Published in final edited form as:

J Acquir Immune Defic Syndr. 2016 August 01; 72(4): 408–415. doi:10.1097/QAI.0000000000000985.

Expenditures for Persons Living with HIV Enrolled in Medicaid, 2006–2010

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Abstract

Background—Costs of care for persons living with HIV (PLWH) have been high historically. Cost estimates based on data from one health care site may underestimate total expenditures; using insurance claims avoids this limitation. We used Medicaid claims data to comprehensively assess payments for care for PLWH between 2006 and 2010.

Methods—Five sites from the HIV Research Network (HIVRN) provided information on patients with Medicaid coverage. Medicaid data were obtained from the sites' states (MD, NY, and MA) and 3 surrounding states and matched to HIVRN medical record-based data. Individuals less than 18, those with Medicare, and those in Medicaid managed care plans were excluded. Medicaid and HIVRN data were compared to ascertain concordance in capturing any inpatient event and any antiretroviral medication (ART) use.

Results—Of 6,892 unique HIVRN identifiers, 6,196 (90%) were linked to Medicaid data. The analytic sample included 11,341 person-years of Medicaid claims data from 3,697 individuals in fee for service (FFS) programs. The mean annual FFS payment for all services was \$47,434; mean annual FFS payment for only medical services was \$38,311. Concordance between Medicaid and HIVRN data was excellent for ART use, but HIVRN data did not record a substantial proportion of years in which Medicaid recorded inpatient use.

Conclusions—Estimated Medicaid payment amounts in this study are higher than **some** prior estimates. More complete capture of expensive inpatient hospitalizations in Medicaid data may

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Disclaimer: The views expressed in this article are those of the authors and do not represent the views or policies of the Agency for Healthcare Research and Quality or the Department of Health and Human Services.

Conflicts of Interest: The authors have no conflicts of interest to report.

List of Supplemental Digital Content
Medicaid Supplemental Table 1. DOCX

partially explain this finding. While inpatient care and ART medications contribute the most, expenditures for non-medical services are substantial.

The Medicaid program funds a substantial proportion of care for persons living with HIV infection (PLWH). [1] A national surveillance study estimated that 39% of people receiving care for HIV infection in 2010 were Medicaid beneficiaries. [2] Among patients receiving care at 11 large urban HIV clinics between 2006–2012, 36.7% were covered by Medicaid. [3] With the advent of the Affordable Care Act (ACA) and the expansion of the Medicaid program in some states, Medicaid's role in funding HIV care may grow. There are little recent data on Medicaid expenditures at the level of the individual patient, on variations in Medicaid expenditures as a function of demographic and clinical variables, and on expenditures by type of service.

Several estimates of the costs of providing medical care to persons living with HIV infection (PLWH) have been reported. Gebo et al estimated that annual costs in 2006 ranged from \$16,614 to \$40,678, depending on stage of infection. [4] Schackman et al. updated these estimates to 2009, reporting estimated annual costs of \$19,682 to \$48,217, depending on CD4 level and demographic characteristics. [5] These studies used data from service providers' records and did not have direct data on expenditures. "Unit costs" for different types of service were developed and applied to utilization data abstracted from service providers' records. One limitation of this approach is that the estimated unit costs may not correspond to actual expenditures. Another limitation is that provider records may not capture all service utilization, especially if the patient sees multiple providers. Finally, cost estimates based on service utilization patterns of patients with coverage other than Medicaid may differ from costs based on utilization patterns of Medicaid beneficiaries; an overall cost estimate may obscure such differences.

Insurance claims databases offer an alternative to using provider data to estimate expenditures for health care. [6] Claims data can, in principle, reflect all relevant service utilization by a beneficiary, not just utilization at one care provider. Payments for services received may be closer to economic costs than "unit costs" derived from other data sources. One limitation of claims data, however, is that they contain minimal clinical information. Identification of PLWH in Medicaid data or other insurance databases is often based on diagnostic codes, raising the possibility of false negative and false positive identifications. HIV disease staging, using results of CD4 and viral load tests, is difficult because such test results are typically not available in claims databases.

The current study takes advantage of a unique opportunity to estimate Medicaid payments for PLWH, using medical record data linked to Medicaid claims data from 2006–2010 for individual patients receiving care for HIV. We use these linked data to estimate health care payments by stage of HIV disease and for different types of service, including support services often excluded from cost-of-HIV-care calculations. We also compare inpatient utilization and use of antiretroviral (ART) medication reported in Medicaid to that recorded in medical records to gauge the extent to which records from a single provider capture the full extent of service utilization for PLWH.

Methods

The HIV Research Network (HIVRN) is a consortium of clinics that provide primary and subspecialty care to HIV patients. [7] Each site abstracts clinical and demographic data from medical records of patients receiving care for HIV infection. Data are abstracted annually and sent to a data coordinating center after removing personal identifying information. Each patient is assigned an encrypted study ID, which is consistent from year to year. After quality control and verification, data are combined across sites to produce a uniform database. Patients attending HIVRN sites for limited consults and known to be receiving primary care elsewhere are excluded from the database. The study was approved by Institutional Review Boards at the Johns Hopkins School of Medicine and at each participating site.

For the current study, a subset of five HIVRN sites participated; three treated adult (age 18) patients, and 2 treated pediatric patients. Sites treating adults were located in MA, MD, and NY; pediatric sites were in MD and NY. Pediatric sites treated patients past their 18th birthday. Sites provided medical record data encompassing the period from January 1, 2006 through December 31, 2010.

HIVRN patients who had Medicaid insurance recorded for any outpatient primary HIV clinic visit, inpatient admission, or ED visit between 2006–2010 were identified; encrypted HIVRN IDs were sent to the participating sites and linked with patients' social security numbers; SSNs were sent to the Centers for Medicare and Medicaid Services (CMS). CMS identified Medicaid records for the submitted SSNs in the state in which the site was located, and for three adjacent states for each site. 6,892 unique HIVRN IDs were submitted; 6,196 (90%) were matched to data from the Medicaid Analytic Extract (MAX) files for 2006–2010 (the most recent year for which data were available at the time of the data request). MAX data provide enrollment, eligibility, and payment data for individual Medicaid beneficiaries on a calendar year basis. [8,9] After removing identifying information, MAX data were merged with HIVRN data.

Variables

Demographic and clinical variables (age, gender, race/ethnicity, HIV transmission risk, CD4 level) were based on HIVRN data. Age was calculated as of January 1 of each year, categorized as 18–35, 36–49, and 50 years old. Self-reported race/ethnicity was categorized as non-Hispanic white, non-Hispanic black, Hispanic, and other/unknown. Self-reported HIV transmission risk behavior was categorized as men who had sex with men (MSM), heterosexual contact (HET), injection drug use (IDU, including those with a combination of HET and IDU), both MSM and IDU (MSI), and other/unknown. CD4 level was based on results of the first reported test in each calendar year and stratified as 200, 201–500, and >500 cells/mm³. Some persons had Medicaid coverage in a given year but had not yet enrolled at the HIVRN clinic (n=1,854) or were enrolled but did not receive clinical care from the HIVRN site during the year (n=2,010). Observations for such person-years were retained in analyses, with CD4 test results categorized as “not available”.

Antiretroviral medications were identified in the MAX data on the basis of National Drug Codes (NDC). Annual payments for ART drugs and for non-ART drugs were calculated separately for each person-year.

The MAX data include annual fee-for-service (FFS) payments for 30 different types of service. FFS payments in 2006–2009 were inflation-adjusted to 2010 prices using the Gross Domestic Product price index. [10] Inflation-adjusted payments were annualized for those person-years in which the beneficiary did not have a full year of Medicaid eligibility. However, payments for inpatient hospitalizations, residential care, and nursing facility services were not annualized; annualization may be an unwarranted extrapolation for such episodic services. Annualization was not performed in years in which a person died (n=243).

Exclusions

The person-year was the unit of analysis. Analyses excluded person-years (PY) in which the patient was aged less than 18 (n=955). Due to small numbers, 266 PY for transgendered patients were also excluded. To ensure that the link between Medicaid and HIVRN data was accurate, all records for an individual were excluded if there was an age discrepancy of 5 years between Medicaid and HIVRN data (n=92 PY) or if there was more than one PY for an individual with a gender discrepancy between Medicaid and HIVRN (n=157 PY). In addition, PY were excluded if Medicaid eligibility data were missing (n=98), if the PY occurred after the year of death (n=39), or if there were multiple records for the same person in the same state and year (n=354).

Medicaid utilization and payment data may be incomplete for patients who are also enrolled in Medicare, for those enrolled in comprehensive managed care plans (CMCP), or for those with restricted Medicaid benefits. Thus, analyses focused on Medicaid beneficiaries who were enrolled only in fee-for-service (FFS) plans during a year. To maximize the probability of complete capture of expenditures, analyses excluded PY with one or more months of Medicare eligibility (n=3,254), restricted benefits (n=267), or enrollment in a CMCP (n=8,863). Thus, analyses are limited to beneficiaries enrolled in FFS Medicaid programs throughout their enrollment period in a year. Finally, to ensure a minimally sufficient observation period, PY were excluded if the number of days eligible for Medicaid in the year were 30 (n=96).

Statistical Analyses

Analyses examined FFS Medicaid payments, both overall and by type of service. One summary payment variable was the total annual payment across all types of service (Total Payment). For comparison with prior analyses, which examined medical care and excluded other supportive services, we also examined combined payments specifically for inpatient, physician, hospital outpatient, laboratory/x-ray, and prescription medications (Medical Payment). Additional analyses calculated mean annual payments for each specific type of service specified in the MAX data, excluding those services used in fewer than 1% of PY. (Payments for such services were included in total payments.)

We examined unadjusted mean total and medical payments by demographic and clinical characteristics. We conducted regression analyses for these variables using a generalized

linear model with a gamma distribution and a log link; this approach has been recommended for analyses of expenditure data, which are often highly skewed. [11,12] Robust standard errors clustered on patient were used to accommodate multiple observations for the same individual. All variables in the model were entered simultaneously. Because the coefficients from such models are difficult to interpret, we also calculated average predicted payments based on these regression models.

To gauge the completeness of the HIVRN data, we focused on inpatient episodes and ART medications. We excluded PY that preceded HIVRN enrollment or years after enrollment in which the person was not in care (i.e., did not have an outpatient visit or CD4 measurement reported in the HIVRN data in that year). We compared reports of any inpatient episode in a PY in the MAX (inpatient discharge count) to HIVRN data. We also compared any prescribed ART in the HIVRN data with any FFS ART payment in the MAX data.

Results

There were 25,785 PY records overall. After implementing exclusions, 11,341 PY records remained for analysis, comprising 3,695 individuals in FFS Medicaid programs. Because individuals could enroll in or disenroll from Medicaid at different times, the number of person-years varied. Overall, 26% of persons contributed 5 years of data, 17% 4 years, 18% 3 years, 18% 2 years, and 22% 1 year. (Results not shown.) Within a PY, the number of days enrolled in Medicaid was over 360 for 74% of PY (mean=322 day; **median = 365 days**). The majority of PY came from adult treatment sites; only 73 PY (<1%) were from adult patients at pediatric sites.

Table 1 compares the composition of PY in FFS Medicaid programs with those of other coverage types, after implementing other exclusion criteria. The distributions of gender, age, and CD4 category were broadly similar, but FFS programs had higher proportions of Hispanic and MSM beneficiaries and lower proportions of Black and IDU beneficiaries. FFS data also had lower proportions of data from 2009 and 2010. The distributions differed greatly by state, with the majority of FFS data coming from New York. Maryland has managed care for most PLWH in Medicaid, and only 8% of PY in Maryland fell into the FFS category.

Annual Medicaid FFS Payments

For the full analytic sample, the mean total Medicaid FFS payment per year was \$47,434 [95% CI: \$46,395–\$48,474]. For only medical services, the mean payment was \$38,311 [\$37,487–\$39,136]. Payments varied considerably by CD4 stratum. Total annual payments ranged from \$36,377 [\$34,803–\$37,951] for those with CD4>500 cells/mm³ to \$65,967 [\$62,782–\$69,152] for those with CD4<200 cells/mm³. Similarly, annual medical payments ranged from \$30,336 [\$29,093–\$31,578] to \$54,245 [\$51,609–\$56,881] for these two groups.

Table 2 reports mean (unadjusted) Medicaid payments (total and medical) as a function of demographic and clinical variables; Table 3 presents results of multivariate regression analyses. Total and medical payments showed similar patterns of variation. The adjusted

gender difference was not statistically significant. Differences by racial/ethnic category were significant, with Hispanic patients' payments lower than Black patients' payments ($p<0.01$). Payments for white patients did not differ significantly from those for Black or Hispanic patients. Effects of all other variables were statistically significant in both analyses. Both total and medical payments were higher for older patients and for those with more advanced HIV disease. Payments were also higher for patients with IDU or HET risk factors, compared to MSM patients. Payments were higher in 2010 than in 2006, and were lower in MA compared with NY. Supplemental Digital Content 1 shows mean payments based on predictions from the regression analyses.

Payments by Type of Service

Table 4 shows mean Medicaid FFS payments per year by each type of service. Non-users of a service in a PY were included, with a zero payment, when calculating mean payments. Inpatient care (\$14,355 [13,664–15,045]) and ART medications (\$14,114 [\$13,896–\$14,332]) were the most expensive service types. Non-ART medications (\$4,987 [\$4,791–\$5,183]) and outpatient services (\$4,127 [4,027–4,228]) were the next highest payment classes, but notably lower than the first two. Psychiatric care was used in one-third of PY (\$1,309 [\$1,253–\$1,366]). Payments for nursing facility services (\$3,953 [\$3,573–\$4,333]) and home health care (\$1,398 [\$1,232–\$1,563]) were also substantial, although only a minority of patients used these services. Although laboratory and x-ray services were used in a majority of PY, the average payment was \$728 [\$701–\$756].

Concordance of Inpatient and ART Use between Medicaid and HIVRN Data

Table 5 presents information on the concordance between Medicaid and HIVRN data for the two most expensive types of service: inpatient care and ART medications. For each service type, the table shows counts of PY for the four combinations of HIVRN (service use yes/no) by MAX (yes/no) for PY in which the person was in care in the HIVRN. Analyses were performed on two non-overlapping samples: the FFS sample used in previous analyses, and PY covered by a comprehensive managed care plan (CMCP). The latter were examined because CMCP enrollees may be constrained to use specific inpatient providers, which may result in greater capture of inpatient use in HIVRN records.

For PY in which FFS Medicaid showed inpatient use and the patient was in care in the HIVRN ($n=2,018$), HIVRN data recorded inpatient use in 931 instances (46.1%). For CMCP PY ($n=1,984$) with any inpatient use, 1,177 years (59.3%) were recorded in HIVRN data. Thus, on a simple yes/no basis, HIVRN data did not capture a large proportion of years with some inpatient use according to Medicaid.

We also examined numbers of inpatient admissions and numbers of inpatient days in the FFS MAX and HIVRN data, summing over PY in which the patient was in care in the HIVRN. A total of 5,526 discharges were reported in the MAX data, versus 2,451 for the same PY in the HIVRN. A total of 27,483 inpatient days were reported in MAX, versus 15,180 days for the same PY in the HIVRN data. (Results not shown.)

The lower panels of Table 5 present a similar analysis for any recorded ART in a PY. Some discordance between the two data sets is inevitable, as MAX reports payments for ART

medications, while the HIVRN data report an ART prescription, which may not be filled. In years in which FFS Medicaid shows payment for an ART medication and in which the patient is in care at the HIVRN site, the HIVRN data show an ART prescription in 95% of these instances (5,925/6,227). The analogous result for CMCP PY is 97% (3,437/3,547).

Discussion

Using Medicaid Analytic Extract data linked to data from medical records at five clinical sites, this study reveals high annual FFS Medicaid payments for patients with HIV infection. Average annual FFS payments were \$47,434 for all services (medical and supportive), and were \$38,311 for specifically medical services, excluding psychiatric care. As in prior research, [4,5] payments were higher for patients with more advanced HIV disease; payments for patients with CD4 < 200 cells/mm³ were over 1.5 times higher than for patients with CD4 > 500 cells/mm³.

Medicaid payment estimates in this study are higher than in prior research. [4,5] The current estimate of \$38,311 for medical payments is nearly twice as high as Gebo et al.'s annual medical cost estimate of \$19,912. [4] There are several differences between these studies: Gebo et al. used HIVRN utilization data from 2006 (not 2007–2010) and estimates of unit costs for services (not payments); their estimate included patients with all forms of coverage, not just Medicaid. HIV-infected Medicaid enrollees may have a larger burden of comorbidity relative to those with other forms of health insurance, leading to higher expenditures.

A study by Schackman et al. [5] used methodology similar to Gebo et al., updating unit costs and HIVRN utilization data to 2009. Their results showed an overall estimated annual cost of \$25,044; among the subgroup with Medicaid coverage, the estimated annual cost was \$26,444. By contrast, the mean Medicaid payment for medical care in 2009, without inflation adjustment, was \$38,654 in the current study. The Schackman et al. estimates excluded costs for prescription medications whose dosing was irregular or difficult to estimate (such as drugs applied topically, antibiotics, injectables, and analgesics) as well as costs for laboratory or imaging tests other than CD4 and viral load. However, a major difference arises from higher inpatient expenditures in the current study. If inpatient expenditures are excluded, the 2009 HIVRN estimate for Medicaid patients (\$20,418) is closer to the 2009 estimate from MAX data (\$25,471). Specifically, the 2009 HIVRN estimate for ART costs among Medicaid patients (\$15,021) is virtually identical to the 2009 estimate, without inflation adjustment, from MAX data (\$15,830). (Results not shown) One implication is that estimates of the cost savings of preventing a case of HIV infection may be greater than previously estimated. [5]

Comparison of MAX and HIVRN data suggests that medical record data from a single provider may not capture a significant proportion of inpatient episodes. Inspection of individual inpatient claims revealed that patients were often admitted to other hospitals in the same city as the HIVRN site. Other HIV cohorts may have similar issues. Moreover, admissions that occur during a gap in outpatient visits may not be recorded. If inpatient care is the focus of study, or if the focus is on overall medical expenditures and the patient

population has above average rates of inpatient use, using data from one provider may require some adjustment for possible underestimates.

Other studies used Medicaid data to assess Medicaid spending on HIV care. Kates reported mean per capita Medicaid spending in 2007 of \$24,867, but this estimate apparently included enrollees in managed care plans and those with Medicare coverage, which could lower the overall mean. [1] Leibowitz and Desmond, analyzing 2007 Medicaid data from California, also limited analyses to those in Medicaid FFS care and excluded those in managed care plans or those enrolled in Medicare. [13] They estimated per capita FFS Medicaid expenditures for medical and pharmaceutical claims to be \$36,469. In the current study, the mean Medicaid FFS payment for medical care in 2007, without inflation adjustment, was comparable: \$34,318 (n=2,543). It is not clear which specific services Leibowitz and Desmond included as “medical” (e.g., psychiatric). The total FFS expenditure in 2007 in the present study, without inflation adjustment, was \$42,881.

Our results show that nearly \$10,000 per capita is spent on non-medical services annually, especially for nursing facilities, home health care, and adult day care. Non-medical services accounted for 19% of total payments. Kates similarly found that long-term care services comprised 17% of Medicaid spending for HIV-positive enrollees in 2007. [1] Given that only 8% of PY had a payment for nursing facility, the \$3,953 mean payment attests to the high expense of nursing care.

Psychiatric services have been omitted from prior estimates of HIV care expenditures. A payment for psychiatric services occurred in one third of PY, with a relatively high mean annual expenditure (\$1,309). Future research should examine use of psychiatric services among PLWH more closely.

Limitations

The Medicaid data used in this study are primarily from three states in the Northeast: NY, MA, and MD. These data are not nationally representative of all Medicaid programs. Regional differences in utilization patterns may give rise to different levels of expenditure in different states. For example, it has long been observed that rates of hospitalization are lower, and inpatient lengths of stay are shorter, in Western states compared with states in the Northeast. [14,15] Prices for the same services may also vary from state to state. In addition, data from beneficiaries in FFS Medicaid programs may not reflect utilization patterns among beneficiaries in managed care programs. Indeed, in MD, the data may not represent the majority of Medicaid beneficiaries with HIV, who are predominantly in managed care programs. Ultimately, most of the data used in these analyses came from NY, which spends more per Medicaid beneficiary than most other states: \$39,104 in 2011. [16] To the extent that NY offers a wider array of covered services than other states, or that prices for services are higher in NY, the expenditure estimates in this study could be considered an upper bound. Research using data from a larger set of states could shed light on this issue.

Conclusions

The present study demonstrates the utility of linking claims data with medical record data, obtaining estimates of annual FFS Medicaid payments higher than in prior studies. Claims data potentially provide more comprehensive capture of expenditures, especially for inpatient care, than records from one service provider site. Moreover, Medicaid data record actual payments and avoid the necessity of estimating unit costs. On the other hand, the fact that many, if not most, HIV patients in some states are enrolled in managed care limits the use of Medicaid data for expenditure estimation, and Medicaid data will not capture utilization and payments for periods in which a person is not enrolled. Linked claims and clinical data can overcome limitations of each data source.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors thank Ank Nijhawan, M.D., at Parkland Health and Hospital System, for thoughtful comments on a previous draft of this manuscript.

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Sponsoring Agencies

Agency for Healthcare Research and Quality, Rockville, Maryland (Fred Hellinger, Ph.D., John Fleishman, Ph.D.)

Health Resources and Services Administration, Rockville, Maryland (Robert Mills, Ph.D.)

Data Coordinating Center

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Sponsorship:

Supported by the Agency for Healthcare Research and Quality (HHS290201100007C), the Health Resources and Services Administration (HHS250201200008C), the National Institutes of Health (U01 DA036945, P30 AI094189), and the Clinical Investigation and Biostatistics Core of the UC San Diego Center for AIDS Research (AI036214).

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Table 1

Comparison of Fee-for-Service (FFS) and non-FFS Person Years

Variable	FFS N=11,341	non-FFS n=12,386
State		
MA	12.5%	7.7%
MD	5.0	54.8
NY	81.7	35.6
Other/multiple	1.0	1.9
Gender		
Female	30.5	37.7
Male	69.5	62.3
Race/Ethnicity (from HIVRN)		
White	18.3	16.5
Black	49.5	68.7
Hispanic	30.6	13.5
Other	1.2	1.0
Missing	0.4	0.3
HIV Transmission Category (from HIVRN)		
MSM	30.6	24.9
IDU	23.6	31.5
HET	39.4	35.7
MSI	1.7	2.1
VRT	3.5	3.7
Other/unknown	1.2	2.0
Age (from HIVRN)		
18–35	17.0	20.1
36–49	56.1	50.7
50+	26.9	29.2
CD4 category (first recorded value in year)		
200	14.7	16.3
201–499	29.2	29.6
500	22.6	22.7
N/A	33.5	31.4
Year		
2006	21.9	16.6
2007	22.4	16.7
2008	21.4	19.0
2009	19.0	22.3
2010	15.3	25.3

Table 2

Fee-For-Service Sample Description and Annual Medicaid Payments (Total and Medical)

Variable	N (%)	Total Payment Mean (95% CI) [†]	Medical Payment Mean (95% CI) [‡]
Total	11,341 (100)	47,434 (46,395 – 48,474)	38,311 (37,487 – 39,134)
Gender			
Male	7,877 (69.5)	44,444 (43,273 – 45,616)	36,582 (35,646 – 37,517)
Female	3,464 (30.5)	54,234 (52,133 – 56,336)	42,245 (40,591 – 43,898)
Race/Ethnicity			
White	2,070 (18.3)	34,725 (32,919 – 36,532)	28,789 (27,487 – 30,091)
Black	5,618 (49.5)	52,847 (51,163 – 54,531)	42,437 (41,078 – 43,796)
Hispanic	3,468 (30.6)	47,281 (45,647 – 48,915)	38,142 (36,853 – 39,431)
Other	141 (1.2)	31,809 (23,941 – 39,678)	24,985 (19,829 – 30,140)
Unknown/Missing	44 (0.4)	17,471 (9,811 – 23,130)	15,618 (9,370 – 21,867)
HIV Risk			
MSM	3,473 (30.6)	31,492 (30,214 – 32,770)	27,790 (26,755 – 28,825)
IDU	2,676 (23.6)	61,422 (58,990 – 63,853)	47,083 (45,145 – 49,021)
HET	4,466 (39.4)	50,524 (48,804 – 52,244)	40,511 (39,164 – 41,859)
MSM+IDU	198 (1.8)	45,116 (38,235 – 51,998)	34,272 (29,287 – 39,257)
Other/Unknown	398 (3.5)	60,394 (53,173 – 67,616)	48,980 (42,630 – 55,330)
VRT	130 (1.2)	43,141 (31,837 – 54,446)	36,769 (27,315 – 46,223)
Age Category on Jan 1			
18–35	1,929 (17.0)	29,671 (27,681 – 31,661)	25,467 (23,854 – 27,081)
36–49	6,358 (56.1)	48,157 (46,782 – 49,532)	39,317 (38,206 – 40,429)
50 or older	3,054 (26.9)	57,151 (54,966 – 59,335)	44,329 (42,655 – 46,003)
CD4 Category			
<200	1,662 (14.7)	65,967 (62,782 – 69,152)	54,245 (51,609 – 56,881)
201–499	3,310 (29.2)	43,877 (42,263 – 45,491)	36,644 (35,328 – 37,961)
500	2,565 (22.6)	36,377 (34,803 – 37,951)	30,336 (29,093 – 31,578)
N/A	3,804 (33.5)	49,890 (47,810 – 51,970)	38,179 (36,584 – 39,773)
State			
MA	1,421 (12.5)	21,066 (19,751 – 22,381)	19,588 (18,485 – 20,691)
MD	564 (5.0)	55,615 (48,903 – 62,327)	35,956 (30,808 – 41,105)
NY	9,273 (81.7)	51,060 (49,897 – 52,224)	41,365 (40,438 – 42,292)
Other/multiple	83 (0.7)	38,201 (29,524 – 46,878)	33,705 (25,969 – 41,440)
Year			
2006	2,486 (21.9)	46,894 (44,559 – 49,229)	37,975 (36,101 – 39,849)
2007	2,543 (22.4)	44,605 (42,458 – 46,752)	35,697 (34,006 – 37,388)
2008	2,423 (21.4)	46,256 (44,080 – 48,431)	37,842 (36,076 – 39,609)
2009	2,152 (19.0)	48,726 (46,333 – 51,120)	39,138 (37,286 – 40,989)
2010	1,737 (15.3)	52,396 (49,755 – 55,037)	42,252 (40,187 – 44,317)
Days Eligible for Medicaid			
31 – 60	265 (2.3)	15,997 (12,057 – 19,936)	15,366 (11,465 – 19,267)

Variable	N (%)	Total Payment Mean (95% CI) [†]	Medical Payment Mean (95% CI) [‡]
61 – 120	517 (4.6)	21,682 (18,816 – 24,547)	19,554 (16,882 – 22,226)
121 – 180	458 (4.0)	30,855 (26,901 – 34,810)	27,741 (24,179 – 31,304)
181 – 240	492 (4.3)	32,356 (28,307 – 36,406)	28,565 (25,011 – 32,118)
241 – 300	510 (4.5)	38,930 (34,584 – 43,276)	32,208 (28,958 – 35,458)
301 – 360	762 (6.7)	40,239 (36,203 – 44,276)	34,774 (31,404 – 38,144)
361 – 365/366	8,337 (73.5)	53,009 (51,753 – 54,266)	42,057 (41,073 – 43,040)

Note: MSM: Men who have sex with men; IDU: injection drug use (includes combination of IDU and heterosexual transmission); HET: heterosexual transmission; VRT: vertical transmission. N/A: CD4 test not available as patient not enrolled in HIVRN clinic.

[†] Mean total Medicaid payment (USD) per year, including both medical and non-medical services (e.g., transportation, adult day care). Payments have been inflation adjusted to 2010 dollars.

[‡] Mean Medicaid payment (USD) per year for medical services (inpatient, physician, hospital outpatient, clinic, lab/x-ray, medications). Payments have been inflation adjusted to 2010 dollars.

Table 3

Regression Analysis of Annual FFS Medicaid Payments (Total and Medical)

Variable	Total Payment	Medical Payment
Male	-0.08 (-0.16, 0.01)	-0.03 (-0.11, 0.04)
Female (Reference)	-----	-----
Race/Ethnicity		
White (Reference)	-----	-----
Black	0.05 (-0.05, 0.14)	0.07 (-0.02, 0.15)
Hispanic	-0.04 (-0.13, 0.05)	-0.03 (-0.12, 0.05)
Other	-0.21 (-0.49, 0.07)	-0.25 (-0.46, -0.05) *
Unknown/Missing	-0.60 (-1.31, 0.11)	-0.55 (-1.23, 0.12)
HIV Risk		
MSM (reference)	-----	-----
IDU	0.36 (0.27, 0.45) ***	0.29 (0.20, 0.38) ***
HET	0.20 (0.11, 0.30) ***	0.16 (0.07, 0.25) ***
MSM+IDU	0.16 (-0.05, 0.36)	0.07 (-0.11, 0.25)
Other/Unknown	0.42 (0.22, 0.61) ***	0.40 (0.19, 0.61) ***
VRT	0.28 (-0.06, 0.63)	0.38 (0.05, 0.70) *
Age Category on Jan 1		
18-35 (reference)	-----	-----
36-49	0.36 (0.26, 0.46) ***	0.34 (0.24, 0.43) ***
50 or older	0.48 (0.36, 0.59) ***	0.41 (0.30, 0.51) ***
CD4 Category		
<200 (Reference)	-----	-----
201-499	-0.37 (-0.44, -0.30) ***	-0.35 (-0.42, -0.29) ***
500	-0.49 (-0.58, -0.41) ***	-0.49 (-0.57, -0.41) ***
N/A	-0.30 (-0.37, -0.22) ***	-0.37 (-0.44, -0.30) ***
State		
MA	-0.58 (-0.68, -0.48) ***	-0.50 (-0.59, -0.40) ***
MD	-0.04 (-0.22, 0.15)	-0.29 (-0.47, -0.12) **
NY (Reference)	-----	-----
Other/multiple	-0.22 (-0.51, 0.08)	-0.11 (-0.41, 0.18)
Year		
2006 (Reference)	-----	-----
2007	-0.05 (-0.10, -0.01) *	-0.06 (-0.11, -0.01) *
2008	-0.02 (-0.08, 0.03)	-0.01 (-0.07, 0.04)
2009	0.05 (-0.01, 0.10)	0.05 (-0.01, 0.10)
2010	0.16 (0.10, 0.22) ***	0.17 (0.11, 0.23) ***
Intercept	10.60	10.45

Note: Entries are coefficients (95% CI) from generalized linear model analyses, using a log link and gamma-distributed errors.

*
P<0.05;

**
P<.01,

P<.001

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Table 4**Mean Annual FFS Medicaid Payments for Specific Services**

Type of Service	Percentage with Payment >0	Mean Payment (95% CI)[†]
Outpatient Visit	92.8	4,127 (4,027 – 4,228)
Physician	66.0	385 (361 – 409)
Hospital Outpatient	85.4	3,124 (3,044 – 3,204)
Clinic	34.9	618 (573 – 663)
Inpatient	34.9	14,355 (13,664 – 15,045)
ART Medications	77.0	14,114 (13,896 – 14,332)
Other medications	90.6	4,987 (4,791 – 5,183)
Lab/x-ray	82.4	728 (701 – 756)
Dental	36.8	284 (269 – 299)
Psychiatric	33.5	1,309 (1,253 – 1,366)
Nurse Practitioner	3.9	5 (4 – 6)
Nursing Facility	8.2	3,953 (3,573 – 4,333)
Home Health	10.0	1,398 (1,232 – 1,563)
DME	33.3	161 (149 – 173)
Transportation	20.1	225 (203 – 247)
Personal care	2.6	498 (412 – 583)
Rehabilitation	2.8	78 (59 – 97)
Adult Day Care	6.2	727 (649 – 805)
Other Practitioners	7.7	6 (5 – 7)
Other Services	36.3	340 (293 – 388)

[†]Payments have been inflation adjusted to 2010 dollars and annualized. Mean payments include zero payments for non-users of service.

Outpatient visits include physician, hospital outpatient, and clinic.

Table 5

Comparison of Inpatient and ART Use in HIVRN and Medicaid Data, among PY in care in the HIVRN

		Any Inpatient Episode	
		HIVRN	
		No	Yes
Medicaid FFS	No	5,131 (68.8%)	311 (4.2%)
	Yes	1,087 (14.6%)	931 (12.5%)
Medicaid CMCP	No	3,281 (61.2%)	95 (1.8%)
	Yes	807 (15.1%)	1,177 (22.0%)
		Any ART use	
		HIVRN	
		No	Yes
Medicaid FFS	No	940 (12.6%)	290 (3.9%)
	Yes	302 (4.1%)	5,925 (79.5%)
Medicaid CMCP	No	747 (13.9%)	1,176 (21.9%)
	Yes	110 (2.1%)	3,437 (62.1%)

Note: In each 2-by-2 table, cell percentages are reported. N for Medicaid FFS = 7,457; N for CMCP = 5,360. "In care" requires one ambulatory HIV clinic visit and one CD4 test in the calendar year.