

# Affordable Care Act Qualified Health Plan Coverage: Association With Improved HIV Viral Suppression for AIDS Drug Assistance Program Clients in a Medicaid Nonexpansion State

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(See the HIV/AIDS Major Article by Berry et al on pages 387–95, and the Editorial Commentary by Eaton and Mugavero on pages 404–6.)

**Background.** With the Patient Protection and Affordable Care Act, many state AIDS Drug Assistance Programs (ADAPs) shifted their healthcare delivery model from direct medication provision to purchasing qualified health plans (QHPs). The objective of this study was to characterize the demographic and healthcare delivery factors associated with Virginia ADAP clients' QHP enrollment and to assess the relationship between QHP coverage and human immunodeficiency virus (HIV) viral suppression.

**Methods.** The cohort included persons living with HIV who were enrolled in the Virginia ADAP (n = 3933). Data were collected from 1 January 2013 through 31 December 2014. Multivariable binary logistic regression was conducted to assess for associations with QHP enrollment and between QHP coverage and viral load (VL) suppression.

**Results.** In the cohort, 47.1% enrolled in QHPs, and enrollment varied significantly based on demographic and healthcare delivery factors. In multivariable binary logistic regression, controlling for time, age, sex, race/ethnicity, and region, factors significantly associated with achieving HIV viral suppression included QHP coverage (adjusted odds ratio, 1.346; 95% confidence interval, 1.041–1.740;  $P = .02$ ), an initially undetectable VL (2.809; 2.174–3.636;  $P < .001$ ), HIV rather than AIDS disease status (1.377; 1.049–1.808;  $P = .02$ ), and HIV clinic ( $P < .001$ ).

**Conclusions.** QHP coverage was associated with viral suppression, an essential outcome for individuals and for public health. Promoting QHP coverage in clinics that provide care to persons living with HIV may offer a new opportunity to increase rates of viral suppression.

**Keywords.** HIV; Patient Protection and Affordable Care Act; AIDS Drug Assistance Program; healthcare delivery; HIV outcomes.

The Patient Protection and Affordable Care Act (ACA) aims to provide coverage to persons who were previously uninsured. Persons living with human immunodeficiency virus (HIV) (PLWH) are more likely to be uninsured than the general population and may benefit significantly from qualified health plans (QHPs) purchased through the ACA marketplace [1–4]. Before ACA implementation in 2014, state AIDS Drug Assistance Programs (ADAPs) were responsible for providing key medications, including antiretroviral therapy, to uninsured PLWH. ADAP provided medications to one-third of PLWH receiving HIV care in 2013 [5]. Changes in healthcare delivery to this

large population could have important effects for PLWH and for the community more broadly.

Many ADAPs incorporated the ACA into their care delivery model. During 2013, a total of 44 ADAPs used funds for purchasing insurance [6]. During the 2014 ACA enrollment period, Virginia ADAP clients accounted for 2% of ADAP clients nationwide, but they represented 17% of ADAP clients with QHP coverage nationwide and 58% of those in southern states [7].

For the 2014 ACA enrollment period, the Virginia Department of Health (VDH) estimated that 80% of Virginia ADAP clients did not have insurance and were US citizens eligible for an ADAP-funded QHP. These ADAP clients were receiving services through (1) direct provision of medications distributed through the local health departments (Direct ADAP) or (2) premium and copayment assistance through the Pre-Existing Condition Insurance Plan (PCIP). With the ACA Marketplace opportunity, Virginia ADAP started a Health Insurance Marketplace Assistance Program and paid insurance premiums

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for QHPs and medication copayments. ADAP clients who did not enroll in a QHP remained on Direct ADAP.

As of November 2015, a total of 30 states and Washington, DC, have expanded Medicaid [8]. Virginia did not do so, and the Virginia ADAP clients' QHP enrollment experience is relevant to the 20 Medicaid nonexpansion states as well as Medicaid-ineligible ADAP clients in Medicaid expansion states.

The objective of the current study was to assess the association of demographic and healthcare delivery factors with Virginia ADAP clients' QHP enrollment and to quantify the relationship between QHP coverage and viral suppression. We compared health outcomes for a previous standard of care delivery, HIV disease management with Virginia ADAP through direct medication provision, to those achieved with new QHP coverage, which covers antiretroviral medication as well as more comprehensive healthcare.

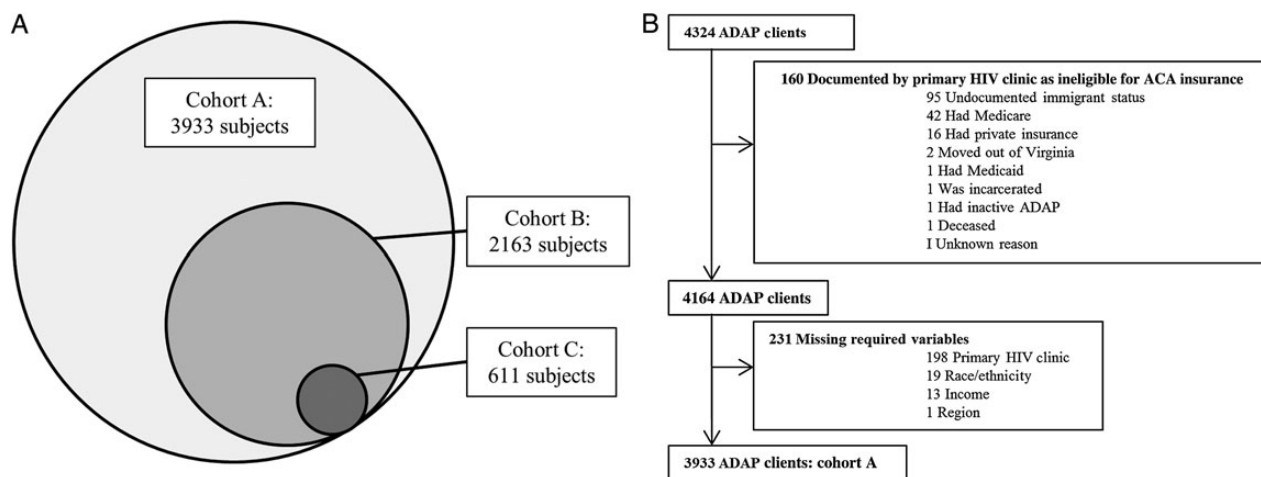
## METHODS

Three nested populations of interest were assessed in the study: cohorts A, B, and C (Figure 1A). Cohort A includes the largest group, all PLWH who were 18–64 years old on 1 January 2013, were ADAP clients by 1 July 2013, did not have Medicare, and had a Social Security number. In Virginia, to qualify for ADAP, PLWH must reside in the state, have an income <400% of the federal poverty level (FPL), not receive Medicaid, and provide a CD4 cell count and HIV viral load (VL) from within the past 6 months [9]. Cohort B includes members of cohort A who

demonstrate consistent engagement in care, as defined by  $\geq 1$  HIV VL recorded in 2013 and  $\geq 1$  between 1 July 2014 and 31 December 2014. If an ADAP client had  $>1$  VL during the 6-month follow-up period, the last one was used for analysis. Cohort C consists of members of cohort B who had an initial detectable VL in 2013, indicating suboptimally controlled HIV disease.

VDH combines multiple state and clinic HIV databases into a single Care Markers Database, which includes demographic and healthcare delivery information as well as HIV VLs and CD4 cell counts. Data for all individuals qualified for cohort A were deidentified and coded by VDH before transmission of the data set to the authors. The University of Virginia Institutional Review Board determined that the study was not human subjects research.

Demographics included age as of 1 January 2013; sex self-reported as male, female, or transgender; race/ethnicity; income; and HIV/AIDS diagnosis based on Centers for Disease Control and Prevention criteria using VDH HIV surveillance data [10]. Healthcare delivery factors included financial status, previous ADAP coverage program, region of residence, and HIV clinic. For financial status, income was categorized by the ADAP client's FPL percentage according to their annual household income and household size [11]. Clients are eligible for federal subsidies for both premiums and cost shares for those with incomes between 101% and 250% FPL and premium-only subsidies for those between 251% and 400% FPL. This factor was considered a healthcare delivery factor because ADAP clients with the largest federal



**Figure 1.** A, Diagram of cohorts. Cohort A includes 3933 subjects. Cohort B includes 2163 subjects, who are members of cohort A who demonstrated consistent engagement in care, as defined by  $\geq 1$  human immunodeficiency virus (HIV) viral load (VL) recorded in 2013 and  $\geq 1$  between 1 July 2014 and 31 December 2014. If an AIDS Drug Assistance Program (ADAP) client had  $>1$  VL during the 6-month follow-up period, the last one was used for analysis. Cohort C includes 611 subjects, who are members of cohort B who had initially detectable VLs in 2013, indicating suboptimally controlled HIV disease. B, Virginia ADAP Client cohort A. Virginia ADAP clients were included if they were aged 18–64 years old by 1 January 2013, were enrolled in ADAP by 1 July 2013, did not qualify for or receive Medicare, and had a Social Security number. ADAP clients were removed from the cohort if their primary HIV clinic reported them as ineligible for an ADAP-funded qualified health plan. Age, sex, race/ethnicity, income, HIV/AIDS diagnosis, previous ADAP 2013 plan, Virginia region of residence, and primary HIV clinic were all required variables; subjects were removed if they did not meet these requirements. Abbreviation: ACA, Affordable Care Act.

tax credits were prioritized by Virginia ADAP for enrollment, because they were less expensive to insure. For previous ADAP coverage program, patients were categorized as Direct ADAP or PCIP depending on their plan for the majority of 2013. PCIP ADAP clients were prioritized in QHP enrollment efforts to avoid gaps in their care. The ADAP client's Virginia region of residence was determined by the health planning regions in the state, and this was considered a healthcare delivery factor because QHP options varied greatly by region [12]. HIV clinic (coded by VDH from 1 to 31 for the 31 clinics that provide care to Virginia ADAP clients) was identified by the provider who completed the client's most recent medical recertification ADAP form, which is completed every 6 months.

Two primary outcomes were evaluated: QHP enrollment and virologic outcome. Those who achieved or maintained viral suppression were categorized as having a good virologic outcome. The number of ADAP clients with ADAP-funded QHP enrollment was analyzed for persons in cohort A, along with demographic differences in enrollment rates. Bivariable and multivariable logistic regression was used to assess the strength and significance of the association between QHP enrollment and the following characteristics: age, race/ethnicity, sex, financial status, HIV/AIDS diagnosis, previous ADAP coverage program, region of residence, and HIV clinic. The analysis of good virologic outcome was performed for cohorts B and C. VLs were categorized as detectable or undetectable, defined as <200 HIV RNA copies/mL [13]. Bivariable and multivariable logistic regression was used to assess the strength and significance of the association between viral suppression and key variables, including QHP coverage.

All statistical analyses were conducted using IBM SPSS Statistics software, version 22. Frequencies were calculated for each outcome variable for each of the demographic and healthcare delivery subpopulation characteristics. Odds ratios were calculated to measure the association between dichotomous outcomes and selected patient and healthcare delivery characteristics, for both the unadjusted (bivariable) and the adjusted (multivariable) case. Statistical significance was measured using 95% confidence intervals (CIs) for each of the estimated odds ratios.

## RESULTS

A total of 4324 ADAP client records were identified. Of these, 160 were excluded as ineligible for ADAP-funded QHP coverage, and 231 records (5.5% of the data set) were excluded due to missing values for key characteristics. These key characteristics were not imputed, because they were not missing at random. Table 1 presents the frequencies of patient characteristics in cohorts A, B, and C.

There were 1853 members (47.1%) of cohort A enrolled in QHPs. Table 2 presents unadjusted and adjusted odds ratios

**Table 1. Characteristics of Cohorts<sup>a</sup>**

Characteristic	Patients, No. (%) <sup>b</sup>		
	Cohort A (n = 3933)	Cohort B (n = 2163)	Cohort C (n = 611)
<b>Age, y</b>			
18–24	252 (6.4)	130 (6.0)	71 (11.6)
25–34	805 (20.5)	391 (18.1)	147 (24.1)
35–44	978 (24.9)	541 (25.0)	140 (22.9)
45–54	1371 (34.9)	799 (36.9)	188 (30.8)
55–64	527 (13.4)	302 (14.0)	65 (10.6)
<b>Race/ethnicity</b>			
American Indian/Alaska Native/Native Hawaiian	25 (0.6)	17 (0.8)	10 (1.6)
Asian	67 (1.7)	37 (1.7)	3 (0.5)
Black/African American	2601 (66.1)	2523 (65.3)	435 (71.2)
Hispanic/Latino	266 (6.8)	175 (8.1)	39 (6.4)
White	974 (24.8)	522 (24.1)	124 (20.3)
<b>Sex</b>			
Female	1086 (27.6)	639 (29.5)	178 (29.1)
Transgender	27 (0.7)	7 (0.3)	3 (0.5)
Male	2820 (71.7)	522 (24.1)	124 (20.3)
<b>HIV/AIDS diagnosis</b>			
AIDS diagnosis	1433 (36.4)	876 (40.5)	240 (39.3)
HIV diagnosis	2500 (63.6)	1287 (59.5)	371 (60.7)
<b>2013 ADAP plan</b>			
PCIP	399 (10.1)	141 (6.5)	26 (4.3)
Direct ADAP	3534 (89.9)	2022 (93.5)	585 (95.7)
<b>Financial status</b>			
251%–400% FPL (tax credit)	201 (5.1)	138 (6.4)	38 (6.2)
139%–250% FPL (tax credit)	677 (17.2)	376 (17.4)	76 (12.4)
101%–138% FPL (Medicaid gap with tax credit)	462 (11.7)	285 (11.9)	58 (9.5)
<100% FPL (Medicaid gap, no Tax Credit)	2593 (65.9)	1391 (64.3)	439 (71.8)
<b>Virginia region of residence</b>			
Northwest	339 (8.6)	220 (10.2)	52 (8.5)
Eastern	1379 (35.1)	439 (20.3)	191 (31.3)
Central	1011 (25.7)	681 (31.5)	195 (31.9)
Southwest	357 (9.1)	236 (10.9)	66 (10.8)
Northern	847 (21.5)	587 (27.1)	107 (17.5)
CD4 cell count, mean (SD), cells/ $\mu$ L	554 (322) <sup>c</sup>	555 (319) <sup>d</sup>	409 (295) <sup>e</sup>
Time since HIV diagnosis, mean (SD), y	9.2 (6.7) <sup>f</sup>	9.6 (6.7) <sup>g</sup>	9.5 (7.0) <sup>h</sup>

Abbreviations: ADAP, AIDS Drug Assistance Program; FPL, federal poverty level; HIV, human immunodeficiency virus; PCIP, Pre-existing Condition Insurance Plan; SD, standard deviation.

<sup>a</sup> Cohort A includes people living with HIV who were 18–64 years old on 1 January 2013, were ADAP clients by 1 July 2013, did not receive Medicare, and had a Social Security number. Cohort B includes members of cohort A who demonstrated consistent engagement in care, as defined by  $\geq 1$  HIV viral load (VL) recorded in 2014 and  $\geq 1$  VL between 1 July 2014 and 31 December 2014. Cohort C includes members of cohort B who had an initial detectable VL in 2013, indicating suboptimally controlled HIV disease.

<sup>b</sup> Data represent No. (%) of patients, unless otherwise specified.

<sup>c</sup> Data available for 3684 subjects in cohort A.

<sup>d</sup> Data available for 2162 subjects in cohort B.

<sup>e</sup> Data available for 610 subjects in cohort C.

<sup>f</sup> Data available for 3381 subjects in cohort A.

<sup>g</sup> Data available for 1926 subjects in cohort B.

<sup>h</sup> Data available for 490 subjects in cohort C.

**Table 2. Affordable Care Act Qualified Health Plan (QHP) Enrollment of Virginia AIDS Drug Assistance Program (ADAP) Clients Eligible for ADAP-Funded QHPs**

Characteristic	Enrollment, No. (%)	OR (95% CI)	P Value	Adjusted OR (95% CI)	P Value
All	1853 (47.1)				
Age, y			<.001		.02
18–24	118 (46.8)	0.858 (.635–1.158)		1.089 (.789–1.504)	
25–34	339 (42.1)	0.708 (.568–.883)		0.780 (.615–.989)	
35–44	435 (44.5)	0.780 (.631–.965)		0.795 (.633–.997)	
45–54	694 (50.6)	0.998 (.817–1.220)		0.973 (.785–1.206)	
55–64	267 (50.7)	Reference		Reference	
Race/ethnicity			.003		.03
American Indian/Alaska Native/Native Hawaiian	13 (52)	0.982 (.443–2.173)		1.118 (.493–2.536)	
Asian	34 (50.7)	0.934 (.566–1.532)		0.983 (.580–1.667)	
Black/African American	1173 (45.1)	0.744 (.642–.863)		0.767 (.649–.908)	
Hispanic/Latino	122 (45.9)	0.768 (.585–1.008)		0.777 (.576–1.048)	
White	511 (52.5)	Reference		Reference	
Sex			.09		.03
Female	541 (49.8)	1.164 (1.012–1.339)		1.229 (1.055–1.431)	
Transgender	14 (51.9)	1.263 (.591–2.696)		1.315 (.588–2.939)	
Male	1298 (44.8)	Reference		Reference	
HIV/AIDS Diagnosis			.28		.001
AIDS Diagnosis	1211 (48.4)	1.157 (1.016–1.319)		1.274 (1.103–1.473)	
HIV Diagnosis	642 (44.8)	Reference		Reference	
Previous ADAP plan (2013)			<.001		<.001
PCIP	299 (74.9)	3.810 (3.009–4.823)		3.836 (2.971–4.927)	
Direct ADAP	1554 (44)	Reference		Reference	
Financial status			<.001		<.001
251%–400% FPL (tax credit)	102 (50.7)	1.328 (.996–1.769)		1.272 (.933–1.734)	
139%–250% FPL (tax credit)	369 (54.5)	1.544 (1.302–1.830)		1.495 (1.246–1.794)	
101%–138% FPL (Medicaid gap with tax credit)	249 (53.9)	1.506 (1.235–1.838)		1.458 (1.181–1.801)	
<100% FPL (Medicaid gap, no tax credit)	1133 (43.7)	Reference		Reference	
Virginia region of residence			<.001		.17
Northwest	210 (61.9)	1.854 (1.433–2.398)		1.372 (.881–2.136)	
Eastern	677 (49.1)	1.098 (.925–1.304)		1.073 (.652–1.764)	
Central	426 (42.1)	0.829 (.690–0.997)		1.352 (.836–2.099)	
Southwest	144 (40.3)	0.770 (.599–.989)		0.759 (.422–1.364)	
Northern	396 (46.8)	Reference		Reference	
HIV clinic	. . .	. . .	<.001	. . .	<.001

Abbreviations: ADAP, AIDS Drug Assistance Program; CI, confidence interval; FPL, federal poverty level; HIV, human immunodeficiency virus; OR, odds ratio; PCIP, Pre-existing Condition Insurance Plan.

(aORs) for the association between QHP enrollment and patient and healthcare delivery characteristics. The multivariable analysis, controlling for region, demonstrates that age ( $P = .02$ ), race/ethnicity ( $P = .03$ ), sex ( $P = .03$ ), financial status ( $P < .001$ ), HIV/AIDS Diagnosis ( $P = .001$ ), previous ADAP coverage program ( $P < .001$ ), and HIV clinic ( $P < .001$ ) had statistically significant associations with QHP enrollment.

For demographics, ADAP clients aged 25–34 (aOR, 0.780; 95% CI, .615–.989) or 35–44 (0.795; .633–.997) were less likely to enroll than the reference group aged 55–64 years and those aged 18–24 or 45–54 years. African American ADAP clients (aOR, 0.767; 95% CI, .649–.908) were less likely to enroll than white ADAP clients, with enrollment rates of 45.9% and 52.5% respectively. Women were more likely to enroll than men (aOR,

1.229; 95% CI, 1.055–1.431). Clients with a diagnosis of HIV were more likely to enroll than those who had progressed to AIDS (aOR, 1.274; CI, 1.103–1.473).

For healthcare delivery factors, ADAP clients who were previously on PCIP plans were more likely to enroll than those who were on Direct ADAP plans, with enrollment rates of 74.9% and 44.0% respectively (aOR, 3.836; CI, 2.971–4.927). The highest enrolling financial status groups were 101%–138% FPL with 53.9% enrollment (aOR, 1.458; CI, 1.181–1.901) and 139%–250% FPL with 54.5% (1.495; 1.246–1.794). In the 31 HIV clinics, the number of ADAP clients eligible for ADAP-funded QHPs per clinic ranged from 3 to 950, with an average of 127 per clinic. HIV clinic was a statistically significant predictor of ACA enrollment, with enrollment rates varying from

14% to 74.1% ( $P < .001$ ). There was no relationship between the number of ADAP clients eligible for ADAP-funded QHP per clinic and the clinic's ADAP client QHP enrollment rate. The individual clinics' number of ADAP clients and QHP enrollment percentages are not reported to protect clinic confidentiality.

Cohort B included 2163 or 55% of cohort A members who had  $\geq 1$  HIV VL recorded in 2013 and  $\geq 1$  between 1 July 2014 and 31 December 2014 (Figure 1A). Of this group, 53.5% were enrolled in QHPs, and the remaining portion accessed antiretroviral therapy through Direct ADAP. In cohort B, ADAP clients with QHP coverage had a higher rate of

**Table 3. Viral Suppression of Virginia AIDS Drug Assistance Program (ADAP) Clients With Qualified Health Plan (QHP) Coverage and ADAP Clients Who Were Eligible for ADAP-Funded QHP Coverage but Did Not Enroll**

Characteristic	Denominator, No. (%)	Enrollment, %	Good Virologic Outcome, %	OR (95% CI)	P Value	Adjusted OR (95% CI)	P Value
All	2163	53.5	81.8				
ACA marketplace status					<.001		.02
QHP Coverage	1157 (53.5)	100.0	84.6	1.495 (1.200–1.862)		1.346 (1.041–1.740)	
Not enrolled/Direct ADAP	1006 (46.5)	0.0	78.6	Reference		Reference	
Initial virologic status (2013)					<.001		<.001
Undetectable	1552 (71.8)	55.9	87.8	3.615 (2.881–4.535)		2.809 (2.174–3.636)	
Detectable	611 (28.2)	47.5	66.6	Reference		Reference	
Days observed	...	...	...	1.003 (1.001–1.004)	<.001	1.001 (1.000–1.003)	.07
Age, y					.001		.28
18–24	130 (6.0)	56.2	71.5	0.351 (.210–.586)		0.554 (.308–.995)	
25–34	391 (18.1)	51.9	78.8	0.518 (.340–.789)		0.642 (.402–1.026)	
35–44	541 (25.0)	50.3	83.0	0.681 (.452–1.027)		0.713 (.454–1.121)	
45–54	799 (36.9)	55.1	82.0	0.635 (.431–.937)		0.662 (.432–1.013)	
55–64	302 (24.1)	62.6	84.9	Reference		Reference	
Race/ethnicity					.01		.10
American Indian/Alaska Native/Native Hawaiian	17 (0.8)	58.8	88.2	1.337 (.300–5.962)		4.320 (.857–21.788)	
Asian	37 (1.7)	54.1	89.2	1.471 (.507–4.267)		0.691 (.204–2.338)	
Black/African American	1412 (65.3)	50.3	79.6	0.696 (.530–.914)		0.773 (.560–1.067)	
Hispanic/Latino	175 (8.1)	51.4	88.6	1.382 (.819–2.333)		1.090 (.591–2.011)	
White	522 (24.1)	62.6	84.9	Reference		Reference	
Sex					.77		.78
Female	639 (29.5)	52.3	81.7	0.983 (.774–1.249)		0.907 (.689–1.175)	
Transgender	7 (0.3)	42.9	71.4	0.551 (.106–2.855)		1.088 (.119–9.940)	
Male	1517 (70.1)	54.1	81.9	Reference		Reference	
HIV/AIDS Diagnosis					.58		.02
AIDS Diagnosis	1287 (59.5)	52.2	82.2	1.064 (.853–1.328)		1.377 (1.049–1.808)	
HIV diagnosis	876 (40.5)	50.9	81.3	Reference		Reference	
Previous ADAP plan (2013)					.10		.61
PCIP	141 (6.5)	73.8	76.6	0.709 (.472–1.064)		0.882 (.543–1.433)	
Direct ADAP	2022 (93.5)	52.1	82.2	Reference		Reference	
Financial status					.97		.53
251%–400% FPL (tax credit)	138 (6.4)	50.7	82.6	1.160 (.732–1.837)		0.814 (.486–1.364)	
139%–250% FPL (tax credit)	376 (17.4)	59.3	84.0	1.286 (.947–1.747)		1.032 (.728–1.462)	
101%–138% FPL (Medicaid gap with tax credit)	258 (11.9)	58.5	86.0	1.506 (1.034–2.194)		1.285 (.844–1.957)	
<100% FPL (Medicaid gap, no tax credit)	1391 (64.3)	51.3	80.4	Reference		Reference	
Virginia region of residence					<.001		.46
Northwest	220 (10.2)	68.6	91.8	1.091 (.623–1.909)		1.756 (.667–4.619)	
Eastern	439 (20.3)	54.2	60.8	.151 (0.107–.213)		1.097 (.389–3.095)	
Central	681 (31.5)	50.2	84.6	0.533 (.375–.759)		1.222 (.483–3.091)	
Southwest	236 (10.9)	49.2	80.5	0.401 (.261–.617)		0.658 (.226–1.920)	
Northern	587 (27.1)	52.8	91.1	Reference		Reference	
HIV clinic	...	...	...	...	<.001	...	<.001

Abbreviations: ACA, Affordable Care Act; ADAP, AIDS Drug Assistance Program; CI, confidence interval; FPL, federal poverty level; HIV, human immunodeficiency virus; OR, odds ratio; PCIP, Pre-existing Condition Insurance Plan; QHP, qualified health plan.

good virologic outcome at 84.6%, compared with 78.6% for those who remained on Direct ADAP.

The percent of participants with viral suppression was also calculated for each age group, and by race/ethnicity, sex, HIV/AIDS diagnosis, previous ADAP coverage program, financial status, region of residence, and HIV clinic (Table 3). In multivariable binary logistic regression analysis, controlling for time between VLs, age, sex, race/ethnicity, and region, factors significantly associated with good virologic outcome include QHP coverage (aOR, 1.346; 95% CI, 1.041–1.740;  $P = .02$ ), an initially undetectable 2013 HIV VL, HIV rather than AIDS disease status, and HIV clinic. Age, sex, race/ethnicity, previous ADAP coverage program, financial status, and region were not significant predictors of good virologic outcome. Clients with initially undetectable VLs were more than twice as likely to have a good virologic outcome than those who started off with a detectable VL (aOR, 2.809; CI, 2.174–3.636;  $P < .001$ ). Subjects with HIV disease were more likely to have good virologic outcomes than those with AIDS (aOR, 1.377; CI, 1.049–1.808;  $P = .02$ ). HIV clinic was a statistically significant predictor of good virologic outcome ( $P < .001$ ).

An analysis was performed of the 611 subjects in cohort C, those with a detectable VL in 2013 (Figure 1A), controlling for time between VLs, age, sex, race/ethnicity, previous ADAP coverage program, financial status, region, and HIV clinic. The results demonstrate that QHP coverage (aOR, 1.564; CI, 1.053–2.323;  $P = .03$ ) and HIV rather than AIDS diagnosis (1.576; 1.032–2.408;  $P = .04$ ) were significantly associated with good virologic outcome.

## DISCUSSION

Just less than half of the eligible Virginia ADAP clients (cohort A) enrolled in QHPs. Although cohort A is similar to the national ADAP population in age and sex, it has a larger proportion of African American PLWH and more PLWH with incomes <138% FPL than the national ADAP population [14]. This difference is consistent with the differences in the composition of Virginia's population and the national population in terms of ethnicity and poverty rates [15, 16]. Both demographic and healthcare delivery factors were associated with enrollment. Studies have shown that demographics affect many aspects of HIV care, including engagement in care [17–19]. ADAP clients between the ages of 25–44 were less likely to enroll in QHPs than 55–64-year-olds. In terms of race/ethnicity, African Americans enrolled at the lowest rate. Women were more likely than men to enroll in QHPs, and those diagnosed with AIDS were less likely to enroll. The groups that were less likely to enroll mirror the identified groups with lower engagement in HIV care [17–19]. Clinics' and state ADAPs' ACA outreach should focus on groups with low QHP enrollment and could coordinate with other efforts to improve retention in care for these less engaged populations.

In terms of healthcare delivery factors, previous ADAP coverage program, financial status, and HIV clinic were associated with enrollment. Subjects on PCIP were much more likely to enroll. This group was targeted as a priority by VDH in the process of transitioning ADAP clients to QHPs because PCIP plans were scheduled to terminate with the implementation of QHPs. Initial QHP enrollment efforts and a disproportionate amount of state funding focused on these clients to avoid gaps in care and to ensure continuing insurance coverage in 2014. Clients with incomes 101%–138% FPL or 139%–250% FPL were also prioritized by VDH. These 2 groups received federal tax credits, making them less expensive for ADAP to insure than those who with incomes 251%–400% FPL, with smaller tax credits, or <100% FPL, with no tax credit. The findings of our study demonstrate that using state resources for targeted outreach is effective.

QHP enrollment varied greatly depending on the patient's HIV clinic. It is unclear what drove these differences. According to published data and state records, some HIV clinics took active roles by having CACs on site, which may have increased enrollment (C. Rhodes, personal communication). Some clinics may not have prioritized enrollment owing to concerns about limited formularies and new copays or cost sharing associated with QHPs [20].

Compared with cohort A, cohort B, the cohort with laboratory documentation of consistent HIV care spanning the study period, is significantly different in terms of being more likely to enroll in QHP, to have started with an undetectable VL, to have been on Direct ADAP rather than PCIP, and to have progressed to AIDS. These patients also differ in age, race/ethnicity, region, and clinic.

The rate of viral suppression for patients in cohort B is higher than the rates reported previously in the literature but similar to those reported in a study of national Ryan White Clinic attendees and expected for those who are engaged in care [19, 21, 22]. Improved virologic outcome associated with QHP enrollment in this cohort may be due to the addition of more comprehensive health coverage to the strong infrastructure of federally funded Ryan White HIV clinics, where the majority of ADAP clients receive medical care. In a secondary analysis, the association between QHP coverage and good virologic outcomes persisted for those who started with a detectable HIV VL in 2013 (cohort C), demonstrating that QHP enrollment does not only benefit those who are already successfully controlling their HIV disease.

Just less than half of cohort A met criteria to be part of cohort B owing to the VL criteria. However, in light of recent statewide Virginia data that only 49% of PLWH in Virginia had a care marker (a physicians' visit, a CD4 count, an HIV VL, or an antiretroviral medication prescription) in 2012, 55% of cohort A meeting criteria for cohort B probably represents the most complete state-level data available [23]. It should be a national priority to improve reporting to state health departments so that we have the best data available to inform clinicians and policy makers.

Our study suggests that access to QHPs available through the ACA is beneficial for PLWH who qualify for ADAP. Prior studies have shown that even among PLWH who access care through federally supplemented Ryan White HIV clinics, being uninsured negatively affects retention in care and HIV VL suppression [19]. Promoting enrollment in QHPs is a new opportunity for state ADAPs and clinics providing HIV care to improve rates of viral suppression.

One limitation of this analysis is that there could be unmeasured differences between those who enrolled in QHPs and those who did not. Those who were previously covered by ADAP under PCIPs may represent persons who were better able to complete paperwork and more likely to be early adopters. Because we did not have information on retention in care, substance abuse, mental health issues, Internet access, transportation, and housing, we were unable to assess the possible effects of these issues on enrollment. Missed visits or poor retention in care could lead to missing or late QHP enrollment. More comprehensive data sets, perhaps at a clinic level, and studies using qualitative methods are needed to understand more fully the determinants of enrollment.

Another limitation is that this study represents a single state that did not expand Medicaid. Medicaid expansion to all persons with incomes <138% of the FPL would have resulted in coverage for approximately 72% of Virginia ADAP clients [7]. Future studies should include other states and assess outcomes associated with different insurance coverage options for PLWH. Finally, insurance enrollment and access to care are not synonymous. Virginia ADAP no longer receives complete prescription and medical visit data on their clients. Therefore, actual access to and use of care cannot currently be assessed at the state level.

Purchasing QHPs rather than paying for medications directly (Direct ADAP), allows Virginia ADAP to use both its federal and state funds to support HIV care delivery for the most clients. The results of this study should inform future Virginia ADAP plans for targeted enrollment outreach and may provide insights for other state ADAPs transitioning patients to QHPs.

Future studies in Virginia will need to assess whether the improvement in viral suppression persists in future years, and studies involving other states will need to be performed to determine whether similar benefits are seen. HIV viral suppression is an important clinical outcome in HIV care because viral suppression improves the health of individual PLWH as well as benefiting public health by reducing the risk of transmission of HIV [24–29]. If targeted efforts to promote QHP enrollment by ADAP clients in other contexts lead to a similar improvement in HIV viral suppression, substantial individual and community health benefits could accrue. Promoting and assessing impacts of QHP enrollment in large cohorts of PLWH should be a priority to guide future policy decisions related to HIV care delivery in the United States.

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