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Primary Care for Transgender Adolescents and Young Adults in Rhode Island: An Analysis of the all Payers Claims Database

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A B S T R A C T

Purpose: Structural stigma has shaped disparities across several domains of health for transgender relative to cisgender (nontransgender) adolescents in the United States. Research on transgender health has largely overlooked the role of preventive care, especially for adolescents.
Methods: We used ICD-9 and ICD-10 codes to identify transgender adolescents in the Rhode Island All Payers Claims Database (APCD) from 2011 to 2017 based on a diagnosis for gender identity disorder (GID). We evaluated differences in the use of preventive care services between transgender and cisgender adolescents. We compared the frequency of sexually transmitted infection and HIV screening and the percentage prescribed pre-exposure prophylaxis among transgender and cisgender adolescents using *t*-tests and chi-square tests. We used logistic regression to evaluate the association between attending regular physical exams and receiving preventive health services.
Results: There was no significant difference in the proportion of transgender and cisgender adolescents who received regular influenza vaccinations, physical exams, and HPV vaccinations. Transgender adolescents were significantly more likely to receive regular cholesterol and BMI screenings compared to cisgender adolescents. While there was a significant positive association between having regular physical exams and receiving most preventive screenings in the cisgender population, in the transgender population, regular physical exams were only significantly positively associated with STI screening.
Conclusions: Transgender adolescents accessing the healthcare system received similar, if not greater, levels of preventive health services compared to their cisgender peers. Because regular physical exams were not associated with receiving most preventive services among transgender adolescents, these services may be delivered outside of primary care settings.

IMPLICATIONS AND CONTRIBUTION

This study used an APCD to describe preventive care use and access among transgender and gender diverse adolescents. These analyses suggest that transgender and gender diverse adolescents identified via gender dysphoria codes are receiving similar levels of preventive services to their cisgender peers.

Transgender and gender diverse (TG/GD) people—individuals whose gender identity does not align with their sex assigned at birth—face disparities across several domains of health relative to cisgender (nontransgender) people in the United States (US)

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[1–3]. Many disparities are driven by structural stigma against TG/GD people, including policies that do not protect TG/GD people from discrimination in access to health care, housing, and employment [4]. TG/GD adolescents are a particularly vulnerable and underserved and under-researched population at increased risk for mental health conditions like depression, anxiety, and substance use disorder compared to their cisgender peers [3,5–8]. Additionally, both discrimination and lack of social support have been shown to increase the risk of homelessness, HIV, and other sexually transmitted infections (STIs) among TG/GD adolescents [9,10]. Barriers to accessing comprehensive medical and mental health care for TG/GD adolescents include limited access to providers who are transgender-friendly and knowledgeable of gender-affirming care [11,12].

Research on TG/GD health has largely focused on sexual and mental health, with less attention paid to primary and preventive care, especially in regard to adolescents. Primary care is how most patients first interact with the healthcare system and offers a vital opportunity for TG/GD adolescents to engage in regular preventive care. Primary care may also be the first place where a child or adolescent may disclose their gender identity in a medical setting, and therefore, primary care providers are key in the provision of gender-affirming care [13]. While some guidelines and evidence exist for primary care providers in regards to the treatment and care of TG/GD adolescent patients [14], there are large gaps in current literature regarding access to and utilization of preventive services among TG/GD individuals of all ages, especially with regard to services other than HIV and STI screening, like cholesterol screening and influenza vaccination.

Research on transgender health has been limited by a lack of studies that have followed large populations of transgender individuals [15]. One emerging method for studying TG/GD health is through medical insurance claims data. Recent studies have used administrative data from Medicare and the Department of Veterans Affairs (VA) to demonstrate that Internal Classification of Diseases (ICD-9 and ICD-10) codes are a valid approach to defining TG/GD populations and to evaluate mental health, HIV, and chronic disease outcomes in these populations [16–24]. These studies have also demonstrated substantial disparities in physical and mental health outcomes between transgender and cisgender patients [20–22]. Unfortunately, these findings can only be generalized to Medicare and VA populations and cannot be generalized to TG/GD adolescents. To our knowledge, no study using administrative claims has explored preventive care use among TG/GD adolescents.

All-Payer Claims Database (APCD) offer a new opportunity to examine preventive care among TG/GD adolescents across a state. APCD contains medical and pharmaceutical claims data from most public and private payers in a state and is a valuable resource to evaluate TG/GD health and health care. While the APCD does not contain gender identity data, it does contain ICD-9/ICD-10 codes that indicate whether an individual has a diagnosis code associated with gender dysphoria or a history of gender-affirming surgery (e.g., genital reconstruction, chest reconstruction). Prior research describing TG/GD health using administrative claims has been limited to Medicare and VA data [16–22], with findings that cannot be generalized to TG/GD adolescents. To fill this gap, we used the Rhode Island (RI) APCD, which captures almost all individuals in the state. We used a previously validated algorithm to identify TG/GD adolescents with ICD-9 and ICD-10 codes in the RI APCD between 2011 and 2017 and evaluated differences in the use of preventive care between TG/GD and cisgender adolescents. We also evaluated the association between attending regular physical exams and receiving preventive health services. This study provides insight into disparities in preventive care among TG/GD adolescents and can inform efforts to improve the health of TG/GD adolescents.

Methods

Sample

This study used medical claims in the RI APCD submitted from January 2011 to October 2017. The Rhode Island APCD includes information on most insured individuals in the state, capturing claims for approximately 87% of the Rhode Island population [25]. The APCD does not include information on individuals who are uninsured, pay for healthcare out of pocket, or receive free healthcare services; claims from insurance companies with fewer than 3,000 members; or some individuals who receive health insurance through a self-funded employer [25]. Data associated with each medical or pharmaceutical claim included age, sex, ZIP code of residence, health insurance type, ICD-9/ICD-10 codes, procedure codes, service or medication rendered, medical provider, and cost of each service. The APCD does not capture race and ethnicity for most individuals. Our study population was restricted to adolescents, which we defined as individuals between the ages of 10 and 25.

Variables

Exposures. The primary exposure of interest was TG/GD status. We identified individuals who were TG/GD if they had at least one diagnosis code associated with gender dysphoria, specifically any ICD-9/ICD-10 code for gender identity disorder (GID), or a history of gender-affirming surgery during the study period, as listed in Table A1. We were limited to this definition because the APCD does not contain information on gender identity. Based on validated methods developed in prior research [16,19], we used medical claims to validate the accuracy of these ICD classifications. For each individual classified as TG/GD with ICD-9/ICD-10 codes, we checked to see if they had at least one of the following validation conditions: multiple GID diagnosis codes in the same year as their initial GID diagnosis, GID diagnoses codes in multiple years, or a principal diagnosis of GID at any point during the study period.

The second exposure of interest was the engagement in consistent primary care visits, defined as attending regular physical exams. While there are no consistent guidelines for the frequency of adult physical exams, the U.S. Preventive Services Task Force (USPSTF) recommendations on preventive services and screenings generally indicate that men and women aged 22–49 should have a physical exam every 1–3 years, while those younger than 22 should have annual primary care visits [26]. In this analysis, individuals ages 21 and younger were determined to have met recommendations for consistent primary care visits if they had annual physical exams, and those 22–25 met recommendations for consistent primary care visits if they had at least one physical exam every three years.

Outcomes. The main outcomes were whether patient standards for selected preventive care services were met for TG/GD patients compared to cisgender patients. These standards included physical exams, influenza vaccination, body mass index (BMI)

screening, human papillomavirus (HPV) vaccination, and cholesterol screening. Engagement in physical exams and BMI screening was defined as described above (annually for those younger than 22, once every three years for those 22–25). Engagement in regular influenza vaccination was defined as annual influenza vaccination, per Centers for Disease Control and Prevention (CDC) guidelines [27]. The National Heart, Lung, and Blood Institute (NHLBI), the American Academy of Pediatrics (AAP), the American Heart Association (AHA), and the American College of Cardiology recommend cholesterol screening at ages 9–11 and again at ages 17–21 [28–30]. We defined meeting recommendations for cholesterol screening as having at least one Current Procedural Terminology (CPT) code for cholesterol screening during the study period. Last, the CDC recommends that females 11–25 and males 13–21 receive the HPV vaccine [31]. We defined meeting recommendations for HPV vaccination as having at least one CPT code for the HPV vaccine during the study period.

Secondary outcomes included frequency of sexual health screenings. We measured the percentage of years a patient received HIV screening and the percentage of years an individual received STI screening for chlamydia or gonorrhea out of the total number of years they were enrolled in any plan in the APCD. We also identified whether patients had any prescription for pre-exposure prophylaxis (PrEP) for HIV prevention, using a previously published algorithm [32]. As the use and need for sexual health services vary, based on individual risk factors that were not available in this dataset, we evaluated the overall use rather than adherence to a defined guideline. All ICD-9/ICD-10 and CPT codes used to classify outcomes are listed in Table A1.

Analyses. We calculated the proportion of TG/GD and cisgender patients who met the recommended number of physical exams, influenza vaccines, and BMI screenings, as well as any cholesterol screening and any HPV vaccination during the study period. We ran a logistic regression analysis evaluating the odds of receiving these services among TG/GD patients relative to the total population of cisgender patients, cisgender men, and cisgender women, adjusting for age, county of residence, insurance type, and the number of years an individual was enrolled in a plan in the APCD. County was used as a control variable to adjust for any county-level sociodemographic variables.

To examine sexual health outcomes, we used *t*-tests to compare the mean percentage of years TG/GD patients and cisgender women, and TG/GD patients and cisgender men received an HIV test and an STI test. We used chi-square analysis to compare the percentage of TG/GD and cisgender patients who had any prescription for PrEP during the study period. Analyses for HIV tests, STI tests, and PrEP use were restricted to patients between the ages of 18 and 25. These analyses evaluated the overall use of STI/HIV screening as opposed to adherence to a specific guideline because the use and need of sexual health services vary based on individual risk factors that were not available in this dataset. We used chi-square analysis to compare PrEP use rather than logistic regression because the number of PrEP users was so small in both the TG/GD and cis-gender populations that we could not use logistic regression to adjust for other variables.

Last, we performed a logistic regression to evaluate whether having consistent physical exams was associated with any HIV and STI screening during the study period, regular BMI screening, regular influenza vaccination, at least once screening for cholesterol, and HPV vaccination among TG/GD and cisgender patients. Models were adjusted for age, county of residence, insurance type, and the number of years an individual was enrolled in a plan APCD. Significance was defined as a p value less than .05. All analyses were conducted with SAS 9.4. All procedures were approved by the Institutional Review Board at the Miriam Hospital (a teaching hospital of Brown University) and also approved by the Rhode Island APCD Board.

Results

The RI APCD contained medical claims from 221,908 individuals between 10 and 25 years of age from January 1, 2011, to October 31, 2017. During this period, 560 unique patients between 10 and 25 were classified as TG/GD. Among this group, 488 (87.1%) fulfilled at least one of the three validation conditions, and 59 (10.5%) had a documented change in gender during the study period (Table 1). Of all 560 TG/GD patients, 45.9% were insured by Medicaid, compared to 38.0% of cisgender patients 10–25 years of age (Table 1). The TG/GD population was more likely to be insured by Medicaid than commercial insurance (adjusted OR = 1.47, 95% CI: 1.24, 1.74) and were significantly more likely to be in the older age categories (Table 1). The population distribution by county was relatively similar among TG/GD and cisgender populations, with both populations concentrated most heavily in the most populous county, Providence County.

Adjusting for age, insurance type, county, and years with a plan in the RI APCD, there was no significant difference in the proportion of TG/GD adolescents who received annual influenza vaccination (AOR = 1.34; 95% CI: .96, 1.85), regular physical exams (AOR = 1.04; 95% CI: .77, 1.40), and had any claim for HPV vaccination (AOR = 1.18; 95% CI: .96, 1.44) relative to cisgender adolescents (Table 2A). Relative to cisgender individuals, TG/GD individuals had 4.07 times the adjusted odds of receiving cholesterol screening (95% CI: 3.36, 4.92), and 1.94 times the adjusted odds of receiving BMI screening (95% CI: 1.62, 2.32) (Table 2A).

Relative to cisgender men, TG/GD individuals had significantly increased odds of having regular influenza vaccinations (AOR = 1.41; 95% CI: 1.01, 1.95), regular physical exams (AOR = 2.29; 95% CI: 1.69, 3.09), regular BMI screening (AOR = 2.42; 95% CI: 2.02, 2.89), and cholesterol screening (AOR = 4.13; 95% CI: 3.41, 5.00) (Table 2B). There was no significant difference in the proportion of TG/GD patients and cisgender men who received the HPV vaccine (AOR = .92; 95% CI: .75, 1.12) (Table 2B).

Relative to cisgender women, TG/GD individuals had significantly increased odds of having regular BMI screening (AOR = 1.58, 95% CI: 1.32, 1.89), receiving the HPV vaccine (AOR = 1.47; 95% CI: 1.21, 1.80) and cholesterol screening (AOR = 4.01; 95% CI: 3.31, 4.85), and had significantly reduced odds of attending regular physical exams (AOR = .60, 95% CI: .45, .82) (Table 2C). There was no significant difference in the proportion of TG/GD individuals and cisgender women who received annual influenza vaccinations (AOR = 1.27; 95% CI: .92, 1.77).

Among those 18–25 years old, the mean percentage of years of TG/GD individuals who received HIV screening was significantly greater than that of the cisgender population ($p < .01$) and cisgender men ($p < .01$) (Table 3). Among those 18–25 years old, the mean percentage of years of TG/GD individuals who received STI screening was significantly greater than that of cisgender

Table 1
Number and percentage of the transgender/gender diverse (TG/GD) and cisgender population by gender, insurance type, age group, county, and year present in the Rhode Island APCD

	TG/GD population		Cisgender population		Odds Ratio	95% Confidence Interval
	N	%	N	%		
Total	560		220,908			
Gender						
No change in gender						
Female	298	53.21	111,263	50.37	-	-
Male	203	36.25	109,623	49.63	-	-
Documented change in gender	*59*	10.54				
Female to Male	41	69.49	-	-	-	-
Male to Female	18	30.51	-	-	-	-
Insurance Type[a,b]						
Commercial	303	54.11	136,822	61.94	Ref	-
Medicare	0	0	101	.05	1.47**	1.24, 1.74
Medicaid	257	45.89	83,963	38.01	-	-
Unknown	0	0	22	.01	-	-
Age Group[a]						
10–12	35	6.73	36,842	17.98	Ref	-
13–15	92	17.69	37,915	18.50	2.55**	1.73, 3.77
16–18	134	25.77	42,996	20.98	2.28**	2.26, 4.76
19–21	140	26.92	41,918	20.45	3.52**	2.43, 5.10
22–25	159	28.39	61,237	27.72	2.74**	1.90, 3.95
County[a]						
Bristol	49	8.75	9,781	4.43	1.42*	1.05, 1.92
Kent	84	15.00	31,408	14.22	.96	.75, 1.22
Newport	32	5.71	12,864	5.82	.76	.55, 1.06
Providence	312	55.71	132,465	59.97	1.05	.86, 1.28
Washington	60	10.71	23,205	10.5	ref	-
Out of State	23	4.11	11,174	5.06	.88	.60, 1.23
Year Present in APCD						
2011	420	75.00	169,141	76.57	-	-
2012	424	75.71	172,528	78.10	-	-
2013	421	75.18	175,956	79.66	-	-
2014	485	86.61	195,116	88.33	-	-
2015	518	92.50	195,841	88.66	-	-
2016	502	89.64	176,671	79,98	-	-
2017	480	85.71	163,933	74.21	-	-

*$P < .05$; **$P < .01$.
[a] At first claim in the APCD.
[b] Adjusted by age group.

men ($p < .01$), and significantly less than that of cisgender women ($p < .01$) (Table 3). Although PrEP use was significantly higher in TG/GD patients compared to the overall cisgender population, cisgender men, and cisgender women, the number of patients using PrEP was too small to characterize the relationship between PrEP use and TG/GD status.

Among TG/GD individuals, having regular physical exams was not significantly associated with any HIV screening, any STI screening, any HPV vaccination, nor any cholesterol screening (Table 4A). TG/GD individuals with regular physical exams had 19.52 times the adjusted odds of having BMI screening during the study visit, relative to those without regular physical exams (95% CI: 4.57, 83.45) (Table 4A). Among cisgender individuals, those with regular physical exams, relative to those who did not have regular physical exams, had significantly increased adjusted odds of having an HIV test (AOR = 2.06; 95% CI: 1.99, 2.13), an STI test (AOR = 3.76; 95% CI: 3.64, 3.89), BMI screening (AOR = 9.76; 95% CI: 9.36, 10.19), and cholesterol screening (AOR = 2.96; 95% CI: 2.87, 3.05) (Table 4B). Among cisgender individuals, having regular physical exams was significantly negatively associated with HPV vaccination (AOR = .54, 95% CI: .52, .56) and influenza vaccination (AOR = .81, 95% CI: .74, .89) (Table 4B).

Discussion

This is among the first studies to examine differences in preventive care in TG/GD and cisgender adolescents across a state using medical insurance claims. Overall, our analysis suggests that TG/GD adolescents who are insured, accessing the healthcare system, and have at least one diagnosis code associated with gender dysphoria, receive similar, if not greater, levels of preventive health services compared to their cisgender peers. This aligns with previous studies using Medicare claims [19], Behavioral Risk Factor Surveillance System (BRFSS) data [33], and clinic-level data [34], which did not find a significant difference in primary care utilization between TG/GD and cisgender individuals.

Overall, the prevalence of TG/GD individuals was higher in the APCD than found in similar claims-based studies [18,19,21,22]. One possible explanation is that most claims-based studies have focused on adults or entire populations rather than an exclusively adolescent population. Research has suggested that younger populations may be more likely to report their gender minority status than older populations, which is why the proportion of TG/GD individuals is higher in this population than others [35].

Table 2
Number and percentage of individuals meeting guidelines for influenza vaccinations, regular physical exams, and BMI screening, HPV vaccination, and cholesterol screening, and the crude and adjusted[a] odds of transgender/gender diverse (TG/GD) individuals meeting these outcomes, relative to the overall cisgender population (A), the cisgender male population (B), and the cisgender female population (C)

A								
	TG/GD	Cisgender	OR	95% CI	*p*	AOR[a]	95% CI	*p*
	N (%)	N (%)						
Influenza Vaccination	43 (7.68)	16,012 (7.25)	1.07	.78, 1.46	.6870	1.34	.96, 1.85	.0821
Regular Physical Exams	76 (13.57)	29,152 (13.20)	1.03	.81, 1.32	.7910	1.04	.77, 1.40	.7985
BMI Screening	320 (57.14)	87,778 (39.74)	2.02	1.71, 2.39	<.0001	1.94	1.62, 2.32	<.0001
HPV Vaccination	285 (50.89)	97,270 (44.04)	1.32	1.12, 1.56	<.0001	1.18	.96, 1.44	.1142
Cholesterol Screening	389 (69.46)	74,873 (33.90)	4.43	3.70, 5.30	<.0001	4.07	3.36, 4.92	<.0001
B								
	TG/GD	Cisgender male	OR	95% CI	*p*	AOR[a]	95% CI	*p*
	N (%)	N (%)						
Influenza Vaccination	43 (7.68)	7,805 (7.12)	1.08	.80, 1.48	.6007	1.41	1.01, 1.95	.0421
Regular Physical Exams	76 (13.57)	8,692 (7.93)	1.82	1.43, 2.33	<.0001	2.29	1.69, 3.09	<.0001
BMI Screening	320 (57.14)	37,822 (34.50)	2.53	2.14, 2.99	<.0001	2.42	2.02, 2.89	<.0001
HPV Vaccination	285 (50.89)	52,997 (48.34)	1.11	.94, 1.31	.2290	.92	.75, 1.12	.3937
Cholesterol Screening	389 (69.46)	35,441 (32.33)	4.75	3.97, 5.69	<.0001	4.13	3.41, 5.00	<.0001
C								
	TG/GD	Cisgender female	OR	95% CI	*p*	AOR[a]	95% CI	*p*
	N (%)	N (%)						
Influenza Vaccination	43 (7.68)	8,207 (7.38)	1.05	.77, 1.43	.7770	1.27	.92, 1.77	.1475
Regular Physical Exams	76 (13.57)	20,460 (18.39)	.70	.55, .89	.0035	.60	.45, .82	.001
BMI Screening	320 (57.14)	49,956 (44.90)	1.64	1.38, 1.94	<.0001	1.58	1.32, 1.89	<.0001
HPV Vaccination	285 (50.89)	44,273 (39.38)	1.57	1.33, 1.85	<.0001	1.47	1.21, 1.80	.0002
Cholesterol Screening	389 (69.46)	39,432 (35.44)	4.14	3.45, 4.95	<.0001	4.01	3.31, 4.85	<.0001

[a] Adjusted for age, insurance type, county of residence, and number of years enrolled in a plan in the APCD.

Engagement in preventive care was low in both the TG/GD and cisgender patients, as 86% of patients in both populations did not attend annual primary care visits. Low use preventive care aligns with nationally representative surveys of adolescent primary care use, which found that only a third of adolescent patients had seen a primary care clinician in the past year, with half of the adolescents surveyed not having a primary care clinician [36]. Additionally, very few cisgender and TG/GD individuals met the CDC recommendations for annual influenza vaccination (7.7% of TG/GD individuals and 7.3% of cisgender individuals), although this likely excludes a substantial portion of individuals who did not receive an influenza vaccination in a medical setting, including those vaccinated at school or work. While TG/GD adolescents were more likely to receive regular cholesterol screening compared to cisgender adolescents, this could be attributed to baseline cholesterol screening for patients initiating gender-affirming hormone therapy [14]. The proportion of TG/GD patients who received any HPV vaccine during the study period was greater in TG/GD patients and cisgender men compared to cisgender women. This is surprising, as HPV vaccination coverage has been reported to be higher among adolescent girls compared to adolescent boys [27,28].

Overall, TG/GD adolescent patients were screened for STIs and HIV at levels in between cisgender men and cisgender women. Adolescents are particularly vulnerable to STIs and HIV. Those between 15–24 years of age account for half of new STI infections, and 21% of new HIV infections [29,30]. In the overall TG/GD population in the U.S., the prevalence of HIV is 9.2%, compared to .5% among the general population, although the risk and prevalence of HIV vary greatly within the TG/GD population depending on risk factors [37]. In these analyses, testing in both the cisgender and TG/GD populations was low, but as we do not know the underlying risk of HIV or STIs for each individual in the APCD, we cannot make any definitive conclusions from these results regarding the comprehensiveness of sexual health

Table 3
Mean percentage of years transgender/gender diverse (TG/GD) and cisgender patients between the ages of 18 and 25 were screened for chlamydia or gonorrhea, and screened for HIV and their T statistic. Percentage of TG/GD and cisgender patients between the ages of 18 and 25 who had any prescription for PrEP during the study period, with their χ^2 statistic

	TG/GD	Cisgender	T	Cisgender males	T	Cisgender females	T
	%	%		%		%	
STI Screening	20.29	19.58	−.57	8.68	−9.31**	29.33	7.23**
HIV Screening	13.28	8.35	−4.44**	4.8	−7.64**	11.53	-1.65
	%	%	χ^2	%	χ^2	%	χ^2
PrEP Use	1.75	.09	99.77**	.17	47.93**	.02	355.77**

**$p < .01$.

Table 4
Odds of selected preventive care activities by meeting routine physical exam guidelines among transgender/gender diverse (TG/GD) (A) and cisgender (B) people, unadjusted and adjusted[a] for confounders

A									
	Total	Regular physical exams	Nonregular physical exams	OR	95% CI	*p*	AOR	95% CI	*p*
		N(%)	N(%)						
HIV Test[b]	139	34 (44.74)	42 (55.26)	1.07	.63, 1.82	.7973	.85	.44, 1.62	.6199
STI Test[b]	200	50 (65.79)	26 (34.21)	1.43	.83, 2.46	.1992	1.97	.99, 3.94	.0533
HPV Vaccination	285	17 (22.37)	268 (55.37)	.23	.13, .41	<.0001	.64	.32, 1.27	.2038
BMI	320	74 (97.37)	246 (50.83)	35.79	8.69, 147.42	<.0001	19.52	4.57, 83.45	<.0001
Influenza Vaccination	43	<11*	-	-	-	-	-	-	-
Cholesterol	389	61 (80.26)	328 (67.77)	1.93	1.07, 3.51	.0301	.75	.37, 1.54	.4331
B									
	Total	Regular physical exams	Nonregular physical exams	OR	95% CI	*p*	AOR	95% CI	*p*
		N(%)	N(%)						
HIV Test[b]	32,574	11,257 (38.97)	18,949 (25.51)	1.86	1.81, 1.92	<.0001	2.06	1.99, 2.13	<.0001
STI Test[b]	58,624	19,538 (67.64)	32,597 s(43.89)	2.67	2.60, 2.75	<.0001	3.76	3.64, 3.89	<.0001
HPV Vaccination	97,275	4.828 (16.56)	92, 447 (48.21)	.21	.20, .22	<.0001	.54	.52, .56	<.0001
BMI	87,778	26,356 (90.41)	61,422 (32.03)	20	19.22, 20.82	<.0001	9.76	9.36, 10.19	<.0001
Influenza Vaccination	16,012	602 (2.07)	15,410 (8.04)	.24	.22, .26	<.0001	.81	.74, .89	<.0001
Cholesterol	74,885	16,710 (57.32)	58,175 (30.34)	3.08	3.01, 3.16	<.0001	2.96	2.87, 3.05	<.0001

<11* cell value is less than 11 and censored in accordance to RI Department of Health policy.
[a] Adjusted for age, insurance type, county of residence, and number of years enrolled in a plan in the APCD.
[b] Over 18 only.

screenings for TG/GD adolescents. Further research is necessary to identify subgroups of TG/GD adolescents who are at increased risk for HIV and STIs and to develop targeted screening strategies, and if necessary, screening guidelines to reach these individuals. While PrEP use was higher for TG/GD versus cisgender adolescents, our study population was too small to make any definitive conclusions about PrEP use among TG/GD adolescents in Rhode Island. Further research with larger population samples, mixed-methods approaches, and in various state contexts will be important to characterize the extent of PrEP use among TG/GD adolescents and their experience being counseled for and receiving PrEP.

While cisgender individuals with regular physical exams had significantly increased odds of HIV testing, STI testing, BMI screening, and cholesterol screening, this association was not as clear in the TG/GD population. While having regular physical exams was associated with BMI screening, regular physical exams were not associated with receiving any HIV screening, STI screening, HPV vaccination, nor cholesterol screening among TG/GD adolescents. This could indicate that many TG/GD individuals are not receiving essential preventive health services and screenings in a primary care setting and instead might be receiving screening services in Title X sexual health clinics or as a part of gender-related care. Fifty-one percent of respondents in the National Transgender Discrimination Survey reported that they saw the same medical provider for routine and transition-related care, suggesting that many TG/GD people could be receiving preventive care from a transgender health specialist rather than from a primary care provider [38]. Reasons for this could include the frequency at which some patients might be seeing their transgender health specialist for transition-related care or that they feel more comfortable and accepted with a transgender health specialist as opposed to a primary care provider [38].

One limitation of this study was our inability to detect and differentiate among transgender men and women and other gender diverse patients. While the APCD can capture if someone updated their sex during the study period, there is no way of differentiating whether an individual's sex refers to their sex at birth or their current gender identity. Due to this limitation, we could not look at differences between transgender women and men or nonbinary individuals. While transgender men and women and gender diverse individuals are at risk for a number of conditions, they each have unique primary care needs that could not be explored in this analysis. Additionally, our analysis was limited by its reliance on ICD-9-ICD-10 codes to identify our cohort of TG/GD patients. Further analyses on this subject could expand upon this work by using CPT codes and pharmaceutical codes to identify patients seeking gender-affirming care, including trans-masculine and trans-feminine care. Further, this study is likely an underestimation of the true size of the adolescent and young adult TG/GD population in Rhode Island. This dataset and algorithm only capture TG/GD individuals who are insured, have a gender identity diagnosis, and/or are receiving gender-affirming care. Clinicians may also choose to bill using alternative ICD codes not captured in this analysis, such as Endocrine Disorder, unspecified [39]. One-third of respondents in the U.S. Transgender Survey reported that none of their medical providers knew they were transgender [2], indicating that we could be missing a sizable portion of TG/GD individuals who are accessing preventative services with diagnosis codes associated with gender dysphoria. Additionally, due to stigma, cost, high rates of underinsurance, and other barriers, many young TG/GD individuals do not or cannot use the healthcare system [2]. The high rates of postponement of care and underinsurance in this population suggest that the population of young TG/GD individuals is larger than what we have presented in this study, and the rates of preventative care use are

likely lower for the overall population. As Rhode Island ranks highly among states in regards to legal equality for transgender people [40], these results cannot be generalized to TG/GD populations outside of Rhode Island, especially those living in states with fewer legal protections for TG/GD people. Last, this analysis was limited by the absence of provider differences. Provider knowledge and comfort providing gender-affirming care can have an important impact on the quality of care a patient receives, as well as their willingness and ability to access regular care [11]. While the APCD does contain some information about providers, there was no way of classifying which provider was a patient's primary care clinician, making it impossible to control for the impact of primary care clinician.

To our knowledge, this is the first study to use an APCD to describe preventive care use and access among TG/GD adolescents. Previous research has shown that TG/GD adolescents and adults face physical and mental health disparities, fueled by structural inequities [1–4]. These analyses suggest that TG/GD adolescents are receiving similar levels of preventive services to their cisgender peers, though they could likely be receiving them outside of a traditional primary care setting. This could suggest that the burden of delivering primary and preventive care to TG/GD adolescents is falling upon providers who might not be traditional PCPs and highlight the need for comprehensive training and education for PCPs on providing care to TG/GD adolescents. With the recent rollback of protections against medical discrimination based on gender identity by the Trump Administration [41], it is possible that we will see a decrease in access and use of primary care services by TG/GD individuals for fear of discrimination and refusal of care by healthcare providers. To combat this, it is vital that primary care providers and practices work to decrease the stigma and discrimination TG/GD patients face when accessing medical care.

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jadohealth.2020.11.014.

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