

## Article

# Similar Sexual Behaviour yet Different Outcomes: Comparing Trans and Gender Diverse and Cis PrEP Users in Germany Based on the Outcomes of the PrApp Study

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**Abstract:** Little knowledge about pre-exposure prophylaxis (PrEP) use in trans and gender diverse (TGD) communities in Germany exists. The PrApp Study collected data on PrEP use and sexual behaviour among PrEP users in Germany. Descriptive methods and logistic regression were used to describe PrEP use among TGD and cis persons. A total of 4350 PrEP users in Germany were included, with 65 (1.5%) identified as TGD. Compared to cis participants, TGD participants were younger (median age 29 vs. 37 years) and more likely to have a lower income (adjusted odds ratio (aOR) = 4.4; 95% confidence interval (CI) = 2.4–8.2) and be born outside Germany (aOR = 2.5; 95% CI = 1.3–4.5). On-demand PrEP use was higher in TGD participants (aOR = 1.9; 95% CI = 1.0–3.5) and numerically more TGD obtained PrEP from informal sources (aOR = 1.8; 95% CI = 0.9–3.5). Testing behaviour, condom use, and number of sexual partners were comparable between both groups. Socioeconomic disparities may constitute structural barriers for TGD people to access PrEP, leading to more informal and on-demand use. PrEP providers need to reduce access barriers for TGD PrEP users and provide information on safe PrEP use for this population.

**Keywords:** trans and gender diverse people; pre-exposure prophylaxis (PrEP); HIV prevention



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## 1. Introduction

Trans and gender diverse (TGD; see Abbreviations) people do not identify with their sex assigned at birth. TGD people can identify as male/masculine (i.e., trans men) or female/feminine (i.e., trans women). At times, they oppose the normative gender labels of male and female and identify outside of the gender binary or do not solely identify as male or female (i.e., non-binary, gender non-conforming, agender, etc.; see 'Abbreviations').

Although data about HIV prevalence in TGD individuals is scarce, studies have found that trans women especially are at elevated risk for human immunodeficiency virus (HIV) transmission [1,2] and trans people are considered a key population by WHO/UNAIDS [3]. Key populations are defined as such because of a higher prevalence of HIV infections among these specific groups and their sexual partners. Globally, trans women aged 15–49 years are 13 times more likely to be living with HIV compared to cis peers [4]. HIV prevalence in transmasculine and trans non-binary populations is under-researched and there is very little data. A recent study based in the USA found that 10% of trans men in the study were HIV positive [5]. A European-wide study among men who have sex with men (MSM) showed that 4.5% of assigned female at birth (AFAB) men (incl. trans men; see 'Abbreviations') were HIV positive [6]. Another study among Zimbabwean transmasculine sex workers showed that 38% were living with HIV [7].

About 50% of HIV infections in Western and Central Europe can be found among MSM and they are considered as a population disproportionately affected by the global HIV epidemic [8]. Additionally, a gender identity such as TGD often intersects with a MSM sexuality or sexual networks cross within these groups [9,10], which can render this population more vulnerable to HIV exposure.

Pre-exposure prophylaxis (PrEP) with tenofovir/emtricitabine has been shown to be effective in preventing an infection with HIV in certain populations [11]. However, very few studies address the use and efficacy of PrEP in the TGD community [12].

Stigma and discrimination in healthcare settings affect HIV prevention and the uptake of HIV treatment [13]. TGD people experience high levels of stigma and discrimination in healthcare settings globally. Overall, 33% of the 2015 U.S. Transgender Survey respondents ( $n = 27,715$ ) reported having had at least one negative experience with a healthcare provider in the year prior to the study [14]; and a European-based study found that 34% (in Germany, 40%) of the TGD participants ( $n = 19,445$ ; in Germany,  $n = 2815$ ) experienced discrimination when accessing healthcare or social services [15].

Based on the lack of sufficient data on the efficacy of 'on demand' PrEP use (taking PrEP not on a daily basis) in TGD people undergoing gender affirming hormone treatment (GAHT), this type of PrEP use is currently not recommended for this population [16]. Research indicates that PrEP efficacy is influenced by GAHT with both oestrogen and testosterone [17–19]. Specifically, for transmasculine individuals engaging in vaginal/front hole penetrative sex, regardless of hormone intake and with no genital affirming surgery, research has shown a lower PrEP concentration in vaginal/front hole tissue compared to anal/back hole tissue [20]. Additionally, TGD individuals undergoing GAHT with testosterone may experience changes to vaginal/front hole tissue, leading to higher infection risk when engaging in vaginal/front hole penetrative sex [19]. Therefore, PrEP on demand may not provide sufficient protection from HIV infection in some TGD people. However, a recent study showed that daily oral PrEP to be effective in TGD people using either oestrogen or testosterone.

A recent study in US coastal metropolitan cities has found that trans women had good knowledge about PrEP [21,22]. Moreover, a nationwide study in the USA among self-reported HIV-negative and sexually active trans people, which also included transmasculine participants, found that 48% of respondents ( $n = 190$ ) had heard about PrEP [23]. Further studies among transmasculine study populations have found high PrEP eligibility according to the Centers for Disease Control and Prevention (CDC) criteria but a low uptake of the drug [24,25]. One study showed that only about 11% of transmasculine participants fulfilling the CDC criteria received a prescription for PrEP [24]. Another study showed about 60% PrEP eligibility in both trans men and trans women, but only about 18% of those eligible were ever prescribed PrEP. High levels of PrEP discontinuation among TGD (former) PrEP users were found in the same study [26]. In both studies that showed the percentages of PrEP prescriptions, it was not indicated if receiving a prescription actually led to the uptake of PrEP [24,26]. A European-wide study among MSM found that trans and AFAB men were lacking basic knowledge about HIV [6]. The results show that they had less knowledge about PrEP and were less likely to be taking PrEP; they were also less likely to have heard about the concept of 'U = U' ('undetectable equals untransmissible').

According to the German-Austrian HIV Pre-Exposure-Prophylaxis Guidelines, PrEP should be offered to individuals with substantial HIV infection risk (i.e., MSM and trans people, who engage in condomless anal/back hole sex; serodiscordant couples; intravenous drug users) [27].

The cross-sectional 'PrApp Study' was initially designed to research PrEP use among MSM residing in Germany [28]. The data analysed here compares the outcomes of TGD and cis male PrEP users in Germany. Both groups share a similar sexual network, and the focus of this analysis is to look at sexual (risk) behaviour in both populations. We highlight the demographic and socioeconomic differences between both groups and how that might interfere with an individual's access to PrEP.

## 2. Methods

This cross-sectional study analysed the use of PrEP among MSM in Germany. Recruitment of current and former PrEP users was done via local community HIV and sexually transmitted infection (STI) testing clinics, three dating apps used by MSM, and a community-run website (<https://prepjetzt.de>, accessed on 18 February 2022) [28]. Participants for the study were recruited in two waves: the first wave during July–October 2018 and the second wave during April–June 2019.

Eligible participants were asked to fill out an anonymous online survey available in German, English, French, Spanish, Arabic, and Turkish. The online survey was accessible through mobile phones or desktop computer using VOXCO software. Once the respondents completed the survey, they had the choice to enter a raffle for gift certificates. Data and analysis security conformed with the German and European data security regulations [28] and study respondents were informed about that prior to giving their informed consent for participation.

### 2.1. Participants

For this analysis we included current PrEP users from Germany, who answered the questions about their current gender identity and sex assigned at birth, and who gave their consent to participate in the study. In Wave 1, this study only asked for current gender identity and not for sex assigned at birth. Gender diversity in Wave 1 was determined based on answers beyond the categories of male or female (i.e., trans, non-binary). However, this did not capture the gender identity of TGD individuals adequately and was therefore altered for Wave 2. Some members of the TGD community solely identify with the binary options of male and female and would not choose options such as ‘trans male’ or ‘trans female’. Without asking for sex assigned at birth, those individuals would falsely be subsumed under cis study participants.

Participants were able to participate in both waves of the study. For those who did, their answers from Wave 2 were eliminated from the dataset so they were only included once in the dataset.

### 2.2. Variables

TGD participants were defined as indicating a gender identity beyond the categories of male or female (Wave 1) or whose gender identity did not match their indicated sex assigned at birth (only in Wave 2).

The analysis included a number of demographic variables, as described previously [28]. Participants were grouped into four age categories (‘18–29’, ‘30–39’, ‘40–49’, and ‘50–80’ years) and gross annual income was binarized into ‘less than EUR 30,000/year’ and ‘more than EUR 30,000/year’; participants were also binarized regarding their country of origin (‘Germany’ and ‘outside Germany’) and the language used to fill out the questionnaire (‘German’ and ‘other than German’).

PrEP use was divided into ‘daily’ and ‘on demand’ use. ‘Daily’ use refers to the intake of PrEP consecutively on a daily basis, whereas ‘on demand’ describes PrEP use only in the days around a potential risk contact [29]. Two options were provided regarding the source of PrEP: ‘prescription’ indicated a formal prescription by healthcare providers, whereas ‘informal’ includes access to PrEP through friends, dealers, or online/abroad purchases of the medication [28].

The use of condoms during PrEP use was also categorized into two strata: one combined the answers ‘always’ and ‘often’, whereas the other combined the responses ‘half of the time’, ‘sometimes’, and ‘never’.

The number of sexual vaginal/front hole and/or anal/back hole partners within the last 6 months prior to the study was grouped into ‘0–3’, ‘4–10’ and ‘10 or more’.

Uptake of HIV testing prior to and during PrEP use was answered with a simple ‘yes’ or ‘no’ question.

### 2.3. Statistical Analysis

The data of categorical variables is presented in absolute numbers or proportions. Medians and interquartile ranges are used to display continuous variables. Differences in cis and TGD participants were analysed using univariable and multivariable logistic regression. For the regression analysis, age, gross annual income, and country of origin covariates were used to calculate an adjusted odds ratio (aOR). Age may play an important role when looking at income and migration, as well as income itself, and country of origin might impact a person's access to healthcare in general and access to PrEP. Participants with missing data for income and country of origin were excluded from the analysis. *p*-values were calculated using Wald test.

### 2.4. Ethical Approval

The ethics committee of the Berlin Chamber of Physicians (Ref: Eth-14/18) approved this study.

## 3. Results

### 3.1. Demographics of TGD and Cis PrEP Users

In this study, we included a total of 4350 current PrEP users from Germany. A total of 1728 participated in the first wave and 2622 in the second wave. The proportion of TGD-identified respondents was 0.9% (16/1712) in the first wave and 1.9% (49/2622) in the second wave (see Table 1).

**Table 1.** Demographic data of trans and gender diverse (TGD) and cis male pre-exposure prophylaxis (PrEP) users (*n* = 4350): Results of univariable and multivariable regression.

	Number of TGD Participants (%)	Number of Cis Participants (%)	Univariable Regression <sup>1</sup>	<i>p</i> -Value	Regression Adjusted for Age <sup>2</sup>	<i>p</i> -Value <sup>3</sup>
Overall	65 (1.5%)	4285 (98.5%)				
<b>Age (years)</b>						
Median (IQR)	29 (26–34)	37 (30–45)				
18–29	34 (52.3%)	924 (21.6%)	2.8 (1.6–4.8)	<b>&lt;0.001</b>		
30–39	21 (32.3%)	1584 (37.0%)	1			
40–49	5 (7.7%)	1191 (27.8%)	0.3 (0.1–0.8)	<b>0.021</b>		
50–80	5 (7.7%)	586 (13.7%)	0.6 (0.2–1.7)	0.378		
<b>Gross annual income</b>						
EUR < 30,000	37 (56.9%)	968 (22.6%)	6.3 (3.5–11.4)	<b>&lt;0.001</b>	4.4 (2.4–8.2)	<b>&lt;0.001</b>
EUR ≥ 30,000	16 (24.6%)	2653 (61.9%)	1		1	
Missing	12 (18.5%)	664 (15.5%)	-		-	
<b>Origin</b>						
Germany	22 (33.8%)	2509 (58.6%)	1		1	
Outside Germany	22 (33.8%)	791 (18.5%)	3.2 (1.7–5.8)	<b>&lt;0.001</b>	2.5 (1.3–4.5)	<b>0.004</b>
Missing	21 (32.3%)	985 (23%)	-		-	
<b>Language</b>						
German	42 (64.6%)	3707 (86.5%)	1		1	
Other language <sup>4</sup>	23 (35.4%)	578 (13.5%)	3.5 (2.1–5.9)	<b>&lt;0.001</b>	2.6 (1.5–4.4)	<b>0.001</b>

<sup>1</sup> Univariable logistic regression model with 4285 cis and 65 TGD current PrEP users in Germany. <sup>2</sup> Multivariable logistic regression model with 4285 cis and 65 TGD current PrEP users in Germany, adjusted for age. <sup>3</sup> *p*-values of age-adjusted regression. Statistically significant *p*-values (*p* < 0.05) are shown in bold. <sup>4</sup> The online survey was available in German, English, French, Spanish, Arabic and Turkish.

In our sample, 1.5% (*n* = 65) identified as trans, non-binary or intersex, or indicated a gender identity that did not match their sex assigned at birth. In Wave 1, 7 participants identified as trans, 4 as intersex, and 4 as non-binary. In Wave 2, 16 identified as trans male or male and assigned female at birth, 4 as trans female or female and assigned male at birth, 1 as intersex, 25 as non-binary, and 3 as 'other'. With a median age of 29 years (interquartile range (IQR) = 26–34), TGD participants were younger than cis respondents

(37 years; IQR = 30–45; Table 1). The majority of TGD respondents (52.3%) were 18–29 years old, compared to 21.6% of cis PrEP users.

Being a TGD participant was associated with a lower gross annual income (Table 1): 56.9% of participating TGD individuals had an income of EUR 30,000 or less per year, compared to 22.6% of cis participants (aOR = 4.4; 95% confidence interval [CI] = 2.4–8.2,  $p < 0.001$ ).

Additionally, TGD participants were more likely to originate outside of Germany. About one-third (33.8%) of TGD compared to 18.5% of cis PrEP users were originally not from Germany (aOR = 2.5; 95% CI = 1.3–4.5,  $p = 0.004$ ). Furthermore, a larger proportion of TGD respondents (35.4%) compared to cis respondents (13.5%) filled out the survey in languages other than German (aOR = 2.6; 95% CI = 1.5–4.4,  $p = 0.001$ ) (see Table 1).

### 3.2. PrEP Use and Testing Behaviour of TGD and Cis PrEP Users

The majority of the study participants used PrEP daily. However, TGD respondents (43.1%) showed higher on-demand or intermittent PrEP use compared to cis respondents (29.3%) (aOR = 1.9; 95% CI 1.0–3.5,  $p = 0.037$ ; Table 2). More than a quarter of TGD PrEP users (26.2%) obtained PrEP from informal sources (buying/getting it abroad, on the Internet, from dealers or friends) compared to 14.7% of their cis counterparts (aOR = 1.8; 95% CI = 0.9–3.5,  $p = 0.091$ ).

**Table 2.** Pre-exposure prophylaxis (PrEP) use and sexual behaviour of trans/gender diverse (TGD) and cis male PrEP users ( $n = 4350$ ).

	Number of TGD Participants (%)	Number of Cis Participants (%)	Univariable Regression <sup>1</sup>	<i>p</i> -Value	Regression Adjusted for Age <sup>2</sup>	<i>p</i> -Value <sup>3</sup>
<b>Overall</b>	65 (1.5%)	4285 (98.5%)				
<b>Type of PrEP use</b>						
Daily	33 (50.8%)	2902 (67.7%)	1		1	
On demand	28 (43.1%)	1256 (29.3%)	2.0 (1.1–3.7)	<b>0.020</b>	1.9 (1.0–3.5)	<b>0.037</b>
Missing	4 (6.2%)	127 (3.0%)	-		-	
<b>PrEP source</b>						
Prescription	39 (60.0%)	3269 (76.3%)	1		1	
Informal	17 (26.2%)	631 (14.7%)	2.2 (1.2–4.3)	<b>0.017</b>	1.8 (0.9–3.5)	0.091
Missing	9 (13.8)	385 (9.0%)	-		-	
<b>Condom use</b>						
Always/often	13 (20.0%)	857 (20.0%)	1.1 (0.6–2.3)	0.714	1.0 (0.5–2.0)	0.976
Half the time or less	44 (67.7)	3107 (72.5%)	1		1	
Missing	8 (12.3%)	321 (7.5%)	-		-	
<b>Number of anal (back hole)/vaginal (front hole) sexual partners within the last 6 months</b>						
0–3 partners	8 (12.3%)	613 (14.3%)	1		1	
4–10 partners	19 (29.2%)	1327 (31.0%)	1.3 (0.4–4.1)	0.639	1.4 (0.4–4.4)	0.558
>10 partners	30 (46.2%)	2051 (47.9%)	1.9 (0.7–5.4)	0.240	2.0 (0.7–5.7)	0.211
Missing	8 (12.3%)	294 (6.9%)	-		-	
<b>Tests before starting PrEP</b>						
Yes	50 (76.9%)	3704 (86.4%)	1		1	
No	3 (4.6%)	150 (3.5%)	2.1 (0.7–7.1)	0.208	1.7 (0.5–5.6)	0.397
Missing	12 (18.5%)	431 (10.1%)	-		-	

Table 2. Cont.

	Number of TGD Participants (%)	Number of Cis Participants (%)	Univariable Regression <sup>1</sup>	<i>p</i> -Value	Regression Adjusted for Age <sup>2</sup>	<i>p</i> -Value <sup>3</sup>
<b>Tests during PrEP use</b>						
Yes	47 (72.3%)	3382 (78.9%)	1		1	
No	7 (10.8%)	369 (8.6%)	1.3 (0.5–3.3)	0.618	1.1 (0.4–2.8)	0.845
Missing	11 (16.9%)	534 (12.5%)	-		-	

<sup>1</sup> Univariable logistic regression model with 3258 cis and 44 TGD current PrEP users in Germany. Participants with missing data for income and country of origin were excluded from the analysis. <sup>2</sup> Multivariable logistic regression model with 3258 cis and 44 TGD current PrEP users in Germany, adjusted for income and origin. <sup>3</sup> *p*-values of age-adjusted regression. Statistically significant *p*-values (*p* < 0.05) are shown in bold.

TGD and cis participants were comparable in their testing behaviour during PrEP use. TGD PrEP users (76.9%) were numerically less likely to get tested than cis PrEP users (86.4%) before starting to take the drug (aOR = 1.7; 95% CI = 0.5–5.6, *p* = 0.397) (see Table 2).

### 3.3. Sexual Behaviour of TGD and Cis PrEP Users

Regarding the number of sexual partners for vaginal/front hole and anal/back hole intercourse within the 6 months prior to the study and condom use, we found similar proportions between both groups: 29.2% of TGD participants (vs. 31% in cis respondents) had 4–10 anal/back hole and/or vaginal/front hole sexual partners (aOR = 1.4; 95% CI = 0.4–4.4, *p* = 0.558) and 46.2% (vs. 47.9% in cis respondents) had 10 or more anal/back hole and/or vaginal/front hole sexual partners (aOR = 2.0; 95% CI = 0.7–5.7, *p* = 0.211) during the 6 months prior to the study (see Table 2).

## 4. Discussion

This analysis of the study included 4350 current PrEP users from Germany, with 65 participants (1.5%) identified as TGD. Demographically, TGD participants were comparably younger than cis participants, were living with less income, were more likely to have their descent from somewhere outside of Germany, and filled out the survey more often in languages other than German. The results show both higher informal, as well as ‘on demand’ PrEP use in TGD participants and similar testing frequency before starting PrEP und during PrEP use was found among both study groups.

The TGD respondents of this survey were, on average, younger than the cis respondents. More than half of the TGD people in this study were aged 18–29 years (median age = 29 years). Despite elevated risk for new HIV infection in adolescents and young adults on a global level [30], the young age of the participating PrEP users in this study might indicate a positive trend regarding accessing HIV prevention in younger cohorts. However, recruiting through dating apps (i.e., Grindr, PlanetRomeo, Hornet) might account for the younger participants in this study. The comparably younger age of the TGD participants might be one factor associated with the low income of this group. The finding of low income in TGD participants in this analysis aligns with studies that have shown that TGD people are disproportionately often living with very little income or even living in poverty due to various reasons [14,15]. Financial difficulties may be one reason as to why TGD individuals are more likely to engage in sex work [5], which might also expose them to an even greater risk of acquiring HIV and other STIs.

Costs related to testing and acquiring PrEP might pose a barrier to accessing this HIV prevention tool. During the study period, PrEP was only available through private prescriptions with self-payment of EUR 50/month in Germany [31]. Thus, a lower income may have constituted a considerable access barrier to PrEP. Coverage of PrEP by statutory health insurances started in September 2019. It is believed that this step has made PrEP available to a wider audience since then [32]. Even though PrEP is covered by statutory health insurance since September 2019, a quarterly co-payment of 10€ is still required. This

might still pose a barrier for TGD people with low income to access PrEP in Germany. Additionally, not every person in Germany has access to statutory health insurance as (undocumented) migrants, refugees, etc., often do not have formal access to statutory health insurance coverage. The TGD PrEP users in this sample were more likely originating from outside Germany and might be affected by this structural barrier. Furthermore, it is unclear if cost coverage for PrEP has also made a positive change to accessibility for the TGD community. Unmet needs (i.e., regional distribution issues) with regard to access to PrEP in cis MSM have been described before [33].

TGD people are often affected by stigma and discrimination in healthcare settings globally [14,15] and barriers to accessing healthcare may even be higher when it comes to sexual health. In addition to negative experiences in healthcare settings and despite being eligible for PrEP, many TGD patients are not being prescribed the drug [24]. This might be related to a lack of knowledge in healthcare providers about the potential risks and vulnerabilities of TGD people and their sexual networks. In the absence of medical prescriptions, TGD people have to rely more often on informal PrEP use. A previous analysis of this data has shown that informal PrEP use was associated with having a country of origin outside of Germany [28]. Similarities were found among this sub-sample and TGD participants more often responded to the survey in a language other than German. Those participants may reside in Germany only transiently or have an unclear immigration status. Additionally, language barriers and not knowing the German health system may impede them to seek health advice overall. In those cases, access to statutory health insurance may be compromised and access to PrEP medication from informal sources might be easier.

Besides using PrEP from informal sources, we have also observed that a higher percentage of TGD people used PrEP 'on demand' than cis users. Being TGD does not always include physical gender affirmative changes, but many TGD people decide to have gender affirming hormonal treatment (GAHT). As mentioned in the introduction, due to insufficient data on the efficacy of 'on demand' PrEP use in TGD people undergoing GAHT, daily PrEP intake is recommended for TGD people undergoing GAHT and to those engaging in vaginal/front hole penetrative sex, regardless of gender affirming testosterone use [12]. Although our study did not ask for gender affirming steps such as GAHT, the more prevalent use of PrEP on demand among TGD PrEP users in our findings is concerning, as some TGD PrEP users might also undergo GAHT parallel. More data from clinical trials on the efficacy of on-demand PrEP use in this population, as well as more education of healthcare providers around the body diversity of TGD PrEP users and their needs, is therefore necessary.

A similar proportion of TGD and cis PrEP users reported being tested before starting PrEP and during PrEP use. The Austrian-German Guidelines for HIV pre-exposure prophylaxis recommend thorough STI and HIV testing before starting PrEP. The recommendation is HIV and syphilis testing every 3 months and chlamydia and gonorrhea testing every 3–6 months during PrEP intake [27]. Since the coverage of PrEP by statutory health insurances in 2019, mandatory HIV and STI testing prior to and during the use of PrEP is fully covered by insurance. Prior to this, quarterly co-payments for testing ranged between 10€ to over 100€. A previous analysis of this study (without segregating TGD and cis participants) found that infrequent testing while using PrEP was associated with obtaining PrEP from informal sources [28]. We did not find any evidence that testing behaviour before and during PrEP use was different between TGD and cis participants. However, obtaining PrEP from informal sources by TGD PrEP users might be related to inaccessibility of adequate and low-cost testing options and general healthcare access barriers.

In this analysis we found similar numbers of sexual partners and comparable frequency of condom use in between both study populations. This study was promoted through MSM dating apps, community websites, and local community HIV/STI testing clinics, and it did not specifically ask about the gender identity of the participant's sexual partners and the specific sexual practices (except number of vaginal/front hole or anal/back

hole sexual partner and condom use) they engage in. More research about sexual partners and practices of TGD people (especially transmasculine and non-binary individuals) is needed to determine HIV risk exposure and potential benefit of PrEP for this community.

Beyond that, this analysis has provided the first insights that the sexual healthcare needs of TGD people are currently not adequately met in Germany. Healthcare policy makers, sexual health providers, and stakeholders in the German HIV response need to become more aware of the specific vulnerabilities and needs of TGD people to minimize HIV infection risk for this population.

#### *Strengths and Limitations*

This study is the first of its kind to give an idea of the experiences and circumstances of TGD PrEP users in Germany, covering various aspects regarding the inaccessibility (i.e., income, barriers to accessing healthcare, etc.) of PrEP for this community and highlighting the need for further research.

TGD persons were not included in the initial planning of the study but were consulted after completion of the first wave. With input and recommendations from a TGD community member and public health expert (who also led the analysis and writing of the manuscript), the study guide and questionnaire were adjusted for greater inclusion of TGD identities and more diverse body representations.

There are a number of limitations to this analysis. We are aware that the sample size of the TGD study population is small. Additionally, trans men, trans women, and trans non-binary people have some shared, but also in some regards different vulnerabilities and needs regarding HIV prevention and care. However, given the small sample size, it made sense to group the various identities within the trans and gender diverse spectrum together. The wide range of some of the confidence intervals might indicate that some findings have arisen due to chance. The results do give an indication of the current situation of TGD PrEP users, but further research is needed to appropriately portray the lived realities and experiences of this group. Moreover, this study delivers initial findings on the sexual health prevention needs in TGD people and a study to address these needs in TGD communities in Germany conducted by the Deutsche Aidshilfe (German AIDS Service Organization) in collaboration with the Robert Koch Institute is underway [34].

Some individuals, whose gender identity does not match the sex assigned to them at birth, do not use the term 'trans' for self-identification. By not having asked for sex assigned at birth in the first wave, this study might have excluded TGD participants who identify solely as male or female (not identifying as 'trans' men or 'trans' women). By not having asked about (receptive) vaginal/front hole intercourse (only anal/back hole intercourse) in the first wave, this study initially missed gathering important data on potential sexual contacts of the TGD community. This was altered in the second wave where we asked for both (receptive) vaginal/front hole and anal/back hole intercourse.

The study was not specifically aimed at TGD communities or promoted in TGD-specific community places. The community members included were PrEP users who had access to the recruitment settings (dating apps, community checkpoints, and STI/HIV clinics, etc.) and they may not represent the TGD population adequately.

## **5. Conclusions**

Despite similar sexual behaviour (i.e., condom use and number of sexual partners), this analysis showed various disparities regarding the different PrEP regimens (daily vs. on demand) and accessibility of PrEP (prescription vs. informal) among TGD and cis PrEP users in Germany. Access to PrEP for members of the TGD community may be compromised for various reasons (i.e., income disparities, access barriers to and discrimination in healthcare, etc.). Additionally, HIV prevention programmes in Germany (and beyond) need to be aware of the multi-faceted intersectional and demographic aspects (i.e., language, income, etc.) that influence access to sexual health services and HIV prevention tools (such as PrEP) for TGD individuals. This study, among others, has shown that urgent action such



as reducing access barriers to (sexual) healthcare services, educating healthcare providers on the TGD realities, and including the TGD community in research is required to minimize the HIV risk exposure for this community.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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**Conflicts of Interest:** UK owns 'Exchange-traded fund' (ETF) shares, which may include stocks of pharmaceutical companies that produce or develop PrEP. The other authors declare no conflicts of interest. The promotion of the study was provided by the dating apps (Grindr, PlanetRomeo, Hornet), the prepjetzt.de (accessed on 18 February 2022) website, and the community checkpoints free of charge.

## Abbreviations

Throughout the manuscript we use different terms to refer to and to describe the diversity within the trans and gender diverse community. Language is constantly changing, and at the time of publication we use the following terms and acronyms in our manuscript:

AFAB	Assigned Female at Birth [35]
AMAB	Assigned male at birth [35]
GAHT	Gender affirming hormone treatment (i.e., with testosterone, oestrogen, and/or hormone blockers) [16]
Genderqueer	A person, who identifies with a different gender than their sex assigned to them at birth. They often identify outside of the binary of male and female, or not exclusively as male or female [36,37]. Their gender-expression may align or may differ from their gender identity (i.e., a genderqueer person does not always have to look 'androgynous') → similar to (trans) non-binary
Trans and gender diverse (TGD)	TGD is being used as an umbrella term to refer to individuals, whose current gender identity does not match the sex assigned to them at birth [35]. This can include trans men, trans women, trans non-binary, genderqueer people, etc.
Transfeminine	A person, who was AMAB and who presents predominantly as female, and identifies (mostly) on the female and/or non-binary spectrum [38]
Trans man	A person, who was AFAB and identifies and presents (stereotypically) as a man [39]
Transmasculine	A person, who was AFAB and presents predominantly as male, and identifies (mostly) on the male and/or non-binary spectrum [40]
(Trans) Non-Binary	A person, who identifies with a different gender than their sex assigned to them at birth. They often identify outside of the binary of male and female, or not exclusively as male or female [37]. Their gender-expression may align or may differ from their gender identity (i.e., a non-binary person does not always have to look 'androgynous'). Many, but not all non-binary individuals also use the term trans for self-identification → similar to genderqueer
Trans woman	A person, who was AMAB and identifies and (stereotypically) as a woman [41]

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