

# Assessing the Impact of a PrEP Aware Week Campaign on PrEP Prescription Fills in NYS

James M. Tesoriero, PhD; Yingchao Yuan, PhD; Rachel Newport, MA; Thomas O'Grady, PhD; Richard Cotroneo, MA; Lyn Stevens, MS, NP, ACRN; Thomas Grisham, MPH; Seungjun Seo, MS; Charles Gonzalez, MD

## ABSTRACT

**Context:** The New York State (NYS) Department of Health AIDS Institute engaged stakeholders across NYS to participate in the state's first "PrEP Aware Week" (PAW). PAW sought to increase the knowledge, interest, and number of PrEP (pre-exposure prophylaxis) prescriptions filled across NYS. PAW activities were designed to be easy to implement, with minimal cost. Stakeholders were provided activities to implement, along with a social media tool kit featuring videos, graphic ads, and sample social media posts in English and Spanish to use as is or modify. PAW included more than 750 distinct events and activities undertaken by more than 250 participating providers.

**Objective:** To assess the impact of PAW on PrEP prescription filling patterns in NYS.

**Design:** An interrupted time-series analysis was conducted to estimate the impact of PAW on overall and new PrEP prescription filling patterns. Separate models were developed by sex (male, female), race and ethnicity (White non-Hispanic, Black non-Hispanic, Hispanic, other, unknown), and region (New York City, rest of NYS).

**Setting:** PAW took place across NYS during the week beginning October 20, 2019.

**Participants:** PAW was undertaken by more than 250 health care providers, nonmedical health & human services providers, local and state health department staff, and colleges and universities.

**Main Outcome Measures:** The number of overall and new PrEP prescriptions.

**Results:** PAW was associated with modest increases (6%-9%) in the number of PrEP prescription fills in NYS. The PAW impact lasted for about 2 months, generated an estimated 2727 additional PrEP prescription fills statewide, and was realized across sex, region, and racial and ethnic subgroups. Increased prescription fills were driven by those previously prescribed PrEP. Increases in new prescriptions were noted among Latinx individuals (21% increase, 55 additional prescriptions) but not overall or across other groups.

**Conclusion:** NYS's PAW was effective at increasing PrEP prescription refills in NYS.

**KEY WORDS:** HIV, pre-exposure prophylaxis, public health campaigns

**Author Affiliations:** Center for Program Development, Implementation, Research and Evaluation (Drs Tesoriero and O'Grady), Office of Sexual Health and Epidemiology (Dr Yuan), Office of the Medical Director (Ms Newport, Mr Cotroneo, and Dr Gonzalez), and Medicaid Policy and Health Care Financing (Messrs Grisham and Seo), New York State Department of Health AIDS Institute, Albany, New York; and Office of the Medical Director, New York State Department of Health AIDS Institute, Syracuse, New York (Ms Stevens).

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For decades, New York State (NYS) was the epicenter of the HIV epidemic in the United States, and it still has more persons living with diagnosed HIV infection (PLWDH) per population than any other state.<sup>1</sup> Favorable epidemiologic conditions, made possible by years of robust HIV policy and programming, a strong state fiscal commitment, actively engaged community stakeholders, advances in medical care, and the advent of new HIV/AIDS

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**Correspondence:** James M. Tesoriero, PhD, New York State Department of Health AIDS Institute, ESP Corning Tower, Room 342, Albany, NY 12237 (James.tesoriero@health.ny.gov).

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prevention options, including pre-exposure prophylaxis (PrEP), enabled NYS to become the first jurisdiction in the United States to formally announce a plan to end its AIDS epidemic.<sup>2</sup> New York's End the Epidemic (ETE) plan includes 3 core components: (1) identifying persons with HIV infection who remain undiagnosed and linking them to care; (2) retaining PLWDH in health care to maximize viral suppression, promote health, and prevent further transmission; and (3) facilitating access to PrEP and nonoccupational post-exposure prophylaxis (PEP) for high-risk persons to keep them HIV-negative. PrEP is critical to the NYS ETE plan because it has been shown to reduce the risk of acquiring HIV/AIDS through sexual contact by more than 90%.<sup>3-5</sup>

The uptake of PrEP has been slower than hoped for, especially among key populations. Notwithstanding the fact that NYS has the highest PrEP coverage rate in the nation, estimated at 30% among those in need by the Centers for Disease Control and Prevention in 2017,<sup>6</sup> NYS has a long way to go before the full benefits of PrEP are realized. And like all jurisdictions, NYS has noted racial and ethnic disparity in its uptake of PrEP: despite accounting for 78% of new HIV/AIDS diagnoses in NYS,<sup>7</sup> Hispanic- and Black-identified persons accounted for just 33% of all PrEP prescriptions in 2019 among those with a known race or ethnicity.<sup>8</sup>

There is some evidence that public messaging campaigns can be effective at increasing HIV testing. A review of the efficacy of social media campaigns on testing uptake reported that 5 of 13 studies found evidence of increased HIV testing, while an additional 3 reported mixed outcomes.<sup>9</sup> Improvements in attitudes and self-efficacy toward HIV testing, as well as increased HIV testing, were connected to a 16-week campaign targeted to Latinx men having male-to-male sexual contact in Seattle.<sup>10</sup> While an HIV testing campaign designed to promote testing to foreign-born Latinx individuals in Baltimore, Maryland, was not associated with increased HIV testing, it did appear to reach persons at an elevated risk for acquiring HIV/AIDS and it was connected to increases in PrEP referrals.<sup>11</sup> Another study found evidence that a media campaign targeting NYC-based men who have sex with men was successful at increasing PEP requests at the clinic associated with the campaign.<sup>12</sup> Although we found no study to demonstrate a connection between PrEP awareness campaigns and actual increases in PrEP uptake, a few studies provided support that public messaging can increase awareness of PrEP.<sup>13,14</sup>

## Intervention

### *PrEP Aware Week*

The New York State Department of Health AIDS Institute (NYSDOH-AI) engaged stakeholders across NYS to participate in the state's first annual "PrEP Aware Week" (PAW). Taking place during the week beginning on October 20, 2019, PAW sought to increase the knowledge, interest, and number of PrEP prescriptions being filled across NYS, especially among people disproportionately at risk of acquiring HIV/AIDS. PAW was selected to be held in late October because of the historically low number of PrEP prescriptions during this time of year and to not interfere with other HIV/AIDS-related awareness days, many of which occur in the spring or summer months. There is only one other HIV/AIDS-related awareness day occurring in October (National Latinx AIDS Awareness Day is October 15).<sup>15</sup> Awareness activities were designed to be easy for agencies to implement, with minimal cost. NYSDOH-AI provided a list of suggested activities for stakeholders to implement, along with a social media tool kit featuring 11 community PrEP ambassadors from across NYS's diverse communities with brief videos, graphic ads, and prewritten social media content in English and Spanish for stakeholders to use as is or modify.

PAW included more than 750 distinct events and activities undertaken by more than 250 health care providers, nonmedical health & human services providers, local and state health department staff, and colleges and universities. PAW events occurred on each day of the designated week, with each provider encouraged to engage in 2 different activities and to be intentional about the date, time, and type of event to ensure that it matched the needs of their population.

PAW activities occurred across NYS, including rural, suburban, and urban areas. Examples of PAW activities include posting PrEP information and materials from the PrEP Aware Week Social Media tool kit on agency Web sites and social media platforms (Facebook, Instagram, Snapchat, Twitter) developing video testimonials with representatives of priority communities; posting pictures of staff wearing NYSDOH-AI PrEP Aware T-shirts to agency social media pages; holding Facebook live events, Twitter town halls, and podcasts on PrEP; publishing special interest stories about PrEP in newspapers, community papers, magazines; working with local TV/radio stations to develop public service announcements and interviews on PrEP; hosting community events (health fairs, cultural, sports, festival, etc); conducting street outreach events to promote PrEP; utilizing peers to promote

PrEP within their networks; presenting PrEP during medical resident training, Medical Grand Rounds, and nursing-led chalk talk meetings; establishing pop-up PrEP screening and linkage sites; and promotion of PrEP using informational videos on TV sets in waiting rooms, news feeds, newsletters, or through display of posters.

## Methods

A population-based time-series analysis of NYS PrEP prescriptions issued weekly between October 21, 2018, and February 29, 2020, was conducted to assess the potential impact of PAW on PrEP prescription filling patterns in NYS. The 71-week data series allowed for 1 year of data prior to the initiation of PAW and 4 months of post-PAW follow-up data. The start of the COVID-19 pandemic in March 2020 precluded the use of additional data. This work was conducted as part of a routine program evaluation of PAW. Consultation with the NYSDOH Institutional Review Board (IRB) verified that IRB review was not required.

### Data source and coding

Individual PrEP prescription fill data in NYS from October 20, 2018, to February 29, 2020, were extracted from Symphony Health IDV (Integrated Dataverse). This longitudinal data source contains adjudicated prescription, medical, and hospital claims from across the United States for all payment types. Patients were included in the data set for this analysis based on NYS residence and prescription criteria. The data extracted were then converted into weekly PrEP prescriptions for both the total population and new PrEP initiators by applying a validated PrEP algorithm to determine who is prescribed PrEP.<sup>16</sup> The algorithm included cases prescribed emtricitabine and tenofovir disoproxil fumarate (TDF/FTC) or emtricitabine and tenofovir alafenamide (TAF/FTC). The algorithm excluded these prescriptions when they were prescribed as part of HIV/AIDS treatment, PEP, or hepatitis B virus treatment.

PrEP prescription counts by region, sex, and race and ethnicity were calculated. The regional variable was created by designating the 5 regions of Bronx County, Kings County, New York County, Queens County, and Richmond County as New York City (NYC), while the remaining 57 counties in NYS were designated as “Rest of State.” The variable sex was evaluated as male and female sex assigned at birth, as additional categories of gender were not available. Race and ethnicity were combined into a mutually exclusive variable that highlighted non-Hispanic White, non-Hispanic Black/African American, and Hispanic

prescription fills. Because of small numbers of cases that precluded meaningful analyses, all other race and ethnicity categories had to be combined into a single category. Finally, because race and ethnicity were missing for a large percentage of cases, an unknown race and ethnicity category was also tracked.

### Statistical methods

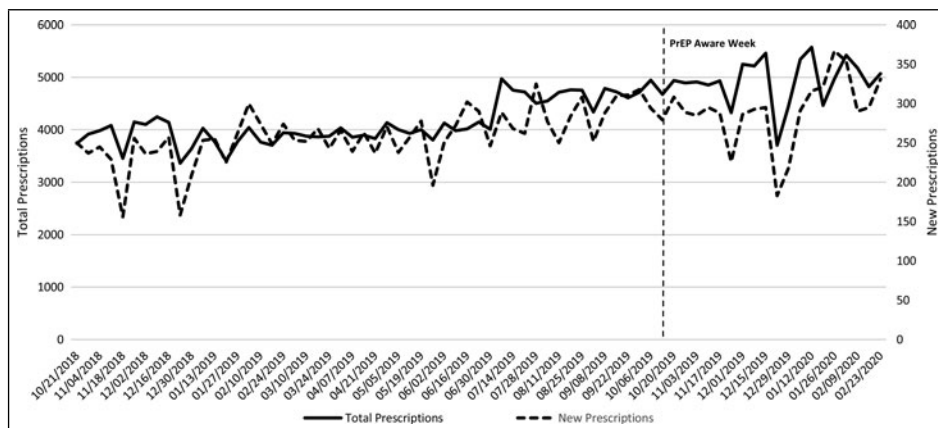
We conducted an interrupted time-series analysis measuring the impact of PAW on overall and new PrEP prescription fills in NYS. More specifically, the intervention analysis developed by Box and Taio based on the Box-Jenkins autoregressive, integrated, moving average (ARIMA) time-series modeling technique was employed.<sup>17,18</sup> The ARIMA process produces time-series regression models developed for each subpopulation of interest and accounts for trend and seasonal variation.<sup>19</sup> Models were built on the result of the stationarity test, test and analyses of residuals and outliers, and diagnostic statistics. Separate models for total (ARIMA 3,1,0) and new PrEP prescriptions (ARIMA 2,1,0) were developed for the following demographic categories: sex (male, female); race and ethnicity (White non-Hispanic, Black non-Hispanic, Hispanic, other, unknown); and region NYC, rest of NYS (ROS).

The estimated impact of NYS’s PAW campaign was modeled as a continuing intervention and assigned a value of 1 from the week of PAW (October 20, 2019) to the week leading up to Christmas (December 15, 2019) and 0 for all other observations. This temporary impact function provided the best fit across models. Other known influencers of PrEP prescriptions were included in the models to improve fit: Thanksgiving and Christmas weeks, historically associated with sharp and short-lived drops in PrEP prescribing, were coded as 1-week impulse interventions and assigned a value of 1 for the weeks of the holidays and 0 for all remaining observations. In addition, as a large and permanent increase was observed around the fourth of July 2019, a continuing intervention was coded and assigned a value of 1 for all weeks starting on the week of July 7, 2019, and 0 for all weeks prior.

Data extraction and statistical analyses were conducted using SAS, version 9.4 software (SAS Institute Inc, Cary, North Carolina).

## Results

The Figure displays the weekly number of total and new PrEP prescriptions from the week beginning October 21, 2018, through the week beginning February 23, 2020. An intervention line is included for PAW. Consistently increasing numbers of PrEP



**FIGURE** Total and New PrEP Prescription Fills in NYS: October 21, 2018, to February 29, 2020  
Abbreviations: PrEP, pre-exposure prophylaxis; NYS, New York State.

prescriptions are clearly visible throughout the period for both total and new prescriptions. Sizable seasonal dips in prescriptions are also clearly visible for the weeks containing Thanksgiving and Christmas, as is an increase in total prescriptions during the week containing July 4. While small increases in prescriptions can be seen immediately following PAW for total and new prescriptions, a clear impact is difficult to discern visually, given the dips corresponding to Thanksgiving and Christmas and the generally increasing trend in the series over time (Figure).

Results of ARIMA time-series models predicting total and new PrEP prescriptions by demographic subgroups in NYS are displayed in the Table. The following information is displayed for each model: the mean number of weekly prescriptions during the pre-COVID-19 period, the estimated weekly impact of PAW, and its corresponding *P* value, the percent change in the time series represented by the PAW impact, and the total number of additional prescriptions attributable to PAW. Additional detail from the ARIMA models is presented in Supplemental Digital Content Tables S1 and S2 (available at <http://links.lww.com/JPHMP/A980>). There was a mean of 4137 total PrEP prescriptions per week across NYS prior to PAW. Most prescriptions were among males (3936), residents of NYC (2905), and persons identified as White (1807). PAW had a statistically significant impact on total PrEP prescriptions in 9 of the 10 ARIMA time-series models, with a 9-week impact realized as the best fit for each model. In the overall NYS model, total prescriptions increased by 303 per week, corresponding to a 7.3% increase in the series and total increase of 2729 PAW-attributable prescriptions. Generally, similar PAW impacts were observed across categories of sex, region, and race/ethnicity, with percent changes in series attributable to PAW ranging from 6% to 9% across categories (Table).

There was a mean of 260 new PrEP prescriptions per week prior to PAW. New PrEP prescriptions were distributed similarly across demographic categories to overall prescriptions, with most occurring among males (257), NYS residents (166), and persons identified as White (88). PAW served to increase new PrEP prescriptions by an estimated 21% among Latinx individuals, corresponding to 6 additional prescriptions per week and 55 additional prescriptions overall (Table). The PAW intervention variable was not statistically significant in any of the models for other populations.

## Discussion

To our knowledge, this is the first published study to demonstrate evidence that a public awareness campaign translated into increased PrEP prescriptions. Our interrupted time-series models found evidence that NYS's PAW campaign generated a modest increase (6%-9%) in the number of total PrEP prescriptions. This impact lasted for about 2 months (9 weeks) and was realized across sex, region, and race and ethnicity. The finding that PAW served to increase prescription fills among Black and Hispanic persons is particularly significant, as racial and ethnic minorities have been shown to be less aware of PrEP and far less likely to receive it.<sup>8,20-22</sup>

PAW was effective at initiating PrEP refills among those already on PrEP and new prescriptions among Latinx individuals but not effective at initiating new persons on PrEP from other subpopulations. Our data do not permit an understanding of why there was increased PrEP initiation among Latinx following PAW. As detailed earlier, PAW events were varied, occurred throughout NYS, and were undertaken by numerous entities. Perhaps, the increase among Latinx individuals could be attributed to availability of materials

**TABLE**  
**ARIMA Time-Series Intervention Results: Total and New PrEP Prescription Fills<sup>a</sup>**

	Mean Prescriptions per Week Prior to PAW	Estimate of PAW Impact per Week	<i>P</i> <sup>b</sup>	Percent Change in Series During PAW <sup>c</sup>	PAW Total Impact <sup>d</sup>
Total prescriptions NYS	4137.3	303.0	<b>.002</b>	7.3%	2727
Sex					
Female	201.4	18.4	<b>.018</b>	9.1%	166
Male	3935.9	277.6	<b>.002</b>	7.1%	2498
Region of residence					
New York City	2905.3	195.5	<b>.004</b>	6.7%	1760
ROS	1096.1	102.2	<b>.000</b>	9.3%	920
Race/ethnicity					
White	1807.4	153.2	<b>.001</b>	8.5%	1379
Black	409.6	28.1	<b>.029</b>	6.9%	253
Hispanic	476.7	33.0	<b>.034</b>	6.9%	297
Not White, not Black, not Hispanic	175.8	10.6	.056	...	NS <sup>e</sup>
Missing or unknown	1267.9	71.4	<b>.027</b>	5.6%	643
New prescriptions NYS	259.6	15.6	.175	...	NS
Sex					
Female	32.7	1.1	.381	...	NS
Male	227.0	11.6	.220	...	NS
Region of residence					
New York City	166.3	8.2	.234	...	NS
ROS	80.7	4.6	.292	...	NS
Race					
White	87.8	0.6	.466	...	NS
Black	28.2	-1.9	.717	...	NS
Hispanic	29.6	6.2	<b>.038</b>	20.8%	55
Not White, not Black, not Hispanic	9.4	-1.1	.689	...	NS
Missing or unknown	104.7	11.8	.099	...	NS

Abbreviations: PAW, PrEP Aware Week; NYS, New York State; PrEP, pre-exposure prophylaxis; ROS, rest of NYS.

<sup>a</sup>All total prescription models were best fit as ARIMA (3,1,0). All new prescription models were best fit as ARIMA (2,1,0). All models controlled for the impact of July 4, Thanksgiving, and Christmas. Complete model specifications are provided in Supplemental Digital Content Tables S1 and S2 (available at: <http://links.lww.com/JPHMP/A980>).

<sup>b</sup>One-tailed *P* values are shown. Bold values indicate statistical significance (*P* ≤ .050).

<sup>c</sup>Calculated as: [Estimate of PAW impact per week - Mean prescriptions per week prior to PAW] × 100.

<sup>d</sup>Calculated as: [Estimated of PAW impact per week × 9 (the duration that PAW impacted the time series)].

<sup>e</sup>NS = not statistically significant (*P* > .05).

in Spanish and particularly successful PAW activities among providers targeting and serving Latinx populations.

The finding that PAW increased PrEP refills but not new prescriptions among all groups is not surprising. Persons reached by PAW who were already on PrEP could simply refill their existing prescription or contact their provider for a new prescription. In contrast, persons inspired by PAW (or reached by provider-initiated PAW activities) without an existing prescription would need to connect with a PrEP provider or navigator, be determined eligible for PrEP,

receive a prescription, accommodate payment, and fill that prescription. In addition, these activities would likely be spread out over time, making it more difficult to detect an impact from PAW.

Additional research is needed to connect specific PAW campaign activities to observed changes in PrEP prescription fills. The 2021 NYS PAW campaign is systematically collecting PAW activities at a regional level. This should permit a more detailed investigation and understanding of what, where, and why PAW activities are effective at increasing PrEP prescription fills in NYS.

## Implications for Policy & Practice

- NYS's PAW should be replicable by other jurisdictions by similarly leveraging their HIV/AIDS-funded provider networks, planning bodies, medical and nonmedical health & human services providers, local and state health department staff, and academic partners.
- Being able to connect public health campaigns to measurable outcomes (in this case, changes in PrEP prescription fills) facilitates more precise assessments of their worth.
- This work allowed us to consider the cost of our PAW campaign relative to the estimated increase in overall and new PrEP prescriptions attributable to the campaign.
- This assessment, along with other considerations, was instrumental in our decision to continue PAW as an annual event in NYS.

## Limitations

Discerning the impact of PAW was made challenging by the closely timed seasonal impacts of Thanksgiving and Christmas and the relatively short post-PAW observation period due to the COVID-19 pandemic, which significantly reduced PrEP prescriptions in NYS.<sup>23</sup> These data do not permit an understanding of the mechanism by which PAW increased PrEP prescriptions (ie, how persons were exposed to the campaign, how much of the impact was consumer vs provider driven, etc) or the relationship between the increased prescriptions and unmet need for PrEP. Race and ethnicity were missing or unknown for 30% of total prescriptions and 40% of new prescriptions. Race and ethnicity results should therefore be viewed as conditional and interpreted with caution. Although not necessarily a limitation, it is important to note that the total prescription data represent prescriptions and not unique persons, most of whom are presented more than once across the 71-week observation period. In contrast, the new prescription data represent first prescriptions among unique persons.

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