The Lifetime Cost of Current Human Immunodeficiency Virus Care in the United States

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Objective: We sought to project the lifetime cost of medical care for human immunodefiency virus (HIV)-infected adults using current antiretroviral therapy (ART) standards.

Methods: Medical visits and hospitalizations for any reason were from the HIV Research Network, a consortium of high-volume HIV primary care sites. HIV treatment drug regimen efficacies were from clinical guidelines and published sources; data on other drugs used were not available. In a computer simulation model, we projected HIV medical care costs in 2004 U.S. dollars.

Results: From the time of entering HIV care, per person projected life expectancy is 24.2 years, discounted lifetime cost is $385,200, and undiscounted cost is $618,900 for adults who initiate ART with CD4 cell count $<350/\mu$L. Seventy-three percent of the cost is antiretroviral medications, 13% inpatient care, 9% outpatient care, and 5% other HIV-related medications and laboratory costs. For patients who initiate ART with CD4 cell count $<200/\mu$L, projected life expectancy is 22.5 years, discounted lifetime cost is $354,100 and undiscounted cost is $567,000. Results are sensitive to drug manufacturers' discounts, ART efficacy, and use of enfuvirtide for salvage. If costs are discounted to the time of infection, the discounted lifetime cost is $303,100.

Conclusions: Effective ART regimens have substantially improved survival and have increased the lifetime cost of HIV-related medical care in the U.S.

Key Words: HIV, AIDS, cost, life expectancy, computer simulation model

(*Med Care* 2006;44: 990–997)

The introduction of combination antiretroviral therapy (ART) in 1996 resulted in dramatic improvements in survival for human immunodeficiency virus (HIV)-infected persons,[1] and also affected HIV-related medical costs.[2] During the past 10 years, federal government spending on HIV-related medical care in the United States has tripled, from $3.7 billion in fiscal year 1995 to $11.6 billion in fiscal year 2005.[3] Nevertheless, cost considerations still limit access to HIV care.[4] Estimates of the future cost of HIV care are used for planning and cost-effectiveness evaluation by policy makers seeking to ensure broad access to high-quality HIV care at a reasonable cost. If policy makers rely on outdated estimates of HIV care costs, treatment programs will be under-funded and the economic value of HIV prevention will be understated.

In 1993, Hellinger[5] estimated that the life expectancy for an HIV-infected adult with a CD4 cell count of $500/\mu$L was 6.8 years and lifetime cost was $119,300 ($150,000 in discounted 2004 dollars), of which approximately 50% was for inpatient stays and 14% was for medications. In 1997, Holtgrave and Pinkerton[6] estimated that the life expectancy of patients with HIV would increase by 4 years from the zidovudine-monotherapy era as a result of ART and that the lifetime cost from time of infection was $274,800 ($266,000 in discounted 2004 dollars), of which approximately 54% was for medications. Bozzette and colleagues[7] estimated a similar percentage for medications of the $18,300 annual cost for HIV patients in care in 1998. Further improvements in ART have increased life expectancies for HIV-infected patients far beyond this early estimate. Today, ART regimens in the United States are selected from 24 drugs in 4 different drug classes using sophisticated tests for drug resistance that were unavailable in the mid-1990s,[8] while hospitalization

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Supported in part by the National Institute of Allergy and Infectious Diseases (K23 AI01794, K24 AI062476, K25 AI50436, P30 AI42851 and R01 AI42006), the National Institute on Drug Abuse (K01 DA17179 and K23 DA00523), and the Agency for Healthcare Research and Quality (Contract 290-01-0012).

Presented in part at the 3rd International AIDS Society Conference on HIV Pathogenesis and Treatment, July 24–27, 2005, Rio de Janeiro, Brazil.

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ISSN: 0025-7079/06/4411-0990

rates have declined as a result of these effective therapies.[9] Our objective was to project the life expectancy and lifetime cost of medical care for adults with HIV in the United States from the time of entering into care until death, based on current knowledge of ART treatment efficacy and using recent national data on health care resource utilization from experienced providers.

METHODS

Overview

We estimated medical service utilization by patients at different stages of HIV disease from cross-sectional data collected by the HIV Research Network (HIVRN), a consortium of experienced, high-volume HIV care sites.[10] We assigned costs to the medical services and applied these data to a previously published state-transition model of HIV disease to project lifetime medical costs for HIV-infected adults from the time of entry into HIV care.[11] Because we wanted to estimate the cost of providing optimal care by experienced HIV care providers, we assumed patients received care according to current U.S. guidelines for ART[8] and remained in care throughout the remainder of their lives. Sensitivity analyses were conducted to evaluate parameter uncertainties and alternative assumptions regarding treatment efficacy and interpretation of ART treatment guidelines.

Results are reported as projected life expectancies in years and projected lifetime medical costs in 2004 US dollars. Life expectancy results are reported undiscounted and cost results are reported both undiscounted and discounted to present value at an annual rate of 3% as recommended by the U.S. Panel on Cost-Effectiveness in Health and Medicine.[12] Results are for the index HIV-infected patient only and do not include any potential benefits of entry into care on preventing HIV transmission to sexual partners.

Utilization of Inpatient and Outpatient Medical Services

Inpatient and outpatient medical services utilization was estimated using data on patients enrolled in participating HIVRN sites, totaling 59,093 patient-months. Consistent with our objective to estimate the cost of providing the best care currently available, HIVRN sites were all high-volume clinics staffed with experienced providers who provide primary and subspecialty care to HIV patients.[13] To be included in this analysis, a site had to have a minimum data set available in electronic format or through paper abstraction. The minimum data required were the patients' age, sex, AIDS-defining illnesses, CD4 level, HIV-1 RNA, and use of antiretroviral medication (including start and stop dates). Of the 14 HIVRN sites that collect data on adult patients, the 7 sites that collected all relevant data were located in the Eastern (n = 3), Midwestern (n = 1), Southern (n = 2), and Western (n = 1) United States. Six of the sites have academic affiliations; one is community-based. The analysis was limited to adult patients (≥18-years-old) who were in longitudinal HIV primary care at one of these HIVRN sites during 2001. Primary care was defined by having at least 1 visit to the primary care provider and a CD4 count drawn between January 1, 2001, and July 1, 2001.

The numbers of outpatient visits and hospitalizations for any reason were recorded for each patient-month to determine average resource utilization per patient month (Table 1). Because HIVRN data on emergency room visits were unavailable, we estimated the number of these visits by using the ratio of emergency room visits to outpatient visits reported in the HIV Cost and Services Utilization Study (HCSUS).[14] Patient-months were stratified by CD4 cell count, acuity, and by whether or not the patient was receiving ART as defined in 2001 guidelines.[15]

Cost of Inpatient and Outpatient Medical Services

The average cost per inpatient day was derived from the University HealthSystem Consortium (UHC) database of costs for academic medical centers and affiliated community hospitals in the U.S.[16] The 2001 UHC database contains cost information collected from 117 hospitals in 37 states and the District of Columbia with a median (interquartile range) of 356 (235–530) beds. Patient charge data were obtained by UHC from the hospitals' billing records and were adjusted to represent costs by applying a ratio of costs to charges provided by each institution. These costs include all medications provided to patients on an inpatient basis. The database was queried for hospitalizations of patients with an ICD-9 code indicative of HIV infection, and the results were stratified by whether the inpatient diagnosis included an opportunistic infection and whether the patient survived the hospitalization. The cost of 1 physician inpatient visit per day, derived from the 2004 Medicare fee schedule,[17] was added to the hospital's cost to determine total hospitalization cost per inpatient day. The costs of an outpatient visit and an emergency department visit were from HCSUS.[7] Costs were updated to 2004 U.S. dollars using the Medical Care component of the Consumer Price Index.[18]

Medication Regimens

Four sequential ART regimens were determined based on current clinical guidelines[8] including the optimal selection of individual drugs based on resistance testing; the efficacy of the regimens was from published clinical trials (Table 2).[19–23] The fourth-line regimen was 1 of 3 commonly used "salvage" regimens, each of which included enfuvirtide.[22] Enfuvirtide was discontinued after HIV RNA returned to pretreatment baseline, but the remaining antiretroviral agents ("optimized background regimen") were continued.[24] We assumed that substitutions of individual ART drugs within regimens would occur in response to toxicities. Medication regimens for opportunistic infection prophylaxis were included for patients with low CD4 cell counts based on current published guidelines and opportunistic infection treatments were also based on guidelines.[25,26] Acute drug-related toxicities are also from clinical trials.[24,27–31] Medications other than ART and opportunistic infection prophylaxis and treatment were excluded because these data were not available from HIVRN or other sources.

TABLE 1. Outpatient Visits, Inpatient Days, and Costs

	Mean Outpatient Visits	Mean Inpatient Days	Cost (2004 US$)*
Patients without a history of an AIDS-defining OI (per month)			
Patients on ART			
CD4 > 500	0.53	0.07	249
301–500	0.72	0.16	431
201–300	0.79	0.16	452
101–200	0.88	0.19	516
51–100	1.00	0.41	861
≤50	1.00	0.37	806
Patients not on ART			
CD4 > 500	0.63	0.09	302
301–500	0.79	0.11	374
201–300	0.89	0.18	507
101–200	0.87	0.39	789
51–100	0.86	0.50	946
≤50	0.96	0.98	1,653
Patients with a history of an AIDS-defining OI (per month)			
Patients on ART			
All CD4	0.91	0.21	546
Patients not on ART			
All CD4	0.92	0.22	570
Patients experiencing acute OIs†			
PCP	2.19	6.26	7,220
MAC	2.74	3.08	2,883
CMV	2.54	4.57	4,487
Toxoplasmosis	2.50	14.57	16,959
Fungal	2.67	4.77	4,913
Other	2.77	3.29	3,290
Patients in last month of life			
Acute OI	0.71	16.14	29,515
No acute OI	0.86	9.15	20,368
Unit costs of services			
Inpatient day, no OI			1,412
Inpatient day, with OI			1,206
Inpatient day in last month of life, non-OI death			2,249
Inpatient day in last month of life, OI death			1,843
Outpatient visit (sensitivity analysis range)			242 (278–206)
ER visit (sensitivity analysis range)			472 (401–543)
CD4 cell count test			66
HIV RNA test			119
HIV genotype test			360

*Total cost excluding outpatient drugs (see Table 2) but including emergency room visits.

†From 30 d before and until 60 d after the acute OI diagnosis.

OI indicates opportunistic infection; PCP, *Pneumocystis jiroveci* pneumonia; MAC, *Mycobacterium avium* complex; CMV, cytomegalovirus infection.

Medication and Laboratory Costs

Costs of ART and opportunistic infection medications were calculated using 2004 average wholesale prices (AWPs),[32] adjusted for the average state Medicaid reimbursement rate to retail pharmacies weighted by the geographic distribution of AIDS cases as a proxy for HIV prevalence.[18] The result was a cost calculated as the AWP discounted by 10.2%, with a $3.76 dispensing fee added per 30-day prescription. ART regimen costs were not reduced to account for the availability of generics, because newer patent-protected drugs were assumed to continue to be preferred based on efficacy and convenience. HIV RNA and CD4 cell counts were measured every 3 months and an HIV resistance test was performed before the initiation of each antiretroviral regimen after the first one.[8] The costs of these tests were from the 2004 Medicare fee schedule.[33]

HIV Disease Model

Average monthly costs of inpatient care, outpatient care, ART and opportunistic infection medications, and laboratory tests were calculated and applied to a state-transition model of HIV disease, the Cost-effectiveness of Preventing AIDS Complications (CEPAC) model. Disease progression is modeled as monthly transitions between health states that describe clinically and economically relevant aspects of HIV disease including CD4 cell count (>500 cells/μL; 301–500 cells/μL; 201–300 cells/μL; 101–200 cells/μL; 51–100 cells/μL; and ≤50 cells/μL); HIV RNA level (>30,000 copies/mL; 10,001–30,000 copies/mL; 3001–10,000 copies/mL; 501–3000 copies/mL, and ≤500 copies/mL); ART efficacy and toxicities; and history, treatment, and prophylaxis related to opportunistic infections (*Pneumocystis jeroveci* pneumonia, toxoplasmosis, *Mycobacterium avium* complex disease, disseminated fungal infection, cytomegalovirus, and bacterial and other infections). The model defines 3 general categories of health states: "acute" (from 30 days before to 60 days after diagnosis of an opportunistic infection); "chronic" (neither "acute" nor the 1 month before death); or the 1 month before death.

In the model, HIV RNA level determines the monthly rate of CD4 cell count decline in the absence of ART or in patients who have failed ART. This monthly decrease in CD4 cell count was estimated from the Multicenter AIDS Cohort Study (MACS).[34] Public use MACS data were also used to estimate the monthly incidence of primary and secondary opportunistic infections, death related to opportunistic infections, and chronic HIV-related deaths as functions of the CD4 cell count and history of opportunistic infections.[35] Opportunistic infection rates have been externally validated with data from another cohort.[36] A random-effects model was used to estimate missing CD4 cell counts at the time of an opportunistic infection or death.[37]

In the model, ART decreases HIV RNA and increases CD4 cell count, and different levels of efficacy are specified according to the regimen sequence (Table 2). CD4 cell count increases lead to a reduction in the risk of opportunistic infections and AIDS-related mortality, but ART also has an independent effect on reducing these risks.[38] ART failure is defined as virologic (an observed increase in HIV RNA over 2 consecutive months) or clinical (the develop-

TABLE 2. Efficacy and Cost of Antiretroviral Regimens

Line of Therapy	Drugs	HIV RNA <400 Copies/mL	CD4 Cell Count Increase	Cost/Mo (2004 US$)	Reference
Base case					
First-line	Efavirenz + tenofovir DF + 1 NRTI	80% at 48 wk	263/μL at 144 wk	1140	19
Second-line	Lopinavir/ritonavir + 2 NRTIs	82% at 24 wk	121/μL at 24 wk	1250	20
Third-line	Atazanavir/ritonavir + 2 NRTIs	56% at 48 wk	110/μL at 48 wk	1840	21
Fourth-line*	Enfuvirtide + OBR	30% at 48 wk	91/μL at 48 wk	3770	22
Sensitivity analyses for ART salvage regimens					
No availability of enfuvirtide					
Fourth-line*	OBR	12% at 48 wk	45/μL at 48 wk	1970	22
Use of enfuvirtide with >2 active drugs					
Fourth-line*	Enfuvirtide + OBR	44% at 48 wk	134/μL at 48 wk	3770	22,23

*After failure of the final line of therapy, patients continue on OBR at a cost of $1970 per month.
NRTI indicates nucleoside reverse transcriptase inhibitor; OBR, optimized background regimen.

ment of an opportunistic infection). HIV-infected patients may die from opportunistic infections, from chronic HIV–related causes, or from non-HIV–related causes. Chronic HIV-related death rates depend on CD4 cell counts and the patients' history of previous opportunistic infections.[35,36]

Hypothetical patients with HIV enter the model one at a time and are followed until death, at which point another patient enters the simulation. Each simulated patient is assigned an initial age and is followed individually until death, with an ongoing tally of clinical events and costs during that patient's lifetime. As patients age, their probability of non-HIV death increases each year based on life expectancies for the U.S. population by age and gender.[39] To achieve stability in our estimates, we ran 1 million patient simulations for the base case and for each sensitivity analysis scenario. Once all simulations for each set of assumptions were complete, mean summary statistics for the entire cohort were calculated, including projected life expectancy and lifetime costs from entry into care. Further model specifications are described in detail elsewhere.[11]

Patient Characteristics

We analyzed a hypothetical cohort of HIV-infected adults initially presenting for care with no history of AIDS-defining opportunistic infections. The health status of this cohort was the same as for patients who entered care at HIVRN adult sites in 2002 with an HIV RNA >400 copies/mL: mean (standard deviation) CD4 cell count of 310/μL (280/μL). The age at entry into the model was from the same source and was mean (standard deviation) 39 (10) years. These characteristics are consistent with other studies of newly diagnosed HIV-infected patients.[40–42] The HIV RNA distribution was derived from a comparable cohort of patients who presented for initial outpatient HIV care in Boston.[40] At entry into care, patients were assumed to initiate antiretroviral therapy immediately if their HIV RNA was ≥100,000 copies/mL or if their CD4 cell count was <350/μL, and otherwise to delay initiation of therapy until their CD4 cell count fell below 350/μL or they developed an AIDS-defining opportunistic infection.[8]

Sensitivity Analyses

We performed sensitivity analyses that affected the duration and efficacy of ART. First, the CD4 cell count threshold for ART initiation was reduced to <200/μL.[8] Next, the efficacy of ART was reduced 15% to reflect clinical practice situations where adherence and potency of antiretroviral regimens may be less than reported in clinical trials. This efficacy level reduction was determined by comparing results from an observational cohort study of a Medicaid population in Maryland to results from a clinical trial population at a similar stage of disease progression.[19,43] Finally, we examined both greater efficacy of enfuvirtide in patients who have >2 other active drugs available in this regimen,[22,23] and the scenario of no enfuvirtide use in any regimen (to reflect ADAP formulary restrictions on access to enfuvirtide that exist in some states[44]).

Three additional sensitivity analyses were performed on the cost of ART medications. First, to reflect rebates that are currently paid by pharmaceutical manufacturers directly to Medicaid programs and ADAPs, we examined an additional 15% discount from AWP.[32,45,46] Second, we examined an additional 30% discount that is consistent with proposed additional rebates.[46–48] Finally, we examined a scenario with no discount from AWP and no dispensing fee, to represent retail prices paid for ART medications by consumers without prescription drug coverage. Additional sensitivity analyses were performed on the costs of an outpatient visit and of an emergency department visit.

Finally, we performed a sensitivity analysis in which the lifetime cost discounted from the time of entry in care was further discounted at an annual rate of 3% to the time of HIV infection, which was estimated as 8.1 years before entry into care.[40] The result represents the estimated future cost of medical care for each adult newly infected with HIV and is relevant for evaluating investments in HIV prevention programs.

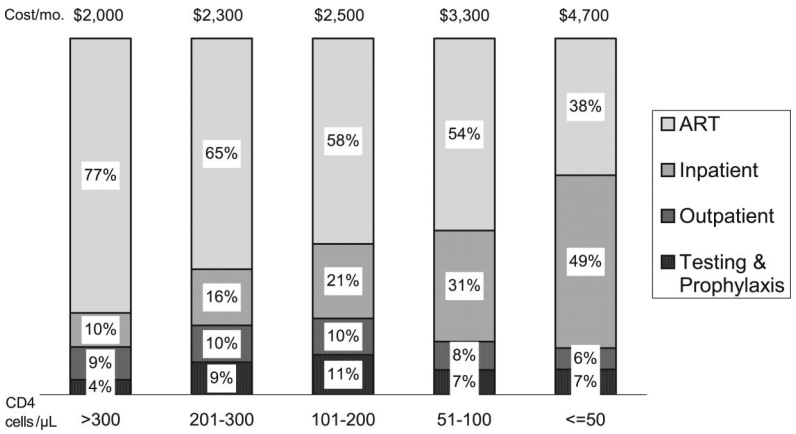

FIGURE 1. Components of monthly cost of HIV care, by CD4 cell stratum.

RESULTS

From the time of entering into HIV care, the projected life expectancy is 24.2 years and the discounted total lifetime cost per person is $385,200 for adults initiating ART at a CD4 cell count <350/μL. The undiscounted lifetime cost per person is $618,900, equivalent to an average monthly cost of $2100. ART drug costs represent 73% of the undiscounted lifetime cost, followed by inpatient costs (13%), outpatient costs (9%), and other HIV-related medication and laboratory costs (5%). The average monthly cost is $2000 when patients have a CD4 cell count >300/μL either initially or because their CD4 cell count rises as a result of successful ART; ART drugs constitute 77% and inpatient costs 10% of this cost. In contrast, the average monthly cost when patients have a CD4 cell count ≤50/μL is $4700; ART drugs are 38% and inpatient costs 49% of this cost (Fig. 1).

We conducted several sensitivity analyses that changed both ART effectiveness and cost assumptions (Table 3). When the efficacy of all ART regimens is reduced by 15%, the projected life expectancy is reduced by 2.9 years and the discounted lifetime cost is $17,200 lower than the base case. For patients who initiate ART at a CD4 cell count <200/μL, life expectancy is reduced by 1.7 years and the discounted lifetime cost is $31,100 lower than in the base case. If enfuvirtide is not used in any regimen, life expectancy is reduced by 0.9 years and the discounted lifetime cost is $27,300 lower than in the base case. In the most restrictive situation for access to ART, where patients initiate ART at a CD4 cell count <200/μL and enfuvirtide is not available, the life expectancy is reduced by 2.5 years and the discounted lifetime cost is $55,400 lower than in the base case. If the fourth-line regimen is assumed to include enfuvirtide and >2 active drugs, life expectancy increases by 0.7 years and the discounted lifetime cost is $14,800 higher than in the base case.

We also conducted sensitivity analyses that varied costs but had no impact on life expectancy. When the costs of all ART medications are reduced by assuming additional manufacturers' rebates of 15% or 30% of AWP, discounted lifetime cost estimates decrease by $45,400 and $90,800 respectively from the base case. If no discount from AWP and no dispensing fees are assumed (as a proxy for retail prices paid by consumers without prescription drug coverage), the estimated discounted lifetime cost increases by

TABLE 3. Life Expectancy and Lifetime Costs

	Discounted Lifetime Cost (2004 US$)	Undiscounted Lifetime Cost (2004 US$)	Life Expectancy (Undiscounted Years)
Base case analysis	385,200	618,900	24.2
Sensitivity analyses affecting ART efficacy and cost			
ART efficacy reduced 15%	368,000	561,900	21.3
Start ART at CD4 <200*	354,100	567,000	22.5
No availability of enfuvirtide	357,900	561,400	23.3
Start ART at CD4 <200* and no availability of enfuvirtide	329,800	514,900	21.7
Use of enfuvirtide with >2 active drugs	400,000	653,100	24.9
Sensitivity analyses affecting cost			
15% additional ART manufacturer's rebate	339,800	544,700	24.2
30% additional ART manufacturer's rebate	294,400	470,600	24.2
Estimated retail price to consumers without drug coverage†	413,600	665,500	24.2
Outpatient costs and emergency room costs −15%	379,500	610,400	24.2
Outpatient costs and emergency room costs +15%	390,800	627,300	24.2

*or AIDS-defining opportunistic infection or HIV RNA ≥100,000 copies/mL.
†Average wholesale price.[32]

$28,400 from the base case. Additional sensitivity analyses indicate that the estimated discounted lifetime cost could vary by +$5600 or −$5700 when outpatient and emergency room cost estimates are varied ±15% to reflect uncertainties in these estimates.

When the base case lifetime cost is estimated from the time of infection instead of from entry into care, life expectancy is 32.1 years and the discounted lifetime cost is $303,100. The decrease by $82,100 from the base case results from discounting the base case result at an annual rate of 3% for an additional 8.1 years.

DISCUSSION

New ART regimens provide better therapeutic options, are less complicated to adhere to, and have improved life expectancies far beyond the original projections when ART was introduced.[19] In addition, ART treatment efficacy seen in community-based cohorts now more closely approximates results reported in clinical trials.[43] Not surprisingly, the U.S. federal government, states, and private insurers have seen substantial increases in payments for medical care of HIV-infected individuals. Out-of-pocket payments are increasing for privately insured patients, and those with advanced disease are more likely to reach lifetime medical cost caps imposed by their insurers. HIV cost estimates must take into account this changing landscape so that policy makers can effectively evaluate the current and future impact on these payers.

We projected the lifetime cost of HIV medical care by experienced HIV care providers according to current U.S. guidelines from the time of entering into care until death. The average monthly cost over the remaining lifetime of these individuals is $2100. In comparison, Bozzette and colleagues[7] estimated an average monthly cost of $1500 for patients in care in 1998; the difference is attributable to higher costs at all CD4 levels in our projection (consistent with medical inflation), as well as a greater proportion of patient-months on antiretroviral medications compared with the average patient in care in 1998. We found that the discounted projected lifetime per person medical care cost for individuals entering HIV care is now more than $380,000, the undiscounted cost is about $620,000, and the projected life expectancy is 24.2 years (compared with 4 years estimated in 1997[6]). This cost is comparable to the estimated undiscounted lifetime medical cost for women younger than 65 years of age in the United States with cardiovascular disease, who can also be expected to have long life expectancies with appropriate medical management ($599,000, of which $423,000 is attributable to cardiovascular disease).[49]

When the base case lifetime cost estimate is discounted to the time of infection, the potential savings per HIV infection prevented is $303,100; Holtgrave and Pinkerton's comparable estimate updated to 2004 dollars is $266,600. This means that preventing the estimated 40,000 new HIV infections in the United States each year would avoid obligating $12.1 billion annually in future medical costs for HIV-infected patients assuming the current standard of care. Although individuals who avoid HIV infection will eventually incur medical costs for other diseases, the financial burden of most non-HIV diseases occurs much later in life.

The analysis presented here is a projection of future cost with currently available treatments only, and is necessarily limited by our inability to project future cost and life expectancy gains associated with new treatments. Potential cost savings from new technologies, such as therapeutic vaccines, are also not included. The sensitivity analyses we performed to reflect differences between efficacy results reported in clinical trials and results observed in clinical practice may not have reflected the experiences of all HIV populations, especially populations without access to experienced HIV care providers. For instance, we did not separately examine particular patient subgroups for whom antiretroviral management may be more complex and more expensive, such as patients coinfected with hepatitis B or C or injection drug users. Utilization of outpatient medical services reflects the practices of experienced high volume HIV providers, who may schedule more frequent outpatient visits and tests than other HIV providers. Inpatient costs were derived from the University HealthSystem Consortium, which reflects costs for academic medical centers and their affiliated community hospitals, and are likely higher than the costs in nonaffiliated community hospitals. On the other hand, the assumption of 1 inpatient physician visit per hospital day may underestimate the cost of consultations.

The costs that we used for each outpatient and emergency room visit and the emergency room utilization assumptions were from data collected by HCSUS investigators in 1996 and may not fully reflect current practices. However, the impact of this uncertainty was relatively small. Our estimates include medical visits and hospitalizations for all causes, and therefore include the costs of treating acute adverse events associated with ART and comorbidities that occurred in the HIVRN patient sample. However, we did not separately project future costs that may increase as patients live longer, including costs to treat comorbidities that are exacerbated by long-term HIV infection or treatment such as cardiovascular disease, diabetes, or hepatitis C. In addition, we did not include the cost of medications unrelated to ART or opportunistic infection prophylaxis and treatment. Based on a recent report from 1 university-based HIV clinic, we estimate including these medication costs would increase lifetime costs by approximately 8%.[50] Finally, the medical costs reported in this study do not include mental health treatment, substance abuse treatment, and case management services. These services improve the medical management of many persons with HIV and are used by 6–25% of HIV patients in care.[47,50]

The cost of HIV medical care in the United States has increased substantially since the introduction of ART, and the financial impact of caring for persons with HIV will continue to grow. The remarkable clinical benefit of ART is driving these increasing costs. Not only is ART the most costly component of care, but individuals are also incurring these costs over more years due to improved life expectancies. With more than 70% of all costs coming from antiretroviral drugs, further scrutiny of drug pricing and utilization is to be

expected. Access to ART may become increasingly difficult unless more government funds become available or the cost of HIV care is reduced. With $12.1 billion in future medical care costs from new HIV infections occurring each year, greater investments in evidence-based HIV prevention activities that can reduce this burden are clearly needed. However, these investments must be matched by the commitment of sufficient resources to HIV medical care so that persons living with HIV today can fulfill the expectation that they will live long and healthy lives.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the assistance of colleagues at Johns Hopkins University (Jeanne Keruly, MS, CRNP, Erin Reilly, MPH, and Liming Zhou, MS); members of the CEPAC team (Wendy H. Aaronson, MPH, Sue J. Goldie, MD, MPH, April D. Kimmel, MSc, Lauren M. Mercincavage, BA, A. David Paltiel, PhD, and Hong Zhang, SM); and colleagues at Weill Cornell Medical College and New York Presbyterian Hospital (David W. Caplan, BA, Heather T. Gold, PhD, Lisa M. Kern, MD, MPH, Christopher P. Neukermans, BA, and Christine M. Valentin, BA). We also thank the investigators and funders of the HIV Research Network: Montefiore Medical Group, Bronx, New York (Robert Beil, MD); Alameda County Medical Center, Oakland, California (Kathleen Clanon, MD); Wayne State University, Detroit, Michigan (Lawrence Crane, MD); Community Health Network, Rochester, New York (Steven Fine, MD); St. Jude's Children's Hospital, Memphis, Tennessee (Patricia Flynn, MD); Montefiore Medical Group, Bronx, New York (Marc Gourevitch, MD); Montefiore Medical Center, Bronx, New York (Lawrence Hanau, MD); Community Medical Alliance, Boston, Massachusetts (James Hellinger, MD); Henry Ford Hospital Detroit, Michigan (John Jovanovich, MD); Parkland Health and Hospital System, Dallas, Texas (Philip Keiser, MD); Oregon Health and Science University, Portland, Oregon (P. Todd Korthuis, MD, MPH); University of California, San Diego, California (W. Christopher Mathews, MD, MPH); Johns Hopkins University, Baltimore, Maryland (Richard D. Moore, MD, MHS); Tampa General Health Care, Tampa, Florida (Jeffrey Nadler, MD); Nemechek Health Renewal, Kansas City, Missouri (Patrick Nemechek, MD); Children's Hospital of Philadelphia, Philadelphia, Pennsylvania (Richard Rutstein, MD); St. Luke's Roosevelt Hospital Center, New York, New York (Victoria Sharp, MD); Drexel University, Philadelphia, Pennsylvania (Peter Sklar, MD, MPH); University of California, San Diego, La Jolla, California (Stephen Spector, MD); Drexel University, Philadelphia, Pennsylvania (James Witek, MD); Agency for Healthcare Research and Quality, Rockville, Maryland (Fred Hellinger, PhD, John Fleishman, PhD, Irene Fraser, PhD); Health Resources and Services Administration, Rockville, Maryland (Richard Conviser, PhD); Substance Abuse and Mental Health Services Administration, Rockville, Maryland (Joan Dilonardo, PhD, Pat Roth); Office of AIDS Research, NIH, Bethesda, Maryland (Paul Gaist, PhD).

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