



*Update Report #38*

# Ancillary Services & Adherence to HIV Medications

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**C.H.A.I.N. REPORT**

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<b>TABLE OF CONTENTS</b>	
Executive Summary .....	2
Introduction .....	2
Data & Methodology .....	5
Table 1.    Comparison of Epidemiological Data with CHAIN Data .....	6
Measuring Outcomes, Ancillary Services, and Other Factors .....	6
Table 2.    Outcome variables .....	7
Table 3.    Measuring Ancillary Services .....	7
Table 4.    Independent Variables .....	8
Analysis & Findings .....	9
Table 5.    Relationship Among Outcome Variables (unadjusted odds ratios) .....	9
Table 6.    Adherence, by Sociodemographic, Health & Risk Characteristics .....	12
Table 7.    Odds Ratios of Outcome Variables, by Ancillary Service .....	13
Table 8.    Odds Ratios of Outcome Variables, by Case Management Models of Care .....	14

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## **Executive Summary**

Given that earlier CHAIN reports and analyses have found significant associations between ancillary services and various health and service-related outcomes, and that there is considerable interest in factors associated with increased adherence to HIV medications, this report extended the analysis to the following question – do ancillary services have a positive effect on increasing adherence?

The fundamental premise of this analysis is that ancillary services should lead to increased levels of appropriate HIV medical care (care that meets minimum preferred practice guidelines), which in turn should lead to increased use of antiretroviral therapies and increased adherence.

Among the key findings of this analysis are the following:

Appropriate medical care is significantly associated with the increased likelihood of being on antiretroviral therapy, but is only tenuously related to the likelihood of being adherent to HIV medications;

There are several sociodemographic characteristics significantly associated with adherence – men, individuals over 50 years old, participants with greater than a high school education, and individuals more recently diagnosed are all more likely to be adherent than comparable groups.

All the ancillary services – housing, drug treatment, professional mental health, case management – are significantly associated with increased reporting of appropriate HIV medical care. Housing and professional mental health treatment, as well as certain case management models, are also associated with increased use of antiretroviral therapy.

None of the ancillary services was associated with a positive impact on increasing adherence to HIV medications. The analysis suggests that ancillary services may demonstrate secondary effects on health outcome “processes,” such as appropriate medical care, but that factors relating to adherence may be too complex to be responsive to services designed to meet other objectives (i.e., finding housing, securing drug treatment, etc.).

## **Introduction**

A number of previous CHAIN reports and papers have examined the benefits of ancillary services and of antiretroviral HIV medications. In Update Report #30 and in the HRSA evaluation report, “Assessing the Impact of Ancillary Services on Entry and Retention to HIV

Medical Care in New York City,” we illustrated the positive impact of ancillary services on getting people into appropriate HIV medical care and maintaining continuity of care. A further analysis of the positive health effects of treating “social comorbidities” – unstable housing, drug abuse, and mental illness – demonstrated how ancillary services increased the level of reported appropriate medical care and decreased the number of in-patient days.

Separately, a number of CHAIN reports have illustrated the trends in the increased use of antiretroviral medications, increased use of the NIH-approved protocol (Highly Active Antiretroviral Therapy, HAART), and the relatively stable proportion of individuals adherent to HIV medications (see Update Reports #1, 12, 14, 19, 20, and 23). Update Report #26, “Declining Mortality Rates and Service Interventions,” demonstrated the positive impact that antiretroviral medications had upon decreasing mortality among individuals in the CHAIN cohort. A recent report, “Medication Adherence and Patient Outcomes” (Update Report #34), explored the positive health impact experienced by adherent CHAIN participants (other than the overall longevity reported in the earlier mortality paper). Interestingly, the only consistent and significant positive effect found was increased CD4 counts; adherence to HIV medications was neither positively nor negatively associated with such other health outcomes as ER use, in-patient use, opportunistic infections, or physical or mental health status.

Across all of these reports, several points have emerged:

- C Ancillary services have been associated with positive health “system” outcomes – more appropriate medical care, more continuous medical care, and less intensive use of services (such as in-patient hospitalization);
- C Since their introduction in 1996, protease inhibitors and other antiviral medications have been widely adopted, and various racial and socioeconomic disparities in antiretroviral use have narrowed or been eliminated;
- C Adherence to these HIV medications has been associated with higher CD4 counts and lower mortality rates.

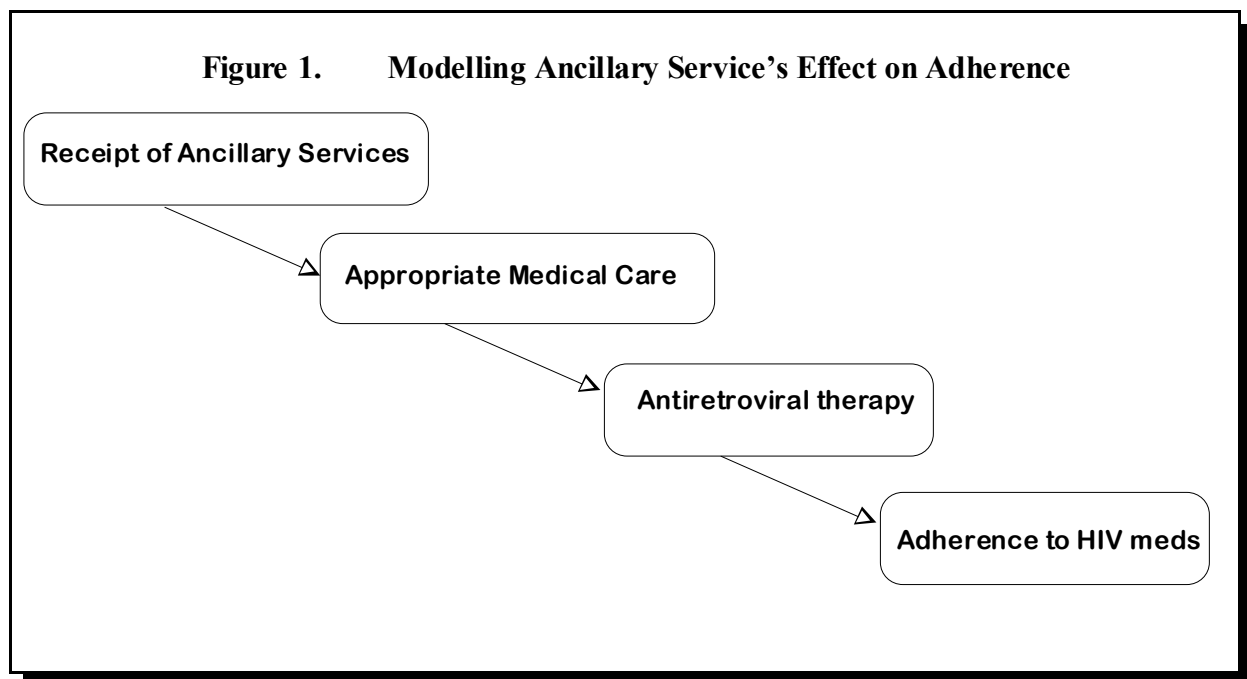
This report extends these analyses by testing a further question – ***Do people who receive ancillary services tend to be more adherent than those who don’t?*** Or, stated another way, do ancillary services exert an independent effect on increasing adherence?

The logic of such questions is predicated on several themes enumerated in the earlier CHAIN reports. First is the relationship between ancillary services and medical care services. Among the rationales for incorporating ancillary services into a comprehensive system of care is that they facilitate system integration by increasing the ease of navigation between different providers, promote greater accountability within a system, and enhance continuity of care within a highly decentralized care system. The principal ancillary services addressing these strategies involve coordinative case managers, agency linkage agreements, and co-location. If the reason

that an individual is not adherent is related to inadequate health education, lapses between primary and specialty medical care in explaining or assisting an individual in being adherent, or insufficient quality assurance mechanisms to detect non-adherence among patients, then perhaps specific ancillary services – such as case management, in particular – might increase adherence. In this scenario, ancillary services work to bolster the system of care that support an individual patient.

A second broad set of rationales for a connection between supportive services and medical outcomes and services is that ancillary services often address behavioral and situational impediments, thereby allowing for greater attention to problems that are not strictly “medical” in nature but that are amenable to non-medical interventions. These behavioral and situational impediments could include unstable housing, mental illness, and substance abuse history, among others. In this situation, ancillary services could eliminate or ameliorate the conditions which prevent or deter an individual from being adherent to HIV medications.

Finally, ancillary services showed their greatest effect when they were associated with higher levels of need for a specific service. As one might expect, the greater the need for a particular service, the greater its impact, once received. Under this scenario, ancillary services serve to eliminate competing needs experienced by an individual, thus freeing the person from factors constraining his or her adherence.



Notwithstanding these potential benefits of ancillary services in increasing adherence to HIV medications, medication adherence involves many complex dynamics. Although non-adherence may be more prevalent among individuals in unstable living conditions (such as those that are unstably housed, current drug users, or mentally ill), there are a number of individual and environmental factors related to a person's decision to be adherent or not. The two most prominent reasons offered by CHAIN respondents who stopped or never used protease inhibitors were experience or fear of side effects, and the belief that the medications were ineffective, unnecessary, or counter-productive. In these cases, adherence is as much related to personal belief systems and an individual's sense of well-being as it is to an individual's relationship with a medical care system or competing needs. The role of ancillary services in directly addressing such reasons for non-adherence seems quite remote. If these are indeed the driving reasons for non-adherence, we would not expect to find a strong positive association between ancillary services and adherence.

Generally speaking, then, the model we have tested, as illustrated in Figure 1, is that ancillary services are hypothesized to operate in stepwise fashion – first by increasing levels of appropriate medical care, which leads to increased use of antiretroviral therapy, and which also lead to adherence to these HIV medications.

## **Data & Methodology**

The CHAIN data set is composed of 967 individuals recruited through a multi-stage sampling strategy and targeted sampling techniques. The baseline cohort of 700 individuals was recruited in 1994-1995 and a refresher cohort of 267 individuals was added in 1998. The cohort is broadly representative of the city's estimated 80,000 HIV-positive population in care (see Table 1), with over-representation of non-Hispanic blacks and a slight under-representation of whites. The research team has conducted seven waves of interviews since the original recruitment, allowing for an interval of approximately six to twelve months between interviews. At each successive wave of interviews a small number of study participants were lost to follow-up. The research team has used a number of resources and strategies to recontact or confirm the status of individuals lost to follow-up, and occasionally an individual who has been lost to follow-up in an earlier wave is recontacted and interviewed at a subsequent wave.

In the two-hour long interviews, conducted in a face-to-face setting by community-based trained interviewers, participants are asked about: (1) their encounters with the health care delivery system, (2) their need for services, (3) their access, utilization and satisfaction with health and social services, (4) key sociodemographic characteristics, (5) informal caregiving from friends, family and volunteers, and (6) their quality of life with respect to health status, psychological and social functioning. A number of items have been added over the years related to antiretroviral therapies, specific medical care services, viral load levels, and other topics of interest to policymakers, planners, providers, and clients on the Title I Planning Council.

**Table 1. Comparison of Epidemiological Data with CHAIN Data**

	Surviving AIDS Cases, NYC†	CHAIN: Wave 7
	Through December, 1999	2000-2001
n	43,150	444
<b>MALE</b>	32,012	238
<i>Non-Hispanic White</i>	27%	19%
<i>Non-Hispanic Black</i>	38%	54%
<i>Hispanic</i>	33%	26%
<i>Other</i>	2%	1%
<b>FEMALE</b>	11,138	206
<i>Non-Hispanic White</i>	12%	5%
<i>Non-Hispanic Black</i>	53%	66%
<i>Hispanic</i>	34%	29%
<i>Other</i>	1%	1%

† NYC DOH Office of AIDS Surveillance, "Estimates of Persons Living with AIDS in NYC, 1999 Edition"

Data for this analysis were drawn from the fifth through seventh waves of CHAIN data, ranging from 1997 through 2001. We restricted the analyses to these years because they allow for comparable measures of adherence. Specific survey questions addressing the new antiretroviral medications and adherence were added to the CHAIN questionnaire in wave 5.

#### *Measuring Outcomes, Ancillary Services, and Other Factors*

Table 2 lists the outcome variables, all of which are scored dichotomously (that is, yes/no). The first outcome, "appropriate medical care," is based on a respondent's reported receipt of specific diagnostic tests (for example, a complete blood test and a complete physical exam) as well as on a minimum number of primary care visits over the prior six-month period. This is intended to measure clinical care that meets preferred practice guidelines established by the NYS AIDS Institute for HIV adult primary care. The complete algorithm can be found in Table A-1 at the end of this report.

**Table 2. Outcome variables**

Indicator	Measurement
<i>Appropriate medical care</i>	Based on number of medical care visits in prior 6 months, self-reported complete physical and blood work, and use of antiretroviral therapy. See Table A-1 at the end of the report for detailed criteria
<i>ARV</i>	On any antiretroviral therapy at time of interview
<i>Adherence to HIV Medications</i>	Self-reported "completely adherent" to HIV medications and no missed pills in 2 days prior to interview

The other two dichotomously coded outcome variables measure a respondent's report of any antiretroviral therapy, regardless as to whether the medications meet the criteria of Highly Active Antiretroviral Therapy (HAART), and any inpatient hospitalization in the past 6 months.

**Table 3. Measuring Ancillary Services**

ANCILLARY SERVICE	MEASURING NEED	CORRESPONDING SERVICES
<i>Drug treatment</i>	Based on problem drug use in past 6 months, measured as problem alcohol use, or any cocaine, crack, or heroin use	Received therapeutic drug treatment, such as methadone maintenance, residential, in-patient, out-patient, detox or therapeutic community
<i>Mental health treatment</i>	Less than 37.0 on the mental components summary scale, a portion of the Medical Outcomes Scale.	Received mental health services from a professional (psychiatrist or psychologist)
<i>Housing services</i>	Current unstable housing, or any episode of unstable housing in past six months. "Unstable" includes doubled up with a friend or relative, in an SRO or "welfare hotel," in drug treatment housing, in a shelter, on the street, in jail or in prison	Received a housing subsidy, lives in specialized AIDS housing (such as scatter-site housing), or received housing services to assist with house/apartment maintenance, landlord/tenant issues, access, etc.
<i>Case mgmt: counseling</i>		Case manager has counseled respondent about personal problems, drug use, safe sex, or combination therapy
<i>Case mgmt: medical referral</i>		Case manager has referred respondent to a specific medical service
<i>Case mgmt: social services</i>		Case manager developed a care plan, coordinated services and entitlements

Table 3 illustrates the strategies used to measure ancillary services. For the purposes of this analysis, three of the ancillary services – housing, drug treatment, and mental health – are associated with the presence of a need for that service, whereas the case management services are measured independent of need. For each of the ancillary services tied to a need, the need was measured contemporaneously with the service. In other words, an individual who reports current drug use and current drug treatment is measured as having an ancillary service, whereas an individual who reports former drug use and current drug treatment is not counted as having the ancillary service. A number of sensitivity analyses were conducted [data not shown] in which the need preceded the receipt of service by one wave of interviewing, and which also included supportive services (such as self-help drug treatment, or supportive mental health services provided by social workers or support groups), but the impact of ancillary services in these situations was attenuated rather than strengthened. Based upon this analysis it was decided to measure service and need contemporaneously.

Table 4 lists the independent variables used in the analyses. Most of the listed variables are scored dichotomously. Among those that are categorical (such as race/ethnicity, with multiple categories), a series of dummy variables were created for the purposes of the multivariate analyses. These factors may be broadly grouped as sociodemographic characteristics (gender, race/ethnicity, age, education, neighborhood poverty), health characteristic (T-cell count), and HIV risk group (MSM, IDU, MSM + IDU, Other). We have also included the interview round as a potential explanatory variable, since this accounts for historical changes over time.

**Table 4. Independent Variables**

<b>Sociodemographic characteristics</b>	
<i>Gender</i>	Respondent's self-report of gender
<i>Race/Ethnicity</i>	Black, non-Hispanic; White, non-Hispanic; Hispanic
<i>Age group</i>	Respondent's age at interview (20-34, 35-49, 50+)
<i>Educational Level</i>	Respondents report less than a high school diploma
<i>High Poverty Community</i>	Residential zip code > 40% population under federal poverty line
<b>Health characteristics</b>	
<i>T-cell count</i>	Self-reported CD4 count (<200, 201-500, >501)
<b>Risk</b>	
<i>HIV risk behavior</i>	Self reported as MSM; MSM + IDU; IDU; Other
<i>Round</i>	Interview round (1-7)



In the final analyses, we used a logistic multivariate regression equation to examine the effects of the specific ancillary services upon appropriate medical care, use of antiretroviral therapies, and adherence to HIV medications, taking into consideration other potential explanatory factors. Table 7 illustrates the increased odds of each of the three outcomes for three ancillary services – housing, drug treatment, and professional mental health. Table 8 documents the increased odds of the outcomes as a result of receiving one of the models of case management – counseling, medical referral, or social service entitlement and care planning. In each of these tables, two odds ratios are presented for each ancillary service. The unadjusted (or crude) odds ratio illustrates the direct association of the ancillary service on the outcome without taking into consideration other explanatory factors. The adjusted odds ratio illustrates the association of the ancillary service on the outcome holding all other factors even. In other words, if there is a significant unadjusted effect of an ancillary service upon an outcome, and this effect is sustained in an adjusted equation, it suggests that the ancillary service does indeed exert an independent effect on the outcome, notwithstanding any of the other factors being considered. If, on the other hand, a significant unadjusted odds ratio loses its significance completely when placed in a regression equation with other explanatory factors, then it suggests that it is the other factors exerting an effect on the outcome rather than the ancillary service.

As illustrated in these two tables, all of the ancillary services exert significant, independent effects on increasing the likelihood of appropriate medical care. Individuals are anywhere from 1.5 to 2.8 times as likely to report appropriate medical care if they have also reported one of the ancillary services. The services associated with specific needs – housing, drug treatment, and mental health – show adjusted odds ratios from 1.5 through 2.1, and just reach levels of statistical significance. The case management models, on the other hand, have adjusted odds ratios that range from 1.7 to 2.8, but are very strongly significant.

In exploring the relationship between ancillary services and use of antiretroviral therapy, the next step in the logical model we are evaluating, ancillary services show a mixed effect. The unadjusted odds ratios for housing and mental health services signify that individuals are 2.3 to 1.9 times as likely to be on antiretroviral therapy if they have these respective ancillary services, but in the adjusted models these services lose their significance. This suggests that some of the other factors have replaced the ancillary services in explaining the association. Two of the case management models, however, counseling and social service planning, both maintain significant odds ratios of 1.7 and 1.8. This suggests that individuals reporting these types of case management are 70 to 80% more likely to also report being on antiretroviral therapy than individuals who don't have these case management services.

In the final stage of this analysis, in which we explored the relationship between ancillary services and adherence to HIV medications, we actually found an inverse relationship. First, most of the ancillary services show minimal or significant relationship with adherence. Second, in those instances where there is a statistically significant association, it appears that people who receive drug treatment, case management counseling, or case managed medical referral, are *less* likely to report adherence than similarly needy individuals who don't report receiving the

ancillary service.

This last finding suggests several possibilities. The first is that the immediate objectives of ancillary services – securing housing, drug treatment, serving mental health needs, coordinating benefits – are too distant from the complex needs of maintaining adherence to complicated medication regimens to be “held accountable” for such adherence. Also, as has been suggested in a number of other reports, the link between ancillary service and adherence may actually be operating in the opposite direction. In other words, individuals who are not adherent may be more likely to come to the attention of agencies and providers because of this and other co-existing needs, and then are provided with the ancillary services. Finally, this analysis has confirmed earlier analyses which demonstrated the strength of ancillary services in increasing the processes of health care, in this situation the report of appropriate medical care and the use of antiretroviral therapies, but the factors which underlie adherence are too complex and nuanced to be responsive to such “distant treatment.”

**Table 6. Adherence, by Sociodemographic, Health & Risk Characteristics (data reported are row percentages)**

	Among individuals on HIV meds (n)	% Adherent	% Not Completely Adherent
<i>Male*</i>	303	66%	34%
<i>Female</i>	217	55%	45%
<i>White, non-Hispanic</i>	73	56%	44%
<i>Black, non-Hispanic</i>	296	60%	40%
<i>Hispanic</i>	144	66%	34%
<i>19-34 years old *</i>	106	53%	47%
<i>35-49 years old</i>	335	61%	39%
<i>50+ years old</i>	79	73%	27%
<i>Less than high school education ^</i>	238	57%	43%
<i>Greater than high school education</i>	282	65%	35%
<i>Lives in high poverty neighborhood</i>	129	64%	36%
<i>Lives in low poverty neighborhood</i>	377	60%	40%
<i>MSM</i>	107	70%	30%
<i>IDU</i>	205	59%	41%
<i>MSM + IDU</i>	40	55%	45%
<i>Other (heterosexual)</i>	168	60%	40%
<i>Less than 200 CD4 count</i>	152	64%	36%
<i>200-500 CD4 count</i>	239	57%	43%
<i>Greater than 500 CD4 count</i>	129	65%	35%
<i>Original cohort, diagnosed before 1994*</i>	306	57%	43%
<i>Refresher cohort, diagnosed after 1994</i>	214	67%	33%

^ p &lt; .10

\* p &lt; .05

\*\* p &lt; .01

\*\*\* p &lt; .001

**Table 7. Odds Ratios of Outcome Variables, by Ancillary Service<sup>1</sup> (NYC CHAIN data, 1994-2001)**

	Housing		Drug Treatment		Mental Health	
	Unadj. <sup>2</sup>	Adj. <sup>3</sup>	Unadj.	Adj.	Unadj.	Adj.
# of Individuals	653	627	520	627	520	627
# Repeated Observations <sup>4</sup>	1,604	1,556	1,079	1,556	1,079	1,556
<b>OUTCOMES</b>						
<i>Appropriate HIV medical care</i>	2.1**	1.8 ^	2.3**	2.1*	2.0**	1.5 ^
<i>On antiretroviral therapy</i>	2.3*	1.8	1.6	1.3	1.9 ^	1.6
<i>Adherent to HIV meds</i>	.57	.56	.51 ^	.54 ^	.78	.70
<sup>^</sup> p < .10	* p < .05		** p < .01		*** p < .001	

Notes

- These odds ratios represent the increased odds that someone who receives one of the specific ancillary services will experience one of the outcomes, when compared with a similarly needy individual who did not receive the ancillary service.
- Unadjusted odds ratios describe the odds (or likelihood) of a particular outcome occurring for individuals in one category compared to individuals grouped in the comparison category. For example, individuals who report therapeutic drug treatment are 2.3 times as likely as individuals who are current drug users but not in drug treatment to also report appropriate medical care.
- Adjusted odds ratios describe odds (or likelihoods) as described above in Note 2, in addition to controlling for other factors which might be associated with the outcome. The factors controlled for include gender, race/ethnicity, age, risk category (i.e., MSM, IDU, MSM+IDU, Heterosexual), education, high poverty neighborhood, cell counts (<200, 201-500, >500), and the round of the interview. For example, individuals reporting drug treatment are half as likely as drug user not in treatment to be adherent to their HIV medications. This significant association between drug treatment and adherence cannot be “explained away” by any of the other factors in the regression equation.
- These logistic regression equations were conducted using a generalized estimation equation, which allows for repeated observations (pooled cross-sectional data) from the same individual over time. The analysis takes into consideration the natural tendency for an individual’s repeated values to bias the results, and controls for this “intra-individual” weighting.

**Table 8. Odds Ratios of Outcome Variables, by Case Management Models of Care <sup>1</sup>**  
(NYC CHAIN data, 1994-2001)

	Case Mgmt: Counseling		Case Mgmt: Medical Referral		Case Mgmt: Social Services	
	Unadj. <sup>2</sup>	Adj. <sup>3</sup>	Unadj.	Adj.	Unadj.	Adj.
# of Individuals	653	627	520	627	520	627
# Repeated Observations <sup>4</sup>	1,604	1,556	1,079	1,556	1,079	1,556
<b>OUTCOMES</b>						
<i>Appropriate HIV medical care</i>	3.2***	2.8***	1.9***	1.7***	2.5***	2.1***
<i>On antiretroviral therapy</i>	1.9***	1.7**	1.3	1.2	2.1***	1.8**
<i>Adherent to HIV meds</i>	.73*	.71*	.70*	.69*	.83	.80
<sup>^</sup> p < .10	* p < .05		** p < .01		*** p < .001	

Notes

1. These odds ratios represent the increased odds that someone who receives one of the specific ancillary services will experience one of the outcomes, when compared with a similarly needy individual who did not receive the ancillary service.
2. Unadjusted odds ratios describe the odds (or likelihood) of a particular outcome occurring for individuals in one category compared to individuals grouped in the comparison category. For example, individuals who report receiving social service planning from a case manager are over twice as likely to report being on antiretroviral therapy as individuals who don't report social service case management.
3. Adjusted odds ratios describe odds (or likelihoods) as described above in Note 2, in addition to controlling for other factors which might be associated with the outcome. The factors controlled for include gender, race/ethnicity, age, risk category (i.e., MSM, IDU, MSM+IDU, Heterosexual), education, high poverty neighborhood, tcell counts (<200, 201-500, >500), and the round of the interview. For example, individuals who report a counseling case manager are nearly three times as likely to also report appropriate medical care as are individuals who don't have a counseling case manager. This significant association between case management model and adherence cannot be "explained away" by any of the other factors in the regression equation.
4. These logistic regression equations were conducted using a generalized estimation equation, which allows for repeated observations (pooled cross-sectional data) from the same individual over time. The analysis takes into consideration the natural tendency for an individual's repeated values to bias the results, and controls for this "intra-individual" weighting.