Pathways to fatherhood: clinical experiences with assisted reproductive technology in single and coupled intended fathers

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Objective: To explore the cycle characteristics and outcomes of single and coupled intended fathers (SCIFs) using assisted reproductive technology.
Design: Cross-sectional study.
Setting: Multicenter, fertility practices from 2016 to 2020.
Patient(s): In this study, cycles among SCIFs with access to fertility coverage from 2016 to 2020 were included.
Intervention(s): None.
Main Outcome Measure(s): Our primary outcome was live birth rate. The secondary outcomes included the number of embryos transferred, miscarriage rate, and incidence of multifetal birth.
Result(s): Five single and 39 coupled intended fathers completed an in vitro fertilization cycle with a majority using egg donation and an agency-based gestational carrier (69.7%, 83/119). In most couples, both partners wanted to serve as the sperm source (64.4%, 29/45). The vast majority (97.7%, 43/44) also used preimplantation genetic testing for aneuploidy. Among the embryo transfer (ET) cycles (n = 27), most consisted of a single euploid ET (74.07%, 20/27), whereas the remaining consisted of a double euploid ET (25.92%, 7/27). The SCIFs had high rates of success, with a live birth rate of 85.19% (23/27). A mean of 1.26 ± 0.44 embryos were transferred, with a majority resulting in singleton birth (70.37%, 19/27).
Conclusion(s): Our study of SCIFs using assisted reproductive technology in the United States demonstrates that this population shares similar preferences for sperm source and the use of preimplantation genetic testing. Clinical outcomes suggest that this population is successful at achieving a live birth when using egg donation and a gestational carrier. (Fertil Steril Rep® 2022;3:317–23. ©2022 by American Society for Reproductive Medicine.)
Key Words: LGBTQ+, sexual and gender minorities, gay, fatherhood, assisted reproductive technologies

Over the last decade, there has been burgeoning medical literature published about improving the lesbian, gay, bisexual, transgender, and queer (LGBTQ+) population's health and, most recently, diverse and inclusive pathways to parenthood (1–3). For the first time in history, the US Census Bureau explicitly collected household data on same-sex cohabiting couples in 2020 (4, 5). A purported 18 million Americans belong to the LGBTQ+ community, with close to a third being parents (6–8), highlighting the increasing acceptance of mainstream values such as marriage and building a nuclear family in this historically marginalized group.

As shown in Figure 1, the initial focus on criminalizing and pathologizing homosexuality became overshadowed by the sexual revolution and civil rights movement. In the 1960s and 1970s, a series of highly publicized divorce proceedings and custody battles brought attention and community efforts to support LGBTQ+ parenthood; however, setbacks

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FIGURE 1

Seven key paradigm shifts illustrate the evolution of LGBTQ+ family building, and the historic/clinical contexts that motivated the shifts.

Paradigm	I. Pathologizing of homosexuality	II. Formation of SM advocacy groups	III. Publicized sexual orientation custody cases	IV. Formation of SM parent activist groups	V. Gayby Boom	VI: Fight for equal rights & same-sex marriage	VII: Focus on intersectionality
Timeline	1930s	1950s	1960s	1970s	1980s	2000s	2020s
Historic context	"Sex crime panics"	Civil Rights Movement	Sexual Revolution, Custody Denials	Stonewall Riots, Gay Liberation Movement	HIV/AIDS Crisis	Don't Ask, Don't Tell, Repeal of sodomy laws	Same-Sex Marriage Equality; Diversity, Equity, & Inclusion
Clinical context	Electroshock therapy, lobotomization, & castration	DSM-I: homosexuality as mental illness; Kinsey Scale studies	DSM-II: homosexuality as sexual orientation disturbance	Lesbian grassroots insemination network; Homosexuality removed from DSM-II	Advent of IVF, Single/lesbian women granted access to sperm banks	ASRM supports fertility treatment access for lesbian, gay, and unmarried persons	ASRM broadens and affirms access to fertility treatment for all LGBTQ+ persons
Paradigm shift into	LGBTQ+ families in hiding; children must be "protected"	Evolving societal perceptions of homosexuality	Increase in LGBTQ+ parent visibility; concerns for "best interest of child" remain	Some LGBTQ+ parents achieve visitation, custody, and right to openly adopt	LGBTQ+ family building possible through ART and second-parent adoption	Increasing trend of societal acceptance / permissive legislation for LGBTQ+ parents	Same-sex parents on birth certificates; call for routine SOGI data collection

A brief history of LGBTQ+ family building in the United States. Dates of paradigm shift are approximate only. ART = assisted reproductive technology; ASRM = American Society for Reproductive Medicine; DSM = Diagnostic and Statistical Manual of Mental Disorders II; IVF = in vitro fertilization; LGBTQ+ = lesbian, gay, bisexual, transgender, and queer; SM = sexual minority; SOGI = sexual orientation and gender identity.

Monseur. ART use among single and gay men. Fertil Steril Rep 2022.

occurred as an unforeseen consequence of the human immunodeficiency virus/acquired immunodeficiency syndrome crisis (9). Being unable to acquire visitation rights to see children or sick partners galvanized the LGBTQ+ community to champion the necessity of legally recognized relationships and the importance of chosen family. There has been an increase in societal acceptance, permissive legislation, as well as widespread diversity, equity, and inclusion efforts for the LGBTQ+ community (9). Yet, persistent gender stereotypes exist and reflect how prevailing social constructs have led to invasive practices (e.g., sexual orientation change efforts) and systemic discriminatory barriers in building their families: custody denials; barring from adoption; and impaired access to assisted reproductive technologies (ARTs) (e.g., provider refusals, affordability, and lack of evidence-based guidelines). (3, 9–11). Traditionally, the LGBTQ+ community was restricted to foster care, adoption, and/or coparenting (arrangements to conceive and raise child(ren) together without being in an intimate relationship) (9). With the advent of ART treatment in the late 1970s, the chosen family could now be extended to LGBTQ+ individuals having children of their own (12). The timely confluence of permissive adoption cases, the first in vitro fertilization (IVF) case in the United States, and access to donor sperm by lesbians prompted a sea change coined as the first "gayby boom" (9).

Similarly, prior studies demonstrated an increase in married same-sex couples due to medical legal changes (e.g., in 2015, the legalization of same-sex marriage)—a subgroup of LGBTQ+ individuals more likely to have children than unmarried counterparts (13–15). Communities of single and coupled intended fathers (SCIFs) who choose ART treatment for their path to parenthood typically require both donor gametes (e.g., egg) and a gestational carrier (GC). Around the country, more SCIFs are presenting to build families through ART treatment signaling a second gayby boom involving both donor gametes and GCs; however, little is known about the family building efforts through ART treatment in this unique and vulnerable population.

Because the family building efforts of SCIFs typically require elements of third-party reproduction (i.e., involving someone other than the individual(s) planning to raise the child(ren)), additional Food and Drug Administration (FDA) regulations disproportionately affect these communities and present access to care barriers (e.g., expensive testing, refusals of care, and discrimination of human immunodeficiency virus-positive patients) (16). Despite the increasing use of ART treatment by the SCIF community, this population is conspicuously absent from the literature with resultant knowledge gaps and a poor understanding of their clinical outcomes and decision-making processes.

The SCIF population has been described as highly educated, employed, nonreligious, and without fertility benefits who typically desires 2 children—1 genetically related to each father (17–19). Among the paucity of small, heterogeneous studies, a majority unilaterally focus on the well-being of children born to sexual and gender minority parents or are qualitative studies exploring their relationship with GCs (19–28). Significantly, the fear of negatively impacted childhood development has not been corroborated in the literature (9, 29). Despite persistent healthcare disparities, the last few decades have been characterized by a transformative shift in SCIF parenting from paradox to possibility. In a recent American Society for Reproductive Medicine (ASRM) Ethics Committee Opinion, healthcare access to LGBTQ+ communities, including, but not limited to SCIFs, was reaffirmed and highlighted as a national priority (3).

When considering family building specifically for gay men, the first and necessary step in achieving a more inclusive paradigm shift is descriptive studies characterizing demographic trends, patterns of usage, and clinical outcomes. To the investigators' knowledge, this multicenter study provides

the largest US data set describing the collective decision-making process and clinical outcomes of the same-sex male intended parents using ART treatment. This study is the first critical step in describing a historically marginalized population who will increasingly present with GCs for care by reproductive specialists and obstetricians/gynecologists. Furthermore, our findings are intended to help guide clinical counseling in a unique subset of ART users with clinical outcomes and treatment patterns heretofore understudied and poorly characterized.

MATERIALS AND METHODS

This multicenter, retrospective study included SCIFs who underwent an initial consultation for ART treatment with a reproductive endocrinologist and infertility specialist. All patients had access to fertility and family building coverage through a fertility benefit company, Progyny. Clinics treating Progyny members were contacted through E-mail and telephone for inclusion in the study. Progyny offers inclusive benefits to LGBTQ+ members that include, but are not limited to, the following: IVF; preimplantation genetic testing; embryo transfer (ET); reimbursement for ovum donation; and agency-based gestational surrogacy. Single and coupled intended fathers received treatment at various fertility centers across the United States (WA, NY, CA, UT, AZ, NJ, IN, MN, MA, TX, IL, ME, TN, and DC) and were included if they completed a fresh egg donation cycle or used frozen donor eggs. At the initial time of data collection, single men were defined as those individuals who were not linked to a partner. In 3 single participants, sexual orientation could not be confirmed in the medical record, 3 individuals identified as "gay," and 1 individual was subsequently linked to a same-sex male partner. Because the temporality of this relationship cannot be determined from the data set, the decision was made to keep this individual classified as "single." Participants in couples were individually included as the denominator. For couples, special attention was given to partner roles, including who would be the "biologic father" (i.e., source of sperm), which was discussed with their physician. Fertility benefit policies did not promote one service or third-party agency over another—clinical decisions were left to the discretion of the individual clinic/provider. For SCIFs who underwent an IVF cycle, baseline characteristics included age of participants, oocyte retrieval count, use of preimplantation genetic testing for aneuploidy (PGT-A), and total number of embryos transferred. Additional demographic characteristics and data on the type of ET performed were not available. Clinical outcomes included live birth and miscarriage rates. Western Institutional Review Board approval was obtained to analyze deidentified data for this nonrandomized observational study. Descriptive statistics were used. A P value of $<.05$ was considered statistically significant.

RESULTS

A total of 119 SCIFs (37.99 ± 5.60 years) from 18 fertility centers were included in the study (Table 1), including 7 single men (n = 7) and 56 coupled intended fathers (n = 112). All participants planned treatment with ART, with most SCIFs having completed both egg donation and transfer into a GC (69.7%, 83/119). A majority used an agency-based (72.45%, 71/98) or fertility clinic–based (19.39, 19/98) egg donors, with a minority using a directed (known) donor (6.12%, 6/98) or egg bank (2.04%, 2/98). Of respondents, 95.2% (59/62) desired their family to include at least 2 children, with a majority preferring only male (48.0%, n = 24/50) or both male and female offspring (36.0%, n = 18/50) and a minority preferring only female offspring (16.0%, n = 8/50). At the time of this survey, 5 single and 39 coupled intended fathers had completed an IVF cycle (n = 44), and 2

TABLE 1

Cycle characteristics and clinical outcomes among SCIFs using assisted reproductive technologies.

Metric	Mean (±SD) or Percent (count)
Number of SCIFs who underwent initial consultation	n = 119
Number of single intended father	n = 7
Number of couple intended fathers	n = 56
Number of SCIFs who underwent an IVF cycle	n = 83
Number of single intended father	n = 5
Number of couple intended fathers	n = 39
Number of fertility clinics	n = 18
Number of study states	n = 14
Age of participants	38.0 ± 5.60
% of participants desiring a male and female offspring	36.0% (18/50)
% of participants desiring female offspring	16.0% (8/50)
% of participants desiring male offspring	48.0% (24/50)
Egg donor source: agency	72.5% (71/98)
Egg donor source: fertility clinic	19.4% (19/98)
Egg donor source: egg bank	2.04% (2/98)
Egg donor source: known individual	6.12% (6/98)
Surrogacy source: agency	100.% (87/87)
Number of DET	n = 7
Number of single intended father cycles	n = 0
Number of coupled intended father cycles	n = 7
Mean number euploid embryos transferred	1.26 ± 0.44
Number of SCIF pregnancy outcomes	n = 27
Number of single intended father cycles	n = 2
Number of coupled intended father cycles	n = 25
Overall SCIF live birth rate (pregnancy/ET)	85.2% (23/27)
Singleton: single intended father	100.% (2/2)
Singleton: couple intended fathers	68.0% (17/25)
Twins: couple intended fathers	16.0% (4/25)
SCIF miscarriage rate (pregnancy loss/ET)	14.8% (4/27)
Miscarriages in single intended father cycles	0% (0/2)
Miscarriages in coupled intended father cycles	16.0% (4/25)

DET = double embryo transfer; ET = embryo transfer; IVF = in vitro fertilization; SCIFs = single and coupled intended fathers

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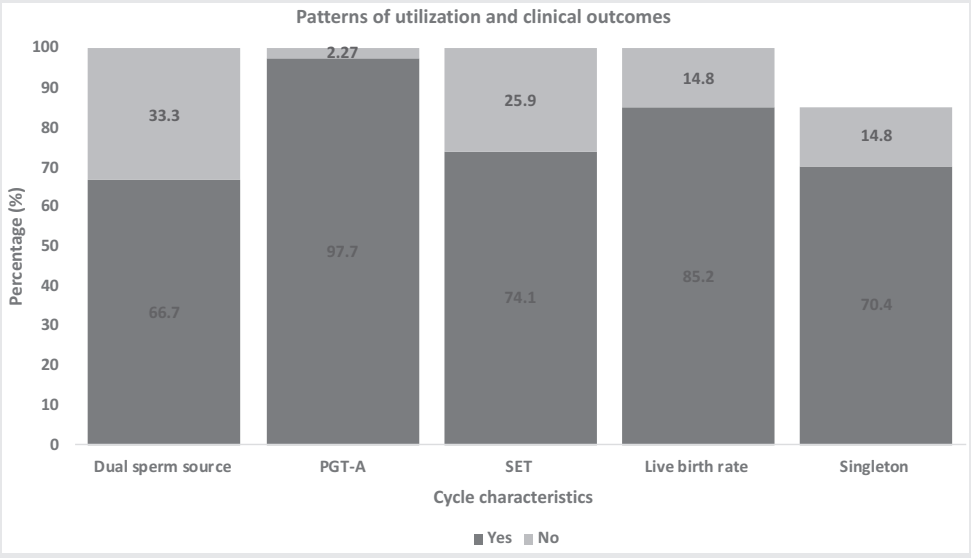
FIGURE 2



Patterns of fertility treatment utilization and clinical outcomes in single and coupled intended fathers. Single fathers were excluded from dual sperm source because there was only 1 source. All single and coupled intended fathers achieved pregnancy; those who did not have a live birth resulted in spontaneous abortion. Live births that were not singletons were all twin gestations. The remaining 14.8% in the singleton bar are accounted for by miscarriage (not shown). PGT-A = preimplantation genetic testing for aneuploidy; SET = single embryo transfer.

Monseur. ART use among single and gay men. Fertil Steril Rep 2022.

single and 25 coupled intended fathers had completed an ET (n = 27). Most respondents had planned to use an egg donor agency (72.5%, 71/98) and a GC agency (100%, 87/87). After undergoing ovarian stimulation, oocytes (27.36 ± 13.37) were retrieved from donors. In most couples, both partners wanted to serve as the sperm source (64.4%, 29/45), which is also reflected in couples who completed treatment with dual sperm source (66.67%, 26/39; Fig. 2). The vast majority (97.7%, 43/44) also used PGT-A (Fig. 2). Among the ET cycles (n = 27), most consisted of a single euploid ET (74.07%, 20/27), whereas the remaining consisted of double euploid ET (25.92%, 7/27; Fig. 2). At the time of data collection, 12 SCIFs had not completed an ET cycle. The mean number of euploid embryos transferred was 1.3 ± 0.4 (85.19%, 23/27). Of couples who had ETs and achieved a live birth, the majority (70.37%, 19/27; Fig. 2) resulted in a singleton birth. A minority of cases resulted in twins (14.8%, 4/27) or miscarriage (14.8%, 4/27).

DISCUSSION

Most literature published within the field of reproductive endocrinology and infertility has a cisgender (i.e., person's identity/gender correspond to sex assigned at birth), heteronormative (i.e., heterosexuality viewed as preferred sexual orientation) infertile focus that often cannot be extrapolated to LGBTQ+ populations, such as SCIFs. This study population provides insight into the choices made by a group of SCIFs with benefits covering IVF, PGT-A, and ET and occasionally reimbursement for the purchase of frozen eggs and/or an agency-based gestational carrier (GC). Given the high success rates, we propose that clinical outcomes in SCIFs serve as a new gold standard for the modern IVF laboratory due to the combined utilization of an ovum donor, a GC, and the availability of 2 separate sperm sources. To the investigators' knowledge, this is the largest cohort of SCIFs in the United States, uniquely examining outcomes among those with fertility benefits. This unique combination controls for various factors that may highlight a clinic's intrinsic success rates of embryo culture and subsequent ET.

Despite evidence of the increasing use of ART treatment by SCIFs, this group is consistently absent from fertility research, particularly in the United States (30). Notably, a recent study uniquely included >75 donor egg cycles in same-sex male couples to control for uterine and male factor when comparing perinatal outcomes but did not discuss the gay intended parents (31). The few studies on gay men encountered in the literature are often qualitative and tend to focus on cross-border reproductive care and relationships with the GC.

Our results corroborate findings from several small heterogeneous clinical studies and surveys with regard to mean age (38.0 years), a preference for a dual sperm source (66.7%) with high rates of overall success as measured by a live birth rate of 85.2%. In contrast with previous published work and data from conference abstracts, this study had a higher mean oocyte yield (27.4) and rate of utilization of PGT-A (98.0%) but a lower mean number of euploid embryos transferred (1.3) with 74.1% using elective single ET (eSET) and using 25.9% double ET (DET). Previously, gay men ranging from a mean age between 35 and 46 years showed rates of dual sperm sources between 61.0% and 71.4%, oocyte yield of 16–17, 75.0% utilization of PGT-A, as low as 19.0% eSET, and as high as 85.0% DET (22, 32–34). Pregnancy outcomes have

overall been reported as successful but vary in how they were reported (e.g., pregnancy rate per transfer, clinical pregnancy rate, and ongoing pregnancy rate) and usually have not included live birth rate. According to the Centers for Disease Control and Prevention, ART contributes to 10.6% of multiples born in the United States despite only accounting for 2.1% of all infants born. Nationally, <20% of transfers in women aged <35 years involve >1 embryo corresponding to an eSET rate of 80.6% (35). In the present study, we report an elevated incidence of twins (14.8%) likely related to the patient choice of DET, despite being lower than previous reports of DET rates in this population as high as 31.5%–50.0% (32, 36). The investigators suspect that this preference is a combination of the financial burden of surrogacy (i.e., approximately $150,000 per pregnancy) and a desire to avoid the choice of whose sperm to use first (37). Given the high rate of twin pregnancies, particularly among the DET group (42.9%, n = 3/7), the investigators recommend that clinics consider developing policies regarding ET practice that reflects the ASRM recommendations specifically within the context of SCIFs with GC arrangements.

Our study significantly builds on prior research and includes not only the decision-making components of care but also clinical outcomes of SCIFs pursuing IVF in what is one of the largest studies on single and gay men. Although much of the prior research focuses on the legal and social complexities of GCs, especially within the context of cross-border reproductive healthcare, our results represent a multicenter, nationwide analysis in the United States. Notably, many people do not have fertility benefits, and even those with coverage through a conventional insurance plan face high costs of treatment (38). Specifically, LGBTQ+ family building patients with conventional insurance plans face restrictions because they do not meet the clinical definition of infertility (i.e., defined as the failure of successful pregnancy after 12 months of unprotected penis-in-vagina sexual intercourse) (39). However, in this study, all patients had access to comprehensive and inclusive fertility benefits permitting a unique opportunity to assess clinical patterns in a community impacted by both financial and health access barriers. Nevertheless, SCIFs still have substantial financial burdens related to compensation to GC, GC agencies, GC insurance coverage, consultation with reproductive attorneys, and other residual costs (40).

Although clinicians are aware of the ubiquity of counseling in third-party reproduction, LGBTQ+ patients may assume that this is an assessment of their ability to parent. This is due, in part, to a long history of uncorroborated claims that outcomes of children with sexual and gender minority parents may be negatively impacted because of their parents' sexual orientation and/or gender identity (29). Historically, some clinics or agencies may not have worked with SCIFs; however, recent data confirm that >90% of GCs are willing to work with gay men with overall positive relationships reported that they may wish to maintain after treatment (21, 27, 41). Notably, all SCIFs in this study used a GC agency. Prior studies have shown that intended parents using GCs from another country are less satisfied with the overall experience (26, 41). Regardless of the use of a domestic or international GC, SCIFs should be counseled that laws vary widely, including on the state level, while acknowledging the difficulties and inconsistencies in legal protection that they may encounter depending on the location of delivery (42).

In our study, most respondents wanted at least 2 children and shared preferences for male offspring and genetic relatedness of both parents through a dual sperm source. Most cycles in this study included ovarian stimulation of a donor that despite a higher cost (43) may address the preference for >1 child who is genetically related. Although the preference for dual sperm source (and, thus, the desire for genetic relatedness) in our study is clear, the decision-making around which partner goes first (e.g., based on age, carrier screening, and semen parameters) is not well elucidated. Notably, semen parameters are reportedly improved compared with heterosexual controls (44), and split cycles (using 2 separate batches of sperm source) are employed. This practice is poorly studied, with some preliminary evidence of discordance in blastulation and euploidy rates between partners even in the setting of normal semen parameters (45, 46). A recent systematic review and meta-analysis demonstrated that advanced paternal age in the setting of ovum donation was not associated with higher rates of aneuploidy (47).

In consideration of Food and Drug Administration (FDA) regulations (48), which require the sperm source to pass FDA sexually transmitted disease (STI) screening within 7 days of production, several clinics cryopreserve and test sperm far before the cycle. This process provides the advantage of having an FDA-cleared specimen on hand for fresh embryo creation while eliminating the risk of an unpredicted STI or production problems on the day of egg retrieval. Furthermore, monogamous, 2-person relationships should not be assumed (49), and patients should be counseled on the importance of negative STI screening with repeat testing throughout treatment because of the possibility of a GC refusing to proceed after a positive test result.

After the creation of embryos from both intended parents, patients often request DET because of perceived increased chances of success and financial considerations. Despite the increased risk of multifetal pregnancy and associated complications of transferring >1 embryo (e.g., miscarriage, preterm birth, preeclampsia, placental abnormalities, cesarean delivery, and perinatal mortality) and clear recommendations from the ASRM to use SET as the standard of care, providers still transferred >1 embryo in the cohort (the DET rate in this study was 25.9%) (50). The investigators suspect that this is due, in part, to patient requests stemming from a combination of the associated costs as well as the perception of increased success (36, 51, 52). In the case of the latter, patients should be counseled on mounting evidence that the success rates for sequential SET are comparable to or even higher than DET while minimizing the associated risk of multifetal pregnancy for the GC. Notably, a small retrospective analysis of SCIFs (n = 46) demonstrated that even after a consultation with the medical director on the risks of DET, 44% still wished to pursue a DET (51). However, the awareness of the risks of multiple gestations to the GC and the pregnancy is leading to increased acceptance of SET as the standard of care (53).

Almost all participants used PGT-A, which is likely influenced by a combination of fertility benefits specifically for genetic testing and the possibility that GC agencies required a

euploid blastocyst for transfer. Furthermore, there is a perception that it may reduce the chance of miscarriage or termination due to aneuploidy, especially in the setting of using a GC—a costly and lengthy process. This high utilization of PGT-A may have contributed to the low miscarriage rates (14.8%) in the present study. A recent analysis of commissioned GC cycles for single and same-sex male couples showed a higher rate of adverse perinatal outcomes in singleton births than in spontaneous cycles in the same GC; however, the rates did not increase with the use of DET (compared with that of SET) or with the use of PGT-A (31). Given the increased maternal and fetal risks associated with ARTs, primarily because of increased rates of multiples, labor and delivery units and neonatal intensive care units should be prepared to account for an increase in SCIFs with GCs presenting for care. Furthermore, the SCIF population may need additional education on all aspects of the female reproductive system and the delivery process, be susceptible to role confusion (e.g., one genetically related father but both are the father to the child(ren) delivered by the GC), and have described a perceived loss of control in the pregnancy and delivery process (21, 42).

We acknowledge several limitations to our study, including only being descriptive. Until sexual orientation and gender identity data are routinely collected in the clinical setting, studies will continue to suffer from methodological flaws and be limited to smaller sample sizes resulting in the aggregation of distinct sexual and gender minority subgroups together (54). Furthermore, several of the studies cited in this discussion section remain unpublished, probably due, in part, to the aforementioned limitations. We also recognize that misclassification of the 5 "single" participants may have occurred. In fact, 1 individual has subsequently been linked to a same-sex male partner since the initial data collection despite being classified as single at the onset of the study. Furthermore, sexual orientation was not always explicitly documented or was determined based on linkage to a same-sex partner. The investigators suggest that this is due to the lack of routine data collection on sexual orientation and gender identity, limitations of the electronic medical record system, or a result of not disclosing orientation owing to fear of stigma or other repercussions. We must prioritize the dissemination and discussion of these data to fill critical knowledge gaps, especially now that the SCIF population represents an increasing majority of reported GC cycles using thawed embryos from donated eggs (approximately 4,000 cycles annually) in the United States (2017, 48.5%; 2018, 54.6%; 2019, 59.2%; and 2020, 61.1%; personal communication, Ethan Wantman, Society for Assisted Reproductive Technology). The ASRM has recently broadened and affirmed their support for fertility treatment for the LGBTQ+ community; however, guidelines on the creation of inclusive environments and special treatment considerations are still needed to address the ever-increasing use of ART by these unique and vulnerable populations.

CONCLUDING REMARKS

For a comment on language in this study, the investigators acknowledge that not all individuals assigned male at birth identify as "fathers" and that same-sex male relationships are not limited to "couples." However, we believe that these terms accurately represent our study population.

Lastly, the first (B.M.) and senior (M.L.) investigators of this study are both gay reproductive endocrinologists, the latter also being a parent in a same-sex male couple. Their insider-status has helped them consider aspects of gay fatherhood that outsiders may overlook or not even consider.

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