Enhanced Care Coordination Improves HIV Viral Load Suppression Rates

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Untreated HIV infection results in loss of immune function, which ultimately leads to opportunistic infection or neoplasms and death.[1] Antiretroviral therapy (ART) is highly efficacious in both research studies and real-world populations in restoring or preserving immune function, extending life span, and improving the quality of life for HIV-positive individuals.[2,3] For individuals to fully benefit from ART, they need to know they are infected, engage in regular HIV care, and receive and adhere to ART. These are the elements of the HIV care continuum.[4-6]

At the end of 2015, the latest year for which data are reported, approximately 1.1 million individuals were living with HIV in the United States.[7] New York City has been an epicenter of the AIDS epidemic in the United States.[8-10] In 2016, approximately 110,000 individuals were living with HIV in New York City and almost 50% of those with a diagnosis were not engaged in HIV care programs.[11]

Upon initiation of ART, plasma virus concentration (viral load) declines rapidly to undetectable levels with high medication adherence.[12] With poor or no medication adherence, viral load becomes detectable again, and over time, HIV infection progresses to AIDS with poor health outcomes such as AIDS-related morbidity and hospitalizations.[13,14] Suboptimal medication adherence can lead to loss of immunologic benefit and viral resistance, limiting future treatment options.[15] Moreover, despite good adherence to medication, some patients with HIV will have detectable viral loads even when being treated with ART.

Low medication adherence is detrimental not only to the individual but also to the community, as the increase in viral load poses an increase in the risk of transmission,[16] which is associated with the level of viremia.[17] Thus, the goal of HIV care is to achieve and maintain viral load suppression through a high level of medication adherence. However, a portion of the treated population continues to have difficulty achieving or maintaining viral load suppression. Social determinants of health play an important role in viral suppression.[18,19] Factors that affect medication adherence include depression, adverse effect severity, self-efficacy, and social support.[20] Low levels of engagement in care, especially in the early stages of treatment (eg, missed visits), are correlated with poor medication adherence.[13]

ABSTRACT

OBJECTIVES: Optimizing HIV treatment benefits the health of the individual and the community at large. Health department HIV surveillance data matched with Medicaid managed care rosters can be used to target people with HIV infection who have an unsuppressed viral load or are unengaged in care. MetroPlus Health Plan, a Medicaid managed care organization, implemented a 2-pronged approach: street outreach and peer care connection interventions.

STUDY DESIGN: A cohort study that included demographics, program contact type and frequency, antiretroviral therapy refill pattern, and CD4 count and HIV viral load values/ranges and dates.

METHODS: Members without a viral load test result during the prior 9 months (not engaged) received outreach, and those with unsuppressed viral loads received intensified care coordination and peer support. A retrospective statistical analysis was conducted on cohort members with sufficient viral load data. A subanalysis excluded members who had suppressed viral loads at baseline.

RESULTS: A total of 1429 (82%) members in the state cross-referenced list were still enrolled in the plan at study initiation. Successful contact with targeted members by outreach was 60% compared with 40% by care coordination and peer support combined. Members who were successfully contacted by the program had a 44% suppression rate (<200 copies/mL) and a greater likelihood of achieving viral load suppression (odds ratio, 1.55; 95% CI, 1.23-1.95; *P* <.01) than those who were not.

CONCLUSIONS: Surveillance data were successfully used to target HIV-positive Medicaid members who had an unsuppressed viral load or were unengaged in care. Individuals with an unsuppressed viral load can achieve suppression through intensified outreach, care coordination, and peer support by a Medicaid managed care plan.

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TAKEAWAY POINTS

‣ Enhanced care coordination and support for HIV-positive members by a Medicaid managed care plan that leveraged surveillance data helped those who had an unsuppressed viral load or were unengaged in care achieve viral load suppression.

‣ Within 2 years, 44% of those successfully contacted achieved a viral load of less than 200 copies/mL.

‣ More effort will be needed to reach and support HIV-positive people who continue to have a chronically unsuppressed viral load.

New York State (NYS) created a task force to develop specific recommendations to improve the diagnosis, treatment, and prevention of HIV in its citizens. One recommendation in the resulting blueprint to end the epidemic was to "use client-level data to identify and assist patients either lost to care or not virally suppressed."[21] This was an example of the CDC's Data to Care initiative, a novel public health strategy that aimed to use HIV surveillance data to identify HIV-diagnosed individuals not in care, link them to care, and support the HIV care continuum.[22]

The NYS Department of Health (NYSDOH) maintains 2 large databases that are operationally separate: the HIV Surveillance Registry, which contains individual identifiers, viral load, and other HIV-related laboratory results; and an active roster of all Medicaid managed care recipients, which contains individual identifiers, contact information, and Medicaid plan assignments. The surveillance registry had been previously used only for epidemiologic monitoring on a population health and not an individual health basis. In April 2014, the NYS Public Health Law was amended to allow for the information within the registry, which was created with strict confidentiality protections, to be cross-referenced with its Medicaid roster in an individually identified manner. This identified some people who were not engaged in HIV care or who were known to have an unsuppressed viral load at last observation. The comparison showed that a few Medicaid managed care plans insured a large number of the HIV-positive individuals in New York City. In August 2015, the NYSDOH AIDS Institute shared the resultant comparison with 5 plans and funded a pilot program to allow the plans to target the identified population with specific enhanced care coordination, which began in January 2016.

The goal of this cohort study was to assess the effectiveness of the first 2 years of a Medicaid managed care plan's program. Using surveillance program viral load data, care coordinators and peer counselors reached out to viremic members to address barriers to medication adherence and to engagement in care.

METHODS

Study Interventions

MetroPlus, a participant plan in the pilot, established 2 interventions: street outreach, designed to target members who were not engaged in care; and peer care connection, designed to target members who were engaged in care but had an unsuppressed viral load.

Inclusion criteria for the street outreach intervention were (1) actively enrolled, (2) no viral load test or primary care provider visit in the prior 9 months, and/or (3) no ART refill in the prior 6 months. Exclusion criteria were (1) the discovery of a negative HIV antibody test or (2) disenrollment from the plan after only 1 month of enrollment. MetroPlus partnered with the Alliance for Positive Change, an AIDS service organization, to conduct street-based outreach using trained peers to seek out these lost-to-care members either by telephone or through face-to-face interaction. When contact was made, the peers discussed returning to care with the member and, with member consent, helped to make an appointment and escort the member to an HIV-related primary care appointment. Some of these visits occurred on the same day the contact was made.

Inclusion criteria for the peer care connection intervention were (1) included in the target population, (2) actively enrolled and engaged in care, and (3) with an unsuppressed viral load, defined as 200 copies/mL or greater, at last available result. Exclusion criteria were (1) the discovery of a negative HIV antibody test after program initiation or (2) disenrollment from the plan after only 1 month of enrollment. Once a member in the street outreach intervention group became engaged in care, they were also included in the peer care connection intervention. Care coordinators, working together with trained peer educators and peer counselors, sought to contact these members through telephone and/or face-to-face interactions at the clinics or hospitals that the members attended. Comprehensive psychosocial assessments were conducted whenever possible. Activities within this intervention included educational workshops, creative arts workshops, individual adherence counseling, referrals to community programs and other supportive services, and individual navigation to appointments.

Study Population

MetroPlus received a cross-referenced list in August 2015. NYS purposely sent names of individuals who were enrolled with MetroPlus at any time in the prior 4 years because members may return to the plan (beneficiaries have the right to switch Medicaid managed care plans once every 12 months). Monthly, MetroPlus reconciled the list with its active enrollment roster.

Viral Load Data Handling and Collection

For listed members with surveillance viral load results, baseline values were as recent as July 2015. To maintain some measure of confidentiality, NYS chose not to share exact numeric values and dates for viral load results but instead reported them with month/year only and in predefined logarithmic ranges categorized as suppressed (<200 copies/mL) and unsuppressed (200-999, 1000-9999, 10,000-99,999, and ≥100,000 copies/mL). MetroPlus reconciled the list with its internal care coordination database, which included available viral load results collected from provider medical records. If the internal

database contained a quantified viral load value that matched the range, month, and year of the surveillance viral load value, the quantified value was kept. When there was a range value for which MetroPlus was unable to obtain a corresponding quantified value, the range value was assigned a quantified value for statistical analysis as follows: 999.99, 9999.99, 99,999.99, or 100,000.99. Using the ".99" within the value allowed for clear recognition by staff working with the members that the result was an approximation and originated from the state list. Throughout the 2-year study interval, quantified viral load values were collected and recorded from available medical records.

Data Collection

Collected data included demographics, program contact type and frequency, ART usage (refill pattern), CD4 cell counts and dates, and HIV viral load values and dates over 2 years. A successful program contact was defined as direct contact with a member who agreed to speak with the person attempting the contact either by telephone or face-to-face.

Statistical Methods

Not all members in the program had viral load data. Hence, the sample selection methodology required that eligible members for analysis had at least 2 viral load data points to measure the change in viral load from baseline. The closest viral load value to the program initiation date (+/– 90 days) was labeled the baseline viral load value. The current viral load value was selected based on the viral load available at last observation. Finally, the viral load values were categorized into suppressed or unsuppressed logarithmic ranges.

This study analyzed 2 groups: one including the derived sample of members with comparable viral loads and a subset who had an unsuppressed viral load at baseline. Because of the participation overlap of the outreach and peer care connection interventions, as well as the small number of members referred to the street outreach intervention, members from both interventions were combined for analysis.

The null hypothesis was that the program had no impact on lowering viral load values from program initiation to termination. We conducted a retrospective statistical analysis on viral load values to evaluate the change of member viral loads in each logarithmic range at baseline compared with current viral load. We visualized the change from baseline to current viral load using a kernel density estimation (KDE) plot. A χ^2 analysis was performed with a P value α of .05 as a cutoff for significance for the above comparisons. Additionally, an odds ratio (OR) analysis was conducted on variables of program contact and viral load suppression, with a P value α of .05 as the cutoff for significance.

RESULTS

Study Population Derivation

The cross-referenced state list contained 1741 members (**Figure 1**). After eliminating members who were disenrolled from the plan as

FIGURE 1. Study Population Derivation
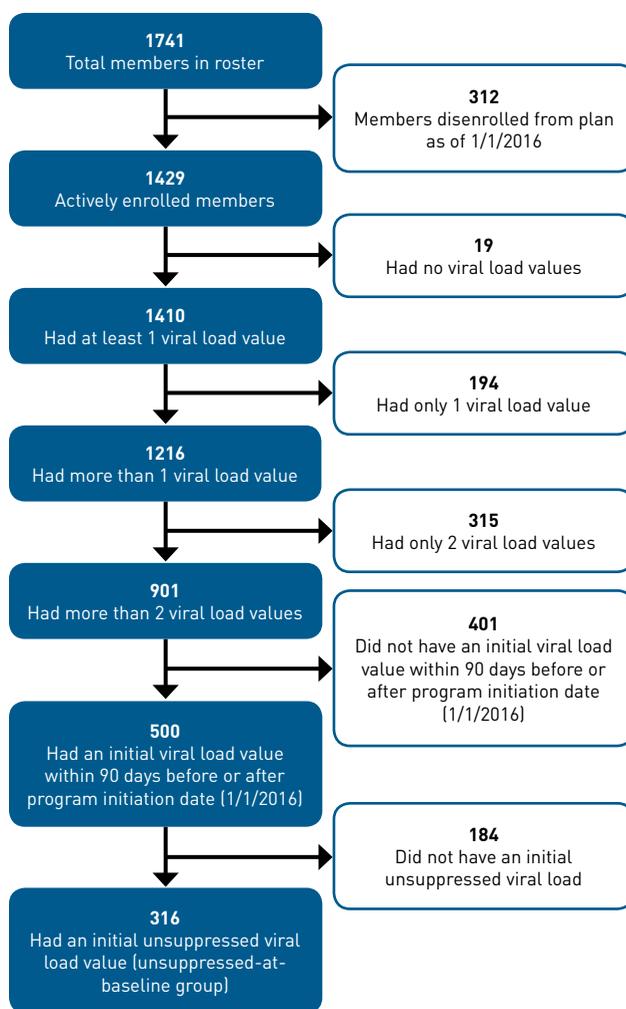
of January 1, 2016, the study population consisted of 1429 actively enrolled members during the 2-year study interval. Of those, 1410 members had at least 1 viral load value, 1216 had more than 1 viral load value, and 901 had more than 2 viral load values. Of those, 500 members had an initial viral load value within 90 days before or after the program initiation date of January 1, 2016 (comparable group). Of those, 316 members had an initial unsuppressed viral load value (unsuppressed-at-baseline group).

Baseline Characteristics

The targeted population represented 24% (1429/5919) of the total identified HIV-positive Medicaid population actively enrolled with the plan at the time of the program initiation. The baseline characteristics of all targeted members, those with comparable (baseline and current) viral loads, and those with unsuppressed viral loads at baseline are summarized in **Table 1**. Because of the

TABLE 1. Baseline Characteristics

	Total Target Population	Comparable Group	Unsuppressed-at-Baseline Group
Number	1429	500	316
Age in years, median	47	48	48
Female (%)	42	42	43
Referred for outreach intervention (%)	13	13	16
CD4 count at baseline, median (cells/mL)	294	327	342
History or current substance disorder[a] (%)	48	56	58
Viral load value in 2017 (%)	81	83	67
Prescribed ARTs at last observation (%)	98	98	95
Filled ART prescriptions 6 of 6 months at last observation (%)	45	50	43

ART indicates antiretroviral therapy.
[a]According to diagnoses within claims data.

TABLE 2. Program Contact

	Total Target Population	Comparable Group	Unsuppressed-at-Baseline Group
Number	1429	500	316
Attempted outreach contact[a] (%)	87	92	92
Successful outreach contact (%)	56	61	61
Attempted care coordination contact (%)	23	27	24
Successful care coordination contact (%)	22	25	22
Telephone (%)	53	58	59
Face-to-face (%)	2	3	2
Attempted peer contact (%)	28	31	34
Successful peer contact (%)	18	19	22
Telephone (%)	17	18	21
Face-to-face (%)	0.5	0.6	0.6

[a]Percentage of total population with at least 1 attempted or successful contact.

nearly 6-month gap between receipt of the list from the state and the program initiation, 184 listed members had already achieved viral load suppression. The comparable and unsuppressed groups were representative of the total population with respect to age, gender, and baseline CD4 count. A relative proportion (13%-15%) of those referred to the street outreach intervention contributed to the composition of all 3 groups.

Program Contact

Contact with either the outreach or peer care connection interventions is summarized in **Table 2**. The total population, comparable, and unsuppressed groups had 56%, 61%, and 61% successful contacts with the outreach team, respectively, compared with 40%, 44%, and 44% successful contacts by the care coordinators and the peer educators/counselors combined, respectively. Thus, a notable portion of members from all groups were engaged in care but did not have any successful contact with the program staff. Despite our best efforts, the program could not contact every targeted member.

Viral Load Suppression

The viral load suppression rates at last observation were 40.9%, 47.4%, and 38.6% for the total population, comparable, and unsuppressed-at-baseline groups, respectively, suggesting that members in the program experienced significantly improved viral load suppression (*P* <.01 for both groups) (**Figure 2**). Members with viral loads in the suppressed range increased by 10.6% in the comparable group. However, members with viral loads of 100,000 copies/mL or greater increased by 3%. The observed increase in viral load suppression was even greater in the unsuppressed-at-baseline group, as seen in Figure 2B. Members with viral loads in the suppressed range increased by 38.61% at current viral load measurement, whereas members with viral loads of 100,000 copies/mL or greater increased by 3.16%. The fact that some members' viral loads increased to more than 100,000 copies/mL indicates poor, if any, medication adherence in this small percentage of the population.

Viral load movement patterns in the comparable group are visualized in a KDE plot (**Figure 3**) (*P* <.01). This plot confirms that many members experienced viral load suppression, even those in the high viral load ranges (≥10,000 copies/mL). Nonetheless, the plot also demonstrates that members who had higher viral loads at program initiation were somewhat less likely to lower their viral loads at current viral load measurement.

Approximately one-third of members with unsuppressed viral loads at baseline in the higher viral load ranges (>10,000) achieved viral load suppression at current viral load measurement, compared with 40% to 51% of members in the lower viral load ranges (**eAppendix Figure** [available at **ajmc.com**]) (*P* <.01).

However, of the 1410 members with at least 1 viral load value, 44% (417/945) who were successfully contacted achieved viral suppression compared with 34% (157/465) who were not (OR, 1.55; 95% CI, 1.23-1.95; *P* <.01). Therefore, successful contact was associated with an improved health outcome.

DISCUSSION

Within our plan's total HIV-positive Medicaid managed care population, approximately 76% were engaged in care and had viral suppression at the start of 2016. This is consistent with the citywide viral load suppression rate of 74% as reported by the New York City Department of Health and Mental Hygiene at the end of 2016.[23] However, a quarter of the population has a viral load that remains

FIGURE 2. Program Initiation and Current Viral Load Values for Comparable Group and Unsuppressed-at-Baseline Group[a]

A. Program Initiation and Current Viral Load Values for Comparable Group (n = 500)

Viral Load Category (copies/mL)	% of Members at Baseline	% of Members Current
<200	36.80%	47.40%
200-999	13.40%	10.40%
1000-9999	17.00%	12.60%
10,000-99,999	28.40%	22.20%
≥100,000	4.40%	7.40%
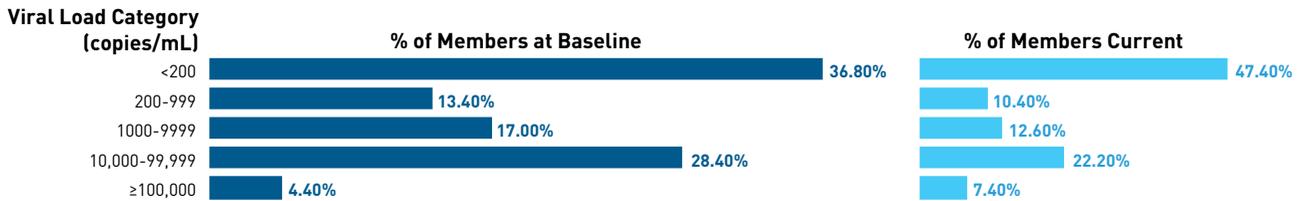
B. Program Initiation and Current Viral Load Values for Unsuppressed-at-Baseline Group (n = 316)

Viral Load Category (copies/mL)	% of Members at Baseline	% of Members Current
<200	0.00%	38.61%
200-999	21.20%	9.81%
1000-9999	26.90%	12.34%
10,000-99,999	44.94%	29.11%
≥100,000	6.96%	10.13%
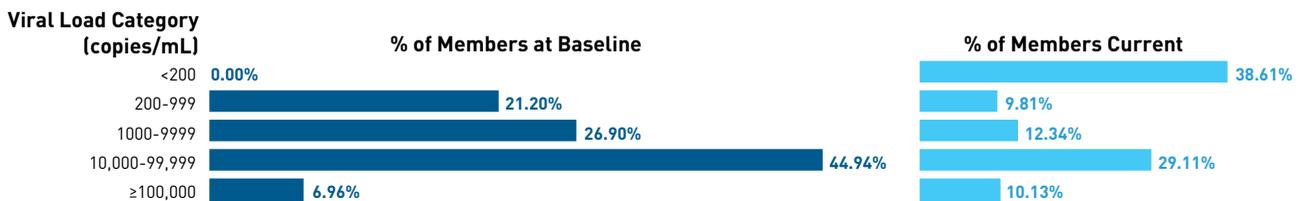
[a]A χ^2 test was performed to obtain statistical significance between baseline and current viral load values.

or becomes unsuppressed at any given time. Of that quarter, 44% achieved viral load suppression over the program's first 2 years.

The novel Data to Care public health strategy, which leveraged surveillance data to target HIV-positive individuals who are not engaged in care or who have unsuppressed viral loads despite being in care, was originally conceptualized as a state and local health department exercise. However, NYS took an innovative approach by involving Medicaid managed care plans that already had proven care coordination programs, and this approach proved to be successful in this study.

This pilot program resulted in other unexpected benefits. Our plan developed a good working collaboration with a community agency that continues to the present day. The placement of our care coordinators and peers on-site at provider clinics has engendered an improved collaboration with our providers and brought us closer to our members. Our care coordinators are no longer just a voice on the telephone. Finally, the process of hiring and working alongside HIV-positive peer educators and peer counselors has humanized the disease for our care coordinators and resulted in improved functioning as a team to support our HIV-positive membership.

Although the analysis focused on those participants with available data, it is likely that all members who received the interventions benefited. This analysis focuses on the first cohort we received, as it has the longest observation time. We have received additional lists annually from NYS in 2017, 2018, and 2019. We plan to report on these cohorts in the future. The program is ongoing and still being funded.

The results of this study suggest that HIV-positive members not engaged in care and those with high viral loads at baseline can

FIGURE 3. KDE Plot Viral Load Values (unsuppressed-at-baseline group) (n = 316)
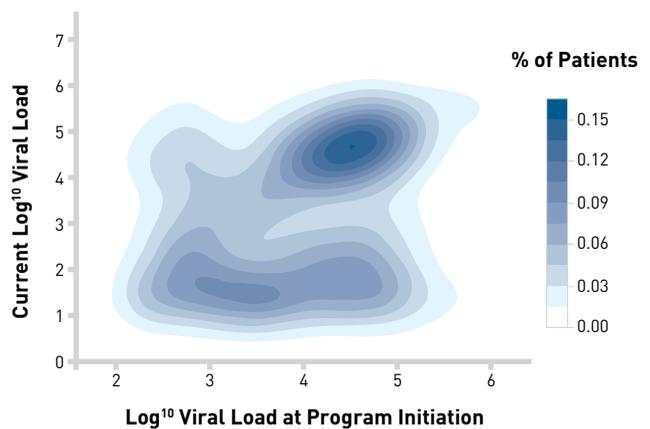
KDE indicates kernel density estimation.

achieve viral load suppression with outreach and enhanced care coordination from a Medicaid managed care organization. Such efforts positively contribute to overall improved engagement in HIV primary care and ART medication adherence.

Limitations

This study has some important drawbacks that chiefly involve data collection. Although significant effort was devoted to the collection of viral load values, collection was incomplete. Surveillance viral loads were reported in ranges and not in absolute values. For 8.6% of members, the range value was the only available viral load

value. This caused the values in the high unsuppressed viral load ranges to be tightly centered around the 100,000 level, resulting in a distinct concentration within the KDE plot, especially in members whose values did not change. In addition, not all members of the cohort were able to be engaged, and some members achieved viral load suppression without program contact. Additionally, 13.6% of members were already engaged and had viral load suppression at program initiation because of the time lag of reporting viral loads to the HIV Surveillance Registry and the inability of MetroPlus to collect more real-time viral load data.

CONCLUSIONS

Although a large majority of identified people living with HIV can achieve and maintain viral load suppression with routine HIV care and support, there remains an important minority who do not. Viral load suppression is transient if adherence to ART is not maintained. Cross-referencing Medicaid plan rosters with health department surveillance data can help identify higher-risk populations to target. Medicaid managed care organization programs that provide enhanced care coordination and support can successfully contribute to improving viral load suppression within an urban HIV population. Such programs will continue to be needed as long as social determinants of health exist. ■

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eAppendix Figure. Viral Load Suppression in Unsuppressed-at-Baseline Group (n = 316)

Viral Load at Initiation	% of Members Achieving Viral Load Suppression
200-999	40%
1K-9,999	51%
10K-99,999	31%
>100K	33%

A χ^2 test was performed to obtain statistical significance between initial and current viral load values.