

Costs of Care for HIV Infection in a Managed Care Population From 1995 to 1997

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Abstract

Objective: To determine costs of drug and non-drug treatment of HIV-infected patients during introduction of protease inhibitors and combination therapy.

Study Design: Longitudinal, observational study of insurance claims data.

Patients and Methods: Data from managed care organizations in Texas and California contracting with an HIV case management group were reviewed for all non-Medicaid/non-MediCal adults infected with HIV for costs of drugs and nondrug treatment per HIV-infected member per month from January 1995 to December 1997. Costs of care for patients with and without undetectable viral loads (<400 copies/mL) were quantified.

Results: Per HIV-infected member, average monthly drug costs increased, nondrug costs decreased, and total costs remained stable. Quarterly mortality rates decreased from 4.8% to 0.25%. From the first quarter of 1996 to the last quarter of 1997, the proportion of patients with undetectable viral loads increased from 6% to 56%.

Increasing drug costs and decreasing nondrug costs were observed in patients with and without undetectable viral loads, but costs were higher for the latter: after the second quarter of 1996, drug costs were \$67 to \$277 higher for patients without undetectable viral loads, nondrug costs were \$185 to \$741 higher, and total costs were \$333 to \$808 higher.

Conclusions: Reduced mortality rates and increased viral suppression to undetectable levels were observed during introduction of protease inhibitors and combination therapy in this MCO setting. Increased average monthly drug costs per HIV-infected patient were offset by decreased average monthly nondrug costs, and both costs were lower when patients achieved undetectable viral loads.

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In 1995 and 1996 we saw landmark changes in therapy for HIV infection. Until late in 1995, the accepted standard of care for HIV-infected adults was antiretroviral monotherapy with nucleoside analog reverse transcriptase inhibitors. In September 1995, initial results from the ACTG 175¹ and Delta² trials showed improved patient outcomes associated with use of combinations of nucleoside analogs. Studies³⁻⁶ of the clinical benefit of combinations of nucleoside analogs and HIV-1 protease inhibitors were published soon thereafter, in January 1996. HIV-1 protease inhibitors were first marketed in December 1995 and became widely available early in 1996. Subsequent recommendations and guidelines for treatment of HIV incorporated combination antiretroviral drug therapy with nucleoside analogs and protease inhibitors as the new standard of care.⁷⁻⁹

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There is some published evidence of an increase in the use of combination therapy with protease inhibitors. For example, expenditures on antiretroviral agents escalated in 1996 at St. Vincent's Hospital and Medical Center in New York, NY.¹⁰ In a recent study¹¹ of the use of antiretroviral drug therapy in HIV infection, about half of the patients were prescribed protease inhibitors. Although a causal relationship cannot be proven by data on trends, the increased use of protease inhibitor regimens coincided with a 23% decline in AIDS-related mortality in 1996 in the United States, the first such decline in the history of the epidemic.¹² A similar dramatic decline in mortality and other patient-related events coincidental with the introduction of combination therapy in 1996 was reported in an observational study of AIDS in Scotland.¹³ In France, an observational study¹⁴ assessed the impact of the use of protease inhibitors, reporting a decrease in deaths by 46% from September 1995 to October 1996.

The annual cost of drug therapy is approximately \$2300 to \$3500 for a reverse transcriptase inhibitor and \$5400 to \$6900 for a protease inhibitor at currently recommended doses; hence, the cost of combination antiretroviral therapy (ART) can exceed \$10,000 per year.¹⁵ In addition, use of combination therapy may precipitate more laboratory measurement of plasma HIV-1 ribonucleic acid (RNA) levels, adding to the costs of treatment.¹⁶ There is, therefore, a budgetary concern among formulary decision makers in managed care organizations about increasing costs of care for patients with HIV infection with the introduction of new therapy. The extent to which increased antiretroviral drug costs are offset by a decrease in other healthcare costs because of the effectiveness of the treatment has been modeled from clinical trial data,¹⁷ but additional data from actual practice are needed. To address this question, this study examines the costs of care for managed care patients with HIV infection from January 1995 to December 1997.

... METHODS ...

Data Source

The source of data was a proprietary claims database established by Clinical Partners (San Francisco, CA), a national company that provides HIV case management services and data support for managed care organizations. The database contains demographic information and medical, pharmacy, professional, hospital, and home care claims data for

patients infected with HIV. Patients are enrolled in various capitated or noncapitated, preferred provider, Medicaid, and MediCal healthcare plans managed by Clinical Partners in Texas and California.

Study Population and Definitions

This study included non-Medicaid/non-MediCal patients with HIV enrolled in the Texas and California plans who were 18 years or older. Enrollees were classified each quarter as having undetectable viral load if their viral RNA level was <400 copies/mL or as not having undetectable viral load if their viral RNA level was \geq 400 copies/mL (measured by standard polymerase chain reaction assay, which was a widely used assay during the investigation period). If the viral RNA value was unavailable for a quarter and the patient was still enrolled, the value for the previous quarter was used. Approximately 12% of patients required a viral RNA value to be carried forward for 1 quarter (<0.5% required a value to be carried forward \geq 2 consecutive quarters).

Drug costs included the costs of all oral medications. The actual amounts paid on claims were used to estimate costs. If actual amounts were not available, estimates were calculated using the average wholesale drug price less 12%, reflecting actual paid claims across different contractual arrangements. Nondrug costs included hospital, professional, laboratory, and home care services. These categories of care were identified from administrative codes attached to medical claims. The costs of services were determined from the amounts paid on claims for the month in which the charge was incurred or, when actual payments were unavailable (as in the case of capitation), were based on contractual rates of the costs of similar services in those plans. Total costs reflect the sum of the drug and nondrug costs.

Data Analysis

Quarterly mortality rates, number of patients with undetectable viral loads per quarter, mean CD4 laboratory values (for 1996-1997), and average monthly costs were plotted and correlated over time to identify trends. Data were grouped by patient by quarter, with a designation of category based on viral RNA suppression to undetectable levels (ie, if a patient achieved undetectable viral RNA levels in a quarter, he or she was designated as having undetectable viral load). The viral RNA level for a given quarter was determined using the latest value on file at that time. Average CD4 cell counts and average

cost of care per HIV-infected member per month were calculated using the number of enrollees each month as the denominator. Costs were determined by quarter using actual paid amounts and dates of service. Claims were categorized as hospital, professional, laboratory, home care, and oral medications. These categories were based on National Drug Codes for oral medications and a combination of Current Procedural Terminology codes, the Health Care Financing Administration Common Procedure Coding System, and place of service for all other categories.

... RESULTS ...

Patient Demographics

The database contained information on 1425 HIV-positive patients from Texas and California from January 1995 to December 1997. Ninety-five percent of these patients were white men aged 25 to 45 years. There were no known injection drug users. The number of HIV-infected patients enrolled per month was 474 to 723 (Figure 1).

Mortality

Mortality rates declined from 4.8% in the first quarter of 1995 to <1.0% in the third quarter of 1996 and remained <1.0% thereafter (Figure 2). The mortality rate in the fourth quarter of 1997 was 0.25%.

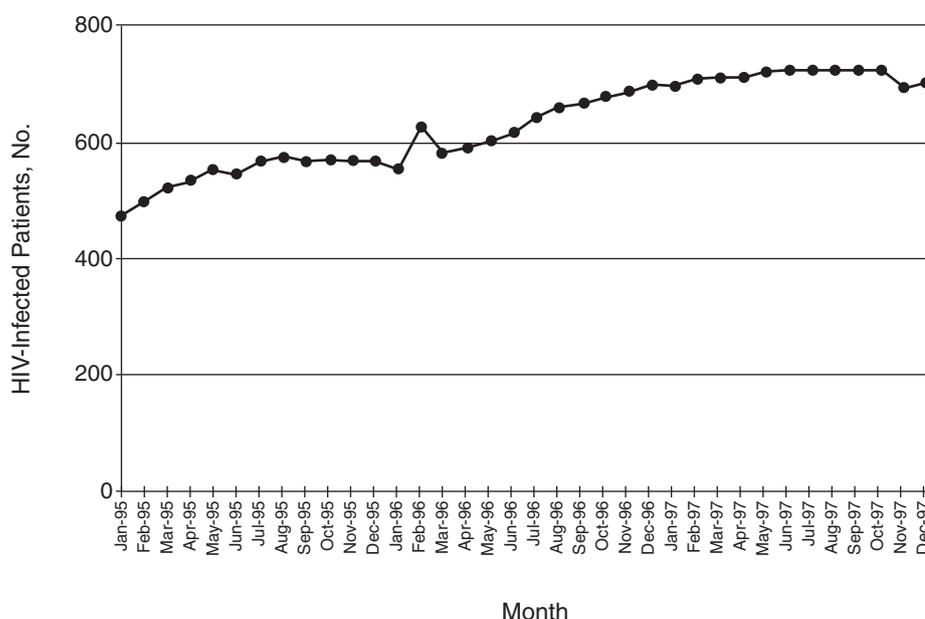
CD4 Cell Counts

Average CD4 cell counts observed for patients were consistently >200 cells/mm³ after January 1996 (Figure 3). For patients without undetectable viral load, average CD4 cell counts were within the 200- to 300-cells/mm³ range. Average CD4 cell counts for patients with undetectable viral load gradually increased over time, but they did not greatly differ from average CD4 cell counts for patients without undetectable viral load.

Costs

Average monthly drug, nondrug, and total costs per HIV-infected member from January 1995 to December 1997 are shown in Figure 4. Average monthly oral drug costs increased continuously from \$226 to \$1081 per patient during this period (correlation coefficient [*r*] = 0.98, *P* < .001), whereas nondrug costs decreased from \$1245 to

Figure 1. Number of HIV-Infected Patients by Month, 1995 to 1997



\$235 ($r = -0.87, P < .001$). Average monthly total costs per HIV-infected member fluctuated but were about the same at the end of the study as they were at the beginning ($r = 0.08, P = .65$), ie, \$1472 per month in January 1995 and \$1316 per month in December 1997, representing a decrease of 10.6%. Average monthly drug costs

increased as a proportion of total costs from 15% in January 1995 to 82% in December 1997.

Costs for Patients With vs Without Undetectable Viral Loads

The proportion of HIV-infected members with undetectable viral loads (viral RNA level <400 copies/mL) increased steadily from 6% in the first quarter of 1996 to 56% in the last quarter of 1997 (Figure 5). From the first quarter of 1996 onward, average monthly drug costs per quarter increased for patients with ($r = 0.91, P = .002$) and without ($r = 0.99, P < .01$) undetectable viral loads, with costs being generally higher for patients without undetectable viral loads

Figure 2. Mortality Rates by Quarter, 1995 to 1997

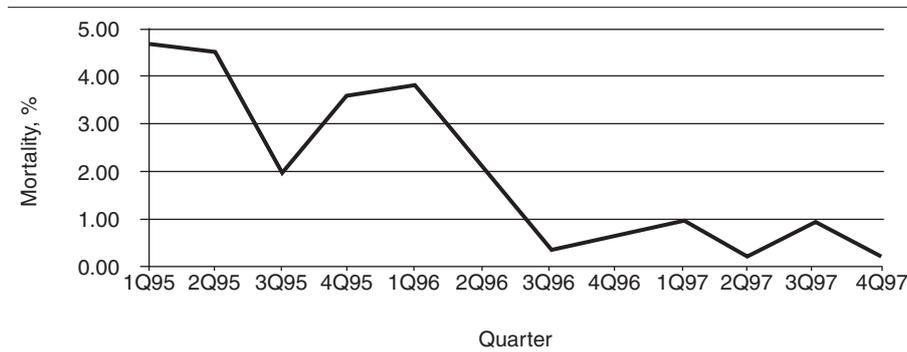


Figure 3. Average CD4 Cell Counts by Quarter, 1996 and 1997

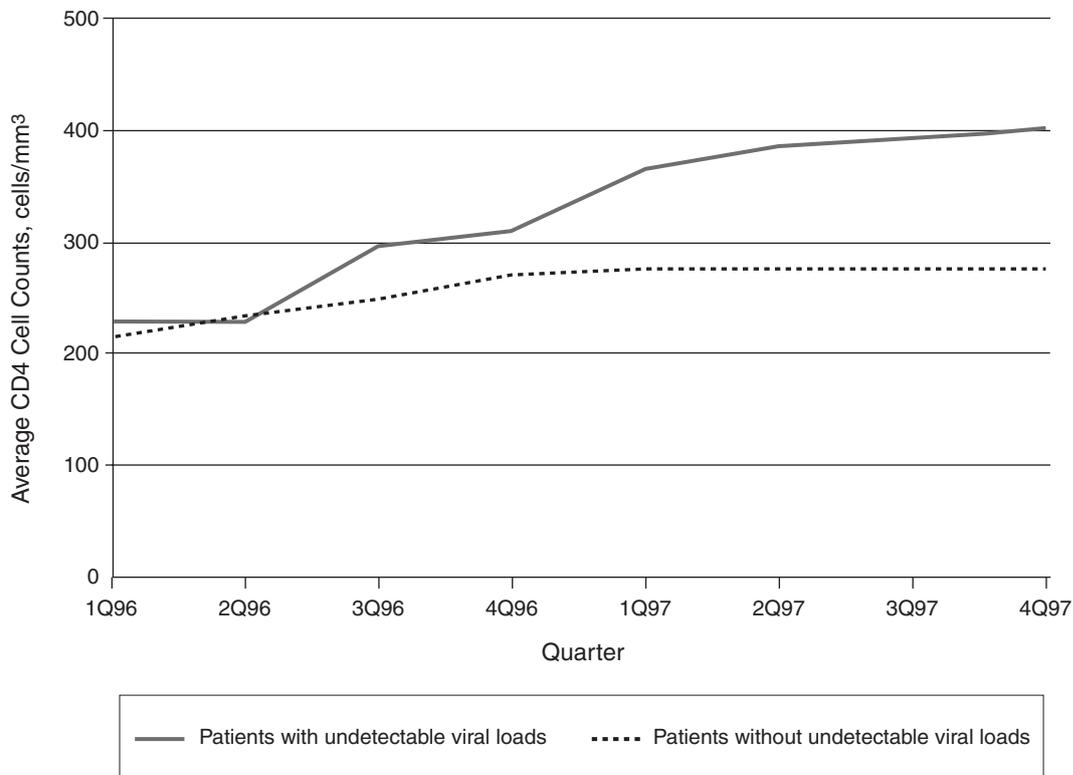


Figure 4. Drug, Nondrug, and Total Costs per Patient by Month, 1995 to 1997

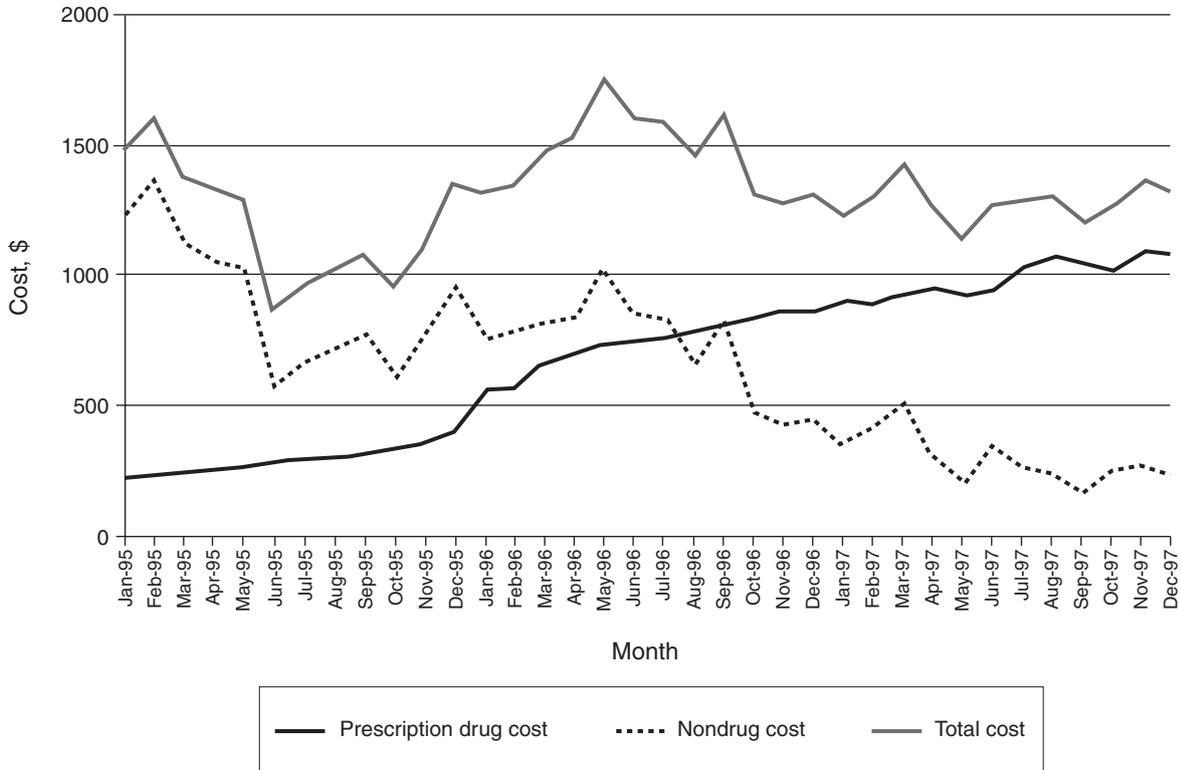
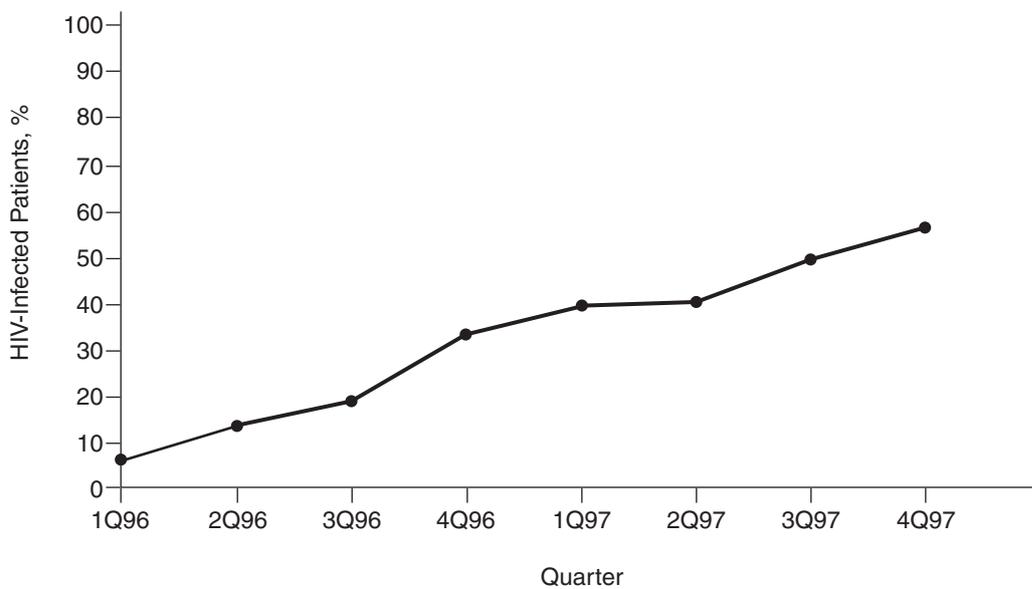


Figure 5. Proportion of Patients With Undetectable Viral Loads by Quarter, 1996 and 1997



(Figure 6). Average monthly nondrug costs per quarter decreased for patients with ($r = -0.79, P < .03$) and without ($r = -0.89, P < .004$) undetectable viral loads throughout this period, with costs being higher for those without undetectable viral loads (Figure 7). Average monthly total costs per quarter were relatively stable, without any observed trend over time for patients without ($r = -0.06, P = .9$) and with ($r = -0.17, P = .7$) undetectable viral loads, with costs for those without viral suppression to undetectable levels being higher than costs for those with undetectable viral loads (Figure 8).

... DISCUSSION ...

There are several methods for assessing the costs of care associated with HIV, including evaluating costs of inpatient episodes, estimating the annual costs of care or costs of care over various time periods, examining lifetime costs, or analyzing costs by stage of disease.¹⁸ This study examined trends in the average monthly costs of care over 3 years for enrollees in an HIV case management organization. Contrary to provider, payer, and member concern, average monthly total costs of care per HIV patient

did not increase in this managed care patient population between 1995 and 1997. Although average monthly drug costs per HIV-infected patient increased, the rates of mortality and immunodeficiency declined, as did average monthly nondrug costs per HIV-infected patient. These results support those of recently published studies that report increases in drug costs but decreases in the use of other HIV-related healthcare services. Keiser and colleagues¹⁹ observed a marked decrease in inpatient services coupled with a modest decline in the number of outpatient visits between January 1995 and July 1997. In their study, although the increased use of protease inhibitors was associated with an increase in drug costs, the overall cost per HIV-infected patient was lower, with monthly costs of HIV care declining from \$1905 at the start of the study to \$1122 at the end. In a Medicaid patient population in the Baltimore, MD, metropolitan area, the cost of HIV inpatient care was significantly lower among patients receiving a protease inhibitor-containing regimen.²⁰ Similarly observed in that study as in this analysis, Gebo and colleagues²⁰ also noted a concurrent increase in pharmacy costs, whereas the total healthcare costs for these patients were stable in 1997 compared with

Figure 6. Average Monthly Drug Costs per Patient by Quarter for Patients With and Without Undetectable Viral Loads, 1996 and 1997

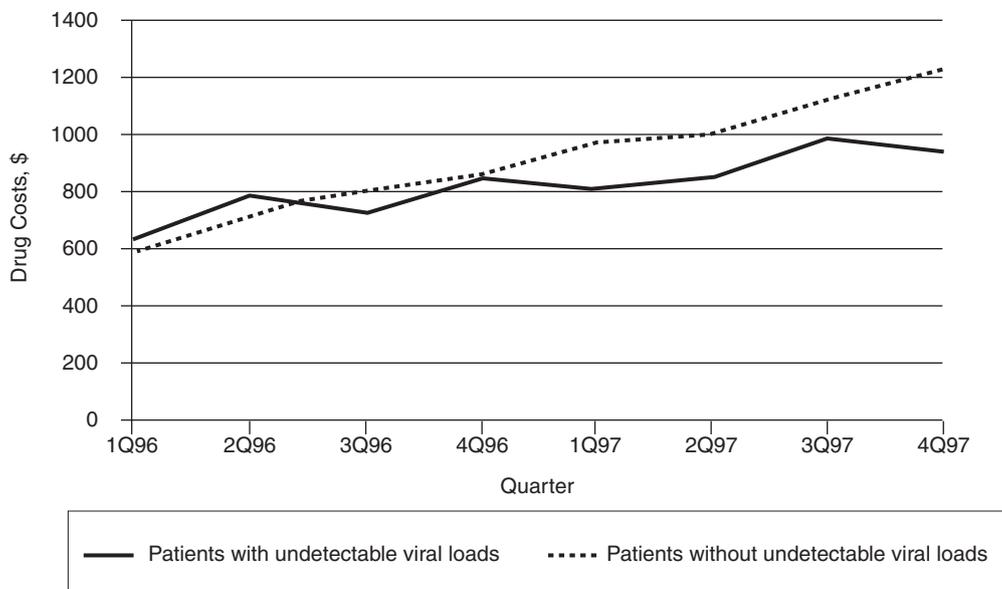


Figure 7. Average Monthly Nondrug Costs per Patient by Quarter for Patients With and Without Undetectable Viral Loads, 1996 and 1997

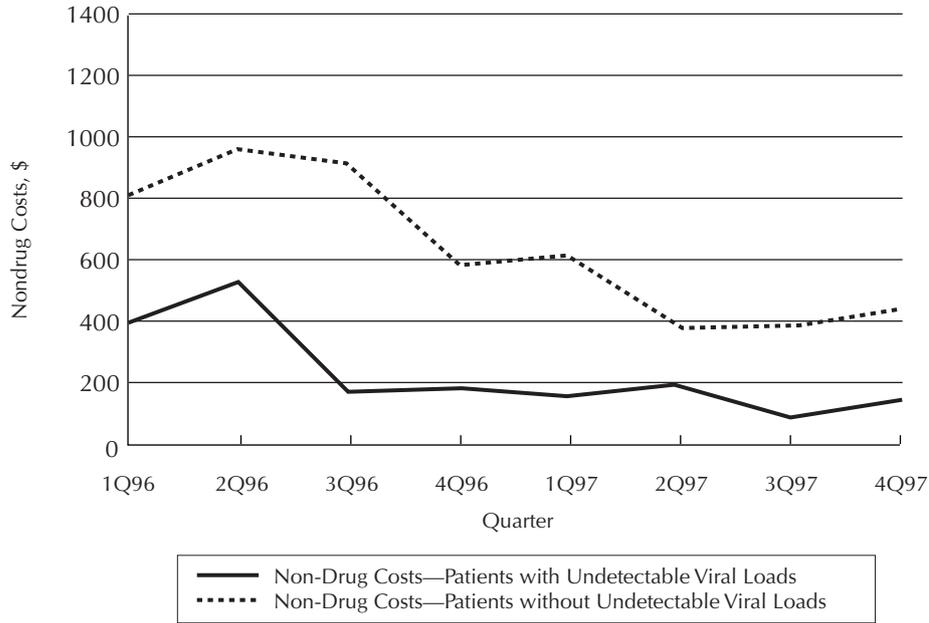
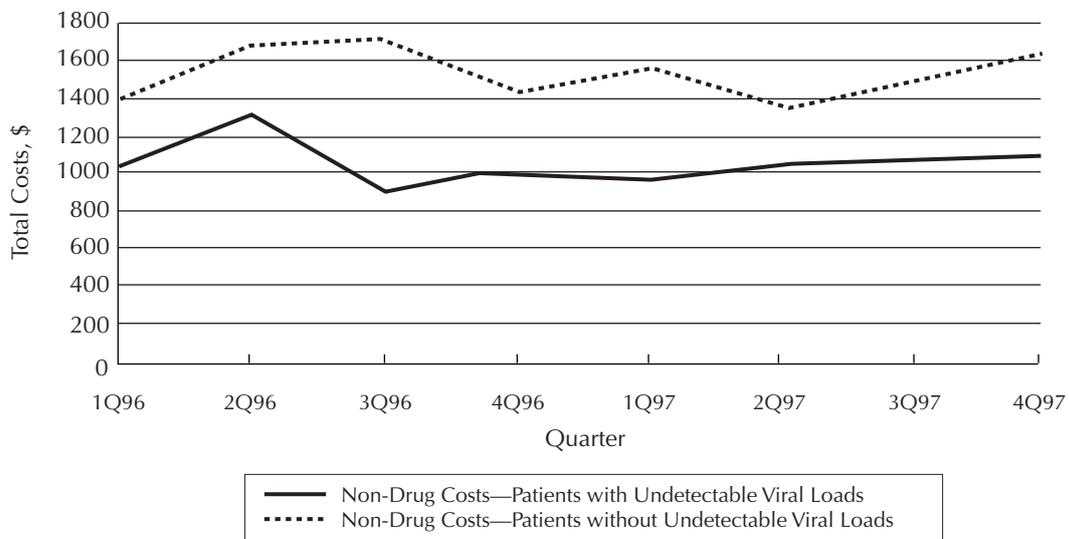


Figure 8. Average Monthly Total Costs per Patient by Quarter for Patients With and Without Undetectable Viral Loads, 1996 and 1997



in 1995. The introduction of protease inhibitors at St. Vincent's Hospital and Medical Center in New York coincided with a decreased inpatient census and increased outpatient visits.¹⁰ The use of healthcare services at AIDS centers in France declined with the availability of combination therapy,¹⁴ and reductions in morbidity and opportunistic infections in the United States were attributed to use of these therapies.²¹ Numerous studies²²⁻²⁶ have demonstrated an inverse relationship between the degree of immunodeficiency and the average cost of care.

The precise reasons for the observed trends in costs were not determined in our study population. Although nondrug costs per month were consistently lower for patients with vs without undetectable viral RNA levels, a decline in nondrug costs over time was observed in both groups. The overall downward trend in nondrug costs could be attributed to improved efficiency in care, improved use of prophylaxis for opportunistic infections, or perhaps some benefit from newer antiretroviral therapy even among patients not achieving undetectable viral RNA levels. From the HIV Outpatient Study, (HOPS),²¹ the incidence of AIDS-defining events began to decline after 1995; this decline in HIV morbidity was strongly correlated with use of a combination regimen containing a protease inhibitor. For the low mortality rates observed, we did not quantify the mortality rates specifically for patients with detectable or undetectable viral loads.

Differences in drug costs were less pronounced during time periods with versus without undetectable viral loads. The distribution of types of drugs used among those with undetectable viral RNA levels compared with those without undetectable viral RNA levels was likely to have varied. Future analyses of cost trends should determine the proportion of the drug dollars aimed at suppressing the virus vs treating the opportunistic infections or comorbidities associated with the disease.

This study has several limitations. It focused on a specific HIV managed care population. The costs reported here are average costs for HIV enrollees in a case management program in California and Texas. As a result, the findings may not be generalizable to HIV-infected populations with different types of insurance or no insurance (even within California and Texas) because providers in this managed care setting use protocols for the treatment of HIV that may or may not be duplicated by providers in other settings. In addition, the impact of growth

of the HIV epidemic on absolute costs of care in the United States cannot be assessed in this sample. Average costs reported are for enrollees and are not representative costs for a cohort of patients. Calculations were based on the number of eligible enrolled patients per month, which ranged from 474 to 723 patients during the study. Total cost estimates also were not adjusted for population disease severity or inflation. The estimate of patient disease severity was based solely on a surrogate marker of CD4 cell counts because we did not have access to information on patient comorbidity or events of opportunistic illness, which may suggest the overall magnitude of the illness. In analyses focusing on viral suppression to undetectable levels, patients were reclassified as having or not having undetectable viral loads for each quarter. Furthermore, drug costs included the costs of all oral medications. Although the majority of these were antiretroviral drug therapies, specific drugs or regimens were not identified. Therefore, trends in viral suppression to undetectable levels are displayed but are not directly correlated with use of antiretroviral drug therapy. As a reflection of rapidly evolving HIV care, the classification of undetectable viral load was based on the threshold of standard assay (viral RNA level <400 copies/mL), the most commonly used assay during the study period, may be affected if the assessment of cost was determined in a more recent time when the ultrasensitive assay was commercially available. Changing standards for antiretroviral drug therapy, the ongoing introduction of new agents to treat the disease, and innovative approaches to treatment response prediction and monitoring can influence future cost trends for the care of persons with HIV infection.

In conclusion, concern about increasing drug costs for the care of HIV-infected patients must be viewed in the context of total costs of HIV care as well as the changing course of the disease. With the introduction of new antiretroviral drug therapies, HIV infection is becoming a chronic disease.²⁷ Patients do not progress to AIDS as quickly, and mortality is declining. As the results of this study suggest, the availability of new drug combinations has increased the costs of drug care for the HIV-infected patient. The improvement in patient outcomes, however, can result in a greater decrease in the nondrug costs of care. Future analyses of costs of HIV care may yield a greater offset of increasing drug costs if other indirect costs of care (such as patient productivity, com-

munity service use, and family commitment) can be quantified and included.

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