.012

Feaster, D. J., Parish, C. L., Gooden, L., Matheson, T., Castellon, P. C., Duan, R., … Metsch, L. R. (2016). Substance use and STI acquisition: Secondary analysis from the AWARE study. *Drug and Alcohol Dependence*, *169*, 171–179. https://doi.org/10.1016/j.drugalcdep.2016.10.027

Fellenzer, J. L., & Cibula, D. A. (2014). Intendedness of pregnancy and other predictive factors for symptoms of prenatal depression in a population-based study. *Maternal and Child Health Journal*, *18*(10), 2426–2436. https://doi.org/10.1007/s10995-014-1481-4

Fennell, J. L. (2011). Men bring condoms, women take pills: Men's and women's roles in contraceptive decision making. *Gender and Society*, *25*(4), 496–521. https://doi.org/10.2307/23044208

Finer, L. B., & Zolna, M. R. (2016). Declines in unintended pregnancy in the United States, 2008–2011. *New England Journal of Medicine*, *374*(9), 843–852. https://doi.org/10.1056/NEJMsa1506575

Finnegan, L. P., Connaughton, J. F., Kron, R. E., & Emich, J. P. (1975). Neonatal abstinence syndrome: Assessment and management. *Addictive Diseases*, *2*(1–2), 141–158. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/1163358

Fischbein, R. L., Lanese, B. G., Falletta, L., Hamilton, K., King, J. A., & Kenne, D. R. (2018). Pregnant or recently pregnant opioid users: Contraception decisions, perceptions and preferences. *Contraception and Reproductive Medicine*, *3*(4), 1–9. https://doi.org/10.1186/s40834-018-0056-y

Fisher, J. D., & Fisher, W. A. (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, *Ill*(3), 455–474. Retrieved from https://search-proquest-com.ezproxy.uvm.edu/docview/614331123/fulltextPDF/22474D78DFD54299PQ/4?accountid=14679

Forste, B. R., & Morgan, J. (1998). How relationships of U.S. men affect sexually transmitted diseases. *Family Planning Perspectives*, *30*(2), 56–62.

Forste, R. (2003). Where are all the men? A concenptual analysis of the role of men in

family formation. *Journal of Family Issues*, *23*(5), 579–600. https://doi.org/10.1177/0192513x02023005001
Foster, D. G., Bley, J., Mikanda, J., Induni, M., Arons, A., Baumrind, N., … Stewart, F. (2004). Contraceptive use and risk of unintended pregnancy in California. *Contraception*, *70*(1), 31–39. https://doi.org/10.1016/j.contraception.2004.01.012
Foster, D. G., Ralph, L. J., Arons, A., Brindis, C. D., & Harper, C. C. (2007). Trends in knowledge of emergency contraception among women in California, 1999-2004. *Women's Health Issues*, *17*(1), 22–28. https://doi.org/10.1016/j.whi.2006.11.001
Frank, M. L., Poindexter, A. N., & Bateman, L. (1993). Factors associated with the choice of Norplant by women attending subsidized clinics in the US. *Advances in Contraception*, *9*(2), 161–174. https://doi.org/10.1007/BF01990147
Frost, J. J., & Darroch, J. E. (2008). Factors associated with contraceptive choice and inconsistent method use, United States, 2004. *Perspectives on Sexual and Reproductive Health*, *40*(2), 94–104. https://doi.org/10.1363/4009408
Frost, J. J., Lindberg, L. D., & Finer, L. B. (2012). Young adults' contraceptive knowledge, norms and attitudes: Associations with risk of unintended pregnancy. *Perspectives on Sexual and Reproductive Health*, *44*(2), 107–116. https://doi.org/10.1363/4410712
Gavin, L., Moskosky, S., Carter, M., Curtis, K., Glass, E., Godfrey, E., … Zapata, L. (2014). Providing quality family planning strategies: Recommendations of CDC and the U.S. Office of Population Affairs. *MMWR Recommendations and Reports*, *63*(4), 1–54. Retrieved from https://www.cdc.gov/mmwr/pdf/rr/rr6304.pdf
Gilbert, L., El-Bassel, N., Wu, E., & Chang, M. (2007). Intimate partner violence and HIV risks: A longitudinal study of men on methadone. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, *84*(5), 667–680. https://doi.org/10.1007/s11524-007-9214-2
Gilliam, M. L., Warden, M., Goldstein, C., & Tapia, B. (2004). Concerns about contraceptive side effects among young Latinas: A focus-group approach. *Contraception*, *70*(4), 299–305. https://doi.org/10.1016/j.contraception.2004.04.013
Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2008). *Health behavior and health education: Theory, research, and practice* (4rth ed.). San Francisco, CA: Jossey-Bass. Retrieved from http://www.repository.poltekkesmajapahit.ac.id/index.php/E-POL/article/viewFile/595/507
Goodman, M., Onwumere, O., Milam, L., & Peipert, J. F. (2017). Reducing health disparities by removing cost, access, and knowledge barriers. *American Journal of Obstetrics & Gynecology*, *216*(4), 382 e1-5. https://doi.org/10.1016/j.ajog.2016.12.015
Grady, C. D., Dehlendorf, C., Cohen, E. D., Bimla Schwarz, E., & Borrero, S. (2015). Racial and ethnic differences in contraceptive use among women who desire no future children, 2006-2010 National Survey of Family Growth. *Contraception*, *92*, 62–70. https://doi.org/10.1016/j.contraception.2015.03.017
Grady, W. R., Klepinger, D. H., Billy, J. O. G., & Cubbins, L. A. (2010). The role of relationship power in couple decisions about contraception in the US. *Journal of Biosocial Science*, *42*, 307–323. https://doi.org/10.1017/S0021932009990575
Grady, W. R., Tanfer, K., Billy, J. O. G., & Lincoln-Hanson, J. (1996). Men's

perceptions of their roles and responsibilities regarding sex, contraception and childrearing. *Family Planning Perspectives*, *28*(5), 221. https://doi.org/10.2307/2135841

Green, M. E., & Biddlecom, A. E. (2000). Absent and problematic men : Demographic accounts of male reproductive roles. *Population and Development Review*, *26*(1), 81–115.

Grimes, D. A., & Schulz, K. F. (2010). Nonspecific side effects of oral contraceptives: Nocebo or noise? *Contraception*, *83*, 5–9. https://doi.org/10.1016/j.contraception.2010.06.010

Guttmacher Institute. (2016). Contraceptive use in the United States. https://doi.org/10.2307/2134378

Haber, P. S., Elsayed, M., Espinoza, D., Lintzeris, N., Veillard, A. S., & Hallinan, R. (2017). Constipation and other common symptoms reported by women and men in methadone and buprenorphine maintenance treatment. *Drug and Alcohol Dependence*, *181*, 132–139. https://doi.org/10.1016/j.drugalcdep.2017.09.024

Haeger, K. O., Lamme, J., & Cleland, K. (2018). State of emergency contraception in the U.S., 2018. *Contraception and Reproductive Medicine*, *3*(20), 1–12. https://doi.org/10.1186/s40834-018-0067-8

Haight, S. C., Ko, J. Y., Tong, V. T., Bohm, M. K., & Callaghan, W. M. (2018). Opioid use disorder documented at delivery hospitalization-United States, 1999-2014. *MMWR*, *67*(31), 845–849. Retrieved from https://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

Hall, K. S. (2012). The Health Belief Model can guide modern contraceptive behavior research and practice. *Journal of Midwifery & Women's Health*, *57*(1), 74–81. https://doi.org/10.1111/j.1542-2011.2011.00110.x

Hall, K. S., Castaño, P. M., Stone, P. W., & Westhoff, C. (2010). Measuring oral contraceptive knowledge: A review of research findings and limitations. *Patient Education and Counseling*, *81*(3), 388–394. https://doi.org/10.1016/j.pec.2010.10.016

Hall, K. S., Ela, E., Zochowski, M. K., Caldwell, A., Moniz, M., McAndrew, L., … Ernst, S. (2016). "I don't know enough to feel comfortable using them:" Women's knowledge of and perceived barriers to long-acting reversible contraceptives on a college campus. *Contraception*, *93*(6), 556–564. https://doi.org/10.1016/j.contraception.2016.02.007

Hamm, M., Evans, M., Miller, E., Browne, M., Bell, D., & Borrero, S. (2019). "It's her body": Low-income men's perceptions of limited reproductive agency. *Contraception*, *99*(2), 111–117. https://doi.org/10.1016/j.contraception.2018.10.005

Hand, D. J., Short, V. L., & Abatemarco, D. J. (2017). Substance use, treatment, and demographic characteristics of pregnant women entering treatment for opioid use disorder differ by United States census region. *Journal of Substance Abuse Treatment*, *76*, 58–63. https://doi.org/10.1016/j.jsat.2017.01.011

Harding, C., & Ritchie, J. (2003). Contraceptive practice of women with opiate addiction in a rural centre. *Australian Journal of Rural Health*, *11*(1), 2–6. https://doi.org/10.1046/j.1440-1584.2003.00477.x

Hauck, B., & Costescu, D. (2015). Barriers and misperceptions limiting widespread use

of intrauterine contraception among Canadian women. *Journal of Obstetrics and Gynaecology Canada*, *37*(7), 606–616. https://doi.org/10.1016/S1701-2163(15)30198-5

Haynes, M. C., Ryan, N., Saleh, M., Winkel, A. F., & Ades, V. (2017). Contraceptive knowledge assessment: Validity and reliability of a novel contraceptive research tool. *Contraception*, *95*, 190–197. https://doi.org/10.1016/j.contraception.2016.09.002

Hedegaard, H., Warner, M., & Minino, A. M. (2017). *Drug overdose deaths in the United States, 1999-2016*. *NCHS Data Brief*. Hyattsville, MD. Retrieved from https://www.cdc.gov/nchs/data/databriefs/db294_table.pdf#3.%0Ahttps://www.cdc.gov/nchs/data/databriefs/db294.pdf

Heil, S. H., Hand, D. J., Sigmon, S. C., Badger, G. J., Meyer, M. C., & Higgins, S. T. (2016). Using behavioral economic theory to increase use of effective contraceptives among opioid-maintained women at risk of unintended pregnancy. *Preventive Medicine*, *92*, 62–67. https://doi.org/10.1016/j.ypmed.2016.06.023

Heil, S. H., Jones, H. E., Arria, A., Kaltenbach, K., Coyle, M., Fischer, G., … Martin, P. R. (2011). Unintended pregnancy in opioid-abusing women. *Journal of Substance Abuse Treatment*, *40*(2), 199–202. https://doi.org/10.1016/j.jsat.2010.08.011

Hladky, K. J., Allsworth, J. E., Madden, T., Secura, G. M., & Peipert, J. F. (2011). Women's knowledge about intrauterine contraception. *Obstetrics and Gynecology*, *117*(1), 48–54. https://doi.org/10.1097/AOG.0B013E318202B4C9

Jaccard, J., Helbig, D. W., Wan, C. K., Gutman, M. A., & Kritz-Silverstein, D. C. (1996). The prediction of accurate contraceptive use from attitudes and knowledge. *Health Education Quarterly*, *23*(1), 17–33. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/8822399

Jackson, A. V., Wang, L.-F., & Morse, J. (2017). Racial and ethnic differences in contraception use and obstetric outcomes: A review. *Seminars in Perinatology*, *41*(5), 273–277. https://doi.org/10.1053/j.semperi.2017.04.003

James-Hawkins, L., Dalessandro, C., & Sennott, C. (2019). Conflicting contraceptive norms for men: equal responsibility versus women's bodily autonomy. *Culture, Health & Sexuality*, *21*(3), 263–277. https://doi.org/10.1080/13691058.2018.1464209

Jarlenski, M., Barry, C. L., Gollust, S., Graves, A. J., Kennedy-Hendricks, A., & Kozhimannil, K. (2017). Polysubstance use among US women of reproductive age who use opioids for nonmedical reasons. *American Journal of Public Health*, *107*(10), 1308–1310. Retrieved from http://ajph.aphapublications.org.ezproxy.uvm.edu/doi/pdf/10.2105/AJPH.2017.303825

Johnston, T. A., & Howie, P. W. (1985). Potential use of postcoital contraception to prevent unwanted pregnancy. *British Medical Journal*, *290*(April), 1040–1041.

Jones, H.E., Tuten, M., Keyser-Marcus, L., & Svikis, D. S. (2006). Specialty treatment for women. In C. Strain & M. L. Stitzer (Eds.), *The treatment of opioid dependence* (pp. 455–484). Baltimore, MD: Johns Hopkins University Press.

Jones, Hendrée E, Kaltenbach, K., Heil, S. H., Stine, S. M., Coyle, M. G., Arria, A. M., … Fischer, G. (2010). Neonatal abstinence syndrome after methadone or

buprenorphine exposure. *The New England Journal of Medicine*, *363*(24), 2320–2331. https://doi.org/10.1056/NEJMoa1005359

Jones, R. K., Darroch, J. E., & Henshaw, S. K. (2002). Contraceptive use among US women having abortions in 2000-2001. *Perspectives on Sexual and Reproductive Health*, *34*(6), 294–303.

Kakaiya, R., Lopez, L. L., & Nelson, A. L. (2017). Women's perceptions of contraceptive efficacy and safety. *Contraception and Reproductive Medicine*, *2*(1), 19. https://doi.org/10.1186/s40834-017-0046-5

Kavanaugh, M. L., & Jerman, J. (2018). Contraceptive method use in the United States: Trends and characteristics between 2008, 2012 and 2014. *Contraception*, *97*, 14–21. https://doi.org/10.1016/j.contraception.2017.10.003

Kaye, K., Suellentrop, K., & Sloup, C. (2009). *The Fog Zone: How misperceptions, magical thinking, and ambivalence put young adults at risk for unplanned pregnancy*. Washington DC. Retrieved from https://powertodecide.org/what-we-do/information/resource-library/fog-zone

Kelty, E., & Hulse, G. (2017). A retrospective cohort study of birth outcomes in neonates exposed to naltrexone in utero: A comparison with methadone-, buprenorphine- and non-opioid-exposed neonates. *Drugs*, *77*(11), 1211–1219. https://doi.org/10.1007/s40265-017-0763-8

Killick, S. R., Leary, C., Trussell, J., & Guthrie, K. A. (2011). Sperm content of pre-ejaculatory fluid. *Human Fertility*, *14*(1), 48–52. https://doi.org/10.3109/14647273.2010.520798

Kim, T. Y., Dagher, R. K., & Chen, J. (2016). Racial/ethnic differences in unintended pregnancy: Evidence from a national sample of U.S. women. *American Journal of Preventive Medicine*, *50*(4), 427–435. https://doi.org/10.1016/j.amepre.2015.09.027

Kollar, L. M., Biro, F. M., Boehner, C. W., & Rosenthal, S. L. (2000). Barriers to adolescent adherence to contraception. Knowledge of depo provera timing. *Journal of Pediatric and Adolescent Gynecology*, *13*(2), 92. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10869981

Kozhimannil, K. B., Graves, A. J., Jarlenski, M., Kennedy-Hendricks, A., Gollust, S., & Barry, C. L. (2017). Non-medical opioid use and sources of opioids among pregnant and non-pregnant reproductive-aged women. *Drug and Alcohol Dependence*, *174*, 201–208. https://doi.org/10.1002/jmri.25711.PET/MRI

Kozhimannil, K. B., Graves, A. J., Levy, R., & Patrick, S. W. (2017). Nonmedical use of prescription opioids among pregnant U.S. women. *Women's Health Issues*, *27*(3), 308–315. https://doi.org/10.1016/j.whi.2017.03.001

Krans, E. E., Kim, J. Y., Everette, A., Iii, J., Kelley, D. K., & Jarlenski, M. (2018). Postpartum contraceptive use and interpregnancy interval among women with opioid use disorder. *Drug and Alcohol Dependence*, *185*, 207–213. https://doi.org/10.1016/j.drugalcdep.2017.12.023

Krans, E. E., & Patrick, S. W. (2016). Opioid use disorder in pregnancy: Health policy and practice in the midst of an epidemic. *Obstetrics and Gynecology*, *128*(1), 4–10. https://doi.org/10.1097/AOG.0000000000001446

Kreitinger, C., Gutierrez, H., Hamidovic, A., Schmitt, C., Sarangarm, P., Rayburn, W. F., … Bakhireva, L. N. (2016). The effect of prenatal alcohol co-exposure on

neonatal abstinence syndrome in infants born to mothers in opioid maintenance treatment. *Journal of Maternal, Fetal & Neonatal Medicine*, *29*(5), 783–788. https://doi.org/10.3109/14767058.2015.1018168

Landry, D. J., & Camelo, T. M. (1994). Young unmarried men and women discuss men's role in contraceptive practice. *Family Planning Perspectives*, *26*(5), 222–227. https://doi.org/10.2307/2135943

Leeman, L. (2007). Medical barriers to effective contraception. *Obstetrics and Gynecology Clinics of North America*, *34*(1), 19–29. https://doi.org/10.1016/j.ogc.2007.01.003

Levinson, R. A. (1995). Reproductive and contraceptive knowledge, contraceptive self-efficacy, and contraceptive behavior among teenage women. *Adolescence*, *30*(117), 65–85. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7625265

Lewis, M. W., Wu, L., & Ethelyn Strong, T. R. (2017). A comparison of opioid using women attending high risk prenatal clinic versus a regular OB clinic. *Journal of Drug Abuse*, *3*(3), 16. https://doi.org/10.21767/2471-853X.100056

Lindberg, L., Maddow-Zimet, I., Kost, K., & Lincoln, A. (2015). Pregnancy intentions and maternal and child health: An analysis of longitudinal data in Oklahoma. *Maternal and Child Health Journal*, *19*(5), 1087–1096. https://doi.org/10.1007/s10995-014-1609-6

Lopez, L. M., Grey, T. W., Chen, M., Tolley, E. E., & Stockton, L. L. (2016). Theory-based interventions for contraception. *Cochrane Database of Systematic Review*, (11), 1–134. https://doi.org/10.1002/14651858.CD007249.pub5.www.cochranelibrary.com

Lundsberg, L. S., Pal, L., Gariepy, A. M., Xu, X., Chu, M. C., & Illuzzi, J. L. (2014). Knowledge, attitudes, and practices regarding conception and fertility: A population-based survey among reproductive-age United States women. *Fertility and Sterility*, *101*(3), 767-774.e2. https://doi.org/10.1016/j.fertnstert.2013.12.006

Mackin, M. L., Clark, M. K., McCarthy, A. M., & Farris, K. (2015). Knowledge and use of emergency contraception in college women. *Western Journal of Nursing Research*, *37*(4), 462–480. https://doi.org/10.1177/0193945914551005

Marcell, A. V, Gibbs, S. E., Choiriyyah, I., Sonenstein, F. L., Astone, N. M., Pleck, J. H., & Dariotis, J. K. (2016). National needs of family planning among US men aged 15 to 44 years. *American Journal of Public Health*, *106*(4), 733–739. https://doi.org/10.2105/AJPH.2015.303037

Marshall, C., Kandahari, N., & Raine-Bennett, T. (2018). Exploring young women's decisional needs for contraceptive method choice: A qualitative study. *Contraception*, *97*, 243–248. https://doi.org/10.1016/j.contraception.2017.10.004

Marteau, T. M., Hollands, G. J., & Kelly, M. P. (2015). Changing population behavior and reducing health disparities: Exploring the potential of "choice architecture" interventions. In R. M. Kaplan, M. Spittel, & D. H. David (Eds.), *Emerging behavioral and social science perspectives on population health* (pp. 105–126). Bethesda, M.D.: National Institutes of Health/Agency For Healthcare Research and Quality. Retrieved from https://www.researchgate.net/profile/Michael_Spittel/publication/311734534_Population_Health_Behavioral_and_Social_Science_Insights/links/58582f3c08aeffd7c4fb

b370/Population-Health-Behavioral-and-Social-Science-Insights.pdf#page=395
Martin, C. E., Longinaker, N., & Terplan, M. (2015). Recent trends in treatment admissions for prescription opioid abuse during pregnancy. *Journal of Substance Abuse Treatment*, *48*(1), 37–42. https://doi.org/10.1016/j.jsat.2014.07.007
Martins, S. S., Sarvet, A., Santaella-Tenorio, J., Saha, T., Grant, B. F., & Hasin, D. S. (2017). Changes in US lifetime heroin use and heroin use disorder prevalence from the 2001-2002 to 2012-2013 National Epidemiologic Survey on Alcohol and Related Conditions. *JAMA Psychiatry*, *74*(5), 445–455. https://doi.org/10.1001/jamapsychiatry.2017.0113
Matteson, P. S., & Hawkins, J. W. (1997). Women's patterns of contraceptive use. *Health Care for Women International*, *18*(5), 455–466. https://doi.org/10.1080/07399339709516300
Matusiewicz, A. K., Melbostad, H. S., & Heil, S. H. (2017). Knowledge of and concerns about long-acting reversible contraception among women in medication-assisted treatment for opioid use disorder. *Contraception*, *96*, 365–369. https://doi.org/10.1016/j.contraception.2017.07.167
Maxwell, L., Devries, K., Zionts, D., Alhusen, J. L., & Campbell, J. (2015). Estimating the effect of intimate partner violence on women's use of contraception: a systematic review and meta-analysis. *PloS One*, *10*(2), e0118234. https://doi.org/10.1371/journal.pone.0118234
McCrory, C., & McNally, S. (2013). The effect of pregnancy intention on maternal prenatal behaviours and parent and child health: results of an Irish cohort study. *Paediatric and Perinatal Epidemiology*, *27*(2), 208–215. https://doi.org/10.1111/ppe.12027
Merchant, R. C., Casadei, K., Gee, E. M., Bock, B. C., Becker, B. M., & Clark, M. A. (2007). Patients' emergency contraception comprehension, usage, and view of the emergency department role for emergency contraception. *Journal of Emergency Medicine*, *33*(4), 367–375. https://doi.org/10.1016/j.jemermed.2007.02.031
Meschke, L. L., McNeely, C., Brown, K. C., & Prather, J. M. (2018). Reproductive health knowledge, attitudes, and behaviors among women enrolled in medication-assisted treatment for opioid use disorder. *Journal of Women's Health*, *27*(10), jwh.2017.6564. https://doi.org/10.1089/jwh.2017.6564
Metz, V. E., Brown, Q. L., Martins, S. S., & Palamar, J. J. (2018). Characteristics of drug use among pregnant women in the United States: Opioid and non-opioid illegal drug use. *Drug and Alcohol Dependence*, *183*, 261–266. https://doi.org/10.1016/j.drugalcdep.2017.11.010
Michie, S., West, R., Campbell, R., Brown, J., & Gainforth, H. (2014). *ABCs of behaviour change theories*. Great Britain: Silverback Publishing.
Moore, A., Ryan, S., & Stamm, C. (2018). Seeking emergency contraception in the United States: A review of access and barriers. *Women & Health*, 1–11. https://doi.org/10.1080/03630242.2018.1487905
Moreau, C., Cleland, K., & Trussell, J. (2007). Contraceptive discontinuation attributed to method dissatisfaction in the United States. *Contraception*, *76*(4), 267–272. https://doi.org/10.1016/j.contraception.2007.06.008
Morrison, C. L., Ruben, S. M., & Beeching, N. J. (1995). Female sexual health problems

in a drug dependency unit. *International Journal of STD & AIDS*, *6*(3), 201–203. https://doi.org/10.1177/095646249500600311

Mosher, W., Jones, J., & Abma, J. (2015). Nonuse of contraception among women at risk of unintended pregnancy in the United States. *Contraception*, *92*(2), 170–176. https://doi.org/10.1016/j.contraception.2015.05.004

Nelson, A. L., & Jaime, C. M. (2009). Accuracy of information given by Los Angeles County pharmacies about emergency contraceptives to sham patient in need. *Contraception*, *79*(3), 206–210. https://doi.org/10.1016/J.CONTRACEPTION.2008.10.003

Nettleman, M. D., Chung, H., Brewer, J., Ayoola, A., & Reed, P. L. (2007). Reasons for unprotected intercourse: Analysis of the PRAMS survey. *Contraception*, *75*(5), 361–366. https://doi.org/10.1016/j.contraception.2007.01.011

Nguyen, B. T., & Zaller, N. (2009). Male access to over-the-counter emergency contraception. A survey of acceptability and barriers in Providence, Rhode Island. *Women's Health Issues*, *19*(6), 365–372. https://doi.org/10.1016/j.whi.2009.07.003

Novak, S. P., Ball, E. L., Winstock, A., & Peiper, N. (2016). The prevalence of common infectious diseases among nonmedical prescription opioid users: Preliminary findings from the national prescription opioid misuse, abuse, and diversion (NOMAD) study. *Epidemiology: Open Access*, *05*(04). https://doi.org/10.4172/2161-1165.1000205

Olsen, A., Banwell, C., & Madden, A. (2014). Contraception, punishment and women who use drugs. *BMC Women's Health*, *14*, 5. https://doi.org/10.1186/1472-6874-14-5

Olsen, Y., & Sharfstein, J. M. (2014). Confronting the stigma of opioid use disorder - and its treatment. *The Journal of the American Medical Association*, *311*(14), 1393–1394. https://doi.org/10.1001/jama.2014.2147.

Orr, S. T., James, S. A., & Reiter, J. P. (2008). Unintended pregnancy and prenatal behaviors among urban, black women in Baltimore, Maryland: The Baltimore preterm birth study. *Annals of Epidemiology*, *18*(7), 545–551. https://doi.org/10.1016/j.annepidem.2008.03.005

Oudshoorn, N. (2004). "Astronauts in the Sperm World." The renegotiation of masculine identities in discourses on male contraceptives. *Men and Masculinities*, *6*(4), 349–367. https://doi.org/10.1177/1097184x03260959

Pallone, S. R., & Bergus, G. R. (2009). Fertility awareness-based methods: Another option for family planning. *Journal of the American Board of Family Medicine*, *22*(2), 147–157. https://doi.org/10.3122/jabfm.2009.02.080038

Pan, I.-J., & Yi, H.-Y. (2013). Prevalence of hospitalized live births affected by alcohol and drugs and parturient women diagnosed with substance abuse at liveborn delivery: United States, 1999-2008. *Maternal Child Health Journal*, *17*(4), 667–676. https://doi.org/10.1007/s10995-012-1046-3

Parlier, A. B., Fagan, B., Ramage, M., & Galvin, S. (2014). Prenatal care, pregnancy outcomes, and postpartum birth control plans among pregnant women with opiate addictions. *Southern Medical Journal*, *107*(11), 676–683. https://doi.org/10.14423/SMJ.0000000000000189

Patrick, S., Kaplan, H., Passarella, M., Davis, M., & Lorch, S. (2014). Variation in

treatment of neonatal abstinence syndrome in US children's hospitals, 2004–2011. *Journal of Perinatology*, *34*, 867–872. https://doi.org/10.1038/jp.2014.114

Patrick, S. W., Dudley, J., Martin, P. R., Harrell, F. E., Warren, M. D., Hartmann, K. E., … Cooper, W. O. (2015). Prescription opioid epidemic and infant outcomes. *Pediatrics*, *135*(5), 842–850. https://doi.org/10.1542/peds.2014-3299

Patrick, Stephen W, Davis, M. M., Lehman, C. U., & Cooper, W. O. (2015). Increasing incidence and geographical distribution of neonatal abstinence syndrome: United States 2009-2012. *Journal of Perinatology*, *35*(8), 650–655. https://doi.org/10.1038/jp.2015.36.Increasing

Patrick, Stephen W, Schumacher, R. E., Horbar, J. D., Buus-Frank, M. E., Edwards, E. M., Morrow, K. A., … Soll, R. F. (2016). Improving care for neonatal abstinence syndrome. *Pediatrics*, *137*(5), e20153835. Retrieved from http://pediatrics.aappublications.org/content/pediatrics/137/5/e20153835.full.pdf

Pazol, K., Zapata, L. B., Dehlendorf, C., Malcolm, N. M., Rosmarin, R. B., & Frederiksen, B. N. (2018). Impact of contraceptive education on knowledge and decision making: An updated systematic review. *American Journal of Preventive Medicine*, *55*(5), 703–715. https://doi.org/10.1016/j.amepre.2018.07.012

Poulton, G., Parlier, A. B., Scott, K. R., Fagan, E. B., & Shelley, L. (2015). Contraceptive choices for reproductive age women at methadone clinics in western North Carolina. *MAHEC Online Journal of Research*, *2*(2), 1–11.

Pritt, N. M., Norris, A. H., & Berlan, E. D. (2017). Barriers and facilitators to adolescents' use of long-acting reversible contraceptives. *Journal of Pediatric and Adolescent Gynecology*, *30*(1), 18–22. https://doi.org/10.1016/j.jpag.2016.07.002

Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research & Practice*, *19*(3), 276–288. https://doi.org/10.1037/h0088437

Prochaska, J. O., & DiClemente, C. C. (1986). Toward a comprehensive model of change. In *Treating addictive behaviors* (pp. 3–27). Boston, MA: Springer US. https://doi.org/10.1007/978-1-4613-2191-0_1

Pruitt, S. L., & Mullen, P. D. (2005). Contraception or abortion? Inaccurate descriptions of emergency contraception in newspaper articles, 1992–2002. *Contraception*, *71*(1), 14–21. https://doi.org/10.1016/J.CONTRACEPTION.2004.07.012

Ralph, N., & Spigner, C. (1986). Contraceptive practices among female heroin addicts. *American Journal of Public Health*, *76*(8), 1016–1017. https://doi.org/10.2105/AJPH.76.8.1016

Rassi, A., Wattimena, J., & Black, K. (2013). Pregnancy intention in an urban Australian antenatal population. *Australian and New Zealand Journal of Public Health*, *37*(6), 568–573. https://doi.org/10.1111/1753-6405.12098

Reece, M., Herbenick, D., Schick, V., Sanders, S. A., Dodge, B., & Fortenberry, J. D. (2010). Condom use rates in a national probability sample of males and females ages 14 to 94 in the United States. *Journal of Sexual Medicine*, *7*(S5), 266–276. https://doi.org/10.1111/j.1743-6109.2010.02017.x

Richards, M. J., Peters, M., Sheeder, J., & Kaul, P. (2016). Contraception and adolescent males: An opportunity for providers. *Journal of Adolescent Health*, *58*(3), 366–368. https://doi.org/10.1016/j.jadohealth.2015.10.011

Righarts, A., Dickson, N. P., Parkin, L., & Gillett, W. R. (2017). Ovulation monitoring and fertility knowledge: Their relationship to fertility experience in a cross-sectional study. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, *57*(4), 412–419. https://doi.org/10.1111/ajo.12606

Roberts, S. C. M., & Pies, C. (2011). Complex calculations: How drug use during pregnancy becomes a barrier to prenatal care. *Maternal and Child Health Journal*, *15*(3), 333–341. https://doi.org/10.1007/s10995-010-0594-7

Robinowitz, N., Muqueeth, S., Scheibler, J., Salisbury-Afshar, E., & Terplan, M. (2016). Family planning in substance use disorder treatment centers: Opportunities and challenges. *Substance Use & Misuse*, *51*(11), 1477–1483. https://doi.org/10.1080/10826084.2016.1188944

Rollnick, S., Butler, C. C., Kinnersley, P., Gregory, J., & Mash, B. (2010). Motivational interviewing. *British Medical Journal*, *340*(7758), 1242–1245. https://doi.org/10.1136/BMJ.C1900

Rosenberg, M. J., Waugh, M. S., & Meehan, T. E. (1995). Use and misuse of oral contraceptives: Risk indicators for poor pill taking and discontinuation. *Contraception*, *51*, 283–288. https://doi.org/10.1016/0010-7824(95)00074-K

Rosenfeld, E., Callegari, L. S., Sileanu, F. E., Zhao, X., Schwarz, E. B., Mor, M. K., & Borrero, S. (2017). Racial and ethnic disparities in contraceptive knowledge among women veterans in the ECUUN study. *Contraception*, *96*(1), 54–61. https://doi.org/10.1016/j.contraception.2017.03.008

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education Quarterly*, *15*(2), 175–183. Retrieved from http://journals.sagepub.com.ezproxy.uvm.edu/doi/pdf/10.1177/109019818801500203

Rudd, R. A., Aleshire, N., Zibbell, J. E., & Matthew Gladden, R. (2016). Increases in drug and opioid overdose deaths-United States, 2000-2014. *American Journal of Transplantation*, *16*(4), 1323–1327. https://doi.org/10.1111/ajt.13776

Ryan, P. (2009). Integrated theory of health behavior change: Background and intervention development. *Clinical Nurse Specialist*, *23*(3), 161–172. https://doi.org/10.1097/NUR.0b013e3181a42373

Saia, K., Bagley, S. M., Wachman, E. M., Patel, P. P., Nadas, M. D., & Brogly, S. B. (2017). Prenatal treatment for opioid dependency: Observations from a large inner-city clinic. *Addiction Science & Clinical Practice*, *12*(5), 1–8. https://doi.org/10.1186/s13722-016-0070-9

Sallis, J. F., & Owen, N. (2015). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, practice* (5th ed., pp. 43–64). San Francisco, CA: John Wiley & Sons, Inc.

Santelli, J., Rochat, R., Hatfield-Timajchy, K., Gilber, B. C., Curtis, K., Cabral, R., … Schieve, L. (2003). The measurement and meaning of unintended pregnancy. *Perspectives on Sexual and Reproductive Health*, *35*(2), 94–101. Retrieved from https://www.guttmacher.org/sites/default/files/article_files/3509403.pdf

Santen, F. J., Sofsky, J., Bilic, N., & Lippert, R. (1975). Mechanism of action of narcotics in the production of menstrual dysfunction in women. *Fertility and Sterility*, *26*(6), 538–548. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/236938

Schmittner, J., Schroeder, J. R., Epstein, D. H., & Preston, K. L. (2005). Menstrual cycle length during methadone maintenance. *Addiction*, *100*(6), 829–836. https://doi.org/10.1111/j.1360-0443.2005.01091.x

Schrager, S. M., Olson, J., Beharry, M., Belzer, M., Goldsich, K., Desai, M., & Clark, L. F. (2015). Young men and the morning after: A missed opportunity for emergency contraception provision? *Journal of Family Planning and Reproductive Health Care*, *41*, 33–37. https://doi.org/10.1136/jfprhc-2013-100617

Seth, P., Rudd, R. A., Noonan, R. K., & Haegerich, T. M. (2018). Quantifying the epidemic of prescription opioid overdose deaths. *American Journal of Public Health*, *108*(4), 500–502. https://doi.org/10.2105/AJPH.2017.304265

Shoupe, D. (2016). LARC methods: Entering a new age of contraception and reproductive health. *Contraception and Reproductive Medicine*, *1*(1), 4. https://doi.org/10.1186/s40834-016-0011-8

Silverman, J., Torres, A., & Forrest, J. D. (1987). Barriers to contraceptive services. *Family Planning Perspectives*, *19*(3), 94–97, 101–102.

Smith, C., Morse, E., & Busby, S. (2019). Barriers to reproductive healthcare for women with opioid use disorder. *The Journal of Perinatal & Neonatal Nursing*, *33*(2), E3–E11. https://doi.org/10.1097/JPN.0000000000000401

Smoley, B. A., & Robinson, C. M. (2012). Natural family planning. *American Family Physician*, *86*(10), 924–928. Retrieved from http://web.b.ebscohost.com/abstract?site=ehost&scope=site&jrnl=0002838X&AN=83071614&h=iNiAvo7xNS8qO8gWhooLdHPr%2FkUtCnjnfeh6ZJjb3btWwy6VZxT7%2FYge4G0Moa2n9Q%2BPGuWB9j1S2FPjyKiaCQ%3D%3D&crl=c&resultLocal=ErrCrlNoResults&resultNs=Ehost&crlhashurl=login.aspx

Sobell, L. C., & Sobell, M. B. (2013). *Group therapy with substance use disorder: A motivational cognitive behavioral approach*. New York: Guilford Press. Retrieved from http://www.nova.edu/gsc/online_files.html.

Sonfield, A., Hasstedt, K., & Gold, R. B. (2014). *Moving forward: Family planning in the era of health reform*. New York: Guttmacher Institute. Retrieved from https://www.guttmacher.org/sites/default/files/report_pdf/family-planning-and-health-reform.pdf

Sternberg, P., & Hubley, J. (2004). Evaluating men's involvement as a strategy in sexual and reproductive health promotion. *Health Promotion International*, *19*(3), 389–396. https://doi.org/10.1093/heapro/dah312

Stewart, M., Ritter, T., Bateson, D., McGeechan, K., & Weisberg, E. (2017). Contraception - what about the men? Experience, knowledge and attitudes: A survey of 2438 heterosexual men using an online dating service. *Sexual Health*, *14*, 533–539. https://doi.org/10.1071/SH16235

Substance Abuse and Mental Health Services Administration. Center for Behavioral Health Statistics and Quality. (2017). *Treatment Episode Data Set (TEDS): 2005-2015. National admissions to substance abuse treatment services. BHSIS Series S-91, HHS Publication No. (SMA) 17-5037*. Rockville, MD. https://doi.org/10.3886/ICPSR24280.v6

Substance Abuse and Mental Health Services Administration. (2015). Certification of opioid treatment programs (OTPs). Retrieved from

https://www.samhsa.gov/medication-assisted-treatment/opioid-treatment-programs
Substance Abuse and Mental Health Services Administration. (2018). Clinical guidance for treating pregnant and parenting women with opioid use disorder and their infants. *HHS Publication, (SMA)*(18–5054), 1–165. Retrieved from https://store.samhsa.gov/shin/content//SMA18-5054/SMA18-5054.pdf
Tanfer, K. (1994). Knowledge, attitudes and intentions of American women regarding the hormonal implant. *Family Planning Perspectives*, *26*(2), 60–65. https://doi.org/10.2307/2136003
Tapales, A., Douglas-Hall, A., & Whitehead, H. (2018). The sexual and reproductive health of foreign-born women in the United States. *Contraception*, *98*(1), 47–51. https://doi.org/10.1016/j.contraception.2018.02.003
Terplan, M., Hand, D. J., Hutchinson, M., Salisbury-Afshar, E., & Heil, S. H. (2015). Contraceptive use and method choice among women with opioid and other substance use disorders: A systematic review. *Preventive Medicine*, *80*, 23–31. https://doi.org/http://dx.doi.org/10.1016/j.ypmed.2015.04.008
Tolia, V. N., Patrick, S. W., Bennett, M. M., Murthy, K., Sousa, J., Smith, P. J., … Spitzer, A. R. (2015). Increasing incidence of the neonatal abstinence syndrome in U.S. neonatal ICUs. *New England Journal of Medicine*, *372*(22), 2118–2126. https://doi.org/10.1056/NEJMsa1500439
Tough, S. C., Vekved, M., & Newburn-Cook, C. (2012). Do factors that influence pregnancy planning differ by maternal age? A population-based survey. *Journal of Obstetrics and Gynaecology Canada*, *34*(1), 39–46. Retrieved from https://www-clinicalkey-com.ezproxy.uvm.edu/service/content/pdf/watermarked/1-s2.0-S1701216316351325.pdf?locale=en_US
Trussell, J., & Aiken, A. R. A. (2018). Contraceptive efficacy. In Robert A. Hatcher, A. L. Nelson, J. Trussell, C. Cwiak, P. Cason, M. S. Policar, … J. M. Marrazzo (Eds.), *Contraceptive technology* (21st ed., pp. 829–928). New York, NY: Ayer Company Publishers, Inc.
Trussell, J., Aiken, A. R. A., Micks, E., & Guthrie, K. A. (2018). Efficacy, safety, and personal considerations. In R.A. Hatcher, A. L. Nelson, J. Trussell, C. Cwiak, P. Cason, M. S. Policar, … D. Kowal (Eds.), *Contraceptive technology* (21st ed., pp. 95–128). New York, NY: Ayer Company Publishers, Inc.
Trussell, James. (2017). Validated contraceptive knowledge assessment. *Contraception*, *96*(4), 260. https://doi.org/10.1016/j.contraception.2017.05.018
Trussell, James, Cleland, K., & Schwarz, E. B. (2018). Emergency contraception. In Robert A. Hatcher, A. L. Nelson, J. Trussell, C. Cwiak, P. Cason, M. S. Policar, … J. M. Marrazzo (Eds.), *Contraceptive technology* (21st ed., pp. 329–366). New York, NY: Ayer Company Publishers, Inc.
Trussell, James, Raymond, E. G., & Cleland, K. (2018). *Emergency contraception: A last chance to prevent unintended pregnancy*. Princeton, NJ. Retrieved from http://ec.princeton.edu/questions/ec-review.pdf
Trussell, James, Stewart, F., Guest, F., & Hatcher, R. A. (1992). Emergency contraceptive pills: A simple proposal to reduce unintended pregnancies. *Family Planning Perspectives*, *24*(6), 269–273. https://doi.org/10.2307/2135857
Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases.

Science, *185*(4157), 1124–1131. Retrieved from http://psiexp.ss.uci.edu/research/teaching/Tversky_Kahneman_1974.pdf

U.S. Food & Drug Administration. (2016). Postmarket drug safety information for patients and providers - Plan B (0.75mg levonorgestrel) and Plan B One-Step (1.5 mg levonorgestrel) tablets information. Retrieved February 19, 2018, from https://www.fda.gov/Drugs/DrugSafety/PostmarketDrugSafetyInformationforPatientsandProviders/ucm109775.htm

US Census Bureau. (2018). QuickFacts: Vermont. Retrieved from https://www.census.gov/quickfacts/VT

US Department of Health and Human Services. (2017). HHS acting Secretary declares Public Health Emergency to address national opioid crisis. Retrieved from https://www.hhs.gov/about/news/2017/10/26/hhs-acting-secretary-declares-public-health-emergency-address-national-opioid-crisis.html

USAID. (2015). *Condom fact sheet*. Retrieved from https://www.usaid.gov/sites/default/files/documents/1864/condomfactsheet.pdf

Vermont Department of Health. (2018). *Vermont household health insurance survey: 2018 report*. Retrieved from http://www.healthvermont.gov/sites/default/files/documents/pdf/VHHIS_Report_2018.pdf

Waknine, Y. (2005). *FDA safety changes : ParaGard Copper T 380A*. Retrieved from https://www.medscape.org/viewarticle/520576

Welle-Strand, G. K., Skurtveit, S., Jones, H. E., Waal, H., Bakstad, B., Bjarkø, L., & Ravndal, E. (2013). Neonatal outcomes following in utero exposure to methadone or buprenorphine: A national cohort study of opioid-agonist treatment of pregnant women in Norway from 1996 to 2009. *Drug and Alcohol Dependence*, *127*(1–3), 200–206. https://doi.org/10.1016/j.drugalcdep.2012.07.001

Welle-Strand, G. K., Skurtveit, S., Tanum, L., Waal, H., Bakstad, B., Bjarkø, L., & Ravndal, E. (2015). Tapering from methadone or buprenorphine during pregnancy: Maternal and neonatal outcomes in Norway 1996-2009. *European Addiction Research*, *21*(5), 253–261. https://doi.org/10.1159/000381670

Whiteman, V. E., Salemi, J. L., Mogos, M. F., Cain, M. A., Aliyu, M. H., & Salihu, H. M. (2014). Maternal opioid drug use during pregnancy and its impact on perinatal morbidity, mortality, and the costs of medical care in the United States. *Journal of Pregnancy*, *2014*, 906723. https://doi.org/10.1155/2014/906723

Widman, L., Welsh, D. P., McNulty, J. K., & Little, K. C. (2006). Sexual communication and contraceptive use in adolescent dating couples. *The Journal of Adolescent Health* , *39*(6), 893–899. https://doi.org/10.1016/j.jadohealth.2006.06.003

Wigginton, B., Harris, M. L., Loxton, D., & Lucke, J. (2018). Who takes responsibility for contraception, according to young Australian women? *Sexual and Reproductive Healthcare*, *15*, 2–9. https://doi.org/10.1016/j.srhc.2017.11.001

Winkelman, T. N. A., Chang, V. W., & Binswanger, I. A. (2018). Health, polysubstance use, and criminal justice involvement among adults with varying levels of opioid use. *JAMA Network Open*, *1*(3), e180558. https://doi.org/10.1001/jamanetworkopen.2018.0558

Winkelman, T. N. A., Villapiano, N., Kozhimannil, K. B., Davis, M. M., & Patrick, S. W.

(2018). Incidence and costs of neonatal abstinence syndrome among infants with Medicaid: 2004 – 2014. *Pediatrics*, *141*(4), e20173520. https://doi.org/10.1542/peds.2017-3520

Yazdy, M. M., Desai, R. J., & Brogly, S. B. (2015). Prescription opioids in pregnancy and birth outcomes: A review of the literature therapeutic use and prescribing patterns of opioids. *Journal of Pediatric Genetics*, *4*(2), 56–70. https://doi.org/10.1055/s-0035-1556740

Yen, S., Parmar, D. D., Lin, E. L., & Ammerman, S. (2015). Emergency contraception pill awareness and knowledge in uninsured adolescents: High rates of misconceptions concerning indications for use, side effects, and access. *Journal of Pediatric and Adolescent Gynecology*, *28*(5), 337–342. https://doi.org/10.1016/j.jpag.2014.09.018

Zelnik, M., & Kantner, J. F. (1979). Reasons for nonuse of contraception by sexually active women aged 15-19. *Family Planning Perspectives*, *11*(5), 289–296.

Zieman, M., Hatcher, R. A., Allen, A. Z., Lathrop, E., & Haddad, L. (2016). *Managing contraception 2016* (13th ed.). Tiger, Georgia: Bridging The Gap Foundation.

Zolna, M. R., Lindberg, L. D., & Frost, J. J. (2011). *Couple-focused services in publicly funded family planning clinics: Identifying the need*. New York, NY. Retrieved from https://www.guttmacher.org/sites/default/files/report_pdf/couples-services.pdf

Appendix

Contraceptive Knowledge Assessment (CKA)

1. When during a woman's cycle is she most likely to become pregnant? **a.** During her period (start of her cycle) **b.** 3 days after her period ends ***c. Two weeks before her next period starts*** **d.** 3 days before she gets her period (end of cycle) **e.** I don't know	7. All of the following are TRUE about using male condoms EXCEPT: a. You should use water-based lubricants with spermicide b. ***Wear two condoms to be extra safe*** c. Prevent air bubbles by holding the condom tip when putting it on d. Check the expiration date and keep them in a cool and dry environment (i.e. not in a wallet or in a car) e. I don't know
2. How long can sperm stay alive in a woman's body? a. 1-3 hours b. 24 hours c. ***3-5 days*** d. 7-10 days e. I don't know	8. Hormonal birth control comes in which of the following forms? a. Pills taken by mouth b. Patch worn on the skin c. Ring placed in the vagina d. ***All of the above*** e. I don't know
3. Which of the following choices is TRUE about pregnancy? **a.** You cannot become pregnant the first time you have sex **b.** You cannot become pregnant if you have sex standing up **c.** You cannot become pregnant if you do not have an orgasm ***d. None of the above are true*** **e.** I don't know	9. Which one is NOT a benefit of hormonal birth control? a. ***Improvement of diabetes*** b. Improvement of acne c. Reduction in menstrual cramps and bleeding problems like anemia d. Decreased risk of ovarian and uterine cancer e. I don't know
4. Which of the following choices is TRUE about withdrawal, or the "pull-out" method? ***a. Sperm may be released before ejaculation*** **b.** Withdrawal works as well as condoms at preventing pregnancy **c.** Withdrawal can protect against some sexually transmitted diseases (STDs) **d.** Withdrawal works as well as the birth control pill at preventing pregnancy **e.** I don't know	10. How long should the vaginal ring (NuvaRing) stay in place before changing it? a. 1 day b. 1 week c. ***3 weeks*** d. 3 months e. I don't know
5. Which birth control method guarantees you will not become pregnant? ***a. None*** **b.** Using a condom every time you have sex **c.** Douching, showering, or bathing immediately after sex **d.** "Pulling out" before ejaculation **e.** I don't know	11. Which of the following make hormonal birth control less effective? a. Seizure (epilepsy) medicine b. HIV medicine c. Herbal supplements d. ***All of the above*** e. I don't know
6. Which is the only birth control method that helps prevent infections? a. The birth control pill ***b. Male and female condoms*** c. Depo-Provera ("the shot") d. The IUD (intrauterine device, the "T") e. I don't know	12. What is the main way that birth control works? a. ***It prevents the ovary from releasing the egg (ovulation)*** b. It prevents the sperm from entering the uterus c. It prevents the fertilized egg from implanting in the utuerus d. It prevents the embryo from growing past a certain size e. I don't know

Note. Correct answers are in bold and italicized.

13. Birth control pills can have which of the following ingredients? a. Testosterone b. ***Estrogen*** c. Magnesium d. Calcium e. I don't know	19. Which birth control method is not easily noticed by a partner? a. ***The IUD (intrauterine device)*** b. The vaginal ring c. Male condom d. Female condom e. I don't know
14. You should *NOT* use the birth control pill if you have any of the following: a. Fibroids b. Drink alcohol c. Currently taking antibiotics d. ***None: it is safe to use the birth control pill in all of these situations*** e. I don't know	20. A provider places an IUD (intrauterine device) in which part of the body? a. Fallopian tube b. ***Uterus*** c. Cervix d. Vagina e. I don't know
15. How long after a woman stops using birth control can she become pregnant? a. ***Immediately*** b. 1 month c. 3 months d. 6 months e. I don't know	21. Which method of birth control is the best at preventing pregnancy? a. ***The IUD (intrauterine device)*** b. Depo-Provera ("the shot") c. Male condom d. Withdrawal ("pull out method") e. They are equally effective f. I don't know
16. If you forget to take one birth control pill and remember the next day, what should you do? a. Throw the missed pill away and then continue the following day from where you left off b. Take the rest of the week's pills at once and then start the placebo ("reminder") week c. ***Take two pills then continue*** d. Throw the missed pill away and wait 1 month to start a new pack e. I don't know	22. Which choice is FALSE about IUDs (intrauterine devices)? a. Women of all ages may get an IUD b. Women who have never had a baby may get an IUD c. Women can have an IUD put in right after having a baby or having an abortion d. ***Women cannot get an IUD if they have ever had a sexually transmitted disease (STD)*** e. I don't know
17. Which of the following is FALSE about Depo-Provera (the "shot")? a. It is administered every 3 months b. Gradual weight gain is possible c. It might take a few months after stopping to become pregnant d. ***It cannot be used while breastfeeding*** e. I don't know	23. A provider places the birth control implant (Nexplanon) in what part of the body? a. Thigh b. Vagina c. ***Arm*** d. Buttock e. I don't know
18. Which of the following birth control methods may be reversed if you decide you want to become pregnant? a. Tubal ligation ("tying your tubes" or "cutting your tubes") b. Essure coils c. Vasectomy d. ***IUD (intrauterine device)*** e. I don't know	24. How soon after sex must the "morning after pill" (emergency contraception) be used to be effective? a. 1 hour b. 24 hours c. ***3 days*** d. 20 days e. I don't know
25. How can you get the emergency contraception pill (i.e. the morning after pill)? a. If under 18, you cannot get it, even with a prescription b. If under 21, you must have your parent go with you to the doctor for a prescription c. All women must have a prescription, no matter her age d. ***You can buy it at the pharmacy, without prescription, no matter what age*** e. I don't know	

Note. Correct answers are in bold and italicized.

Table 4. Sample Characteristics

	Overall	Patient Sample			Sex			Patient Sample X Sex				
								Female		Male		
		OAT	PC	*p* value	Female	Male	*p* value	OAT	PC	OAT	PC	*p* value
	N=332	n=167	n=165		n=169	n=163		n=85	n=84	n=82	n=81	
Age (mean yrs. ± SE)	32.1± 0.3	32.9 ± 0.4	31.3 ± 0.5	**<.05**	31.2 ± 0.5	33.0 ± 0.5	**<.01**	32.1 ± 0.6	30.3 ± 0.8	33.8 ± 0.6	32.2 ± 0.7	.89
Race/Ethnicity (%)				.29			.44					.51
White	86	87	85		87	85		88	86	85	85	
Hispanic/ Latino	2	2	3		2	2		1	4	2	2	
Black/African American	3	2	5		2	5		1	2	2	7	
Other	8	10	7		9	7		9	8	10	5	

Note. OAT: Opioid Agonist Treatment Sample. PC: Primary Care Sample. *p* values represent total two-way analysis of variance analysis.

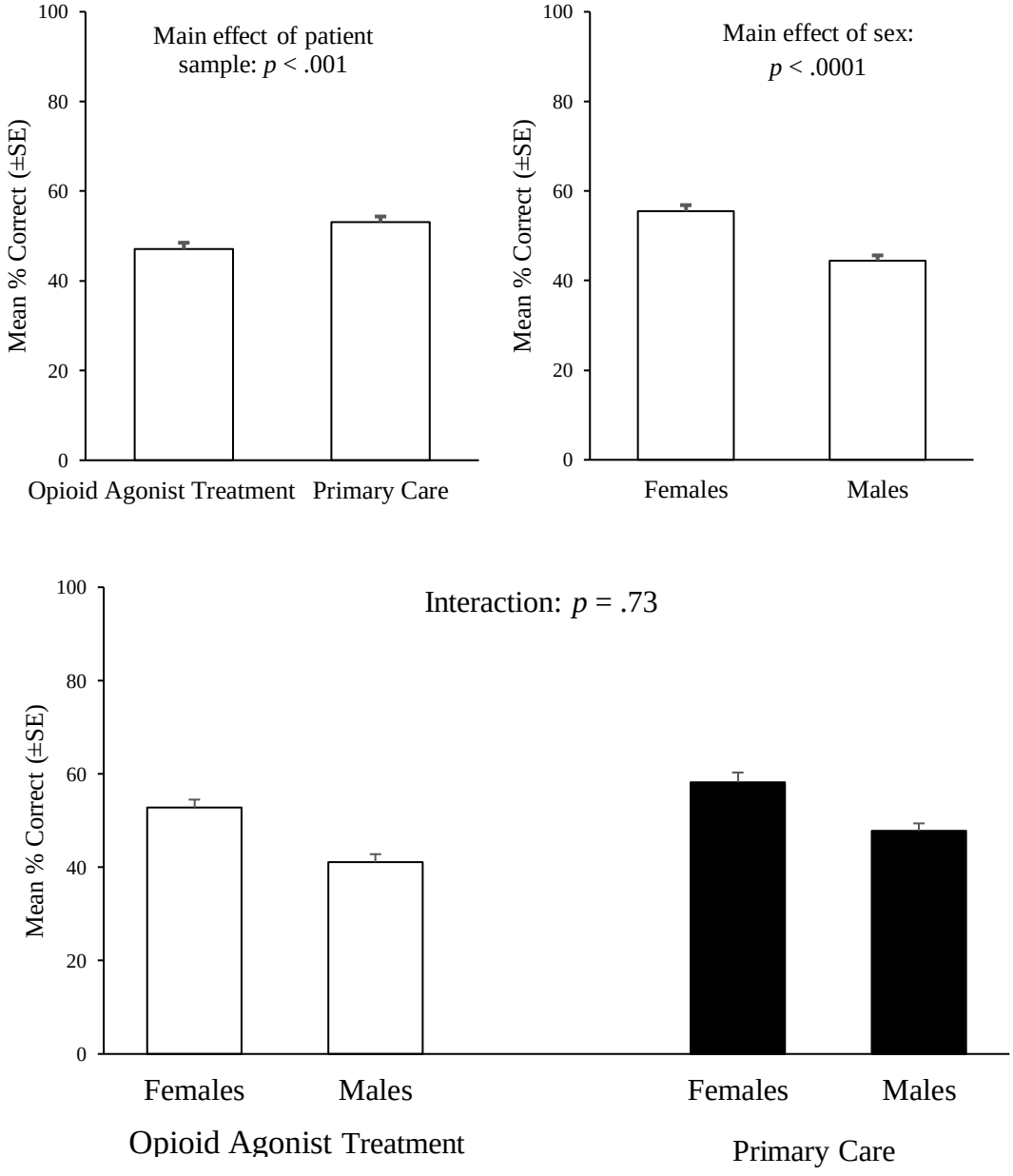

Figure 5. Mean Percent Correct on the Contraceptive Knowledge Assessment (CKA) by Main Effects of Patient Sample (top left panel) and Sex (top right panel) and Interaction (bottom panel).

Table 5. **Responses to Contraceptive Knowledge Assessment (CKA) Content Area Questions**

(Mean % Correct ± SE)	**Overall**	**Patient Sample**			**Sex**			**Patient Sample X Sex**				
		OAT	**PC**	***p* value**	**Female**	**Male**	***p* value**	**Female**		**Male**		***p* value**
								OAT	**PC**	**OAT**	**PC**	
	N=332	n=167	n=165		n=169	n=163		n=85	n=84	n=82	n=81	
Fertility Awareness (3 questions)	53 ± 1	49 ± 2	58 ± 2	**<.01**	58 ± 2	48 ± 2	**<.01**	53 ± 3	62 ± 3	44 ± 2	53 ± 3	.97
General Contraceptive Knowledge (6 questions)	66 ± 1	62 ± 2	70 ± 2	**<.001**	70 ± 2	62 ± 2	**<.01**	67 ± 2	72 ± 3	57 ± 2	68 ± 3	.23
Short-Acting Contraception (9 questions)	37 ± 1	37 ± 2	38 ± 2	.66	45 ± 2	30 ± 1	**<.001**	43 ± 2	46 ± 2	30 ± 2	29 ± 2	.48
Long-Acting Contraception (3 questions)	43 ± 2	38 ± 2	48 ± 3	**<.01**	53 ± 2	33 ± 2	**<.001**	49 ± 3	56 ± 3	27 ± 3	39 ± 4	.47
Other Methods (4 questions)	58 ± 1	53 ± 2	62 ± 2	**<.01**	59 ± 2	56 ± 2	.28	55 ± 3	63 ± 3	51 ± 3	61 ± 3	.71

Note. OAT: Opioid Agonist Treatment Sample. PC: Primary Care Sample. *p* values represent total two-way analysis of variance analysis.