

Supplementary Online Content

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eTable 1. Comparative Health Service Use Between Transgender and Age-Matched Cisgender Individuals From 2012 to 2016

eTable 2. Health Service Use of Transgender Individuals by Gender Identity Category From 2012 to 2016

eAppendix 1. Self-Reported Gender Identities

eAppendix 2. ACGs and ADGs Information

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Comparative health service use between transgender and age-matched cisgender individuals from January 2012 to December 2016						
	Transgender Individuals (n=2,085)	Cisgender Individuals (n=10,425)	Total (n=12,510)	P-Value	Standardized Difference	Variance Ratio
Physician visits						
Primary Care Provider (PCP) visits						
Overall						
Mean ± SD	22.55 ± 27.15	13.18 ± 19.62	14.74 ± 21.35	0.4	1.91	<.001
Median (IQR ^a)	16 (8-28)	8 (3-17)	9 (4-19)	0.6	0.92	<.001
Sum	47,026	137,414	184,440			
0 visits	93 (4.5%)	1,219 (11.7%)	1,312 (10.5%)	0.27	0.48	<.001
01 - 02 visits	106 (5.1%)	1,059 (10.2%)	1,165 (9.3%)	0.19	0.38	
3+ Visits	1,886 (90.5%)	8,147 (78.1%)	10,033 (80.2%)	0.34	0.4	
Mental Health (MH) PCP visits						
Mean ± SD	9.11 ± 20.19	2.10 ± 13.44	3.27 ± 15.01	0.41	2.26	<.001
Median (IQR)	4 (1-10)	0 (0-1)	0 (0-2)	1.33	1.12	<.001
Sum	19,000	21,897	40,897			
0 visits	401 (19.2%)	7,320 (70.2%)	7,721 (61.7%)	1.19	0.27	<.001
01 - 02 visits	387 (18.6%)	1,713 (16.4%)	2,100 (16.8%)	0.06	0.18	
3+ Visits	1,297 (62.2%)	1,392 (13.4%)	2,689 (21.5%)	1.17	0.1	
Non-MH PCP visits						
Mean ± SD	13.44 ± 14.66	11.08 ± 13.19	11.47 ± 13.47	0.17	1.24	<.001
Median (IQR)	9 (4-18)	8 (3-15)	8 (3-16)	0.22	0.93	<.001
Sum	28,026	115,517	143,543			
0 visits	135 (6.5%)	1,292 (12.4%)	1,427 (11.4%)	0.2	0.36	<.001
01 - 02 visits	215 (10.3%)	1,164 (11.2%)	1,379 (11.0%)	0.03	0.21	
3+ Visits	1,735 (83.2%)	7,969 (76.4%)	9,704 (77.6%)	0.17	0.26	
Total Psychiatrist visits						
Mean ± SD	8.25 ± 23.13	0.93 ± 9.57	2.15 ± 13.15	0.41	5.84	<.001
Median (IQR)	1 (0-6)	0 (0-0)	0 (0-0)	1.23	3.26	<.001
Sum	17,210	9,691	26,901			
0 visits	873 (41.9%)	9,536 (91.5%)	10,409 (83.2%)	1.24	0.06	<.001
01 - 02 visits	465 (22.3%)	404 (3.9%)	869 (6.9%)	0.57	0.04	
3+ Visits	747 (35.8%)	485 (4.7%)	1,232 (9.8%)	0.84	0.04	
Total Urologist visits						
Mean ± SD	0.29 ± 1.47	0.13 ± 0.95	0.16 ± 1.06	0.13	2.37	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.17	1.88	<.001
Sum	605	1,354	1,959			
0 visits	1,909 (91.6%)	9,973 (95.7%)	11,882 (95.0%)	0.17	0.11	<.001
01 - 02 visits	98 (4.7%)	278 (2.7%)	376 (3.0%)	0.11	0.12	
3+ Visits	78 (3.7%)	174 (1.7%)	252 (2.0%)	0.13	0.09	
Total Plastic Surgeon visits						
Mean ± SD	0.38 ± 1.16	0.16 ± 0.90	0.20 ± 0.95	0.21	1.68	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.32	2.35	<.001

Sum	787	1,698	2,485			
0 visits	1,746 (83.7%)	9,789 (93.9%)	11,535 (92.2%)	0.33	0.08	<.001
01 - 02 visits	239 (11.5%)	424 (4.1%)	663 (5.3%)	0.28	0.08	
3+ Visits	100 (4.8%)	212 (2.0%)	312 (2.5%)	0.15	0.09	
Total OBGYN visits						
Mean ± SD	0.66 ± 2.49	1.21 ± 5.23	1.12 ± 4.89	0.13	0.23	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.02	0.98	0.482
Sum	1,366	12,583	13,949			
0 visits	1,723 (82.6%)	8,758 (84.0%)	10,481 (83.8%)	0.04	0.19	<.001
01 - 02 visits	184 (8.8%)	629 (6.0%)	813 (6.5%)	0.11	0.14	
3+ Visits	178 (8.5%)	1,038 (10.0%)	1,216 (9.7%)	0.05	0.23	
Total Cardiologist visits						
Mean ± SD	0.18 ± 2.02	0.12 ± 1.16	0.13 ± 1.34	0.04	3.06	0.06
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.08	1.39	<.001
Sum	366	1,200	1,566			
0 visits	1,962 (94.1%)	9,992 (95.8%)	11,954 (95.6%)	0.08	0.14	<.001
01 - 02 visits	97 (4.7%)	307 (2.9%)	404 (3.2%)	0.09	0.13	
3+ Visits	26 (1.2%)	126 (1.2%)	152 (1.2%)	0	0.19	
Total Endocrinologist visits						
Mean ± SD	0.92 ± 2.35	0.13 ± 0.94	0.26 ± 1.32	0.44	6.21	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.57	5.23	<.001
Sum	1,911	1,325	3,236			
0 visits	1,641 (78.7%)	10,073 (96.6%)	11,714 (93.6%)	0.57	0.04	<.001
01 - 02 visits	171 (8.2%)	173 (1.7%)	344 (2.7%)	0.31	0.04	
3+ Visits	273 (13.1%)	179 (1.7%)	452 (3.6%)	0.45	0.03	
Total Emergency Department (ED) visits						
Overall						
Mean ± SD	4.66 ± 11.05	1.88 ± 3.95	2.35 ± 5.86	0.33	7.84	<.001
Median (IQR)	2 (0-5)	1 (0-2)	1 (0-3)	0.5	1.14	<.001
Sum	9,717	19,621	29,338			
0 visits	564 (27.1%)	4,630 (44.4%)	5,194 (41.5%)	0.37	0.25	<.001
01 - 02 visits	629 (30.2%)	3,433 (32.9%)	4,062 (32.5%)	0.06	0.21	
3+ Visits	892 (42.8%)	2,362 (22.7%)	3,254 (26.0%)	0.44	0.14	
MH ED visits						
Mean ± SD	1.22 ± 5.18	0.11 ± 0.76	0.30 ± 2.26	0.3	46.28	<.001
Median (IQR)	0 (0-1)	0 (0-0)	0 (0-0)	0.69	4.2	<.001
Sum	2,536	1,174	3,710			
0 visits	1,451 (69.6%)	9,835 (94.3%)	11,286 (90.2%)	0.68	0.05	<.001
01 - 02 visits	381 (18.3%)	483 (4.6%)	864 (6.9%)	0.44	0.06	
3+ Visits	253 (12.1%)	107 (1.0%)	360 (2.9%)	0.46	0.02	
Self-Harm (SH) ED visits						
Mean ± SD	0.13 ± 0.91	0.01 ± 0.36	0.03 ± 0.50	0.18	6.53	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.34	8.82	<.001
Sum	279	135	414			
0 visits	1,933 (92.7%)	10,344 (99.2%)	12,277 (98.1%)	0.34	0.02	<.001

1+ visits	152 (7.3%)	81 (0.7%)	233 (1.9%)	0.31	0.02	
Non-MH ED visits						
Mean ± SD	3.31 ± 6.67	1.76 ± 3.49	2.02 ± 4.23	0.29	3.66	<.001
Median (IQR)	1 (0-4)	1 (0-2)	1 (0-2)	0.36	1.12	<.001
Sum	6,902	18,312	25,214			
0 visits	665 (31.9%)	4,725 (45.3%)	5,390 (43.1%)	0.28	0.23	<.001
01 - 02 visits	674 (32.3%)	3,467 (33.3%)	4,141 (33.1%)	0.02	0.2	
3+ Visits	746 (35.8%)	2,233 (21.4%)	2,979 (23.8%)	0.32	0.15	
Total number of hospitalizations						
Overall						
Mean ± SD	0.77 ± 2.25	0.23 ± 0.77	0.32 ± 1.18	0.32	8.41	<.001
Median (IQR)	0 (0-1)	0 (0-0)	0 (0-0)	0.39	1.84	<.001
Sum	1,602	2,366	3,968			
0 visits	1,472 (70.6%)	8,946 (85.8%)	10,418 (83.3%)	0.37	0.12	<.001
01 - 02 visits	449 (21.5%)	1,318 (12.6%)	1,767 (14.1%)	0.24	0.13	
3+ Visits	164 (7.9%)	161 (1.5%)	325 (2.6%)	0.3	0.04	
MH hospitalizations						
Mean ± SD	0.53 ± 1.87	0.03 ± 0.33	0.12 ± 0.84	0.37	31.4	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.6	8.64	<.001
Sum	1,105	357	1,462			
0 visits	1,674 (80.3%)	10,227 (98.1%)	11,901 (95.1%)	0.6	0.02	<.001
01 - 02 visits	288 (13.8%)	160 (1.5%)	448 (3.6%)	0.47	0.03	
3+ Visits	123 (5.9%)	38 (0.4%)	161 (1.3%)	0.32	0.01	
Non-MH hospitalizations						
Mean ± SD	0.24 ± 1.11	0.19 ± 0.67	0.20 ± 0.76	0.05	2.81	0.012
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0.03	1.06	0.216
Sum	497	2,009	2,506			
0 visits	1,799 (86.3%)	9,101 (87.3%)	10,900 (87.1%)	0.03	0.19	0.311
01 - 02 visits	256 (12.3%)	1,206 (11.6%)	1,462 (11.7%)	0.02	0.19	
3+ Visits	30 (1.4%)	118 (1.1%)	148 (1.2%)	0.03	0.16	

^a Interquartile range (IQR).

eTable 2. Health service use of transgender individuals by gender identity category from January 2012 to December 2016

	Non-Binary (n=130)	Transgender Man (n=761)	Transgender Woman (n=771)	Unknown (n=433)	Total (n=2,085)	P-Value
Total Primary Care Provider (PCP) visits						
Mean ± SD	20.95 ± 25.83	23.43 ± 25.52	22.72 ± 27.37	21.21 ± 29.80	22.55 ± 27.15	0.504
Median (IQR ^a)	16 (8-25)	17 (9-29)	17 (9-29)	13 (6-27)	16 (8-28)	0.004
0 visits	7 (5.4%)	27 (3.6%)	29 (3.8%)	30 (6.9%)	93 (4.5%)	0.003
1+ visit	123 (94.6%)	730 (96.4%)	736 (96.2%)	403 (93.1%)	1,992 (95.5%)	
Total Mental Health (MH) PCP visits						
Mean ± SD	8.40 ± 19.98	8.86 ± 15.83	10.11 ± 23.16	8.00 ± 21.38	9.11 ± 20.19	0.325
Median (IQR)	4 (1-10)	5 (1-11)	5 (1-11)	3 (0-8)	4 (1-10)	<.001
0 visits	28 (21.5%)	126 (16.6%)	134 (17.5%)	113 (26.1%)	401 (19.2%)	<.001
1 visit	14 (10.8%)	77 (10.2%)	75 (9.8%)	58 (13.4%)	224 (10.7%)	
2+ Visits	88 (67.7%)	554 (73.2%)	556 (72.7%)	262 (60.5%)	1,460 (70.0%)	
Total Non-MH PCP visits						
Mean ± SD	12.55 ± 12.06	14.57 ± 16.72	12.61 ± 11.91	13.21 ± 15.81	13.44 ± 14.66	0.056
Median (IQR)	9 (5-17)	10 (5-19)	9 (4-17)	9 (4-18)	9 (4-18)	0.143
0 visits	9 (6.9%)	41 (5.4%)	43 (5.6%)	42 (9.7%)	135 (6.5%)	0.029
1+ visit	121 (93.1%)	716 (94.6%)	722 (94.4%)	391 (90.3%)	1,950 (93.5%)	
Total Psychiatrist visits						
Mean ± SD	8.53 ± 18.24	7.38 ± 19.54	8.13 ± 25.95	9.91 ± 24.86	8.25 ± 23.13	0.34
Median (IQR)	1 (0-7)	1 (0-5)	1 (0-5)	1 (0-6)	1 (0-6)	0.718
0 visits	57 (43.8%)	309 (40.8%)	300 (39.2%)	207 (47.8%)	873 (41.9%)	0.049
1 visit	15 (11.5%)	112 (14.8%)	121 (15.8%)	45 (10.4%)	293 (14.1%)	
2+ Visits	58 (44.6%)	336 (44.4%)	344 (45.0%)	181 (41.8%)	919 (44.1%)	
Total Urologist visits						
Mean ± SD	0.05 ± 0.39	0.31 ± 1.55	0.32 ± 1.60	0.28 ± 1.26	0.29 ± 1.47	0.257
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0.027
0 visits	128 (98.5%)	695 (91.8%)	694 (90.7%)	392 (90.5%)	1,909 (91.6%)	0.084
1+ visit	*	*	*	*	176 (8.4%)	
Total Plastic Surgeon visits						
Mean ± SD	0.28 ± 0.86	0.52 ± 1.38	0.27 ± 0.93	0.35 ± 1.18	0.38 ± 1.16	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0.002
0 visits	113 (86.9%)	605 (79.9%)	660 (86.3%)	368 (85.0%)	1,746 (83.7%)	0.004
1 visit	8 (6.2%)	67 (8.9%)	62 (8.1%)	29 (6.7%)	166 (8.0%)	
Total OBGYN visits						
Mean ± SD	0.72 ± 2.38	0.85 ± 3.24	0.52 ± 1.56	0.54 ± 2.32	0.66 ± 2.49	0.043
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	<.001

0 visits	109 (83.8%)	586 (77.4%)	642 (83.9%)	386 (89.1%)	1,723 (82.6%)	<.001
1+ visit	21 (16.2%)	171 (22.6%)	123 (16.1%)	47 (10.9%)	362 (17.4%)	
Total Cardiologist visits						
Mean ± SD	0.08 ± 0.31	0.24 ± 3.18	0.14 ± 0.85	0.16 ± 0.88	0.18 ± 2.02	0.75
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0.818
0 visits	120 (92.3%)	713 (94.2%)	723 (94.5%)	406 (93.8%)	1,962 (94.1%)	0.115
1+ visit	10 (7.7%)	44 (5.8%)	42 (5.5%)	11 (6.2%)	123 (5.9%)	
Total Endocrinologist visits						
Mean ± SD	0.29 ± 1.10	1.03 ± 2.43	1.21 ± 2.60	0.39 ± 1.86	0.92 ± 2.35	<.001
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-1)	0 (0-0)	0 (0-0)	<.001
0 visits	118 (90.8%)	569 (75.2%)	556 (72.7%)	398 (91.9%)	1,641 (78.7%)	<.001
1+ visit	12 (9.2%)	188 (24.8%)	209 (27.3%)	35 (8.1%)	444 (21.3%)	
Total Emergency Department (ED) visits						
Mean ± SD	3.67 ± 6.42	4.21 ± 9.44	4.95 ± 14.09	5.24 ± 8.28	4.66 ± 11.05	0.259
Median (IQR)	2 (0-4)	2 (0-4)	2 (0-5)	3 (0-7)	2 (0-5)	0.008
0 visits	43 (33.1%)	205 (27.1%)	204 (26.7%)	112 (25.9%)	564 (27.1%)	0.075
1 visit	22 (16.9%)	138 (18.2%)	139 (18.2%)	55 (12.7%)	354 (17.0%)	
2+ Visits	65 (50.0%)	414 (54.7%)	422 (55.2%)	266 (61.4%)	1,167 (56.0%)	
Total MH ED visits						
Mean ± SD	1.02 ± 2.93	1.06 ± 5.18	1.30 ± 6.07	1.41 ± 3.83	1.22 ± 5.18	0.639
Median (IQR)	0 (0-1)	0 (0-1)	0 (0-1)	0 (0-1)	0 (0-1)	0.459
0 visits	93 (71.5%)	534 (70.5%)	532 (69.5%)	292 (67.4%)	1,451 (69.6%)	0.733
1 visit	16 (12.3%)	97 (12.8%)	95 (12.4%)	51 (11.8%)	259 (12.4%)	
2+ Visits	21 (16.2%)	126 (16.6%)	138 (18.0%)	90 (20.8%)	375 (18.0%)	
Total Self Harm (SH) ED visits						
Mean ± SD	0.15 ± 0.55	0.10 ± 0.43	0.19 ± 1.39	0.09 ± 0.40	0.13 ± 0.91	0.123
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0.345
0 visits	118 (90.8%)	706 (93.3%)	702 (91.8%)	407 (94.0%)	1,933 (92.7%)	0.528
1+ visit	12 (9.2%)	51 (6.7%)	63 (8.2%)	26 (6.0%)	152 (7.3%)	
Total Non-MH ED visits						
Mean ± SD	2.49 ± 3.87	3.05 ± 5.64	3.46 ± 8.30	3.74 ± 5.67	3.31 ± 6.67	0.154
Median (IQR)	1 (0-3)	1 (0-4)	1 (0-4)	2 (0-5)	1 (0-4)	0.029
0 visits	52 (40.0%)	240 (31.7%)	241 (31.5%)	132 (30.5%)	665 (31.9%)	0.021
1 visit	23 (17.7%)	160 (21.1%)	160 (20.9%)	64 (14.8%)	407 (19.5%)	
2+ Visits	55 (42.3%)	357 (47.2%)	364 (47.6%)	237 (54.7%)	1,013 (48.6%)	
Total number of hospitalizations						
Mean ± SD	0.69 ± 1.68	0.66 ± 1.94	0.78 ± 2.71	0.96 ± 1.97	0.77 ± 2.25	0.161
Median (IQR)	0 (0-1)	0 (0-1)	0 (0-1)	0 (0-1)	0 (0-1)	0.009

0 visits	94 (72.3%)	542 (71.6%)	555 (72.5%)	281 (64.9%)	1,472 (70.6%)	0.021
1 visit	18 (13.8%)	113 (14.9%)	115 (15.0%)	65 (15.0%)	311 (14.9%)	
2+ Visits	18 (13.8%)	102 (13.5%)	95 (12.4%)	87 (20.1%)	302 (14.5%)	
Total MH hospitalizations						
Mean ± SD	0.49 ± 1.53	0.45 ± 1.67	0.53 ± 2.13	0.68 ± 1.76	0.53 ± 1.87	0.26
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0.055
0 visits	106 (81.5%)	614 (81.1%)	625 (81.7%)	329 (76.0%)	1,674 (80.3%)	0.058
1 visit	10 (7.7%)	78 (10.3%)	73 (9.5%)	43 (9.9%)	204 (9.8%)	
2+ Visits	14 (10.8%)	65 (8.6%)	67 (8.8%)	61 (14.1%)	207 (9.9%)	
Total Non-MH hospitalizations						
Mean ± SD	0.20 ± 0.56	0.21 ± 0.74	0.25 ± 1.54	0.29 ± 0.88	0.24 ± 1.11	0.659
Median (IQR)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)	0.388
0 visits	111 (85.4%)	656 (86.7%)	668 (87.3%)	364 (84.1%)	1,799 (86.3%)	0.471
1+ visit	19 (14.6%)	101 (13.3%)	97 (12.7%)	69 (15.9%)	286 (13.7%)	

* denotes suppressed values due to small cell counts.

^a Interquartile range (IQR).

eAppendix 1

Self-Reported Gender Identities

Trans man,
Female to male,
Trans woman,
Male to female,
Non-binary,
Gender non-conforming,
Genderqueer,
Genderfluid,
2-spirit,
Androgynous,
Agender,
Queer

eAppendix 2

Adjusted Clinical Groups and Aggregated Diagnostic Groups Information

Johns Hopkins Adjusted Clinical Groups (ACGs) and Aggregated Diagnostic Groups (ADGs)

The Adjusted Clinical Group (ACG) scoring system was used to measure patients' comorbidity based on 2 years health service utilization prior to index.

ACGs are a person-focused diagnosis-based method of categorizing patients' illnesses. Over time, each person develops numerous conditions. Based on the pattern of these morbidities, the ACG approach assigns each individual to a single ACG category. Thus, an ACG captures the specific clustering of morbidities experienced by a person over a given period of time, such as a year.

The ACG System assigns all ICD (-9, -9-CM, -10) codes to one of 32 diagnosis clusters known as Aggregated Diagnosis Codes, or ADGs. Individual diseases or conditions are placed into a single ADG cluster based on five clinical dimensions:

- **Duration of the condition (acute, recurrent, or chronic):** How long will healthcare resources be required for the management of this condition?
- **Severity of the condition (e.g., minor and stable versus major and unstable):** How intensely must healthcare resources be applied to manage the condition?
- **Diagnostic certainty (symptoms versus documented disease):** Will a diagnostic evaluation be needed or will services for treatment be the primary focus?
- **Etiology of the condition (infectious, injury, or other):** What types of healthcare services will likely be used?
- **Specialty care involvement (e.g., medical, surgical, obstetric, hematology):** To what degree will specialty care services be required?