HIV Clinician Workforce Study

Final Report

May 31, 2013

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EXECUTIVE SUMMARY

The United States faces a growing demand for care related to HIV infection and mounting evidence suggests that the HIV clinician supply might not keep pace with the growth in demand for HIV-related health care services. In a joint statement on the HIV medical workforce, the American Academy of HIV Medicine (AAHIVM) and HIV Medicine Association (HIVMA) concluded: "With the growing number of people living with HIV, a failure to promptly address HIV medical workforce issues could lead to the collapse of the HIV care system—risking lives and the public health of communities across the country." (HIVMA 2009) To address concerns about the potential shortage of HIV clinicians, the HIV/AIDS Bureau (HAB) within the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) contracted with Mathematica Policy Research and its partner, The Lewin Group, to conduct a national quantitative HIV clinician workforce study. The study was conducted from October 2010 to May 2013.

A. Overview of Study Methods and Data Sources

We developed the methods for this study with input from a technical expert panel of providers and other individuals knowledgeable about HIV clinician workforce issues. The panel reviewed the proposed methodology during a two-day meeting in Washington, D.C., in March 2011. We revised the study methods based on their feedback. In this section, we provide a brief overview of the methods for estimating current demand for and supply of HIV medical services and for projecting these base-year estimates forward.

1. Base-Year Demand for HIV Care

We define the demand for HIV care as the observed total number of HIV-related medical visits provided under prevailing market conditions. We do not attempt to derive an optimal level of demand based on normative assumptions or on policy goals and guidelines for testing, engagement, treatment, and adherence. Our estimate of visits demanded is based on two components estimated by demographic group: (1) the number of diagnosed cases and (2) the number of visits per diagnosed case. We describe our approach to measuring each component below.

We developed estimates of individuals living and diagnosed with HIV and AIDS based on Centers for Disease Control and Prevention (CDC) and state and local and HIV surveillance data.[1] We separately estimate ambulatory and inpatient HIV visits. We measured ambulatory visits based on two National Center for Health Statistics (NCHS) provider surveys: the National Ambulatory Medicare Care Survey (NAMCS) for 2002 through 2009 and the National Hospital Ambulatory Medicare Care Survey (NHAMCS) for 2002 through 2008. We used the diagnosis, prescription drug, and reason-for-visit codes to identify HIV-related visits. We excluded visits related only to HIV testing and counseling because these types of visits are appropriately provided by non-HIV primary care clinicians. However, we include visits for which HIV is a secondary diagnosis because the presence of HIV as a secondary diagnosis will frequently complicate treatment, implying that

[1] CDC provides data for 46 states that implemented name-based HIV infection reporting since at least January 2007 and began reporting to CDC by June 2007.

optimal treatment of the primary diagnosis will require the knowledge of an HIV care specialist. We estimated inpatient visits based on the Health Care Cost and Utilization Project's National Inpatient Sample (HCUP-NIS) using data from 2002 through 2009. To estimate the number of inpatient hospital discharges related to HIV care, we selected discharges classified under Clinical Classifications Software (CCS) category 5 for HIV infection from the HCUP-NIS database, using both primary and secondary diagnoses. We assumed that inpatients with a primary diagnosis of HIV received a daily visit from an HIV specialist. For hospital discharges with a secondary diagnosis of HIV infection, we assumed an HIV specialist would provide one consultation visit per discharge.

The strengths of these surveys are that they are nationally representative and include uninsured patients who would not appear in insurance claims databases. Because of the small number of HIV care patients included in each annual survey sample, we pooled the data across the years to increase the precision of our estimates. To calculate utilization rates per diagnosed person, we divided the estimated annual total count of ambulatory and inpatients visits for HIV based on the NCHS surveys and HCUP-NIS database by the number of individuals diagnosed and living with HIV in each demographic group using the estimates derived from surveillance system data.

2. Base-Year Supply of HIV Care

Because there is no explicit credentialing requirement or self-reported specialty standard for those who provide, focus on, or specialize in the provision of services to HIV patients, we identified HIV clinicians based on the services they provide. Members of our technical expert panel recommended identifying clinicians as those who treat a minimum of 20 HIV patients; the panel also suggested giving priority to clinicians who prescribe HIV-related medications. The panelists argued that clinicians who treat fewer than 20 patients with HIV or do not prescribe antiretroviral therapies are less likely to provide the level of ongoing, comprehensive, and high quality care necessary to be considered an HIV provider.

To locate providers who provide HIV-related care, we used a national, all-payer, proprietary claims database from SDI Health. We used SDI Health's pharmacy (RX) and medical (DX) claims databases for calendar year 2010. The RX file captures about half of all electronically transmitted pharmaceutical records in the country The DX database captures approximately two-thirds of all electronically filed medical claims. In these files we identified all HIV-related claims for 2010 based on diagnosis and drug codes. The claims identified were associated with 572,952 patients representing two-thirds of all diagnosed HIV cases in the United States. Because the SDI Health databases were not comprehensive, we lowered the threshold and required that a clinician be identified as treating at least 10 patients with HIV-related care in the SDI Health databases to be deemed a potential HIV clinician. We also limited our study to clinicians who are likely to manage HIV patient care independently on an ongoing basis, including primary care physicians in family practice and general internal medicine, infectious disease specialists, nurse practitioners, and physician assistants. Clinicians in specialties that treat patients with HIV for other medical reasons were excluded. These included clinicians in geriatrics, obstetrics and gynecology, pediatrics, cardiovascular disease, gastroenterology, ophthalmology, oncology, and endocrinology.

Based on the claims analysis, 9,145 clinicians met our initial criteria as high-volume HIV providers in 2010. These clinicians formed the universe for the HIV clinician survey conducted from August to October 2012. However, based on the survey screener, only 54 percent of the providers we identified as potential HIV clinicians on the claims were active HIV clinicians treating a minimum of 10 HIV patients in 2010. Thus, the study estimated 4,937 high-volume HIV clinicians were practicing in 2010. In addition to refining the estimate of the high-volume HIV clinicians, we used the survey responses to develop supply-side parameter estimates (for example, hours worked per week, proportion of time in HIV care, HIV visits per hour in HIV care, and entry and retirement rates) for the HIV clinician workforce model.

3. Demand and Supply Projections

We projected future supply and demand from 2011 to 2015 using a Markov model. We calculated the number of active HIV clinicians in each projection year of the model as the number of active HIV clinicians in the prior year, plus new entrants into the HIV workforce and minus losses from retirement and mortality in the projection year. We multiplied the active supply of HIV clinicians in each year by average estimated number of hours worked per year; the proportion of time spent in HIV care; and the number of visits provided per hour by age group, gender, and clinician type as estimated based on responses to the clinician survey.

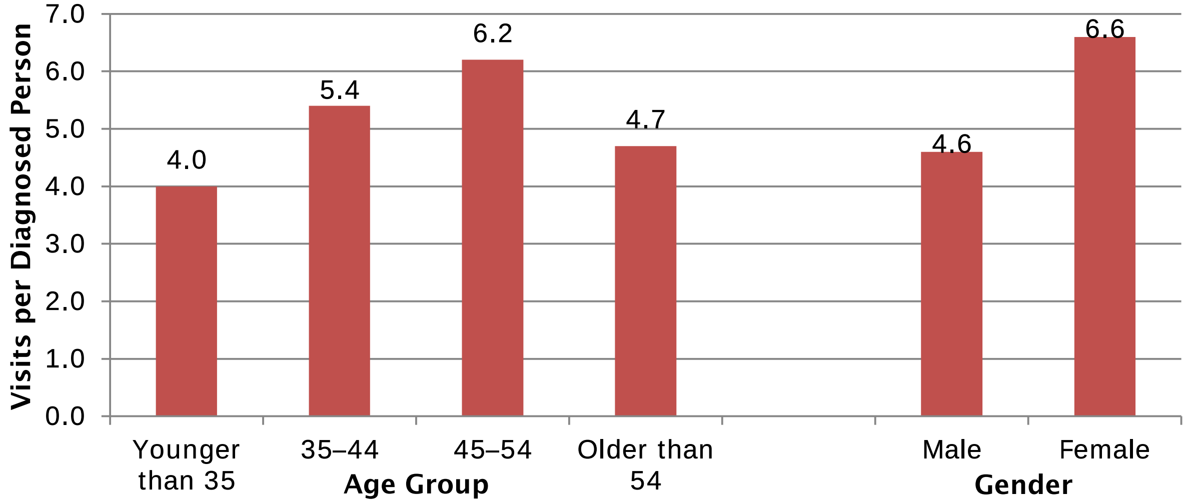
We projected demand similarly. The number of HIV cases in each projection year was calculated as the number of HIV cases in the prior year, plus newly diagnosed cases minus mortality in the projection year. We derived new cases and mortality among people living with HIV from federal and state HIV surveillance data and varied them by age, gender, and race/ethnicity. Using data from nationally representative federal surveys of ambulatory and inpatient service use, we calculated utilization rates by age group and gender in the base year as the ratio between the total number of HIV visits used and the total number of HIV cases in each age and gender group. We then multiplied the average utilization rates by the forecasted HIV population in each age and gender group in each projection year to obtain the total number of HIV-related visits in each of the forecasted years.

Finally, we converted forecasted visits supplied and demanded in each projection year to full-time equivalent (FTE) clinician values based on the average number of visits supplied per full-time clinician in the base year.

B. Current Demand for HIV Care

Overall, we found about 850,000 diagnosed HIV cases in the United States at the end of 2008 based on the CDC HIV surveillance system and state and local surveillance data. Figure ES.1 displays our estimates of the average number of ambulatory HIV-related visits per diagnosed person in the base year. We find that, on average, individuals diagnosed with HIV, including those not engaged in longer-term care, have 5.1 HIV-related ambulatory medical care visits in the base year. Women and individuals ages 45 to 54 have higher rates of ambulatory visits than males. Individuals younger than 35 years have lower utilization rates than those 35 and older.

Figure ES.1. Average Annual Ambulatory Visits for HIV-Related Care per Diagnosed Person, 2008



Source: Mathematica analysis of NAMCS (2006-2009) and NHAMCS (2006-2008).

Table ES.1 displays our estimate of the average number of inpatient visits per diagnosed person in the base year. The overall average is 0.92 visits per diagnosed person. The number of annual inpatient visits per female diagnosed with HIV (1.17 visits) was higher than that for men (0.83 visits).

Table ES.1. Average Annual Inpatient Visits for HIV-Related Care per Diagnosed Person, 2008

	Average Annual Inpatient Visits per Diagnosed Person
Total	0.92
Male	0.83
Female	1.17

Source: Mathematica analysis of data from HCUP-NIS (2002–2009) and HIV surveillance data.

Note: We calculated total inpatient visits per diagnosed person by assigning one HIV clinician visit per inpatient day for inpatients with a principal diagnosis of HIV and one HIV clinician consultation per inpatient stay for inpatients with a secondary diagnosis of HIV.

Table ES.2 displays our estimates of the total number of visits demanded in 2008 by demographic group. This total includes visits in ambulatory settings (on average, 5.1 visits per diagnosed person annually), as well as visits provided to hospital inpatients (on average, 0.92 visits per diagnosed person annually). Overall, we estimate 5.1 million HIV-related medical visits were provided in the United States in 2008. Approximately 63 percent of all HIV-related visits demanded in 2008 were for individuals ages 35 to 54. Individuals ages 25 to 34 and 55 and older each represented about 15 percent of total visits. Approximately two-thirds of total visits were for males and one-third for females. Black non-Hispanics accounted for the highest share of visits (45 percent), followed by white non-Hispanics (34 percent). Hispanic individuals represented 18 percent of all visits demanded. The South represents the highest proportion of visits (42 percent), followed by the Northeast (28 percent). The West and Midwest have about 17 and 12 percent of visits, respectively.

Table ES.2. Number of HIV Visits Demanded, by Demographic Group, 2008

Demographic Group	Number of Visits Demanded (in thousands)	Percentage of Visits Demanded
Total	5,148	100.0
Age Group		
Younger than 13	28	0.5
13 to 24	293	5.7
25 to 34	800	15.5
35 to 44	1,623	31.5
45 to 54	1,614	31.3
55 to 64	658	12.8
Older than 64	132	2.6
Gender		
Male	3,455	67.1
Female	1,693	32.9
Race/Ethnicity		
White, non-Hispanic	1,758	34.1
Black, non-Hispanic	2,317	45.0
Other/multiple race, non-Hispanic	138	2.7
Hispanic only	935	18.2
Region		
Northeast	1,463	28.4
South	2,190	42.5
Midwest	604	11.7
West	891	17.3

Source: Mathematica and Lewin analysis of HIV clinician workforce model.

Note: Percentages might not sum to 100 percent due to rounding.

C. Current Supply of HIV Care

In Table ES.3, we show the demographic distribution of the 4,937 high-volume HIV clinicians identified via the claims and survey analyses. Of these, an estimated 54.6 percent are primary care physicians, 37.2 percent are infectious disease physicians, and 8.3 percent are nurse practitioners or physician assistants. An estimated 65.8 percent of all high-volume HIV clinicians are male and 16.5 percent are age 65 and older. More than two-thirds of all primary care physicians and infectious disease physicians are male, compared with fewer than one-third of all nurse practitioners and physician assistants. The majority of all HIV clinicians are white, non-Hispanic.

Table ES.3. Percentage Distribution of High-Volume HIV Clinicians, by Demographic Characteristics and Clinician Type (percentages)

Demographic Characteristic	Percentage of HIV Clinicians
Clinician Type	
Primary Care Physicians	54.6
Infectious Disease Physicians	37.2
Nurse Practitioners and Physician Assistants	8.3
Gender	
Male	65.8
Female	34.2
Age Group	
Younger than 45 years	31.8
45 to 64 years	51.7
65 years and older	16.5
Race/Ethnicity	
White, non-Hispanic	68.0
Black, non-Hispanic	8.3
Hispanic	7.3
Other/multiple race, non-Hispanic	16.3

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Notes: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Percentages are within clinician type and might not sum to 100 percent due to rounding. Among eligible respondents, 90.0 percent reported this information.

Based on the findings of the survey, Table ES.4 provides estimates of the number of HIV-related visits supplied by the high-volume HIV clinicians identified. We derived the total number of HIV visits supplied during the base year by multiplying the number of high-volume HIV clinicians (column A) by the product of the average number of hours worked per year (column B), the proportion of time spent in HIV care (column C), and the number of HIV visits per hour (column D). The results presented in columns B–D reflect overall averages after adjusting for statistically significant differences across age, gender, and clinician type categories and applying the survey weights. In total, we estimate the high-volume HIV clinicians provided 5.1 million HIV-related medical visits in the United States in 2010.

Table ES.4. Total Number of HIV Clinician Visits Supplied in 2010, by Clinician Type

	(Column A) Number of HIV Clinicians	(Column B) Number of Hours Worked per Year	(Column C) Proportion of Time Spent in HIV Care (%)	(Column D) Number of HIV Visits per Hour	(Column E) Total Number of HIV Visits Supplied (in 1,000s)
PCP	2,693	1,872	30.4	1.5	2,297
IDP	1,836	1,871	39.3	1.5	2,024
NP/PA	408	1,993	66.9	1.4	762
All Clinicians	4,937	1,882	36.7	1.5	5,083

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

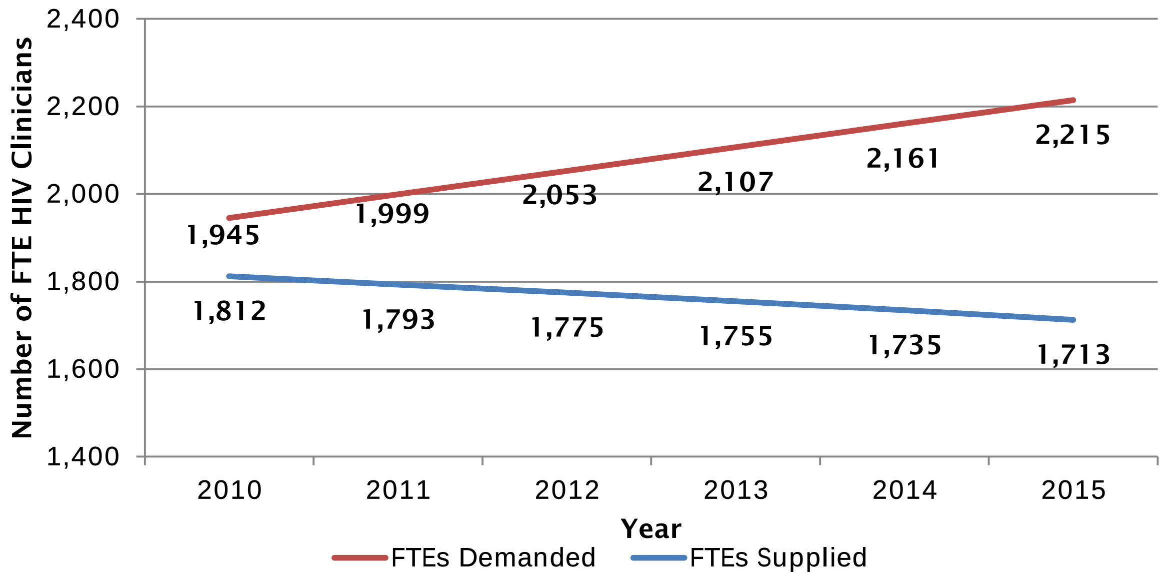
Notes: The results shown in columns B, C, and D were derived from the model using statistically significant subgroup means only and, thus, may differ from the age, gender, and clinician type means presented in the earlier tables.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

D. Future Supply of and Demand for Supply of HIV Care

Figure ES.2 presents the baseline demand and supply projections expressed in FTE HIV clinicians per year over the five-year forecasting period. Under the baseline assumptions, the total number of FTE HIV clinicians supplied in the United States is expected to decline 5.5 percent over this period, from 1,812 FTE HIV clinicians in 2010 to 1,713 in 2015. During the same period, the total number of FTE HIV clinicians demanded in the United States is expected to increase 13.9 percent, from the base-year value of 1,945 to 2,215 by 2015. The net result of the model is an estimated shortage of 133 FTE clinicians in the base year, growing to an excess demand of 502 FTE HIV clinicians in 2015.

Figure ES.2. Baseline Forecasts of FTE HIV Clinicians Demanded and Supplied, 2010–2015



Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), Medical Group Management Association (MGMA) survey (2012), NAMCS (2009) and NHAMCS (2008) surveys, HCUP-NIS data (2002-2009), and state and federal HIV surveillance data (2008).

FTE = full-time equivalent.

The decline in FTE HIV clinician supply is largely due to the fact that the number of new clinicians entering the HIV workforce is not sufficient to fill the gap left by clinicians leaving the HIV workforce due to retirement and mortality. The decline in FTE HIV clinician supply is also due to the demographic shift in the HIV workforce toward female clinicians. A disproportionate share of new entrants are female, and, on average, female clinicians tend to work fewer hours per year than their male counterparts. The growth in FTE HIV clinician demand, on the other hand, is primarily due to the addition of newly diagnosed cases each year and the low mortality rate among the currently diagnosed population.

Table ES.5 provides additional information on the supply forecast, displaying the counts of active HIV clinicians forecast in each year from 2010 to 2015 by clinician type. Our model forecasts a decline in the number of primary care clinicians and infectious disease specialists managing HIV care by 2015 of about 400 and 200 clinicians, respectively. In contrast, the number of nurse practitioners and physician assistants supplying HIV care is expected to increase from 408 clinicians in the base year to 511 clinicians in 2015. Thus, nurse practitioners and physician assistants will provide an increasing share of HIV specialty care.

Table ES.5. Baseline Forecasts of HIV Clinicians Supplied, 2010–2015

	2010	2011	2012	2013	2014	2015
HIV Clinicians						
PCP	2,693	2,602	2,524	2,445	2,369	2,292
IDS	1,836	1,789	1,748	1,707	1,666	1,625
NP/PA	408	431	453	473	493	511
Total	4,937	4,823	4,724	4,625	4,527	4,429

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012).

IDS = infectious disease specialist; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

As a result of these trends in the demand and supply of HIV services, our model indicates that the shortage of FTE HIV clinicians will almost quadruple over the forecasting period, from an excess demand of 133 FTE HIV clinicians in 2010 (equivalent to 7.3 percent of total supply) to 502 in 2015 (equivalent to 29.3 percent of total supply). Although we expect a small amount of excess demand to persist throughout our forecasting period given the exclusion of low-volume HIV clinicians from the supply-side calculations, the five-year projections reflect a real and growing shortage. Improvements in HIV detection and engagement in care will only make the predicted shortage worse.

E. Discussion and Limitations

This study has several limitations that should be kept in mind when reviewing the results. First, there were gaps in the available data sources supporting our supply and demand estimates. Most importantly, the supply estimates include only providers who can be identified on medical claims. This is likely to result in an undercount of federally employed providers and nurse practitioners and physician assistants. Similarly, our demand estimates also underestimate services provided by nurse practitioners and physician assistants, as these providers are generally excluded from the universe of the NAMCS survey, a primary source of our demand estimates. Second, the findings reflect current market-based supply and demand. They do not take into account unmet needs in the current market, such as people living with HIV but not yet diagnosed and in care, people diagnosed with HIV but not linked to or engaged in care, and people engaged in care but not yet receiving the optimal level of care. In addition, the projections presented in this study do not take into account changes in market conditions, such as expanded health insurance coverage likely to occur after the full implementation of the 2010 Patient Protection and Affordable Care Act (ACA), or changes in treatment patterns. Finally, although we estimate the known determinants of the demand for and supply of care, the future will be determined by both known and unknown forces and, as a result, our findings should be interpreted as representing the general magnitude of the shortage, rather than as precise estimates.

With these limitations in mind, the study offers many new insights into the composition of the HIV clinician workforce. Most significantly, the HIV clinicians identified represent a range of medical specialties and health professions. Nurse practitioners and physician assistants are likely to be an increasingly important component of the HIV workforce. Effective workforce strategies will have to be tailored to the differences in training and scope of practice across the range of HIV specialists. Another important feature of the HIV workforce is that most HIV clinicians spend only a portion of their overall patient care time treating patients with HIV. The capacity of the HIV clinician workforce might be expanded by increasing the proportion of time that clinicians currently treating patients with HIV spend in HIV care. Alternatively, our analysis identified many clinicians who treat a low volume of HIV patients and who do not manage the HIV treatment of these patients on an ongoing basis. The HIV workforce might be expanded by providing additional training or professional support, such as comanaging care with an HIV specialist, to these low-volume clinicians.

Overall, this study shows a currently small, but rapidly expanding shortage of HIV providers over the next few years. By 2015, our forecasting model predicts that the supply of HIV clinicians will be sufficient to meet only three-quarters of the total demand for HIV medical services under current market-based assumptions. Expanded HIV testing and diagnosis and improvements in linkages, engagement, and adherence to care—without an increase in the number of health care providers willing to treat people with HIV or improvements in the productivity of the HIV workforce—will only make the forecasted deficit of HIV providers worse.

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I. INTRODUCTION

The United States faces a growing demand for care related to HIV infection. In September 2010, amid growing concern about the potential shortage of HIV clinicians, the HIV/AIDS Bureau (HAB) within the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) contracted with Mathematica Policy Research and its partner, The Lewin Group, to conduct an HIV workforce study to estimate the number of clinicians providing HIV-related medical care in the United States today, and to forecast the magnitude of the expected HIV clinician shortages or surpluses nationally and regionally in the future. HRSA initiated the study in an effort to promote the goals of the National HIV/AIDS Strategy, launched by the White House Office of National AIDS Policy (ONAP) in 2010 to reduce new HIV infections, increase access to care and improve health outcomes for people living with HIV, and reduce HIV-related disparities (ONAP 2010).

The primary research questions of the HIV workforce study were as follows:

- How many clinicians provide HIV-related medical care in Ryan White- and non-Ryan White-funded settings in the United States today and what are their demographic and professional characteristics?
- What is the current market demand and need for HIV-related medical services in the United States today?
- How do the current supply of HIV clinicians and the current demand and need for HIV-related medical care vary by geographic region?
- What specific factors will influence the supply of HIV clinicians in the future? What specific factors will influence the market demand and need for HIV-related medical services in the future?
- Will the projected supply of HIV-related clinicians in the future be sufficient to meet the demand and need for HIV-related medical care under current market conditions?
- How does the current and future supply of HIV clinicians relative to the demand and need for HIV-related services vary by geographic region?
- How will selected alternative market scenarios affect the magnitude of the forecasted shortage or surplus of HIV clinicians?

The purpose of this report is to provide HRSA with the updated results from our HIV workforce model, incorporating supply-side inputs derived from the national HIV clinician workforce survey (see Section D for a description of the survey). Because HIV medicine is not a credentialed medical specialty, many of the supply-side inputs used in the previous version of the model (such as number of hours worked, proportion of hours spent treating patients with HIV, average number of HIV-related visits per hour, and entry into and retirement from HIV medicine) were based on estimates available from other specialties and subspecialties, including internal medicine, general practice, and infectious disease. Relying on other specialties to develop HIV clinician workforce projections resulted in an overestimate of the number of HIV-related visits supplied. Having completed a national survey of HIV clinicians, we are now able to update the supply-side inputs and reestimate the model to more accurately reflect the magnitude and characteristics of the HIV clinician workforce.

A. Project Timeline

Mathematica and Lewin began this 30-month study in October 2010. In March 2011, we presented our approach for estimating the current size of the HIV workforce and for projecting the supply of and demand for HIV clinicians in the future at a two-day meeting in Washington, D.C., with providers and other individuals knowledgeable about HIV workforce issues. The purpose of the meeting was to review the proposed methodology and solicit guidance on how best to model HIV clinician workforce behavior. (Appendix A provides a list of the individuals who participated in the all-day expert panel meeting.) Based on the feedback and recommendations of the expert panelists, we revised our methodology and submitted a final design report to HRSA later that month (Gilman et al. 2011). In January 2012, while awaiting federal review and approval to administer the HIV workforce survey, we presented to HRSA staff the preliminary results of the model at their headquarters in Rockville, Maryland, focusing mainly on the inputs, methodology, and underlying assumptions of the model. We also introduced the model and preliminary findings at the Ryan White HIV/AIDS Program All-Grantees meeting in November 2012 (Gilman et al. 2012). We received federal approval to administer the HIV clinician workforce survey in June 2012 and, from August to October, collected data from a national sample of HIV providers. We provided a description of our survey methodology and a summary of the results in a survey report to HRSA in December 2012 (Stalley et al. 2012). This report completes the work under our current contract with HRSA by updating the earlier projections to include supply-side inputs based on responses to the HIV clinician workforce survey and by extending the previous analysis to include regional estimates of supply and demand and forecasts under alternative policy and market-driven scenarios. By the end of May, we will also provide HRSA with a de-identified copy of the survey data and a user-friendly version of the HIV workforce model that agency staff can use to examine the potential effect of changes in health care policies or markets on the ability of the HIV workforce to meet the demand for care.

B. Overview of the HIV Workforce

In the United States, approximately 1.1 million adults and adolescents are living with HIV and, each year, another 50,000 become infected (Centers for Disease Control and Prevention [CDC] 2011). Because of advances in HIV care, people are living longer than they previously did with the disease and AIDS-related deaths are declining. The estimated number of people ages 13 years or older living with HIV infection increased 55 percent from 1996, when highly active antiretroviral therapy became widely available in the United States, to 2008; during the same period, the estimated number of people age 13 years or older with an AIDS-defining diagnosis more than doubled (CDC 2011). At the end of 2008, approximately 20 percent of the people living with HIV had an undiagnosed infection (CDC 2011). Furthermore, only about 77 percent of HIV-diagnosed people are linked to care within three or four months after diagnosis, and only about 51 percent of those with a diagnosis of HIV infection are engaged in long-term care (CDC 2011). Should universal routine HIV testing for people ages 13 through 64 be adopted, as recommended by the CDC and ONAP, and should improvements in linkages with and engagement in care be achieved, the demand for HIV care will increase rapidly and create significant new challenges for the health care system (Kaiser Family Foundation 2008). The 2010 Patient Protection and Affordable Care Act (ACA) should also result in increased access to care and improved outcomes for people living with HIV who have not previously seen a provider. Under the new law, people who are living with HIV but not diagnosed or at increased risk for HIV will be more likely to be screened for HIV infection and, among those newly diagnosed, to receive treatment and services that strengthen their ability to adhere to treatment regimens (CDC 2011).

Mounting evidence suggests that the HIV clinician supply might not be keeping pace with the growth in demand for HIV-related health care services. In the general literature, studies in the 1990s predicted shortages of primary care physicians and surpluses of specialists by the end of the 1990s (see Greenberg and Cultice [1997] for an example of this research). However, by the early 2000s, new approaches to studying supply and demand of health care clinicians predicted shortages of all types of physicians (Cooper et al. 2002). The more recent literature emphasizes that physician hours of work could be declining because the workforce is more likely to be employees (rather than self-employed or in partnerships), experiencing greater pressure on personal time (particularly among women in their child-rearing years), experiencing greater job-related stress, and retiring earlier. These factors might be especially true for clinicians specializing in HIV medicine. In a 2008 survey of its members, the American Academy of HIV Medicine (AAHIVM) found that one-third of current providers plan to retire within the next 10 years and a majority are concerned about a pending shortage of HIV clinicians.[2] In another recent study of HIV providers, nearly 70 percent of practices receiving Part C funding for early intervention services under the Ryan White HIV/AIDS Program reported having a difficult or very difficult time recruiting primary care providers; the principal cause of this difficulty was lack of qualified clinicians (HIV Medicine Association [HIVMA] 2008).[3] In a joint statement on the HIV medical workforce, AAHIVM and HIVMA concluded: "With the growing number of people living with HIV, a failure to promptly address HIV medical workforce issues could lead to the collapse of the HIV care system—risking lives and the public health of communities across the country" (HIVMA 2009).

C. The Field of HIV Medicine

The management of HIV care has changed dramatically since the introduction of antiretroviral therapy in the mid-1990s, and the evolution in HIV care and treatment poses a challenge to HIV workforce studies. HIV-related treatments and drug regimens have become more complex, requiring more time and resources for clinicians to provide HIV care and to stay informed about the latest HIV care research and guidelines. Pharmaceutical use has also become a central part of HIV treatment, increasing the use of clinical pharmacists with HIV expertise. At the same time, HIV medicine has changed from acute to chronic care. Early in the epidemic, HIV specialists such as infectious disease doctors provided most of the primary and specialty care needs of their patients. Today, responsibility for HIV care is shifting more toward primary care clinicians with HIV expertise. In some communities, responsibility for treating patients with HIV has been carved out by full-time HIV providers, who administer to all their patients' health care needs. In other communities, clinicians spend a small proportion of their time addressing the primary care needs of their HIV-positive patients, with specialist referrals for complex medical concerns. Finally, many HIV providers are beginning to test alternative practice models to improve quality and lower costs,

[2] AAHIVM is medical society for physicians, nurse practitioners, physician assistants, and pharmacists specializing in HIV care. The academy offers three professional certifications in advanced HIV care, one for practicing frontline clinical providers, one for nonpracticing clinicians, and one for HIV-specialized pharmacists. The organization advocates for federal action to address HIV workforce issues.

[3] HIVMA, an affiliate of the Infectious Disease Society of America, represents physicians, nurse practitioners, and physician assistants working in the area of HIV medicine. The member organization represents many of the medical disciplines needed to care for HIV infection and its complications, and advocates for the identification and credentialing of physicians specializing in HIV care. HIVMA and AAHIVM have initiated programs to mitigate the HIV workforce problem, to encourage students and newly trained clinicians to enter the field of HIV medicine, and to provide clinical resources and education to the existing HIV medical providers.

such as (1) using nurse practitioners and physician assistants as so-called physician extenders to take on more patient care and free physicians' time, (2) working in multidisciplinary groups of clinicians to provide more organized and comprehensive care, (3) comanaging patients between experienced generalists and HIV experts in areas with a shortage of specialists, and (4) sending medical staff from urban clinics with HIV expertise to suburban or rural primary care clinics without the internal capacity to treat their patients' HIV disease. In this study, we attempt to understand the implications of these and other changes in the treatment of HIV infection for the HIV clinician workforce.

D. Overview of the HIV Clinician Workforce Survey

To develop supply-side inputs for the projection model that reflect the reality of the HIV clinician workforce in the United States today, Mathematica conducted a national survey for HRSA in the fall of 2012 of clinicians who manage care for patients with HIV. The purpose of the HIV clinician workforce survey was to collect information that HRSA could use to develop HIV-specific workforce parameters (such as the proportion of time spent treating patients with HIV, number of HIV-related visits providers can conduct in a given hour, rate of new health professionals entering HIV medicine, and rate of current practitioners retiring from HIV care) for accurately forecasting provider supply at the local, state, regional, and national levels.4 In the absence of this information, HIV clinician workforce projections would have to rely on supply-side inputs developed from existing surveys of other medical specialties, such as internal medicine or infectious disease, which would likely provide a misleading or incomplete picture of the HIV clinician workforce. The supply-side inputs used in our HIV clinician workforce model—and reflected in the results presented in this report—are based on clinicians' responses to the HIV workforce survey.

Using a census of 9,145 HIV clinicians in our sampling frame (see Chapter III for a discussion of how we obtained an initial census of HIV clinicians), we drew a nationally representative probability sample of 5,000 clinicians to survey. By using a national probability sample, we hoped that the survey's results would be generalizable to the nation. We selected 5,000 clinicians using explicit and implicit stratification to help ensure that the sample chosen reflected the sampling frame. The explicit strata were defined by degree (physicians versus nonphysician clinicians), specialization (primary care physicians versus specialists), and urbanicity (metropolitan versus nonmetropolitan practice location). We implicitly stratified within these strata by U.S. Census region and specialization (for nonphysician clinicians) and gender (for physicians).

The clinician instrument consisted of 43 questions organized into the following sections:[5]

- **Eligibility screener.** We used the screener to identify and exclude clinicians who did not meet the health profession and medical specialty criteria applied to the survey frame.

[4] HRSA also conducted a separate survey of the practices within which the sampled clinicians work. The main purpose of the practice survey was to collect information that could be used to further measure the magnitude of current capacity constraints and to assess the effect of differences in practice management strategies on productivity. Due to the low response rate among the sampled practices, the results of the practice survey are not included in the analysis presented in this report.

[5] We included a copy of the HIV clinician workforce survey questionnaire in our survey report to HRSA (Gilman et al. 2012b).

- **Background (Section A).** In this section, we asked clinicians to report the year they received their clinical degree, the country in which they received their degree, the year they began treating patients with HIV, and the factors that led them to enter into HIV patient care.
- **Hours in patient care (Section B).** In this section, we gathered information on the number of hours clinicians spend treating all patients and those with HIV, and how they use their HIV patient-care hours.
- **Patient load (Section C).** In this section, we asked clinicians to report the number of patients they treat and the proportion of patients with HIV in their overall patient caseload. We also asked clinicians about the clinical and treatment characteristics of their HIV patients and the changes in the HIV patient caseload.
- **Practice settings (Section D).** In this section, we gathered information on the type of settings within which HIV clinicians practice and the primary practice setting of each provider. We also asked clinicians to indicate whether their primary practice receives Ryan White HIV/AIDS Program funds, as well as the length of initial and follow-up appointments for patients with HIV in their primary practice.
- **Practice management (Section E).** In this section, we asked clinicians to identify the types of strategies their primary practices use to manage care, including electronic medical record systems, scheduling procedures and policies, comanagement of HIV patients, delegation of clinical tasks to staff with less training, team-based care, and patient activation and disease management services.
- **Future plans (Section F).** In this section, we asked clinicians about their plans to provide care to patients with HIV in the future and their expected retirement plans.
- **Perception about workforce capacity (Section G).** In this section, we gathered information on clinicians' perception about the future supply of HIV clinician services relative to the demand for these services in their community.
- **Demographic characteristics (Section H).** In this section, we asked clinicians to report their gender, age, race, ethnicity, and income.
- **Contact information (Section I).** In this section, we asked clinicians to provide their name, mailing address, telephone number, and email address in case we had to clarify any of their responses.

Data collection for the HIV clinician workforce survey lasted for 12 weeks, beginning August 9, 2012, and ending October 31, 2012. Clinicians responded to the questionnaire either by web or mail. We provided a prepayment of $20, plus a differential post-payment of $20 for mail responses or $40 for web-based responses. Of the 5,000 clinicians sampled, 1,183 clinicians completed the survey and were eligible for inclusion based on our screener. Another 963 respondents were coded as ineligible due to having died or moved, leaving medical practice or having an ineligible medical specialty, or treating fewer than 10 patients with HIV. Based on the eligibility rate among the 2,146 clinicians who responded to the screening questions, we estimate that 2,757 of the 5,000 clinicians sampled were eligible to participate in the survey, giving a response rate of 42.9 percent (1,183 eligible completes divided by 2,757 estimated eligibles). Because the relatively low response rate increases the risk of nonresponse bias, we conducted a nonresponse bias analysis and developed nonresponse adjustments to mitigate that risk. (See Stalley et al. [2012] for a detailed description of our methodology for adjusting for the potential of a nonresponse bias.)

The main purpose of the clinician survey was to develop supply-side parameter estimates (for example, hours worked per week, proportion of time in HIV care, and HIV visits per hour in HIV care) for the HIV workforce model. We did not design the survey samples to test hypotheses having to do with a comparison of subgroups. Despite the lower-than-expected response rate, the completed eligible sample size of 1,183 enables us to estimate supply-side parameters with precision for the full sample and for certain subgroups within the sample. We weighted the results to adjust for survey sampling and nonresponse and used specialized procedures to account for sample stratification and weighting in the variance estimates when conducting statistical testing.

The size of the survey sample was not sufficient to develop precise estimates of the number of HIV clinicians at state and local levels. To address HRSA's need for information on clinician supply at these levels, we used small area estimation techniques to estimate the supply of HIV clinicians in larger states and high-prevalence metropolitan statistical areas (MSAs) based on information in the survey frame to predict the likelihood that a clinician with given characteristics met the criteria for survey eligibility, and thus would be defined as an HIV clinician. We developed a model to predict how likely survey respondents were to meet the criteria to be defined as HIV clinicians based on their characteristics and survey responses. The model had a 78 percent concordance rate (that is, more than three quarters of the cases were classified correctly according to whether the model's propensity score was above or below 0.5). We aggregated the state level estimates to develop the national estimate of HIV clinician supply in 2008.

We provide a full description of our survey methodology (including sampling frame and methods, survey content, data collection procedures, response patterns, data edits and imputation methodologies, quality assurance procedures, nonresponse analysis, and survey weights and adjustments) and a comprehensive review of the survey results in our survey report to HRSA (Stalley et al. 2012).

E. Several Words of Caution

This study has several limitations that should be kept in mind when reviewing the results presented here. First, we based our supply projections on an estimate of the current supply of high-volume HIV providers that can be identified on medical claims (and verified through the survey), and exclude clinicians who treat fewer than 10 HIV patients and those who do not appear in our claims file. To achieve equilibrium in the current market (that is, to ensure that the services currently received equal the services currently provided), one would have to increase the number of providers currently treating patients with HIV to account for those not included in our definition and database. Second, the findings we present in this report are based on an estimate of the number of services currently demanded in the market, which reflects today's underlying market conditions, such as insurance coverage, known prevalence, and treatment patterns. In Chapter V, we examine the impact of alternative market conditions, such as an increase in diagnosed prevalence, on the HIV clinician workforce. Finally, all workforce studies are predictive. In Chapter IV, we identify the known determinants of the supply of and demand for HIV-related medical services and attempt to account for the most important of these factors. However, the future will be determined by both known and unknown forces and, as a result, our findings should be interpreted as representing the general magnitude, rather than a precise estimate, of any shortage or surplus under a set of reasonable assumptions.

F. Organization of the Report

Following this introduction (Chapter I), the report consists of six major sections. In Chapter II, we use HIV surveillance and national health care utilization survey data to estimate the number of HIV-related visits currently demanded, based on the number of people diagnosed and living with HIV and the average number of HIV-related visits per diagnosed person per year. In Chapter III, we use health care claims and responses to the HIV clinician workforce survey to estimate the number, characteristics, and geographic distribution of HIV providers and to estimate the number of HIV-related visits currently supplied. In Chapter IV, we describe the factors affecting the future demand for and supply of HIV-related services and, for the most important of these factors, present the HIV-specific trend factors that we used in our forecasting model. In Chapter V, we describe our methods for estimating the future demand for and supply of HIV-related visits and present the results of the HIV clinician workforce model based on a set of baseline assumptions. We also recalculate the projections under several alternative scenarios about the future demand for and supply of HIV care. In Chapter VI, we summarize the main findings of the study, highlight the limitations of our model, and describe several future analyses that could be useful for planning for the growing demand for HIV care in the United States.

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II. MEASURING THE NUMBER OF HIV CLINICIAN VISITS DEMANDED

In this chapter, we address our methods and findings on the number of HIV-related medical visits demanded during our base year. In Section A, we provide an overview of our approach. In Sections B and C, we describe the individual components of our demand estimates. In Section D, we present the findings related to total demand. Finally, we summarize the findings and discuss the limitations of our market-based demand analysis in Section E.

A. Overview of HIV Care Demand

We define demand as the observed total number of HIV-related medical visits provided under the market conditions prevailing in 2008. These market conditions include the level of public and private funding available to support the provision of HIV care and the number of individuals diagnosed with HIV and their HIV-related medical care needs. We do not attempt to derive an optimal level of demand based on normative assumptions or on policy goals and guidelines for treatment, engagement, and adherence. However, as shown in Chapter VI, the model can be used to simulate the impact of shifts in demand required to achieve normative goals and objectives.

For this analysis, HIV-related medical visits are defined as those visits that provide medical care for an HIV-related diagnosis code. We exclude visits related only to HIV testing and counseling because our analysis focuses on clinicians who manage HIV care longitudinally, and these types of visits are appropriately provided by non-HIV primary care clinicians as well as by HIV care specialists. However, we include visits for which HIV is a secondary diagnosis, because the presence of HIV as a secondary diagnosis will frequently complicate treatment, implying that optimal treatment of the primary diagnosis will require the knowledge of an HIV care specialist.

We develop our estimate of the total number of HIV-related visits provided based on two components:

1. **Number of individuals diagnosed with HIV.** This measure includes the number of individuals diagnosed and living with HIV infection only and those with an AIDS-defining diagnosis. It excludes undiagnosed cases of HIV because these cases do not generate HIV-related medical visits until they are diagnosed.
2. **Number of HIV-related visits per diagnosed person.** This measure is based on the observed number of ambulatory and inpatient hospital visits per person diagnosed with HIV only or AIDS. All utilization measures are for HIV-related medical care only. Visits for HIV testing and counseling associated with an initial diagnosis are not included in our demand estimates.

We disaggregate both of these components (number of individuals diagnosed and visits per diagnosed person) into subgroups defined by the diagnosed individual's age group, gender, and geographic location. This level of disaggregation helps facilitate development of model projections. It also enables us to display detail on the demographic and geographic distribution of HIV demand.

B. Number of Individuals Diagnosed with HIV or AIDS

In this section, we discuss our approach to developing estimates of the number of individuals diagnosed with HIV. First, we describe our methods and data sources. Then, we present the findings.

1. Methodology

We developed estimates of current market demand based on counts of individuals in the United States who are living diagnosed with HIV and AIDS. Our counts include those engaged in longer-term care and those who seek care sporadically or not at all. We disaggregated patients into subgroups based on the following dimensions:

1. **AIDS status.** We organized HIV patients into two groups: one based on a diagnosis of HIV infection only and one based on having an AIDS-defining condition.
2. **Age and gender.** We developed estimates of market demand by patient age group and gender.
3. **Geographic location.** We developed HIV patient counts for each state, for metropolitan statistical areas (MSAs) with more than 5,000 diagnosed people, and nationally.
4. **Race/ethnicity.** The CDC surveillance system includes information on the race/ethnicity of individuals diagnosed with HIV. We used this information to disaggregate the number of diagnosed cases into groups based on the following four racial and ethnic categories: white non-Hispanic, black non-Hispanic, Hispanic, and other/multiple race.

We developed our estimates of the number of diagnosed cases in multiple steps. First, we developed counts of all individuals diagnosed with an HIV infection (regardless of AIDS diagnosis). Then, we developed counts of individuals with an AIDS diagnosis. Finally, we subtracted the number of individuals living with an AIDS diagnosis from the total number of individuals living with an HIV infection (regardless of AIDS diagnosis) to obtain a count of the number of individuals living with HIV but without an AIDS diagnosis. We describe our approach to developing each of these three counts in more detail below.

For people 13 years and older, we obtained the total number of diagnosed individuals living with HIV or AIDS for each state and the District of Columbia, as reported in Table 21 in the 2009 CDC HIV surveillance report (CDC 2009). In four of these areas, state surveillance data indicated a substantially greater total number of HIV or AIDS cases relative to the CDC surveillance report.[6]

[6] State and federal HIV surveillance data will differ in states that have not yet implemented name-based HIV infection reporting required by the federal agency. The CDC data are also statistically adjusted to account for delays in reporting of diagnoses and death. To allow for stabilization of data collection and for adjustment of the data to monitor trends, only jurisdictions that have been conducting confidential name-based HIV infection reporting for a sufficient length of time are included in the estimated data. In the 2009 HIV Surveillance Report, estimated data are shown for 46 states that implemented name-based HIV infection reporting since at least January 2007 and began reporting to CDC by June 2007.

For these areas, we used the estimates from the state surveillance data rather than the CDC estimates. Jurisdictions with local estimates greater than the CDC estimates were District of Columbia, Mississippi, Montana, and New Mexico. Across these four states, use of the state surveillance estimates increased the overall count of diagnosed cases by 5,230.

Although the CDC surveillance report provides an estimate of the number of individuals living with HIV or AIDS nationally who are younger than 13, it does not provide this information by state. Therefore, we used alternative sources to develop our estimate of the total count for this population. When information on the number of individuals younger than 13 years living with HIV or AIDS was available from state surveillance data, we used the state data. When this information was not available from state surveillance data, we assumed that the share of individuals living with HIV or AIDS younger than 13 years in a state was the same as the national estimate of the share of HIV or AIDS cases among individuals younger than 13 years based on the CDC surveillance report. In other words, the state distributions of the younger-than-13-years cases versus the older-than-13-years cases were based on the national distributions for this population.

Because Table 21 of the 2009 CDC surveillance report provides estimates of the distribution of the population living with HIV or AIDS in each state by race/ethnicity, we used this distribution to allocate the total number of cases in each state by the four racial and ethnic categories mentioned earlier. For individuals ages 13 years and older, we used state surveillance data, when available, to distribute the total number of HIV or AIDS cases in the state by age and gender. If state surveillance age groups were not aligned with the age categories needed for the aggregate supply and demand model, we used the distribution of cases by age nationally from the CDC surveillance report to develop consistent age group categories.[7] When state surveillance data were not available, we used the national age/gender distribution for individuals 13 years or older. When state surveillance data did not provide information on the gender distribution of children younger than 13 years living with HIV or AIDS, we assumed that the male–female distribution among such individuals was equal.

We applied a similar methodology for estimating the overall number and demographic distribution of individuals with a CDC-defined AIDS diagnosis in each state. We obtained total counts of the number of individuals living with AIDS by state and race/ethnicity from Table 22 of the 2009 CDC surveillance report. We obtained estimates of the age and gender distribution of the population in each state with an AIDS diagnosis from state surveillance data, when available. If these data were not available from the state, we used the national proportion of individuals living with AIDS in each age group to estimate the share of individuals in each age group living with HIV who were diagnosed with AIDS. Then, we calculated the population with AIDS that would be in each age group based on the national shares. We then used this distribution to allocate the total AIDS cases for the state from the CDC report by age group. If no data on the gender distribution of the population living with HIV were available in a state, then we assumed the gender distribution of AIDS cases within the state was the same as the distribution of HIV cases in the state. To calculate

[7] The model includes the following uniform age groups for each state: younger than 13, 13 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 or older. When the age groups reported by a state differed from these categories, national shares were used to allocate the individuals in the state categories to the model categories. For example, if state data reported a 45-or-older category for individuals living with HIV/AIDS, then 67.5, 25.8, and 6.7 percent of the people living with HIV/AIDS in this category were allocated to the 45 to 54 years old, 55 to 64 years old, and 65 or older categories in the model, respectively.

the number of HIV diagnoses that have not yet progressed to AIDS, we subtracted the number of individuals diagnosed with AIDS from the total number of individuals diagnosed with HIV for each age, gender, and racial and ethnic group in each state.

Because HRSA provides assistance through the Ryan White HIV/AIDS Program at the MSA level, we also developed estimates at the MSA level for MSAs with at least 5,000 diagnosed cases at the end of 2008 according to Table 23 of the 2009 CDC surveillance report. We obtained information on the total number of diagnosed cases in each MSA from Table 23 of the CDC surveillance report. Estimates were then distributed by age, gender, and race/ethnicity based on surveillance data reported by state and local organizations, when available. For four MSAs—Charlotte, Denver, San Diego, and Virginia Beach—MSA-specific information was not available. State-level information was used to distribute diagnosed people in Charlotte and San Diego. National-level information was used to distribute diagnosed people in Denver and Virginia Beach.

2. Data Sources

Our primary source of information for the number of people living with HIV/AIDS was the CDC HIV surveillance system. Under this system, the CDC funds states and the District of Columbia to collect data on individuals diagnosed with HIV. These data are de-identified and transmitted to the CDC. CDC releases an annual surveillance report showing the number of diagnosed cases by jurisdiction, age, gender, and race. This study relies on data from the 2009 surveillance report, which presents counts of living diagnosed cases as of the end of 2008 (CDC 2009). When detailed information on the demographic characteristics of individuals living and diagnosed with HIV was not available in the 2009 CDC surveillance report, we reviewed surveillance data collected by state or local organizations to obtain additional detail, when available. We emphasize that the CDC and state surveillance systems include only diagnosed cases. The federal and state systems do not include undiagnosed individuals living with HIV.

3. Results

Our aggregate supply and demand model allows for the disaggregation of the current population living with HIV or AIDS by state or MSA, age group, sex, and race/ethnicity. In this section, we present summary statistics based on these detailed estimates. Table II.1 displays our estimates of the number of individuals living with HIV overall and by AIDS status by age group. These data reflect only diagnosed cases reported to the CDC or on state surveillance systems, and include diagnosed individuals who are not engaged in longer-term care. Overall, we find about 850,000 diagnosed HIV cases in the United States at the end of 2008, with 56 percent having progressed to AIDS and 44 percent with an HIV-only diagnosis.

Table II.1. Population Living with Diagnosed HIV, by AIDS Status and Age Group, End of 2008

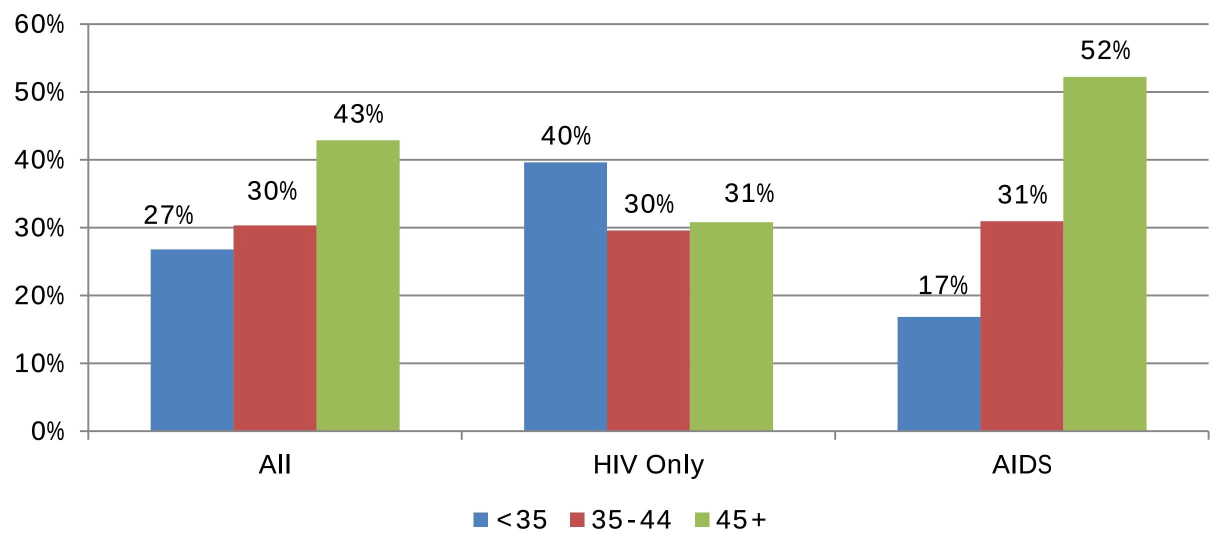
	Number of HIV Cases			Percentage of HIV Cases		
Age Group	All	HIV Only	AIDS	All	HIV Only	AIDS
Younger than 13	5,245	4,197	1,048	0.6	1.1	0.2
From 13 to 24	59,810	43,756	16,054	7.0	11.7	3.3
From 25 to 34	163,387	99,719	63,668	19.2	26.8	13.3
From 35 to 44	258,790	110,214	148,576	30.4	29.6	30.9
From 45 to 54	226,147	66,837	159,310	26.5	17.9	33.2
From 55 to 64	115,905	41,139	74,766	13.6	11.0	15.6
Older than 64	23,363	6,701	16,662	2.7	1.8	3.5
Total	852,647	372,563	480,084	100.0	100.0	100.0

Sources: Mathematica analysis of CDC and state HIV surveillance data, 2012.

Note: Percentages might not sum to 100 due to rounding.

Figure II.1 displays the distribution of HIV cases by age group and AIDS status at the end of 2008. Those having progressed to AIDS tend to be older (52 percent of the diagnosed AIDS population are older than 45 compared with 31 percent of the population with diagnosed HIV only).

Figure II.1. Distribution of Diagnosed HIV Cases, by Age Group and AIDS Status, End of 2008



Sources: Mathematica analysis of CDC and state HIV surveillance data, 2012.

Table II.2 displays the number of individuals living with HIV nationally by age and gender. We estimate that, overall, 75 percent of the population living with HIV is male and 25 percent is female. Our estimate of the male percentage is slightly higher than the estimate (73 percent) from Table 15a of the 2009 CDC surveillance report. However, the CDC estimate includes only the 40 states with mature HIV reporting systems and we based our estimates on available data from all 50 states and the District of Columbia. With the exception of the younger-than-13 age group, the share of each age group represented by males is relatively constant. The lack of gender variation across age groups is unsurprising due to the absence of data on the distribution of cases by gender across age groups within many states. We were able to obtain information on the gender distribution for different age groups in only a small number of states. For all other states, we assumed a constant distribution of cases by gender across all age groups within the state based on the overall distribution of cases in the state by gender. The exception to this was the age group of individuals younger than 13 years, for which we assumed cases were equally distributed between males and females.

Table II.2. Population Diagnosed and Living with HIV, by Age and Gender, End of 2008

	Number of Cases		Percentage of Cases	
Age Group	Male	Female	Male	Female
Younger than 13	2,639	2,606	50.3	49.7
From 13 to 24	44,646	15,164	74.6	25.4
From 25 to 34	122,653	40,734	75.1	24.9
From 35 to 44	193,859	64,931	74.9	25.1
From 45 to 54	168,492	57,655	74.5	25.5
From 55 to 64	85,290	30,615	73.6	26.4
Older than 64	17,323	6,040	74.1	25.9
Total	634,903	217,745	74.5	25.5

Sources: Mathematica analysis of CDC and state HIV surveillance data, 2012.

Table II.3 displays the population diagnosed and living with HIV by race/ethnicity and gender. Similar to the distribution by age and gender, there is limited variation across the racial and ethnic groups. Again, this lack of variation might be due to the lack of available data on the distribution of cases by racial and ethnic groups and gender. When data were unavailable, we assumed a constant distribution of cases by gender across all racial and ethnic groups within a state.

Table II.3. Population Diagnosed and Living with HIV, by Race/Ethnicity and Gender, End of 2008

	Number of Cases		Percentage of Cases	
Race/Ethnicity	Male	Female	Male	Female
White, Non-Hispanic	227,247	66,705	77.3	22.7
Black, Non-Hispanic	271,479	108,004	71.5	28.5
Hispanic	118,575	37,599	75.9	24.1
Other/Multiple Race Non-Hispanic	17,602	5,437	76.4	23.6

Sources: Mathematica analysis of CDC and state HIV surveillance data, 2012.

Tables II.4 and II.5 display the population diagnosed and living with HIV in the four U.S. Census regions and the 10 HRSA regions by gender. The proportion of females is highest in the Northeast (31 percent) followed by the South (28 percent). The Midwest and West have much lower proportions of females living with HIV (22 and 14 percent, respectively).

Table II.4. Population Diagnosed and Living with HIV, by Region and Gender, End of 2008

	Number of Cases		Percentage of Cases	
Region	Male	Female	Male	Female
Northeast	160,991	72,723	68.9	31.1
South	259,579	100,805	72.0	28.0
Midwest	78,341	22,010	78.1	21.9
West	135,982	22,216	86.0	14.0

Sources: Mathematica analysis of CDC and state HIV surveillance data, 2012.

Using the HRSA regions, Region 2 (New Jersey and New York) and Region 3 (Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia) have the highest proportions of females (32 and 31 percent, respectively). In Region 9 (Arizona, California, Hawaii, and Nevada) and Region 10 (Alaska, Idaho, Oregon, and Washington), females represent a smaller proportion of diagnosed cases (at 13 and 14 percent, respectively).

Table II.5. Population Diagnosed and Living with HIV, by Region and Gender, End of 2008

HRSA Region		Number of Cases		Percentage of Cases	
		Male	Female	Male	Female
1	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont	20,949	8,288	71.7	28.3
2	New Jersey and New York	117,863	54,930	68.2	31.8
3	Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia	70,431	31,371	69.2	30.8
4	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee	143,114	59,283	70.7	29.3
5	Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin	64,075	18,819	77.3	22.7
6	Arkansas, Louisiana, New Mexico, Oklahoma, and Texas	71,437	20,100	78.0	22.0
7	Iowa, Kansas, Missouri, and Nebraska	13,857	3,036	82.0	18.0
8	Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming	10,508	3,763	73.6	26.4
9	Arizona, California, Hawaii, and Nevada	108,629	15,802	87.3	12.7
10	Alaska, Idaho, Oregon, and Washington	14,040	2,352	85.7	14.3

Sources: Mathematica analysis of CDC and state HIV surveillance data, 2012.

C. Number of HIV-Related Visits per Diagnosed Person

In this section, we discuss the second component of current market-based demand: average number of HIV-related medical visits per diagnosed person. First, we describe our data and methods, followed by a summary of the main findings.

1. Data and Methods

We estimated market utilization of ambulatory services among individuals living with HIV infection or an AIDS diagnosis based on two National Center for Health Statistics (NCHS) provider surveys: the National Ambulatory Medicare Care Survey (NAMCS) for 2002 through 2009 and the National Hospital Ambulatory Medicare Care Survey (NHAMCS) for 2002 through 2008. We used information on patient diagnoses in these surveys to identify HIV-related visits. These surveys also provide information on patient demographics, including age, gender, race/ethnicity, and geographic region. The strengths of these surveys are that they are nationally representative and include uninsured patients who would not appear in insurance claims databases. Because of the small number of HIV care visits included in each annual survey sample, we pooled the data across the years to increase the precision of our estimates. We estimated market demand for HIV-related visits in hospital inpatient settings from the Health Care Cost and Utilization Project's National Inpatient Sample (HCUP-NIS), using data from 2002 through 2009. The HCUP-NIS database classifies discharges by diagnosis, using the Clinical Classifications Software (CCS). HIV-related discharges are classified under CCS category 5.

We used the diagnosis, prescription drug, and reason-for-visit codes provided in the NAMCS and NHAMCS files to estimate the number of HIV-related ambulatory visits nationally. We provide the diagnosis, prescription, and reason-for-visit codes to identify HIV-related visits in Appendix B. From NAMCS, we calculated the number of HIV-related visits to a physician office and, from NHAMCS, the number of HIV-related visits to a hospital outpatient department or clinic. We included both primary and secondary diagnosis codes for HIV. Approximately 82 percent of the ambulatory visits were identified based on a primary diagnosis of HIV. As noted, we excluded codes indicating HIV testing and counseling only because our analysis focuses on clinicians who manage HIV care longitudinally, and these testing and counseling visits are appropriately provided by non-HIV primary care clinicians as well as by HIV care specialists. We constructed 95 percent confidence intervals around the total HIV-related ambulatory visits per diagnosed person for selected subpopulations by subtracting or adding the standard error times 1.96 to the mean for each group.[8]

To estimate the number of inpatient hospital discharges related to HIV care, we selected discharges classified under CCS category 5 for HIV infection from the HCUP-NIS database, using both primary and secondary diagnoses. We assumed that inpatients with a primary diagnosis of HIV received a daily visit from an HIV specialist. Total patient days were calculated for hospital discharges with a principal diagnosis of HIV by multiplying the number of discharges by the average length of stay. The estimated number of HIV specialist visits associated with these inpatient stays was set equal to the total number of these inpatient days. For hospital discharges with a secondary diagnosis of HIV infection, we assumed an HIV specialist would provide one consultation visit per discharge. The number of HIV specialist visits associated with inpatient stays with a secondary diagnosis of HIV was set equal to the total number of these hospital discharges.

2. Results

Tables II.6 and II.7 display estimates of the annual number of physician office and hospital ambulatory care visits, respectively, by patient demographic characteristic. In total, approximately 4.4 million visits were provided per year during the period under review, with 58.1 percent being office

[8] The authors will provide a description of the methodology for conducting confidence intervals around mean visits per diagnosed case for selected subpopulations on request.

visits and the remaining 41.9 percent being provided in the emergency room or hospital outpatient department. About half of the hospital outpatient department visits were emergency room visits.

Table II.6. Average Annual Number of Physician Office Visits for HIV-Related Care, 2006–2009

Demographic Group	Number of HIV Visits in Survey	National Average Number of Visits per Year	Annual Number of Visits: Lower 95% CI	Annual Number of Visits: Upper 95% CI
Total United States	383	2,535,473	2,270,307	2,800,639
Age Group				
Younger than 35	88	513,836	363,407	664,264
35 to 44	118	811,799	615,372	1,008,225
45 to 54	114	817,657	619,268	1,016,046
Older than 54	63	392,182	261,271	523,094
Sex				
Male	262	1,769,566	1,516,234	2,022,898
Female	121	765,907	582,691	949,124
U.S. Census Region				
Northeast	49	226,522	139,787	313,258
Midwest	30	238,797	111,143	366,450
South	228	1,461,178	1,211,337	1,711,018
West	76	608,977	458,388	759,566
Race/Ethnicity				
White only, Non-Hispanic	168	1,216,925	1,009,044	1,424,805
Black only, Non-Hispanic	128	728,527	533,093	923,961
Other/multiple race Non-Hispanic	10	NA	NA	NA
Hispanic only	77	461,048	317,645	604,451
Insurance Status				
Medicaid	96	495,518	333,683	657,352
Medicare	66	518,886	357,954	679,818
Privately insured	120	1,080,874	864,209	1,297,538
Other/uninsured/charity	101	440,196	308,495	571,898

Sources: Mathematica analysis of data from NAMCS (2002–2009).

Note: National estimates derived based on NAMCS survey weights. NA signifies the estimate was suppressed because its coefficient of variation was greater than 30 percent, suggesting high sampling variability.

CI = confidence interval; NA = not applicable.

Table II.7. Average Annual Number of Hospital Outpatient Visits for HIV-Related Care, 2006–2008

Demographic Group	Sample Size	Average Number of Visits per Year	Annual Number of Visits: Lower 95% CI	Annual Number of Visits: Upper 95% CI
Total United States	1,363	1,831,438	1,767,021	2,030,631
Age Group				
Younger than 35	315	398,182	322,185	474,179
35 to 44	385	575,493	487,317	663,669
45 to 54	464	589,196	505,281	673,112
Older than 54	199	268,567	210,186	326,948
Sex				
Male	798	1,157,758	1,042,356	1,273,160
Female	656	673,680	583,226	764,133
Region				
Northeast	618	599,074	520,844	677,304
Midwest	93	242,467	173,918	311,015
South	398	766,586	669,161	864,010
West	257	223,312	166,064	280,560
Race/Ethnicity				
White only, Non-Hispanic	372	413,296	339,501	487,091
Black only, Non-Hispanic	656	993,927	883,397	1,104,457
Other/multiple race Non-Hispanic	38	24,037	10,726	37,349
Hispanic only	297	400,178	329,458	470,898
Insurance Status				
Medicaid	754	838,345	746,321	930,369
Medicare	188	259,576	201,744	317,409
Privately insured	128	193,821	137,646	249,996
Other/uninsured/charity	293	539,696	447,527	631,864

Sources: Mathematica analysis of data from NHAMCS (2002–2008).

CI = confidence interval.

Table II.8 summarizes information across the physician office (NAMCS) and hospital outpatient department (NHAMCS) survey files. The first column displays the proportion of all ambulatory visits for each demographic group that were estimated from the hospital outpatient department survey. The second column shows the share of all visits attributed to each demographic group. Overall, about 42 percent of visits were provided in a hospital outpatient department. The proportion of visits provided in a hospital outpatient department was similar by age and gender. A greater share of visits was from hospital outpatient departments in the Northeast and a smaller share in the West. A higher percentage of visits for black, non-Hispanic people (58 percent) relative to white, non-Hispanic (25 percent) individuals occurred in a hospital outpatient department. By health insurance status, individuals with Medicaid had the highest share of claims from a hospital outpatient department and privately insured patients (15 percent) had the smallest share.

Focusing on the distribution of visits by demographic group, 64 percent of the visits were provided to individuals 35 to 54 years of age. Fifteen percent were provided to individuals ages 55 or older. About two-thirds of the visits were provided to males and one-third to females. By region, about half the visits were provided in the South and 19 percent each in the Northeast and the West. The remaining 11 percent of visits were provided in the Midwest. By race and ethnicity, white, non-Hispanic and black, non-Hispanic individuals represented about 37 to 39 percent of visits, respectively. Hispanic individuals accounted for 20 percent of all visits. Finally, by health insurance status, individuals with Medicaid represented 31 percent of all visits and individuals classified as uninsured/charity care/other represented 22 percent of visits. Individuals with Medicare represented 18 percent and privately insured individuals represented the remaining 29 percent.

Table II.8. Distribution of Ambulatory Visits for HIV Care, by Setting of Care and Demographic Group, 2006–2009

Demographic Group	Percentage of Ambulatory Visits in Hospital Outpatient Department	Proportion of All Visits Represented by Demographic Group
Total United States	41.9	100.0
Age Group		
Younger than 35	43.7	20.9
35–44	41.5	31.8
45–54	41.9	32.2
Older than 54	40.6	15.1
Sex		
Male	39.6	67.0
Female	46.8	33.0
Region		
Northeast	72.6	18.9
Midwest	50.4	11.0
South	34.4	51.0
West	26.8	19.1
Race/Ethnicity		
White only, Non-Hispanic	25.4	37.3
Black only, Non-Hispanic	57.7	39.4
Other/multiple race Non-Hispanic	NA	NA
Hispanic only	46.5	19.7
Insurance Status		
Medicaid	62.9	30.5
Medicare	33.3	17.8
Privately insured	15.2	29.2
Other/uninsured/charity	55.1	22.4

Sources: Mathematica analysis of data from NAMCS (2002–2009) and NHAMCS (2002–2008).

Note: NA signifies the estimate was suppressed because its coefficient of variation was greater than 30 percent, suggesting high sampling variability.

NA = not applicable.

To calculate utilization rates for HIV-related ambulatory care, we divided the estimated annual total count of ambulatory visits for HIV by the number of individuals diagnosed and living with HIV in each demographic group (based on the estimates of the number of diagnosed cases discussed in the previous section). We report the results of our utilization analysis in Table II.9. We do not present results by health insurance status because there is limited comprehensive information on the health insurance status of individuals diagnosed with HIV across our data sources. We find that, on average, individuals diagnosed with HIV, including those not engaged in long-term care, have 5.1 ambulatory medical care visits per year. Women and individuals ages 45 to 54 have higher rates of ambulatory visits than males. Individuals younger than 35 have lower utilization rates than those 35 and older.

Table II.9. Average Annual Visits for HIV-Related Care per Diagnosed Person

	Annual Visits per Diagnosed Person		
Demographic Group	Average	Lower CI	Upper CI
Total	5.1	4.7	5.5
Age Group			
Younger than 35	4.0*	3.3	4.7
35–44	5.4	4.5	6.2
45–54	6.2*	5.3	7.2
Older than 54	4.7	3.7	5.8
Gender			
Male	4.6	4.2	5.0
Female	6.6*	5.7	7.5
Race/Ethnicity			
White only, Non-Hispanic	5.5	4.8	6.3
Black only, Non-Hispanic	4.5	3.9	5.1
Other/multiple race Non-Hispanic	NA	NA	NA
Hispanic only	5.5	4.5	6.5

Sources: Mathematica analysis of data from NAMCS (2002–2009), NHAMCS (2002–2008), and CDC and state HIV surveillance systems (2008).

Note: A "*" indicates mean is significantly different from the national average at the 95 percent confidence level. NA signifies the estimate was suppressed because its coefficient of variation was greater than 30 percent, suggesting high sampling variability.

CI = confidence interval; NA = not applicable.

Table II.10 displays estimates of the annual average number of inpatient discharges with a principal diagnosis of HIV from 2006 through 2009. On average, there were about 65,000 discharges annually, with approximately two-thirds for males and one-third for females. Table II.10 also displays the average length of stay and the associated total number of inpatient days for these discharges. The average length of stay was 9.21 days, which was similar for males and females. The final column of the table displays the average number of inpatient discharges with a secondary diagnosis of HIV from 2006 through 2009. There were, on average, approximately 186,000 inpatient discharges with a secondary diagnosis of HIV per year, about three times the number of discharges with a primary HIV diagnosis. Similar to the discharges with a primary diagnosis of HIV, about two-thirds of those with a secondary diagnosis of HIV were for males and about one-third for females.

Table II.10. Number of Inpatient Discharges and Average Length of Stay for Admissions for HIV Infection, 2006–2009

	Number of Discharges with HIV Principal Diagnosis	Mean Length of Stay per Discharge with HIV Principal Diagnosis	Total Inpatient Days Among Discharges with HIV Principal Diagnosis	Number of Discharges with HIV Secondary Diagnosis
Total	64,726	9.21	596,050	185,509
Male	43,724	9.27	405,456	120,424
Female	20,995	9.08	190,594	65,085

Source: Mathematica analysis of data from HCUP-NIS (2002–2009).

To calculate utilization rates for inpatient HIV care, we assumed that one HIV specialist visit was provided during each day of an inpatient discharge with a primary diagnosis of HIV. Thus, the number of HIV specialist visits associated with these discharges is equal to the average annual total number of inpatient days. For discharges with a secondary diagnosis of HIV, we assumed that one HIV specialist consultation was provided for each discharge. Thus, the average annual number of visits associated with these discharges is equal to the average annual number of discharges. In Table II.11, we divided the average annual total number of inpatient days with a principal diagnosis of HIV and the average annual number of discharges with a secondary diagnosis of HIV by the number of individuals living with an HIV infection in 2008 to estimate visits per diagnosed person. Overall, we estimate 0.70 and 0.22 visits per diagnosed person per year for discharges with a primary and secondary diagnosis of HIV, respectively. In total, we estimate 0.92 inpatient visits per diagnosed person annually. The number of annual inpatient visits per female diagnosed with HIV (1.17 visits) was higher than that for men (0.83 visits).

Table II.11. Calculation of the Number of HIV Visits per Diagnosed Person

	Number of Individuals Living with an HIV/AIDS Diagnosis, 2008	Number of Principal Diagnosis Inpatient Days per Diagnosed Person	Number of Secondary Diagnosis Discharges per Diagnosed Person	Total Inpatient Visits per Diagnosed Person
Total	852,647	0.70	0.22	0.92
Male	634,903	0.64	0.19	0.83
Female	217,745	0.88	0.30	1.17

Source: Mathematica analysis of data from HCUP-NIS (2002–2009).

Note: We calculated total inpatient visits per diagnosed person by assigning one HIV clinician visit per inpatient day with a principal diagnosis of HIV and one HIV clinician consultation per inpatient stay with a secondary diagnosis of HIV.

D. Total Number of HIV Clinician Visits Demanded

In this section, we present estimates of the total number of HIV-related medical visits demanded by age, gender, race/ethnicity, region, state, and MSA. Table II.12 displays our estimates of the total number of visits demanded by age group. This total includes visits in ambulatory settings (on average, 5.1 visits per diagnosed person annually), as well as visits provided to hospital inpatients (on average, 0.92 visits per diagnosed person annually). Overall, we estimate 5.1 million HIV-related medical visits were provided in the United States in 2008. Approximately 63 percent of all HIV-related visits demanded in 2008 were for individuals ages 35 to 54. Individuals 25 to 34 and 55 or older each represented about 15 percent of total visits.

Table II.12. Number of HIV Visits Demanded, by Age Group, 2008

	Number of HIV Visits (in thousands)			Percentage of HIV Visits		
Age Group	All	Male	Female	All	Male	Female
Younger than 13	28	12	16	0.5	0.3	1.0
From 13 to 24	293	197	96	5.7	5.7	5.7
From 25 to 34	800	542	257	15.5	15.7	15.2
From 35 to 44	1,623	1,097	525	31.5	31.8	31.0
From 45 to 54	1,614	1,083	530	31.3	31.4	31.3
From 55 to 64	658	435	223	12.8	12.6	13.2
Older than 64	132	88	44	2.6	2.6	2.6
Total	**5,148**	**3,455**	**1,693**	**100.0**	**100.0**	**100.0**

Source: Mathematica and Lewin analysis of HIV clinician workforce model.

Note: Percentages might not sum to 100 due to rounding.

Table II.13 displays the total number of visits provided by race/ethnicity and gender. Black non-Hispanics accounted for the highest share of visits (45 percent), followed by white non-Hispanics (34 percent). Hispanic individuals represented 18 percent of all visits demanded.

Table II.13. Number of Visits Demanded, by Race/Ethnicity and Gender, 2008

	Number of HIV Visits (in thousands)			Percentage of HIV Visits		
Race/Ethnicity	All	Male	Female	All	Male	Female
White, Non-Hispanic	1,758	1,239	519	34.1	35.9	30.7
Black, Non-Hispanic	2,317	1,478	839	45.0	42.8	49.6
Hispanic	935	643	292	18.2	18.6	17.2
Other/Multiple Race Non-Hispanic	138	95	42	2.7	2.8	2.5
Total	**5,148**	**3,455**	**1,693**	**100.0**	**100.0**	**100.0**

Source: Mathematica and Lewin analysis of HIV clinician workforce model.

Note: Percentages might not sum to 100 due to rounding.

Table II.14 displays the population diagnosed with HIV and the number of visits demanded, by U.S. Census region. The South represents the highest proportion of both diagnosed cases and visits (42 percent) followed by the Northeast, with about 27 percent of diagnosed persons and 28 percent of all visits. The Midwest and West have about 12 and 19 percent of all cases and visits, respectively.

Table II.14. Number of Diagnosed Cases and Visits Demanded, by U.S. Census Region, 2008

U.S. Census Region	Number of Diagnosed Persons	Number of Visits Demanded (in thousands)	Percentage of Diagnosed Persons	Percentage of Total Visits Demanded
Northeast	233,714	1,463	27.4	28.4
South	360,384	2,190	42.3	42.5
Midwest	100,351	604	11.8	11.7
West	158,198	891	18.6	17.3
Total	**852,647**	**5,148**	**100.0**	**100.0**

Source: Mathematica and Lewin analysis of HIV Clinician Workforce Model.

Note: Percentages might not sum to 100 due to rounding.

Table II.15 shows the number of diagnosed cases and visits demanded, for high-prevalence states, defined as states with at least 6,000 diagnosed cases at the end of 2008 according to the 2009 CDC surveillance report. States with fewer than 6,000 cases are grouped and reported in the "Other" category. New York had the highest number of cases and visits demanded, representing about 16 percent of each nationally, followed by California and Florida, with about 11 to 12 percent of all diagnosed cases and visits demanded annually.

Table II.15. Number of Diagnosed Cases and Visits Demanded, for HIV-Prevalence States

State	Number of Individuals Diagnosed with HIV	Number of Visits Demanded (in thousands)	Percentage of Diagnosed Persons	Percentage of Total Visits Demanded
High-Prevalence States				
Alabama	10,406	59	1.2	1.2
Arizona	11,860	71	1.4	1.4
California	103,645	569	12.2	11.1
Colorado	10,727	67	1.3	1.3
Connecticut	10,946	69	1.3	1.3
District of Columbia	16,591	102	1.9	2.0
Florida	92,156	548	10.8	10.6
Georgia	35,415	216	4.2	4.2
Illinois	33,155	200	3.9	3.9
Indiana	8,146	49	1.0	1.0
Louisiana	16,282	102	1.9	2.0
Maryland	28,595	183	3.4	3.6
Massachusetts	13,799	89	1.6	1.7
Michigan	14,304	81	1.7	1.6
Minnesota	6,121	38	0.7	0.7
Mississippi	9,214	55	1.1	1.1
Missouri	11,175	67	1.3	1.3
Nevada	6,723	40	0.8	0.8
New Jersey	37,134	238	4.4	4.6
New York	135,659	850	15.9	16.5
North Carolina	22,431	139	2.6	2.7
Ohio	16,337	100	1.9	1.9
Pennsylvania	31,684	190	3.7	3.7
South Carolina	13,763	86	1.6	1.7
Tennessee	14,589	90	1.7	1.7
Texas	61,826	371	7.3	7.2
Virginia	20,554	124	2.4	2.4
Washington	10,173	60	1.2	1.2
Other States	49,238	295	5.8	5.7
United States	852,647	5,148	100.0	100.0

Source: Mathematica and Lewin analysis of HIV clinician workforce model.

Notes: HIV-prevalence states based on states with at least 6,000 cases at the end of 2008. Percentages might not sum to 100 due to rounding.

Table II.16 shows the number of diagnosed cases and visits demanded for each high-prevalence MSA. High-prevalence MSAs are those with more than 5,000 diagnosed cases according to the CDC surveillance system at the end of 2008. New York City had the highest number of cases and visits demanded, representing about 17 percent of each nationally, followed by Miami and Los Angeles, which each representing about 5 percent of diagnosed cases and visits demanded annually.

Table II.16. Number of Diagnosed Cases and Visits Demanded, for High-Prevalence MSAs

High-Prevalence MSAs	Number of Individuals Diagnosed with HIV	Number of Visits Demanded (in thousands)	Percentage of Diagnosed Persons	Percentage of Total Visits Demanded
Atlanta	23,368	144	2.7	2.8
Baltimore	17,882	114	2.1	2.2
Boston	9,542	58	1.1	1.1
Charlotte	5,342	34	0.6	0.7
Chicago	28,960	172	3.4	3.3
Dallas	19,045	114	2.2	2.2
Denver	8,344	51	1.0	1.0
Detroit	9,264	57	1.1	1.1
District of Columbia	29,288	180	3.4	3.5
Houston	20,572	127	2.4	2.5
Jacksonville	5,480	35	0.6	0.7
Las Vegas	5,446	33	0.6	0.6
Los Angeles	44,405	257	5.2	5.0
Memphis	6,499	41	0.8	0.8
Miami	47,288	290	5.5	5.6
Minneapolis	5,390	33	0.6	0.6
New Orleans	7,453	45	0.9	0.9
New York City	146,176	902	17.1	17.5
Orlando	9,051	56	1.1	1.1
Philadelphia	26,200	163	3.1	3.2
Phoenix	8,909	52	1.0	1.0
Riverside	7,426	44	0.9	0.9
San Diego	6,376	38	0.7	0.7
San Francisco	10,735	64	1.3	1.2
Seattle	23,075	130	2.7	2.5
St. Louis	7,824	46	0.9	0.9
Tampa	9,599	59	1.1	1.1
Virginia Beach	6,210	38	0.7	0.7
Rest of United States	297,498	1,770	34.9	34.4
Total	852,647	5,148	100.0	100.0

Source: Mathematica and Lewin analysis of HIV clinician workforce model.

Note: Percentages might not sum to 100 due to rounding.

E. Conclusions and Limitations

Overall, we find that about 850,000 individuals diagnosed with HIV lived in the United States in 2008. On average, these individuals had six HIV clinician visits each in 2008, resulting in slightly more than 5.1 million HIV-related medical visits demanded in total. However, there are several limitations to our analysis. First, focusing on the estimates of the number of diagnosed cases, in 2008, only 40 states had mature CDC surveillance reporting systems. For those states that did not have mature reporting systems, we used CDC or state estimates of the number of diagnosed cases instead. These estimates are less reliable than those from states with mature reporting systems. In addition, HIV surveillance data do not contain information for all of the demographic cells desired for this analysis. When necessary, we imputed estimates for demographic cells based on state and national distributions. This imputation method reduces the variation in the distribution of cases across demographic cells. Second, we developed utilization estimates for ambulatory visits through diagnosis codes, using both primary and secondary diagnoses. This method might overstate demand for HIV specialists when the visit did not require an HIV specialist to treat the primary diagnosis. In addition, because of the limited sample sizes in NAMCS and NHAMCS, we were unable to estimated individual utilization rates for every demographic cell in our model. We imputed utilization estimates for inpatient care based on discharge counts (assuming one visit per day for primary diagnoses and one visit per stay for secondary diagnoses) because no information was available on inpatient visits for HIV. Further research is needed to develop more precise estimates of demand for HIV clinician visits during inpatient stays.

III. MEASURING THE NUMBER OF HIV CLINICIAN VISITS SUPPLIED

In this chapter, we provide a description of the size, demographic characteristics, and geographic distribution of the HIV clinician workforce and the number of HIV clinician visits supplied in the United States in 2010. The number of full-time equivalent (FTE) clinician visits currently supplied is a function of four factors: (1) the number of clinicians managing HIV care, (2) the number of hours those clinicians spend in direct patient care per year, (3) the proportion of those direct patient-care hours dedicated to the treatment of patients with HIV, and (4) the number of HIV-related visits that an HIV clinician can provide during an hour of patient care. We discuss each of these factors separately, focusing first on the size, demographic characteristics, and geographic distribution of the HIV clinician workforce based in part on an analysis of claims data. We then use data from the HIV clinician workforce survey to estimate the other components of supply (that is, total hours in patient care, proportion of time in HIV care, and number of visits per hour). Finally, we combine the components to estimate the total number of HIV clinician visits supplied during the base year used for this study. Later, in Chapter V, we combine our estimates of visits supplied during the base year with estimates of the number of clinicians entering and leaving the HIV workforce (from either retirement or death) to project the total number of HIV clinician visits supplied in the future.

A. Number of Clinicians Currently Managing HIV Care

1. Methodology

The master file of the American Medical Association (AMA) is often used to derive estimates of the current number of physicians with a given medical specialty. Information on board certification, fellowship and residency training, or self-reported specialty in the AMA file is used to infer medical specialty. However, there is no explicit credentialing requirement or self-reported specialty standard for those who provide, focus on, or specialize in the provision of services to HIV patients. Moreover, many of those who focus on managing HIV-related health care services do not do so exclusively. A primary care physician might, in addition to providing care to a significant number of HIV patients, provide primary care services to a general patient population; an infectious disease specialist who focuses on HIV disease might also treat patients with other infectious diseases. Although the HIVMA and AAHIVM offer credentialing in HIV medicine, many physicians providing HIV care do not have this certification. This is also true for physician assistants and nurse practitioners providing care to HIV patients. There is no specific required credential or list of professionals that we can use to determine the number of clinicians managing HIV care nationally for this study.

Given the lack of an established credentialing requirement for physicians and other nonphysician clinicians providing HIV services, we identified HIV clinicians based on the services they provide and for which they bill. Rather than relying on a membership database of providers to identify HIV clinicians, our patient-centered approach to workforce measurement assumes that a clinician who provides and bills for HIV-related services for a minimum number of patients qualifies as an HIV clinician for the purposes of this study. Using prescription drug and other ambulatory medical claims data, we identified HIV-related services based on the associated diagnosis, procedure, and drug codes. (Appendix C provides a list of the diagnosis and national drug codes we used to identify HIV-related visits on the claims data.) For each clinician providing and billing for an HIV-related service observed on the claims database, we determined the number and share of his or her total billed patient caseload with an HIV-related claim. We also calculated the number and share of each clinician's total claims related to the treatment of HIV disease.

The next step in our patient-centered approach was to determine the minimum number of patients with HIV that an individual provider would have to treat to be considered an HIV clinician for the purposes of this study. Our goal was to establish a patient volume threshold high enough to filter out episodic providers (such as emergency department physicians, medical residents, or primary care providers who test for but do not manage the treatment of HIV disease), but low enough to capture a substantial majority of HIV care. Members of our technical expert panel recommended including only clinicians who treat a minimum of 20 HIV patients; the panel also suggested giving priority to clinicians who prescribe HIV-related medications. The panelists argued that clinicians who treat fewer than 20 patients with HIV or do not prescribe antiretroviral therapies are less likely to provide the level of ongoing, comprehensive, and high quality care necessary to be considered an HIV provider. Moreover, AAHIVM considers providers with a minimum of 20 HIV patients under their care to be eligible for the HIV specialist or HIV expert certification examination. However, due to the potential underreporting of HIV clinicians on claims data (see below), we restricted the baseline supply of HIV providers for this study to primary care clinicians and infectious disease specialists with HIV-related claims for 10 or more patients.

Finally, we had to select the medical specialties to include in the study. The focus of this study is on clinicians (including physicians, nurse practitioners, and physician assistants) who manage the continuum of primary and specialty care services for patients with HIV. Reflecting this focus, the expert panelists suggested restricting the study to clinicians who are most likely to manage patients' overall HIV-related health care needs. This includes specialists in internal or family medicine, general practice, and infectious disease. The panelists also recommended excluding clinicians who might treat patients with HIV for other medical reasons or who follow HIV protocols specific to their subspecialty. This includes potentially high-volume HIV clinicians in obstetrics and gynecology, pediatrics, cardiovascular disease, gastroenterology, ophthalmology, oncology, and endocrinology.

2. Data Sources

To identify the current supply of HIV clinicians, we used a national, all-payer, proprietary claims database from SDI Health, a national health care data warehouse and analytics organization. SDI Health collects and maintains a warehouse of both pharmacy (RX) and medical (DX) claims from all-payer sources, including managed care plans, billing providers, and geographic regions. The RX database includes electronic final-action claims submitted primarily by retail pharmacies. The RX file captures about half of all electronically transmitted pharmaceutical records in the country and includes 120 to 130 million covered lives. The DX file includes medical claims transmitted electronically between providers and payers via third-party transaction houses or medical practice management companies. The DX database captures approximately two-thirds of all electronically filed medical claims, includes roughly 1.1 billion records per year, and represents about 157 million covered lives. Both files contained the diagnosis, procedure, and drug codes and medical specialty information we needed to identify claims associated with the treatment of HIV by primary care and infectious disease clinicians. The files also contained a unique provider/prescriber identifier (called the national provider identifier, or NPI) and a unique patient identifier that we used to aggregate the claims up to the provider level to identify clinicians who met the volume threshold of HIV-related patients. We extracted the data in October 2011 and identified our list of HIV clinicians based on all claims from calendar year 2010. The 2010 claims identified 572,952 patients with at least one HIV-related claim, representing approximately two-thirds of all diagnosed cases in the United States, and an even higher proportion of those who are in care.

3. Limitations

Two limitations affect the use of claims data to identify HIV clinicians. First, the SDI Health database does not provide a complete sample of claims for any payer and we are likely to miss some clinicians who manage HIV patient care. And for those clinicians who appear in the database, we will capture only those claims submitted through the electronic channels used by SDI Health to collect billing information. Second, the SDI database includes only claims for insured and self-pay patients. The claims data will not capture HIV clinicians who mainly treat uninsured and indigent patients and undocumented immigrants, as well as clinicians who do not bill for their services under their own names (such as many nonphysician clinicians). In addition, given the absence of claims for uninsured patients, the claims database will underrepresent clinicians' patient caseloads to the extent that they treat patients without health insurance coverage.[9] Lowering the minimum patient threshold needed to qualify as an HIV provider for this study is meant to offset the potential underreporting of patients and claims in the SDI Health database.

4. Results

Based on our analysis of the DX and RX claims files from SDI Health, we identified a total of 55,954 primary care clinicians (including internal medical and general practice subspecialties, nurse practitioners, and physician assistants) and 4,974 infectious disease physicians with at least one HIV-related claim in 2010 (see Table III.1). Of the 55,954 primary care clinicians with an HIV-related claim, 11.7 percent (6,527) had HIV-related claims for 10 or more patients. These high-volume providers accounted for the majority of all patients with HIV-related claims. Nearly three-quarters of all patients with an HIV-related claim submitted by a primary care clinician were treated by a provider with 10 or more HIV-positive patients. Specialists in infectious disease medicine were more likely to fall into one of the high-volume HIV patient categories than those in primary care medicine. Of the 4,974 infectious disease specialists with an HIV-related claim in 2010, 52.6 percent (2,618) had an HIV-related claim for 10 or more HIV-patients. As a result of the concentration of providers in high-volume patient groupings, 95.2 percent of all patients with an HIV-related claim submitted by an infectious disease specialist were treated by a provider with 10 or more HIV-positive patients.

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[9] To test the completeness of the claims data, we matched the HIV clinicians included in our study with members of the HIV medical societies and/or those who attended a Ryan White HIV/AIDS Clinical Conference in any of the past five years. Based on a names-based matching algorithm, we found that 848 (13 percent) of the high-volume primary care clinicians and 1,467 (56 percent) of the high-volume infectious disease specialists identified through the SDI Health claims databases were members of one of the HIV medical societies and/or attended an HIV clinical conference.

Table III.1. Number of Clinicians with an HIV-Related Claim, by HIV Patient Caseload and Medical Specialty

	Primary Care Medicine			Infectious Disease		
HIV Patient Caseload	Number of Clinicians	Number of HIV Patients	Percentage of HIV Patients	Number of Clinicians	Number of HIV Patients	Percentage of HIV Patients
1	26,026	26,026	6.5	685	685	0.4
2	9,478	18,956	4.7	417	834	0.5
3	4,744	14,232	3.5	288	864	0.5
4	2,978	11,912	3.0	239	956	0.6
5 to 9	6,201	40,227	10.0	727	4,868	2.9
10 to 14	2,103	24,518	6.1	456	5,410	3.2
15 to 19	1,095	18,407	4.6	309	5,231	3.1
20 or more	3,329	249,119	61.8	1,853	150,707	88.9
Total	**55,954**	**403,397**	**100.0**	**4,974**	**169,555**	**100.0**

Source: Mathematica and Lewin analysis of SDI Health DX and RX claims databases (2010).

Notes: Figures for primary care include family or internal medicine and general practice specialties, plus 2,876 nurse practitioners and physician assistants with unspecified medical specialties. An individual patient treated by more than one HIV clinician is counted separately each time. Percentages might not sum to 100 due to rounding.

DX = pharmacy claim; RX = medical claim.

Based on the responses to the HIV clinician workforce survey, many of the 9,145 providers identified through claims analysis as high-volume HIV clinicians failed to meet the inclusion criteria for this study. After excluding those clinicians who reported not treating patients with HIV or providing HIV care but treating fewer than 10 patients, no longer practicing medicine, or not being specialized in primary care or infectious disease, we estimate a new census of 4,937 high-volume HIV clinicians, roughly half the supply identified through claims data (see Table III.2). Of these, an estimated 54.6 percent are primary care physicians, 37.2 percent are infectious disease physicians, and 8.3 percent are nurse practitioners or physician assistants. This distribution differs substantially from the 71.4 percent of clinicians in primary care and 28.6 percent of physicians in infectious disease identified through claims, suggesting that claims data overestimate the number of physicians in internal and family medicine who self-identify as HIV providers. Based on responses to the HIV workforce survey, a significant number of primary care clinicians appear to provide care to a sizeable group of patients with HIV, but do not think of themselves as HIV clinicians, at least in terms of the definition used for this study as managing their HIV care.

Table III.2. Number and Percentage of High-Volume HIV Clinicians, by Clinician Type

	Number of HIV Clinicians	Percentage of HIV Clinicians
Primary Care Physicians	2,693	54.6
Infectious Disease Physicians	1,836	37.2
Nurse Practitioners and Physician Assistants	408	8.3
All HIV Clinicians	4,937	100.0

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Percentages might not sum to 100 due to rounding.

In Table III.3, we show the percentage of high-volume HIV clinicians by demographic characteristics, in total and for each clinician type. Based on the survey data, an estimated 65.8 percent of all high-volume HIV clinicians are male and 16.5 percent are age 65 or older. More than two-thirds of all primary care physicians and infectious disease physicians are male, compared with less than one-third of all nurse practitioners and physician assistants. Physicians managing HIV care are more likely to be 45 years or older compared with nonphysician clinicians as well. The majority of all HIV clinicians are white, non-Hispanic. Primary care physicians are more likely than infectious disease specialists or nonphysician clinicians to be members of a racial or ethnic minority. Nearly 15 percent of all HIV physicians received their medical degrees outside of the United States.

Table III.3. Percentage Distribution of High-Volume HIV Clinicians, by Demographic Characteristics and Clinician Type (percentages)

Demographic Characteristics	PCP (%)	IDP (%)	NP/PA (%)	All Clinicians (%)
Gender				
Male	68.7	70.4	29.6	65.8
Female	31.3	29.6	70.4	34.2
Age				
Younger than 45 years	30.1	32.8	34.0	31.8
45 to 64 years	53.1	51.2	48.0	51.7
65 years and older	16.8	16.0	18.0	16.5
Race/Ethnicity				
White, non-Hispanic	63.8	70.0	76.1	68.0
Black, non-Hispanic	13.2	3.7	11.4	8.3
Hispanic	5.9	8.5	6.8	7.3
Other/multiple race, non-Hispanic	17.1	17.8	5.7	16.3
Income				
Less than $75,000	1.9	0.9	14.7	2.7
$75,000 – $99,999	4.6	2.1	44.4	7.5
$100,000 – $124,999	9.7	6.1	29.4	10.0
$125,000 – $149,999	18.9	12.8	5.7	14.6
$150,000 – $199,999	33.9	30.3	4.3	29.1
$200,000 – $224,999	11.7	17.6	0.8	13.4
$225,000 – $249,999	6.0	8.7	0.7	6.8
$250,000 – $299,999	9.1	11.8	0.0	9.5
$300,000 – $349,999	0.4	3.3	0.0	1.8
More than $350,000	3.8	6.4	0.0	4.7
Country of Highest Clinical Degree				
United States	86.4	84.7	100.0	86.8
International	13.6	15.3	0.0	13.2

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Notes: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Percentages are within clinician type and might not sum to 100 percent due to rounding. Among eligible respondents, 90.0 percent reported this information.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

Table III.4 shows the distribution of currently practicing high-volume HIV clinicians by HRSA region, in total and for each clinician type. Nearly one-quarter (22.8 percent) of all high-volume HIV providers are located in HRSA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee). Seventeen percent are located in HRSA Region 2 (New Jersey and New York) and 12.5 percent in HRSA Region 9 (Arizona, California, Hawaii, and Nevada). HRSA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) uses a relatively large proportion of nurse practitioners and physician assistants to manage HIV care. In contrast, HRSA Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin) relies disproportionately on infectious disease specialists to deliver HIV services.

Table III.4. Percentage Distribution of High-Volume HIV Clinicians in Each Specialty, by HRSA Region

HRSA Region	States in Region	PCP (%)	IDP (%)	NP/PA (%)	All Clinicians (%)
1	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont	5.5	5.4	10.5	5.9
2	New Jersey and New York	18.9	14.8	18.3	17.3
3	Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia	14.2	13.4	14.5	13.9
4	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee	22.5	23.9	19.9	22.8
5	Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin	9.2	16.0	8.7	11.7
6	Arkansas, Louisiana, New Mexico, Oklahoma, and Texas	9.5	7.3	5.3	8.3
7	Iowa, Kansas, Missouri, and Nebraska	3.2	2.6	2.1	2.9
8	Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming	1.1	1.9	2.0	1.5
9	Arizona, California, Hawaii, and Nevada	13.1	11.2	14.9	12.5
10	Alaska, Idaho, Oregon, and Washington	2.8	3.6	3.8	3.2

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Percentages are within clinician type and might not sum to 100 percent due to rounding. Among eligible respondents, 98.8 percent reported this information.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

Tables III.5 and III.6 show the distribution of high-volume HIV clinicians by state, in total and for each clinician type. Based on our definition of HIV clinicians, California, Florida, New York, and Texas (states with the highest prevalence of HIV infection) have the highest number of HIV providers. In low-prevalence states such as North Dakota, Wyoming, and Montana, with few high-volume providers, a larger proportion of HIV care is managed by clinicians with fewer than 10 HIV-infected patients. There also appear to be differences among states in the types of clinicians used to manage HIV care. For example, New York appears to rely disproportionately on primary care clinicians (including physicians and nonphysician clinicians), whereas Midwestern states such as Ohio, Michigan, and Indiana rely more heavily on infectious disease specialists to deliver HIV care. However, the number of survey respondents makes it difficult to draw statistically meaningful inferences between states. Nor do these results adjust for state or regional differences in practice patterns among HIV clinicians, such as the proportion of time spent treating patients with HIV or the length of the average HIV-related visit.

Table III.5. Number of High-Volume HIV Clinicians in the United States, by State

State	Number of HIV Clinicians
United States	4,937
Alabama	26
Alaska	6
Arizona	78
Arkansas	17
California	515
Colorado	43
Connecticut	95
Delaware	16
District of Columbia	125
Florida	482
Georgia	181
Hawaii	9
Idaho	12
Illinois	158
Indiana	69
Iowa	31
Kansas	35
Kentucky	37
Louisiana	53
Maine	27
Maryland	191
Massachusetts	120
Michigan	118
Minnesota	52
Mississippi	41
Missouri	61
Montana	5
Nebraska	17
Nevada	17
New Hampshire	16
New Jersey	201
New Mexico	21
New York	653
North Carolina	184
North Dakota	2
Ohio	152
Oklahoma	24
Oregon	40
Pennsylvania	242
Rhode Island	25
South Carolina	77
South Dakota	7
Tennessee	98
Texas	295
Utah	11
Vermont	7
Virginia	104
Washington	99
West Virginia	9
Wisconsin	29
Wyoming	3

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Among eligible respondents, 98.8 percent reported this information.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

Table III.6. Percentage Distribution of High-Volume HIV Clinicians in Each Specialty, by State (%)

State	PCP (%)	IDP (%)	NP/PA (%)	All Clinicians (%)
Alabama	0.3	0.9	0.1	0.5
Alaska	0.1	0.1	0.2	0.1
Arizona	1.8	1.2	1.9	1.6
Arkansas	0.3	0.4	0.4	0.4
California	10.9	9.3	12.6	10.4
Colorado	0.6	1.2	1.0	0.9
Connecticut	1.4	2.1	4.8	1.9
Delaware	0.1	0.6	0.4	0.3
District of Columbia	3.1	1.3	4.4	2.5
Florida	9.3	10.8	8.2	9.8
Georgia	3.8	4.0	1.7	3.7
Hawaii	0.2	0.2	0.1	0.2
Idaho	0.3	0.1	0.7	0.2
Illinois	3.1	3.8	1.2	3.2
Indiana	0.8	2.2	1.3	1.4
Iowa	0.6	0.6	1.0	0.6
Kansas	1.1	0.2	0.9	0.7
Kentucky	0.3	1.5	0.7	0.8
Louisiana	1.0	1.2	1.0	1.1
Maine	0.6	0.4	0.9	0.6
Maryland	4.7	2.9	2.5	3.9
Massachusetts	3.0	1.5	3.1	2.4
Michigan	1.5	3.9	1.5	2.4
Minnesota	1.0	0.7	3.2	1.1
Mississippi	0.7	0.4	3.7	0.8
Missouri	1.3	1.5	0.0	1.2
Montana	0.1	0.1	0.4	0.1
Nebraska	0.3	0.4	0.2	0.3
Nevada	0.2	0.6	0.3	0.3
New Hampshire	0.1	0.6	0.4	0.3
New Jersey	3.4	5.6	1.8	4.1
New Mexico	0.6	0.1	0.6	0.4
New York	15.5	9.2	16.6	13.2
North Carolina	0.0	3.0	3.1	3.7
North Dakota	4.3	0.1	0.1	0.0
Ohio	2.2	4.8	1.1	3.1
Oklahoma	0.5	0.5	0.4	0.5
Oregon	0.9	0.8	0.5	0.8
Pennsylvania	4.4	5.6	5.0	4.9
Rhode Island	0.5	0.6	0.6	0.5
South Carolina	1.6	1.6	1.5	1.6
South Dakota	0.1	0.1	0.3	0.2
Tennessee	2.3	1.7	1.0	2.0
Texas	7.1	5.1	3.0	6.0
Utah	0.2	0.3	0.2	0.2
Vermont	0.0	0.2	0.7	0.1
Virginia	1.7	2.7	2.2	2.1
Washington	1.5	2.6	2.4	2.0
West Virginia	0.1	0.3	0.0	0.2
Wisconsin	0.6	0.6	0.4	0.6
Wyoming	0.1	0.0	0.2	0.1

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Percentages are within clinician type and might not sum to 100 percent due to rounding. Among eligible respondents, 98.8 percent reported this information.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

Table III.7 shows the total number of high-volume HIV clinicians in metropolitan areas versus nonmetropolitan areas nationally, and for the 15 MSAs with the highest prevalence of HIV/AIDS, defined as those with more than 5,000 diagnosed cases. The vast majority of high-volume providers in the United States are located in metropolitan areas. Only 158 high-volume providers (3.2 percent) work in nonmetropolitan areas. Nearly 15 percent of all high-volume HIV providers are located in the New York City MSA. New York (with 718 high-volume HIV clinicians) has more than three times the number of high-volume providers as the next high-prevalence MSAs (Los Angeles with 237 providers, District of Columbia with 223 providers, and Miami with 208 providers). Table III.8 shows the distribution of high-volume providers for high-prevalence MSAs for each type of clinician. However, given the small number of survey respondents and potential regional variation in practice patterns, differences between MSAs should be interpreted with caution.

Table III.7. Number of High-Volume HIV Clinicians, by Area of Residence and for High Prevalence MSAs

Area of Residence/MSA	Number of HIV Clinicians
Area of Residence	
Metropolitan areas	4,780
Nonmetropolitan areas	158
High-Prevalence MSAs	
Atlanta	144
Baltimore	139
Boston	76
Charlotte	50
Chicago	154
Dallas	119
Denver	26
Detroit	40
District of Columbia	223
Houston	111
Jacksonville	29
Las Vegas	13
Los Angeles	237
Memphis	40
Miami	208
Minneapolis	41
New Orleans	24
New York City	718
Orlando	53
Philadelphia	196
Phoenix	62
Riverside	36
San Diego	36
San Francisco	95
Seattle	75
St. Louis	24
Tampa	80
Virginia Beach	23
Other MSAs	1,708

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: High-prevalence MSAs include MSAs with more than 5,000 diagnosed cases of HIV. Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Among eligible respondents, 98.8 percent reported this information.

MSA = metropolitan statistical area.

Table III.8. Percentage Distribution of High-Volume HIV Clinicians in Each Specialty, by Area of Residence and for High-Prevalence MSAs

Area of Residence/MSA	PCP (%)	IDP (%)	NP/PA (%)	All Clinicians (%)
Area of Residence				
Metropolitan areas	96.3	98.2	93.5	96.8
Nonmetropolitan areas	3.6	1.8	6.5	3.2
High-Prevalence MSAs				
Atlanta	3.0	3.2	0.8	2.9
Baltimore	3.3	2.2	2.5	2.8
Boston	2.0	0.9	1.6	1.5
Charlotte	1.4	0.6	0.4	1.0
Chicago	3.0	3.7	1.0	3.1
Dallas	3.1	1.6	1.6	2.4
Denver	0.4	0.8	0.4	0.5
Detroit	0.4	1.4	0.6	0.8
District of Columbia	5.3	3.1	5.1	4.5
Houston	2.7	1.9	0.8	2.2
Jacksonville	0.5	0.8	0.7	0.6
Las Vegas	0.2	0.5	0.1	0.3
Los Angeles	4.6	4.8	5.8	4.8
Memphis	1.0	0.6	0.5	0.8
Miami	4.4	4.3	3.1	4.2
Minneapolis	0.8	0.4	2.7	0.8
New Orleans	0.4	0.7	0.3	0.5
New York	16.4	12.1	13.5	14.5
Orlando	0.8	1.6	0.2	1.1
Philadelphia	3.6	4.5	4.1	4.0
Phoenix	1.4	1.1	1.3	1.3
Riverside	0.8	0.5	1.3	0.7
San Diego	0.8	0.6	0.8	0.7
San Francisco	2.1	1.4	2.8	1.9
Seattle	1.1	2.1	1.5	1.5
St. Louis	0.5	0.6	0.0	0.5
Tampa	1.5	1.6	2.8	1.6
Virginia Beach	0.2	0.8	0.9	0.5
Other MSAs	30.9	39.7	36.1	34.6

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: High-prevalence MSAs include MSAs with more than 5,000 diagnosed cases of HIV. Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in HIV clinician workforce survey. Percentages are within clinician type and might not sum to 100 percent due to rounding. Among eligible respondents, 98.8 percent reported this information.

IDP = infectious disease physician; MSA = metropolitan statistical area; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

B. Total Number of Hours Spent in Clinical Care

In Table III.9, we show the number of hours that high-volume HIV clinicians spend in patient care. This includes time treating both HIV and non-HIV patients. It also includes direct patient-care hours in both clinical and nonclinical care, such as patient examination, chart review, clinical documentation, ordering and reviewing lab tests, case consultations, case management, counseling patients and their families, making referrals, and traveling between practice locations. According to their responses to the survey, HIV clinicians spend on average 43.7 hours per week in total patient care. Primary care physicians spend 44.2 hours, infectious disease physicians spend 44.1 hours, and nurse practitioners and physician assistants spend 39.2 hours per week on average in direct patient care.[10] Male clinicians spend longer hours in patient care than do female providers, and clinicians ages 65 or older spend less time in patient care than do younger clinicians. Nurse practitioners and physician assistants are more likely than physicians to reduce the number of hours they spend in patient care after age 65. We use only statistically significant differences among the age, gender, and clinician type categories to estimate supply in the HIV workforce model. We also assume that age-related differences are constant, so that current providers younger than 45 will behave like their older cohorts as they age.

Table III.9. Number of Hours per Week Spent in Total Patient Care, by Age, Gender, and Clinician Type

	Number of Hours per Week Spent in Total Patient Care			
	PCP	IDP	NP/PA	All Clinicians
Total	44.2	44.1	*39.2	43.7
Gender				
Male	45.1	45.8	43.4	*45.4
Female	42.3	39.9	37.4	40.3
Age				
Younger than 45	44.9	43.7	38.6	43.6
45 to 64	44.3	44.9	39.2	44.1
65 or older	43.0	42.3	40.2	**42.4

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Notes: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. We used specialized procedures to account for the sample stratification and weighting in the variance estimates when conducting statistical testing. Among eligible respondents, 99.9 percent reported this information.

We tested for statistical significance of differences between: (1) all IDPs versus all PCPs and all NP/PAs versus all PCPs; (2) all males versus all females; and (3) all younger than 45 years versus all 45 to 64 years and all older than 65 years versus all 45 to 64 years. An "*" indicates the difference is significant at the 1 percent level; an "**" indicates significance at the 5 percent level; and an "***" indicates significance at the 10 percent level using a two-tailed t-test. Only statistically significant differences were used in the model to estimate the number of HIV clinician visits supplied.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician

[10] Estimates from the survey of the number of hours that HIV physicians spend in direct patient care are similar to those obtained from the Medical Group Management Association (MGMA) survey of primary care physicians and infectious disease physicians used in the initial version of the model. The MGMA survey showed that physicians in internal and family medicine worked 43 and 48 hours per week, respectively, and infectious disease physicians spent an average of 43 hours per week in patient care. The survey estimate of the amount of time that nonphysician clinicians spend in patient care, however, is significantly lower than the estimate used in our earlier model. In the absence of comparable data for nonphysician clinicians, our initial model assumed that nurse practitioners and physician assistants work 48 hours per week, the same number of hours per week as physicians in family medicine.

C. Proportion of Hours Spent Treating Patients with HIV

The next important supply-side parameter in the model is the proportion of total patient-care hours that HIV clinicians spend treating patients with HIV. According to the survey responses, HIV clinicians spend on average 42.9 percent of their time in total patient care treating patients with HIV (see Table III.10). Primary care physicians, who are more likely than infectious disease physicians or nonphysician clinicians to treat non-HIV patients and to comanage their HIV patients with other specialists, spend 34.0 percent of their direct patient-care time treating patients with HIV, compared with 45.5 percent among infectious disease physicians and 68.4 percent for nurse practitioners and physician assistants.[11] Female clinicians in HIV medicine spend more of their patient-care time treating patients with HIV than male clinicians do (50.6 versus 39.1 percent), and midcareer clinicians (those ages 45 to 64) spend more of their time treating patients with HIV than newer entrants (younger than 45) and those closer to retirement (65 or older) do. Again, only statistically significant differences among the age, gender, and clinician type categories are used to estimate supply in the HIV workforce model and we assume that age-related differences are constant—that is, younger providers behave like their older cohorts as they age.

[11] The survey-based estimates of proportion of time spent treating patients with HIV are significantly higher than the estimates we included in our original model. In the absence of survey data, we used the proportion of a clinician's overall claims with an HIV-related diagnosis or drug code as a proxy for the proportion of time spent in HIV patient care. Using proportion of claims as a proxy for proportion of time resulted in an overall estimate of 6.0 percent and clinician-specific estimates of 3.2 percent for physicians in family medicine, 4.6 percent for physicians in internal medicine, 9.1 percent for infectious disease physicians, 9.9 percent for nurse practitioners, and 9.6 percent for physician assistants.

Table III.10. Proportion of Clinical Hours Spent Treating Patients with HIV, by Age, Gender, and Clinician Type

	Proportion of Hours Spent Treating Patients with HIV			
	PCP	IDP	NP/PA	All Clinicians
Total	34.0	*45.5	*68.4	42.9
Gender				
Male	33.3	42.2	58.3	*39.1
Female	35.6	53.8	72.5	50.6
Age				
Younger than 45	27.0	45.4	60.4	**39.8
45 to 64	37.5	48.1	73.8	45.8
65 or older	35.8	37.0	72.2	40.1

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Notes: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. We used specialized procedures to account for the sample stratification and weighting in the variance estimates when conducting statistical testing. Among eligible respondents, 99.8 percent reported this information.

We tested for statistical significance of differences between (1) all IDPs versus all PCPs and all NP/PAs versus all PCPs; (2) all males versus all females; and (3) all physicians younger than 45 years versus all 45 to 64 years and all older than 65 years versus all 45 to 64 years. An "*" indicates the difference is significant at the 1 percent level; an "**" indicates significance at the 5 percent level; and an "***" indicates significance at the 10 percent level using a two-tailed t-test. Only statistically significant differences were used in the model to estimate the number of HIV clinician visits supplied.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

D. Number of HIV Clinician Visits per Hour

In addition to the number of clinicians in HIV care and the amount of time they spend treating patients with HIV, the supply of HIV-related services depends on the productivity of the HIV workforce. For the purposes of this study, we define the productivity of the HIV workforce as the number of HIV-related visits that each high-volume clinician can conduct in a given hour of clinical care time. This measure of clinician productivity will differ from the self-reported duration of patient visits because it includes all clinical and nonclinical care activities related to patient care, not only the time spent examining the patient. As shown in Table III.11, the number of HIV visits provided per hour of patient care is 1.59 for primary care physicians, 1.48 for infectious disease physicians, and 1.42 for nurse practitioners and physician assistants (equivalent to approximately 37 to 42 minutes per visit). Nurse practitioners and physician assistants—often tasked with performing screenings and procedures before the visit, providing basic primary care during the visit, and offering patient education following the visit—complete fewer visits per hour than physicians. On average, male clinicians conduct more visits per hour spent in patient care than female clinicians (1.55 versus 1.45), and midcareer clinicians provide more visits per hour than newer entrants and those approaching retirement.[12] The model uses only statistically significant differences in the number of visits per hour and assumes the number of visits per hour is constant for each age category.

Table III.11. Number of HIV Patient Visits per Hour, by Age, Gender, and Clinician Type

	Number of HIV Visits per Hour			
	PCP	IDP	NP/PA	All Clinicians
Total	1.59	1.48	***1.42	1.52
Gender				
Male	1.62	1.50	1.53	***1.55
Female	1.49	1.44	1.38	1.45
Age				
Younger than 45	1.59	1.59	1.36	1.57
45 to 64	1.63	1.37	1.58	1.49
65 or older	1.47	1.63	1.12	1.51

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Notes: Results are weighted to account for the probability of selection and for differential survey nonresponse patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. We used specialized procedures to account for the sample stratification and weighting in the variance estimates when conducting statistical testing. Among eligible respondents, 87.6 percent reported this information.

We tested for statistical significance of differences between (1) all IDPs versus all PCPs and all NP/PAs versus all PCPs; (2) all males versus all females; and (3) all physicians younger than 45 years versus all 45 to 64 years and all older than 65 years versus all 45 to 64 years. An "*" indicates the difference is significant at the 1 percent level; an "**" indicates significance at the 5 percent level; and an "***" indicates significance at the 10 percent level using a two-tailed t-test. Only statistically significant differences were used in the model to estimate the number of HIV clinician visits supplied.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

E. Total Number of HIV Clinician Visits Supplied

Finally, in Table III.12, we use the four components of supply from the survey to estimate the total number of HIV-related visits provided during the base year of our study, in total for each clinician type. The total number of HIV visits supplied during the base year is derived by multiplying the number of high-volume HIV clinicians (column A) by the product of average number of hours worked per year (column B), proportion of time spent in HIV care (column C), and number of HIV visits per hour (column D). The results presented in columns B–D reflect overall averages after adjusting for statistically significant differences across age, gender, and clinician type categories and applying the survey weights and, thus, might differ slightly from the unadjusted means presented in

[12] The survey-based estimates of productivity for physicians are slightly lower than those included in our preliminary model. In the absence of HIV-specific information, we relied on MGMA survey data for physicians in family and internal medicine and infectious disease generally, and obtained productivity measures of 1.8 visits per hour for primary care physicians and 1.6 visits per hour for infectious disease physicians. The survey data suggest that HIV clinicians need more time to manage the care of their HIV patients, on average, than primary care and infectious disease physicians require generally. Nonclinical care activities, such as monitoring prescriptions, ordering and reviewing lab tests, case management, and counseling patients and their families, likely explain much of the additional time needed for an HIV-related visit.

the earlier tables. Overall, we estimate that 5.1 million HIV-related visits were supplied by high-volume HIV providers in 2010. Of these visits, primary care clinicians supplied approximately 2.3 million (45.2 percent), infectious disease specialists provided 2.0 million (39.8 percent), and nurse practitioners and physician assistants supplied nearly 0.8 million (15.0 percent).

Table III.12. Total Number of HIV Clinician Visits Supplied in 2010, by Clinician Type

	(Column A) Number of HIV Clinicians	(Column B) Number of Hours Worked per Year	(Column C) Proportion of Time Spent in HIV Care (%)	(Column D) Number of HIV Visits per Hour	(Column E) Total Number of HIV Visits Supplied (in 1,000s)
PCP	2,693	1,872	30.4	1.5	2,297
IDP	1,836	1,871	39.3	1.5	2,024
NP/PA	408	1,993	66.9	1.4	762
All Clinicians	4,937	1,882	36.7	1.5	5,083

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Notes: The results shown in Columns B, C, and D were derived from the model using statistically significant subgroup means only and, thus, may differ from the age, gender, and clinician type means presented in the earlier tables.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

F. Conclusions and Limitations

An analysis of the HIV clinician workforce survey reveals that the existing information on the general health profession workforce used to populate the preliminary version of the model, even when focused on physicians who specialize in family and internal medicine and infectious disease, provides a misleading picture of the characteristics and behavior of the small group of clinicians who manage care for most of the people living with HIV and AIDS in the United States. The survey indicates that half of all clinicians who submit HIV-related claims for 10 or more patients, particularly among primary care physicians, do not manage HIV patient care on an ongoing basis and do not think of themselves as HIV providers. The survey suggests that the number of clinicians who manage care for a minimum caseload of HIV patients in the United States is close to 5,000 and that the HIV workforce consists of clinicians from multiple medical specialties and health professions. The survey also reveals that, on average, HIV clinicians spend less than half of their direct patient-care time treating patients with HIV, suggesting that the capacity of the HIV workforce could be expanded by increasing the proportion of time currently practicing clinicians spend treating patients with HIV, particularly among primary care physicians who devote less time to HIV care than other HIV clinicians do. Finally, the survey indicates that HIV clinicians spend more time treating each patient on a per-visit basis than primary care and infectious disease physicians do generally, likely due to the clinical complexity of these cases and the nonmedical support needs of this population.

As previously mentioned, for the purposes of our baseline projection model, we assume that the number of hours spent in clinical care, the proportion of time spent treating patients with HIV, and the number of HIV-related visits per hour during the base year are constant for each age, gender, and clinician type category. The model assumes that, as each age cohort in the base year ages, that group will adopt the practice patterns of the next oldest age group. In the next chapter, we describe three other factors that will affect the supply of HIV clinicians in the future: (1) the rate of new entry into HIV care, (2) the rate of retirement from HIV medicine, and (3) the mortality rate among HIV clinicians. We also describe several factors affecting the future demand for HIV-related services.

IV. FACTORS AFFECTING THE FUTURE DEMAND FOR AND SUPPLY OF HIV CLINICIAN SERVICES

In Chapters II and III, we described our methodology for estimating the demand for and supply of HIV clinician services in the base year of our study, without regard for how they might change over time to influence the future demand for and supply of care. In this chapter, we discuss the factors affecting the future demand for (Section A) and supply of (Section B) HIV-related health care services. We focus mainly on factors that result in changes in the population living and diagnosed with HIV (such as the number of newly diagnosed cases and mortality among people living with HIV) and the census of HIV providers (such as the number of new health profession graduates entering HIV medicine and the retirement rate among current HIV clinicians). However, we also discuss several factors likely to affect demand and supply, holding the population living and diagnosed with HIV and the number of HIV clinicians constant (such as the average level of engagement in care among the diagnosed population and the proportion of time clinicians spend treating patients with HIV).

A. Factors Affecting the Future Demand for HIV Clinician Services

In this section, we turn our attention to the factors that will affect the future demand for HIV-related health care services. Numerous factors might affect the demand for HIV clinician services over the next several years. Our demand estimates for the base year of our study (presented in Chapter II) are the product of the number of people living and diagnosed with HIV in the United States and the average number of HIV-related medical services used per diagnosed person living with HIV. The factors influencing the future demand for HIV health care services result in shifts in either or both of these components. Table IV.1 summarizes the most prominent of these factors and the sources of information needed to estimate their effect on future demand. The last two columns indicate whether we incorporate the specific factor in our baseline model projections (presented in Section B of Chapter V) or include it under one of our alternative market or policy scenarios (presented in Section C of Chapter V).

Next, we discuss each of the demand-side determinants, describe how they might influence the demand for HIV-related health care services, and present (where applicable) the appropriate adjustment factors for the projection model. Several additional demand-side determinants are not modeled. These include (1) the impact of implementation of the ACA and its influence on health insurance coverage and access to care; (2) advances in HIV treatment; and (3) changes in government policy, including Ryan White HIV/AIDS Program funding and/or treatment guidelines, as well as changes in Medicaid and Medicare policies affecting the coverage of HIV services. We discuss these determinants at the end of this section and, in Chapter VI, highlight their importance for future research.

Table IV.1. Factors Affecting the Future Demand for HIV Clinician Services

Demand-Side Determinant	Description	Data Source	Baseline Model	Alternative Scenario
Number People of Living and Diagnosed with HIV/AIDS				
New HIV Infections	Number of newly infected cases in 2008 by age, gender, race/ethnicity, and region	CDC surveillance data	√	
Deaths Among People Living with HIV	Mortality among people living with HIV in 2008 by age, gender, and race/ethnicity	CDC surveillance data	√	
New HIV Diagnoses Among People Living with HIV	Number of newly diagnosed cases resulting from expanded HIV testing	Findings from CDC expanded HIV testing initiative		√
Service Utilization per People Living and Diagnosed with HIV				
Demographic Characteristics of People Living with HIV	Differences in the average number of visits per person living with HIV by demographic group	CDC surveillance data and NCHS survey data	√	
Engagement in Care Among People Living with HIV	Changes in the proportion of people living with HIV who are linked to and engaged in care	Literature review (Gardener 2011)		√

CDC = Centers for Disease Control and Prevention; NCHS = National Center for Health Statistics.

1. Number of Newly Infected HIV Cases

Table 19 of the 2009 CDC surveillance report (CDC 2009) provides estimates of the total count of new HIV/AIDS cases in each state in 2008. We used this estimate of total new cases nationally and for each state for each of our projection years. In some states, state surveillance data were available and provided the distribution of these new cases by age, gender, and race/ethnicity categories. We used state-specific data, when available, to distribute the total count of new cases reported by the CDC by age, gender, and race/ethnicity for the state. If state-specific estimates were not available, we multiplied the national new-infection rate for each age, gender, and race/ethnicity grouping by the United States Census population estimate for the state in each demographic group to a impute the distribution of new cases for the state. We then used this imputed distribution to allocate the total number of new cases reported by the CDC across demographic groups.

Table IV.2 shows the overall national count of new cases by demographic group based on these methods. We find that there were about 51,000 newly diagnosed HIV cases in 2008, and we assume that the rate of new cases will remain constant in each of our projection years. About 75 percent of these new cases are male. More than half (53 percent) of the newly diagnosed cases were among individuals of black, non-Hispanic race/ethnicity. White, non-Hispanic individuals had the next highest share of new infection cases with 28 percent, and Hispanic individuals accounted for 16 percent. By age group, most new cases are for individuals from age 25 to 44 years (53 percent). However, there are substantial numbers of new cases among individuals 45 years and older (28 percent) and from 13 to 24 years (18 percent). For the purposes of our baseline scenario, we assume that the annual number and distribution of newly infected cases are constant over the five-year projection period.

Table IV.2. Estimated Number of New HIV Infections by Age, Gender, and Race/Ethnicity, 2009

	Male				Female				
Age Group	White Only, Non-Hispanic	Black Only, Non-Hispanic	Other/ Multiple Race Non-Hispanic	Hispanic Only	White Only, Non-Hispanic	Black Only, Non-Hispanic	Other/ Multiple Race Non-Hispanic	Hispanic Only	Total
Younger than 13 years	29	48	11	15	25	45	11	13	197
13–24 years	1,963	3,702	201	1,126	602	1,269	63	354	9,280
25–34 years	2,962	5,323	306	1,727	890	1,829	95	534	13,666
35–44 years	2,870	5,184	297	1,667	866	1,784	92	518	13,279
45–54 years	2,058	3,842	214	1,153	633	1,335	68	366	9,668
55–64 years	757	1,507	85	446	236	524	27	145	3,727
65 years and older	178	351	21	110	55	122	11	35	883
Total	**10,817**	**19,957**	**1,126**	**6,244**	**3,306**	**6,908**	**354**	**1,966**	**50,678**

Source: Mathematica and Lewin analysis of state and CDC HIV surveillance data and United States Census data, 2009.

Note: Cells representing fewer than 11 cases are reported as 11 cases. Totals are correspondingly adjusted.

2. Mortality Rate of People Living with HIV

In this section, we discuss our forecast of annual mortality among people living with HIV based on the data reported in Table 11a of the 2009 CDC surveillance report for the 40 states with mature, confidential, name-based reporting systems. Our model reflects variation in mortality rates by age, sex, and race/ethnicity. Because Table 11a in the CDC surveillance report provides only one-dimensional estimates of deaths by age, sex, and race/ethnicity, we developed multidimensional mortality estimates by age, sex, and race/ethnicity by applying constant distributions reflecting the overall distribution to the total number of deaths, first by age, then by race/ethnicity, and finally by sex. We divided the counts of deaths in each demographic group by the total number of individuals living with HIV in the demographic group in the 40 states with mature, confidential, name-based reporting to estimate the mortality rate among individuals living with HIV in each demographic group.

Table IV.3 displays the estimated annual mortality rates for individuals living and diagnosed with HIV that we incorporate into our model to project future demand for care. As expected, mortality rates among people living with HIV increase with age. Also, individuals of black, non-Hispanic race and other/multiple race have higher mortality rates than those in the white, non-Hispanic and Hispanic-only race/ethnicity categories. Men and women have similar mortality rates. We assume that mortality rates remain constant at the level observed for 2008 for each projection year of the model.

Table IV.3. Estimated Annual Mortality Rate Among Individuals Living with HIV/AIDS (percentages)

	Male				Female			
Age Group	White Only, Non-Hispanic	Black Only, Non-Hispanic	Other/ Multiple Race Non-Hispanic	Hispanic Only	White Only, Non-Hispanic	Black Only, Non-Hispanic	Other/ Multiple Race Non-Hispanic	Hispanic Only
Younger than13	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.1
13–24	0.5	0.5	0.8	0.5	0.5	0.5	0.8	0.5
25–34	1.0	1.3	1.8	1.1	1.1	1.2	1.9	1.1
35–44	1.8	2.4	3.2	1.9	2.1	2.4	3.3	2.0
45–54	2.6	3.9	5.0	2.9	3.2	3.7	5.2	3.0
55–64	3.1	4.0	5.0	2.8	3.5	3.8	4.9	2.7
65 and older	5.6	7.9	9.7	5.4	6.8	7.6	10.0	5.6
Total	**2.1**	**2.8**	**3.7**	**2.2**	**2.4**	**2.7**	**3.9**	**2.2**

Source: Mathematica and Lewin analysis of CDC surveillance data, 2009.

3. Number of New HIV Diagnoses Among People Living with HIV

The CDC estimates that approximately one-fifth of the 1.2 million individuals living with HIV or AIDS in the United States today are unaware of their serostatus (CDC 2011). Because of the number of undiagnosed cases of HIV and the knowledge that early diagnosis and treatment can prevent morbidity and mortality and reduce a person's risk of transmitting HIV to someone else, in 2006 the CDC recommended screening patients ages 13 to 64 years for HIV infection in health care settings who have a prevalence of undiagnosed HIV infection of more than 0.1 percent (CDC 2006).

The White House Office of National AIDS Policy's National HIV/AIDS Strategy also promotes the goal of increased HIV testing among people at high risk of infection. To assess the potential impact of increased testing on the demand for HIV care services, in Chapter V we present results from an alternative scenario in which we assume that 5 percent of the approximately 240,000 currently unidentified people living with HIV are diagnosed and linked to care in each year of the projection period. We assume that the demographic and regional distribution of the 12,000 additional cases each year parallels the demographic and regional distribution of those currently in care. We also assume they have the same number of visits per year, on average, as those diagnosed as of 2008.

4. Demographic and Clinical Characteristics of People Living with HIV

Because of variation in utilization rates across demographic subgroups (discussed in Chapter II), shifts in the demographic characteristics of the HIV population—either through new infections, expanded testing, longer survival rates, improved outreach and linkage to care, or greater engagement in care—will have an indirect effect on the demand for HIV-related health care services. The baseline scenario of our model considers two potential causes of a shift in the demographic characteristics of the HIV population: (1) differences in the demographic distribution of newly diagnosed cases relative to the current cases; and (2) an increase in the survival rate among people living with HIV today, resulting in the aging of the HIV population. With regard to the first cause, because the distribution of new cases differs from that of the old cases, as we project the model forward the demographic distribution of people living with HIV shifts over time. The explanation for the second cause is that the current mortality rates used for our projections are lower because of the current availability of the new antiretroviral therapies. This low mortality is evinced in our projection model with the aging of the HIV population.

Table IV.4 compares the current distribution of people living with HIV with the distribution of newly diagnosed HIV cases. New cases are more likely to be among individuals younger than 35. The share of new cases is 75 percent male, similar to the share of males among existing cases. Although 27.4 percent of existing cases are in the Northeast, only 13.6 percent of new cases are in this region. The share of cases in the South is similar among new and existing cases. However the share of new cases in the West and Midwest is higher than the share of existing cases in these regions. The share of new cases among blacks is substantially higher than the share of existing cases, 53.0 to 44.5 percent, respectively; the share of new cases among whites is substantially lower than the share of existing cases, 34.5 versus 27.9 percent, respectively. Given the variation in visit rates among these subgroups, an increase (or decrease) in the number of diagnosed cases among one demographic population relative to another will automatically change the estimated total number of HIV-related visits demanded per diagnosed case each year in our model.

Table IV.4. Comparison of the Demographic Distribution of Current and New HIV Cases (Percentages)

Demographic Group	Percentage of Current HIV Cases	Percentage of New HIV Cases
Age Group		
Younger than 35 years	25.1	45.6
35–44 years	31.8	26.2
45–54 years	29.4	19.1
55 years and older	13.7	9.1
Sex		
Male	74.5	75.3
Female	25.5	24.7
Region		
Northeast	27.4	13.6
Midwest	11.8	21.4
South	42.3	43.2
West	18.6	21.8
Race/Ethnicity		
White only, non-Hispanic	34.5	27.9
Black only, non-Hispanic	44.5	53.0
Other/multiple race non-Hispanic	2.7	2.9
Hispanic only	18.3	16.2

Source: Mathematica and Lewin analysis of state and CDC HIV surveillance data, 2009.

Mortality rates will also have an indirect effect on the utilization of HIV-related services per person living with HIV. Advances in HIV treatment have resulted in declines in mortality rates among people living with HIV. This increased life expectancy will lead to an increase in the proportion of the infected population in the older age groups (assuming the demographic distribution of newly infected cases remains constant). Evidence from the NCHS surveys presented in Chapter II indicates that people with HIV in older age groups receive, on average, more ambulatory medical visits than those in younger age categories. People ages 45 to 54 with HIV receive on average 6.2 visits annually, whereas those younger than 35 years and 35 to 44 years receive 4.0 and 5.4 visits annually, respectively. An increase in the proportion of the HIV population in the older age groups, holding other demand-side determinants constant, will lead to an increase in the estimated number of HIV-related health care visits demanded per diagnosed case each year.

5. Level of Engagement in Care Among People Living with HIV

Only about 77 percent of all HIV-diagnosed people are linked to care within three to four months after diagnosis, and only about 51 percent of those with a diagnosis of HIV are engaged in longer-term care and treatment (Chen 2012). HRSA funded a series of studies related to improving outreach, engagement, and adherence through its Special Programs of National Significance (SPNS) initiative. These studies found that increased use of case management services, mental health services, substance abuse treatment, transportation assistance, and housing assistance were associated with modest improvements in engagement and adherence to care. Based on our analysis of NCHS survey data, we estimated an average of 5.1 ambulatory visits per diagnosed individual per year. However, according to the CDC, an estimated 49 percent of all diagnosed individuals are not engaged in longer-term care and treatment. If we assume nonengaged individuals receive only 2.0 HIV-related visits annually, the 51 percent of the diagnosed population who are engaged in care would need to have 8.1 ambulatory visits per person annually to maintain an overall average rate of 5.1 visits per diagnosed individual. If diagnosed individuals who are currently not engaged in care become fully engaged in care, their ambulatory visit rate would increase by 6.1 visits, from 2.0 to 8.1 visits annually. If 5 percent of the diagnosed population that is not currently engaged in care becomes fully engaged, this would in turn increase the average number of ambulatory visits across all diagnosed people from 5.1 to 5.4 visits annually. Therefore, to simulate the effect of improved linkages to and engagement with care, we assume that the overall clinician visit rate in the model (including visits in both outpatient and inpatient settings) will increase from 6.0 to 6.6 visits per year, on average.

B. Factors Affecting the Future Supply of HIV Clinician Services

In this section, we discuss the primary factors affecting the future supply of HIV clinician services (summarized in Table IV.5). The future supply of HIV clinician services will be determined by the number of clinicians practicing HIV medicine, which is a function of (1) the number of providers currently providing HIV care, (2) the number of new clinicians entering the HIV workforce, (3) the number of current clinicians retiring from clinical practice or no longer providing HIV care, and (4) the mortality rate among HIV clinicians. For a given number of clinicians, the future supply of HIV services will also depend on changes in (1) the number of hours that practicing clinicians spend in direct patient care, (2) the proportion of clinical care time spent treating patients with HIV, and (3) the number of HIV-related visits provided within a given hour of patient care. We use the HIV clinician survey to estimate the effect of these factors on the future supply of HIV clinician services. We discussed our methods for estimating the number of currently practicing HIV clinicians, as well as the number of hours in HIV care and the number of visits provided per hour, in Chapter III. In this chapter, we focus mainly on supply-side determinants related to entry into and exit from the HIV workforce.

We include all of these factors in our baseline projection model presented in Chapter V. Also in Chapter V, we present alternative scenarios in which we adjust several of these factors to examine the potential effect on supply. In particular, we assess the impact of expanding the integration of HIV treatment into primary care (through increasing the average proportion of time that primary care physicians spend treating patients with HIV). We also model the effect of improving the productivity of the HIV workforce (through increasing the average number of HIV patients who can be treated within a given hour of patient care) on the future supply of HIV services.

Table IV.5. Factors Affecting the Future Supply of HIV Clinician Services

Supply-Side Determinant	Description	Data Source	Baseline Model	Alternative Scenario
Current Supply of HIV Clinicians				
Current Active HIV Clinicians	Number of physician and nonphysician providers who currently manage HIV patient care	SDI Health claims database and HIV clinician workforce survey	√	
Hours in Clinical Care	Number of hours that HIV clinicians spend in total direct patient care, by age, gender, and type of clinician	HIV clinician workforce survey	√	
Hours in HIV Care	Proportion of total patient care hours HIV clinicians spend treating patients with HIV, by age, gender, and type of clinician	HIV clinician workforce survey	√	√
Additions to HIV Clinician Workforce				
Clinicians Entering HIV Medicine	Number of new physician and nonphysician clinicians choosing to manage HIV patient care, by age, gender, and type of clinician	HIV clinician workforce survey	√	
Losses to HIV Clinician Workforce				
HIV Clinicians Retiring from Medical Practice	Number of clinicians retiring from medical practice, by age, gender, and type of clinician	HIV clinician workforce survey	√	
Mortality Rate Among HIV Clinicians	Number of deaths among HIV clinicians, by age, gender, and type of clinician	CDC mortality data	√	
Productivity of HIV Clinician Workforce				
HIV Visits per Hour in Patient Care	Average number of HIV patients who can be treated within a given hour of direct patient care time, by type of clinician	HIV clinician workforce survey	√	√

1. Entry into HIV Medicine

One of the main determinants of the future supply of HIV provider services is the number of physician and nonphysician clinicians entering the HIV workforce each year. In the absence of a nationally recognized accreditation and licensure program in HIV medicine, we estimated the proportion of new entrants based on responses to the HIV clinician survey. We defined new entrants as clinicians who reported that they began treating patients with HIV between 2005 and 2010.[13] We used two survey questions to determine if a respondent was a new entrant. One question asked, "In approximately what year did you begin providing medical care to patients with HIV or AIDS?" and the other asked, "In approximately what year did you receive your highest clinical degree?" We used both questions because many respondents reported beginning to provide care to

[13] Although the survey was conducted in 2012, respondents were selected based on having submitted an HIV-related claim for 10 or more patients in calendar year 2010. As a result, the survey does not include clinicians who entered HIV medicine in 2011 or 2012. In addition, we used a six-year look-back period instead of five years because clinicians who finished their training and began providing HIV care in 2010 might not have a sufficient claims history to meet our inclusion criterion.

patients with HIV or AIDS during their medical training, and for the purposes of this study we did not consider someone an HIV specialist until after he or she completed medical training. Similarly, some clinicians reported beginning to treat patients with HIV or AIDS in the years following completion of their highest clinical degree and we did not consider these clinicians to have become HIV specialists until they began treating patients with HIV. Thus, if a respondent indicated a year from 2005 to 2010 in either of these questions, we considered the respondent a new entrant.

As shown in Tables IV.6 and IV.7, we estimated that annually an average of 150 high-volume HIV clinicians reported entering HIV from 2005 to 2010. Of these, roughly 38 percent were primary care physicians and 37 percent were infectious disease specialists. The remaining 25 percent were nurse practitioners and physician assistants. More than half of all new high-volume HIV providers (57.3 percent) were female and three-quarters (76.0 percent) were younger than 45. More than half of all new HIV clinicians (54.7 percent) were white, non-Hispanic; 11.3 percent were black, non-Hispanic; and 9.3 percent were Hispanic. A disproportionate share of the new nurse practitioners and physician assistants was female and 45 years or older. Primary care physicians were also more likely to begin managing HIV patient care at an older age than infectious disease specialists.

Table IV.6. Average Annual Number of High-Volume Clinicians Entering HIV Medicine, by Clinician Type, 2005–2010

	Number of New HIV Clinicians per Year	Percentage of New HIV Clinicians per Year
Primary Care Physicians	57	38.0
Infectious Disease Physicians	56	37.3
Nurse Practitioners and Physician Assistants	37	24.7
All HIV Clinicians	150	100.0

Source: Mathematica and Lewin analysis of the HIV clinician workforce survey, 2012.

Note: New clinicians are based on survey respondents who reported that they received their highest medical degree or began providing HIV care from 2005 to 2010. Results are weighted to account for the probability of selection and for differential survey response patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Percentages might not sum to 100 due to rounding.

Table IV.7. Percentage Distribution of New High-Volume HIV Clinicians, by Demographic Characteristics and Clinician Type, 2005–2010 (percentages)

Demographic Characteristics	PCP	IDP	NP/PA	All Clinicians
Sex				
Male	43.9	53.6	24.3	42.7
Female	56.1	46.4	75.7	57.3
Age Group				
Younger than 45 years	70.2	94.6	56.8	76.0
45 years or older	29.8	5.4	43.2	24.0
Race/Ethnicity				
White only, non-Hispanic	47.4	51.8	70.3	54.7
Black only, non-Hispanic	17.5	5.4	10.8	11.3
Hispanic	7.0	12.5	8.1	9.3
Other/multiple race, non-Hispanic	28.1	30.4	10.8	24.7

Source: Mathematica analysis of the HIV clinician workforce survey, 2012.

Notes: New clinicians are based on survey respondents who reported that they received their highest medical degree or began providing HIV care from 2005 to 2010. Results are weighted to account for the probability of selection and for differential survey response patterns. The sum of these weights reflects our best estimate of the population of clinicians eligible to participate in the HIV clinician workforce survey. Among eligible respondents, 100 percent reported this information. Percentages might not sum to 100 due to rounding

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

2. Retirement from HIV Medicine

The future supply of HIV clinicians will be determined by the number of currently practicing clinicians leaving medical practice as well. To measure this, survey respondents were asked, "How likely are you to retire from clinical practice entirely within the next five years?" An estimated 6.8 percent of all clinicians reported that they are very likely to retire within the next five years and an additional 9.9 percent reported that they are somewhat likely to retire within that period. The expected retirement rate was similar for all three clinician types. Not surprisingly, older clinicians are more likely to retire within five years than their younger counterparts. In addition, male clinicians are more likely to retire within the next five years than female clinicians (7.9 percent of males versus 4.7 percent of females reported being very likely to retire and 10.6 of males versus 8.7 of females reported being somewhat likely to retire). However, the differences between male and female clinicians might be related to the slightly older mean age of currently practicing male clinicians (51 years) versus that of females (48 years).

We ran two regression models to estimate the likelihood of HIV clinician retirement based on the survey data. The first model was estimated on the likelihood that clinicians reported being very likely to retire. The second model was estimated on the likelihood that clinicians reported being either very or somewhat likely to retire. We included age group, gender, and clinician type in the regression models. Because only age group was significant, we included the age groups only in the final models. We calculated the predicted probability of retirement in the next five years for each of the two models for each age group. Then, for each model and age group, we subtracted the predicted probability of retirement in the next five years from one to obtain the predicted probability of remaining in the labor force for the next five years. Next, for each model and age group, we took the fifth root of this probability to calculate the annual likelihood of remaining in the labor force each year, assuming that the likelihood of remaining in the labor force in each of the five years was equal. Because many of the clinicians who report being somewhat likely to retire in the next five years might choose not to retire, we set our baseline forecast of the annual likelihood of remaining in the labor force for each age group at the average of the likelihood estimated based on the very likely to retire model and the likelihood estimated based on the very or somewhat likely to retire model.

In Table IV.8, we present the estimated average annual retirement rate (one minus the likelihood of remaining in the labor force) for each age group. Based on our measure of retirement, 7.4 percent of clinicians ages 60 to 64 are likely to retire this year. The likelihood of retirement increases to 11.4 percent for clinicians ages 65 to 69, and 16.9 percent of those ages 70 to 74. For the purposes of our model, we assume all clinicians retire at age 75.[14]

Table IV.8. Estimated Average Annual Retirement Rate Among High-Volume HIV Clinicians, by Clinician Age

Age Group	Likelihood of Retiring This Year (%)
Younger than 45 years	0.5
45 to 59 years	3.1
60 to64 years	7.4
65 to 69 years	11.4
70 to 74 years	16.9
75 years	100.0

Source: Mathematica analysis of the HIV clinician workforce survey, 2012.

Notes: Likelihood of retiring based on average of respondents who reported that they were very likely and those who reported they were either very or somewhat likely to retire in next five years. We weighted the results to adjust for survey sampling and nonresponse, and used specialized procedures to account for the sample stratification and weighting in the variance estimates when conducting statistical testing. Among eligible respondents, 100 percent reported this information.

3. Mortality Rate Among HIV Clinicians

We obtained age-specific mortality rates from CDC mortality data (CDC 2010). Using information on mortality rates by profession obtained from Johnson et al. (1999), we are able to estimate mortality rates for health professionals. We present these age- and gender-specific conditional mortality rates for health professionals in Table IV.9. These rates are the cumulative probabilities of mortality at each age shown. For example, assuming that a male HIV clinician reaches age 65, he has a 1.8 percent probability of dying that year. When the clinician reaches age 75, he has a 5.8 percent chance of dying that year. We assume mortality rates are constant across clinician types and over time.

[14] Several members of our technical expert panel explained that HIV clinicians continue to practice HIV medicine until retirement rather than choosing to switch to other types of medicine before retiring. However, other researchers and health care advocates have argued that administrative burden and burn-out among HIV clinicians, as well as practice closures due to lack of funding for HIV care, have contributed to a reduction in the number of available HIV services even when HIV clinicians choose to continue clinical practice. In our baseline projections, we ignore potential decreases in the number of HIV services supplied due to provider burn-out or practice closures.

Table IV.9. Annual Mortality Rates Among High-Volume HIV Clinicians, by Age and Gender

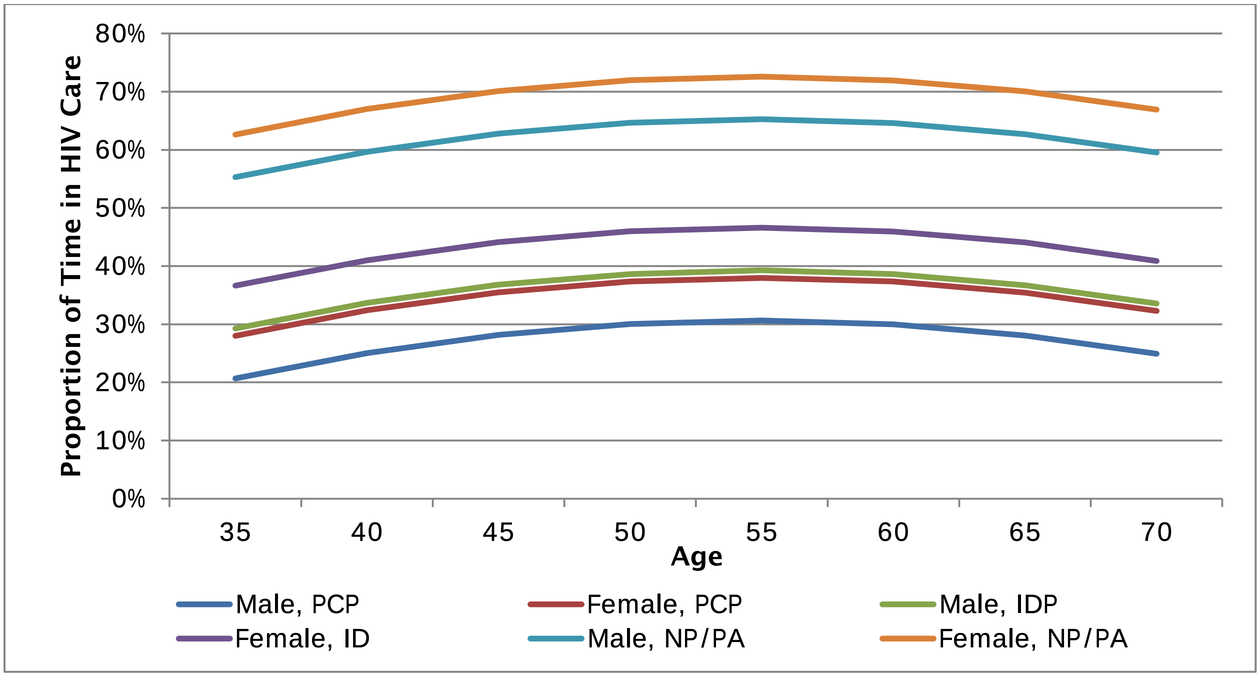
Age	Male (%)	Female (%)
40 years	0.2	0.1
45 years	0.3	0.2
50 years	0.5	0.3
55 years	0.7	0.4
60 years	1.1	0.7
65 years	1.8	1.1
70 years	3.1	1.8
75 years	5.8	3.1

Source: Mathematica and Lewin analysis of CDC mortality data, 2010.

4. Changes in Time Dedicated to HIV Care over Career

Finally, based on the responses to the HIV clinician survey, we reported in Chapter III that older clinicians tend to reduce their total hours worked as they near retirement. Using the survey data, we found a statistically significant reduction in total hours worked between male clinicians younger than 65 and those 65 and older. (The age-group difference was not statistically significant among female clinicians.) As a result, our baseline forecast model assumes that male clinicians reduce their hours worked at age 65, from 46.0 to 39.8 hours per week. In addition to changes in the number of hours worked per week, we also observed in the survey data that the proportion of time in HIV care tended to be higher for older clinicians until they near retirement age. (Younger clinicians were also more likely than their older counterparts to indicate that they planned to increase their HIV caseload over the next five years.) Thus, our baseline forecast model also assumes that through age 55, current HIV clinicians will increase the proportion of time they dedicate to HIV care each year. The proportion of time dedicated to HIV care peaks at age 55 and then decreases until retirement. Figure IV.1 displays the proportion-of-time trajectory assumed in the baseline model by clinician type and gender.

Figure IV.1. Proportion of Time in HIV Care, by Age, Gender, and Clinician Type



Source: Mathematica analysis of the HIV clinician workforce survey, 2012.

Note: Information in figure is presented as fitted values based on regression analysis.

IDP = infectious disease physician; NP = nurse practitioner; PA = physician assistant; PCP = primary care physician.

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V. RESULTS FROM THE HIV CLINICIAN WORKFORCE MODEL

In this chapter, we present the aggregate supply and demand results from the HIV clinician workforce model. We start by explaining our methods for converting supply and demand into a common metric that can be used to measure the shortage or surplus of clinicians. We then provide a brief overview of the HIV clinician workforce model and explain how we use it to generate projections of supply and demand through 2015. (For a detailed description of the model, the reader should refer to the final design report we submitted to HRSA in March 2011 [Gilman et al. 2011].) Next, we present the projection results under the current market-based baseline assumptions outlined in the previous three chapters. Finally, we provide a series of forecasts based on alternative scenarios. We examine two alternative scenarios related to the demand for HIV services and two related to supply. The purpose of the simulations is to illustrate how HRSA can use the HIV clinician workforce model to analyze the impact of a range of policy- and market-based scenarios on future HIV clinician workforce needs.

A. Converting Base-Year Visits into Full-Time Equivalent HIV Clinicians

An important step in constructing demand and supply estimates is to convert the number of HIV visits demanded and supplied during the base year into the number of FTE HIV clinicians demanded and supplied. This conversion from visits to FTE clinicians is essential, as it provides a way to meaningfully compare the demand for and supply of HIV-related services and to measure the magnitude of the HIV clinician shortage or surplus. To convert the number of HIV visits demanded and supplied into an FTE measure, we first divide the total number of HIV visits demanded and the total number of HIV visits supplied by the average number of HIV visits that a typical HIV clinician can provide in an hour to obtain a measure of the total number of HIV clinician hours demanded and supplied. (For example, if 4,000 visits are demanded per year and a clinician can treat two patients per hour, then the number of hours of a clinician's time demanded is 2,000.) We then divide this number by the average number of hours that HIV clinicians work per year (defined as weeks worked per year times average hours worked per week) to obtain a measure of the total number of FTE clinicians demanded and supplied. (For example, if 2,000 hours are demanded and a typical clinician works 1,882 hours per year, then the number of FTE clinicians demanded is 1.1.) After we define our FTE measure in this way, the current productivity level (count of visits produced per hour worked) becomes a fixed reference point in our model. In 2010, this reference point was 2,805 visits produced per FTE. Future increases (declines) in the number of visits conducted per hour of HIV care (for example, through improvements in workforce productivity) will result in the same number of hours worked yielding more (or less) than one FTE.

As shown in Table V.1, this calculation converts 5.4 million visits demanded in our base year (from Chapter II) into 1,945 FTE HIV clinicians demanded and 5.1 million HIV visits supplied in our base year (from Chapter III) into 1,812 FTE HIV clinicians supplied. The net result is an excess demand (or shortage) of 133 FTE HIV clinicians during the base year of our study. Given that we constructed our demand estimates using visits that actually occurred in inpatient and outpatient settings (base on an analysis of NAMCS, NHAMCS, and HCUP survey data), from a conceptual point of view demand and supply in the base year should be equal. It is important to note, however, that the difference between demand and supply in the base year is at least in part attributable to the fact that some of the HIV services we observe were provided by clinicians who did not meet our threshold of treating 10 or more patients with HIV (that is, some patients were treated by low-volume providers and thus their services are included in our model on the demand side, but the clinicians who provided the services are not included in our estimates of supply, which are based on only high-volume providers). Nonetheless, the model provides a reasonable estimate of the overall demand and supply of medical services for the HIV population in the base year.

Table V.1. Number of HIV Clinician Full-Time Equivalents Demanded and Supplied in Base Year

	Column A Total Number of HIV Visits	Column B Average Number of HIV Visits per Hour	Column C Total Number of Hours	Column D Average Number of Hours Worked per Year	Column E Total FTE Clinicians
Demand	5,451,057	1.49	3,658,427	1,882	1,945
Supply	5,083,217	1.49	3,411,555	1,882	1,812
Excess Demand	367,840	1.49	246,872	1,882	133

Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), Medical Group Management Association (MGMA) data (2012), and state and federal HIV surveillance data (2008).

Notes: Figures might not sum evenly due to rounding.

FTE = full-time equivalent.

B. Overview of the HIV Clinician Workforce Model

We use the HIV clinician workforce model to construct projections of the supply of and demand for FTE HIV clinicians using the input parameters described in the previous chapters. The purpose of the projections is to (1) provide a realistic assessment of the market-based demand and supply for HIV clinicians from 2010 to 2015, (2) provide insights into the effect of relevant factors on the future demand for and supply of HIV services, and (3) offer concrete examples of how HRSA can use the model to conduct "what if" analyses of the potential impact of alternative scenarios on the HIV clinician workforce.

As shown in the Equation (1), the number of active HIV clinicians in the first projection year of the model (denoted by t+1) is defined as the number of active HIV clinicians in the base year (denoted by t), plus new entrants into the HIV workforce in year t+1 minus losses from retirement and mortality in year t+1. We define the active supply of clinicians as those who provide care to 10 or more patients with HIV in a given year. Because of the lag in the availability of data needed to build the model, the base year for this study is 2010 and the first projection year is 2011. The last projection year is 2015.

$$(1)\ Active\ Supply_{t+1} = Active\ Supply_t + New\ Entrants_{t+1} - Attrition_{t+1}$$

We multiply the active supply of HIV clinicians in each year by the estimated number of hours worked per year; the proportion of time spent in HIV care; and the number of visits provided per hour by each age group, gender, and clinician type to determine the total number of HIV services supplied. In our baseline model, we assume these estimates are constant for each demographic group and clinician type throughout the five-year forecasting period. The only dynamic supply-side factors in the baseline model are entry and attrition among clinicians, plus shifts in the underlying demographic distribution of the HIV workforce over time due to entry, attrition, and aging. We then convert the total number of visits supplied into FTE HIV clinicians supplied by dividing total visits supplied by the average number of hours worked per year to obtain a meaningful measure for workforce supply.

The demand component of the model projects future demand for HIV services on an annual basis through 2015 by taking into account changes in the demographic characteristics and patterns of utilization of medical services among people living and diagnosed with HIV. As shown in Equation (2), the number of HIV cases in the first projection year (t+1) is defined as the number of HIV cases in the base year (t), plus newly diagnosed cases in year t+1 minus mortality in year t+1 among individuals diagnosed with HIV in the base year (t). New cases and mortality among people living with HIV are derived from federal and state HIV surveillance data and vary by age, gender, and race/ethnicity. In our baseline model, we assume incidence and mortality rates among the HIV population are constant over the five-year projection period.

$$(2)\ HIV\ Cases_{t+1} = HIV\ Cases_{t} + New\ HIV\ Cases_{t+1} - Mortality_{t+1}$$

Using data from nationally representative federal surveys of ambulatory and inpatient service use, we calculate utilization rates by age group and gender in the base year as the ratio between the total number of HIV visits used and the total number of HIV cases in each age and gender group. As shown in Equation (3), we then multiple the utilization rates by the forecasted HIV population in each age and gender group in year t+1 to obtain the total number of HIV-related visits in each of the forecasted years.

$$(3)\ HIV\ Visits_{\,t+1} = HIV\ Cases_{t+1} * Utilization\ Rates$$

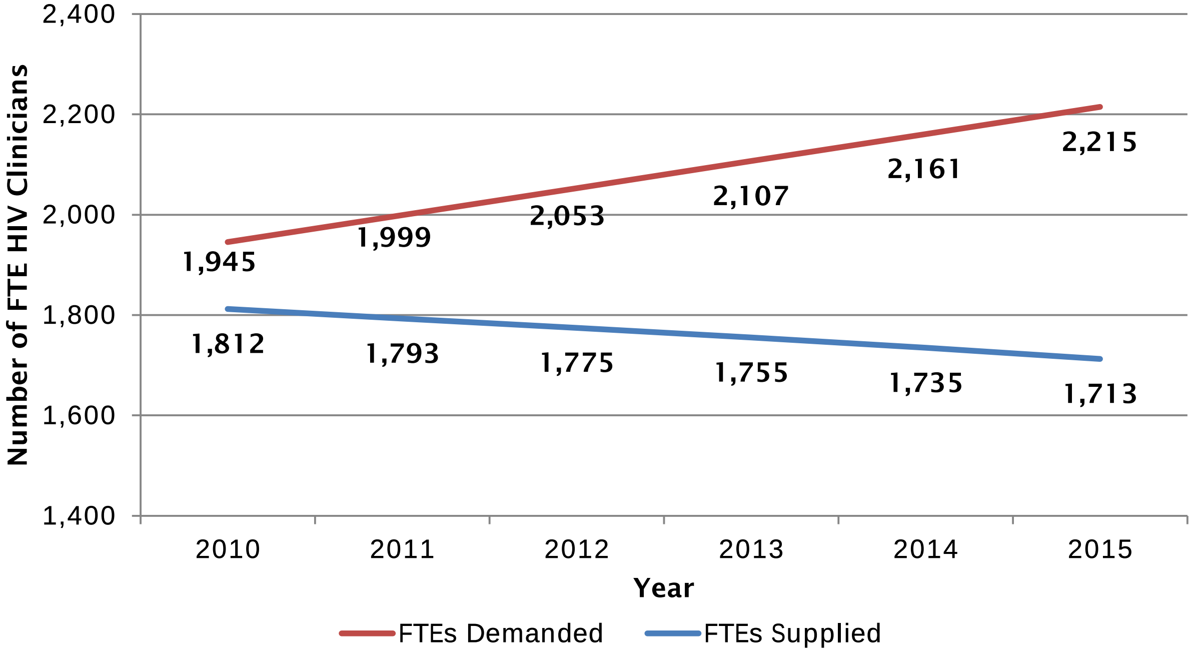
In our baseline model, we assume HIV service utilization rates for each age and gender group are constant over the five-year forecasting period. However, the overall average number of visits per diagnosed case will change over time due to underlying shifts in the distribution of HIV cases across the age and gender groups. For example, on the one hand, the overall average visit rate might increase over time as the HIV population ages because older individuals living with HIV use more services than do younger people. On the other hand, an increase in new infections among younger people, who use relatively fewer services, might lower the overall average visit rate.

Finally, as explained earlier in this chapter, we divide the total number of HIV-related visits demanded in each forecasted year by the average number of visits that an HIV clinician can provide in a given hour to determine the total number of HIV-related hours demanded. Then, we divide total number of HIV hours demanded by the average number of hours worked per year among HIV clinicians in the same forecasted year to convert hours demanded into FTE HIV clinicians demanded.

C. Baseline Forecasts of FTE HIV Clinicians Demanded and Supplied

In this section, we present the demand and supply forecasts from 2010 through 2015 under baseline assumptions. In Figure V.1, we present the baseline demand and supply projections expressed in FTE HIV clinicians per year over the five-year forecasting period. Under the baseline assumptions, the total number of FTE HIV clinicians supplied in the United States is expected to decline 5.5 percent over this period, from 1,812 FTE HIV clinicians in 2010 to 1,713 in 2015. During the same period, the total number of FTE HIV clinicians demanded in the United States is expected to increase 13.9 percent, from the base-year value of 1,945 to 2,215 by 2015. The net result of the model is an estimated shortage of 133 FTE clinicians in the base year, growing to an excess demand of 502 FTE HIV clinicians in 2015.

Figure V.1. Baseline Forecasts of FTE HIV Clinicians Demanded and Supplied, 2010–2015



Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), MGMA survey (2012), NAMCS (2009) and NHAMCS (2008) surveys, HCUP data (2009), and state and federal HIV surveillance data (2008).

FTE = full-time equivalent.

Table V.2 shows the forecasted number of HIV clinicians by type of clinician, along with the forecasted number of HIV visits supplied by clinician type from 2010 to 2015. If the current patterns of retirement, mortality, and entry into HIV care remain the same as in the base year (as reflected in the survey data), our model forecasts a decline in the number of primary care clinicians and infectious disease specialists managing HIV care by 2015 of about 400 and 200 FTE clinicians, respectively. In contrast, the number of nurse practitioners and physician assistants supplying HIV care is expected to increase from 408 clinicians in the base year to 511 clinicians in 2015. Largely as a result of the decline in the number of primary care physicians and infectious disease specialists managing HIV care, the number of HIV visits supplied is expected to decline 6.1 percent over the forecasting period, from 5.1 million in 2010 to 4.8 million in 2015.

Table V.2. Baseline Forecasts of HIV Clinicians and Visits Supplied, 2010–2015

	2010	2011	2012	2013	2014	2015
HIV Clinicians						
PCP	2,693	2,602	2,524	2,445	2,369	2,292
IDS	1,836	1,789	1,748	1,707	1,666	1,625
NP/PA	408	431	453	473	493	511
Total	4,937	4,823	4,724	4,625	4,527	4,429
Visits Supplied						
PCP	2,297,165	2,237,539	2,179,493	2,120,860	2,061,589	2,000,908
IDS	2,023,814	1,978,503	1,936,158	1,893,450	1,849,754	1,806,565
NP/PA	762,238	805,993	848,868	889,285	927,861	964,288
Total	5,083,217	5,022,035	4,964,519	4,903,595	4,839,204	4,771,762

Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012).

IDS = infectious disease specialist; NP = nurse practitioners; and PA = physician assistant; PCP = primary care physicians.

Table V.3 shows the baseline forecasts of the number of HIV patients and the number of HIV visits demanded by these patients from 2010 to 2015. Given the base year assumptions about mortality and incidence of new cases in this population, the number of diagnosed HIV cases is expected to increase by about 140,000, from 0.9 million in the base year to slightly more than 1.0 million by 2015. Assuming the same utilization of HIV services by age and gender group as observed in the base year, the total number of visits demanded is expected to increase 13.8 percent, from 5.4 million in 2010 to 6.2 million in 2015.

Table V.3. Baseline Forecasts of HIV Patients and Visits Demanded, 2010–2015

	2010	2011	2012	2013	2014	2015
HIV Cases						
Male	678,556	700,272	722,026	743,841	765,683	787,529
Female	231,122	237,799	244,474	251,156	257,832	264,505
Total	909,678	938,071	966,500	994,997	1,023,515	1,052,034
HIV Visits Demanded						
Gender						
Male	3,666,900	3,772,103	3,877,386	3,982,853	4,088,411	4,193,953
Female	1,784,157	1,829,765	1,875,314	1,920,866	1,966,349	2,011,784
Age Group						
Younger than 35 years	1,322,415	1,422,861	1,523,329	1,623,921	1,724,197	1,824,070
35 to 44 years	1,713,726	1,757,475	1,800,314	1,842,454	1,884,195	1,925,491
45 to 54 years	1,638,418	1,650,483	1,662,237	1,673,572	1,684,499	1,695,083
55 years or older	776,498	771,050	766,820	763,771	761,869	761,094
Total	5,451,057	5,601,868	5,752,700	5,903,719	6,054,760	6,205,738

Sources: Mathematica and Lewin analysis of NAMCS (2009), NHAMCS (2008), HCUP data (2009), and state and federal HIV surveillance data (2008).

The decline in FTE HIV clinician supply is largely due to the fact that the number of new clinicians entering the HIV workforce over the next few years is not sufficient to fill the gap left by clinicians leaving the HIV workforce due to retirement and mortality. The decline in FTE HIV clinician supply is also due to the demographic shift in the HIV workforce toward female clinicians. A disproportionate share of new entrants is female and, on average, female clinicians tend to work fewer hours per year than their male counterparts. The growth in FTE HIV clinician demand, on the other hand, is primarily due to the continued number of newly diagnosed cases each year and the low mortality rate among the currently diagnosed population. The increase in FTE HIV clinician demand is also due to the increase in the number of visits for people ages 45 and older.

As a result of these trends in the demand and supply of HIV services, our model indicates that the shortage of FTE HIV clinicians will almost quadruple over the forecasting period, from an excess demand of 133 FTE HIV clinicians in 2010 (equivalent to 7.3 percent of total supply) to 502 in 2015 (equivalent to 29.3 percent of total supply). Although we expect a small amount of excess demand to persist throughout our forecasting period given the exclusion of low-volume HIV clinicians from the supply-side calculations, the five-year projections reflect a real and growing shortage of HIV clinicians as current providers reach retirement age and the number of people living with HIV continues to grow.[15] By 2015, our forecasting model predicts that the supply of HIV clinicians will be sufficient to meet only three-quarters of the total demand for HIV services, under our current market-based assumptions. Improvements in HIV detection and engagement in care will only make the predicted shortage worse.

D. Forecasts of FTE HIV Clinicians Demanded and Supplied Under Alternative Scenarios

The projections shown in the previous section reflect forecasted demand and supply under the baseline set of assumptions. In this section, we provide additional projections under four alternative scenarios, meant to illustrate the types of policy analyses that HRSA can conduct with the HIV workforce model. We describe the four alternative scenarios in Table V.4, as well as the way we introduced them into the model and their expected impact on the future clinician workforce. The results of each of these alternative scenarios follow.

[15] The results presented in this report are based on national-level estimates of supply-side inputs, such as number of hours worked, proportion of time spent in HIV care, number of visits per hour, and retirement rate. These national-level estimates yield statistically unreliable projections at the state and local levels. As a result, we do not present workforce projections at the state and MSA levels in this report. Instead, we provide a set of tables showing the variation in the estimated number of high-volume HIV clinicians per 1,000 diagnosed HIV cases by state, region, and MSA in Appendix D. Future analyses that examine regional differences in supply-side inputs might support more statistically reliable projections of FTE HIV clinicians supplied and demanded in the future.

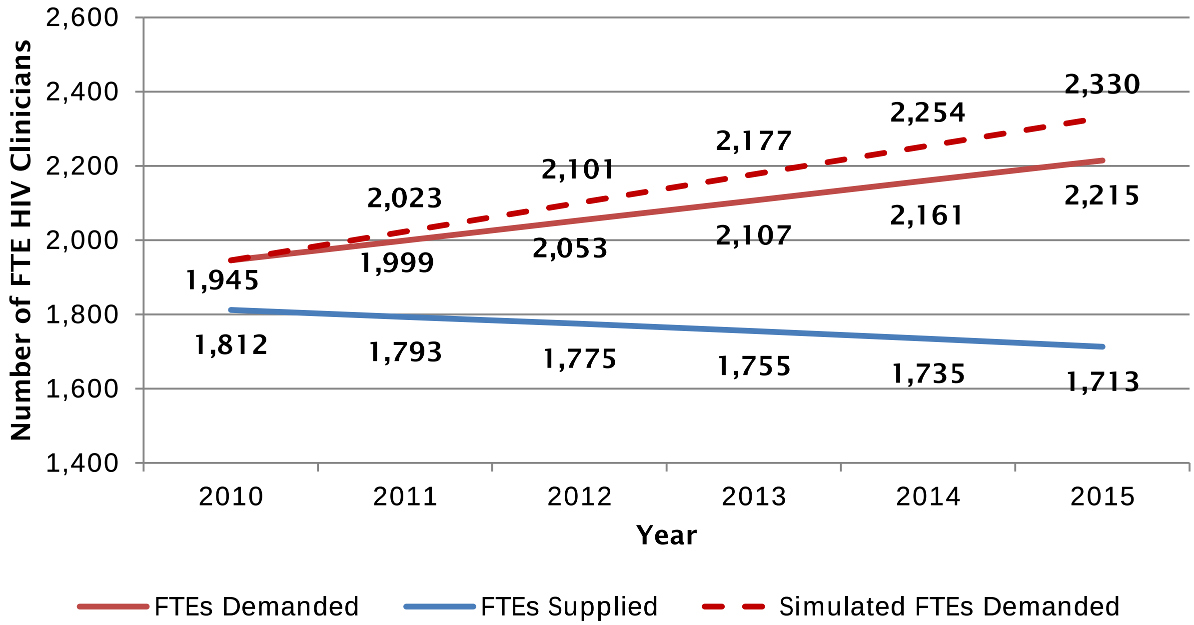
Table V.4. Alternative Scenarios and Expected Impact on HIV Clinician Workforce

Alternative Scenario	Change in Model Parameters	Expected Impact
1. Increase in number of people diagnosed with HIV	5 percent of currently living but undiagnosed HIV cases are diagnosed and enter care each year	Increase in demand for HIV services and increase in shortage of HIV clinicians
2. Increase in level of engagement in care among people living with HIV	10 percent increase in average number of visits demanded per person per year relative to average demand in base year	Increase in demand for HIV services and increase in shortage of HIV clinicians
3. Increase in comanagement of HIV by primary care clinicians	5 percent increase in proportion of time primary care physicians, nurse practitioners, and physician assistants spend treating patients with HIV	Increase in supply of HIV services and decrease in shortage of HIV clinicians
4. Increase in productivity of HIV clinician workforce	10 percent increase in average number of visits supplied per hour of clinical care time	Increase in supply of HIV services and decrease in shortage of HIV clinicians

As noted in Chapter IV, CDC estimates that approximately one-fifth of the 1.2 million individuals living with HIV in the United States are currently undiagnosed. To prevent morbidity and mortality and reduce secondary transmission, CDC recommends screening patients ages 13 to 64 years for HIV infection in health care settings that have a prevalence of undiagnosed HIV infection of more than 0.1 percent. The White House Office of National AIDS Policy's National HIV/AIDS Strategy also promotes the goal of increased HIV testing among people at high risk of infection. To assess the potential impact of increased testing on the demand for HIV care services, we present results from an alternative scenario in which we assume that 5 percent of the approximately 240,000 currently unidentified people living with HIV are diagnosed and linked to care in each year of the projection period. We assume that the demographic and regional distribution of the 12,000 additional cases each year parallels the demographic and regional distribution of those currently in care. We also assume they have the same number of visits per year on average as those diagnosed as of 2008.

As shown in Figure V.2, if national expanded HIV testing efforts are successful in identifying and linking to care 5 percent of the estimated 240,000 living but undiagnosed cases of HIV annually over the forecasting period, the projected demand for FTE HIV clinicians would rise from 1,945 in 2010 to 2,330 in 2015. By the last year of our forecasting period, expanded testing and diagnosis would increase the demand of FTE HIV clinicians 5.2 percent (relative to what it would have been under baseline assumptions) and would widen the overall shortage of FTE HIV clinicians to 36.0 percent of expected supply (compared with a 29.3 percent gap under baseline assumptions).

Figure V.2. Impact of Increase in Number of Newly Diagnosed Cases on Forecasted Demand



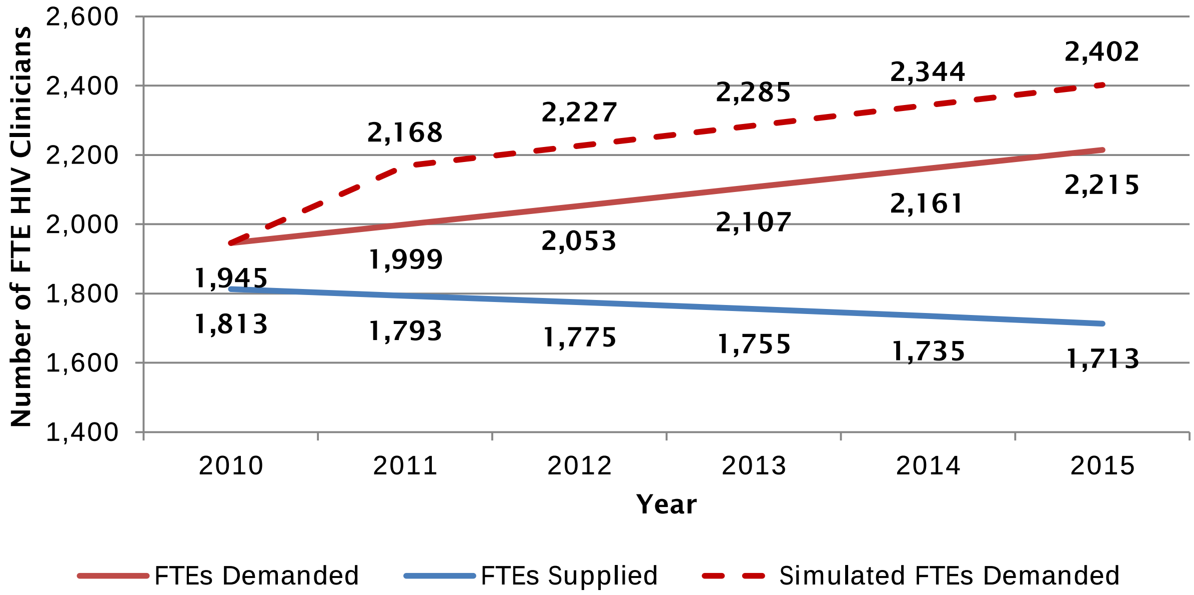
Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), MGMA survey (2012), NAMCS (2009) and NHAMCS (2008) surveys, HCUP data (2009), and state and federal HIV surveillance data (2008).

FTE = full-time equivalent.

The second alternative scenario we consider is an improvement in linkages to and engagement in care among individuals who know their serostatus but are not yet engaged in ongoing care with an HIV provider. As noted in Chapter IV, an estimated 77 percent of all HIV-diagnosed persons are linked to care within three to four months after diagnosis, and only about 51 percent of those with a diagnosis of HIV are engaged in longer-term care and treatment (Chen 2012). Through its early intervention services program and other initiatives, HRSA has made a considerable effort to improve the level of engagement in care among people known to be HIV-positive. To simulate the effect of improved linkages to and engagement with care, we assume that 5 percent of the diagnosed population that is not currently engaged in care becomes fully engaged. We model this by assuming that the overall clinician visit rate (including visits in both outpatient and inpatient settings) will increase from 6.0 visits to 6.6 visits per year on average.

Figure V.3 illustrates the effect of improved linkages and engagement with care on the demand for FTE HIV clinicians. By increasing the average visit rate from 6.0 visits to 6.6 visits per diagnosed person per year, there is an 8.4 percent jump in the demand for HIV services, starting in 2011 and remaining at that higher level through the end of the forecasted period. Holding our baseline supply projections constant, the simulated demand scenario will increase the demand for FTE HIV clinicians by 2015 to 2,402 (compared with 2,215 under our baseline assumptions) and will widen the expected clinician shortage to 40.2 percent of projected supply (compared with 29.3 percent under our baseline assumptions).

Figure V.3. Impact of Increase in Level of Engagement Among Current HIV Population on Forecasted Demand



Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), MGMA survey (2012), NAMCS (2009) and NHAMCS (2008) surveys, HCUP data (2009), and state and federal HIV surveillance data (2008).

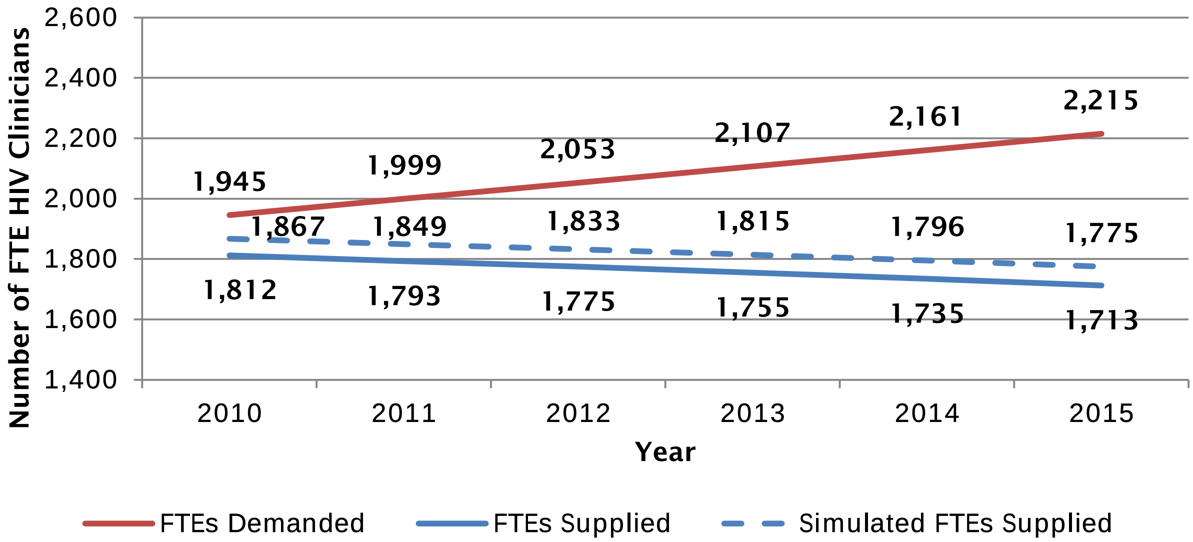
FTE = full-time equivalent.

Next, we consider two supply-side alternative scenarios. The HIV workforce survey indicated that, on average, primary care physicians spend a smaller portion of their time treating patients with HIV than infectious disease specialists (34.0 percent compared with 45.5 percent). Many primary care physicians who treat patients with HIV also manage the primary care needs for a large number of non-HIV patients. Despite the pressures on their time, these physicians might have the capacity to increase the number of HIV patients they admit into their primary care practice, particularly if they know they have ready referrals for their patients' specialty care needs. One strategy that HRSA has considered to increase the supply of HIV services, particularly in geographic regions of the country where there is a relatively low number of people living with HIV and/or a lack of experienced and qualified HIV providers, is to integrate HIV care into primary care settings and allow primary care clinicians to comanage these patients with experienced HIV specialists, usually from nearby metropolitan areas. Comanagement of HIV patients between primary care clinicians and HIV specialists might occur via telephone consultation or telemedicine, by providing transportation to HIV clinics in metropolitan areas for periodic check-ups or complex medical issues, or by organizing regularly scheduled HIV clinics in the underserved community staffed by visiting specialists. Given the recognized shortage of primary care physicians in this country, which is predicted to become more severe under health reform, we simulate the effect of an increase in the comanagement of HIV patients in primary care settings by assuming a modest 5 percent increase in the proportion of time that primary care physicians, nurse practitioners, and physician assistants spend treating patients with HIV.

As shown in Figure V.4, a 5 percent increase in the proportion of time that high-volume HIV primary care clinicians spend treating patients with HIV results in a small relative increase in total FTE HIV clinicians supplied. The number of FTE HIV clinicians supplied increases to 1,775 in 2015 (compared with 1,713 under our baseline assumptions) and reduces the expected shortage to

24.8 percent of available supply (compared with 29.3 percent under our baseline assumptions). However, even with this change, the number of FTE HIV clinicians supplied continues to decline over our projection period due to the net exit of HIV clinicians from the health care workforce.

Figure V.4. Impact of Increased Comanagement of HIV Patients with Primary Care Clinicians on Forecasted Supply



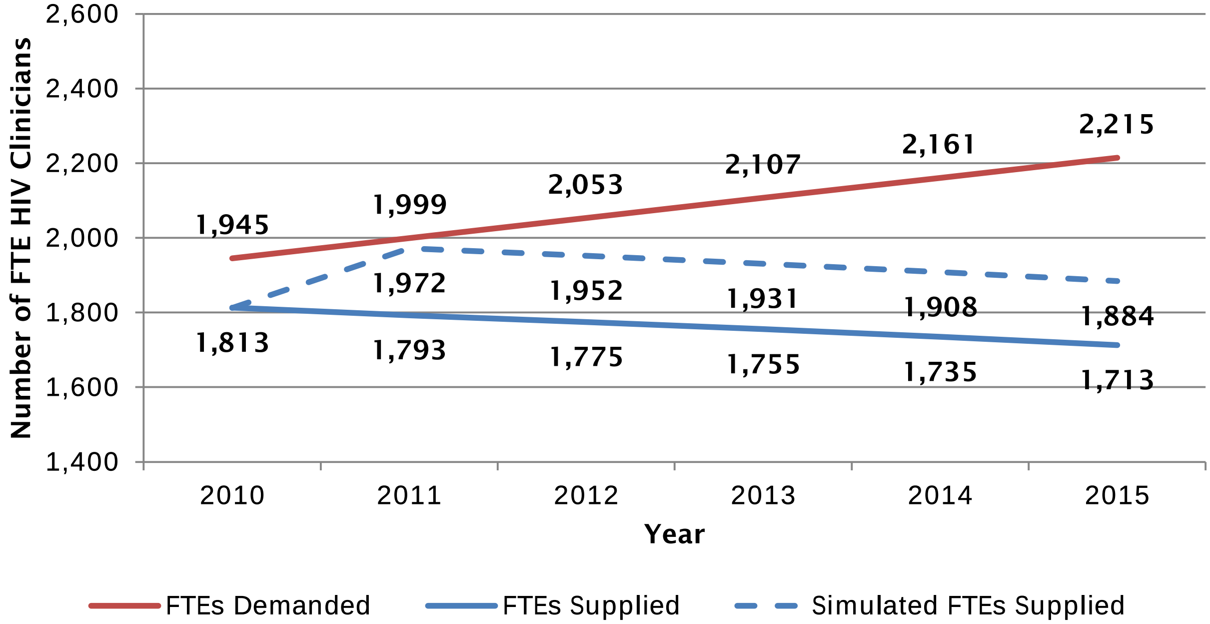
Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), MGMA survey (2012), NAMCS (2009) and NHAMCS (2008) surveys, HCUP data (2009), and HCUP data (2009), state and federal HIV surveillance data (2008).

FTE = full-time equivalent.

Finally, we consider the impact of an improvement in the productivity of the HIV workforce on the number of HIV services supplied. In previous work, HRSA identified several strategies for improving HIV workforce productivity, including comanagement of HIV patients between primary care clinicians and HIV specialists, reassignment of appropriate clinical duties to clinic staff with less advanced training, greater coordination and communication across teams of medical and nonmedical personnel within a practice, reengineering scheduling procedures to minimize physician down time and maximize patient appointments, adoption and use of health information technologies, and greater use of volunteers and peer navigators. We simulate the effect of an increase in productivity by increasing the number of HIV-related medical visits provided per hour of clinical care by 10 percent. We apply this adjustment to each type of clinician and in each of the forecasted years.

As illustrated in Figure V.5, a relatively modest one-time increase in the number of visits conducted within a given hour results in a significant increase in the supply of FTE HIV clinicians, nearly closing the predicted shortage in 2011. But, without a sustained improvement in workforce productivity, the steady increase in demand means that the clinician shortage begins to widen again, reaching an overall gap of 331 FTE HIV clinicians in 2015 (equivalent to 17.6 percent of available supply), compared with a gap of 502 under our baseline supply assumptions (equivalent to 29.3 percent of available supply).

Figure V.5. Impact of Increased Productivity in HIV Workforce on Forecasted Supply



Sources: Mathematica and Lewin analysis of the HIV clinician workforce survey (2012), MGMA survey (2012), NAMCS (2009) and NHAMCS (2008) surveys, HCUP data (2009), and state and federal HIV surveillance data (2008).

FTE = full-time equivalent.

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VI. CONCLUSIONS, LIMITATIONS, AND FUTURE ANALYSES

In this chapter, we summarize the main findings of the HIV clinician workforce study and discuss their implications for the capacity of the HIV clinician workforce to meet the growing demand for care through 2015. We also reiterate important limitations of the study. Finally, we propose several areas of future research to assist HRSA in identifying potential gaps in the supply of HIV services and in developing effective policy and program responses to ensure that people living with HIV and AIDS continue to have access to quality care in the coming years. We also highlight the ability of the HIV clinician workforce survey to help answer these research questions.

A. Conclusions and Implications

This study provides the first large-scale effort to identify the number of HIV clinicians currently practicing in the United States, to characterize their workforce behavior, and to assess HIV workforce needs at the national and regional levels. Previous studies use small, nonrepresentative samples of clinicians (such as those practicing in selected urban areas or in clinics funded under the Ryan White HIV/AIDS Program) and are unable to characterize the HIV clinician workforce nationally. This study fills an important gap in the existing literature by attempting to identify the census of all clinicians in the United States who treat enough HIV patients to be considered qualified, nonepisodic HIV providers by their peers. This study is also the first to conduct a nationally representative survey of HIV clinicians focused on characterizing their workforce behavior. Finally, this study provides the first estimate of the demand for HIV medical services, nationally and at the state and MSA levels, and then expresses those visits in terms of the demand for FTE HIV clinicians to enable us to forecast future workforce needs.

The study offers many new insights into the composition of the HIV clinician workforce. First, many clinicians identified in the claims analysis as having treated 10 or more patients for an HIV-related diagnosis did not identify themselves as providing medical care to patients diagnosed with HIV or AIDS. These clinicians likely provide primary care or emergency medical services to patients with an HIV diagnosis and then refer them to HIV specialists. This confirms the recommendation of the expert panel to define HIV clinicians as those providers who actually manage HIV patient care on an ongoing basis, including the prescription of antiretroviral medications, rather than the broad range of clinicians who provide primary care or other specialty care to patients diagnosed with HIV, but who do not manage the HIV diagnosis of those patients. Second, we find that the responsibility of managing HIV care in the United States today is shared by an HIV clinician workforce drawn from multiple medical specialties and health professions, including physicians in family or internal medicine, general practice specialties, and infectious disease, plus nonphysician clinicians such as nurse practitioners and physician assistants. Moreover, the importance the nonphysician clinicians in the delivery of HIV care is growing. Effective workforce strategies will have to encompass the range of active HIV providers and consider the unique ways in which they are trained and participate in the HIV delivery system. Third, we estimate that most HIV clinicians spend less than half of their overall patient care time treating patients with HIV. HIV workforce capacity could be expanded by increasing the proportion of time that HIV clinicians currently spend treating patients with HIV, particularly primary care clinicians who currently spend on average only one-third of their time in HIV care. Fourth, our results suggest that a small but important proportion of the diagnosed population receives sporadic care from providers who do not treat many HIV patients or who do not consider themselves HIV clinicians. Low-volume primary care clinicians might offer an untapped source for expanding supply, particularly for patients disengaged or new to care. But low-volume providers would likely require additional training or professional support, such as comanaging care with an HIV specialist, to ensure the quality of care remains high.

In addition to providing new insights into the composition of the HIV workforce, the study provides the first quantitative assessment of its ability to meet the demand for care. The study shows a currently small, but rapidly expanding shortage of HIV providers over the next few years. Even though some of the excess demand is attributable to the exclusion of low-volume providers from this study (a proportion of current estimated demand is being met by providers who treat fewer than 10 HIV patients), the model indicates a real and growing shortage of HIV providers. By 2015, our forecasting model predicts that the supply of high-volume HIV clinicians will be sufficient to meet only three-quarters of the total demand for HIV medical services, under current market-based assumptions. Two opposing forces drive the growing shortage of HIV clinicians. First, the number of clinicians entering HIV medicine is not sufficient to offset the number leaving the workforce, either because of retirement or mortality, and those remaining are likely to work fewer hours than the previous generation of HIV specialists. Second, the number of people living with HIV is expected to continue climbing, due to new infections and increasing survival. The net result of these countervailing factors is a widening gap in the demand for and the supply of HIV medical care over the next few years.

Expanded HIV testing and diagnosis and improvements in linkages, engagement, and adherence to care—without an increase in the number of health care providers willing to treat people with HIV and improvements in the productivity of the HIV workforce—will only make the forecasted deficit of HIV providers worse. Without a significant increase in the supply of HIV providers in the next few years, the results of the model suggest that future HIV patients will be less likely to receive care from physicians or nonphysician clinicians who specialize in HIV care and treatment. Alternatively, the health care market might encourage HIV medicine to behave increasingly like a subspecialty, with patients receiving most of their care from a primary care clinician while making only occasional visits when necessary to a physician with specialized abilities and knowledge in HIV care and treatment. For less complex patients whose disease is being managed effectively, this type of health care arrangement might work fine. For others, such as patients with coexisting conditions or those whose disease is not well controlled on an ongoing basis, the workforce model might not provide the quality care they need.

B. Study Limitations

As mentioned at the beginning of this report, this study has several limitations that should be kept in mind when interpreting the findings and when using the results to develop workforce programs and policies. First, we based our supply projections on an estimate of the current supply of high-volume HIV providers that can be identified on medical claims. The study purposefully excludes clinicians who treat fewer than 10 HIV patients. It also fails to capture clinicians who do not treat insured patients, who practice in closed systems such as the U.S. Department of Veterans Affairs, and do not bill under their own names. This is likely to result in an undercount of nurse practitioners and physician assistants, many of whom manage HIV care but bill under a supervising physician's name. The projections presented in this report likely undercount the number of services provided by nurse practitioners and physician assistants on the demand side as well. Our demand estimates are largely based on the number of visits reported in the NAMCS and NHAMCS surveys. The NAMCS survey is primarily a sample of ambulatory physician office visits. As such, it generally excludes services provided by nonphysician clinicians such as nurse practitioners and physician assistants, with the exception of those practicing in clinics. The NHAMCS, in contrast, samples hospital outpatient department visits and, thus, generally will include visits to nurse practitioners and physician assistants in that setting.

Second, the findings we present in this report are based on an estimate of the number of services currently demanded in the market, which reflects today's underlying market conditions, such as insurance coverage, known prevalence, and treatment patterns. The workforce projections under our baseline assumptions reflect actual demand in 2008 projected forward, not optimal demand over the next few years. To say that 80 percent of current market demand is being met is not the same as saying 80 percent of normative demand is being met; the later would take into account a range of unmet needs in the current market, such as people living with HIV but not yet diagnosed and in care, people diagnosed with HIV but not linked to or engaged in care, and people engaged in care but not yet receiving the optimal level of care. In addition, the market-based demand projections presented in this study do not take into account changes in market conditions, such as expanded health insurance coverage under the ACA, or changes in treatment patterns. Any of these factors will alter the demand for care, very likely within the span of this study. However, the model provides a useful tool for forecasting demand under alternative normative assumptions or market conditions.

Finally, all workforce studies are, by definition, incomplete. In Chapter IV, we identify the known determinants of the supply of and demand for HIV-related medical services and attempt to account for the most important of these factors. However, the future will be determined by both known and unknown forces and, as a result, our findings should be interpreted as representing the general magnitude, rather than a precise estimate, of any shortage or surplus under a set of reasonable assumptions.

C. Future Analyses

The 2012 HIV clinician workforce survey provides the first opportunity to better understand the size, composition, and behavior of the roughly 5,000 clinicians who manage care for most of the 1.2 million people living with HIV or AIDS in the United States today. In this report, we estimate the size of the HIV workforce at the national level and, based in part on responses to the HIV clinician survey, we forecast the supply of HIV clinician services relative to demand through 2015. We also attempt to use the survey data to explore the potential impact of alternative scenarios on workforce projections. However, this report leaves many salient research questions unanswered—questions that can help guide effective program and policy decision making. We next present four such research questions.

5. The survey collected information about the settings and characteristics of the practices within which HIV clinicians work (such as type of practice, receipt of Ryan White HIV/AIDS Program funds, use of innovative scheduling procedures, and adoption of health information technologies). This information could be used to better understand the determinants of workforce productivity and to identify and disseminate effective practice management strategies.
6. The survey data provide an opportunity to examine more closely regional variation in provider behavior, such as regional differences in the composition of the HIV workforce, number of hours worked, amount of time spent treating patients with HIV, number of visits conducted per hour, and retirement. We show average FTEs per 1,000 HIV cases by state and MSA in Appendix D. With additional time and resources, the survey could yield greater insight into regional variation in workforce needs.

7. The survey also asks about wait times for appointments and length of intake and follow-up appointments, key indicators of workforce capacity that we do not analyze in this report.

8. The survey offers clinicians' perspectives on a range of workforce issues—such as why they entered HIV medicine, why they might increase or decrease their HIV caseloads in the future, which factors are likely to have the greatest influence on the decision of a new student to pursue a career providing medical care to patients with HIV, and which workforce strategies are most effective for meeting an increase in the demand for medical services among patients with HIV without compromising the quality of care provided—which have yet to be analyzed.

In addition, the HIV clinician workforce model provides useful a tool for analyzing the effect of external or policy changes on future HIV workforce needs. We presented four alternative scenarios in this report, mainly as a way of illustrating how the model can be used to conduct simulation analyses. A more rigorous approach to examining the potential impact of such factors as an expansion in the size of the insured HIV patient population, an increase in the number of seropositive people who are aware of their HIV status, an increase in the number of diagnosed cases who receive optimal levels of care, and an increase in the number of older HIV patients could help HRSA plan for increases in clinician demand in the future. The model can also be used to examine the potential impact of practice management strategies (such as greater reliance on nonphysician clinicians, increased comanagement of HIV patients, greater use of integrated teams of clinicians, and greater use of practices to promote the long-term self management of care for patients with HIV, including medication therapy management, patient education, or peer counseling) and workforce development programs aimed at increasing the number or type of health professionals entering HIV medicine. We designed the model to be a tool that HRSA can use to ensure that people living with HIV or AIDS in the United States continue to have access to quality care in the years ahead.

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APPENDIX A

LIST OF PARTICIPANTS AT EXPERT CONSULTATION MEETING

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HRSA/HAB HIV CLINICIAN WORKFORCE STUDY

EXPERT CONSULTATION MEETING

Wednesday, February 23 – Thursday, February 24, 2011

LIST OF PARTICIPANTS

INVITED PARTICIPANTS

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APPENDIX B

NATIONAL DIAGNOSIS AND DRUG CODES

USED TO IDENTIFY NUMBER OF HIV VISITS DEMANDED

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Table B.1. Diagnosis Codes Used to Identify HIV-Related Visits in NAMCS AND NHAMCS

Diagnosis Code	Category Description	AIDS Status
042--	HIV disease, with codes for the HIV-related manifestations or conditions, if the results are positive and the patient exhibits symptoms	AIDS
04200	HIV disease, with codes for the HIV-related manifestations or conditions, if the results are positive and the patient exhibits symptoms	AIDS
V08--	Asymptomatic HIV infection status, if the results are positive but the patient is asymptomatic	HIV only
V0179	Exposure to HIV virus	Unknown
79571	Nonspecific serologic evidence of HIV	Unknown
V6544	HIV counseling (if counseling is provided during the encounter for the test or after the results are available)	Unknown

NAMCS = National Ambulatory Medicare Care Survey; NHAMCS = National Hospital Ambulatory Medicare Care Survey.

Table B.2. Prescription Drug Codes Used to Identify HIV Related Visits in NAMCS AND NHAMCS

Lexicon Multum Category	Category Description	Drug IDs Included	Drug IDs Excluded	AIDS Status
175	Protease inhibitors			Unknown
176	Nucleoside analogue reverse transcriptase inhibitor (NRTI)		d05525, d04814	Unknown
177	Miscellaneous antivirals	a11082, d04853, a11751		Unknown
227	Nonnucleoside reverse transcriptase inhibitor (NNRTI)			Unknown
327	Antiviral combinations			Unknown
364	Antiviral chemokine receptor antagonist			Unknown
366	Integrase strand transfer inhibitor			Unknown

NAMCS = National Ambulatory Medicare Care Survey; NHAMCS = National Hospital Ambulatory Medicare Care Survey.

Table B.3. Reason for Visit Codes Used to Identify HIV-Related Visits in NAMCS AND NHAMCS

Reason for Visit Code	Category Description	AIDS Status
20151	HIV with or without associated condition	Unknown
33140	HIV test	Unknown
46040	HIV counseling	Unknown

NAMCS = National Ambulatory Medicare Care Survey; NHAMCS = National Hospital Ambulatory Medicare Care Survey.

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APPENDIX C

DIAGNOSIS, PROCEDURE, AND NATIONAL DRUG CODES USED TO IDENTIFY HIV PATIENTS ON SDI HEALTH CLAIMS DATABASE

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Table C.1. Diagnosis Codes Used to Identify HIV-Related Visits on SDI Health Database

ICD-9-CM Codes (Diagnosis)	
042x to 044x	HIV disease, with codes for the HIV-related manifestations or conditions, if the results are positive and the patient exhibits symptoms
V08	Asymptomatic HIV infection status if the results are positive but the patient is asymptomatic
V01.79	Exposure to HIV virus
795.71	Nonspecific serologic evidence of HIV
V65.44	HIV counseling (if counseling is provided during the encounter for the test or after the results are available)
CPT Codes (Laboratory tests)	
86701	antibody HIV-1 test
86702	antibody HIV-2 test
86703	antibody HIV-1 and HIV-2 single assay
86689	Antibody; HTLV or HIV antibody, confirmatory test (for example, Western Blot)
87534	Infectious agent detection by nucleic acid (DNA or RNA); HIV-1, direct probe technique
87535	Infectious agent detection by nucleic acid (DNA or RNA); HIV-1, amplified probe technique
87536	Infectious agent detection by nucleic acid (DNA or RNA); HIV-1, quantification
87390	Infectious agent antigen detection by enzyme immunoassay technique, qualitative or semi-quantitative, multiple step method; HIV-1
99211–99215	HIV counseling for patients with positive test results; office or other outpatient visit for the evaluation and management of an established patient
87536	HIV viral load test
86359	T-cells, total count
86360	Absolute CD4/CD8 count with ratio
After February 2010 (Medicare HCPCS) (Laboratory tests)	
G0432	Infectious agent antigen detection by enzyme immunoassay (EIA) technique, qualitative or semi-quantitative, multiple-step method, HIV-1 or HIV-2, screening (conventional test)
G0433	Infectious agent antigen detection by enzyme-linked immunosorbent assay (ELISA) technique, antibody, HIV-1 or HIV-2, screening
G0435	Infectious agent antigen detection by rapid antibody test of oral mucosa transudate, HIV-1 or HIV-2, screening

Table C.2. National Drug Codes Used to Identify HIV-Related Visits on SDI Health Database

NDC Code	NDC Description
00003196401	ZERIT 15 MG CAPSULE
00003196501	ZERIT 20 MG CAPSULE
00003196601	ZERIT 30 MG CAPSULE
00003196701	ZERIT 40 MG CAPSULE
00003196801	ZERIT 1 MG/ML SOLN RECON
00003362212	REYATAZ 300 MG CAPSULE
00003362312	REYATAZ 100 MG CAPSULE
00003362412	REYATAZ 150 MG CAPSULE
00003363112	REYATAZ 200 MG CAPSULE
00004024451	INVIRASE 500 MG TABLET
00004024515	INVIRASE 200 MG CAPSULE
00004038039	FUZEON 90 MG KIT
00006022761	ISENTRESS 400 MG TABLET
00006057062	CRIXIVAN 100 MG CAPSULE
00006057143	CRIXIVAN 200 MG CAPSULE
00006057301	CRIXIVAN 400 MG CAPSULE
00006057318	CRIXIVAN 400 MG CAPSULE
00006057340	CRIXIVAN 400 MG CAPSULE
00006057342	CRIXIVAN 400 MG CAPSULE
00006057354	CRIXIVAN 400 MG CAPSULE
00006057362	CRIXIVAN 400 MG CAPSULE
00006057465	CRIXIVAN 333 MG CAPSULE
00054005221	ZIDOVUDINE 300 MG TABLET
00056047030	SUSTIVA 50 MG CAPSULE
00056047330	SUSTIVA 100 MG CAPSULE
00056047492	SUSTIVA 200 MG CAPSULE
00056051030	SUSTIVA 600 MG TABLET
00069080760	SELZENTRY 150 MG TABLET
00069080860	SELZENTRY 300 MG TABLET
00074052260	KALETRA 100MG-25MG TABLET
00074194063	NORVIR 80 MG/ML SOLUTION
00074333330	NORVIR 100 MG TABLET
00074395646	KALETRA 400-100/5 SOLUTION
00074395977	KALETRA 133.3-33.3 CAPSULE
00074663322	NORVIR 100 MG CAPSULE
00074663330	NORVIR 100 MG CAPSULE
00074679922	KALETRA 200MG-50MG TABLET
00087663241	VIDEX FNL10MG/ML SOLN RECON

NDC Code	NDC Description
00087663341	VIDEX FNL10MG/ML SOLN RECON
00087667117	VIDEX EC 125 MG CAPSULE DR
00087667217	VIDEX EC 200 MG CAPSULE DR
00087667317	VIDEX EC 250 MG CAPSULE DR
00087667417	VIDEX EC 400 MG CAPSULE DR
00173010793	RETROVIR 10 MG/ML VIAL
00173010855	RETROVIR 100 MG CAPSULE
00173010856	RETROVIR 100 MG CAPSULE
00173011318	RETROVIR 10 MG/ML SYRUP
00173047001	EPIVIR 150 MG TABLET
00173047100	EPIVIR 10 MG/ML SOLUTION
00173050100	RETROVIR 300 MG TABLET
00173059500	COMBIVIR 150-300MG TABLET
00173059502	COMBIVIR 150-300MG TABLET
00173066100	ZIAGEN 300 MG TABLET
00173066101	ZIAGEN 300 MG TABLET
00173066400	ZIAGEN 20 MG/ML SOLUTION
00173067900	AGENERASE 50 MG CAPSULE
00173068700	AGENERASE 15 MG/ML SOLUTION
00173069100	TRIZIVIR 150-300MG TABLET
00173071400	EPIVIR 300 MG TABLET
00173072100	LEXIVA 700 MG TABLET
00173072700	LEXIVA 50 MG/ML ORAL SUSP
00173074200	EPZICOM 600-300MG TABLET
00378504091	STAVUDINE 15 MG CAPSULE
00378504191	STAVUDINE 20 MG CAPSULE
00378504291	STAVUDINE 30 MG CAPSULE
00378504391	STAVUDINE 40 MG CAPSULE
00378610691	ZIDOVUDINE 300 MG TABLET
00378888693	DIDANOSINE 125 MG CAPSULE DR
00378888793	DIDANOSINE 200 MG CAPSULE DR
00378888893	DIDANOSINE 250 MG CAPSULE DR
00378888993	DIDANOSINE 400 MG CAPSULE DR
00555058801	DIDANOSINE 200 MG CAPSULE DR
00555058901	DIDANOSINE 250 MG CAPSULE DR
00555059001	DIDANOSINE 400 MG CAPSULE DR
00597000201	APTIVUS 100 MG/ML SOLUTION
00597000302	APTIVUS 250 MG CAPSULE
00597004660	VIRAMUNE 200 MG TABLET

NDC Code	NDC Description
00597004724	VIRAMUNE 50 MG/5 ML ORAL SUSP
15584010101	ATRIPLA 600-200MG TABLET
16590006106	COMBIVIR 150-300MG TABLET
16590006110	COMBIVIR 150-300MG TABLET
16590006418	CRIXIVAN 400 MG CAPSULE
16590006430	CRIXIVAN 400 MG CAPSULE
16590006460	CRIXIVAN 400 MG CAPSULE
16590006490	CRIXIVAN 400 MG CAPSULE
173010793	RETROVIR 10 MG/ML VIAL
173010855	RETROVIR 100 MG CAPSULE
173010856	RETROVIR 100 MG CAPSULE
173011318	RETROVIR 10 MG/ML SYRUP
173047001	EPIVIR 150 MG TABLET
173047100	EPIVIR 10 MG/ML SOLUTION
173050100	RETROVIR 300 MG TABLET
173059500	COMBIVIR 150-300MG TABLET
173059502	COMBIVIR 150-300MG TABLET
173066100	ZIAGEN 300 MG TABLET
173066101	ZIAGEN 300 MG TABLET
173066400	ZIAGEN 20 MG/ML SOLUTION
173067200	AGENERASE 150MG CAPSULE
173067900	AGENERASE 50 MG CAPSULE
173068700	AGENERASE 15 MG/ML SOLUTION
173069100	TRIZIVIR 150-300MG TABLET
173069120	TRIZIVIR 150-300MG TABLET
173071400	EPIVIR 300 MG TABLET
173072100	LEXIVA 700 MG TABLET
173072700	LEXIVA 50 MG/ML ORAL SUSP
173074200	EPZICOM 600-300MG TABLET
21695036212	KALETRA 200MG-50MG TABLET
21695036618	CRIXIVAN 400 MG CAPSULE
21695036706	EPIVIR 150 MG TABLET
21695036918	ZIDOVUDINE 300 MG TABLET
21695084606	COMBIVIR 150-300MG TABLET
23490708706	COMBIVIR 150-300MG TABLET
31722050960	ZIDOVUDINE 300 MG TABLET
31722051560	STAVUDINE 15 MG CAPSULE
31722051660	STAVUDINE 20 MG CAPSULE
31722051760	STAVUDINE 30 MG CAPSULE

NDC Code	NDC Description
31722051860	STAVUDINE 40 MG CAPSULE
3196401	ZERIT 15 MG CAPSULE
3196501	ZERIT 20 MG CAPSULE
3196601	ZERIT 30 MG CAPSULE
3196701	ZERIT 40 MG CAPSULE
3196801	ZERIT 1 MG/ML SOLN RECON
3362212	REYATAZ 300 MG CAPSULE
3362312	REYATAZ 100 MG CAPSULE
3362412	REYATAZ 150 MG CAPSULE
3363112	REYATAZ 200 MG CAPSULE
35356006406	ATRIPLA 600-200MG TABLET
35356006430	ATRIPLA 600-200MG TABLET
35356006530	EPIVIR 300 MG TABLET
35356006624	EPIVIR 10 MG/ML SOLUTION
35356006706	LEXIVA 700 MG TABLET
35356006760	LEXIVA 700 MG TABLET
35356006806	REYATAZ 150 MG CAPSULE
35356006860	REYATAZ 150 MG CAPSULE
35356006990	SUSTIVA 200 MG CAPSULE
35356007006	TRUVADA 200-300MG TABLET
35356007030	TRUVADA 200-300MG TABLET
35356007106	VIRAMUNE 200 MG TABLET
35356007160	VIRAMUNE 200 MG TABLET
35356007224	VIRAMUNE 50 MG/5 ML ORAL SUSP
35356007306	VIREAD 300 MG TABLET
35356007330	VIREAD 300 MG TABLET
35356007460	ZERIT 40 MG CAPSULE
35356007506	ZIAGEN 300 MG TABLET
35356007560	ZIAGEN 300 MG TABLET
35356010906	EPZICOM 600-300MG TABLET
35356010930	EPZICOM 600-300MG TABLET
35356011006	ISENTRESS 400 MG TABLET
35356011060	ISENTRESS 400 MG TABLET
35356011160	KALETRA 100MG-25MG TABLET
35356011201	KALETRA 200MG-50MG TABLET
35356011230	KALETRA 200MG-50MG TABLET
35356011301	PREZISTA 300 MG TABLET
35356011330	PREZISTA 300 MG TABLET
35356011406	REYATAZ 300 MG CAPSULE

NDC Code	NDC Description
35356011430	REYATAZ 300 MG CAPSULE
35356011506	SUSTIVA 600 MG TABLET
35356011530	SUSTIVA 600 MG TABLET
35356011606	TRIZIVIR 150-300MG TABLET
35356011660	TRIZIVIR 150-300MG TABLET
35356011701	VIRACEPT 625 MG TABLET
35356013830	NORVIR 100 MG CAPSULE
35356013918	CRIXIVAN 400 MG CAPSULE
35356013960	CRIXIVAN 400 MG CAPSULE
35356018630	VIDEX EC 400 MG CAPSULE DR
35356020530	EMTRIVA 200 MG CAPSULE
35356020660	FUZEON 90 MG KIT
35356020760	REYATAZ 200 MG CAPSULE
35356020860	SELZENTRY 150 MG TABLET
35356020960	SELZENTRY 300 MG TABLET
35356025930	DIDANOSINE 400 MG CAPSULE DR
35356028460	PREZISTA 600 MG TABLET
35356028560	ZERIT 30 MG CAPSULE
378504091	STAVUDINE 15 MG CAPSULE
378504191	STAVUDINE 20 MG CAPSULE
378504291	STAVUDINE 30 MG CAPSULE
378504391	STAVUDINE 40 MG CAPSULE
378610691	ZIDOVUDINE 300 MG TABLET
4022001	HIVID 0.375MG TABLET
4022101	HIVID 0.750MG TABLET
4024451	INVIRASE 500 MG TABLET
4024515	INVIRASE 200 MG CAPSULE
4024648	FORTOVASE 200MG CAPSULE
4038039	FUZEON 90 MG KIT
49999006206	COMBIVIR 150-300 MG TABLET
49999006210	COMBIVIR 150-300MG TABLET
49999006260	COMBIVIR 150-300MG TABLET
49999011906	EPIVIR 150 MG TABLET
49999011960	EPIVIR 150 MG TABLET
49999038618	RETROVIR 100 MG CAPSULE
49999043103	VIRACEPT 250 MG TABLET
50962045010	RETROVIR 10MG/ML SYRUP
50962045205	UNKNOWN
51129299902	DIDANOSINE 400 MG CAPSULE DR

NDC Code	NDC Description
52959028930	VIRACEPT 250 MG TABLET
52959038706	RETROVIR 300 MG TABLET
52959050712	CRIXIVAN 400 MG CAPSULE
52959050718	CRIXIVAN 400 MG CAPSULE
52959050724	CRIXIVAN 400 MG CAPSULE
52959050730	CRIXIVAN 400 MG CAPSULE
52959050802	EPIVIR 150 MG TABLET
52959050804	EPIVIR 150 MG TABLET
52959050806	EPIVIR 150 MG TABLET
52959050808	EPIVIR 150 MG TABLET
52959050814	EPIVIR 150 MG TABLET
52959050815	EPIVIR 150 MG TABLET
52959050860	EPIVIR 150 MG TABLET
52959050906	RETROVIR 100 MG CAPSULE
52959050912	RETROVIR 100 MG CAPSULE
52959050918	RETROVIR 100 MG CAPSULE
52959050920	RETROVIR 100 MG CAPSULE
52959050924	RETROVIR 100 MG CAPSULE
52959050928	RETROVIR 100 MG CAPSULE
52959050930	RETROVIR 100 MG CAPSULE
52959054602	COMBIVIR 150-300MG TABLET
52959054603	COMBIVIR 150-300MG TABLET
52959054604	COMBIVIR 150-300MG TABLET
52959054606	COMBIVIR 150-300MG TABLET
52959054608	COMBIVIR 150-300MG TABLET
52959054610	COMBIVIR 150-300MG TABLET
52959054614	COMBIVIR 150-300MG TABLET
52959054615	COMBIVIR 150-300MG TABLET
52959054620	COMBIVIR 150-300MG TABLET
52959054628	COMBIVIR 150-300MG TABLET
52959096812	KALETRA 100MG-25MG TABLET
52959096903	TRUVADA 200-300MG TABLET
54005221	ZIDOVUDINE 300 MG TABLET
54390558	VIRAMUNE 50MG/5ML ORAL SUSP
54464721	VIRAMUNE 200MG TABLET
54464725	VIRAMUNE 200MG TABLET
54569177200	RETROVIR 100MG CAPSULE
54569177201	RETROVIR 100MG CAPSULE
54569177202	RETROVIR 100MG CAPSULE

NDC Code	NDC Description
54569177203	RETROVIR 100MG CAPSULE
54569177204	RETROVIR 100MG CAPSULE
54569177205	RETROVIR 100MG CAPSULE
54569365700	VIDEX 100MG TAB CHEW
54569387700	HIVID 0.750MG TABLET
54569387701	HIVID 0.750MG TABLET
54569397100	VIDEX 150MG TAB CHEW
54569405300	ZERIT 30 MG CAPSULE
54569405400	ZERIT 40 MG CAPSULE
54569405401	ZERIT 40MG CAPSULE
54569422100	EPIVIR 150 MG TABLET
54569422101	EPIVIR 150MG TABLET
54569422102	EPIVIR 150MG TABLET
54569424200	INVIRASE 200MG CAPSULE
54569424201	INVIRASE 200MG CAPSULE
54569424202	INVIRASE 200MG CAPSULE
54569424203	INVIRASE 200MG CAPSULE
54569431300	VIDEX 100MG TAB CHEW
54569431301	VIDEX 100MG TAB CHEW
54569433300	EPIVIR 10 MG/ML SOLUTION
54569433400	RETROVIR 10MG/ML SYRUP
54569433500	NORVIR 100MG CAPSULE
54569448500	HIVID 0.375MG TABLET
54569451400	VIDEX FNL10MG/ML SOLN RECON
54569452400	COMBIVIR 150-300MG TABLET
54569452401	COMBIVIR 150-300MG TABLET
54569452402	COMBIVIR 150-300MG TABLET
54569452403	COMBIVIR 150-300MG TABLET
54569453800	RETROVIR 300 MG TABLET
54569454300	VIRACEPT 250MG TABLET
54569454301	VIRACEPT 250MG TABLET
54569454302	VIRACEPT 250MG TABLET
54569454303	VIRACEPT 250 MG TABLET
54569454304	VIRACEPT 250MG TABLET
54569454305	VIRACEPT 250MG TABLET
54569454306	VIRACEPT 250MG TABLET
54569456100	VIRAMUNE 200 MG TABLET
54569456101	VIRAMUNE 200MG TABLET
54569456200	RESCRIPTOR 100MG TAB DISPER

NDC Code	NDC Description
54569456300	FORTOVASE 200MG CAPSULE
54569456301	FORTOVASE 200MG CAPSULE
54569461100	SUSTIVA 200 MG CAPSULE
54569461300	NORVIR 80MG/ML SOLUTION
54569479200	NORVIR 100MG CAPSULE
54569481300	AGENERASE 150MG CAPSULE
54569488300	ZIAGEN 300 MG TABLET
54569490500	VIDEX 200MG TAB CHEW
54569512200	RESCRIPTOR 200MG TABLET
54569514200	KALETRA 133.3-33.3 CAPSULE
54569517600	VIDEX EC 400 MG CAPSULE DR
54569519100	TRIZIVIR 150-300MG TABLET
54569533400	VIREAD 300 MG TABLET
54569537400	SUSTIVA 600 MG TABLET
54569538700	ZERIT 1MG/ML SOLN RECON
54569539000	ZIAGEN 20 MG/ML SOLUTION
54569541200	ZERIT 15MG CAPSULE
54569548000	ZERIT 20 MG CAPSULE
54569550100	EPIVIR 300 MG TABLET
54569550400	VIDEX EC 250 MG CAPSULE DR
54569552100	EMTRIVA 200 MG CAPSULE
54569552500	KALETRA 100-400/5 SOLUTION
54569553000	REYATAZ 150 MG CAPSULE
54569553200	REYATAZ 200 MG CAPSULE
54569555000	LEXIVA 700 MG TABLET
54569558800	TRUVADA 200-300MG TABLET
54569559400	EPZICOM 600-300MG TABLET
54569560200	RESCRIPTOR 200 MG TABLET
54569564200	DIDANOSINE 250 MG CAPSULE DR
54569564300	DIDANOSINE 400 MG CAPSULE DR
54569565600	NORVIR 100 MG CAPSULE
54569566400	INVIRASE 500 MG TABLET
54569575200	KALETRA 200MG-50MG TABLET
54569578100	FUZEON 90 MG KIT
54569580500	ATRIPLA 600-200MG TABLET
54569581400	PREZISTA 300 MG TABLET
54569603400	ISENTRESS 400 MG TABLET
54569614300	SELZENTRY 150 MG TABLET
54569615900	PREZISTA 400 MG TABLET

NDC Code	NDC Description
54569617000	NORVIR 100 MG TABLET
54569617100	ZIDOVUDINE 300 MG TABLET
54569862000	CRIXIVAN 400 MG CAPSULE
54569862001	CRIXIVAN 400MG CAPSULE
54864725	VIRAMUNE 200MG TABLET
54868011700	ISENTRESS 400 MG TABLET
54868197400	RETROVIR 100 MG CAPSULE
54868197402	RETROVIR 100 MG CAPSULE
54868197403	RETROVIR 100 MG CAPSULE
54868249901	HIVID 0.375MG TABLET
54868250001	HIVID 0.750MG TABLET
54868250002	HIVID 0.750MG TABLET
54868250200	VIDEX 100 MG TAB CHEW
54868250401	RETROVIR 10 MG/ML SYRUP
54868335200	ZERIT 40 MG CAPSULE
54868335201	ZERIT 40 MG CAPSULE
54868335300	ZERIT 20 MG CAPSULE
54868336000	ZERIT 15 MG CAPSULE
54868344800	ZERIT 30 MG CAPSULE
54868369300	EPIVIR 150 MG TABLET
54868369302	EPIVIR 150 MG TABLET
54868369900	INVIRASE 200 MG CAPSULE
54868369901	INVIRASE 200 MG CAPSULE
54868369902	INVIRASE 200 MG CAPSULE
54868378200	NORVIR 100MG CAPSULE
54868378201	NORVIR 100 MG CAPSULE
54868378202	NORVIR 100 MG CAPSULE
54868378203	NORVIR 100 MG CAPSULE
54868384400	VIRAMUNE 200 MG TABLET
54868384401	VIRAMUNE 200 MG TABLET
54868394700	VIRACEPT 250 MG TABLET
54868411000	FORTOVASE 200MG CAPSULE
54868411300	CRIXIVAN 400 MG CAPSULE
54868411400	COMBIVIR 150-300MG TABLET
54868411406	COMBIVIR 150-300MG TABLET
54868452000	RESCRIPTOR 200 MG TABLET
54868452200	ZIAGEN 300 MG TABLET
54868452201	ZIAGEN 300 MG TABLET
54868452400	KALETRA 133.3-33.3 CAPSULE

NDC Code	NDC Description
54868466600	VIDEX EC 400 MG CAPSULE DR
54868466800	SUSTIVA 600 MG TABLET
54868466900	VIREAD 300 MG TABLET
54868485300	EMTRIVA 200 MG CAPSULE
54868485400	REYATAZ 200 MG CAPSULE
54868485700	REYATAZ 150 MG CAPSULE
54868495400	LEXIVA 700 MG TABLET
54868506100	VIRACEPT 625 MG TABLET
54868514100	TRUVADA 200-300MG TABLET
54868541600	EPIVIR 300 MG TABLET
54868546400	DIDANOSINE 250 MG CAPSULE DR
54868556600	KALETRA 200MG-50MG TABLET
54868559500	VIDEX EC 250 MG CAPSULE DR
54868560000	EPZICOM 600-300MG TABLET
54868563100	PREZISTA 300 MG TABLET
54868580900	SELZENTRY 300 MG TABLET
54868583800	REYATAZ 300 MG CAPSULE
54868586400	INTELENCE 100 MG TABLET
54868596900	PREZISTA 400 MG TABLET
55045220701	HIVID 0.750MG TABLET
55045348103	TRUVADA 200-300MG TABLET
55045348201	KALETRA 200MG-50MG TABLET
55045354901	ZIDOVUDINE 300 MG TABLET
55175449401	RETROVIR 100MG CAPSULE
55175520706	COMBIVIR 150-300MG TABLET
55175520807	VIRACEPT 250MG TABLET
55175520901	CRIXIVAN 400MG CAPSULE
55289038904	COMBIVIR 150-300MG TABLET
55289038906	COMBIVIR 150-300MG TABLET
55289038914	COMBIVIR 150-300MG TABLET
55289038920	COMBIVIR 150-300MG TABLET
55289039203	VIRAMUNE 200 MG TABLET
55289047727	VIRACEPT 250 MG TABLET
55289093118	KALETRA 133.3-33.3 CAPSULE
55289094712	KALETRA 200MG-50MG TABLET
555058801	DIDANOSINE 200 MG CAPSULE DR
555058901	DIDANOSINE 250 MG CAPSULE DR
555059001	DIDANOSINE 400 MG CAPSULE DR
55887023030	CRIXIVAN 400 MG CAPSULE

NDC Code	NDC Description
55887023060	CRIXIVAN 400 MG CAPSULE
55887023090	CRIXIVAN 400 MG CAPSULE
55887023130	COMBIVIR 150-300MG TABLET
55887023160	COMBIVIR 150-300MG TABLET
55887023190	COMBIVIR 150-300MG TABLET
56047030	SUSTIVA 50 MG CAPSULE
56047330	SUSTIVA 100 MG CAPSULE
56047492	SUSTIVA 200 MG CAPSULE
56051030	SUSTIVA 600 MG TABLET
58016068900	EPIVIR 150 MG TABLET
58016068930	EPIVIR 150 MG TABLET
58016068960	EPIVIR 150 MG TABLET
58016068990	EPIVIR 150 MG TABLET
58016069000	RETROVIR 100 MG CAPSULE
58016069018	RETROVIR 100 MG CAPSULE
58016069030	RETROVIR 100 MG CAPSULE
58016069060	RETROVIR 100 MG CAPSULE
58016069090	RETROVIR 100 MG CAPSULE
58016069800	COMBIVIR 150-300MG TABLET
58016069830	COMBIVIR 150-300MG TABLET
58016069860	COMBIVIR 150-300MG TABLET
58016069890	COMBIVIR 150-300MG TABLET
58016069900	CRIXIVAN 400 MG CAPSULE
58016069930	CRIXIVAN 400 MG CAPSULE
58016069960	CRIXIVAN 400 MG CAPSULE
58016069990	CRIXIVAN 400 MG CAPSULE
58016079500	EPIVIR 300 MG TABLET
58016079530	EPIVIR 300 MG TABLET
58016079560	EPIVIR 300 MG TABLET
58016079590	EPIVIR 300 MG TABLET
58016086400	RETROVIR 300 MG TABLET
58016086430	RETROVIR 300 MG TABLET
58016086460	RETROVIR 300 MG TABLET
58016086490	RETROVIR 300 MG TABLET
58864046230	RETROVIR 100MG CAPSULE
58864046260	RETROVIR 100MG CAPSULE
58864046293	RETROVIR 100MG CAPSULE
59676056001	PREZISTA 300 MG TABLET
59676056101	PREZISTA 400 MG TABLET

NDC Code	NDC Description
59676056201	PREZISTA 600 MG TABLET
59676056301	PREZISTA 75 MG TABLET
59676056401	PREZISTA 150 MG TABLET
59676057001	INTELENCE 100 MG TABLET
597000201	APTIVUS 100 MG/ML SOLUTION
597000302	APTIVUS 250 MG CAPSULE
597004601	VIRAMUNE 200MG TABLET
597004660	VIRAMUNE 200 MG TABLET
597004661	VIRAMUNE 200MG TABLET
597004724	VIRAMUNE 50 MG/5 ML ORAL SUSP
59762119001	STAVUDINE 15 MG CAPSULE
59762119101	STAVUDINE 20 MG CAPSULE
59762119201	STAVUDINE 30 MG CAPSULE
59762119301	STAVUDINE 40 MG CAPSULE
59762365001	ZIDOVUDINE 300 MG TABLET
6022761	ISENTRESS 400 MG TABLET
6057062	CRIXIVAN 100 MG CAPSULE
6057142	CRIXIVAN 200MG CAPSULE
6057143	CRIXIVAN 200 MG CAPSULE
6057301	CRIXIVAN 400 MG CAPSULE
6057318	CRIXIVAN 400 MG CAPSULE
6057340	CRIXIVAN 400 MG CAPSULE
6057342	CRIXIVAN 400 MG CAPSULE
6057354	CRIXIVAN 400 MG CAPSULE
6057362	CRIXIVAN 400 MG CAPSULE
6057465	CRIXIVAN 333 MG CAPSULE
60760001018	VIRACEPT 250 MG TABLET
60760001063	VIRACEPT 250 MG TABLET
60760059504	COMBIVIR 150-300MG TABLET
60760059514	COMBIVIR 150-300MG TABLET
61958040101	VIREAD 300 MG TABLET
61958060101	EMTRIVA 200 MG CAPSULE
61958060201	EMTRIVA 10 MG/ML SOLUTION
61958070101	TRUVADA 200-300MG TABLET
62584004611	DIDANOSINE 250 MG CAPSULE DR
62584004621	DIDANOSINE 250 MG CAPSULE DR
62584004811	DIDANOSINE 400 MG CAPSULE DR
62584004821	DIDANOSINE 400 MG CAPSULE DR
62682104801	COMBIVIR 150-300MG TABLET

NDC Code	NDC Description
63010001027	VIRACEPT 250MG TABLET
63010001030	VIRACEPT 250 MG TABLET
63010001190	VIRACEPT 50 MG/G POWDER
63010002036	RESCRIPTOR 100 MG TAB DISPER
63010002118	RESCRIPTOR 200 MG TABLET
63010002770	VIRACEPT 625 MG TABLET
63304092060	ZIDOVUDINE 300 MG TABLET
65862002460	ZIDOVUDINE 300 MG TABLET
65862004660	STAVUDINE 30 MG CAPSULE
65862004760	STAVUDINE 40 MG CAPSULE
65862004824	ZIDOVUDINE 10 MG/ML SYRUP
65862010701	ZIDOVUDINE 100 MG CAPSULE
65862011160	STAVUDINE 15 MG CAPSULE
65862011260	STAVUDINE 20 MG CAPSULE
65862031030	DIDANOSINE 125 MG CAPSULE DR
65862031130	DIDANOSINE 200 MG CAPSULE DR
65862031230	DIDANOSINE 250 MG CAPSULE DR
65862031330	DIDANOSINE 400 MG CAPSULE DR
66267050906	COMBIVIR 150-300 MG TABLET
66267051418	VIRACEPT 250 MG TABLET
66267051463	VIRACEPT 250 MG TABLET
67253010910	ZIDOVUDINE 100 MG CAPSULE
67253076120	STAVUDINE 1 MG/ML SOLN RECON
67253096124	ZIDOVUDINE 10 MG/ML SYRUP
67263023060	REYATAZ 150 MG CAPSULE
67263023212	KALETRA 200 MG-50 MG TABLET
67263025860	EPIVIR 150 MG TABLET
67263026030	TRUVADA 200-300 MG TABLET
67263038760	LEXIVA 700 MG TABLET
67263040260	SELZENTRY 150 MG TABLET
67263043460	VIRAMUNE 200 MG TABLET
67263045530	VIREAD 300 MG TABLET
67263045836	RESCRIPTOR 100 MG TAB DISPER
67263051401	ZIDOVUDINE 100 MG CAPSULE
67263056830	SUSTIVA 600 MG TABLET
67263059060	PREZISTA 600 MG TABLET
68030605901	RETROVIR 100 MG CAPSULE
68030606001	EPIVIR 150 MG TABLET
68030606401	EPIVIR 150 MG TABLET

NDC Code	NDC Description
68030606501	RETROVIR 100 MG CAPSULE
68030728301	COMBIVIR 150-300 MG TABLET
68030728401	VIRACEPT 250 MG TABLET
68115009006	COMBIVIR 150-300 MG TABLET
68258900301	VIREAD 300 MG TABLET
68258902001	SUSTIVA 600 MG TABLET
68258902101	SUSTIVA 200 MG CAPSULE
68258910801	EPIVIR 150 MG TABLET
68258912601	ZERIT 20 MG CAPSULE
68258914201	REYATAZ 150 MG CAPSULE
68258915801	TRIZIVIR 150-300 MG TABLET
69080760	SELZENTRY 150 MG TABLET
69080860	SELZENTRY 300 MG TABLET
74052260	KALETRA 100 MG-25 MG TABLET
74194063	NORVIR 80 MG/ML SOLUTION
74333330	NORVIR 100 MG TABLET
74395646	KALETRA 400-100/5 SOLUTION
74395977	KALETRA 133.3-33.3 CAPSULE
74663322	NORVIR 100 MG CAPSULE
74663330	NORVIR 100 MG CAPSULE
74679922	KALETRA 200 MG-50 MG TABLET
74949202	NORVIR 100 MG CAPSULE
74949254	NORVIR 100 MG CAPSULE
81010793	RETROVIR IV 10 MG/ML VIAL
81010855	RETROVIR 100 MG CAPSULE
81010856	RETROVIR 100 MG CAPSULE
81011318	RETROVIR 10 MG/ML SYRUP
87661443	VIDEX 100MG PACKET
87661543	VIDEX 167MG PACKET
87661643	VIDEX 250MG PACKET
87661743	UNKNOWN
87662443	VIDEX 50MG TAB CHEW
87662643	VIDEX 150MG TAB CHEW
87662743	VIDEX 100MG TAB CHEW
87662843	VIDEX 25MG TAB CHEW
87663241	VIDEX FNL10 MG/ML SOLN RECON
87663341	VIDEX FNL10 MG/ML SOLN RECON
87665001	VIDEX 25MG TAB CHEW
87665101	VIDEX 50MG TAB CHEW

NDC Code	NDC Description
87665201	VIDEX 100MG TAB CHEW
87665301	VIDEX 150MG TAB CHEW
87666515	VIDEX 200MG TAB CHEW
87667117	VIDEX EC 125 MG CAPSULE DR
87667217	VIDEX EC 200 MG CAPSULE DR
87667317	VIDEX EC 250 MG CAPSULE DR
87667417	VIDEX EC 400 MG CAPSULE DR
93553006	ZIDOVUDINE 300 MG TABLET
9376103	RESCRIPTOR 100 MG TABLET
9757601	RESCRIPTOR 200 MG TABLET

APPENDIX D

NUMBER OF HIGH-VOLUME HIV CLINICIANS

PER 1,000 DIAGNOSED CASES OF HIV BY REGION, STATE, AND MSA

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Table D.1. Estimated Number of High-Volume HIV Clinicians per 1,000 Diagnosed HIV Cases, by Census Region

Region	2010	2011	2012	2013	2014	2015
Northeast	5.73	5.52	5.32	5.12	4.93	4.74
South	5.00	4.70	4.43	4.17	3.94	3.72
Midwest	6.77	6.41	6.09	5.80	5.53	5.28
West	5.09	4.82	4.58	4.36	4.14	3.94

Source: Mathematica and Lewin analysis of the HIV Clinician Workforce Survey (2012) and state and federal HIV surveillance data (2008).

Table D.2. Estimated Number of High-Volume HIV Clinicians per 1,000 Diagnosed HIV Case, by HRSA Region

HRSA Region	States in Region	2010	2011	2012	2013	2014	2015
1	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont	9.67	9.38	9.10	8.84	8.57	8.30
2	New Jersey and New York	4.80	4.61	4.45	4.28	4.12	3.95
3	Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia	6.40	6.10	5.83	5.58	5.35	5.14
4	Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee	5.07	4.75	4.46	4.19	3.95	3.72
5	Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin	6.42	6.05	5.72	5.40	5.11	4.85
6	Arkansas, Louisiana, Oklahoma, New Mexico, and Texas	4.09	3.82	3.59	3.37	3.16	2.97
7	Iowa, Kansas, Missouri, and Nebraska,	7.90	7.40	6.95	6.55	6.18	5.85
8	Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming	4.72	4.85	4.99	5.12	5.22	5.33
9	Arizona, California, Hawaii, and Nevada	4.70	4.42	4.19	3.96	3.76	3.57
10	Alaska, Idaho, Oregon, and Washington	9.04	8.73	8.43	8.11	7.80	7.49

Source: Mathematica and Lewin analysis of the HIV Clinician Workforce Survey (2012) and state and federal HIV surveillance data (2008).

Table D.3. Estimated Number of High-Volume HIV Clinicians per 1,000 Diagnosed HIV Cases, for High-Prevalence States

State	2010	2011	2012	2013	2014	2015
United States	5.42	5.14	4.89	4.65	4.42	4.21
High-Prevalence States						
Alabama	2.29	2.10	1.97	1.84	1.73	1.62
Arizona	6.10	5.71	5.39	5.05	4.78	4.52
California	4.71	4.44	4.20	3.99	3.79	3.60
Colorado	3.94	3.81	3.68	3.56	3.41	3.31
Connecticut	8.36	8.14	7.91	7.69	7.46	7.22
District of Columbia	7.33	7.14	7.01	6.90	6.78	6.67
Florida	4.80	4.49	4.22	3.96	3.73	3.51
Georgia	4.56	4.24	3.95	3.69	3.45	3.23
Illinois	4.46	4.25	4.06	3.87	3.70	3.53
Indiana	7.84	7.33	6.98	6.66	6.35	6.06
Louisiana	2.93	2.71	2.55	2.40	2.25	2.11
Massachusetts	8.60	8.38	8.16	7.94	7.72	7.51
Maryland	6.43	6.13	5.85	5.58	5.35	5.12
Michigan	7.47	6.93	6.45	6.00	5.62	5.27
Minnesota	7.89	7.54	7.23	6.93	6.65	6.40
Missouri	5.15	4.78	4.46	4.20	3.98	3.77
Mississippi	4.11	3.94	3.78	3.64	3.51	3.38
North Carolina	7.40	6.95	6.53	6.12	5.75	5.42
New Jersey	5.18	4.90	4.64	4.40	4.17	3.95
Nevada	2.34	2.22	2.09	1.97	1.85	1.75
New York	4.69	4.54	4.39	4.25	4.10	3.95
Ohio	8.38	7.81	7.31	6.85	6.39	6.02
Pennsylvania	7.13	6.81	6.49	6.21	5.94	5.69
South Carolina	5.23	4.94	4.66	4.41	4.18	3.95
Tennessee	6.08	5.74	5.41	5.11	4.82	4.55
Texas	4.36	4.08	3.83	3.58	3.36	3.15
Virginia	4.71	4.40	4.14	3.89	3.68	3.47
Washington	9.17	8.85	8.54	8.21	7.89	7.56
Other States	7.62	7.29	7.00	6.73	6.47	6.22

Source: Mathematica and Lewin analysis of the HIV Clinician Workforce Survey (2012) and state and federal HIV surveillance data (2008).

Note: High-prevalence states include states with more than 6,000 diagnosed cases of HIV.

Table D.4. Estimated Number of High-Volume HIV Clinicians per 1,000 Diagnosed HIV Cases, for High-Prevalence MSAs

State	2010	2011	2012	2013	2014	2015
Atlanta	5.52	5.02	4.58	4.18	3.81	3.47
Baltimore	7.74	7.37	7.01	6.61	6.27	5.92
Boston	8.07	7.78	7.47	7.14	6.81	6.49
Charlotte	8.28	7.98	7.68	7.39	7.11	6.84
Chicago	5.09	5.28	5.45	5.59	5.73	5.84
Dallas	5.86	5.47	5.12	4.80	4.48	4.19
Denver	3.19	3.49	3.76	4.04	4.27	4.52
Detroit	4.01	4.06	4.10	4.15	4.20	4.25
Houston	5.02	4.62	4.25	3.89	3.57	3.26
Jacksonville	4.91	6.75	8.39	9.84	11.12	12.27
Las Vegas	2.33	2.98	3.58	4.13	4.63	5.10
Los Angeles	5.32	4.98	4.67	4.36	4.06	3.77
Memphis	5.62	5.29	4.96	4.64	4.35	4.08
Miami	4.23	3.89	3.59	3.31	3.05	2.80
Minneapolis	7.30	7.50	7.70	7.85	7.99	8.12
New Orleans	3.04	3.11	3.16	3.21	3.24	3.25
New York	4.86	4.58	4.31	4.05	3.79	3.53
Orlando	5.44	5.10	4.80	4.51	4.23	3.97
Philadelphia	7.24	6.83	6.44	6.06	5.70	5.36
Phoenix	6.67	6.56	6.51	6.40	6.34	6.28
Riverside	4.81	4.97	5.36	5.73	6.08	6.38
San Diego	5.17	4.84	4.52	4.23	3.96	3.71
San Francisco	8.14	7.63	7.17	6.77	6.41	6.10
Seattle	3.45	3.50	3.55	3.57	3.59	3.58
St. Louis	2.94	2.82	2.75	2.75	2.75	2.74
Tampa	7.91	7.54	7.18	6.82	6.49	6.17
Virginia Beach	3.46	3.25	3.04	2.85	2.66	2.48
Washington DC	7.35	6.97	6.66	6.38	6.11	5.85

Source: Mathematica and Lewin analysis of the HIV Clinician Workforce Survey (2012) and state and federal HIV surveillance data (2008).

Note: High-prevalence MSAs include MSAs with more than 5,000 diagnosed cases of HIV.

MSA = metropolitan statistical area.