

Worsening Disparities in State-Level Uptake of Human Immunodeficiency Virus Preexposure Prophylaxis, 2014–2018

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Retrospective analysis of human immunodeficiency virus (HIV) preexposure prophylaxis (PrEP) use among individuals with PrEP indications demonstrates worsening disparities in uptake between early- and late-adopting states from 2014 to 2018. To end the HIV epidemic, federal and state governments must close gaps by translating successful policies from early-adopting states to late-adopting states.

Keywords. healthcare disparities; health equity; HIV pre-exposure prophylaxis; HIV prevention; PrEP; public health.

Daily use of human immunodeficiency virus (HIV) preexposure prophylaxis (PrEP) is estimated to prevent >90% of infections in men who have sex with men and 70% of infections in people who inject drugs [1]. However, since its Food and Drug Administration approval in 2012, uptake among individuals with indications for PrEP has been low in the United States (US). Less than 20% of individuals who could benefit from PrEP are currently taking it [2]. Additionally, only 30% of total PrEP users live in the South despite 51% of new HIV diagnoses being made in the South each year [3].

The US “Plan to End the HIV Epidemic” (EHE) prioritizes state- and county-level partnerships to prevent >250 000 new HIV infections over 10 years [4]. A key EHE component is increasing access to PrEP. Statewide policy actions that increase awareness for PrEP and reduce economic barriers to access can foster an environment for increased uptake and contribute to

EHE. We assess state-level and region-level trends in PrEP uptake from 2014 to 2018. Specifically, we examine if early adoption of PrEP is a predictor of more rapid year-to-year gains in uptake and discuss policies of states with successful uptake.

METHODS

We performed a descriptive retrospective study of PrEP uptake using data on individuals with PrEP prescriptions and individuals with indications for PrEP between 2014 and 2018. State-level PrEP uptake is defined as the ratio of individuals who receive a prescription for PrEP to the estimated number of individuals who have indications for initiating PrEP.

To calculate PrEP uptake, state-level numbers of individuals with PrEP prescriptions (the numerators) were obtained from AidsVu.org [5]. We obtained state-level estimates of individuals with indications for PrEP (the denominators) for 2015 from data published by the Centers for Disease Control and Prevention (CDC) [6]. The estimation procedure for these denominators combined the CDC indications for PrEP—those who do not have HIV and (1) have shared injection or drug preparation equipment in the last 6 months, (2) have condomless anal or vaginal sex with individuals of unknown HIV status, or (3) had a bacterial sexually transmitted infection (STI) within the last 6 months [7]—with state- and transmission group-level risk of HIV infection to obtain estimates of those at increased risk for HIV. To calculate state-level counts of individuals with indications for PrEP in 2014 and 2016–2018, we first calculated 2015 state-level rates of individuals with indications for PrEP per 100 000 state residents by dividing the 2015 estimates of individuals with indications for PrEP from the CDC by 2015 state-level resident populations from the US Census. Assuming an equal rate of individuals with indications for PrEP per 100 000 state residents between 2014 and 2018, we multiplied state-level population estimates for 2014 and 2016–2018 by the 2015 rate of individuals with indications for PrEP to estimate state-level counts of individuals with indications for PrEP for those years.

PrEP uptake and change in PrEP uptake between 2014 and 2018 were estimated at the state and regional levels. To understand if the rate of uptake was dependent on prior levels of coverage, we estimated the association between current prevalence of PrEP use and the percentage point change in uptake into the following year using linear regression and controlling for year to account for overall secular changes. We also assessed whether uptake was associated with region using linear regression and whether the association between PrEP uptake and change in uptake into the following year was heterogeneous by region by including an interaction term and conducting a likelihood ratio test. Additionally, we estimated the disparity in PrEP

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uptake between early adopters (the 10 states with the highest initial PrEP uptake in 2014) and late adopters (the 10 states with lowest uptake in 2014) for all years between 2014 and 2018.

This study used public data and is not human subjects research.

RESULTS

The Northeastern US experienced the greatest increase in PrEP uptake between 2014 and 2018 at 16.6%, followed by the Midwest (9.2%), the West (7.1%), and the South (7.0%). Across all years, higher prevalence of PrEP use was significantly associated with greater increase in PrEP uptake in the following year. On average, every 5% of baseline usage was related to a 1.18% (95% confidence interval, .89%–1.46%) increase in uptake in the following year. Thus, disparities between high-uptake and low-uptake states increased between 2014 and 2018. The association between current PrEP uptake with change in PrEP uptake into the next year did not differ between regions ($P = .29$).

State-level uptake in 2014 ranged between 0.4% (Wyoming; [Table 1](#)) and 8.3% (Massachusetts) with a median uptake of 1.9% (Minnesota). State-level uptake in 2018 ranged between 2.4% (Wyoming) and 29.7% (New York) with a median uptake of 9.6% (California). Massachusetts, New York, and Connecticut remained among the 5 states with the highest prevalence for all years. Idaho, Montana, and Wyoming were consistently among the lowest 5 uptake states ([Table 1](#), [Figure 1](#)). By 2018, only 2 late-adopter states had moved from being in the 10 lowest-uptake states (Oklahoma: 6th lowest to 14th; Tennessee: 7th lowest to 11th), indicating consistent stratification among states. In 2014, the average uptake difference between early and late adopters was 3.2 percentage points (4.3 compared with 1.1). By 2018, this difference increased to 12.0 percentage points (18.0 compared with 6.0). Being one of the 10 earlier adopting states as opposed to being one of the 10 late-adopting states in 2014 was associated with increased PrEP uptake in 2018.

DISCUSSION

Ideally, past performance on state-level PrEP uptake would not predict year-to-year capacity to increase usage. Alternatively, we would expect a negative trend with late adoption predicting larger gains as low-uptake states catch up to early adopters. Yet, in 2014–2018, we see greater prior PrEP use predicting increased growth. This results in increasing disparities in PrEP access between early- and late-adopting states, suggesting that underperforming states are not “catching up.” The consequences of being a low uptake state could differ depending on HIV prevalence. Early-adopting states may have consistently focused PrEP programs/planning.

Recent work suggests the importance of social networks and peer effects in reducing PrEP stigma and increasing PrEP knowledge [8]. This potentially explains why greater PrEP

uptake is related to greater increase in PrEP usage into the next year. More users implies greater potential for community-based information spread. This should be explored further within states such as Massachusetts, Connecticut, Louisiana, and Arkansas, which show more exponential trends in uptake consistent with the pattern of uptake gaining momentum each year. Access to providers and geographic variability in PrEP clinics relative to need may also explain some of the variance in uptake.

EHE phase 1 focuses on providing resources, expertise, and technology to key states and counties across the US. Early adopter states’ more significant diffusion of PrEP use may be due to the social and health policy environments in these states. For example, a recent study found that Medicaid expansion was associated with increased PrEP uptake. States that have not expanded Medicaid could see increased PrEP uptake with expansion [9].

In addition to providing resources, EHE should focus on facilitating local- and state-level policy environments that reduce barriers to PrEP, and any regulations or laws that can be enacted at the federal level should be considered. For example, we previously found that Affordable Care Act Qualified Health Plans (QHPs) in the South were almost 16 times as likely to require PrEP prior authorization compared with QHPs in the Northeast [10]. Increased federal- or state-level regulation of QHPs’ prior authorization use may be necessary to remove this system-level barrier that disproportionately affects the South. Additionally, as PrEP’s US Preventive Services Task Force grade A recommendation, which requires most private insurance plans to cover PrEP without cost sharing went into effect this year, states should consider regulations to ensure QHP compliance.

Best practices of PrEP early-adopter states should be identified and disseminated to states with lower PrEP uptake alongside necessary material support. For example, Iowa, an early adopter and Midwestern outlier, piloted a successful regional telehealth program in 2017 that connected individuals with indications for PrEP to telehealth PrEP navigators via referral from STI testing clinics or online advertisement. Patients were connected to infectious disease physicians, tele-PrEP pharmacists, and local clinics for laboratories, facilitating access for individuals with geographic barriers to care [11]. Tele-PrEP programs could prove effective in many of the more rural low-uptake states.

Similarly, a handful of states, many of them early adopters, implemented PrEP drug assistance programs (DAPs) modeled after AIDS DAPs for HIV treatment [12]. PrEP DAPs, funded by state and local dollars, target uninsured and underinsured individuals and provide assistance accessing medication as well as clinic visits, laboratory services, and other PrEP support services. Future work should be done to investigate tele-PrEP and PrEP DAPs at the state level.

Table 1. Human Immunodeficiency Virus Prevalence, Estimate of People With Preexposure Prophylaxis (PrEP) Indications, PrEP Uptake, and PrEP Uptake Rank by State, 2014–2018

State	2014				2015				2016				2017				2018			
	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake Rank ^d	Estimate of People With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake Rank ^d	Estimate of People With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake Rank ^d	Estimate of People With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake Rank ^d	Estimate of People With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake Rank ^d	Estimate of People With PrEP Indications ^b
Alabama	300	11814	1.48%	41	297	11840	3.72%	34	306	11868	5.33%	27	319	11894	7.56%	20	330	11925	10.01%	21
Alaska	103	2356	0.93%	49	108	2360	2.42%	49	114	2373	2.70%	49	118	2367	3.72%	48	118	2360	6.27%	46
Arizona	256	24980	1.55%	40	262	25350	2.92%	43	266	25765	3.90%	45	271	26149	5.98%	36	277	26604	8.15%	36
Arkansas	203	4593	2.29%	17	208	4610	4.79%	17	217	4629	6.29%	17	225	4648	8.41%	16	228	4665	13.20%	14
California	366	154895	2.49%	14	374	156210	5.18%	15	383	157237	6.61%	14	390	157999	8.09%	17	396	158632	9.59%	26
Colorado	241	23860	1.61%	38	245	24310	3.44%	37	257	24706	4.24%	39	259	25040	5.65%	40	265	25396	7.30%	42
Connecticut	326	9660	4.99%	3	331	9640	9.53%	3	331	9616	9.87%	5	338	9603	12.64%	5	343	9600	18.48%	4
Delaware	389	3972	2.32%	16	389	4010	4.19%	28	390	4043	6.06%	18	404	4077	7.51%	22	404	4120	9.78%	24
DC	2486	13559	3.13%	8	2454	13820	7.41%	6	2435	14052	11.18%	3	2400	14238	13.13%	4	2361	14377	15.97%	5
Florida	592	113127	1.62%	37	599	115200	3.54%	35	601	117511	4.80%	35	605	119487	6.36%	33	607	121324	8.43%	35
Georgia	568	35307	2.24%	18	584	35700	4.63%	18	597	36134	5.99%	20	612	36513	7.27%	27	625	36886	8.89%	33
Hawaii	206	4864	1.32%	42	210	4890	3.19%	41	207	4909	4.30%	37	208	4896	4.94%	45	204	4883	6.21%	47
Idaho	74	3813	1.23%	47	76	3860	2.54%	46	79	3933	3.79%	46	81	4017	4.58%	47	82	4100	5.66%	48
Illinois	309	51338	3.07%	9	316	51240	6.72%	8	321	51091	8.62%	7	326	50929	10.62%	8	335	50749	13.66%	12
Indiana	183	23428	1.09%	48	191	23480	2.87%	45	196	23569	4.05%	42	201	23664	5.22%	44	206	23777	7.27%	44
Iowa	90	4164	3.55%	6	93	4180	8.01%	5	98	4194	11.04%	4	102	4210	16.10%	3	106	4226	21.63%	3
Kansas	119	4387	2.89%	10	117	4400	6.11%	11	122	4403	7.25%	13	125	4402	8.88%	14	128	4403	13.47%	13
Kentucky	175	12158	1.32%	43	178	12190	2.90%	44	184	12224	3.66%	47	190	12267	4.85%	46	196	12307	7.17%	45
Louisiana	482	13331	1.92%	24	498	13390	4.20%	27	515	13428	5.28%	29	527	13407	8.04%	18	541	13376	14.08%	9
Maine	121	3256	2.03%	22	123	3250	4.25%	25	132	3257	5.16%	31	135	3266	6.89%	30	138	3274	9.77%	25
Maryland	619	27259	1.95%	23	648	27390	4.26%	24	638	27472	5.46%	26	646	27565	7.31%	26	653	27646	10.14%	20
Massachusetts	334	21786	8.29%	1	339	21890	15.71%	1	342	21987	15.66%	2	346	22107	17.20%	2	349	22232	23.05%	2
Michigan	174	27534	1.78%	31	172	27540	3.95%	31	181	27594	4.90%	33	186	27662	6.56%	32	189	27716	9.98%	23
Minnesota	164	21697	1.88%	25	169	21820	4.00%	30	174	21983	5.87%	22	179	22161	7.21%	29	184	22332	9.11%	30
Mississippi	355	5013	2.21%	20	366	5010	4.53%	19	371	5009	5.79%	23	377	5012	7.24%	28	381	5006	10.37%	19
Missouri	225	17894	1.82%	29	231	17930	4.52%	20	235	17976	5.98%	21	240	18039	7.35%	25	246	18092	10.00%	22
Montana	63	2479	0.81%	50	65	2500	2.44%	48	66	2525	3.21%	48	69	2555	3.72%	49	72	2577	4.97%	49
Nebraska	126	2454	2.57%	13	129	2470	5.99%	12	132	2489	6.35%	16	135	2504	9.35%	12	137	2519	13.70%	11
Nevada	340	9542	1.56%	39	354	9710	3.77%	33	367	9883	5.47%	25	386	10061	7.60%	19	403	10271	9.31%	28
New Hampshire	104	2644	4.12%	5	99	2650	7.17%	7	100	2662	8.49%	8	101	2677	9.30%	13	107	2690	14.94%	6
New Jersey	460	26598	3.17%	7	460	26610	6.33%	9	459	26621	7.40%	12	464	26663	9.97%	10	464	26723	14.23%	8
New Mexico	177	5600	1.64%	34	184	5600	3.39%	39	189	5607	4.39%	36	195	5609	6.58%	31	205	5614	9.16%	29
New York	738	72591	5.86%	2	743	72610	12.55%	2	753	72537	17.49%	1	759	72349	23.78%	1	765	72170	29.68%	1
North Carolina	338	29525	1.84%	28	346	29820	4.08%	29	351	30187	4.88%	34	358	30527	5.89%	37	364	30862	8.15%	37

Table 1. Continued

State	2014				2015				2016				2017				2018			
	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake ^c Rank ^d	Estimate of People With PrEP With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake ^c Rank ^d	Estimate of People With PrEP With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake ^c Rank ^d	Estimate of People With PrEP With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake ^c Rank ^d	Estimate of People With PrEP With PrEP Indications ^b	HIV Prevalence ^a	PrEP Uptake ^c	PrEP Uptake ^c Rank ^d	Estimate of People With PrEP With PrEP Indications ^b
North Dakota	48	1.63%	36	1320	53	2.50%	47	1321	60	4.01%	44	65	1322	35	6.28%	35	71	1331	8.64%	34
Ohio	201	38061	1.77%	33	208	4.32%	22	38166	216	6.50%	15	223	38262	15	8.75%	15	228	38345	12.72%	15
Oklahoma	173	9066	1.25%	46	177	3.30%	40	9180	182	4.30%	38	186	9193	43	5.23%	43	192	9218	8.11%	38
Oregon	184	16658	1.88%	26	192	3.90%	32	17193	193	5.49%	24	195	17425	24	7.42%	24	198	17610	9.04%	31
Pennsylvania	303	36059	2.62%	12	308	5.72%	14	36044	327	7.61%	11	325	36063	9	10.56%	9	331	36110	13.75%	10
Rhode Island	254	4879	4.18%	4	256	8.11%	4	4884	264	8.95%	6	279	4881	6	11.06%	6	284	4885	14.86%	7
South Carolina	386	8913	2.22%	19	389	4.28%	23	9162	393	5.17%	30	398	9278	34	6.36%	34	406	9395	9.59%	27
South Dakota	72	1283	1.79%	30	75	5.04%	16	1304	76	5.29%	28	80	1319	38	5.76%	38	85	1333	8.10%	39
Tennessee	290	22706	1.27%	45	296	3.01%	42	23068	291	4.07%	41	296	23290	39	5.74%	39	305	23502	7.70%	41
Texas	360	115007	1.64%	35	368	3.44%	38	119101	374	4.04%	43	383	120744	41	5.33%	41	393	122360	7.72%	40
Utah	112	6727	2.33%	15	114	5.97%	13	6968	114	7.75%	10	113	7106	11	9.74%	11	118	7239	11.22%	17
Vermont	117	2690	1.30%	44	118	2.34%	50	2683	121	2.27%	50	127	2687	50	3.13%	50	130	2695	4.60%	50
Virginia	298	32183	1.78%	32	302	3.51%	36	32566	307	4.19%	40	315	32776	42	5.32%	42	322	32979	7.28%	43
Washington	202	30667	2.77%	11	206	6.26%	10	31720	208	8.49%	9	212	32289	7	10.69%	7	215	32768	12.38%	16
West Virginia	110	3072	2.21%	21	108	4.22%	26	3042	112	5.03%	32	116	3019	21	7.55%	21	122	3000	10.80%	18
Wisconsin	119	12160	1.88%	27	120	4.47%	21	12204	123	6.03%	19	127	12245	23	7.48%	23	129	12290	8.94%	32
Wyoming	53	2019	0.40%	51	58	0.84%	51	2025	64	1.28%	51	67	2007	51	1.44%	51	73	2003	2.35%	51

For each year, the top 10 states for PrEP uptake have their PrEP uptake rank bolded and highlighted with a light green color. For each year, the bottom 10 states for PrEP uptake have their PrEP uptake rank bolded and highlighted with a light red color. Abbreviations: DC, District of Columbia; HIV, human immunodeficiency virus; PrEP, pre-exposure prophylaxis.

^aHIV prevalence reported as rate of people with HIV per 100,000 state residents from the Centers for Disease Control and Prevention (CDC) AtlasPlus Database, available at <https://www.cdc.gov/nchhstp/atlas/index.htm>.

^bEstimate of people with PrEP indications is an estimate of state residents with indications for PrEP. The estimation procedure combined the criteria of CDC indications for PrEP—those who do not have HIV and (1) have shared injection or drug preparation equipment in the last 6 months, (2) have condomless anal or vaginal sex with individuals of unknown HIV status, or (3) had a bacterial sexually transmitted infection within the last 6 months [7]—with state- and transmission group-level risk of HIV infection to obtain estimates of those at increased risk for HIV.

^cPrEP uptake is the ratio of individuals who receive a prescription for PrEP to the estimated number of individuals with indications for initiating PrEP.

^dPrEP uptake rank is an annual ranking of states by PrEP uptake.

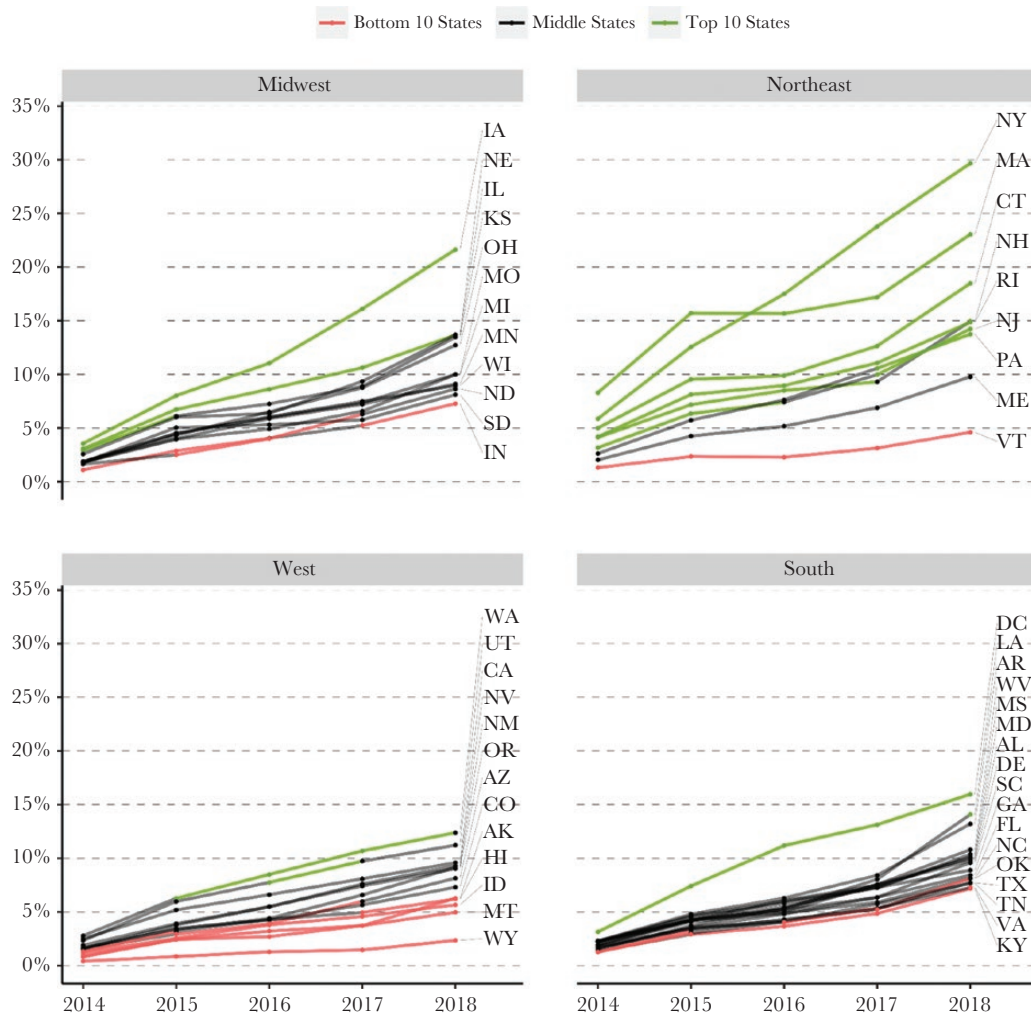


Figure 1. State-level preexposure prophylaxis (PrEP) uptake, as a percentage of individuals in the state with indications for PrEP who received a PrEP prescription, by state in regional categories, 2014–2018. Figure is paneled by region (Northeast, Midwest, South, and West; see https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf for a list of states and state abbreviations). The green and red lines demonstrate the top 10 states and bottom 10 states, respectively, for PrEP uptake in each year. There was consistent stratification as states saw little change in relative rank.

This analysis was limited by using PrEP data from AIDsVu, which is based on prescriptions written as opposed to filled for PrEP, and could over- or underestimate actual PrEP use. Additionally, AIDsVu does not account for records from closed health system networks and other health maintenance organizations (HMOs), leading to systematic underestimation of PrEP uptake in areas with higher HMO penetration such as California. Furthermore, both data on PrEP prescriptions and PrEP indications are calculated at the state level and do not refer to individual-level outcomes. Finally, the assumption of a stable rate of individuals with indications for PrEP per 100 000 state residents, while necessary, may not hold, although we do not find substantial reason to believe it is systematically increasing or decreasing.

With disparities in PrEP uptake worsening, federal and state health policies must align with broader EHE goals to ensure the plan's success for all communities. Further research on PrEP uptake should be conducted to target these policy proposals.

Notes

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