

**Assessment of Potential Disparities in HIV Care Quality
and Clinical Outcomes in Boston EMA Sites
Providing Primary Medical Care
1999-2002**

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Executive Summary

HIV/AIDS treatment has been one of the areas in which recent inequities in care and outcomes have been identified for racial/ethnic minorities and women in the US. There has also been concern that other disadvantaged subgroups of persons living with HIV (e.g., immigrants, substance abusers, prisoners) might be receiving suboptimal treatment or not benefiting equally from medical care with respect to disease stabilization. Using data from extensive medical chart reviews across 10 HIV/AIDS clinics funded by Boston's Ryan White CARE Act Title I program, we studied whether disparities in healthcare process (consistent medical visits and laboratory monitoring, and receipt of recommended medications) and disease outcome (medical hospitalizations and CD4 count response to treatment) could be identified for any subgroups of a random sample of 612 HIV/AIDS patients.

Using the Andersen-Newman Behavioral model of healthcare utilization and multi-level logistic regression models, we identified the predisposing, enabling and need factors that predicted five selected process and outcome measures. Patient characteristics of gender, race/ethnicity, country of birth (nativity), age, substance use and mental health diagnoses were evaluated as predisposing factors.

We found that 18% of patients experienced prolonged gaps (> 8 months) between medical care visits at the sites, but that no patient-level characteristics other than clinical need (based on CD4 count at entry into care) were associated with this quality of care measure. However, the likelihood of gaps in visits was higher for patients attending small clinics (<200 HIV patients) and for those who entered care after 1996. Gaps in laboratory monitoring occurred in 26% of patients, and were more likely in patients less than age 40 and active substance users. Small clinic size and clinical need were also significant predictors. The third process measure, failure to receive recommended medications for HIV and OI prophylaxis, was observed in 22% of patients, more commonly in persons born in the US or US territories than in foreign-born persons (after controlling for clinical need).

Clinical outcome factors assessed included medical hospitalization after the first year in care and having a last CD4 count of <200/mm³; these occurred in 26% and 21%, respectively. The only gender-related disparity was observed in the hospitalization measures, with women being significantly more likely to be hospitalized. Other patient-level predisposing factors were IDU history and having a mental health diagnosis. After controlling for clinic need (AIDS diagnosis), being treated at a small clinic was also a significant positive predictor of hospitalization. After adjustment for clinical need, having a low final CD4 count was significantly more frequent for patients with IDU history and those attending a specialty clinic (infectious disease/HIV), compared to those in a general medical clinic.

In this group of publicly-funded HIV/AIDS clinical sites, there were no healthcare or outcome disparities observed for racial/ethnic minority patients, foreign-born persons, or prisoners. Somewhat unexpectedly, foreign-born persons were at a significant advantage compared to US natives with respect to the receipt of recommended medications. The single gender-based difference was a higher frequency of hospitalization for women; however, this has been observed by others and may represent true biologic factors that fall outside the realm of HIV management. Clinic factors including size of HIV patient caseload and specialty status were found to be important factors for several outcomes.

These data point out high levels of care quality across the Boston Title I EMA network and a corresponding lack of any significant disparities based on sociodemographic characteristics. Given the limitation that this is a population of patients identified *because of their connection to healthcare*, no global conclusions can be made about general access to care for the larger HIV/AIDS population. However, it is gratifying to verify that, once connected to treatment at these 10 clinical sites, process and outcome differences do not stem from sociodemographic disadvantages.

1. INTRODUCTION

1.1 Background

Throughout the first two decades of the ongoing US AIDS epidemic, researchers have identified variations in HIV/AIDS care among potentially disadvantaged subgroups of the population, most notably women and racial/ethnic minority groups. In large national studies, these subgroups have consistently lagged behind in access to medications for opportunistic infection prophylaxis and antiretroviral therapy[1, 2]. They have also had higher rates of Emergency Room visits, persistently lower outpatient visit rates and higher hospitalization rates [3]. Compared to Whites, Blacks and Latinos have demonstrated longer delays in seeking care following an HIV diagnosis[4] and higher mortality rates.

Although these disturbing disparities have been reported from nationally representative studies (HIV Cost and Utilization Study, HCSUS), research collaboratives (HIV Research Network), and individual clinical programs (Johns Hopkins) or cities (Los Angeles), the ability to assess such quality gaps on a system or regional level has been limited. On behalf of the Boston Public Health Commission, which serves as the grantee for Ryan White CARE Act Title I program, a research team from JSI Research and Training Institute has assessed potential HIV/AIDS care disparities for the Eligible Metropolitan Area (EMA) of Boston, Massachusetts. Using recent clinical chart review data collected for quality management purposes, we address in this report the question of whether gender, race/ethnicity or country of birth are the basis for quality gaps in process and outcome measures.

1.2 Racial/ethnicity differences:

The first studies to point out racial differences in HIV care predated the availability of specific HIV medications. An early study in 5 cities evaluated racial differences in hospital care for *pneumocystis carinii* pneumonia (PCP), the principal infectious complication of advanced HIV infection [5]. In non-VA facilities, black and Hispanic patients were more likely than whites to die in the hospital and less likely to have a prompt (within 2 days of admission) diagnostic procedure (bronchoscopy) to confirm PCP. No such difference was found in the VA facilities, pointing out the potential influence of insurance status and hospital type on clinical outcomes early in the epidemic.

Once specific HIV medications became available in 1987, researchers began to focus on utilization patterns and outcomes of antiretroviral therapy (ART) and preventive drugs for PCP and found recurring racial differences. Moore and colleagues analyzed data on new patients presenting for comprehensive HIV care from 1990 to 1992 at Johns Hopkins Hospital[6]. Despite being at a comparable stage of HIV disease, black patients were significantly less likely to receive both interventions; 48% of blacks were on ART (vs. 63% of whites) and only 58% received PCP prophylaxis (vs. 82% of eligible whites). After controlling for background variables including HIV risk behavior, insurance, education and income, the adjusted relative odds for blacks were 0.59 (.95 CI 0.38-0.93) for ART and 0.27 (.95 CI 0.13-0.56) for PCP prophylaxis, compared to whites. New Jersey Medicaid claims data analysis from 1987-1992 found a significantly lower rate of ART use in blacks than whites in the early years, but a convergence of rates later on, during a time when overall enthusiasm was waning for the less potent 1 or 2- drug ART regimens and overall use went down[7]. The authors concluded that less advantaged subgroups of HIV patients lagged in access to the medications initially, suggesting a role for non-financial barriers to care.

Since 1996, combinations of HIV medications representing two or more drug classes (nucleosides, protease inhibitors and non-nucleosides) have become the standard; this approach is known as highly active antiretroviral therapy (HAART). Since 1998, national treatment guidelines have been in effect that identify the clinical criteria for treatment and the most effective combinations[8]. A groundbreaking national study --- the HIV Cost and Services Utilization Study (HCSUS) --- was undertaken right at the time that use of HAART was becoming widespread. Using multistage national probability sampling, a representative cohort of over 2800 HIV patients receiving care in non-military settings was surveyed in-person or by phone[9]. The baseline interviews took place between January 1996 and April 1997, and two follow-up surveys were conducted in 1997 through early 1998.

A wealth of information has been gleaned from HCSUS concerning racial differences in care processes and medications. The following are highlights of HCSUS results:

- Inferior patterns of care received by blacks and Latinos were seen for 4 of the 6 quality measures assessed, including office and emergency room visits, HAART and PCP prophylaxis[1]. These differences remained after adjustment for stage of illness.

- Patients with the most limited access to HAART have multiple characteristics of vulnerability (race/ethnicity, gender, education, HIV risk behavior) and there are substantial inequities vis-à-vis early receipt of the most efficacious treatments[10].
- For blacks, the odds of receiving HAART early (by December 1996) were less than half that of whites (OR=0.44), after controlling for all relevant covariates. Unmeasured variables like provider biases regarding the patients' adherence potential, discrimination effects, patient beliefs about HAART or mistrust of providers could possibly account for the differences[10].
- Reassessment in January 1998 found that HAART use had increased similarly in blacks and whites, but that blacks continued to lag behind with only 59% of participants every having taken HAART[2]. In a multivariate analysis, the effect of race was not significant when insurance, education and region were added to the other demographic factors in the model; only insurance and low CD4 count remained as significant predictors.

Support for HSCUS findings regarding racial differences has come from other researchers, including a population-based study from 1996-99 in San Francisco[11]. In this multivariate analysis, blacks, injection drug users (IDU's) and the uninsured were less likely to be on HAART before an AIDS diagnosis. Blacks were also found to delay initiation of HAART after being diagnosed with AIDS, compared to whites. Another non-clinic-based study involved 1996 surveys of clients receiving AIDS services from a community-based organization in Los Angeles to assess use and knowledge of HAART[12]. After controlling for income and insurance, the odds ratio for blacks not being on HAART was borderline significant at 1.5 (.95 CI 0.96-2.35). For respondents currently taking HAART, blacks were more likely to report low self-perceived knowledge of these medications (OR=2.09, .95 CI 1.19-3.68).

Two other important areas of healthcare utilization that have been studied for racial disparity are inpatient and outpatient services. Fleishman and Hellinger (2001) used hospital discharge data from seven states to examine trends that might reflect positive clinical benefits of HAART[13]. They found a steady decline in overall admission rates that began in late 1995. However, the magnitude of the decline varied between subgroups, with admission rates for blacks consistently exceeding those for whites among both men and women. This finding is consistent with data from

early in the epidemic, and a more recent study confirms that diffusion of HAART as standard therapy has not led to a change. According to the HIV Research Network, blacks in their multi-practice sample (N=5255) continue to have higher inpatient utilization (369 days/100 person-years) than whites (202 days, $p<0.05$)[3]. Conversely, outpatient visits were less frequent for blacks (9.9/year) than whites (11.5/year). The same trend had been seen in an earlier study of gay and bisexual men, where lower utilization rates by black men were not found to be related to health insurance status[14].

1.3 Gender Disparities

Barriers to care may be greater for women with HIV than for their male counterparts. Lack of health insurance and competing social needs related to childcare and family responsibilities have been proposed explanations for their lower rates of recommended medication use and higher rates of Emergency Room visits[1, 2, 15]. Women were found to have longer delays in seeking care than men[16]. However, differences in clinical sites that treat women with HIV may also be a factor [17]since sites with more HIV experience were shown to have improved patient survival in women.

1.4 Potential Importance of Country of Birth

The scope of the global pandemic is enormous and countries of southern Africa and the Caribbean have been particularly hard hit. In Massachusetts, immigrants from these regions are making up a growing percentage of HIV/AIDS cases. While it seems logical that these immigrant groups will have difficulty accessing health care for their HIV disease or may experience problems with obtaining quality medical care in their new surroundings, there has been virtually no attention to this question in research to date. Since most available information has focused on race/ethnicity, and a significant proportion of blacks with HIV/AIDS are immigrants, the findings of analyses based on race alone may be misleading.

Racial groupings used in most literature use the terms “black” and “African-American” interchangeably and generally fail to define them. The resulting problem is that actual country of birth or national origin is unknown, and the AIDS epidemic involves many non-US born groups of black race. Failure to clarify this issue opens the literature to assumptions that the African-Americans studied were all US born, when often they include persons of Caribbean and continental African origin. The social and cultural issues --- particularly stigma, economics, immigration and

the co-existence of substance abuse --- are very distinct among these different populations and non-US born individuals constitute a growing percentage of AIDS cases among blacks. Lumping them into one “race” when analyzing research data will certainly result in confusing or misleading findings. For example, there is evidence that foreign-born Latinos differ from those born here in relation to decisions about taking HAART[18].

To add to the current understanding of how gender, race and country of birth might lead to health disparities in HIV/AIDS, this analysis makes use of a unique and rich database gathered for clinical quality management purposes at publicly-funded clinics across the Boston area. We will identify the factors that are independently related to sub-standard care processes and outcomes and use multivariate statistical modeling to adjust for all significant predictors to determine whether gender, race or immigrant status account for any disparity.

2. METHODS

2.1 Clinical Quality Management Project

In 2000, the HIV/AIDS Bureau of the Massachusetts Department of Public Health (MDPH) contracted with JSI Research and Training Institute, Inc. to create a flexible and comprehensive quality assurance/continuous quality improvement plan (including protocol, instruments and electronic data-sharing capacity) for use in their 17 publicly funded clinical sites (known as ACTNow clinics). The JSI protocol was designed in light of the resource limitations of public clinics, the competing expectations of multiple funding sources, the current priorities of funders and the clinical program leadership, and other logistical concerns and information needs communicated by the participating sites.

Beginning in 2002, the Boston Public Health Commission contracted with JSI to conduct chart reviews in four additional Title I-funded programs providing primary medical care. Because the data were abstracted and analyzed using the same protocol, findings could be merged for BPHC clinics and the statewide ACTNow sample. This report provides an analysis of 6 ACTNow/Title I clinics and 4 Title I only clinics, using clinical data from 1999-2002.

2.2 Protocol

Chart abstraction was conducted by research nurses and clinical research assistants from JSI who have had detailed training in the project and are familiar with standards and processes of HIV outpatient care. The JSI staff sign confidentiality agreements assuring their adherence to complete patient privacy protection. Nurses use clinic records including progress notes, flow sheets, laboratory reports and other documentation contained within the record to complete the data collection instrument. Other sources of supporting secondary data (i.e. from information system database or billing information) are sometimes used to fill in gaps or corroborate chart information if appropriate.

Client level data collected includes demographics, clinical events (hospitalizations, pregnancies, comorbidities, incident STD's and OI's), laboratory measures, prevention education and counseling, screening, immunizations, prophylaxis, medications (for HIV and mental health problems) and adherence. Background information at the clinic level is also obtained including overall caseload, mortality experience, protocols and practice guidelines, and model of care.

Guidelines and recommendations from a number of established and nationally recognized sources (based on data from clinical studies or expert opinion) were used to establish benchmarks

for standards of care. The United States Public Health Service (USPHS) and the Infectious Diseases Society of America (IDSA) have collaborated for many years on guidelines for the prevention of opportunistic infections (OI's) among PLWH. These include recommendations for prevention of *Pneumocystis carinii* pneumonia (PCP), mycobacterial infections, and potentially vaccine-preventable diseases such as invasive pneumococcal diseases and viral hepatitis (types A and B)[3-5]. The guidelines define populations at risk based on CD4 cell count and exposure risk and provide recommendations for initiation (and discontinuation) of preventive measures. Routine clinical interventions include universal administration of vaccine for hepatitis B virus, pneumococcus and influenza, Pap smears for cervical cancer screening at least annually for HIV-positive women, and prophylaxis for PCP and MAI for individuals at risk (based on low CD4 counts). The version of the guidelines that was current during the review period was utilized and supplemented by other nationally recognized sources for primary care HIV management[6-8].

Recommendations for screening and vaccination for hepatitis C virus (HCV) coinfecting individuals were based on the CDC recommendations [3, 7]. Standards for initiation of antiretroviral therapy, monitoring of viral loads, CD4 cell count and adherence were derived from the national guidelines current in 2000. These recommended initiation of highly active antiretroviral therapy (HAART) for individuals with CD4 cell counts <500/mm³ or plasma viral loads >5-10,000 copies/ml[9, 10]. Recommendations for risk reduction counseling and management of mental illness and substance abuse were based on formal recommendations [10,11] and current standards of general clinical practice.

2.3 Participating Sites

Record abstraction for HIV care information was carried out in ten clinical programs funded by the Ryan White CARE Act Title I:

- Boston Medical Center Infectious Disease Clinic
- East Boston NHC
- Fenway Health
- Great Brook Valley HC
- Greater Lawrence HC
- Lowell CHC
- Lynn CHC
- Martha Elliot HC
- Whittier Street HC
- Zinberg Clinic (Cambridge Hospital)

All of the patients receiving care at these sites are also potentially eligible to receive the prescription drugs essential to their treatment through the HIV Drug Assistance Program (HDAP), supported by a combination of state and federal CARE Act funds. The availability of these public funds sets a level playing field of generous support and widespread geographic access for all persons diagnosed with HIV/AIDS in Massachusetts. Thanks to this support, necessary outpatient treatment, laboratory testing and medications are accessible to all with a minimum of barriers; in order to publicize the availability of these services, a public awareness campaign was also conducted through posters and billboards in appropriate settings to reach low income populations.

Patients were included in the full review if they received at least two medical visits for primary HIV care during the calendar year. A medical visit was defined as a visit with a physician, physician's assistant, or nurse practitioner; a visit with only nursing input (i.e., RN or LPN) did not qualify as a medical visit for the purposes of this review.

The periods of study were defined by calendar year cycles, beginning in 1999 and continuing through 2002. Clinical sites produced a systematic random sample of 70-80 adult patients from their active list of HIV/AIDS participants during their first year of chart audit; over-sampling of women (addition of 10 per site if available) provided adequate numbers to assess gender-specific care indicators. Exceptions to the overall sampling rule were: 1) four pilot sites in which larger samples were derived (approximately 100 patients from each), and 2) sites with fewer than 70 active patients, where the total population was studied.

Two rounds of chart reviews were conducted, with each cycle capturing two years of retrospective data. Variables of interest included demographics (race/ethnicity, gender, age, country of birth, zip code of residence), HIV risk behavior information, date of care engagement at the site, baseline clinical status (CD4 and viral load), stage of illness, mental health and substance abuse problems, incarceration episodes, preventive care delivered (recommended counseling, screenings, immunizations, medications), HIV visits, treatment and laboratory monitoring, comprehensive CD4 and viral load results, testing for viral resistance, adherence problems and support provided, side effects and treatment interruptions, hospitalizations (both medical and psychiatric/substance abuse), and vital status.

2.4 Theoretical Framework for HIV Healthcare Utilization

The Behavioral Model of healthcare utilization (Andersen-Newman) will provide the framework for this analysis[19, 20]. This model was originally designed to explain the use of formal personal

health services [19]; over the years it has been employed to study the determinants of acute and long-term care and frequently used to assess racial differences[21]. It has been successively updated and revised, first to emphasize the importance of health system and provider factors [20] and more recently to adapt the traditional model to vulnerable populations [22, 23]. Two published studies involving HIV/AIDS have been based on the Behavioral Model framework [10, 24].

The core concepts of the model are that healthcare utilization is a function of a predisposition by people to use services, factors that enable or impede such use (including person and system-level characteristics), and individual levels of need for care. Under the domain of Predisposing Factors (PF's), the traditional model captures the demographic characteristics (e.g., age, gender, marital status), health beliefs and social structure (e.g., ethnicity, education, employment, and family size); the PF's are generally considered immutable conditions and not subject to policy forces. The revision for vulnerable populations adds acculturation, immigration status, literacy, criminal behavior, prison history, mental illness, substance abuse[22]. Included as Enabling Factor (EF's) for the traditional model are personal and family resources (e.g., regular source of care, insurance and income), community resources related to residence and region, and health services resources (e.g., capacity, price, distribution, structure and process of care). In Aday's adaptation of the model, contextual factors of the healthcare system (environmental and provider-related) are separately distinguished [25]. Under the adapted version for vulnerable groups, additional personal and contextual EF's might include public assistance/benefits, competing needs, availability and use of information resources, community crime rates and social service access. Need Factors (NF's) capture both perceived need (self-assessed) and evaluated need (determined by others, typically healthcare providers). The level of need is determined by the presence and level of health conditions such as symptoms, laboratory abnormalities or disease states.

For this report, we will focus on a set of predisposing, enabling (including both personal and contextual) and need factors that are relevant to HIV/AIDS care, including several that originate from the Vulnerable Populations modification of Andersen's original model. Table 2.1 describes these factors in detail.

Table 2.1: Analytic Framework based on Andersen-Newman Behavioral Model ---
Independent Variables

<i>Predisposing Factors</i>	<i>Enabling Factors</i>	<i>Need Factors</i>
Race/ethnicity	<u>Personal:</u> Financial coverage (all sites with generous public funding for care and medications)	Stage of HIV illness (CDC-defined AIDS or not)
Gender	Duration of care engagement	Immune status at entry into care (baseline CD4 count)
Age	Incarceration	
Nativity (US or foreign born)	<u>Contextual:</u> Type of clinic (ID/HIV specialty or general)	
Mental health diagnoses	Setting of clinic (hospital or free-standing community clinic)	
Substance abuse	Size of clinic's HIV patient caseload	
Male-to-male sexual contact	Clinic location inside or outside Metro Boston area	
Injection drug use		

According to the Behavioral Model, predisposing, enabling, contextual and need factors combine to predict healthcare utilization, related health behaviors and potentially health outcomes. The measures selected for evaluation in this report include five parameters described in Table 2.3. For consistency, all dependent variables are defined according to a deficit perspective (i.e., the less favorable condition in a dichotomous category).

2.5 Description of Independent and Dependent Variables

As noted above, the medical chart is the source of all data elements used in our analysis. The specific definitions of the selected variables are noted in the following tables:

Table 2.2: Independent Variables --- Definitions and Source

<i>Predisposing Factors</i>	<i>Definition</i>
Race	According to documentation in medical record or questioning of clinic staff (when missing); according to the OMB hierarchy of race and ethnicity
Gender	As noted in medical record (males and females only; transgender excluded due to small numbers)
Age	Based on date of birth; defined as age as of January 1, 2002
Nativity	Based on country of birth, US 50 states, US territories, other (listed); Immigrant defined as being born outside US states or territories
Mental health diagnoses (active)	Any active clinical diagnoses of psychiatric problems as noted in the medical record
Substance abuse (active)	Any active drug or alcohol abuse as noted in the medical record
Male-to-male sexual contact	History noted in record, typically as part of HIV care intake (assessment of route of HIV acquisition)
Injection drug use	History noted in record, typically as part of HIV care intake (assessment of route of HIV acquisition)
Hepatitis C infection (comorbidity)	Screened positive for antibody to hepatitis C virus
<i>Enabling Factors</i>	
Financial coverage	Not specifically measured; inferred by the availability of generous public funding for care, laboratory testing and medications
Duration of care engagement	Number of months/years between entry into care at the site and the last follow-up period; dichotomized as entered care before or after 1/1/1996
Type of clinic	Identified as an Infectious Disease specialty clinic or general adult medicine practice
Setting of clinic	Based in a hospital or a community site (i.e., community health center)
Incarceration	Any notation that the patient was in jail or prison during the follow-up period
<i>Need Factors</i>	
Stage of HIV illness (AIDS or HIV non-AIDS)	All patients are HIV-positive; CDC-defined AIDS according to any prior clinical diagnosis of opportunistic infection or cancer, or episode of CD4 count <200
Immune status at entry into care (baseline CD4 count)	Baseline CD4 count when HIV care was established at the site

Table 2.3. Dependent Variables selected for Assessment --- Definitions and Sources

<i>Utilization/Quality Measures</i>	<i>Definition</i>	<i>Source/Standard</i>
Gaps in outpatient visits for HIV care greater than 8 months	Two consecutive 4-month periods without documentation of being seen by an MD, NP or PA at site.	NY State AIDS Institute Quality of Care Guidelines ¹ ; medical visits every 3-4 months
Gaps in laboratory monitoring of HIV disease greater than 8 months	Two consecutive 4-month periods without documentation of a CD4 count or viral load test	NY State AIDS Institute Quality of Care Guidelines ¹ ; laboratory monitoring every 3-4 months
Missing any recommended medication (antiretroviral drugs, PCP or MAI prophylaxis)	Episodes during any year of follow-up where patients did not receive or take recommended antiretrovirals, PCP or MAI prophylaxis (according to their clinical and laboratory status)	Version of USPHS guidelines ² in effect during the timeframe of observation
Medical hospitalization after the first year in care	Documentation of a medical hospitalization more than 1 year after initiation of HIV care	HRSA and IHI indicators of HIV care quality ³
Last CD4 Count less than 200	Final CD4 cell count value found in the record for the study period	Used in CDC's AIDS case definition to indicate serious immune system compromise

The selected dependent variables are consistent with other research on this topic and considered to be robust measures of HIV care quality. Other quality management projects have tracked these five outcomes as the core measures of HIV treatment quality according to the chronic disease model of the Institute for Healthcare Improvement [26] [27].

¹ Primary Care Approach to the HIV-Infected Patient http://www.hivguidelines.org/public_html/a-primca/a-primca.pdf

² Guidelines for Use of Antiretroviral Agents in HIV-infected adults and adolescents www.hivatis.org

³ <http://www.ihl.org/IHI/Topics/HIVAIDS/HIVDiseaseGeneral/>

2.6 Statistical Approach

The analysis was performed using SAS version 9.0 (SAS Institute, Inc., Cary NC); details of the steps are described below:

1. Weighting the Sample:

The sampling scheme for the Quality Management data collection project was designed to estimate, with sufficient power and at reasonable cost, program-specific quality parameters within each clinic. Seventy charts were sampled per year per clinic; clinics with < 70 patients contributed all active HIV/AIDS patients. This scheme resulted in small clinics contributing 100% and large clinics contributing as little as 10% of their active HIV/AIDS caseload. Since the present analysis will make generalizations across participating clinics and thus to the larger HIV-patient population in the Boston EMA, a weighting step was applied to all analyses to make the sample more representative of the total clinic population. The weight for each site (and applied to each patient sampled from the site) was the product of two factors, which themselves were ratios: (1) site case load / sample size; (2) total sample size/sum of the weights from (1). Thus, the weights took into account the imbalance of sampling within each site and the imbalance across sites.

2. Unadjusted Bivariate Analysis:

In characterizing differences in predisposing, enabling and need factors for the subgroups based on race/ethnicity, gender and nativity, chi square statistics for categorical variables (Rao-Scott chi square for complex samples) and student t-tests for continuous variables were used; two tailed tests of significance were used throughout. To make statistically valid inferences with the complex sample design, SAS SURVEYFREQ and SURVEYMEANS was used.

3. Hierarchical Modeling:

The SURVEYLOGISTIC procedure was used with the clinic (n=21) as the class variable. The five dependent variables tested were dichotomous categories (coded 0 and 1), and the parameters of the model included the covariates found to be associated in the bivariate comparisons (Rao-Scott chi square statistic $p \leq 0.10$) or identified as potentially important in the literature. The SURVEYLOGISTIC models were initially run using all significant covariates.

3. RESULTS

In this section, the findings will be described sequentially as they relate to primary research questions:

- What factors account for differences in *care processes*, such as consistency of medical visits, laboratory monitoring of HIV disease and response to or need for therapy (CD4 counts and viral load)?
- What factors account for differences in *health outcomes*, such as medical hospitalizations and CD4 cell stability?
- When clinical site factors and severity of illness are taken into account, do gender, race/ethnicity or nativity (being born in US or territories compared to foreign born) make a significant difference for HIV care process and outcome variables?

To set the stage for the presentation of findings, a brief description of the study population will be provided.

3.1 Study Population

The cohort of patients randomly selected for this chart review is a diverse group (N=612) that closely mirrors the Boston EMA HIV/AIDS statistics in most predisposing factors. Table 3.1 provides the weighted percentages for the group, organized according to the Andersen-Newman Behavioral Model framework.

Table 3.1 Weighted Percentages of Explanatory Factors Evaluated in Title I Continuing cohort (N=612)

<u>Explanatory Variables</u>	<u>Weighted %</u>
Predisposing factors:	
Gender (female)	30.3
Age >40 (in 2002)	63.2
Black	25.2
Hispanic	24.8
Immigrant	17.4
Active substance abuse	33.8
Mental health diagnosis	59.1
Injection drug use history	34.4
Hepatitis C -positive	39.1
Enabling factors:	
Entered care before 1996	38.1
Incarceration in study period	7.9
ID/HIV specialty clinic	17.9
Community health center	72.5
Clinic with >200 HIV pts	78.3
MetroBoston clinic	77.0
Need factors:	
AIDS diagnosis	59.7
CD4 <200 at entry	30.1

3.2 Findings of Disparities Analysis

In the following section, we will describe the findings of the analysis for each of the five dependent variables used as indicators of quality in process and outcome. In an effort to make this report useful to a broad audience of readers, we introduce the results with a basic explanation of how to interpret the technical and statistical terms used.

Evaluating the importance of a range of factors on health care processes and outcomes requires complex statistical tools. In the case of HIV/AIDS, many important background factors (including patient characteristics and stage of illness, healthcare provider, clinic, and resource/financial aspects) must be taken into account in a comprehensive fashion. The sequence of the analysis progresses from a crude measurement of the importance of each separate factor *on its own* to each of the measures, to a complex model that calculates the importance of each factor *while taking into account or “adjusting for” the effect of the others*. The relative importance of each factor in the adjusted model is described by the Odds Ratio (OR) with a specific Confidence Interval (CI). If the OR is less than 1, then patients with this factor are less likely than others to have the outcome; conversely, when the OR is greater than 1, the factor increases the likelihood that a patient will have the outcome. For example, an OR of 1.4 means that patients with this factor are 40% more likely than those without it to have the outcome. The strength of the relationship between the factor and outcome is measured in the CI, which is the 95% range that the OR value would be captured within (in other studies or samples of patients). As long as the 95% CI does not contain a value of 1, the relationship between the factor and the outcome is considered “statistically significant”; the basis for this is a less than 5% chance that the relationship is due to chance alone and not an indication of a true relationship. The actual probability that a relationship is due to chance is shown as the “p value”; when it is less than 5% ($p < 0.05$), the observed relationship is considered to be real and not due to chance.

1) Inconsistent Medical Care Visits.

Each of the predisposing, enabling and need factors was evaluated in relationship to the first process measure --- having a lapse of more than 8 months between medical visits at the site. Data from these chart reviews indicated that 18% of patients overall had this extended gap between medical visits. The unadjusted odds ratios noted in Table 3.2 under the heading “Crude Analysis” represent the association of each factor with this outcome, when none of the other factors are considered.

Statistically significant relationships are indicated in boldface type. The “Adjusted Analysis” shows the impact of taking the multiple factors into account simultaneously.

Table 3.2. Factors Independently Associated with the Probability of Having Lapse in Clinical Visits (>8 months)

Explanatory Variables	Crude Analysis			Adjusted Analysis		
	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Predisposing factors:						
Gender (female)	0.73	0.44-1.22	0.23	0.63	0.35-1.12	0.11
Age >40 (in 2002)	0.92	0.53-1.60	0.78	0.89	0.47-1.69	0.73
Black	0.83	0.46-1.47	0.52	0.68	0.33-1.40	0.29
Hispanic	1.05	0.64-1.71	0.85	0.71	0.37-1.40	0.33
Immigrant	0.40	0.19-0.84	0.02	0.63	0.28-1.42	0.26
Active substance abuse	1.87	1.10-3.18	0.02	1.48	0.78-2.81	0.23
Mental health diagnosis	0.78	0.45-1.34	0.37	0.64	0.33-1.22	0.18
Injection drug use history	2.26	1.33-3.86	0.003	1.94	0.83-4.55	0.13
Hepatitis C -positive	1.71	1.01-2.90	0.05	0.89	0.37-2.16	0.81
Enabling factors:						
Entered care before 1996	0.56	0.31-1.00	0.05	0.51	0.27-0.97	0.04
Incarceration in study period	2.49	1.24-4.99	0.01	1.51	0.72-3.19	0.28
ID/HIV specialty clinic	1.01	0.50-2.02	0.98	1.09	0.39-3.04	0.87
Community health center	1.07	0.61-1.87	0.82	0.69	0.27-1.75	0.44
Clinic with >200 HIV pts	0.64	0.41-1.00	0.05	0.56	0.31-0.99	0.05
MetroBoston clinic	0.66	0.41-1.08	0.10	0.83	0.41-1.70	0.61
Need factors:						
AIDS diagnosis	0.70	0.41-1.21	0.20	1.00	0.50-2.01	0.98
CD4 <200 at entry	0.46	0.25-0.87	0.02	0.37	0.17-0.77	0.008

Because of complex relationships between these explanatory variables, several of the factors that were significant in the crude analysis lose their impact following adjustment. For example, the crude analysis found several predisposing factors to be independently related to having a lapse in clinical visits. Immigrants were less likely to miss visits, and three variables related to substance abuse (active substance abuse, injection drug use history and hepatitis C-positivity) were found to increase the chance

of missing clinical visits. However, after controlling for the enabling factors of length of time in care (categorized as before 1996) and clinic size, along with the need factor of baseline CD4, all four predisposing factors became no longer significant. For this process of care measure, no disparities were found by gender, race/ethnicity or country of birth.

2) Inconsistent Laboratory Monitoring.

Although guidelines recommend that persons with HIV disease have their CD4 counts and HIV viral load levels checked every 3-4 months, we observed that 26% had lapses of more than 8 months between tests. As shown in Table 3.3, the strongest predictors of inconsistent laboratory monitoring by crude analysis were black race, active substance abuse (predisposing factors), incarceration during study period and clinic size (enabling factors). However, with adjustment for the powerful need factor of baseline CD4 and predisposing factor of patient age, race and incarceration become no longer significant. Active substance abuse increased the likelihood of gaps in lab monitoring by 3-fold, while patients from larger clinics had 50% lower likelihood of gaps in the adjusted model.

Table 3.3 Factors Independently Associated with the Probability of Having Lapse in Laboratory Monitoring (>8 months without CD4 or viral load test)

Explanatory Variables	Crude Analysis			Adjusted Analysis		
	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Predisposing factors:						
Gender (female)	1.15	0.74-1.81	0.53	0.85	0.52-1.38	0.51
Age >40 (in 2002)	0.70	0.43-1.14	0.15	0.58	0.33-1.00	0.05
Black	1.68	1.02-2.77	0.04	1.46	0.70-3.04	0.31
Hispanic	1.02	0.65-1.61	0.92	0.79	0.40-1.55	0.49
Immigrant	0.76	0.41-1.40	0.38	0.93	0.43-2.03	0.86
Active substance abuse	2.85	1.77-4.56	<0.001	3.06	1.70-5.50	0.0002
Mental health diagnosis	1.08	0.67-1.76	0.74	0.78	0.47-1.30	0.34
Injection drug use history	1.46	0.93-2.31	0.10	0.72	0.38-1.36	0.31
Hepatitis C -positive	1.46	0.93-2.33	0.10	1.06	0.52-2.13	0.88
Enabling factors:						
Entered care before 1996	0.98	0.59-1.61	0.93	1.00	0.57-1.77	0.98
Incarceration in study period	2.55	1.32-4.93	0.005	1.55	0.78-3.08	0.21
ID/HIV specialty clinic	1.66	0.93-2.94	0.08	1.76	0.76-4.05	0.18
Community health center	0.70	0.43-1.13	0.15	0.85	0.38-1.91	0.69
Clinic with >200 HIV pts	0.64	0.44-0.95	0.025	0.51	0.29-0.87	0.01
MetroBoston clinic	0.77	0.51-1.18	0.23	0.71	0.38-1.34	0.29
Need factors:						
AIDS diagnosis	1.19	0.74-1.91	0.47	1.53	0.83-2.84	0.17
CD4 <200 at entry	0.65	0.38-1.09	0.10	0.46	0.23-0.94	0.03

3) Missing Recommended Medications for HIV or Opportunistic Infection

Detailed national guidelines are available concerning use of antiretroviral medication combinations and prophylaxis for PCP and MAI. In general, the Boston EMA study population had very high levels of receiving these medications and no serious financial barriers have been identified for patients in Massachusetts. Nonetheless, we found that 22% of patients was not receiving one or more of these recommended medications during the study period. Four explanatory variables were found to significantly predict this process measure (Table 3.4): crude rates were increased for patients who were US-natives, active substance abusers, incarcerated during the study period, or diagnosed with AIDS (by CDC definition). After adjustment, only need (e.g., AIDS diagnosis) and nativity (e.g., US-born) were found to significantly predict missing recommended medications. No differences by gender or race/ethnicity were identified.

Table 3.4. Factors Independently Associated with the Probability of Missing Recommended Medications (Antiretrovirals or Prophylaxis for PCP or MAI)

Explanatory Variables	Crude Analysis			Adjusted Analysis		
	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Predisposing factors:						
Gender (female)	1.13	0.69-1.86	0.62	1.47	0.82-2.61	0.19
Age >40 (in 2002)	0.88	0.52-1.51	0.65	0.81	0.46-1.43	0.47
Black	0.97	0.54-1.72	0.91	0.81	0.34-1.93	0.63
Hispanic	1.27	0.78-2.06	0.34	1.24	0.58-2.68	0.57
Immigrant	0.47	0.25-0.89	0.02	0.40	0.18-0.88	0.02
Active substance abuse	1.69	1.02-2.83	0.04	1.48	0.79-2.76	0.21
Mental health diagnosis	0.84	0.50-1.42	0.52	0.67	0.37-1.22	0.19
Injection drug use history	1.54	0.93-2.55	0.10	1.61	0.67-3.85	0.29
Hepatitis C -positive	1.20	0.73-1.96	0.47	0.63	0.30-1.33	0.22
Enabling factors:						
Entered care before 1996	0.77	0.45-1.32	0.34	0.68	0.35-1.30	0.24
Incarceration in study period	2.14	1.09-4.23	0.03	1.99	0.89-4.46	0.09
ID/HIV specialty clinic	1.16	0.61-2.19	0.65	0.77	0.31-1.93	0.58
Community health center	0.88	0.52-1.49	0.63	0.80	0.34-1.87	0.60
Clinic with >200 HIV pts	0.75	0.50-1.14	0.18	0.77	0.43-1.39	0.39
MetroBoston clinic	1.09	0.69-1.72	0.72	1.89	0.97-3.69	0.06
Need factors:						
AIDS diagnosis	2.29	1.27-4.11	0.006	2.91	1.44-5.88	0.003
CD4 <200 at entry	1.32	0.76-2.23	0.32	0.78	0.39-1.57	0.49

4) Medical Hospitalization after First Year in Care

While the initial three measures we have focused on involve aspects of the process of HIV/AIDS medical care (e.g., visits, laboratory testing and medications), there is considerable interest in assessing whether individuals receiving healthcare have different outcomes of treatment. Consequently, we selected hospital admissions and CD4 count levels as useful and well-documented outcomes measures for this analysis. In the case of medical hospitalization, we further

specified that only admissions occurring after the first year in care at the site would be analyzed, since many admissions occur early in the treatment period for HIV or happen during the period of initial HIV diagnosis. Such early hospitalizations would not represent a specific time-sequenced indicator of the quality of HIV medical management, leading to our narrowing of the focus to those events after year one. Using this definition, an overall rate of 26% was found in the study group.

In Table 3.5, the crude analysis identified a possible gender difference for the first time, with women having nearly a 70% increase in likelihood of hospitalization. Several other predisposing factors related to substance abuse and mental health issues also were found to increase risk. Clinic-related enabling factors and clinical need factors were also independently significant. Five significant factors remained after adjustment --- females were nearly 2 times more likely, after controlling for clinical need (e.g. AIDS diagnosis) and clinic size. Interestingly, mental health diagnosis and IDU history were also associated with increased risk.

Table 3.5. Factors Independently Associated with the Probability of Having Medical Hospitalization after the First Year in Care

Explanatory Variables	Crude Analysis			Adjusted Analysis		
	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Predisposing factors:						
Gender (female)	1.69	1.07-2.66	0.02	1.91	1.12-3.26	0.02
Age >40 (in 2002)	1.55	0.94-2.57	0.09	1.03	0.58-1.84	0.91
Black	1.51	0.92-2.48	0.10	1.08	0.54-2.16	0.82
Hispanic	1.33	0.87-2.03	0.19	0.88	0.48-1.59	0.67
Immigrant	0.58	0.32-1.04	0.07	0.55	0.27-1.12	0.09
Active substance abuse	2.14	1.35-3.39	0.001	1.12	0.61-2.03	0.72
Mental health diagnosis	2.28	1.37-3.78	0.001	2.08	1.12-3.89	0.02
Injection drug use history	3.11	1.97-4.91	<.0001	2.51	1.09-5.76	0.03
Hepatitis C -positive	2.47	1.55-3.94	0.0001	0.87	0.41-1.82	0.70
Enabling factors:						
Entered care before 1996	1.06	0.65-1.71	0.82	1.02	0.56-1.84	0.95
Incarceration in study period	0.96	0.49-1.89	0.91	0.48	0.23-1.02	0.56
ID/HIV specialty clinic	2.91	1.68-5.06	<.0001	1.95	0.88-4.43	0.10
Community health center	0.39	0.24-0.61	<.0001	0.48	0.21-1.12	0.09
Clinic with >200 HIV pts	0.72	0.49-1.03	0.07	0.49	0.27-0.88	0.02
MetroBoston clinic	0.69	0.46-1.03	0.07	0.62	0.31-1.12	0.16
Need factors:						
AIDS diagnosis	4.47	2.58-7.73	<.0001	5.06	2.59-9.91	<.0001
CD4 <200 at entry	1.71	1.05-2.79	0.03	0.82	0.43-1.56	0.53

5) Last Recorded CD4 Count less than 200/mm³

The outcome of impaired immune function, as indicated by having a low CD4 count on the final recorded result during the study period, was selected as an indicator for the outcome of HIV treatment; overall, 21% of the study patients had CD4 counts below 200 in their final result. The predictive factors that increased risk from the crude analysis included active substance abuse, IDU history, attending a specialty or hospital-based clinic, and having a low CD4 count at baseline (Table 3.6). After adjustment, only active substance abuse, specialty clinic and low baseline CD4 remained significantly associated with this outcome. Once again, there was no evidence of disparities related to gender, race/ethnicity or nativity status.

Table 3.6. Factors Independently Associated with the Probability of Having Last CD4 Count Less than 200/mm³

Explanatory Variables	Crude Analysis			Adjusted Analysis		
	Odds Ratio	95% CI	p	Odds Ratio	95% CI	p
Predisposing factors:						
Gender (female)	0.83	0.50-1.38	0.47	1.03	0.58-1.83	0.93
Age >40 (in 2002)	1.59	0.90-2.78	0.11	0.95	0.47-1.93	0.89
Black	1.16	0.65-2.08	0.61	0.81	0.36-1.86	0.63
Hispanic	1.22	0.75-1.97	0.42	0.92	0.47-1.83	0.82
Immigrant	0.67	0.35-1.29	0.23	0.47	0.22-1.03	0.06
Active substance abuse	1.83	1.09-3.08	0.02	1.53	0.76-3.06	0.23
Mental health diagnosis	0.78	0.46-1.32	0.36	0.73	0.40-1.33	0.30
Injection drug use history	2.04	1.22-3.42	0.007	2.23	1.05-4.75	0.04
Hepatitis C -positive	1.26	0.75-2.10	0.37	0.56	0.28-1.11	0.09
Enabling factors:						
Entered care before 1996	0.92	0.53-1.59	0.76	1.40	0.75-2.64	0.29
Incarceration in study period	0.88	0.39-1.99	0.75	0.57	0.26-1.23	0.15
ID/HIV specialty clinic	2.53	1.40-4.60	0.002	3.23	1.16-8.95	0.02
Community health center	0.58	0.34-0.97	0.04	1.18	0.46-3.05	0.73
Clinic with >200 HIV pts	0.90	0.59-1.38	0.63	0.67	0.37-1.21	0.18
MetroBoston clinic	0.84	0.53-1.33	0.46	0.80	0.42-1.54	0.51
Need factors*:						
CD4 <200 at entry	5.86	3.36-10.19	<.0001	5.80	3.12-10.78	<.0001

*AIDS diagnosis deleted from the model since CD4 <200 is the equivalent of an AIDS diagnosis

6) Summary of Disparities Analysis

The following tables highlight the findings of the adjusted models for the three process (Table 3.7) and two outcome measures (Table 3.8) related to HIV/AIDS care quality. Clinical need factors, based on entry CD4 count and AIDS diagnosis, were important adjustments to each of the five models. Interestingly, the size of the HIV/AIDS patient caseload at the clinic was also a strong predictor for 3 of 5 of these indicators, with larger clinics having more favorable results. Patient-related predisposing factors linked to IDU or other substance abuse were the most

consistently linked with poor results (e.g. lab monitoring gaps, medical hospitalization and low CD4 at last measure). Care and outcome disparities based on gender or nativity were infrequent; women were found to have excess risk of hospitalization and US natives were found to have increased likelihood of missing medications. No evidence was seen for any race/ethnicity-based disparity in this analysis.

Table 3.7 Predictors of Sub-Standard Quality in Care Process from Adjusted Model

Factors	Inconsistent Care	Inconsistent Labs	Missed Recommended Medications
Predisposing	None	Age <40 Active substance abuse	Born in US/territory
Enabling	Small clinic size (<200 pts) Entered care after 1996	Small clinic size	None
Need	Entry CD4 >200	Entry CD4 >200	AIDS - diagnosis

Table 3.8 Predictors of Poor Health Outcomes from Adjusted Model

Factors	Medical Hospitalization after year 1	Last CD4 <200
Predisposing	IDU history Female Mental health diagnosis	IDU history
Enabling	Small clinic size (<200 pts)	Infectious Disease Clinic
Need	AIDS diagnosis	Entry CD4 <200

4. DISCUSSION

Since early in the HIV/AIDS epidemic, there has been an awareness that the disease was disproportionately occurring among disadvantaged population subgroups. Researchers studying whether the healthcare system is reaching and serving the affected populations in an equitable manner have consistently uncovered disparities based on race/ethnicity and often gender. Concerns that immigrant populations, who account for a growing number of Boston-area HIV/AIDS cases, also face difficulties in accessing the healthcare system have generated interest in evaluating possible nativity-based disparities of HIV/AIDS care. The Title I network-wide clinical quality assurance project has provided a rich longitudinal database from which to assess such healthcare inequities.

There are limitations to the information we analyzed here, however. Since it is based on medical record information, failures to document clearly in the patient chart will result in mistaken impressions from the chart review. Patient characteristics including race/ethnicity and place of birth may be inconsistently determined or incorrectly documented. Patients who attend more than one clinical site for care coordination would possibly be misclassified as having missed visits or laboratory tests. The process measure focused on recommended medication may also have misclassified individuals as taking medications based on record notes, since ongoing adherence to the medications is not measured. Hospitalization information may be incomplete in certain clinical sites, depending on whether the communication system with the local in-patient facilities is functioning well.

Despite these weaknesses that are representative of the chart review process, our database is also uniquely specific to questions of HIV treatment. In designing our data collection instrument, we sought to include important patient characteristics that have been neglected in other studies of this type, specifically country of birth and incarceration history. These factors were found to have explanatory power, and our findings support their inclusion by other researchers in the future as a means of strengthening the validity of multivariate outcome models. In addition, we used a multilevel modeling approach, capable of controlling for differences based on clinic since the effects of different management styles or operational features should also be minimized when assessing disparities.

The most gratifying result that our analysis produced is the lack of any measurable disparities between different racial/ethnic groups. According to the recent Boston Disparities Project Data Report[28], “Boston is an increasingly diverse city, with more than half the population now made

up of Asian, Black and Latino residents. One in every four Bostonians was born outside the United States, and 8.2% of all Bostonians speak little or no English.” Although the BPHC report identified a 10-fold excess rate of AIDS incidence for Black women compared to their white counterparts, we found no evidence for disparity in treatment or outcome measures analyzed here.

Women were not disadvantaged in our results, other than an observed excess risk of medical hospitalization. Higher rates of hospitalization for women with HIV, compared to men, have also been seen in recent data from the multi-practice HIV Research network[29]; in 2000, 22.7% of women had inpatient admission vs. 17.4% of men in their cohort. Also, data from the John Hopkins clinic cohort between 1995 and 2000 found female gender to be associated with higher risk of hospitalization, after adjustment for other important factors[30]

Of interest, these findings reinforce earlier research that highlight the clinical difficulties related to substance abuse as an HIV co-morbidity. Not only does ongoing substance abuse impair continuity of laboratory monitoring, the history of injection drug use is associated with less favorable clinical outcomes in the adjusted models. The relationship of mental health diagnoses with increased risk of medical hospitalization is less obvious, although others have shown a link between depression and poor medication adherence in HIV patients, which may be a factor in clinical progression [31, 32]. We also found that clinical need factors were critically important adjustments for all the models, supporting the value of collecting detailed clinical information over the observation period.

Clinic differences related to caseload size and HIV/Infectious Disease specialization were also found to be important covariates for four of the five measures we analyzed. Larger clinics had more favorable results in terms of the care process (visits and laboratory monitoring) and the hospitalization outcome. Not surprisingly, the specialty clinics, which serve as tertiary care centers for patients with complicated medical needs, were found to have greater likelihood of low CD4 counts. Only medication utilization was found to be unaffected by clinic-level enabling factors.

Finally, the relationship we identified between nativity (e.g. country of birth) and missing recommended HIV-related medications was in a direction that was surprising to some. One assumption is that immigrants face barriers to obtaining care and treatment, including lack of insurance coverage, language difficulties, high levels of HIV-stigma and cultural factors that might impede adoption of Western medical concepts. However, our findings suggest that foreign-born patients were 60% less likely to miss their recommended medications than US natives. This is an intriguing result, and one which supports the concept of the “healthy immigrant” phenomenon

observed in general health measures[33]. According to this theory, individuals who are able to migrate to the US distinguish themselves as being highly motivated, resourceful and possibly more resilient than others from their homeland. In the case of HIV disease, they may be actively seeking medical treatment for their illness as a prime motivation for moving to the US. Another possible interpretation is that some subgroups of US natives with HIV might decline HIV medications based on distrust of the medical establishment or lack of race-specific data to support the medication benefits. Further research will be necessary to clarify the underlying differences.

In conclusion, the Boston EMA's clinical care network of sites appears to be functioning efficiently to provide high quality of primary medical care to a diverse population of patients with HIV/AIDS. Although differences are occasionally seen between racial/ethnic groups or genders in crude, unadjusted analyses, no such disparities are identified in our 4-year observation period when properly controlled models are constructed. Substance abuse-related factors and clinic characteristics are the most important predictors of process and outcome quality deficiencies, after controlling for clinical need differences

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