Transgender Health
Volume 8, Number 4, 2023

DOI: 10.1089/trgh.2021.0080

ORIGINAL ARTICLE

Reproductive and Fertility Knowledge and Attitudes Among Transgender and Gender-Expansive Youth: A Replication and Extension

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Abstract

Purpose: This study sought to replicate and expand a previous pilot investigation of reproductive knowledge, attitudes toward fertility and parenthood, and sources of information on these topics among transgender and gender-expansive (TGE) youth.

Methods: The Yale Pediatric Gender Program (YPGP) Reproductive Knowledge and Experiences Survey (YPGP-RKES) was administered to 70 TGE adolescents receiving care at an interdisciplinary clinic providing gender-affirming health care at an academic medical center. Data gathered included sources of information on reproduction and fertility, concerns about future parenthood and reproduction, and interest in different types of parenthood.

Results: Over a third (39.1%) of participants reported it was important to them to have a child one day, while only a small proportion (23.2%) reported an interest in biological parenthood. A plurality of participants (37.3%) reported at least one concern about future fertility. The number of reproductive concerns did not differ by age or treatment (puberty blockers or gender-affirming hormones vs. no treatment) status. With respect to needs for more information and sources of information, most (56.5%) participants received information about fertility issues before this study, with the most cited source of information being online research.

Conclusions: The current study replicated and extended previous findings on the reproductive attitudes and knowledge of TGE adolescents. Understanding the informational needs and priorities of adolescent TGE patients presenting for medical treatment will allow providers to give more robust patient education. This will, in turn, facilitate patients' ability to provide fully informed consent for treatment that aligns with their fertility and reproductive priorities and goals.

Keywords: adolescence; fertility; reproduction; transgender youth

Introduction

A 2017 Centers for Disease Control and Prevention survey found that 1.9% of teens in grades 9–12 identified as transgender.[1] The proportion of people identifying as transgender/gender expansive (TGE) is increasing over time in the United States, although precise estimates of the proportion of TGE adolescents vary.[2]

Many transgender adolescents, who have access to medical providers that provide transition-related care to TGE individuals, pursue gender-affirming medical treatment, including puberty-blocking agents in the form of gonadotropin-releasing hormone agonists or gender-affirming hormones, such as testosterone or estrogen. Current standards of care from the World Professional Association for Transgender Health[3] and the Endocrine Society[4] often recommend treatment before or early in puberty to achieve maximum benefit before irreversible developmental changes.

Patients considering puberty blockers or gender-affirming hormone therapy typically consult a health care professional to discuss initiating treatment. For many patients, the benefits of puberty blockers and/or hormones (e.g., reducing the growth of secondary sex characteristics of their birth sex and stimulating

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development of secondary sex characteristics of their affirmed gender)[3] often outweigh potential risks (e.g., decreased bone density and a possible increase in cardiovascular risk).[5]

TGE youth are at a substantially increased risk of being diagnosed with a variety of mental health conditions,[6–9] and research has shown gender-affirming hormone therapy is associated with a decrease in depression, suicidal ideation, and symptoms of gender dysphoria, as well as an improvement in subjective quality of life and well-being in young TGE patients.[6,7,10–13] A recent study of a wider age range (18–44 years) of TGE individuals found that gender-affirming surgical procedures result in lower psychological distress and suicidal ideation in recipients compared with individuals without access to such procedures.[14]

Gender-affirming hormone therapies are potentially associated with increased risk of infertility, due to decreased sperm production in patients assigned male at birth[15,16] and decreased ovulation in patients assigned female at birth,[17,18] although the degree of infertility and reversibility following discontinuation of hormones remains unclear.[19,20]

Multiple studies have found that a majority of transgender adolescents desire future parenthood.[21–24] However, the rates appear to be much less than their cisgender peers. A study of healthy adolescents assigned female at birth showed a significant difference in desire for parenthood between transgender/gender-diverse adolescents and their cisgender peers, with 67% of TGE respondents endorsing interest in future parenthood and 93% of cisgender participants endorsing the same.[25]

Additionally, multiple studies have found that only a minority of TGE youth planned to have biological children.[21–24] Significant barriers also impact fertility preservation rates of TGE adolescents undergoing medical transition.[19] Detailed consultation with fertility specialists during medical transition happens infrequently,[26] and a recent review[19] reported that utilization rates of fertility preservation range from as low as 2.7% in some U.S. studies to as high as 34% in Dutch studies.

It remains unclear how geographic variations in clinical practices, financial barriers, or cultural differences may contribute to these vastly different utilization rates. Taken together, risks to fertility combined with low rates of consultation and wide-ranging utilization rates of fertility preservation suggest a need for increased research on how patients conceptualize and prioritize future fertility and parenthood, as well as methods of reducing barriers to care.

TGE adolescents undergoing medical transition are required to make considerable risk–benefit decisions, with long-term consequences, at a time in which they are already processing significant physical and social changes. While cisgender adolescents may have difficulty in processing the changes associated with this developmental period, TGE adolescents are simultaneously faced with the additional emotional and cognitive demands of navigating their transgender or nonbinary gender identities in a largely cisnormative, binary-gendered society, as discussed by Strang et al.[27]

This is compounded by the fact that pursuing medical transition requires them to make consequential decisions regarding their future fertility and their desire for biological parenthood later in life. Prior studies have demonstrated that approximately half of TGE adults reported that they specifically desire biological children,[28–30] while only 30% of TGE adolescents in one study reported that future parenthood was important.[22]

Differences in desire for biological parenthood in TGE adults compared with adolescents may reflect changes in attitudes with age or generational differences in the perception of biological parenthood. Clear and effective counseling on fertility risks throughout medical transition is particularly important for adolescents, as adolescents' attitudes regarding desirability and preferred type of future parenthood may change with age. Information on youth's priorities and concerns can assist providers in supporting TGE adolescents as they navigate the unique challenges associated with this developmental period.

Current study

The current study sought to replicate a previous investigation, which surveyed 23 TGE youths regarding their knowledge, attitudes, and beliefs about reproduction and fertility.[22] Adolescents were surveyed during intake to a pediatric gender program. We sought to expand the scope by characterizing TGE youths' knowledge, beliefs, and attitudes based on relevant additional factors (e.g., age, gender identity), and further develop directions for future research. We also expand on previous literature by providing insight into what types and sources of information are preferred by TGE adolescents considering or undergoing medical transition.

Based on data from the previous study[22] and research in the oncofertility literature,[31–34] we hypothesized that both age and medical intervention (use of

puberty blockers or gender-affirming hormones) would be associated with differences in reproductive knowledge and concerns in our patient population. We also expected that desire for future parenthood and preference for biological parenthood would be associated with level of concern regarding the effects of hormone treatment on future fertility.

Methods

Participants

Seventy participants were recruited from the Yale Pediatric Gender Program (YPGP), an interdisciplinary outpatient program that provides gender-affirming care to children, adolescents, and young adults. Participants were included as part of a long-term study on the health of TGE youth.[22] Participants were included if they identified as a gender different than their sex assigned at birth and were between the ages of 12 and 22 years of age. The inclusion criteria were selected based on the authors' previously published pilot study on TGE youths' reproductive and fertility knowledge and attitudes.[22] Our sample in this study does not include participants from the original pilot study. Information on handling of missing data is available in Supplementary Data S1.

Participants were on average 16 years of age (M = 16.17 years; SD = 2.00, range 13–22). Most patients identified as transmasculine (59.4%), white (69.6%), and non-Hispanic (85.5%). Most patients reported having private insurance (82.6%). Nearly 25% (24.6%) of participants were receiving puberty blockers or gender-affirming hormones at the time of survey. Table 1 for complete demographics.

Table 1. Demographic Characteristics of Transgender/ Gender-Expansive Adolescents Completing a Survey on Fertility and Future Parenthood, by Gender Identity

Participant characteristic	Total (N = 69)
Age (years), mean ± SD	16.17 ± 2.00
Gender identity, *n* (%)	
Transmasculine	41 (59.4%)
Transfeminine	16 (23.2%)
Nonbinary/other	12 (17.4%)
Race/ethnicity, *n* (%)	
White/Caucasian	48 (69.6%)
Black/African American	3 (4.3%)
Hispanic or Latino	9 (13.0%)
Asian	2 (2.9%)
Other/unknown	7 (10.1%)
Insurance	
Public	12 (17.4%)
Private	57 (82.6%)
Use of puberty blockers or gender-affirming hormones	
Yes	17
No	52

SD, standard deviation.

Procedure

Participants were recruited as part of their routine care at YPGP. Interested participants, and if under 18, their parents or guardians, provided informed consent and/or parental consent and youth assent following a description of the study risks and benefits. The study was approved by the university's local Institutional Review Board (Protocol ID 1605017811).

Responses to measures as well as demographic information (age, sex assigned at birth, race/ethnicity, insurance status, use of puberty blockers, or gender-affirming hormones) was captured through a standard intake battery and a medical records review, respectively.

Measures

The Yale Pediatric Gender Program Reproductive Knowledge and Experiences Survey (YPGP-RKES) was used to assess knowledge, attitudes, and beliefs about reproduction, fertility, and parenthood in the context of gender-affirming medical treatment.[22]

Questions were a mix of "Yes"/"No"/"Unsure" responses for questions about future parenthood, a 5-point Likert scale (1–5, "Strongly Disagree"-"Strongly Agree") for reproductive concerns, and "True"/"False" questions for reproductive knowledge. Question 1.7 ("It is okay if I am not able to have a child one day") was reverse coded for scoring. Participants were considered as having a reproductive concern if they answered ≥ 3 on the Likert scale. Additional information about the YPGP-RKES can be found elsewhere.[22]

Results

Attitudes toward parenthood

Of our 69 participants, 39.1% (n = 27) endorsed that it was important to them to have a child one day, with 33.3% (n = 23) stating that they were unsure about having a child. With respect to types of parenthood, 23.2% (n = 16) participants endorsed interest in biological parenthood, whereas most participants (82.6%, n = 57) endorsed interest in adoption (Fig. 1).

A one-way analysis of variance (ANOVA) revealed no significant differences in average age by category of importance of parenthood (F[2,66] = 0.137, *ns*) or interest in biological parenthood (F[1,67] = 0.099, *ns*). One-way ANOVA also revealed no differences in the number of types of acceptable parenthood between gender identities (F [2,66] = 1.23, *ns*). Small cell sizes prevented valid

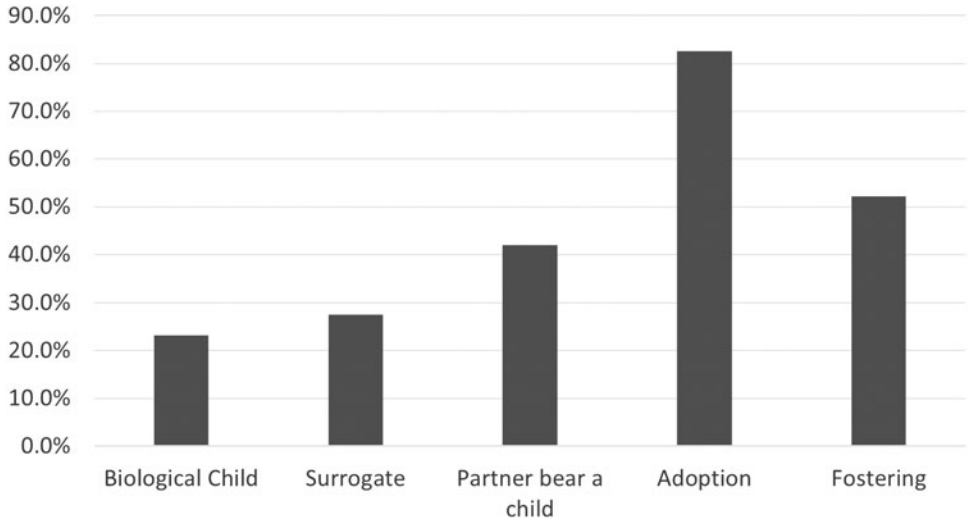

FIG. 1. Interest in types of parenthood.

comparisons of self-reported importance of having a child one day or interest in biological parenthood by gender.

However, it is notable that 50% of transfeminine participants ($n=8$) reported that future parenthood was important, compared with 36.6% of transmasculine participants ($n=15$) and 33.3% of nonbinary respondents ($n=4$) (Table 2). There was no significant difference in self-reported importance of having a child between patients who were taking either puberty blockers or gender-affirming hormones versus those who were not (χ^2 [2, $N=69$] = 5.357, ns). Desire for biological parenthood also did not vary significantly between patients who were taking either puberty blockers or gender-affirming hormones versus those who were not ($p=0.743$, two-tailed Fisher's exact test).

Reproductive concerns

A plurality of participants endorsed one reproductive concern (37.3%, $n=25$), with only 12 participants (17.9%) reporting no reproductive concerns. On average, participants had 1.57 ($SD=1.14$) reproductive concerns.

Table 2. Importance of Parenthood by Gender Identity

Important to have a child one day	Gender identity			
	Transmasculine	Transfeminine	Nonbinary/ Other	Total
Yes	15	8	4	27
No	11	2	6	19
Unsure	15	6	2	23

There were no significant differences in the number of reproductive concerns by stated importance of having children one day (one-way ANOVA, $F[2,66]=0.638$, *ns*) or for participants endorsing interest in biological parenthood ($t[67]=-0.987$, *ns*). There were also no significant differences in the number of concerns by age (linear regression, $F[1,65]=0.202$, *ns*) or for participants on puberty blockers/hormones ($t[65]=0.327$, *ns*). With respect to specific reproductive concerns, 37.6% of participants stated that it was stressful to think about having a child one day ($n=26$). A minority of patients worried about their ability to have a child one day (15.9%, $n=11$) (Fig. 2).

Reproductive knowledge

Reproductive knowledge was assessed based on participants' answers to five questions regarding reproductive principles. The mean reproductive knowledge score was 3.59 (SD = 0.975), corresponding to mean percentage correct of 71.9% ($SD=19.50$). A slight majority (55.1%) of participants scored 4 or more and 3 participants (4.3%) scored only one correct (Table 3).

Transmasculine participants had a mean number of correct answers of 3.61, corresponding to an average of 72.2% correct. Transfeminine participants had a mean number correct of 3.69 (73.8%, SD = 0.87). Participants with other gender identities, including nonbinary

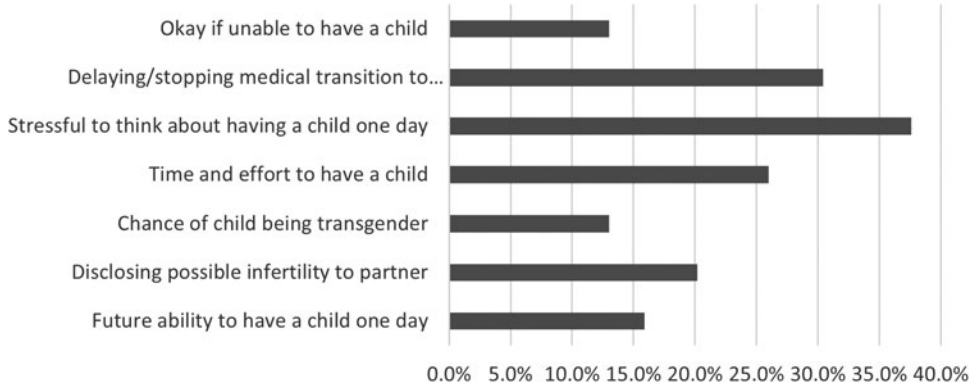

FIG. 2. Frequency of reproductive concerns.

participants, had a mean number correct of 3.42 (68.4%, SD = 1.00). A linear regression found a significant relationship between participant age and number of questions correct ($F[1,67] = 19.44$, $p < 0.001$).

Sources of information

Participants were surveyed on information sources and needs related to fertility and reproduction. Most participants (56.5%, $n = 39$) endorsed speaking to someone about fertility before being surveyed. Table 4 shows frequencies of reported information gaps. Mean number of unmet informational needs per participant was 1.37 ($SD = 1.69$, $n = 68$). Of the 16 patients on puberty blockers or gender-affirming hormone therapy at the time of survey, the majority (9 participants, 56.3%) reported no unmet information needs. Of the 52 patients on no treatment at the time of survey, 25 (48.1%) reported no unmet information needs.

The most cited source of information by participants was research online (56.5%) (Table 5). Participants were also surveyed on preferred sources of information to meet unmet needs, with a plurality (44.9%) endorsing "Discussion with a doctor" as a preferred source of information (Table 6).

Discussion

The present study sought to replicate and extend previous findings from a pilot study[22] on TGE youths' attitudes and knowledge toward fertility and future parenthood. This investigation also adds needed additional evidence to the small existing literature on this topic. We found that a majority of TGE youth reported that future parenthood is either not important to them or that they are unsure of its importance, in line with findings from the previous pilot study.[22]

Notably, adoption was reported to be the most preferred type of parenthood in our sample, and biological parenthood was the least preferred. No significant differences were found in the number of types of acceptable future parenthood based on gender identity, and no differences in importance of future parenthood or interest in biological parenthood were found based on age or on current treatment status. Analysis of differences in the importance of future parenthood by

Table 3. Knowledge About Reproductive Health and Fertility Among Transgender/Gender-Expansive Adolescents

Question		Correct answer	% responding correctly
Q1.	All people who want to become birth parents are able to.	False	75.4%
Q2.	Hormones may affect a person's ability to have a child in the future.	True	85.5%
Q3.	A doctor can accurately predict the effect that hormones will have on a person's ability to have a child in the future.	False	43.5%
Q4.	An egg from a person born female and a sperm from a person born male are needed to make a baby.	True	59.4%
Q5.	Storing eggs or sperm is one way to preserve the ability to have a child in the future.	True	94.2%

Q1 had 68 completed responses and one that was left incomplete. This incomplete response was not awarded points for a correct answer, and sample size was treated as 69.

Table 4. Fertility/Reproduction Informational Gaps of Transgender/Gender-Expansive Adolescents

Informational need	% Endorsing
Possible effects of taking hormones on a person's ability to have a child in the future	22.1%
Risks and benefits of waiting to take hormones to preserve eggs/sperm	27.9%
Who to talk to about my own ability to have a child in the future	27.9%
Options to increase my chance of becoming a birth parent in the future	39.7%
Alternatives to having biological children one day	19.1%

This section was left incomplete by one participant of our sample of 69, resulting in a valid sample of 68 participants.

gender identity was precluded by small cell sizes in our sample. However, we note that half of transfeminine participants endorsed future parenthood being important, whereas approximately a third of both transmasculine and nonbinary participants endorsed the same.

These findings on the importance of biological parenthood in TGE adolescents supplement various findings in the literature, which range from 12% of participants endorsing the importance of biological parenthood[24] to as high as 50% of participants.[30] Low prioritization of biological parenthood may partially stem from participants' hesitancy to forgo or delay medical transition to preserve fertility. Almost a third of our participants endorsed delay of transition as a concern, although this is infrequently reported in the literature.[26,35]

Such levels of interest in parenthood may partially result from a desire to avoid dysphoria associated with traditionally gendered parental roles.[36,37] Dysphoria may be particularly prominent in biological parenthood where pregnancy and contribution of sperm and eggs are considered especially gendered. In addition, disinterest or ambivalence about parenthood may reflect participants' age and developmental stage, as previous literature has shown that TGE adolescents report lower interest in parenthood and biological parenting than TGE adults.[21–24,28–30]

Table 5. Sources of Fertility-Related Information Used by Transgender/Gender-Expansive Adolescents

Source of information	% of respondents endorsing use
Discussion with a doctor	42.0%
Handout with written information from a doctor	10.1%
Discussion with family or friends	44.9%
Researched online on my own	56.5%
Other	13.0%
Did not know anything about these topics before today's visit	8.7%

Table 6. Preferred Potential Sources of Fertility-Related Information

Source of information	% of respondents endorsing acceptability
Discussion with a doctor	44.9%
Handout with written information from a doctor	21.7%
Research online	31.9%
Other	2.9%

Most participants endorsed at least one reproductive concern. The most common reproductive concerns generally did not pertain to the ability to have biological children, but rather to concerns and apprehension related to parenting, such as the time and effort of having a child or to the stress of thinking about future parenthood. This wide variety of patients' concerns highlights the need for providers to have detailed conversations regarding patients' specific feelings toward fertility and parenthood.

Gaps in reproductive knowledge were shown to be common in our sample, with few adolescents correctly stating that physicians cannot accurately predict the effect of hormones on fertility. This finding echoes previous results,[22] and highlights the importance of clear risk–benefit discussions with TGE patients before initiating puberty blockade and hormone therapy.[38]

However, the vast majority of participants were able to correctly state that hormones may affect future fertility, potentially indicating patients' greater familiarity with specific reproductive health concepts pertinent to hormone treatment. Only 59.4% were able to correctly state that "an egg from someone born female and a sperm from someone born male are required to make a baby." This is consistent with results from the original investigation from Morrison et al.,[22] where 60.9% of respondents answered correctly.

These results may reflect participants' reading of the question's terminology, which uses verbiage that is currently considered out of date when describing a person's natal sex. For example, transmasculine individuals may consider themselves "born male" despite being assigned female at birth, in which case an answer of "No" or "Unsure" may indicate conflict with the phrasing of the question rather than a gap in knowledge. Participants' answers on this topic may also result from a high degree of optimism for the potential of reproductive technologies to allow for fertility, although these technologies currently still require a sperm and an egg to function.[39] Notably, age was a

significant predictor of reproductive knowledge – as age increased, so too did the proportion of questions answered correctly.

This association may reflect the fact that older patients may be more likely to be further along the treatment pathway or may have had more opportunities to obtain this information from educators, peers, family, and the internet.[40,41] It should be noted that terminology related to gender identity and associated sex characteristics changes often, and researchers should monitor and be prepared to frequently update measures to ensure accessible and current verbiage balanced with attending to measurement issues (i.e., validity of instruments).

Most participants reported speaking to someone about fertility before study participation, while less than half reported discussing these topics with a physician. Importantly, most patients on puberty blockers or gender-affirming hormones endorsed having such discussions with a physician.

Most patients currently taking gender-affirming hormones or puberty blockers reported feeling sufficiently informed on fertility topics, suggesting that they had been adequately counseled before initiating treatment. At the same time, a substantial portion reported unmet information needs, which suggests an opportunity for improvement in counseling practices before initiating gender-affirming treatment, especially given our finding that discussion with a physician was the most preferred source of information.

These findings reinforce the need for providers to carefully assess patients' informational needs both initially at the start of treatment and as treatment continues, as new questions and concerns may arise with time. A substantial portion of patients not currently on medication also reported no unmet information needs, suggesting that many of these patients either do not prioritize fertility-related information in treatment decisions or feel sufficiently informed before starting treatment.

Limitations

This study has several limitations. First, we are limited in generalizing to the broader TGE population, as participants included only TGE youth patients at a single, urban, pediatric gender program in the Northeast. Demographically, this sample is not representative of the larger population's racial/ethnic and socioeconomic diversity, which also limits generalizability. Second, this sample was actively seeking gender-affirming care whereas not all TGE adolescents choose to or are able to seek affirming care. Future research may supplement this investigation by recruiting a more representative sample of TGE adolescents, including those who may not be connected to gender-affirming care and those from more racially and socioeconomically diverse backgrounds.

Additionally, longitudinal research examining within-subject changes in attitudes and knowledge has the potential to characterize how providers and adolescent patients engage over time in shared decision making on reproductive topics.

It likewise remains unclear how the attitudes described by participants in this study might translate to delaying of transition for fertility preservation or might translate to future treatment attitudes, or retrospective wishes (e.g., regret that they did not delay transition to preserve fertility) among patients undergoing medical transition. Finally, our sample was limited in its representation of patients with nonbinary gender identities (17.4%, $n = 12$), such as those who identify as genderqueer or genderfluid. This limits our ability to generalize findings to nonbinary individuals, which should be a central focus of future investigations, including by oversampling to maximize statistical power.

Future directions

Future research should build on this work by increasing sample diversity. For example, research into the priorities and experiences of nonbinary and genderfluid adolescents is needed to best serve such patients. Nonbinary individuals may be less likely to pursue medical transition and may also be less likely to receive information needed to make decisions on hormones, including information on fertility preservation.[42,43]

Additionally, there is a growing body of literature consisting of qualitative examinations of the fertility/reproductive attitudes of TGE adults[44–47] and TGE adolescents.[23,37,48–51] Future research should expand on these works by providing larger and more diverse samples, as qualitative research has significant potential to present a nuanced view of the varied experiences and challenges of TGE adolescents considering gender-affirming treatment. This qualitative work could, in turn, guide development of measures and quantitative research.

Future research should also include evaluation of specific best practices or protocols for providers counseling patients on hormone therapy and fertility to maximize patient engagement and satisfaction, as work is currently being done to develop such protocols.[52] A protocol could guide providers who often see many patients each clinic day and could ensure consistency of information transmission to patients. In this way, such a

protocol would have both an educational and interventional function to counter incomplete or misinformation received elsewhere. Measures such as the one used in our survey could also be used, once validated, as an intervention to determine patients' priorities and to stimulate discussion of topics therein.

While our study provided opportunities for patients to describe preferred sources of information on reproductive topics, future research could delve into further detail on best practices for these sources. This would allow stakeholders to further optimize information delivery to patients before engaging in shared decision making and fertility counseling. For example, such research could inform stakeholders involved in the creation of online materials for reproductive health education, as our sample and others reported significant engagement with online sources of information. Patients are best served when providers meet them where they are when providing care, and online information continues to be a leading source of patient education for youth.

While the present study investigated participants' knowledge of biological reproduction, it is vital to learn about TGE adolescents' understanding of other pathways to parenthood. In the United States, adoption policy varies on a state-by-state basis, and most states prohibit adoption agencies from discriminating on the basis of gender identity.[53] While there are no specific legal barriers to adoption by TGE parents, TGE individuals may face practical barriers and discrimination similar to that experienced by same-sex couples.[54,55] The experiences of TGE individuals in pursuing adoption requires further study.

Future studies could also examine youth participants' views on the potential challenges of the adoption process to ensure that patients are adequately informed about all options. Future work should additionally examine how patients' knowledge and reproductive priorities change over time, and how endocrine treatment and function may be associated with these changes.

Lastly, future research could elucidate barriers to fertility preservation in this patient population. For example, such work could help stakeholders understand how cost barriers may affect patients from particular demographic groups and geographic areas. Although not assessed in our study, financial barriers have been reported in the literature previously.[35,56]

Conclusions

The current study adds to the existing literature by replicating a previous investigation of and providing further insight into the reproductive attitudes and knowledge of TGE adolescent patients presenting for gender-affirming treatment. Understanding the informational needs and priorities of adolescent TGE patients presenting for medical treatment will allow providers to give more robust patient education. This will, in turn, facilitate patients' ability to provide fully informed consent for treatment that aligns with their fertility and reproductive priorities and goals.

Author Disclosure Statement

No competing financial interests exist.

Funding Information

This publication was made possible by the Yale School of Medicine Fellowship for Medical Student Research awarded to Justin Halloran.

Supplementary Material

Supplementary Data S1

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Cite this article as: Halloran J, Smidt AM, Morrison A, Cron J, Kallen AN, Olezeski CL (2023) Reproductive and fertility knowledge and attitudes among transgender and gender-expansive youth: a replication and extension, *Transgender Health* 8:4, 328–336, DOI: 10.1089/trgh.2021.0080.

Abbreviation Used

TGE = transgender and gender expansive