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Comparing Different Measures of Retention in Outpatient HIV Care

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Introduction

Improving retention in outpatient HIV care benefits both patients and the general public.[1–11] For individual patients, consistent HIV care increases the probability of receiving antiretroviral therapy (ART) and improves clinical outcomes and survival.[1, 3–9] On the population level, retention in care may decrease the transmission of HIV and may reduce aggregate healthcare costs by minimizing acute health service utilization.[1, 2, 10, 12] The United States (U.S.) Health Resources and Service Administration (HRSA) and the Obama Administration's *National HIV/AIDS Strategy for the United States* both identify retention in HIV care as a quality performance measure.[13–15]

Nevertheless, many people living with HIV (PLWH) do not fully utilize HIV care.[8, 9, 15–19] Based on New York surveillance data, 6.5% of people initiating care in 2005 never returned for a second visit.[20] Among 530 patients from one university HIV clinic, 16% had no outpatient visits after the first 6-month period following intake, while only 59% had consistent attendance across 4 consecutive 6-month periods.[3] A study of 2,619 patients at U.S. Department of Veterans' Affairs clinics reported that, in the year after starting ART, only 64% of patients had visits in each quarter.[8]

Multiple measures of retention in outpatient HIV care have been proposed. A recent review describes five commonly used measures: missed visits (number of missed visits during an observation period), appointment adherence (ratio of number of completed visits to the number of total scheduled visits during an observation period), visit constancy (proportion of time intervals with at least 1 visit during an observation period), gaps in care (time

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interval between outpatient visits), and the HRSA medical visit performance measure (whether a patient had 2 or more completed visits in a 12-month period separated by 3 or more months).[15, 21]

There is no gold standard retention measure; each metric possesses advantages and limitations.[15, 22] The majority of prior studies use only one measure to evaluate retention, making comparison of different measures difficult. To fully understand patterns of outpatient HIV care utilization, a comparison of multiple measures of retention is necessary. This study extends prior research by comparing three different measures of retention (visit constancy, gaps in care, and the HRSA measure). We identify demographic and clinical correlates of each retention measure.

Methods

Study Design & Participants

We analyzed patterns of outpatient HIV care utilization among HIV-infected adults enrolled in the HIV Research Network (HIVRN), a consortium of clinics that provide care to PLWH. [23] Fifteen sites treat adult patients. Data from 12 sites, located in the Northeastern (6), Midwestern (1), Southern (2), and Western (3) United States, were included in this analysis. The remaining three HIVRN sites discontinued participation during the study period and did not provide complete data. Nine sites have academic affiliations. All patients are offered enrollment in the HIVRN, excluding one-time consultations and people who are incarcerated; 99% of all clinic patients consent to participate in the HIVRN.

Adult patients (age ≥ 18 years) who enrolled at a HIVRN site between 2001 and 2008 and who had at least one outpatient visit in any calendar year between 2001 and 2008 were eligible for inclusion. Patients who began HIV care prior to 2001 were excluded. Outpatient visits refer only to primary HIV care appointments made to HIVRN clinic.

Data Collection

Data from January 1, 2001 through December 31, 2009 were abstracted from medical records at each site and sent to a data coordinating center after personal identifying information was removed. Problematic data elements were identified, reviewed with the site, and corrected. After quality control and verification, data were combined across sites to produce a uniform database. The study was approved by Institutional Review Boards at the Johns Hopkins School of Medicine and at each participating site.

Retention Measures

Because patients entered and left care at different times, measures were based on each person's specific history of outpatient (OP) visits. Each patient's "OP time" was defined as the period from the date of the first to the last recorded OP visit. We did not evaluate the time period from the last recorded OP visit until death or study completion (post-OP time). Patients with post-OP time ≥ 12 months are considered lost to follow-up.[24–26] While retention in care and loss to follow-up are related, they are considered unique points on the care continuum. This analysis focuses on retention in care.

We derived three measures of retention. Gaps in care reflect intervals between successive OP visits. We distinguished gaps of ≤ 6 months, those between 7–12 months, and those longer than 12 months. Patients were classified as having (1) no gap longer than 6 months, (2) one or more gaps of 7–12 months but none over 12 months, or (3) one or more gaps longer than 12 months. Those in the last group could also have additional shorter gaps of 7–12 months. For each patient, we calculated the total number of months spent in gaps longer

than 6 months. To adjust for varying lengths of OP time, we calculated the proportion of OP time spent in gaps, formed by dividing total number of months in a gap longer than 6 months by the total number of months comprising OP time. For consistency with other measures, we also calculated, for each patient, the percentage of OP time not spent in gaps of >6 months.

A second measure of retention reflects constancy in receiving care.[15] Each patient's OP time was divided into quarters of 91 days. In each quarter, we ascertained whether an outpatient visit occurred. The first recorded OP visit was excluded from this process, as in prior investigations.[3] Next, we counted the number of quarters with one or more visits; then, for each patient, we calculated the proportion of all quarters during OP time in which OP visit(s) occurred.

The third measure of retention, proposed by HRSA, defines retention in care as having 2 OP visits separated by at least 90 days during a 12-month period.[21] To calculate this measure, we divided each patient's OP time into 12-month intervals and assessed, for each interval, whether the HRSA criterion was met. The "HRSA-proportion" is the ratio of number of patient-years in which the HRSA criterion was met divided by the total number of years comprising OP time (with a partial year counted as a full year).

Sociodemographic and Clinical Variables

Age in 2001 was categorized as 18 to 29, 30 to 39, 40 to 49, and 50 years old. Race/ethnicity was categorized as non-Hispanic White, non-Hispanic Black, Hispanic, and other. HIV transmission risk factor was grouped into men who had sex with men (MSM), heterosexual transmission (HET), injection drug use (IDU) only, IDU and HET, IDU and MSM, and other/unknown. Insurance at the time of the first outpatient visit was categorized as private, Medicaid, Medicare/dual eligible, uninsured, and other/unknown. Patients whose care was funded by Ryan White, those recorded as self-pay, and those covered by local governmental programs were considered to be uninsured. CD4 count at the time of the first outpatient visit was classified as 50, 51–200, 201–350, 351–500, > 500 cells/mm³, or missing.

Analyses

Analyses were conducted only for those patients who had more than 6 months of OP time (i.e., were more than minimally engaged in care). Following descriptive analyses of patients' demographic and clinical characteristics, we examined overall distributions of the outcome measures: gaps in care (none, 7–12 months, greater than 12 months, and proportion of OP time spent in gaps), visit constancy, and the HRSA measure.

To enhance comparability with the constancy and HRSA measures, analyses of gaps in care were conducted on the proportion of OP time not spent in gap periods. To assess associations among the measures, we used the concordance correlation coefficient (CCC), which combines measures of both precision and accuracy.[27] Multivariate regression was used to examine factors associated with each retention measure. Because the measures were proportions, bounded between 0 and 1 for each patient, we used a generalized linear model with binomial error and a logit link. All regression models included indicators for each HIVRN site and for year of first outpatient visit. For all analyses, we used robust standard errors clustered on site. Statistical analyses were performed using Stata 11.2 (Stata Corporation, College Station, TX).

Results

A total of 22,652 adult patients enrolled at the 12 HIVRN sites between 2001 and 2008. Of these, 5,103 (22.5%) were removed from analyses because they were in OP care for 6 months or less and did not establish regular care. Of the remaining 17,549, 124 were also removed due to missing data for gender (n=7), or due to transgender status (n=117). The remaining analytic sample contained 17,425 patients.

The sample comprised high proportions of patients who were male (71.9%), of minority race/ethnicity (72.1%), and who had either no health insurance or Medicaid at the time of their first OP visit (66.4%). (Table 1) MSM and HET were the predominant HIV risk behaviors. Mean age in 2001 was 37, with over 9% aged 50 or older. Excluding patients with missing data, the mean first CD4 count was 358 cells/mm³. Numbers of patients entering HIV care were fairly evenly distributed over time.

Staggered entry and exit produced variation in observation periods. Overall, mean OP time was 43.2 months. However, mean OP time ranged from 64.3 months for those who entered care in 2001, to 15.9 months for those who entered care in 2008.

Gaps in Care

Among the 17,425 patients who were engaged in HIV care, 7,179 (41.6%) never experienced an interval between outpatient visits longer than 6 months (no gap); 5,426 (31.1%) had one or more 7–12 month gaps in care, and 4,820 (27.7%) had one or more gaps of longer than 12 months. (Table 2) Among the latter group, 48.5% had no gaps of 7–12 months, while 51.5% had additional 7–12-month gaps. Across the entire sample (including those with no gap), patients spent a mean of 29.5% of total OP time in a gap longer than 6 months [95% Confidence Interval (CI): 29.1%, 30.0%] (i.e., 70.5% of OP time was spent in consistent care). Patients with only 7–12-month gaps spent a mean of 38.5% of OP time in a gap period [median=33.3%; 95% CI: 37.9, 39.2], and patients with gaps of longer than 12 months spent a mean of 63.4% of OP time in a gap period [median= 64.3%; 95% CI: 62.8, 64.0].

Visit Constancy

On average, patients had one or more visits in 72.8% of quarters in OP time (median=76.9%, 95% CI: 72.5%, 73.2%). (Table 3) Among patients entering care in 2001, on average 69.0% of quarters had a visit; this mean percentage rose in more recent cohorts, reaching 83.3% of quarters for those entering care in 2008.

HRSA Proportion

The HRSA measure was initially proposed for a single 12-month period.[15, 21] Our analyses extended this measure to apply to multiple years. Patients met the criterion in an average of 74.6% of years during OP time (median=83.3%; 95% CI: 72.5%, 73.2%). Overall, 42.6% of patients met the HRSA criterion in all years during their OP time. Only 3.5% of patients never met the criterion during any 12-month period.

Associations among Retention Measures

The three measures of retention in care showed moderately strong associations with each other (p<0.05). Visit constancy and the proportion of time not spent in gaps had a CCC of 0.88. The HRSA-proportion had a CCC of 0.70 with visit constancy and 0.67 with the proportion of OP time not spent in gaps >6 months. Among those with no gap, visit constancy was 93.0%; it was 70.3% among those with a 7–12 month gap; and 45.7% among those with gaps longer than 12 months. The mean percentage of years in which the HRSA

criterion was met was 88.5%, 81.7%, and 46.0% in the three respective gap groups. (Figure 1)

Associations with Demographic and Clinical Variables

Tables 3 and 4 report bivariate and multivariate associations between patient factors and the three measures of retention. Multivariate analyses produced very similar results across the three measures. The odds of not having a gap longer than 6 months, of having a visit in a quarter, and of meeting the HRSA criterion in a year were higher in cohorts that entered care more recently; this reflects the reduced opportunity to have poor retention when potential OP time is shorter. Adjusting for year of entry into care, the likelihood of retention, for each measure, was lower for men (versus women), black patients (versus whites), those with higher initial CD4 counts and those with risk behaviors other than MSM. Hispanic patients had greater odds of retention than white non-Hispanic patients. The odds of retention rose among older patients. Patients who entered with Medicare were more likely than those with private coverage to have greater retention in care.

Discussion

The U.S. Centers for Disease Control and Prevention (CDC) estimates that only 28% of PLWH have a suppressed viral load, largely due to the 49% of people diagnosed with HIV and not engaged in continuous care.[28] Examining laboratory data (CD4 and viral load tests) from 13 U.S. areas, Hall and colleagues report that 41% of HIV-infected individuals did not have at least one recommended testing event in 2009.[29] These studies highlight the challenge of retaining PLWH in care. But different definitions of retention, varying observation periods, and use of surrogate markers to measure retention make comparison across studies difficult.

This study is among the first to compare multiple measures of retention in HIV care, and suggests that gaps in care, visit constancy, and HRSA medical visit criteria produce approximately similar estimates of retention in HIV care. The three measures showed moderately strong correlations ($CCC=0.67-0.88$). Additionally, all measures demonstrated similar patterns of associations with sociodemographic and clinical variables. Means for these measures were similar: 73% of all quarters had at least 1 OP visit, 75% of all years in care met the HRSA measure, and 71% of OP time was not spent in a gap. Thus, 25–30% of OP time is spent in an out-of-care status. Given the importance of periodic monitoring, this average proportion of time out of care can be considered excessive and potentially detrimental to optimal clinical management.

In our cohort, 59% of engaged patients had a gap between outpatient visits longer than 6 months, with 28% having one or more gaps longer than 12 months. A multisite study evaluating the effect of outreach program contacts (over a 3-month period) on gaps in care (over the subsequent 12 months), noted that, overall, 40% of patients had a gap in care longer than 4 months.[30] When participants received 9 program contacts over the 3-month intervention period, the likelihood of having a gap in care greater than 4 months over the following 12 months decreased by half.[30] Clinic-level interventions similar to these should be considered for patients at risk of poor retention in HIV care.

Visit constancy, represented as the percentage of quarters during OP time that had at least one OP visit, was 73%. Giordano et al. measured retention in care in the 12-month period following initiation of ART for 2619 HIV-infected men cared for at U.S. Department of Veterans Affairs hospitals and clinics, finding that 64% of patients had visits in all 4 quarters of the year, 19% had visits in 3 of 4 quarters, 11% had visits in 2 quarters, and 6% had visits in only 1 quarter.[8] This translates to a mean visit constancy of 84.5%, higher

than reported in the current study. Possible reasons for this difference include longer patient follow-up time in the current study (35.5 vs. 12 months), which increases the opportunity to have quarters without any visits, and differences in patient demographics. While our study used a 3-month interval as the unit of assessment for calculating visit constancy, others have employed a 6-month interval.[3] The ideal time interval for measuring visit constancy has not been established.

HRSA has been collecting data on medical visits since 2008, but limited data on use of the HRSA medical visit performance measure exist in the literature. Our study represents one of the first to describe the performance of this measure in a large longitudinal cohort. These results can serve as a comparison for HIV practices that utilize the HRSA measure for assessing patient retention.

We analyzed whether there were certain patient characteristics that could help in targeting those patients at highest risk of low retention in HIV care. We found that younger patients, men, Blacks, non-MSM HIV risk groups, and those with higher initial CD4 cell count were more likely to have low retention in care on any of our studied measures. Except for males, each of these characteristics has been associated with low retention in care.^{3,8,9,16,20}

Hypotheses that might explain poor retention for these subgroups include beliefs that they are not “sick”; inability to overcome housing, transportation, or financial obstacles; lack of social support networks; inability to cope with the stigma of HIV; substance abuse, and/or mental illness; and history of or current poor experiences with providers.[3, 9, 31–33]

Hispanics were more likely than white non-Hispanic patients to remain in care. Several prior retention studies did not distinguish Hispanic from white patients.^{3,9,20} One study found no significant Hispanic-white difference in percentage of missed visits;[34] another found that a lower proportion of Hispanic than white patients had visits in all 4 quarters.⁸ Further studies are needed to clarify retention rates among Hispanics.

The finding of greater rates of retention for persons with Medicare or dual eligibility, but not Medicaid alone or no insurance, may reflect the fact that the majority of Medicare patients were eligible due to disability, which requires periodic provider contact for recertification. In addition, patients who entered the HIVRN with Medicare may have been diagnosed with AIDS for several years and treated elsewhere before enrolling in an HIVRN clinic; their longer period of treatment may have led to better integration with the healthcare system.

Currently, there is no consensus regarding acceptable cut-offs for the various retention measures. Although retention of 70–75% appears low, further research is needed to determine if there are specific retention thresholds that are associated with poorer clinical outcomes. Existing measures are based on 3–6 month intervals between visits; consensus is needed on the recommended visit interval and should be tailored to patients’ HIV disease stage, co-morbidities, and social circumstances.

Several limitations of this study should be acknowledged. We did not have access to appointment schedules and thus could not examine measures of retention such as appointment adherence and missed visits. Second, we have assumed that patients were not receiving HIV care during gaps. Our data do not reflect visits to multiple providers by the same patient. It is possible that patients may switch to a different provider in the same locality, emigrate from the area, or become incarcerated or institutionalized but still be receiving care. To address this issue, studies using data from patient interviews or insurance records are needed. Third, although multi-site studies have greater generalizability than single-site studies, the HIVRN data are not nationally representative; rates of retention may differ among providers with smaller HIV patient caseloads or with a different mix of patients. Fourth, we excluded patients with OP time less than six months. This group is

unique in that patients made an initial visit, but did not establish care; exclusion of these patients will overestimate retention rates.

Our findings represent patient-level aggregated data on patterns of care. It is possible that patterns of care will vary over time for individual patients; the same person may have periods of appropriate OP use, intermixed with periods of sub-optimal use. We have interpreted effects of year of entry as reflecting cohort differences in observation period; it is possible that “maturation” effects may also be present, as some patients may become more regular users of care over time, while others may become complacent and start to use care more irregularly. Similarly, use of ART may change over time. It is possible that ART use may affect consistency of utilization, but consistency of utilization may also affect the decision to start ART. Thus, the effect of ART on retention in care would be difficult to interpret using patient-level summary retention indices. This consideration underlies the exclusion of ART use from the analyses. Future analyses need to capture within-patient changes over time in variables such as ART receipt, insurance coverage, and CD4 cell count.

This is the first study to provide a national estimate of retention in HIV care in the U.S., which ranged from 71–75% using any of the accepted retention measures. This study also showed that younger patients, men, Blacks, non-MSM HIV risk groups, and those with higher initial CD4 counts were at greatest risk for low retention. It will be important to determine how this level of retention correlates with HIV clinical outcomes, and to design and target interventions that will improve retention in those patients at greatest risk of poorer outcomes.

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Figure 1.

Visit Constancy and HRSA-Proportion by Gaps in Care

Note: Bars reflect the mean proportions of (1) quarters with a visit, and (2) years with 2 visits separated by 90 days, by gap status.

Table 1

Demographic and Clinical Characteristics of Study Sample

Variable	N (%)
Gender	
Female	4,901 (28.13)
Male	12,524 (71.87)
Race/Ethnicity	
White	4,646 (26.66)
Black	8,474 (48.63)
Hispanic	3,750 (21.52)
Other	332 (1.91)
Missing	223 (1.28)
Risk Group	
MSM	6,584 (37.78)
HET	6,967 (39.98)
IDU	1,365 (7.83)
HET+IDU	1,038 (5.96)
MSM+IDU	557 (3.20)
Missing	914 (5.25)
Age in 2001	
18–29	3,909 (22.43)
30–39	6,938 (39.82)
40–49	4,947 (28.39)
50	1,631 (9.36)
Initial Insurance	
Private	2,106 (12.09)
Medicaid	5,544 (31.82)
Medicare/Dual	1,359 (7.80)
None/Ryan White	6,027 (34.59)
Missing	2,389 (13.71)
Initial CD4 Cell Count	
50	2,313 (13.27)
51–200	3,268 (18.75)
201–350	3,482 (19.98)
351–500	2,987 (17.14)
>501	4,321 (24.80)
Missing	1,054 (6.05)
Year of first visit	
2001	2,438 (13.99)

Variable	N (%)
2002	2,249 (12.91)
2003	2,666 (15.30)
2004	2,223 (12.76)
2005	1,831 (10.51)
2006	1,902 (10.92)
2007	2,013 (11.55)
2008	2,103 (12.07)

Table 2

Percentage of Patients with Gaps in Care

	No Gap	Any 7–12 Month Gap	Any Gap >12 Months
Overall	41.20%	31.14%	27.66%
Gender			
Female	40.28	30.83	28.89
Male	41.56	31.26	27.18
Race/Ethnicity			
White	42.04	33.84	24.13
Black	37.79	31.05	31.17
Hispanic	47.20	27.84	24.96
Other	47.59	31.02	21.39
Missing	43.05	34.08	22.87
Risk Group			
MSM	42.31	32.37	25.32
HET	39.62	30.23	30.16
IDU	46.45	27.40	26.15
HET+IDU	34.30	32.76	32.95
MSM+IDU	34.47	33.93	31.60
Missing	49.34	31.29	19.37
Age in 2001			
18–29	35.07	32.72	32.21
30–39	39.12	31.82	29.06
40–49	45.54	29.86	24.60
50	51.56	28.33	20.11
Initial Insurance			
Private	42.12	36.94	22.87
Medicaid	47.04	29.18	23.77
Medicare/Dual	55.85	28.99	15.16
None/Ryan White	35.56	33.65	30.79
Missing	32.73	25.45	41.82
Initial CD4 Cell Count			
50	42.84	34.28	22.87
51–200	43.91	32.07	24.02
201–350	42.42	31.16	26.42
351–500	41.35	31.24	27.42
>500	41.87	30.69	27.45
Missing	22.01	22.87	55.12

	No Gap	Any 7–12 Month Gap	Any Gap >12 Months
Year of first visit			
2001	29.66	29.57	40.77
2002	28.28	32.28	39.44
2003	32.30	31.17	36.53
2004	34.64	32.39	32.97
2005	37.85	34.35	27.80
2006	44.11	35.23	20.66
2007	56.53	32.04	11.43
2008	72.23	22.01	4.76

Entries are percentages of the sample and add to 100% in each row.

Table 3

Associations of Retention Measures with Sociodemographic and Clinical Variables

	Mean % of OP Time Not in > 6 Month Gap	Mean % Years Met HRSA Criterion	Mean % Quarters with 1 OP Visit
Overall	70.46	74.65	72.85
Gender			
Female	70.44	74.89	72.75
Male	70.47	74.55	72.89
Race/Ethnicity			
White	71.51	75.15	73.40
Black	67.77	72.91	70.72
Hispanic	75.18	77.92	76.86
Other	73.69	77.22	76.17
Missing	66.43	70.81	69.65
Risk Group			
MSM	71.79	75.44	73.59
HET	69.66	73.90	72.15
IDU	71.76	75.29	74.88
HET+IDU	66.53	73.24	70.58
MSM+IDU	65.95	72.52	69.75
Missing	72.23	76.61	74.29
Age in 2001			
18–29	64.66	70.46	68.17
30–39	69.09	73.74	71.66
40–49	73.99	76.96	75.72
50	79.47	81.49	80.37
Initial Insurance			
Private	72.95	76.41	73.89
Medicaid	74.29	77.36	76.71
Medicare/Dual	79.60	80.49	80.52
None/Ryan White	67.40	73.05	70.07
Missing	61.91	67.50	65.57
Initial CD4 Cell Count			
<50	73.90	77.94	76.17
51–200	73.19	76.79	75.75
201–350	71.96	75.85	74.20
351–500	70.71	74.70	72.62
>500	70.15	74.37	72.10
Missing	50.05	57.77	55.76

	Mean % of OP Time Not in > 6 Month Gap	Mean % Years Met HRSA Criterion	Mean % Quarters with 1 OP Visit
Year of First Visit			
2001	65.95	72.60	69.00
2002	64.78	71.62	68.40
2003	67.21	72.98	69.58
2004	66.98	73.54	70.16
2005	69.37	74.58	71.68
2006	71.32	76.18	73.83
2007	77.57	77.91	78.92
2008	82.92	79.08	83.37

Table 4

Multivariate Analyses of Retention Measures

	Mean % of OP time not in > 6 month gap	Mean % Quarters with 1 OP Visit	Mean % Years Met HRSA Criterion
Gender			
Female	----	----	----
Male	0.84 (0.78, 0.90) ***	0.88 (0.82, 0.94) ***	0.86 (0.79, 0.94) ***
Race/Ethnicity			
White	----	----	----
Black	0.85 (0.79, 0.92) ***	0.90 (0.84, 0.95) ***	0.91 (0.85, 0.97) ***
Hispanic	1.12 (1.03, 1.22) **	1.11 (1.04, 1.17) **	1.12 (1.04, 1.19) ***
Other	1.03 (0.90, 1.18)	1.05 (0.93, 1.18)	1.08 (0.92, 1.27)
Missing	0.95 (0.74, 1.22)	0.99 (0.88, 1.10)	0.91 (0.76, 1.10)
Risk Group			
MSM	----	----	----
HET	0.82 (0.71, 0.94) **	0.86 (0.76, 0.98) **	0.84 (0.75, 0.96) **
IDU	0.67 (0.56, 0.80) ***	0.76 (0.65, 0.87) ***	0.73 (0.61, 0.87) ***
HET+IDU	0.68 (0.60, 0.78) ***	0.78 (0.70, 0.87) ***	0.78 (0.70, 0.87) ***
MSM+IDU	0.78 (0.72, 0.85) ***	0.85 (0.79, 0.91) **	0.86 (0.79, 0.95) ***
Missing	0.84 (0.67, 1.05)	0.87 (0.73, 1.03)	0.91 (0.77, 1.07)
Age in 2001			
18–29	----	----	----
30–39	1.24 (1.19, 1.30) ***	1.18 (1.16, 1.20) ***	1.17 (1.13, 1.21) ***
40–49	1.62 (1.51, 1.73) ***	1.46 (1.37, 1.55) ***	1.41 (1.35, 1.47) ***
50	2.19 (1.91, 2.51) ***	1.90 (1.66, 2.17) ***	1.83 (1.66, 2.03) ***
Initial Insurance			
Private	----	----	----
Medicaid	0.98 (0.85, 1.12)	1.07 (0.95, 1.20)	1.00 (0.90, 1.11)
Medicare/Dual	1.27 (1.13, 1.43) ***	1.31 (1.19, 1.44) *	1.16 (1.04, 1.30) ***
None/Ryan White	0.93 (0.83, 1.04)	1.00 (0.92, 1.09)	0.94 (0.85, 1.05)
Missing	0.68 (0.54, 0.86) **	0.77 (0.65, 0.92) *	0.74 (0.59, 0.94) **
Initial CD4 Cell Count			
<50	----	----	----
51–200	0.86 (0.80, 0.93) ***	0.89 (0.85, 0.93) ***	0.87 (0.83, 0.91) ***
201–350	0.81 (0.75, 0.87) ***	0.81 (0.76, 0.88) ***	0.83 (0.78, 0.88) ***
351–500	0.77 (0.73, 0.82) ***	0.76 (0.71, 0.81) ***	0.79 (0.72, 0.86) ***
>500	0.73 (0.67, 0.80) ***	0.72 (0.67, 0.78) ***	0.76 (0.71, 0.82) ***

	Mean % of OP time not in > 6 month gap	Mean % Quarters with 1 OP Visit	Mean % Years Met HRSA Criterion
Missing	0.41 (0.33, 0.51) ***	0.45 (0.37, 0.56) ***	0.44 (0.34, 0.57) ***
Year of First Visit			
2001	----	----	----
2002	1.05 (0.97, 1.14)	1.07 (0.99, 1.15)	1.05 (0.97, 1.13)
2003	1.18 (1.06, 1.31) **	1.14 (1.05, 1.23) *	1.18 (1.05, 1.32) **
2004	1.19 (1.05, 1.35) **	1.19 (1.09, 1.29) *	1.20 (1.06, 1.37) ***
2005	1.21 (1.11, 1.33) ***	1.18 (1.10, 1.26) **	1.17 (1.07, 1.28) ***
2006	1.30 (1.11, 1.53) **	1.29 (1.16, 1.43) **	1.25 (1.08, 1.46) ***
2007	1.79 (1.55, 2.05) ***	1.68 (1.51, 1.88) ***	1.38 (1.18, 1.60) ***
2008	2.44 (2.08, 2.86) ***	2.19 (1.99, 2.41) ***	1.42 (1.28, 1.57) ***

Note: Cell entries are adjusted odds-ratios with 95% CI.

*
p<0.05;

**
p<0.01;

p< 0.001