

Association Between Gender-Affirming Surgeries and Mental Health Outcomes

Anthony N. Almazan, BA; Alex S. Keuroghlian, MD, MPH

IMPORTANCE Requests for gender-affirming surgeries are rapidly increasing among transgender and gender diverse (TGD) people. However, there is limited evidence regarding the mental health benefits of these surgeries.

OBJECTIVE To evaluate associations between gender-affirming surgeries and mental health outcomes, including psychological distress, substance use, and suicide risk.

DESIGN, SETTING, AND PARTICIPANTS In this study, we performed a secondary analysis of data from the 2015 US Transgender Survey, the largest existing data set containing comprehensive information on the surgical and mental health experiences of TGD people. The survey was conducted across 50 states, Washington, DC, US territories, and US military bases abroad. A total of 27 715 TGD adults took the US Transgender Survey, which was disseminated by community-based outreach from August 19, 2015, to September 21, 2015. Data were analyzed between November 1, 2020, and January 3, 2021.

EXPOSURES The exposure group included respondents who endorsed undergoing 1 or more types of gender-affirming surgery at least 2 years prior to submitting survey responses. The comparison group included respondents who endorsed a desire for 1 or more types of gender-affirming surgery but denied undergoing any gender-affirming surgeries.

MAIN OUTCOMES AND MEASURES Endorsement of past-month severe psychological distress (score of ≥ 13 on Kessler Psychological Distress Scale), past-month binge alcohol use, past-year tobacco smoking, and past-year suicidal ideation or suicide attempt.

RESULTS Of the 27 715 respondents, 3559 (12.8%) endorsed undergoing 1 or more types of gender-affirming surgery at least 2 years prior to submitting survey responses, while 16 401 (59.2%) endorsed a desire to undergo 1 or more types of gender-affirming surgery but denied undergoing any of these. Of the respondents in this study sample, 16 182 (81.1%) were between the ages of 18 and 44 years, 16 386 (82.1%) identified as White, 7751 (38.8%) identified as transgender women, 6489 (32.5%) identified as transgender men, and 5300 (26.6%) identified as nonbinary. After adjustment for sociodemographic factors and exposure to other types of gender-affirming care, undergoing 1 or more types of gender-affirming surgery was associated with lower past-month psychological distress (adjusted odds ratio [aOR], 0.58; 95% CI, 0.50-0.67; $P < .001$), past-year smoking (aOR, 0.65; 95% CI, 0.57-0.75; $P < .001$), and past-year suicidal ideation (aOR, 0.56; 95% CI, 0.50-0.64; $P < .001$).

CONCLUSIONS AND RELEVANCE This study demonstrates an association between gender-affirming surgery and improved mental health outcomes. These results contribute new evidence to support the provision of gender-affirming surgical care for TGD people.

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Transgender and gender diverse (TGD) people experience a disproportionate burden of mental health problems compared with the general population.^{1,2} Prior studies of mental health among TGD people have demonstrated a 41% lifetime prevalence of suicide attempts,² 7% to 61% lifetime prevalence of binge drinking,³ and a 33% prevalence of tobacco use.⁴ Increased adverse mental health outcomes among TGD people are likely attributable to stigma, discrimination, pathologization, economic marginalization, violence, and dysphoria associated with an incongruence between gender identity and societal expectations based on one's sex assigned at birth.⁵

According to *Standards of Care* published by the World Professional Association for Transgender Health, gender-affirming surgery is a medically necessary treatment to alleviate psychological distress for many TGD people.⁶ The term *gender-affirming surgery* refers to any surgical procedures offered to affirm the gender identities of TGD people. The process of surgical gender affirmation is individually tailored because not all TGD people desire or access these procedures.⁷ In the largest survey of the TGD community to our knowledge to date, 25% of respondents reported undergoing some type of gender-affirming surgery.⁸

As a result of professional recommendations, insurance nondiscrimination laws, and expansion of dedicated transgender health practices, demand for gender-affirming surgery is steadily rising.⁹ In the United States, incidence of gender-affirming surgeries has increased annually since 2000.¹⁰ Despite growing demand for and access to gender-affirming surgery, there is a paucity of high-quality evidence regarding its effects on mental health outcomes among TGD people.

Existing evidence on the association between gender-affirming surgeries and mental health outcomes is largely derived from small-sample, cross-sectional, and uncontrolled studies.^{1,11,12} A seminal 1998 review of the experiences of more than 2000 TGD people from 79 predominantly uncontrolled follow-up studies demonstrated qualitative improvement in psychosocial outcomes following gender-affirming surgery.¹¹ Attempts since then to empirically demonstrate mental health benefits from gender-affirming surgery have generated mixed results. A meta-analysis of 1833 TGD people across 28 studies concluded that studies offered "low-quality evidence" for positive mental health benefits from surgical gender affirmation.¹² The largest existing study on this subject to our knowledge,¹³ a total population study including 2679 people diagnosed as having gender incongruence in Sweden, demonstrated a longitudinal association between gender-affirming surgery and reduced mental health treatment utilization.¹³ However, a 2020 published correction of this study¹⁴ demonstrated no mental health benefit from gender-affirming surgery after comparison with a control group of TGD people who had not yet undergone surgery. Mental health effects of gender-affirming surgery thus remain controversial.

Given the increasing incidence of surgical gender affirmation among TGD people, there is a significant need for clarification of the mental health benefits of gender-affirming surgery. In this article, we present the largest study to our knowledge to date on the association between gender-

Key Points

Question Are gender-affirming surgeries associated with better mental health outcomes among transgender and gender diverse (TGD) people?

Findings In this secondary analysis of the 2015 US Transgender Survey (n = 27 715), TGD people with a history of gender-affirming surgery had significantly lower odds of past-month psychological distress, past-year tobacco smoking, and past-year suicidal ideation compared with TGD people with no history of gender-affirming surgery.

Meaning These findings support the provision of gender-affirming surgeries for TGD people who seek them.

affirming surgeries and mental health outcomes. Using the 2015 US Transgender Survey, the largest existing data set on surgical and mental health experiences of TGD people, we investigate the hypothesis that gender-affirming surgeries are associated with improved mental health outcomes, including psychological distress, substance use, and suicidality.

Methods

Study Design

In this study, we performed a secondary analysis of the 2015 US Transgender Survey (USTS).⁸ This investigation is reported using Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

Study Population and Data Source

The 2015 USTS was a cross-sectional, nonprobability sample of responses from 27 715 TGD adults from 50 US states, Washington, DC, US territories, and US military bases abroad. The survey was developed by researchers, advocates, people with lived experience, and subject experts over the course of a year. The final survey contained 324 possible questions with 32 domains addressing subjects including health and health care access. It was disseminated by community-based outreach and administered online from August 19, 2015, to September 21, 2015. The USTS protocol was approved by the University of California, Los Angeles institutional review board.⁸ The protocol for the present study was reviewed by the Fenway Institute institutional review board and did not meet criteria for human subjects research. For this reason, consent was not obtained.

Outcomes

Five binary mental health outcomes were examined, including endorsement or denial of the following: (1) past-month severe psychological distress (score on the Kessler Psychological Distress Scale meeting the previously validated threshold of ≥ 13),¹⁵ (2) past-month binge alcohol use (≥ 5 alcoholic drinks on one occasion), (3) past-year tobacco smoking, (4) past-year suicidal ideation, and (5) past-year suicide attempt.

Exposure Group

The exposure group included respondents who endorsed a history of gender-affirming surgery, defined as undergoing 1 or

more types of gender-affirming surgery at least 2 years prior to submitting responses to the USTS. Respondents were asked about their experiences with gender-affirming surgeries through the question, "Have you had or do you want any of the health care listed below for gender transition?" Respondents were presented with 1 of 2 lists of gender-affirming surgeries based on their self-reported sex assigned at birth. For each surgery, respondents were able to indicate one of the following answers: "Have had it," "Want it some day," "Not sure if I want this," or "Do not want this." Respondents were included in the exposure group if they answered "Have had it" to 1 or more of the following types of gender-affirming procedures: breast augmentation, orchiectomy, vaginoplasty/labiaplasty, trachea shave, facial feminization surgery, or voice surgery. Respondents were also included in the exposure group if they answered "Have had it" to one or more of the following types of gender-affirming procedures: chest surgery, hysterectomy, clitoral release/metoidioplasty/centuriion procedure, or phalloplasty.

In this study, outcomes of interest included mental health symptoms in the year prior to taking the USTS. To ensure that exposure to gender-affirming surgeries temporally preceded all outcomes of interest, respondents were included in the exposure group if they had received their first gender-affirming surgery at least 2 years prior to submitting responses to the USTS. For each respondent with a history of gender-affirming surgery, the number of years since their first surgery was calculated by subtracting age at first surgery from current age.

Control Group

The control group included respondents who desired gender-affirming surgeries but had not yet received any. Respondents were included in this group if they answered "Want it some day" for at least 1 of the aforementioned gender-affirming procedures but did not answer "Have had it" for any of them. We excluded participants who did not report desire for any gender-affirming surgeries.

Covariates

The following sociodemographic covariates were examined: age (18-44 years, 45-64 years, and ≥ 65 years), education level (less than high school or high school graduate up to associate degree, bachelor degree, or higher), employment status (employed, unemployed, or out of labor force), gender identity (transgender woman, transgender man, nonbinary, or cross-dresser), health insurance status (uninsured or insured), household income (<\$25 000, \$25 000-\$99 999, or \geq \$100 000), race (Alaska Native/American Indian, Asian/Pacific Islander, Black/African American, Latinx/Hispanic, other/biracial/multiracial, or White), sex assigned at birth (female or male), and sexual orientation (asexual, lesbian/gay/bisexual, or heterosexual).

Family rejection was included as a covariate and was defined by the USTS as history of any of the following experiences with a family member owing to the respondent's gender identity: ending the relationship, physical violence, being forced out of their home, being prevented from wearing desired gender-concordant clothing, and exposure to gender identity conversion efforts. Lifetime exposures to other types of

gender-affirming care were also examined, including gender-affirming counseling, pubertal suppression, and hormone therapy. Given the possibility that any of these covariates could confound the relationship between gender-affirming surgeries and mental health outcomes, all covariates were included in the final multivariable models.

Statistical Analysis

All analyses were conducted using Stata, version 16.1 (StataCorp). Unweighted descriptive statistics for exposure and control groups were calculated and are presented as frequencies and percentages.

Multivariable logistic regression models adjusted for all covariates were generated to examine whether undergoing gender-affirming surgery is associated with each of the examined mental health outcomes.^{16,17} To account for the survey's nonprobability sampling, all models incorporated survey weights to correct sampling biases related to age and race/ethnicity. Adjusted odds ratios (aORs), 95% CIs, and 2-sided *P* values are reported.

We performed a post hoc analysis to determine whether associations between gender-affirming surgeries and mental health outcomes differ based on the degree of surgical affirmation. The exposure variable was recoded as 3 categories: those who received all desired surgeries, some desired surgeries, and no desired surgeries. Because the USTS did not collect information on timing of each respondent's last surgery, respondents for this post hoc analysis could not be excluded to ensure that all exposures temporally preceded mental health outcomes. The recoded 3-category exposure variable was substituted into 5 additional multivariable logistic regression models, adjusted for all aforementioned covariates.

Owing to concerns that baseline mental health status may confound associations between gender-affirming surgery and mental health outcomes, we conducted an additional post hoc analysis to determine whether lifetime mental health measures were associated with exposure to gender-affirming surgeries. We did not incorporate these measures into the primary models due to collinearity. Four separate post hoc models, adjusted for all aforementioned covariates, regressed exposure to gender-affirming surgeries against lifetime suicidal ideation, lifetime suicide attempts, lifetime alcohol use, and lifetime smoking.

To account for multiple hypothesis testing, a Bonferroni correction was applied to adjust for 19 total tests. A *P* value of less than .002 was used as the corrected threshold for statistical significance.

Less than 2% of the study sample had missing data for exposure and outcome variables, and less than 9% of the study sample had missing data for any covariates. Given that these are acceptably low levels of missingness,¹⁸ respondents with missing data were excluded without compensatory methods.

Results

Of the 27 715 respondents, 3559 (12.8%) endorsed undergoing 1 or more types of gender-affirming surgery at least 2 years

Table 1. Sample Sociodemographics^a

Characteristic	No. (%)		Difference, % (95% CI)
	No history of surgery (n = 16 401)	History of surgery (n = 3559)	
Age, y			
18-44	14 170 (86.4)	2012 (56.5)	29.9 (28.2 to 31.6)
45-64	1922 (11.7)	1261 (35.4)	-23.7 (-25.4 to -22.1)
≥65	309 (1.9)	285 (8.0)	-6.1 (-7.0 to -5.2)
Education			
Less than high school	682 (4.2)	37 (1.0)	3.1 (2.7 to 3.6)
High school graduate up to associate degree	10 918 (66.6)	1243 (34.9)	31.6 (29.9 to 33.3)
Bachelor degree or higher	4801 (29.3)	2279 (64.0)	-34.8 (-36.5 to -33.0)
Employment			
Employed	10 306 (62.8)	2585 (72.6)	-9.8 (-11.4 to -8.2)
Unemployed	2474 (15.1)	202 (5.7)	9.4 (8.5 to 10.3)
Out of labor force	3537 (21.6)	755 (21.2)	0.4 (-1.1 to 1.8)
Family rejection			
Yes	7466 (45.5)	2328 (65.4)	-19.9 (-21.6 to -18.2)
No	7360 (44.9)	1173 (33.0)	11.9 (10.2 to 13.6)
Gender identity			
Transgender woman	6277 (38.3)	1474 (41.4)	-3.1 (-4.9 to -1.4)
Transgender man	4764 (29.1)	1725 (48.5)	-19.4 (-21.2 to -17.6)
Nonbinary	4958 (30.2)	342 (9.6)	20.6 (19.4 to 21.8)
Cross-dresser	402 (2.5)	18 (0.5)	2.0 (1.6 to 2.3)
Health insurance			
Uninsured	2397 (14.6)	304 (8.5)	6.1 (5.0 to 7.1)
Insured	13 959 (85.1)	3253 (91.4)	-6.3 (-7.4 to -5.2)
Household income			
<\$25 000	5960 (36.3)	768 (21.6)	14.7 (13.2 to 16.3)
\$25 000-\$99 999	6829 (41.6)	1804 (50.7)	-9.1 (-10.9 to -7.2)
≥\$100 000	2073 (12.6)	840 (23.6)	-11.0 (-12.4 to -9.5)
Race/ethnicity			
Alaska Native/American Indian	206 (1.3)	39 (1.1)	0.2 (-0.2 to 0.5)
Asian/Pacific Islander	436 (2.7)	64 (1.8)	0.9 (0.4 to 1.4)
Black/African American	459 (2.8)	124 (3.5)	-0.7 (-1.3 to -0.03)
Latinx/Hispanic	929 (5.7)	154 (4.3)	1.3 (0.6 to 2.1)
Other/biracial/multiracial	963 (5.9)	200 (5.6)	0.3 (-0.6 to 1.1)
White	13 408 (81.8)	2978 (83.7)	-1.9 (-3.3 to -0.6)
Sex assigned at birth			
Female	9032 (55.1)	2029 (57.0)	-1.9 (-3.7 to -0.1)
Male	7369 (44.9)	1530 (43.0)	1.9 (0.1 to 3.7)
Sexual orientation			
Asexual	2002 (12.2)	228 (6.4)	5.8 (4.9 to 6.7)
Lesbian, gay, bisexual	11 433 (69.7)	2393 (67.2)	2.5 (0.8 to 4.2)
Heterosexual	1729 (10.5)	782 (22.0)	-11.4 (-12.9 to -10.0)
Other gender-affirming care			
Counseling	9016 (55.0)	3099 (87.1)	-32.1 (-33.4 to -30.8)
Pubertal suppression	197 (1.2)	94 (2.6)	-1.4 (-2.0 to -0.9)
Hormone therapy	7104 (43.3)	3213 (90.3)	-47.0 (-48.2 to -45.7)

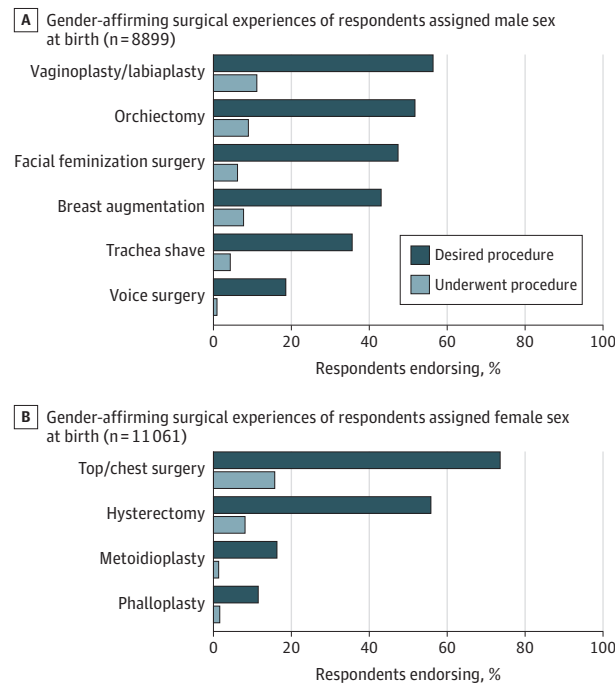
^a Column percentages may not add up to 100% because missing data are not displayed.

prior to submitting survey responses, while 16 401 respondents (59.2%) endorsed a desire to undergo 1 or more types of gender-affirming surgery but denied undergoing any of these.

Compared with the control group, the exposure group had higher percentages of respondents who were older, em-

ployed, more educated, endorsed family rejection, reported having health insurance, and reported higher household income. Respondents in the exposure group were more likely to endorse a history of gender-affirming counseling, pubertal suppression, and hormone therapy (Table 1).

Figure 1. Desire for and History of Gender-Affirming Surgical Procedures in Study Sample



Includes 2015 US Transgender Survey respondents who indicated they desired and either had or had not undergone at least 1 type of gender-affirming surgery. Respondents were presented with 1 of 2 lists of gender-affirming surgeries based on their self-reported sex assigned at birth.

For each surgical procedure, the percentage of people who desired it was higher than the percentage of people who endorsed undergoing it (Figure 1). For every adverse mental health outcome, the percentage of respondents who endorsed it was lower in the exposure group than in the control group (Figure 2).

After adjustment for sociodemographic factors and exposure to other types of gender-affirming care, undergoing 1 or more types of gender-affirming surgery was associated with lower past-month psychological distress (aOR, 0.58; 95% CI, 0.50-0.67; $P < .001$), past-year smoking (aOR, 0.65; 95% CI, 0.57-0.75; $P < .001$), and past-year suicidal ideation (aOR, 0.56; 95% CI, 0.50-0.64; $P < .001$). After Bonferroni correction, there was no statistically significant association between gender-affirming surgeries and past-month binge alcohol use or past-year suicide attempts (Table 2).

In the post hoc analysis stratifying by degree of surgical affirmation, 16 401 respondents were in the reference group who received no desired surgeries. Respondents who had undergone all desired surgeries ($n = 2448$) had significant reductions in the odds of each adverse mental health outcome, and these reductions were more profound than those among respondents who had received only some desired surgeries ($n = 3311$) (Table 3).

Measures of lifetime mental health were not associated with exposure to gender-affirming surgeries. After adjustment for all aforementioned covariates, undergoing gender-

Figure 2. Comparison of Mental Health Outcomes Among Respondents Who Did and Did Not Undergo Gender-Affirming Surgery

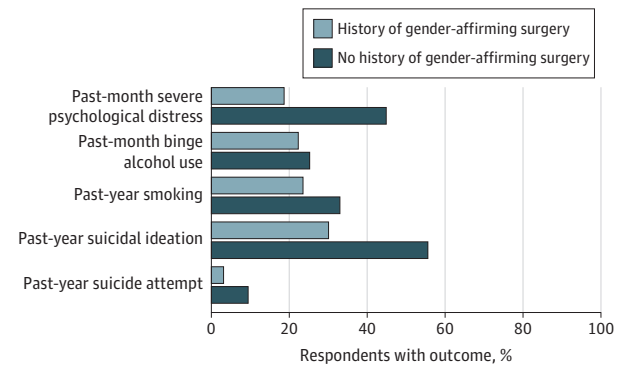


Table 2. Association Between History of Gender-Affirming Surgery and Mental Health Outcomes^a

Variable	aOR (95% CI) ^b	P value
Severe psychological distress (past month) ^c	0.58 (0.50-0.67)	<.001
Substance use		
Binge alcohol use (past month) ^d	0.83 (0.72-0.96)	.01
Smoking (past year)	0.65 (0.57-0.75)	<.001
Suicidality (past year)		
Ideation	0.56 (0.50-0.64)	<.001
Attempt	0.65 (0.47-0.90)	.009

Abbreviation: aOR, adjusted odds ratio.

^a Adjusted for age, education, employment status, family rejection, gender identity, health insurance, household income, race/ethnicity, sex assigned at birth, sexual orientation, history of gender-affirming counseling, pubertal suppression, and history of gender-affirming hormone therapy.

^b Reference/control group ($n = 16\,401$) is composed of individuals who desired at least 1 type of gender-affirming surgery but had not received any surgeries. Exposure group ($n = 3559$) is limited to respondents who had their first surgery at least 2 years prior to submitting survey responses.

^c Defined as a score of at least 13 on the Kessler Psychological Distress Scale.

^d Defined as consuming at least 5 alcoholic drinks on the same occasion.

affirming surgery was not associated with lifetime suicidal ideation (aOR, 1.00; 95% CI, 0.85-1.20; $P = .92$), lifetime suicide attempts (aOR, 1.16; 95% CI, 1.01-1.34; $P = .04$), lifetime alcohol use (aOR, 1.00; 95% CI, 0.99-1.01; $P = .96$), or lifetime smoking (aOR, 1.00; 95% CI, 1.00-1.01; $P = .34$).

Discussion

To our knowledge, this is the first large-scale, controlled study to demonstrate an association between gender-affirming surgery and improved mental health outcomes. In this study, we demonstrate that undergoing gender-affirming surgery is associated with decreased odds of past-month severe psychological distress, past-year smoking, and past-year suicidal ideation. The post hoc analysis stratifying by degree of surgical affirmation demonstrates that TGD people who underwent all desired surgeries had significantly lower odds of all adverse mental health outcomes, and these benefits were stronger than

Table 3. Association Between Degree of Surgical Gender Affirmation and Mental Health Outcomes^a

Variable	Received some desired surgeries (n = 3311) ^b		Received all desired surgeries (n = 2448) ^b	
	aOR (95% CI)	P value	aOR (95% CI)	P value
Severe psychological distress (past month) ^c	0.70 (0.60-0.81)	<.001	0.47 (0.39-0.56)	<.001
Substance use				
Binge alcohol use (past month) ^d	0.97 (0.84-1.11)	.63	0.75 (0.64-0.87)	<.001
Smoking (past year)	0.75 (0.66-0.86)	<.001	0.58 (0.49-0.68)	<.001
Suicidality (past year)				
Ideation	0.72 (0.63-0.81)	<.001	0.44 (0.38-0.51)	<.001
Attempt	0.70 (0.53-0.93)	.01	0.44 (0.28-0.70)	<.001

Abbreviation: aOR, adjusted odds ratio.

^a Adjusted for age, education, employment status, family rejection, gender identity, health insurance, household income, race/ethnicity, sex assigned at birth, sexual orientation, history of gender-affirming counseling, pubertal suppression, and history of gender-affirming hormone therapy.

^b Reference group is individuals who received none of their desired surgeries (n = 16 401).

^c Defined as a score of at least 13 on the Kessler Psychological Distress Scale.

^d Defined as consuming at least 5 alcoholic drinks on the same occasion.

among TGD people who only received some desired surgeries.

The observed associations between gender-affirming surgery, psychological distress, and suicide risk reinforce previous small-sample studies suggesting that gender-affirming surgery improves mental health and quality of life among TGD people.^{1,12} Our findings also reflect evidence from qualitative studies indicating perceived mental health benefits of gender-affirming surgeries among TGD people.¹⁹⁻²¹ In our primary analysis, although gender-affirming surgery was associated with lower odds of past-year suicidal ideation, there was no statistically significant association between gender-affirming surgeries and past-year suicide attempts. However, in a post hoc analysis respondents who underwent all desired gender-affirming surgeries had significantly lower odds of past-year suicide attempts.

The association observed between gender-affirming surgeries and reduction in substance use behaviors is consistent with previous studies involving small community samples that demonstrated associations between gender-affirming medical care and lower odds of high-risk substance use.^{22,23} In the primary analysis, undergoing gender-affirming surgery was not significantly associated with past-month binge alcohol use. This may be consistent with evidence that after adjustment for sociodemographic factors, gender minority identity itself does not predict high-risk alcohol use.²⁴ However, in a post hoc analysis, respondents who underwent all desired gender-affirming surgeries had significantly lower odds of past-month binge alcohol use.

This investigation offers evidence to support the clinical practice of gender-affirming surgery. Guidelines for provision of gender-affirming medical and surgical care have historically been challenged based on a limited evidence base. The American Psychiatric Association has previously concluded that the quality of evidence for treatment of gender dysphoria is low, and consequently, recommendations regarding gender-affirming care have been driven by clinical consensus where empirical evidence is lacking.²⁵ This study offers new data that substantiate the current clinical consensus by expanding the evidence base in support of gender-affirming surgical care.

The observed mental health benefits of gender-affirming surgeries in this study highlight the importance of policies that facilitate access to surgical gender affirmation. In the present study, the percentages of people who had undergone each gender-affirming surgical procedure were substantially lower than the percentages of people who desired them, suggesting significant barriers to accessing gender-affirming surgeries. State-level prohibitions against insurance exclusions for gender-affirming care have been associated with more extensive coverage of gender-affirming surgical procedures.²⁶ In light of this study's results, such policies may be of even greater public health interest. US federal policies related to gender-affirming care have included a recent reversal of Affordable Care Act insurance protections for gender affirmation and the continued prohibition of Veterans Affairs funding allocation for gender-affirming surgeries.^{27,28} Formulation of evidence-based policies for the financing of gender-affirming surgery will be crucial for advancing the health and well-being of TGD communities.

Strengths and Limitations

This study's strengths include aspects of its design that address prior limitations in the existing literature on this subject. Multiple meta-analyses of studies examining the association between gender-affirming surgeries and mental health outcomes have demonstrated that much of the existing literature consists of evidence derived with small sample sizes, lack of control groups, and lack of adjustment for other kinds of gender-affirming care.^{12,29} Our study is responsive to these methodologic concerns.

First, we used the largest existing data set containing information on the surgical and mental health experiences of TGD people. Second, this is, to our knowledge, the first large-scale study on this subject to use the ideal control group to examine associations between gender-affirming surgeries and mental health outcomes: individuals who desire gender-affirming surgery but have not yet received it. Experts have cautioned against using comparison groups that conflate TGD people who did not undergo gender-affirming surgery because they were waiting for it with TGD people not seeking it in the first place. Inability to differentiate these 2 groups likely

contributed to the lack of significant mental health benefit observed in the 2019 large-scale study on this subject.^{13,30}

Third, although this survey-based investigation uses a cross-sectional study design, we constructed an exposure group that includes only individuals exposed to their first gender-affirming surgery prior to the window of assessment for any adverse mental health outcomes. Thus, we ensured that our exposure temporally preceded our outcomes, allowing us to better understand the direction of observed associations. These exclusions could not be performed in our post hoc analysis stratifying by degree of surgical affirmation, and that analysis should therefore be interpreted with caution.

Fourth, our data set allowed us to control for previous experiences of gender-affirming counseling, pubertal suppression, and hormone therapy. Consequently, this study is, to our knowledge, the first large-scale investigation to ascertain the mental health benefits of gender-affirming surgeries independent of other common forms of gender-affirming health care.

Our study has several limitations. The nonprobability sampling of the USTS may limit generalizability. All measures are self-reported and may be subject to response bias. Furthermore, the USTS only offers data on experiences with 10 specific types of gender-affirming surgeries and does not capture the full range of procedures that constitute gender-affirming surgery. Lastly, because this is an observational study, it may be subject to unmeasured confounding. Much of the literature on mental health benefits of gender-affirming surgery has been complicated by inability to adjust for a key con-

founder: baseline mental health status. Our post hoc analysis demonstrates that lifetime suicidality and substance use behaviors are not associated with the exposure variable in this sample. Therefore, prior mental health factors do not appear to confound associations between gender-affirming surgery and subsequent mental health outcomes in our study. There may nevertheless be other types of mental health problems not captured in the USTS that confound these associations. These limitations highlight the need for larger probability-based surveys with TGD communities, more consistent gender identity data collection across health care systems, and more comprehensive baseline health data collection with TGD populations.

Conclusions

In this article, we present the largest study to our knowledge to date on associations between gender-affirming surgeries and mental health outcomes. Our results demonstrate that undergoing gender-affirming surgery is associated with improved past-month severe psychological distress, past-year smoking, and past-year suicidal ideation. Our findings offer empirical evidence to support provision of gender-affirming surgical care for TGD people who seek it. Furthermore, this study provides evidence to support policies that expand and protect access to gender-affirming surgical care for TGD communities.

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Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: All authors.

Critical revision of the manuscript for important intellectual content: All authors.

Statistical analysis: Almazan.

Obtained funding: Keuroghlian.

Administrative, technical, or material support: Keuroghlian.

Supervision: Keuroghlian.

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Invited Commentary

Gender-Affirming Surgeries and Improved Psychosocial Health Outcomes

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There is a growing body of literature supporting the positive outcomes of gender-affirming surgery (GAS) on transgender and gender diverse individuals. Mental health outcomes are among the most vital end points to study, given the fundamental intent of GAS to provide patients with relief from gender dysphoria and improvement of psychosocial distress. Much of the data on this topic come from observational studies that lack either control groups or adequate sample size.^{1,2} In this issue of *JAMA Surgery*, Almazan and Keuroghlian³ contribute an analysis of the US Transgender Survey (USTS), examining the topic of mental health outcomes following GAS.

This study³ compared individuals who desired but had not undergone GAS with those who had, finding significantly lower rates of psychosocial distress, smoking, and suicidal ideation in the surgery group. When the analysis was broadened to include lifetime rather than recent symptoms (ie, the temporal association between surgery and symptoms was removed), the association became insignificant. The authors³ concluded the significant associations were not because of prior mental health status but rather a result of surgical intervention.

We commend the authors³ on their thorough exploration of the USTS, the largest collection of data on the experience of transgender and gender diverse individuals to our knowl-

edge to date. They provide a controlled, well-powered study, and their findings align with prior studies demonstrating the efficacy of GAS. However, the largest challenge in interpreting this association lies in the mental health screening typically necessary to be a candidate for GAS, which may convolute the specific connection between these 2 variables. The authors have fashioned a surrogate temporal association from cross-sectional data, but it is one that inevitably depends on certain key assumptions to hold true.

The second challenge is the use of USTS survey questions to quantify psychosocial distress, rather than a validated outcome instrument targeted toward psychosocial assessment in the transgender and gender diverse population. This is not as much a critique of the method as an acknowledgment of the scarcity of prospective longitudinal data sets measuring robust outcomes. Prospective cohort-level analyses (rather than population-level analyses) with well-validated outcome instruments are widely recognized as the area requiring greater progress. In the interim, though, this report³ contributes additional evidence to support the efficacy of GAS in alleviating dysphoria.

The availability of data on this community is a major impediment to addressing its needs and 1 reason the USTS was conducted in the first place, since nearly all governmental surveys continue to omit gender identity as a survey item. This issue has been recognized by numerous key public health



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