

The Complexities of Categorizing Gender: A Hierarchical Clustering Analysis of Data from the First Australian Trans and Gender Diverse Sexual Health Survey

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Abstract

Purpose: This study used self-reported gender among trans and gender diverse people in Australia to identify and describe broad, overarching gender categories that encompass the expansive ways in which gender can be defined and expressed.

Methods: Data were collected as part of the Australian Trans and Gender Diverse Sexual Health Survey hosted in October 2018. Participant self-identification with nonexclusive gender categories were analyzed using algorithm-based hierarchical clustering; factors associated with gender clusters were identified using logistic regression analyses.

Results: Usable data were collected from 1613 trans and gender diverse people in Australia, of whom 71.0% used two or more labels to describe their gender. Three nonexclusive clusters were identified: (i) women/trans women, (ii) men/trans men, and (iii) nonbinary. In total, 33.8% of participants defined their gender in exclusively binary terms (i.e., men/women, trans men/trans women), 40.1% in nonbinary terms, and 26.0% in both binary and nonbinary terms. The following factors were associated with selecting nonbinary versus binary gender labels: presumed female gender at birth (adjusted odds ratio [aOR]=2.02, 95% confidence interval [CI]=1.60–2.54, $p < 0.001$), having a majority of sexual and/or gender minority friends (aOR=2.46, 95% CI=1.49–3.10, $p < 0.001$), and having spent more than half of one's life identifying as trans and/or gender diverse (aOR=1.75, 95% CI=1.37–2.23, $p < 0.001$).

Conclusion: Trans and gender diverse people take up diverse and often multiple gender labels, which can be broadly categorized as binary and nonbinary. Systems of health care and research must be adapted to include nonbinary people while remaining amenable to further adaptation.

Keywords: cluster analysis; gender identity; health informatics; nonbinary

Introduction

“Certain individuals in certain times and places transcend the categories of male and female, masculine and feminine, as these have been understood in Western culture since at least the later nineteenth century”. (p. 21)¹

In recent years, the emergence of an expanding range of ways in which people express and describe gender has generated considerable attention in both academic and public discourse.² Scholars have variously sought to characterize, categorize, conceptualize, and pathologize

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gender diversity,^{1,2-5} whereas mainstream commentators have tended to approach it with bafflement and derision.⁶⁻⁸ Regardless of whether or not critics question the authenticity and validity of gender diversity, genders other than fixed and supposed innate notions of “male” and “female” have existed back through time and around the world.¹ Furthermore, a growing body of research has made clear that diverse experiences of gender are profoundly meaningful to those who embody them and that having one’s gender misunderstood or ignored can create very real and negative implications for health and well-being.^{9,10}

Among the many characteristics and experiences of trans and gender diverse people, this article takes up the opportunity to explore the complexities of understanding and categorizing gender in health and research systems. We take gender to mean an individual’s internal sense of themselves and their inner relationship to the gendered social environments within which they live. Furthermore, the concept of gender manifests through its expression to others, whether affirmed by or not, and developed, and redeveloped in response to social, cultural, and political moments. Although it may be tempting to think about categories of “sex” and “gender” as immutable or “of nature,” they are strongly influenced by society and culture and have and continue to change within scientific, socioecological, political, and cultural discourse.¹¹

Although gender diversity may seem like a recent phenomenon, historical examples of it can be found from around the world.¹²⁻¹⁴ Twentieth century approaches to gender in Western systems of medicine have been shaped significantly by the European colonial project, which in many cases sought explicitly to control and eradicate gender diversity among Indigenous communities.¹⁵⁻¹⁸ This system of control was reinforced by scientific and medical discourses of the last two centuries, which were invested in categorizing human experiences and bodies as simplistically as possible without attending to power, culture, and other social considerations that ultimately gave shape, motive, and dissent to the process and the categories they produced.¹⁹

Given that gender exists in an incredibly broad range of ways that are increasingly understood as fluid and contextual, it is perhaps not surprising that most medical and research systems continue to ignore or experience anxiety toward gender diversity. Where such systems have adapted to better recognize gender diversity, they have often made the mistake of offering one additional option of “transgender” as, apparently, a

third gender alongside (presumed cisgender) men and women, which aside from being inaccurate does not achieve any meaningful outcomes in terms of improved data collection.²⁰ This set of issues gives rise to important questions about how clinicians, administrators, epidemiologists, researchers, and health practitioners can make sense of and incorporate gender diversity into their work in meaningful and appropriate ways. Put another way, is it possible to simplify the expansive range of genders in a way that aligns with medical and research systems while respecting individual and emerging identities?

Questions about the ways in which trans and gender diverse people are counted (or not) in health and medical research go well beyond the theoretical. Countless studies have documented disparities in health outcomes and care facing trans and gender diverse people,^{21,22} which are exacerbated by their erasure in health research and clinical settings.^{21,23-25} As health practitioners and researchers seek to understand and respond to the needs and experiences of trans and gender diverse people, empirical research is needed to help conceptualize the evolving range of genders embodied by diverse communities of people internationally. This article describes an empirically driven system for categorizing gender using data collected by the largest study of trans and gender diverse people conducted to-date in Australia.

Methods

Study design

In 2018, a national online, anonymous, and cross-sectional survey was conducted of trans and gender diverse people in Australia, known as the Australian Trans and Gender Diverse Sexual Health Survey.²⁶ The study team comprised epidemiologists, social scientists, clinicians, journalists, health promotion specialists, and community advocates who worked to promote the health and well-being of trans and gender diverse people in Australia.

Participants and recruitment

Individuals were eligible to participate if they were living in Australia, at least 16 years old, and were a gender other than what was presumed for them at birth. People whose gender aligned with the gender presumed for them at birth (i.e., cisgender) were not eligible to participate. Participants were informed that whether they had undergone or were planning to undertake social, legal, or medical gender affirmation was immaterial

to eligibility. Participants were also informed that they could withdraw by discontinuing the survey at any point, with survey completion taken as a marker of consent.

Recruitment employed a multifaceted strategy that directed potential participants to a dedicated study webpage, through which they could find out about the study, assess their eligibility, and gain access to the survey. Study advertisements were distributed online through existing networks on social media along with paid advertisements on Facebook and Instagram. Digital and print copies of study advertisements were also sent to organizations that provided services or support to trans and gender diverse people. Finally, we worked with several Australian media outlets to publish stories publicizing the survey to raise awareness and attract participants. Those who completed the survey were invited to enter their contact details in a separate form for a chance to win one of the two 300AUD cash gift cards.

Survey instrument

The online survey used adaptive routing that responded in real time to participants' responses, only presenting relevant questions. The first part of the questionnaire assessed eligibility, discontinuing the survey for those deemed ineligible. The rest of the survey instrument consisted of fixed-response and open-ended questions in the following domains: sociodemographics, gender experience, sexual and romantic partners, online and offline partner-seeking, mental health, sex and drug use practices, testing, prevention and management of HIV and other sexually transmissible infections, gender affirming practices, and experiences of health care. The survey instrument was created in consultation and piloted with collaborators representing Australia's trans and gender diverse communities.

Regarding gender, participants were provided with a list of identities from which they could select as many as they felt represented their experience (Table 1). A free-text option to write-in additional gender identities was also provided, with responses reviewed and, through consensus among several members of the research team, standardized through recoding into existing or new labels. Participants were also asked to select one option for the gender presumed for them at birth (female/male/unspecified or indeterminate); those who did not complete the gender items were excluded from this analysis.

Table 1. Self-Reported Gender Among Trans and Gender Diverse People, Stratified by Gender Presumed at Birth

Gender identity ^a	Gender presumed at birth, <i>n</i> (%)			Total
	Female (<i>n</i> =985)	Male (<i>n</i> =618)	Unspecified (<i>n</i> =10)	
Man	343 (34.8)	27 (4.4)	—	370 (22.9)
Woman	57 (5.8)	328 (53.1)	6 (60.0)	391 (24.2)
Trans man	416 (42.2)	5 (0.8)	3 (30.0)	424 (26.3)
Trans woman	1 (0.1)	424 (68.6)	10 (100.0)	435 (27.0)
Trans masculine	324 (32.9)	5 (0.8)	—	329 (20.4)
Trans feminine	19 (1.9)	209 (33.8)	—	228 (14.1)
Nonbinary	535 (54.3)	176 (28.5)	—	711 (44.1)
Genderqueer	301 (30.6)	106 (17.2)	—	407 (25.2)
Agender	137 (13.9)	35 (5.7)	—	172 (10.7)
Sistergirl	—	14 (2.3)	1 (10.0)	15 (0.9)
Brotherboy	17 (1.7)	1 (0.2)	—	18 (1.1)
Demigirl	36 (3.7)	18 (2.9)	—	54 (3.4)
Demiboy	49 (5.0)	5 (0.8)	—	54 (3.4)
Reject labels	6 (0.6)	4 (0.7)	—	10 (0.6)
Other ^b	2 (0.2)	6 (1.0)	—	8 (0.5)

^aGender options were nonexclusive.

^b"Other" responses that could not be clearly classified in gendered terms included responses like "Bear" and "Lesbian."

Statistical methods

First, descriptive analyses of participant genders were undertaken overall and as stratified by gender presumed at birth. Second, algorithm-based hierarchical cluster analyses were conducted using complete linkage. For our purposes, complete linkage was deemed preferable to other common approaches (e.g., single, average) because it tends to create more compact and clear clusters that are built on the proximity of the most distant (i.e., dissimilar) objects.²⁷ Among participants who selected more than one way of expressing gender, this analysis was stratified by gender presumed at birth, with dendrograms created to guide the identification of distinct clusters. Third, bivariate logistic regression analyses were conducted to identify factors associated with gender clusters, with focus on sociodemographics, social network characteristics, gender experiences, and sex work (Table 2). Continuous variables were dichotomized at the median, and those with bivariate values of $p < 0.1$ were included in a subsequent multivariable analysis. Analyses were conducted using Stata Version 15.

Community collaboration and ethical oversight

Several steps were undertaken to ensure that the survey was centered on the needs of Australia's trans and gender diverse communities. First, the study team comprised predominantly trans and gender diverse investigators. Second, local, state-based, and national organizations involved in providing services or support

Table 2. Gender Clusters Among Trans and Gender Diverse People, Stratified by Gender Presumed at Birth

Gender cluster	All (<i>n</i> = 1613), <i>n</i> (%)	Gender presumed at birth			<i>p</i> -Value ^a	Unspecified/unreported, <i>n</i> (%)
		Female (<i>n</i> = 985), <i>n</i> (%)	Male (<i>n</i> = 618), <i>n</i> (%)			
Binary only	546 (33.8)	258 (26.2)	278 (45.0)	< 0.001	10 (100.0)	
Nonbinary only	647 (40.1)	510 (51.8)	137 (21.7)		—	
Both binary and nonbinary	420 (26.0)	217 (22.0)	203 (32.8)		—	
Dichotomous categories						
Binary	546 (33.9)	258 (26.2)	278 (45.0)	< 0.001	10 (100.0)	
Nonbinary	1067 (66.1)	727 (73.8)	340 (55.0)		—	

^aChi-squared analysis comparing only those with specified and reported sex/gender presumed at birth.

to trans and gender diverse people were invited to review and provide comment on all aspects of the study. Third, a meeting of cisgender, trans and gender diverse community partners, researchers, clinicians, and policy-makers was convened following data collection to conduct preliminary interpretation, propose key analyses, and outline a dissemination plan. The conduct of this study was reviewed and approved by the University of New South Wales' Human Research Ethics Committee (reference HC180613). Review was also provided by the Research Ethics Review Committee of the AIDS Council of New South Wales, which provides specific ethical input relevant to trans and gender diverse people and other sexual and gender minority groups.

Results

In total, 1920 people started the survey, with 288 discontinuing partway through. Of those who completed the survey, two responses were removed as duplicates and 17 people did not respond to the gender items or provide enough detail and were, therefore, excluded from this analysis. The final sample comprised 1613 participants, representing a completion rate of 84.1%. Participants ranged in age from 16 to 80 years (median = 27, interquartile range = 22–36). The majority of participants were born in Australia (84.9%), lived in a major city (82.0%), and reported some form of tertiary education like a trade qualification or university degree (74.2%), whereas a minority (13.6%) were culturally or linguistically diverse within the Australian context (i.e., as primarily speaking a language other than English or being born in a country whose primary language is not English) or Aboriginal and/or Torres Strait Islander (i.e., Indigenous Australian; 4.3%). Overall, 61.1% of participants reported female as their presumed gender at birth, 38.3% male, and 0.6% (*n* = 10) as unspecified or chose not to respond. Thirty-five participants (2.2%) reported a variation of sex characteristics (i.e., intersex). A complete breakdown

of participant demographics by gender presumed at birth has been reported previously.²⁶

Table 1 provides a breakdown of participant gender as reported at the time of the survey. In total, 29.0% participants selected one gender option, 35.8% selected two, and the remaining 35.2% selected three or more. Among participants presumed female at birth, 72.4% selected two or more genders, which was the case for 68.5% of those presumed male at birth and 90.0% of those of unspecified or unreported gender at birth ($\chi^2[2, N = 1613] = 4.6, p = 0.1$). At the time of the survey, the most common gender among participants presumed female at birth was “nonbinary” and among those presumed male at birth was “trans woman.” All participants of unspecified or unreported gender presumed at birth were trans women. Eight participants provided “other,” free-text gender identities that were deemed to not clearly relate to gender as we defined it (e.g., “Bear”) and were excluded from this analysis.

Results of the hierarchical cluster analyses are given in Figure 1. Using the constructed dendrograms, two clusters were identified within each subgroup stratified by presumed gender at birth, which were interpreted to mark a distinction between binary and nonbinary genders. The binary clusters included male and female-specific identities (i.e., man/woman, trans man/trans woman), whereas the nonbinary clusters included identities that eschewed binary gender in favor of those that encompassed a diversity of gender characteristics, which were similar between subsamples and, therefore, were treated as a single cluster. The resultant three clusters were identified as follows: (i) women/trans women, (ii) men/trans men, and (iii) nonbinary.

Table 2 presents stratification of the clusters by gender presumed at birth, simplified further as binary and nonbinary gender identities. Overall, 33.8% of participants reported gender in exclusively binary terms, 40.1% as exclusively nonbinary, and the remaining 26.0% reported in both binary and nonbinary terms.

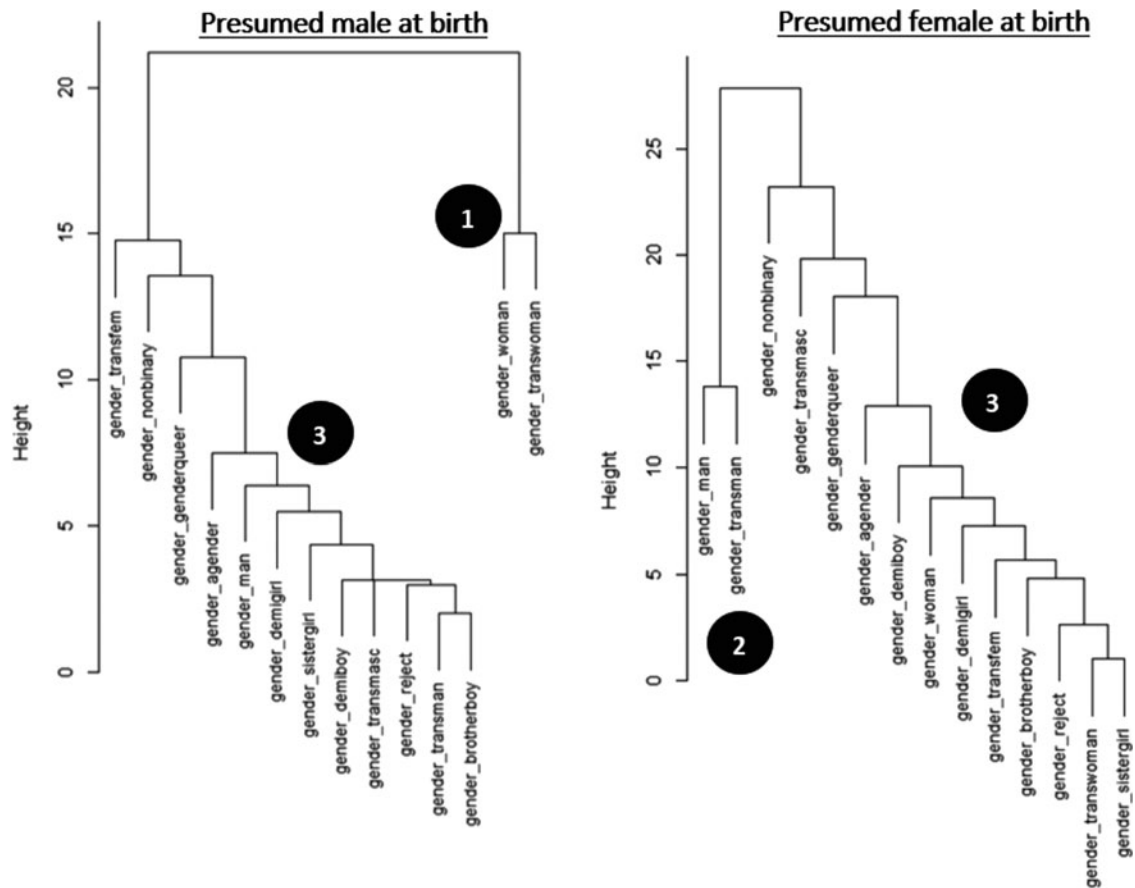


FIG. 1. Hierarchical clustering analysis dendrogram (complete linkage) of gender among trans and gender diverse people, stratified by gender presumed at birth (❶ = women/trans women; ❷ = women/trans women; ❸ = gender nonbinary).

As described earlier, nonbinary genders have previously been conceptualized as being apparently able to encompass binary term,^{4,5} and so nonbinary classifications were given priority over the binary classification when both binary and nonbinary genders were expressed. In a chi-squared analysis, participants whose gender was presumed female at birth were more likely than those presumed male to report a nonbinary gender (73.8% vs. 55.0%; $\chi^2[1, N = 1603] = 60.3, p < 0.001$).

Table 3 presents outcomes of the bivariate and multivariable logistic regression analyses assessing factors associated with the nonbinary cluster of genders. A logistic regression analysis was conducted to assess factors associated with the nonbinary cluster of gender identities; variables independently associated with identifying as nonbinary included being presumed fe-

male at birth, a longer period of time since thinking of oneself as something other than cisgender, and having a majority of one's social network comprising lesbian, gay, bisexual, trans, and queer individuals.

Discussion

Participants of the Australian Trans and Gender Diverse Sexual Health Survey took up a variety of options for describing their genders, which could broadly be categorized as binary (men/trans men and women/trans women) and nonbinary. Similar labels for nonbinary genders were deployed regardless of the gender presumed for participants at birth, although it was observed that participants presumed female at birth were more likely than their peers presumed male at birth to identify in nonbinary terms. Participants who had spent more than half of their lives understanding

Table 3. Bivariate and Multivariable Analyses of Factors Associated with Binary and Nonbinary Genders Among Trans and Gender Diverse People

			Logistic regression			
	Binary, <i>n</i> (%)	Nonbinary, <i>n</i> (%)	Bivariate		Multivariable	
			OR (95% CI)	<i>p</i> -Value	aOR (95% CI)	<i>p</i> -Value
Age						
≥27 years	335 (39.0)	524 (61.0)	1.65 (1.33–2.03)	<0.001	0.85 (0.65–1.12)	0.248
<27 years [ref]	211 (28.0)	543 (72.0)				
Area of residence						
Major city	433 (32.7)	890 (67.3)	1.31 (1.00–1.71)	0.042	0.96 (0.71–1.29)	0.768
Other [ref]	113 (39.0)	177 (61.0)				
Gay/lesbian population in home neighborhood ^a						
≥0.75% of residents	255 (31.4)	557 (68.6)	1.25 (1.02–1.54)	0.034	1.14 (0.90–1.44)	0.270
<0.75% of residents [ref]	285 (36.5)	497 (63.5)				
Country of birth						
Australia	459 (33.5)	911 (66.5)	0.89 (0.68–1.17)	0.403	^e	
Other [ref]	87 (35.8)	156 (64.2)				
Culturally and/or linguistically diverse						
Yes	66 (34.1)	153 (69.9)	1.22 (0.89–1.66)	0.212	^e	
No [ref]	480 (34.4)	914 (65.6)				
Indigenous status						
Indigenous Australian	18 (25.7)	52 (74.3)	1.50 (0.87–2.59)	0.144	^e	
Nonindigenous [ref]	528 (34.2)	1015 (65.8)				
Annual income ^b						
≥65,000AUD	311 (29.9)	731 (70.1)	1.59 (1.28–1.99)	<0.001	1.28 (0.99–1.65)	0.056
<65,000AUD [ref]	224 (40.3)	332 (59.7)				
Education						
University degree	249 (31.9)	531 (68.1)	1.18 (0.96–1.45)	0.114	^e	
Other [ref]	297 (35.7)	536 (64.4)				
Gender presumed at birth ^c						
Female	258 (26.2)	727 (73.8)	2.30 (1.86–2.85)	<0.001	2.02 (1.60–2.54)	<0.001
Male [ref]	278 (45.0)	340 (55.0)				
Intersex status						
Yes	13 (37.1)	22 (62.9)	0.92 (0.46–1.85)	0.818	^e	
No [ref]	476 (35.3)	874 (64.7)				
Lesbian, gay, bisexual, trans, queer friends						
Majority of friends	210 (23.4)	689 (76.6)	2.92 (2.36–3.61)	<0.001	2.46 (1.94–3.10)	<0.001
Minority of friends [ref]	336 (47.1)	378 (52.9)				
Time since connecting to self as trans and gender diverse ^d						
≥Half of life	217 (26.1)	616 (73.9)	2.08 (1.68–2.56)	<0.001	1.75 (1.37–2.23)	<0.001
<Half of life [ref]	329 (42.2)	450 (57.8)				
Recent sex work						
At least once	13 (19.7)	53 (80.3)	2.14 (1.16–3.97)	0.001	1.88 (0.97–3.65)	0.061
None [ref]	533 (34.5)	1014 (65.6)				

^aAs defined by participant home postcodes using an external data set,³⁴ missing for 10 participants.

^bMissing for 15 participants.

^cUnspecified or unreported for 10 participants.

^dMissing for one participant.

^eOnly variables with a univariate value of $p < 0.1$ were included in the multivariate analysis. ref, reference group; OR, odds ratio; aOR, adjusted odds ratio; CI, confidence interval.

themselves as something other than cisgender, and whose social network comprised majority sexual and gender minority groups were also more likely to report a nonbinary gender. Sociodemographic factors like education, income, and heritage were not associated with identifying as nonbinary. In line with a previous network analysis-based study of gender among young people,²⁸ it was common for our participants to use

multiple labels to describe their gender, including over a quarter who used labels that spanned the binary/nonbinary divide.

Although our analysis suggests that many of the ways this sample expressed their gender can be broadly categorized as “nonbinary,” this presents a conceptual challenge given that some genders grouped in this way explicitly reject gender constructs altogether. As

summarized succinctly by one participant in a free text response, “gender can fuck itself.” Seeking to organize diverse genders into categories, therefore, may seem to overlook conceptual and political intentions to critique and reimagine gender. Understanding the clusters that give shape to diverse gender identities, however, can achieve pragmatic goals of transforming systems of classification that dominate health and medical systems, particularly in terms of patient records, public health surveillance, research, and health program implementation. Designers and users of electronic patient management systems, for example, might be more willing and able to use “nonbinary” as an additional gender category than they would be to include multiple additional individual labels (e.g., genderqueer and agender). Nonbinary, then, offers an overarching taxonomy to encompass multiple genders, including for people without a gendered self.

Our findings must be understood within the context of their limitations, including that our sample represents a mainly White, well-educated, Australian-born population of trans and gender diverse people. Given the socially situated nature of gender,^{29,30} it is likely that there are many alternate configurations of gender among people living in other parts of the world or, indeed, among trans and gender diverse people in Australia who were not reached by this survey. Furthermore, the questions we asked about gender did not account for temporality. We found that participants who had understood themselves as not cisgender for longer were more likely to be nonbinary, which provides further evidence of the need to attend to questions of temporality and fluidity in studying and understanding gender. Most of the research that explores how and why people come to understand their gender remains locked in 20th century psychological and developmental models that assume linear “stages” or “pathways” of how gender is experienced³¹; studies that embrace non-linear gender formations, movements, and intersections are needed.

Ultimately, the gender categories proposed by our analysis offer one way of understanding similarities within the broad range of ways in which gender is experienced and expressed, which is not meant to imply uniformity or sameness. We are cognizant of the possibility that this analysis may seem to reinforce and reproduce the colonization of gender in terms that give primacy, as others have noted, to normative standards of gender in medicine, the law, and beyond.^{32,33} Unfortunately, without robust categories of classification within exist-

ing medical systems, trans and gender diverse people will remain invisible in ways that undermine the delivery of quality and relevant care. Although this reality underscores the imperative of this research, any categories used to define and label gender identities must respect individual need, be cognizant of the diversity they mask, and remain amenable to change as social, cultural, and political moments progress.

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Abbreviations Used

aOR = adjusted odds ratio
 CI = confidence interval
 OR = odds ratio