

Pregnancy intentions and outcomes among transgender, nonbinary, and gender-expansive people assigned female or intersex at birth in the United States: Results from a national, quantitative survey

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ABSTRACT

Background: Transgender, nonbinary, and gender-expansive (TGE) people experience pregnancy. Quantitative data about pregnancy intentions and outcomes of TGE people are needed to identify patterns in pregnancy intentions and outcomes and to inform clinicians how best to provide gender-affirming and competent pregnancy care.

Aims: We sought to collect data on pregnancy intentions and outcomes among TGE people assigned female or intersex at birth in the United States.

Methods: Collaboratively with a study-specific community advisory team, we designed a customizable, online survey to measure sexual and reproductive health experiences among TGE people. Eligible participants included survey respondents who identified as a man or within the umbrella of transgender, nonbinary, or gender-expansive identities; were 18 years or older; able to complete an electronic survey in English; lived in the United States; and were assigned female or intersex at birth. Participants were recruited through The PRIDE Study – a national, online, longitudinal cohort study of sexual and gender minority people – and externally via online social media postings, TGE community e-mail distribution lists, in-person TGE community events, and academic and community conferences. We conducted descriptive analyses of pregnancy-related outcomes and


report frequencies overall and by racial and ethnic identity, pregnancy intention, or testosterone use.

Results: Out of 1,694 eligible TGE respondents who provided reproductive history data, 210 (12%) had been pregnant. Of these, 115 (55%) had one prior pregnancy, 47 (22%) had two prior pregnancies, and 48 (23%) had three or more prior pregnancies. Of the 433 pregnancies, 169 (39%) resulted in live birth, 142 (33%) miscarried, 92 (21%) ended in abortion, two (0.5%) ended in stillbirth, two (0.5%) had an ectopic pregnancy, and seven (2%) were still pregnant; nineteen pregnancies (4%) had an unknown outcome. Among live births, 39 (23%) were delivered via cesarean section. Across all pregnancies, 233 (54%) were unintended. Fifteen pregnancies occurred after initiation of testosterone, and four pregnancies occurred while taking testosterone. Among all participants, 186 (11%) wanted a future pregnancy, and 275 (16%) were unsure; 182 (11%) felt “at risk” for an unintended pregnancy.

Discussion: TGE people in the United States plan for pregnancy, experience pregnancy (intended and unintended) and all pregnancy outcomes, and are engaged in family building. Sexual and reproductive health clinicians and counselors should avoid assumptions about pregnancy capacity or intentions based on a patient’s presumed or stated gender or engagement with gender-affirming hormone therapy.

KEYWORDS

abortion, birth, intersex, miscarriage, nonbinary, pregnancy, testosterone, transgender

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Introduction

Transgender, nonbinary, and gender-expansive (TGE) people (*i.e.*, individuals whose gender identity differs from the gender identity commonly assumed for the sex assigned to them at birth) who were assigned female sex at birth often retain a uterus and may carry pregnancies (Cipres et al., 2017; Fein et al., 2019; Light et al., 2018, 2014; Obedin-Maliver & Makadon, 2016). People assigned intersex at birth or who identify as intersex are those who have “natural variations in sex characteristics that do not seem to fit typical binary notions of male or female bodies” (InterAct Advocates for Intersex Youth & Lambda Legal, 2018). Such variations do not necessarily impact capacity for pregnancy, although some irreversible surgeries completed on children diagnosed as intersex may impair fertility (Human Rights Watch & InterAct Advocates for Intersex Youth, 2017). Despite the fact that individuals from both of these groups can and do carry pregnancies, TGE and intersex people have been excluded from

sexual and reproductive health research. Almost all prior research has focused on pregnancies solely among cisgender women (*i.e.*, people whose gender identity aligns with the gender identity commonly assumed for those assigned female sex at birth) (Moseson et al., 2020), which presents a narrow view of reproductive health and family building.

Despite the ability to carry pregnancies, TGE people assigned female sex at birth face barriers to accessing high-quality pregnancy-related healthcare, including provider knowledge barriers, structural barriers such as lack of health insurance, and social barriers such as the fear of discrimination or misgendering (Hoffkling et al., 2017; James et al., 2016; Light et al., 2014; Reisner et al., 2010). Patients, providers, and national professional organizations, like the American College of Obstetrics and Gynecology, have called for eliminating these barriers and improving pregnancy-related resources and care for TGE people assigned female at birth (ACOG, 2011; Light et al., 2014; Obedin-Maliver & Makadon, 2016), but a dearth of data and resources remain.

Lay press articles and films (Barker, 2018; Beatie, 2008; Davis, 2001; Finlay, 2019; Hempel, 2016; Huberdeau, 2012; Pearce & White, 2019), as well as a growing body of peer-reviewed literature (Beckwith et al., 2017; Ellis et al., 2015; Hahn et al., 2019; Hoffkling et al., 2017; Light et al., 2014; 2018; Pearce & White, 2019), have explored the pregnancy experiences of TGE people. These studies reported the sociodemographic characteristics of TGE individuals who have been pregnant, pregnancy intentions, history of gender-affirming hormone use, summary data on pregnancy outcomes, post-partum care considerations, and qualitative descriptions of the pregnancy experience as a TGE person (Beckwith et al., 2017; Ellis et al., 2015; Hahn et al., 2019; Hoffkling et al., 2017; Light et al., 2014; 2018; Pearce & White, 2019).

As highlighted in the above resources, TGE individuals encounter a range of unique barriers to accessing high-quality gynecological and obstetrical care (Hoffkling et al., 2017; Light et al., 2014; 2018). Participants in qualitative research on the pregnancy experiences of TGE individuals have also reported negotiating tensions between their fertility or family building intentions and their desire for gender-affirming hormone therapy, which can be exacerbated by the lack of research on testosterone use during pregnancy (Ellis et al., 2015; Hahn et al., 2019; Hoffkling et al., 2017; Wingo et al., 2018). These studies serve as resources for clinicians and healthcare providers and form the basis of the few clinical recommendations that exist about pregnancy-related care for TGE people (Dutton et al., 2008; Makadon et al., 2015; Obedin-Maliver & Makadon, 2016).

However, further research with larger study samples is needed to build the evidence base for essential reproductive health outcomes including unintended pregnancies, abortion experiences, and fertility experiences (Fein et al., 2019; Light et al., 2018; Obedin-Maliver & Makadon, 2016) and to inform revisions to existing guidelines. Generating evidence among larger samples is vital to gain a more precise understanding of the incidence, prevalence, and patterns of these health experiences and to inform healthcare provider education with evidence-based and culturally competent care for these populations. Toward this goal, we collected data on pregnancy intentions and outcomes among a large sample of TGE people assigned female or intersex at birth in the United States.

Methods

Ethics

This study was reviewed and approved by the Institutional Review Boards of Stanford University and the University of California, San Francisco. In addition, The Population Research in Identity and Disparities for Equality (PRIDE) Study Research Advisory Committee and The PRIDE Study Participant Advisory Committee (pridestudy.org/pridenet) reviewed and approved the study. We obtained informed consent from all survey respondents. The study protocol followed all guidelines and precautions recommended for research involving a vulnerable population, which for this research included pregnant persons. The study was designed by a research team that included TGE individuals and in close collaboration with a paid, study-specific community advisory team comprised of five TGE individuals.

Study design

This study was a self-administered, online, cross-sectional survey of sexual and reproductive health experiences, designed specifically for sexual and gender minority participants. There were two enrollment avenues: an online anonymous survey or through participation in The PRIDE Study. For the anonymous online survey, eligible participants included those who were 18-45 years old; were transgender, nonbinary, or gender-expansive; assigned female or intersex at birth; resided in the United States; and could complete an electronic survey in English. We recruited individuals through social media posts, outreach to community-based organizations, e-mail distribution lists, in-person TGE community events, flyers at academic and community conferences, and a standalone study website. Sexual and gender minority individuals assigned female or intersex at birth and age 18 years or older could participate through

The PRIDE Study, a longitudinal cohort study of people who identify as lesbian, gay, bisexual, transgender, queer (LGBTQ+), or as a sexual or gender minority in the United States (pridestudy.org).

Data collection

We co-created this Qualtrics-based (Qualtrics, Provo, UT) survey with a community advisory team as well as The PRIDE Study's Research and Participant Advisory Committees. We programmed the survey to allow for customizable words for sexual and reproductive body parts and processes to reduce gender dysphoria. We utilized skip logic to increase question relevance for individual respondents and to reduce survey length. Respondents who initiated the survey were entered into a raffle to win one of 100, \$50 electronic gift cards. Survey development, content, and format details are described elsewhere (Moseson et al., [2020](#)).

The survey focused on core domains related to gender identity, sexual activity, and sexual and reproductive health. The primary outcome for this analysis was gravidity, including a current pregnancy. Secondary outcomes were: testosterone use in relation to pregnancy, pregnancy intention, pregnancy outcomes (ongoing pregnancy, miscarriage, ectopic pregnancy, abortion, stillbirth, live-birth, unknown), and delivery method. Additional survey questions asked about future pregnancy intentions, desired timing for future pregnancy, and whether the respondent felt “at risk” of unintended pregnancy (defined as getting pregnant at a time that they did not want to be pregnant).

Measures

For pregnancy-related outcomes, we developed an indicator of “ever pregnant” based on whether a respondent reported “one or more” or zero pregnancies. Currently pregnant respondents were classified as “ever pregnant.” The survey collected detailed information on timing, intention, and outcome of each pregnancy as well as testosterone use. We classified respondents as intending to get pregnant in the future, and the timing of those pregnancy plans, based on responses to modified Pregnancy Attitudes Timing and How (PATH) questions (Callegari et al., [2017](#)).

We included sociodemographic measures. To identify which survey respondents met the study eligibility criteria of being transgender, nonbinary, or gender-expansive, we categorized respondents based on three questions: (1) an open-text response question asking respondents to describe their gender identity, (2) a multiple choice question asking them to pick all options that best reflected their gender identity and an “additional” write-in option if they did not feel represented by the available options, and (3) a sex assigned at birth multiple choice question that included the options

“female,” “male,” “not listed” (with a write-in response), and “prefer not to say.” We categorized respondents as TGE if their categorical or free text responses included any genders other than “cisgender woman” and/or “woman” (see [Table 1](#) for full list of gender identity options). We categorized participants as intersex if they (1) reported an intersex assignment at birth in their open-text response to the sex assigned at birth question, or (2) if they indicated that they identified as intersex in a subsequent question specific to intersex identity (even if they reported having been female sex assigned at birth). To measure race/ethnicity and sexual orientation, respondents could select all that apply (including a write-in response) from a list of ten racial and ethnic identities and a list of ten sexual orientations.

Table 1. Respondent sociodemographic characteristics, overall and by pregnancy history among an online sample of transgender, nonbinary, and gender-expansive individuals assigned female or intersex at birth in the United States (n = 1,694). ([Table view](#))

Sample Characteristics	All Respondents (n = 1,694)		Respondents who reported ever having had a pregnancy (n = 210)	
Median age in years, IQR	n	%	n	%
Age categories				
18-19 y	150	9	3	1
20-24y	469	28	21	10
25-29y	447	26	38	18
30-34y	284	17	44	21
35-39y	149	9	39	19
40-44y	88	5	28	13
45-49y	38	2	13	6
50-54y	31	2	10	5
55-59y	20	1	5	2
60-78y	18	1	9	4
Missing	0	0	0	0
Gender identities*				
Agender	226	13	34	16
Cisgender man	1	0	1	1
Cisgender woman	0	0	17	8
Genderqueer	655	39	95	45
Man	293	17	19	9
Nonbinary	868	51	110	52
Transgender man	662	39	70	33
Transgender woman	4	0	1	1
Two-spirit	26	2	9	4
Woman	204	12	20	10
Additional gender identity	197	12	24	11
Multiple gender identities	1036	61	118	56
Prefer not to say	2	0	1	1

Sample Characteristics	All Respondents (n = 1,694)		Respondents who reported ever having had a pregnancy (n = 210)	
Missing	0	0	0	0
Sex assigned at birth				
Female	1684	99	208	99
Not listed	10	0.6	2	1
Missing	0	0	0	0
Identifies as intersex				
No	1604	95	196	93
Yes	69	4	12	6
Prefer not to say	21	1	2	1
Missing	0	0	0	0
Sexual orientation*				
Asexual	252	15	20	10
Bisexual	571	34	68	32
Gay	348	21	47	22
Lesbian	218	13	26	12
Pansexual	418	25	74	35
Queer	1150	68	142	68
Questioning	69	4	7	3
Same-gender loving	111	7	17	8
Straight/heterosexual	61	4	4	2
Another sexual orientation	129	8	17	8
Multiple sexual orientations	1010	60	126	60
Missing	21	1	0	0
Race/ethnicity*				
American Indian or Alaska Native	42	3	9	4
Asian, Central	0	0	0	0
Asian, East	41	2	4	2
Asian, South	19	1	5	2
Asian, Southeast	25	2	4	2
Black or African American	67	4	8	4
Hispanic or Latinx	101	6	13	6
Middle Eastern or North African	24	1	5	2
Native Hawaiian or Pacific Islander	5	0.3	0	0
White	1472	87	190	91
Unknown	12	1	2	1
Another race	41	2	7	3
Multiple racial/ethnic identities	202	12	34	16
None of these	4	0	2	1
Missing	79	5	5	2
Education level				
High school degree or less	141	8	13	6
Some college, trade or tech school	410	24	54	26
College degree	644	38	64	31
Grad or professional degree	410	24	71	34
Missing	89	5	8	4

Sample Characteristics	All Respondents (n = 1,694)		Respondents who reported ever having had a pregnancy (n = 210)	
Health insurance coverage				
No	92	5	12	6
Yes	1512	89	190	91
Don't know	10	1	1	0.5
Missing	80	5	7	3
US Census Region				
Midwest	304	18	34	16
Northeast	411	24	45	21
South	326	19	44	21
West	468	28	66	31
Missing	185	11	21	10
Ever pregnant	210	12	210	100

* Respondents could select all that apply.

Analytic approach

We conducted descriptive analyses to closed-ended survey questions using Stata 15.1 (StataCorp, College Station, TX). We calculated outcome frequencies overall and by pregnancy intention status, history of testosterone use, and racial/ethnic identity category (American Indian and Alaska Native, Asian, Black or African American, Hispanic or Latinx, Middle Eastern or North African, Native Hawaiian and other Pacific Islander, white, and additionally, a category for anyone who selected two or more racial identities). We tested for a difference in proportion of pregnancies reported as unintended between respondents who reported ever using testosterone *versus* those who reported never using testosterone using a two-tailed test of proportions.

Results

Participant characteristics

Out of 1,694 TGE respondents, approximately one in four (n = 469, 28%) reported ever using testosterone (any formulation), and 210 (12%) reported ever having been pregnant (Table 1). Among these 210 respondents, median age was 35 years (IQR: 29-42); 56% reported more than one gender identity [most commonly nonbinary (52%)]; 99% reported having been assigned female sex at birth, 0.5% reported being assigned “both” sexes at birth, and 0.5% reporting being diagnosed intersex at birth but assigned female; 6% *identified* as intersex. A minority of ever-pregnant respondents (28%) identified with a racial or ethnic identity other than “white,” and most had health

insurance (91%). Over half of ever-pregnant participants (54%) were parents to at least one child.

Pregnancy history and use of testosterone

Among the 210 ever-pregnant participants, 115 (55%) had been pregnant a single time, while 95 (45%) had been pregnant 2 to 13 times (Table 2). Seven (3%) of the ever-pregnant participants were pregnant at the time of the survey. In the past twelve months, 16 respondents reported a pregnancy, or 1% of the sample as a whole (n = 1,694). To more precisely estimate the pregnancy rate among respondents likely capable of pregnancy, we excluded respondents who reported a hysterectomy (n = 175), that they do not have sex where sperm is released in or near the vagina (n = 607), and/or were 45 years or older (n = 107), leaving 16 pregnancies among 955 respondents (1.7%). This translates to an approximate pregnancy rate of 16.8 pregnancies per 1,000 TGE respondents with a uterus who have sex that can lead to pregnancy, per year.

Table 2. Pregnancy history among an online sample of transgender, nonbinary, and gender-expansive people assigned female or intersex at birth in the United States (n = 1,694). (Table view)

Pregnancy history	n	%
Number of pregnancies		
0	1455	85.9
1	115	6.8
2	47	2.8
3	17	1
4	14	0.8
5	4	0.2
6	5	0.3
7	4	0.2
8+	4	0.3
Missing	29	1.7
Current pregnancy		
Yes	7	0.4
Don't Know	1	0.1
Total number of pregnancies	433	100
Number of pregnancies after initiating testosterone	15	3.5
Number of pregnancies while on testosterone	4	0.9

Among respondents who had ever used testosterone, 10% (n = 46) reported ever being pregnant compared to 13% (n = 164) who reported never using testosterone. Twelve respondents reported 15 pregnancies that occurred after initiating testosterone

(Table 2). Of these 12 respondents, seven (58%) had discussed the potential interactions between testosterone use and pregnancy with their health care provider. Three respondents reported using testosterone at the time they became pregnant; of these respondents, one reported two pregnancies while using testosterone. Two of these four pregnancies ended in miscarriage (one after five months of testosterone use, one after six months of testosterone use); one ended in abortion (after four months of testosterone use); and the outcome and testosterone duration for the fourth pregnancy were not reported. None of the respondents who conceived while using testosterone remembered if they were still having regular periods at the time they got pregnant. Eight of the 12 respondents reported stopping testosterone one month prior to getting pregnant. Among these, five stopped testosterone specifically to try to conceive, and three stopped for unrelated reasons. One respondent did not report if testosterone use was ongoing or only prior to conception.

Pregnancy intention and outcomes

Respondents reported details on pregnancy intention and outcome for 433 pregnancies (Table 3). Across all 433 pregnancies, the most common outcome was live birth (n = 169, 39%), followed by miscarriage (n = 142, 33%) and abortion (n = 92, 21%). Among live births, 23% (n = 39) were delivered via cesarean section. Live birth, abortion, and miscarriage alternated as the most common pregnancy outcome, depending on racial and ethnic group (Table 4).

Table 3. Pregnancy outcomes by intention and use of testosterone, among an online sample of transgender, nonbinary, and gender-expansive people assigned female or intersex at birth in the United States (n = 1,694). (Table view)

	Overall	Still pregnant	Outcome of pregnancy					Live birth	Unknown	Testosterone u		
			Miscarriage	Ectopic	Abortion	Stillbirth	Ever used			Never used	Mis	
Were you trying to get pregnant at this time?	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i>	
Yes	183 (42)	7 (4)	55 (30)	0 (0)	2 (1)	1 (0.5)	118 (65)	0 (0)	30 (38)	153 (45)	0	
No	233 (54)	0 (0)	86 (37)	2 (1)	88 (38)	1 (0.4)	51 (22)	5 (26)	49 (62)	184 (54)	0	

	Outcome of pregnancy								Testosterone use		
	Overall	Still pregnant	Miscarriage	Ectopic	Abortion	Stillbirth	Live birth	Unknown	Ever used	Never used	Misused
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Were you trying to get pregnant at this time?											
Don't know	5 (1)	0 (0)	1 (20)	0 (0)	2 (40)	0 (0)	0 (0)	2 (11)	0 (0)	5 (1)	0 (0)
Missing	12 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (63)	0 (0)	0 (0)	0 (0)
Total	433 (100)	7 (2)	142 (33)	2 (0.5)	92 (21)	2 (0.5)	169 (39)	19 (4)	79	342	0

Table 4. Pregnancy intentions and outcomes by racial and ethnic identities, among an online sample of transgender, nonbinary, and gender-expansive people assigned female or intersex at birth in the United States (n = 1,694). (Table view)

	Overall (n = 1694)		American Indian & Alaska Native (n = 42)		Asian (n = 77)		Black or African American (n = 67)		Hispanic or Latinx (n = 101)		Middle Eastern or North African (n = 24)		Native Hawaiian & other Pacific Islander (n = 5)		White (n = 1472)		Multiple racial identities (n = 202)	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Ever use of testosterone	469	28	14	33	15	19	18	27	26	26	6	25	1	20	421	29	58	29
Ever pregnant	210	12	9	21	12	19	8	12	13	13	5	21	0	0	190	13	34	17
Pregnancies per respondent																		
0	1455	--	33	--	65	--	59	--	88	--	19	--	5	--	1280	--	168	--
1	115	--	2	--	9	--	8	--	7	--	4	--	0	--	102	--	19	--
2	47	--	3	--	2	--	0	--	4	--	0	--	0	--	43	--	8	--
3+	48	--	4	--	1	--	0	--	2	--	1	--	0	--	45	--	7	--
Missing	29	--	0	--	0	--	0	--	0	--	0	--	0	--	2	--	0	--
Total pregnancies	433	--	36	--	19	--	8	--	21	--	8	--	0	--	393	--	69	--
Pregnancy outcomes																		
Still pregnant	7	2	0	0	0	0	0	0	0	0	0	0	0	0	7	2	1	1
Miscarriage	142	33	18	50	9	47	5	63	4	19	3	38	0	0	127	32	28	4

	Overall (n = 1694)		American Indian & Alaska Native (n = 42)		Asian (n = 77)		Black or African American (n = 67)		Hispanic or Latinx (n = 101)		Middle Eastern or North African (n = 24)		Native Hawaiian & other Pacific Islander (n = 5)		White (n = 1472)		Multiple racial identities (n = 20)	
Ectopic pregnancy	2	0.5	0	0	0	0	0	0	0	0	1	13	0	0	2	0.5	1	2
Abortion	92	21	2	6	6	32	2	25	7	33	1	13	0	0	90	23	15	2
Stillbirth	2	0.5	0	0	0	0	0	0	0	0	0	0	0	0	2	0.5	0	0
Live birth	169	39	14	39	4	21	1	13	10	48	3	38	0	0	158	40	24	3
Unknown	19	4	2	6	0	0	0	0	0	0	0	0	0	0	7	2	0	0
Cesarean birth	39	23	3	21	1	25	0	0	1	10	0	0	0	0	37	23	4	1
Ever had an unintended pregnancy	153	73	8	89	10	83	7	88	9	69	4	80	0	0	139	73	26	7
Considers self at risk for future unplanned pregnancy	182	11	4	10	9	12	6	9	14	14	3	13	2	40	157	11	26	1

Respondents indicated that they were not trying to get pregnant for 54% of pregnancies (n = 233) (Table 3). Among unintended pregnancies, abortion was the most common outcome (n = 88, 38%), followed closely by miscarriage (n = 86, 37%) and live birth (n = 51, 22%). Among intended pregnancies, the most common outcome was live birth (n = 118, 65%) followed by miscarriage (n = 55, 30%). Intended pregnancies were comparable between respondents who had ever used testosterone (38%) compared to those who had not (45%) (p = 0.26). The proportion of ever-pregnant respondents who had experienced one or more unintended pregnancies was high across all racial and ethnic groups (Table 4).

Perspectives on future pregnancy

Across all 1,694 TGE respondents, 11% (n = 186) desired future pregnancy, and an additional 16% (n = 275) were uncertain (Table 5). Of those who desired future pregnancy, 16% (n = 29) had previously been pregnant; 12% (n = 34) of those who were uncertain about future pregnancy desires had previously been pregnant. Among those who desired future pregnancy, 17% (n = 31) would like to get pregnant in the next year. Nearly one in five respondents considered themselves to be “at risk” of getting pregnant at a time when they did not want to be pregnant (n = 182, 11%) or were unsure about their “risk” (n = 111, 7%). The proportion who considered themselves “at risk” for unintended pregnancy similarly ranged from 9-14% across

racial and ethnic identities, with the exception of one small group among whom 40% (n = 2) considered themselves at-risk (Table 4).

Table 5. Future pregnancy intentions among an online sample of transgender, nonbinary, and gender-expansive people assigned female or intersex at birth in the United States (n = 1,694). (Table view)

Future pregnancy intentions	n	%
Would like to get pregnant at some point		
No	1030	61
Yes	186	11
Don't Know	275	16
Missing	203	12
Would like to get pregnant:		
Within next year	31	2
Within next 5 years	60	4
Within 6-10 years	57	3
More than 10 years	4	0
Don't Know	11	1

Discussion

In this national online survey, 1,694 TGE individuals assigned female or intersex at birth provided data on pregnancy intentions and outcomes. More than one in ten participants reported a past or current pregnancy as well as a desire for future pregnancy. Respondents provided detailed information on pregnancy outcomes for 433 pregnancies, testosterone use in relation to pregnancy, and past and future intentions for pregnancy. To our knowledge, this is the largest report of pregnancies experienced by TGE people. These data offer clinicians, researchers, and community members a better understanding of the frequency and distribution of pregnancy outcomes among gender-diverse populations, toward the goal of improved evidence-based and culturally competent pregnancy care for these populations.

The frequency of pregnancy outcomes reported in this study can be compared to only a handful of prior quantitative studies that report on pregnancy, abortion, birth, miscarriage, and ectopic pregnancies among TGE individuals in the United States (Beckwith et al., 2017; Light et al., 2014; 2018). A 2013 survey reported on the experiences of 41 transgender men who had each been pregnant and delivered a live neonate (Light et al., 2014). Among all live births, 30% reported a cesarean delivery, as compared to 23% reported in our study, while 32% of pregnancies were unintended, compared to 54% in ours. We report fewer pregnancies after initiation of testosterone

(3% *versus* 61% of pregnancies) but a comparable percentage of people who reported stopping testosterone to get pregnant (68% *versus* 73%).

A more recent study reported on 32 transgender men and their 60 pregnancies, 48% of which resulted in delivery (versus 39% in ours), 23% in miscarriage (versus 33% in ours), 12% in abortion (versus 21% in ours), and 5% were pregnant at the time of the study (versus 2% in ours) (Light et al., 2018). A 2018 abstract reported 28 TGE participants with unplanned pregnancy, of which 36% chose abortion (Beckwith et al., 2017). We found no difference in likelihood of intended pregnancy between those who had ever taken testosterone and those who had not in contrast to a prior study where those who had never taken testosterone were nearly three times more likely to have been pregnant than those who had ever taken testosterone (Light et al., 2018).

With regard to future pregnancy desires, a small number of prior studies have measured this sentiment among TGE populations outside of the United States. One study in Australia found that 13% (n=21) of 160 transgender and gender-diverse people indicated that they desired to have children in the future (Riggs et al., 2016) – similar to the 11% reported in our sample. In a study of 433 transgender people ages 16 years and older in Canada, 32.3% (n = 148) desired a child in the future (Pyne et al., 2015). Notably, these two studies included individuals assigned male at birth in the study sample – while ours included only those assigned female or intersex at birth. Despite these differences, these studies confirm that many TGE individuals desire future pregnancy, and preconception and pregnancy planning services should be adapted to be more gender-inclusive and offered to all.

Across studies with quantitative data on pregnancy experiences and outcomes among TGE individuals, we are beginning to see some patterns. However, due to differences in sample recruitment, differences in study population by gender identity and age variation, comparisons across studies are difficult. Routine collection of sexual orientation and gender identity information in all administrative datasets that record pregnancy and birth outcomes will be essential to understand the baseline epidemiology of these communities (CDC, 2020).

Implications for practice

These data provide insight into the distribution of pregnancy experiences and outcomes among TGE people assigned female or intersex at birth in the United States. Findings highlight the reality that TGE people in the United States plan for pregnancy, experience pregnancy (intended and unintended) and all pregnancy outcomes, and are engaged in family building. These results provide insight into the characteristics of

TGE people who experience pregnancy, and explore the relationship between pregnancy intentions and outcomes for this understudied population, as well as pregnancy outcomes by racial and ethnic identities.

The implications for clinicians are clear: sexual and reproductive health providers should avoid assumptions about pregnancy capacity or intentions based on a patient's presumed or stated gender or engagement with gender-affirming hormone therapy. The fact that nearly one in five respondents felt "at risk" of unintended pregnancy, or were unsure of their risk, emphasizes the need for improved contraceptive counseling and care delivery for these populations (Agenor et al., 2020; Bonnington et al., 2020; Boudreau & Mukerjee, 2019; Krempasky et al., 2020). Toward the other end of the family planning spectrum, that one in four respondents desired or were uncertain about future pregnancy desires underscores the need for providers to evaluate fertility plans with all patients, regardless of gender, and to offer high-quality, gender-affirming pre-conception care for those that want it. Relevant for both those desiring pregnancy and those trying to avoid pregnancy, the finding that some pregnancies occurred after starting and while using testosterone reiterates that testosterone does not completely prevent ovulation or pregnancy even if it may attenuate it by an unknown amount. (Bonnington et al., 2020; Krempasky et al., 2020; Light et al., 2014, 2018). The potential for both potentially impaired fertility and pregnancy while using testosterone should be discussed with all patients initiating testosterone.

The findings presented here add a quantitative picture to experiences of pregnancy reported so powerfully by TGE people in the qualitative literature – findings that underscore the need for quantitative research. TGE people in the United States have reported delaying pregnancy due to a lack of data on the influence of testosterone on pregnancy outcomes, or conversely, delaying gender-affirmation hormone therapy until fertility goals are achieved because of this same lack of data (Hoffkling et al., 2017; Wingo et al., 2018). It is our hope that the data presented here begin to address this gap in the evidence.

Limitations

No measures of pregnancy intentions or pregnancy outcomes have been developed or validated specifically for TGE people. We (in collaboration with a community advisory team) subsequently developed our own measures, but we cannot comment on their sensitivity in capturing the intended outcomes. Due to the cross-sectional nature of this survey, these data rely on respondent recall of testosterone initiation and cessation dates, pregnancy conception dates, and pregnancy intentions at the time of pregnancy, which may have occurred many years prior and may be subject to recall bias. Specific

to pregnancy intentions, people may be more likely to report a pregnancy as “intended” when asked retrospectively, even if they were not trying to become pregnant at that time, because perceptions of past conception can change over time (Rocca et al., 2019). As a result, pregnancies reported in this study as unintended (54%) may be an underestimate. Similarly, even though we asked about abortion in two different ways, it is well established that people underreport abortion in surveys due to social stigma and a desire to protect privacy (Jagannathan, 2001; Jones & Forrest, 1992; Moseson et al., 2015). An additional limitation includes the low proportion of respondents from some racial and ethnic groups: while 28% of ever-pregnant respondents indicated at least one race or ethnicity other than “white,” many groups included only a few respondents. This limited our ability to evaluate patterns in pregnancy outcomes by racial/ethnic identity.

Finally, although we included participants assigned both female and intersex at birth in this analysis, this survey was designed to capture experiences based on participant gender identity, not sex assigned at birth. Results of this study do not offer an in-depth or nuanced analysis of pregnancy intentions or outcomes that may be specific to individuals with an intersex assignment at birth or an intersex identity/lived experience. These experiences are deserving of further inquiry.

Conclusion

These findings summarize one of the largest known datasets of pregnancy intentions and outcomes of TGE people assigned female or intersex at birth and provide needed insight into the family planning needs of these understudied populations. Clinicians can draw on these data to inform the information and care provided to TGE patients related to pregnancy, while TGE individuals can utilize these findings to contextualize their own reproductive experiences. The data on the incidence and distribution of major pregnancy outcomes among TGE people presented here will build the evidence based for gender-inclusive pregnancy care, and can be used to evaluate where family planning services are succeeding, and where they are falling short, for TGE people in the United States.

Disclosure of conflicts

JOM has consulted for Sage Therapeutics (May 2017) in a one-day advisory board, Ibis Reproductive Health (a non-for-profit research group 3/2017-5/2018), and Hims Inc. (2019 - present) and Folx, Inc. (2020 – present). MRL has consulted for Hims, Inc. (2019 - present) and Folx, Inc. (2020 - present). None of these roles present a conflict of interest with this work as described here. All other authors declare they have no conflicts of interest.

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