Evaluation of the Pilot Partnership between HASA and HHC-COBRA

Feasibility Report

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October 10, 2006

This pilot was made possible by the tremendous support of Elsie Del Campo (Executive Deputy Commissioner for HASA), Iris Hernandez (Deputy Commissioner for MICSA) and Joanna Omi (HHC's Senior Assistant Vice President of Corporate Planning and HIV Services). HHC-COBRA Directors Shemell Castro (North Brooklyn Hospital Network), Eishelle Tillery (Queens Hospital Network) and Marlon LeeChong (Metropolitan Hospital) and HASA Directors William Millan (Queensboro Center), Jennifer Carroll (Brownsville Center) and Janice Scott (Greenwood Center) provided invaluable assistance.

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Executive Summary

In February 2005, the COBRA programs at the New York City Health and Hospitals Corporation (HHC) began enrolling clients in a pilot partnership with the HIV/AIDS Services Administration (HASA) of the New York City Human Resources Administration (HRA).

Under the framework of the pilot, the HHC-COBRA programs at the Queens and North Brooklyn Hospital Networks collaborated with HASA to help mutual clients persist in medical and behavioral health care and to meet the long-term housing needs of mutual clients.

Through reciprocal training on the services that each organization provides, distribution of administrative contact lists, case conferences and collection of data on pilot participants, the pilot replaced the informal basis on which HASA and HHC-COBRA programs usually work together with a formal relationship.

By creating a formal working relationship between HASA and HHC-COBRA programs, the pilot:

- eliminated duplication of effort,
- kept clients connected to medical and behavioral health care and
- helped clients who needed to relocate avoid emergency housing.

Specifically, contact lists and case conferences enhanced communication between the organizations and eliminated duplication of effort, while reciprocal training helped case management staff collaborate on the cases of mutual clients.

Enrollment in the pilot increased the average client's probability of keeping a medical appointment by about 25 percentage points. The pilot probably also increased the average client's probability of keeping a mental health appointment. (Differences in the way HHC-COBRA sites define a client's need for mental health treatment may have biased upward our measurement of the degree of success).

The pilot was phenomenally successful in reducing a client's probability of requiring emergency housing. If the clients studied constitute a representative sample of HASA clients, expansion of the pilot to the entire population of HASA clients would cut the incidence of emergency housing to about half of its current level.

This is particularly important because HIV-positive individuals who are unstably housed have a higher probability of intravenous drug use and a higher probability of trading sex for money, drugs or housing (Aidala et al. "Housing Status" 2005) and because homeless HIV-positive individuals utilize emergency rooms and inpatient care more frequently than other HIV-positive individuals (Masson et al. 2004).

Therefore, by reducing the incidence of emergency housing, expansion of the pilot to other HASA sites and HHC facilities has the potential to slow the rate of HIV transmission and reduce the incidence of emergency room visits and hospitalizations among HIV-positive individuals.

Expansion of the pilot also has the potential to substantially reduce HASA expenditures on housing. Such a potential arises because pilot participants who needed to relocate had a lower probability of requiring emergency housing, which is more expensive than private market housing.

Most importantly, by meeting clients' long-term housing needs and by helping clients adhere to medical and behavioral health care, expansion of the pilot to other HASA centers and HHC facilities has the potential to improve clients' quality of life.

Introduction

Background and Importance

HIV-positive patients who receive case management, transportation, mental health treatment and substance abuse treatment tend to persist in medical care longer than patients who do not receive such services (Sherer et al., 2002). Such research suggests that collaboration between medical and social case managers can increase the frequency at which patients keep their HIV primary care appointments and therefore help patients achieve better health outcomes.

In an effort to create the necessary collaboration between medical and social case management teams, the COBRA programs at the New York City Health and Hospitals Corporation (HHC) and the HIV/AIDS Services Administration (HASA) of the New York City Human Resources Administration (HRA) developed a pilot project with the primary goal of helping clients establish and keep their medical appointments. To reach that goal, the pilot also aimed to help clients avoid emergency housing and tried to ensure that clients keep their mental health and substance abuse treatment appointments.

The pilot replaced the informal basis on which HASA and HHC-based COBRA programs usually work together with a formal relationship. The pilot's structure eliminated duplication of effort, reduced HASA expenditures on emergency housing and kept clients connected to medical and behavioral health care.

Because the pilot reduced the probability that clients will require emergency housing, expansion of the pilot to other HASA sites and HHC facilities has the potential to slow the rate of HIV transmission and reduce the incidence of emergency room visits and hospitalizations among HIV-positive individuals.

Such a potential arises because HIV-positive individuals who are unstably housed have a higher probability of intravenous drug use and a higher probability of trading sex for money, drugs or housing (Aidala et al. "Housing Status" 2005) and because homeless HIV-positive individuals utilize emergency rooms and inpatient care more frequently than other HIV-positive individuals (Masson et al. 2004).

Collaboration between Medical and Social Case Managers

Previous research suggests that collaboration between medical and social case managers can improve the health outcomes of patients living with HIV. When social case managers ensure that patients have stable housing and income and when medical case managers ensure that patients receive treatment for any mental health and/or substance abuse issues that they have, their combined efforts enable patients to meet with their physician more regularly and adhere to their regimen of medications.

Patients who adhere more stringently to anti-retroviral therapy tend to have better health outcomes than patients who do not persist in care. Paterson et al. (2000) found that patients who were more adherent to treatment were less likely to develop HIV infections that are resistant to antiretroviral drugs.

Adherence to medication also requires regular consultation with a physician, so a program designed to improve the health outcomes of patients must also ensure that patients keep their HIV primary care appointments regularly.

The degree to which a patient persists in care in turn depends on the support services that he/she receives. Sherer et al. (2002) analyzed clinical data and found that patients who received case management, transportation services, mental health treatment and treatment for chemical dependency were significantly more likely to receive any care, to receive regular care and had more visits than patients that did not

receive those services. Patients in their study who received those services also had higher retention rates than clients who did not receive those services.

Other research has shown that stable housing and social support (i.e. having someone to confide in) also play key roles in increasing the rate at which patients adhere to their regimens of medications. Knowlton et al. (2006) studied the links between housing, social support, antiretroviral therapy and health outcomes in a sample of injection drug users and found that social support plays a major role in facilitating effective use of recommended highly active anti-retroviral therapy (HAART).

Of the participants on HAART, those who received strong social support and stable housing had a much higher probability of achieving an undetectable plasma viral load than those who did not receive strong social support and stable housing (after controlling for other individual, interpersonal and structural factors). Knowlton et al. also found that outpatient drug treatment also increased a patient's probability of having an undetectable plasma viral load, but the effect of drug treatment was not as large as the effects of social support and stable housing.

Goals and Principal Findings

Taken together, the studies cited above suggest that collaboration between medical and social case managers can improve the health outcomes of patients by ensuring that patients have stable housing and income and receive treatment for any mental health and/or substance abuse issues that they have.

The pilot project's primary goal was to improve the health outcomes of participating clients by ensuring that the clients attend at least 80 percent of their HIV primary care appointments. To enable the clients to achieve the desired attendance rate, the pilot also sought to ensure that clients keep mental health and substance abuse treatment appointments and ensure that they obtain permanent housing.

The pilot successfully met these goals. Enrollment in the pilot increased the average client's probability of keeping a medical appointment by about 25 percentage points (a statistically significant increase).

Participants in the pilot also had a much lower probability of requiring emergency housing than clients who were not enrolled in the pilot. In fact, a simulation predicts that expansion of the pilot to the entire population of HASA clients would cut the incidence of emergency housing to about half of its current level. Such a prediction assumes that the clients studied are a representative sample of HASA clients.

The pilot probably also increased a client's probability of keeping a mental health appointment, but the measured increase may have been biased upward by differences in the way HHC-COBRA sites define a client's need for mental health treatment.

Simple averages suggest that there was no statistically significant difference between the rates at which pilot clients and control group clients kept their substance abuse treatment appointments, but the small sample sizes prevented us from making comparisons which hold all other factors constant.

The collaboration between HASA and HHC-COBRA enabled pilot clients to increase the frequency at which they keep their HIV primary care appointments and mental health appointments. Collaboration also reduced the incidence of emergency housing among pilot clients who needed to relocate.

When the pilot project was conceived in late 2003, ensuring that clients obtained and retained Medicaid, Public Assistance and Food Stamps benefits was identified as another need. However, a change in HASA recertification procedures greatly improved benefit retention and obviated the need to focus on this issue.

Why Collaboration Led to Better Outcomes

In interviews, HASA and HHC-COBRA staff and administrators suggested several reasons why pilot participants might achieve better outcomes than clients who are not enrolled in the pilot.

One explanation for the pilot's success is that the pilot improved the working relationship between HASA and HHC-COBRA staff through individual contacts, reciprocal training on the services that each organization provides and distribution of contact lists (so that case managers could quickly reach the appropriate administrative staff at the other organization).

Cooperation between HASA and HHC-COBRA staff eliminated duplication of effort and enabled each organization to specialize in providing its core set of services. HASA and HHC-COBRA share the goal of helping people with HIV/AIDS and their families get the services they need to remain healthy and independent, but they differ in the services that they provide.

HHC-COBRA offers case management with supportive services, such as:

- primary medical care,
- mental health treatment,
- substance abuse treatment and
- counseling.

HASA specializes in issuing welfare benefits such as:

- Medicaid,
- food stamps,
- public assistance and
- housing.

HHC-COBRA provides assistance with housing searches, but is not a housing provider. HASA links clients to medical and behavioral health care, but is not a provider of such services. Consequently, HASA and HHC-COBRA services complement each other and the integration of HASA and HHC-COBRA teams generates a comprehensive case management service.

Case conferences also helped pilot clients achieve better outcomes because clients whose cases were discussed in case conferences came to the attention of the HASA Center Directors, the HHC-COBRA Directors and all of the case management staff. During the conferences, a mutual service plan was discussed and case responsibilities were assigned to prevent duplication of effort. The increased attention and coordinated service delivery then led to a better outcome for those clients.

Another key to the pilot's success was measurement of client outcomes. Collection of data from HASA and HHC-COBRA teams helped each team focus on meeting the pilot's goals.

Details of HASA and HHC-COBRA's Collaboration

Preparatory Work: The preparation that occurred prior to enrollment of clients in the pilot was one of the keys to the pilot's success. One element of the preparatory work was reciprocal training on the services provided by each organization. Several months prior to the start of the pilot, HASA provided a basic one-day orientation on HASA services to HHC-COBRA staff and administrators including Serviceline's intake process, eligibility requirements, housing services, vocational rehabilitation services, emergency housing and Fair Hearings.

Of primary importance was the training and guidance the HHC-COBRA staff was given regarding the inspection of apartments. Knowledge of required documentation enabled HHC-COBRA case managers to find a suitable apartment for pilot clients.

HHC-COBRA administrative staff visited HASA centers to provide half-day training to HASA staff on HHC and HHC-COBRA program services. Conducting the training in the HASA centers involved in the project introduced HHC-COBRA staff to HASA staff and familiarized them with the HASA centers.

Contact List: Distribution of an administrative contact list also enhanced communication between HASA and HHC-COBRA staff. The contact list enabled case managers to easily access information and individuals at the other organization, prevented losses of time and helped case managers tell clients about the services available at the other organization.

The contact list was essential because penetrating a large organization like HASA can be difficult and confusing. Prior to the pilot, many members of the HHC-COBRA staff didn't understand the services HASA provides and they found it difficult to reach HASA case managers. Over the course of the pilot, both HASA and HHC-COBRA staff found that the contact list helped them quickly resolve complicated problems because they could access management staff more easily.

By February 2005 the preparatory work was complete and COBRA case managers at the Woodhull Medical and Mental Health Center in Brooklyn and the Elmhurst Hospital Center in Queens began enrolling HASA clients from the Brownsville, Greenwood and Queensboro sites in the pilot. Over the course of the pilot, a total of 135 clients were enrolled.

Case Conferences: Over the course of the pilot, formal case conferences were held on a monthly basis so that senior HASA and HHC staff could meet with HASA and HHC-COBRA case management staff to discuss some of the more complicated cases and develop a service plan for those clients. For the less complicated cases, HASA and HHC-COBRA case managers held informal case conferences over the telephone or during visits to a client's home.

Case conferences reduced the problem of duplication of effort and enabled HASA and HHC-COBRA staff to focus on providing their organization's core set of services.

Multi-Disciplinary Case Conferences: On two occasions, the pilot convened a multi-disciplinary case conference (MDCC) so that HASA and HHC-COBRA staff and administrators could discuss cases with the clients' primary care physicians and mental health providers.

The MDCCs provided HASA staff and administrators with a unique opportunity to ask questions about their clients' medical and mental health. Such an opportunity was particularly valuable because HASA cannot obtain medical and psychiatric evaluations performed by hospital providers unless the client consents to their release. Even when HASA obtains the necessary release, it only obtains a written record.

By contrast, clients who enroll in HHC-COBRA consent to the release of their medical and mental health records at intake, so HHC-COBRA directors and case managers can speak directly with a client's primary care physician or psychiatrist. Contact is further facilitated by the fact that clients usually receive their medical and mental health care at the same HHC facility where they receive HHC-COBRA services.

HASA has never had such access to a client's primary care physician or psychiatrist, but at the MDCCs, HASA staff and administrators could inquire about clients' progress in medical and mental health care. The face-to-face interaction helped HASA adjust its service plan to meet the clients' medical and mental health needs.

For example, during a discussion between a mental health provider and a HASA center director about one particular client's competency to make decisions, the HASA center director decided to refer the client to HRA's Office of Health and Mental Hygiene for a psychiatric evaluation, which (in this particular client's case) would be used to determine whether or not the client needs a court-appointed guardian.

After the MDCCs, participants were asked to provide their thoughts and opinions about how the MDCC contributed to planning treatment for clients and to explain what they learned from the MDCC. The comments were overwhelmingly positive and tended to stress the different perspective of the client that the participants heard and the comprehensive nature of the service plan that was formed at the MDCC.

Data Collection: Finally, HASA and HHC-COBRA case managers were expected to report on their clients' progress towards meeting the goals of the pilot. The accountability that data reporting provided lent credibility to the project and ensured that HASA and HHC-COBRA delivered on their commitments to clients by reminding case managers of the outcomes clients were expected to achieve.

Summary of Empirical Findings

The reports that HASA and HHC-COBRA case managers provided on pilot clients and an identical set of reports on clients at HHC's Metropolitan Hospital (which served as a control group) were combined with information from HASA's Factors database and Welfare Management System (WMS) database to create the dataset used to evaluate the pilot's success in meeting its goals.

The dataset was used to examine the effects that pilot participation and other variables had on clients' probability of keeping medical and behavioral health care appointments and on clients' probability of entering emergency housing. (Appendix A contains a detailed description of data sources and methodology).

It should be noted that the only appointments data that we could obtain reflects the information that clients provided to their HHC-COBRA case managers. We were unable to obtain more reliable data because HHC-COBRA case managers generally do not schedule appointments for their clients.

Data collected by such a method inevitably contains error, but we do not believe that better data collection would fundamentally alter the results because the majority of clients either kept all of their appointments or didn't schedule any at all. Computerized records would also reflect such a pattern had they been kept.

HIV Primary Care Appointments

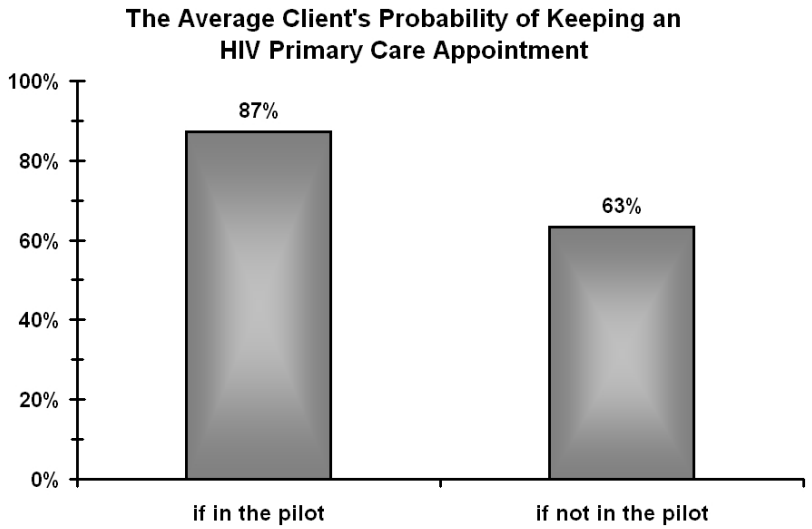
Goal: "Partnership clients will keep at least 80% of their HIV primary care appointments."

By the most conservative estimate, the average client's probability of keeping an HIV primary care appointment was:

- 87 percent if he/she was in the pilot and
- 63 percent if he/she was not in the pilot.

The difference of 24 percentage points is statistically significant.

The responses of pilot clients to a client satisfaction survey support the finding that pilot clients are more likely to make and keep medical appointments. 32 of 42 pilot clients (76 percent) indicated that they began keeping more HIV primary care appointments since they enrolled in the pilot and 38 of 46 pilot



clients (83 percent) indicated that their relationship with their primary care provider improved as a result of the pilot.

In light of Sherer et al.'s (2002) research (discussed above), one can attribute the pilot's success in keeping clients connected with their primary care physicians to the collaborative efforts of HASA and HHC-COBRA to ensure that client's key needs – i.e. housing, income and medical insurance – were met.

The regression analysis also indicates that clients who need substance abuse treatment are less likely to keep their HIV primary care appointments than otherwise identical clients who do not have substance abuse issue. The difference is statistically significant.

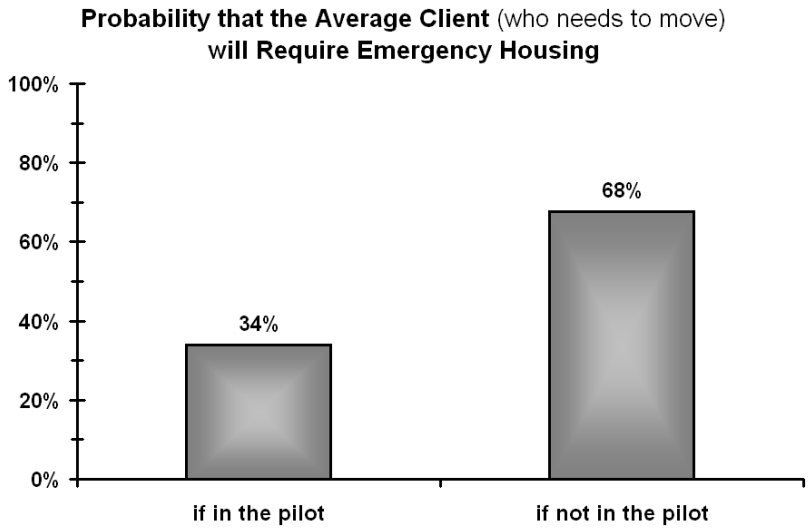
In discussions of this finding, HASA and HHC administrators frequently asked if clients who adhered to substance abuse treatment were more likely to keep their HIV primary care appointments. Unfortunately, our dataset does not have enough chemically dependent clients to examine the relationship between adherence to substance abuse treatment and adherence to HIV primary care.

Sherer et al. studied this relationship and found that HIV-positive patients who needed and received counseling for chemical dependency saw HIV primary care physicians significantly more often than patients who needed but did not receive counseling. Patients who needed and received counseling were initially more likely to receive regular medical care, but were less likely to receive regular medical care in the second year of their study period (as compared to patients who needed but did not receive counseling).

Emergency Housing

Goal: "HASA and HHC-COBRA Case Managers will form a plan for permanent housing and collaborate to obtain permanent housing within 90–180 days of the client's readiness and availability of permanent housing. …"

According to Aidala et al. (CHAIN Update Report #41, 2001), HIV-positive individuals with a history of housing needs who receive housing assistance are much more likely to obtain medical care and persist in care than those who do not get housing assistance. Such a finding helps explain why Knowlton et al. (2006) found that individuals with stable housing had lower viral loads than those who did not. Such research indicates that placement of patients in stable housing supports the pilot's goals of keeping clients connected to medical care and of helping them lead healthier lives.



Stable housing is also less expensive than emergency housing. According to HASA adminstrators, HASA pays a commercial hotel an average of $1620 per month to house a single client on an emergency basis. For comparison, housing a single client in an unsubsidized private market apartment only costs an average of $1017 per month.

In addition to reducing the cost burden imposed on HASA by a high incidence of emergency housing, placing clients in stable housing also has the potential to reduce the rate of transmission of HIV because HIV-positive individuals who are unstably housed are more likely to use intravenous drugs and engage in prostitution (Aidala et al. "Housing Status" 2005).

Because homeless HIV-positive individuals visit emergency rooms and require hospitalizations more frequently than those with some form of housing (Masson et al. 2004), placing clients in stable housing also has the potential to reduce the costs associated with providing acute care to homeless HIV-positive individuals.

Because only 51 clients in our dataset required emergency housing at any point in time, the sample size was too small to evaluate the pilot's success in moving clients out of emergency housing. It was however feasible to examine the pilot's success in preventing clients from requiring emergency housing. The pilot was tremendously successful on this measure.

By the most conservative estimate, the probability that the average client (who needs to move) will require emergency housing was:

- 34 percent if he/she was in the pilot and
- 68 percent if he/she was not in the pilot.

The difference of 34 percentage points is statistically significant.

To estimate the impact that replication of the pilot at all HASA sites would have on the incidence of emergency housing, we assumed that all of the clients in the dataset need to move and computed the expected number of clients who would need emergency housing under two scenarios: one in which all of the clients are enrolled in the pilot and one in which none of the clients are enrolled in the pilot.

The simulation predicts that – if the clients in our dataset are a representative sample of HASA clients – then replication of the pilot at all HASA sites would cut the need for emergency housing in half. More specifically, the scenario in which all clients are enrolled in the pilot yields an expected number of clients

who would need emergency housing that is half as large as the expected number obtained from the scenario in which none of the clients are enrolled.

The assumption that clients in our dataset are a representative sample of HASA clients should not be understated. For example, the regression models that we estimated also indicate that clients who do not speak English well are less likely to require emergency housing than clients who speak English fluently. Therefore, replication of the pilot in predominantly Spanish-speaking neighborhoods will reduce the need for emergency housing in those neighborhoods, but the reductions in those neighborhoods will be smaller than reductions in English-speaking neighborhoods.

The pilot's success in preventing clients from requiring emergency housing can be attributed to both the training that HHC-COBRA staff received on HASA housing guidelines and to the spirit of cooperation that the pilot helped to foster.

Under the framework of the pilot, HHC-COBRA case managers are responsible for assisting with housing searches and work with HASA case managers to develop a plan to place clients in permanent housing. Consequently, the pilot streamlined the assistance a client receives in finding a new place of residence.

Responses to the client satisfaction survey also shed light on the ways in which the pilot helped them obtain permanent housing.

Of the 27 respondents to a question on referrals to permanent housing, 15 pilot clients (56 percent) indicated that they received a referral from HASA and 13 clients (48 percent) indicated that they received a referral from their HHC-COBRA program. Only three clients (11 percent) said that they did not receive a referral from either HASA or HHC-COBRA.

Of the 28 respondents to a question on housing assistance, 18 clients (64 percent) indicated that HASA gave them "a lot" of housing assistance and 23 clients (82 percent) indicated that HHC-COBRA gave them "a lot" of housing assistance.

Mental Health Treatment Appointments

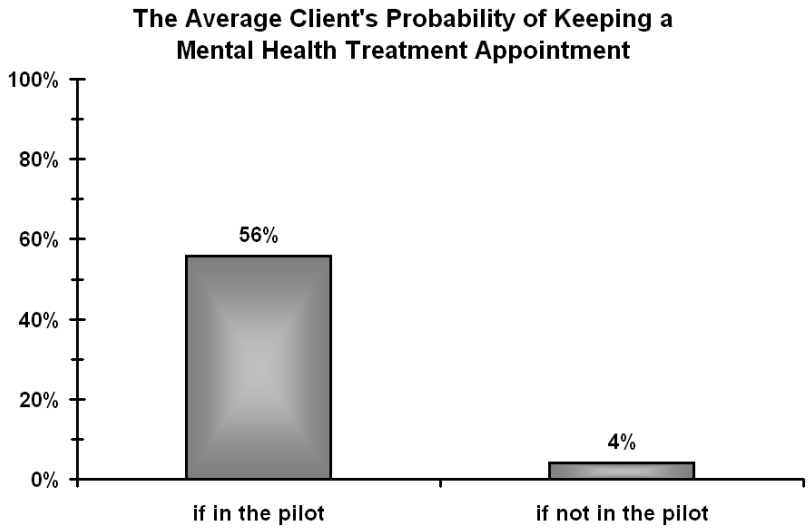
Goal: "Partnership clients will keep at least 70% of their behavioral health treatment appointments where applicable."

Paterson et al. (2000) found that mental illness reduced the rate at which patients adhere to protease inhibitor therapy. Sherer et al. (2002) found that patients whose need for mental health care was met were more likely to receive regular medical care than patients whose need for mental health care went unaddressed. Such research indicates that providing mental health care (when appropriate) keeps clients with mental illness connected to their HIV primary care physicians.

The pilot seems to have significantly increased a client's probability of keeping mental health appointments, but not to the 70 percent level. By the most conservative estimate, the average client's probability of keeping a mental health treatment appointment was:

- 56 percent if he/she was in the pilot and
- 4 percent if he/she was not in the pilot.

The difference of 52 percentage points is statistically significant.



Although the goal of 70 percent was not met, pilot clients were substantially more adherent to mental health treatment than non-pilot clients.

The large difference can be attributed in part to the collaboration between HASA and HHC-COBRA. Of the 19 respondents to a client satisfaction survey question on mental health care, 11 clients (58 percent) said that they began keeping more mental health treatment appointments since they enrolled in the pilot.

However, part of the difference may be attributable to differences in the criteria that HHC-COBRA sites use to determine which clients should be referred to mental health treatment.

To see how differences in criteria may have affected our estimate of the average client's probability of keeping a mental health appointment, imagine that the HHC-COBRA case managers at Metropolitan Hospital (the site of the control group) referred all clients who have borderline mental illness to treatment, while HHC-COBRA case managers at the North Brooklyn and Queens Hospital Networks (the pilot program sites) didn't refer any clients who have borderline mental illness to treatment.

Imagine further that all clients who have borderline cases of mental illness refuse treatment (i.e. they keep zero percent of appointments), while clients who have more severe cases of mental illness keep all of their appointments.

In such a scenario, the efforts of HHC-COBRA case managers at Metropolitan Hospital to place clients in mental health treatment would have reduced the control group's average percentage of appointments kept. Such an extreme scenario is unlikely to have occurred, but it illustrates the way in which the definition of need for mental health treatment can affect the measurement of a client's predicted probability of keeping a mental health treatment appointment.

The regression analysis also indicates that clients who need help managing their finances and clients who need treatment for substance abuse have a lower probability of keeping mental health appointments. Once again, the small number of chemically dependent clients in our dataset prevents us from examining the relationship between adherence to substance abuse treatment and adherence to mental health treatment.

Finally, the regression analysis indicates that motherhood lowers a client's probability of keeping a mental health treatment appointment and that living with another adult increases a client's probability of keeping an appointment. However the two effects do not cancel out. Living with another adult increases a

mother's probability of keeping a mental health treatment appointment, but not to the level that would prevail if she were not a mother.

Substance Abuse Treatment Appointments

Goal: "Partnership clients will keep at least 70% of their behavioral health treatment appointments where applicable."

In a sample of 85 former and current drug users, Arnsten et al. (2002) found that HIV-positive individuals who cope with stress by consuming alcohol and illegal drugs tended to be less adherent to highly active anti-retroviral therapy (HAART) and had higher viral loads. In particular, they found that active cocaine use was strongest predictor of poor adherence. Active users of heroin were also less adherent to therapy, but the difference was not statistically significant.

Other studies have not been able to draw a firm link between substance abuse treatment and adherence to anti-retroviral therapies however. Moatti et al. (2000) found that injection drug users on buprenorphine drug maintenance treatment were more adherent to HAART than former injection drug users. The authors caution however that physicians who treated the sample's patients were very reluctant to prescribe HAART to current injection drug users and may only have prescribed it to the ones who were likely to be adherent to both HAART and drug maintenance.

Sherer et al. (2002) was similarly unable to draw a firm link between substance abuse treatment and retention in medical care. They found that chemically dependent patients who received counseling had a higher number of total visits to their HIV primary care physicians than those who did not receive counseling, but were less likely to receive regular care.

Despite the lack of firm links, one cannot dismiss the possibility that addressing issues of chemical dependency will help clients adhere to anti-retroviral therapy and persist in care. Unfortunately, our dataset doesn't shed any light on the issue. As mentioned previously, the number of clients in our dataset who need substance abuse treatment is too low to examine the relationship between adherence to substance abuse treatment and persistence in medical care.

Two difficulties hampered our ability to examine whether or not participation in the pilot increased clients' probability of keeping substance abuse treatment appointments. First, although pilot clients had a higher average rate of adherence to treatment than control group clients, the difference is not statistically significant because the number of chemically dependent clients in the dataset is too small.

Second, of the 51 clients who need substance abuse treatment, 49 either kept all of their appointments or none at all. The ones who kept all of their appointments were generally in methadone maintenance.

Respondents to the client satisfaction survey did however indicate that the pilot helped them to adhere to substance abuse treatment. Of the 15 respondents, 10 clients (67 percent) said that they began keeping more substance abuse treatment appointments since they enrolled in the pilot.

Conclusion and Recommendations

By creating a formal working relationship between HASA and HHC-COBRA, the pilot program fostered a spirit of cooperation among the case management staff. Contact lists and case conferences enhanced communication between the organizations and eliminated duplication of effort, while reciprocal training on the services that each organization provides helped case management staff collaborate on the cases of mutual clients.

Collaboration between HASA and HHC-COBRA increased pilot participants' probability of keeping a medical appointment. The pilot probably also increased the probability that a client will keep a mental health appointment (although definitional issues cloud the degree of success). Consequently, expansion of the pilot to other HASA centers and HHC facilities has the potential to:

- help clients remain connected to their HIV primary care physicians and
- help clients remain connected to their mental health care providers.

Because the pilot reduced the probability the incidence of emergency housing among participants who needed to move, expansion of the pilot has the potential to:

- substantially reduce HASA expenditures on emergency housing,
- help clients avoid emergency room visits and hospitalizations and
- reduce the rate of HIV transmission.

Although there were not enough clients in our dataset to evaluate the pilot's success in moving clients out of emergency housing, the pilot's success in helping clients avoid emergency housing and the training that HHC-COBRA staff received on HASA housing guidelines indicate that the participation in the pilot has the potential to meet the long-term housing needs of clients residing in emergency housing.

Clients who reside in emergency housing should therefore be encouraged to enroll during the next phase of the pilot. Enrollment should help them obtain long-term medically-appropriate housing, enable them to persist in medical and behavioral health care and – most importantly – improve their quality of life.

Appendix A: Empirical Methods and Findings

Data Sources

Data on participants in the pilot (who were enrolled in HHC-COBRA programs at the North Brooklyn and Queens Hospital Networks) and data on a control group of clients (who were enrolled in the HHC-COBRA program at Metropolitan Hospital) was taken from several sources.

The most important source of data was a "short form" that HASA and HHC-COBRA case managers completed. The "short forms" provided us with basic demographics, language, medical statistics (e.g. viral loads and CD4 counts), information about the clients' living situation, information about whether the client has needs substance abuse and/or mental health treatment, the number of appointments a client made and kept and an assessment of the client's ability to perform the activities of daily living.

HHC-COBRA case managers generally do not schedule appointments for their clients, so the case managers had to obtain appointments data by asking their clients how many appointments they made and kept. Clients who did not schedule any appointments at all were assumed to keep zero percent of their appointments.

Another important source of data was HASA's Factors database. Factors provided us with information on clients housing status and when the date clients were diagnosed as being HIV-positive symptomatic.

Finally, HHC-COBRA records provided us the dates when clients entered the pilot.

Table 1 provides descriptions of the variables created from these data sources.

Model Specifications

For guidance in selecting the variables used in the regression models, we turned to previous research.

Moatti et al. (2000) found that younger clients, clients who consumed alcohol and clients who had negative life–events in the previous six months tended to be less adherent to antiretroviral therapy. Sherer et al. (2002) found that less regular care occurred more frequently among women, younger patients and intravenous drug users.

On the basis of these studies and the data available to us, we decided to include age, gender and substance abuse issue in each of our model specifications. We also chose to control for whether or not the client speaks English well and the degree to which a client needs assistance in managing his/her finances.

We also hypothesized that women may attend care less frequently if they are single mothers, so an alternative specification replaces gender with a variable which indicates whether or not a client is a mother. With one exception, a variable that indicates whether or not the client lives with another adult was included in all model specifications because the other adult may provide assistance in caring for children and may also provide moral support and encouragement to the client.

(We had to exclude the variable that indicates whether or not a client lives with another adult from our regression on a client's probability of keeping a substance abuse treatment appointment to increase the number of included observations).

We also observed a positive correlation between the need for substance abuse treatment and the need for mental health treatment (the simple correlation coefficient for these two dummy variables is 41 percent). Of the 51 clients who need substance abuse treatment, 34 also need mental health treatment. To avoid introducing near singularity into the covariance matrix and to discern whether it is substance abuse or mental illness which affects a client's probability of keeping an appointment or need for emergency housing, we decided not to include both substance abuse treatment needs and mental health treatment needs in the same regression specification.

Finally, many clients kept all of their HIV primary care, mental health appointments and substance abuse treatment appointments. Many others did not schedule any appointments at all. Consequently, the modes occur at 0 and 100 percent, but there is also a relatively large number of clients who kept some, but not all, of their appointments.

Since standard binary choice models assume a symmetric unimodal density function (i.e. one that predicts that the majority of observations will lie close to their mean), we had to use a distribution that yields a bimodal density function, because a bimodal density function predicts more observations far from the mean than observations close to the mean (Appendix B describes the specific distribution that we used).

Empirical Findings

HIV Primary Care Appointments

According to the second column of regression results in Table 3a, the average client has an 87.3 percent probability of keeping an HIV primary care appointment if he/she is in the pilot and a 63.3 percent probability if he/she is a client in the control group at the Metropolitan Hospital.

The 23.9 percentage point difference (standard error: 8.3 percentage points) is the smallest predicted difference. Different specifications suggest that the pilot was slightly more successful.

The estimated coefficients (in the upper panel) that have stars next to them are the variables that have a statistically significant effect on the dependent variable (in this case: the frequency at which a client kept HIV primary care appointments). Statistical significance essentially means that there is a high degree of certainty that the coefficient is not zero.

In this case, the only two statistically significant variables are "Met client" and "needs SA treatment."

The fact that the estimated coefficient of "Met client" is negative means that clients at Metropolitan Hospital (i.e. clients in the control group) have a lower probability of keeping HIV primary care appointments than otherwise identical clients in the pilot.

Similarly, the fact that the estimated coefficient of "needs SA treatment" is negative means that clients who have a substance abuse issue have a lower probability of keeping HIV primary care appointments than otherwise identical clients who do not have substance abuse issue.

The F-statistics in Table 3b indicate that standard logit models (which assume a symmetric unimodal density function) do not explain a significant portion of the variation in the percentage of appointments kept (expressed as the log of an odds ratio) because so many clients kept either all or none of their HIV primary care appointments.

Emergency Housing

As discussed in the body of this report, the pilot's record in keeping clients out of emergency housing was phenomenal. By the most conservative estimate (in the rightmost column of Table 4a), the average client who needed to move had a 67.6 percent probability of requiring emergency housing if he/she was not in the pilot and a 34.0 percent probability of requiring emergency housing if he/she was in the pilot (a difference of 33.5 percentage points, with a standard error of 13.9 percentage points).

To estimate the reduction in the number of clients who need emergency housing, we assumed that all clients in the dataset need to relocate and used the estimated coefficients (in Table 4a) to compute each client's probability of requiring emergency housing under a scenario in which each client is enrolled in the pilot and under a scenario in which no client is enrolled in the pilot.

Because each observation is independent (one client's housing status does not affect another's), summation of the probabilities yields the expected number of clients who will need emergency housing.

The results of the simulation (listed in Table 4c) show that the scenario in which all clients are enrolled in the pilot has half the expected number of clients who would need emergency housing as the scenario in which none of the clients are enrolled.

Because the clients enrolled in the pilot live in Brooklyn and Queens, while the clients in the control group live in Upper Manhattan, we also checked to make sure that the regressions did not pick up a "borough effect." In other words, we checked to make sure that clients in the control group were not more likely to end up in emergency housing simply because they live in the relatively more expensive Upper Manhattan location.

To perform such a check, we included the "Met client" variable in the regression (Table 4b). The "client in pilot before move" variable controls for whether or not the client was enrolled in the pilot for at least one month before he/she moved, while the "Met client" variable controls for a client's borough of residence.

Simple t-tests indicate that the coefficient on "client in pilot before move" is negative and statistically significant, while the "Met client" coefficient is not statistically significant. Furthermore, the likelihood ratio test statistics also indicate that the "Met client" variable should be excluded from the model while the "client in pilot before move" variable should be included.

On the basis of such tests, we can conclude that it is enrollment in the pilot that reduces a client's probability of requiring emergency housing and not a "borough effect."

Finally, the coefficient on the "non-English" was also negative and statistically significant, which indicates that clients who do not speak English well have a lower probability of requiring emergency housing than clients who do speak English well.

Mental Health Treatment Appointments

According to the rightmost column of Table 5a, the average pilot client had a 55.7 percent probability of keeping a mental health appointment, which substantially higher than the 4.1 percent predicted probability for an identical client at Metropolitan Hospital – a difference of 51.6 percentage points (standard error: 5.6 percentage points). The alternative model specification predicts slightly more success.

Although the predicted probabilities of 4.1 and 55.7 percent are consistent with the respective averages of 19.6 and 53.0 percent (see Table 2), there is reason to be skeptical about this result.

While the pilot may have had a positive effect on a client's probability of keeping mental health appointments, something other than the pilot seems to be influencing the predicted probabilities.

For example, consider a client who has borderline mental illness who refuses treatment (despite a case manager's referral). Since the client has borderline mental illness, it is by no means clear whether that client should be classified as needing treatment or not.

If the staff at Metropolitan reported more clients with borderline mental illness than the staff at North Brooklyn and Queens, then Metropolitan would have a larger share of refusals and Metropolitan's average percentage of appointments kept would be lower.

Examining the other variables in the regression, it is interesting to note that the coefficient on "mother" is negative but larger in absolute value than the coefficient on "lives with adult." This suggests that mothers have a lower probability of keeping mental health appointments. Living with another adult increases a mother's probability of keeping an appointment, but not enough to overcome the effect of being a mother (the sum of the two coefficients is equal to –0.055 and the standard error of that sum is 0.478).

Finally, one can also see that clients who need treatment for substance abuse and clients who need help managing their finances have a lower probability of keeping mental health appointments.

Although the regression results in Table 5b indicate that standard logit models explain a significant portion of the variance of the percentage of appointments kept (expressed as the log of an odds ratio), the estimates should be based on a distribution which predicts that there will be more observations far from the mean than observations close to the mean because the majority of clients either kept all of their appointments or refused treatment (i.e. which is equivalent to keeping zero appointments).

The advantage of the bimodal logit model can be seen by comparing R-squared statistics. The bimodal logit model explains about half of the variation in the dependent variable, while the standard logit model only explains about a quarter of the variation.

Substance Abuse Treatment Appointments

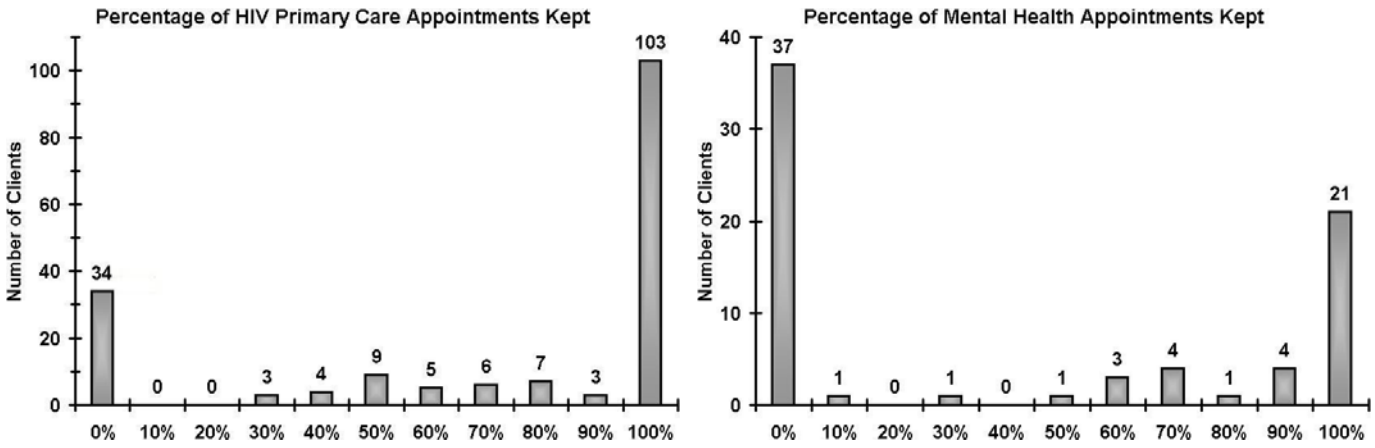
Of the 32 pilot clients who need substance abuse treatment (and for whom we have data), 14 kept all of their appointments (i.e. 44 percent). Of the 17 clients in the control group at Metropolitan Hospital who need substance abuse treatment, 5 kept their appointment (i.e. 29 percent). The 14 percentage point difference is not statistically significant from zero because the standard error of the difference is also 14 percentage points.

Attempts to use regression analysis to control for other factors that may have contributed to the difference in the percentage of clients who kept all of their appointments were unsuccessful. The low likelihood ratio statistics of the estimated models (in Table 6) indicate that we cannot reject the hypothesis that none of the variables has an effect on a client's probability of keeping a substance abuse treatment appointment.

There are two reasons for the lack of statistical significance. One is the small sample size. The sample only has 51 clients who need substance abuse treatment. The other reason is methadone maintenance treatment. Of the few observations that we do have, most of the clients in the sample don't keep any appointments at all and those who do keep appointments are usually going for methadone maintenance.

Appendix B: the Bimodal Logit Model

As mentioned in the text of this report, many clients kept all of their HIV primary care and mental health treatment appointments, while many others did not schedule any appointments at all. There's also a large number of clients that kept some, but not all, of their appointments.



The bimodality in the appointments series may be a form of "state dependence," which would arise if a client's decision to keep an appointment depends on whether or not he/she kept a previous appointment. Unfortunately, the available data does not allow us to estimate an intertemporal binary choice model because we only have information on the percentage of appointments made and kept. (Case managers often schedule a client's initial appointment, but generally do not schedule follow-up appointments).

Since the largest numbers of observations occur at 0 and 100 percent, we need to assume that each client's true probability of keeping an appointment is at least 5 percent and at most 95 percent.

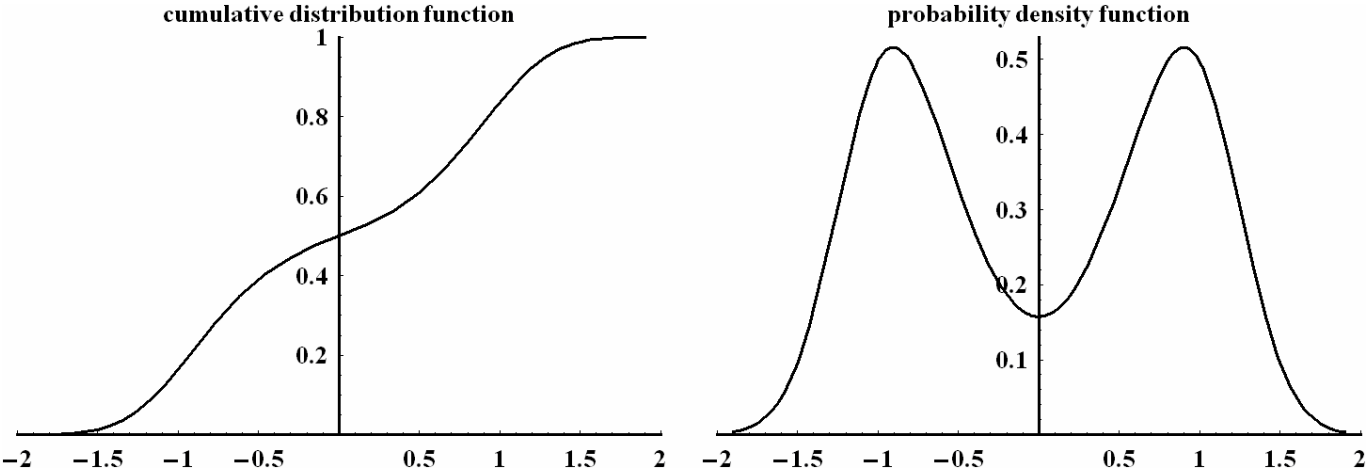
We also need a probability density function (pdf) which predicts that there will be more observations far from the mean than observations close to the mean. Fortunately, a slight modification of the logistic distribution yields a viable pdf. The cumulative distribution

$$\text{Prob}(Y=1)=\frac{\exp\left((\boldsymbol{\beta}'\mathbf{x})^3+\gamma\boldsymbol{\beta}'\mathbf{x}\right)}{1+\exp\left((\boldsymbol{\beta}'\mathbf{x})^3+\gamma\boldsymbol{\beta}'\mathbf{x}\right)}=\Lambda(\boldsymbol{\beta}'\mathbf{x}) \qquad \text{where}: 0<\gamma<2.289$$

has the bimodal density function:

$$\lambda(\boldsymbol{\beta}'\mathbf{x})\equiv\frac{d\,\Lambda(\boldsymbol{\beta}'\mathbf{x})}{d\,(\boldsymbol{\beta}'\mathbf{x})}=\left(3(\boldsymbol{\beta}'\mathbf{x})^2+\gamma\right)\Lambda(\boldsymbol{\beta}'\mathbf{x})(1-\Lambda(\boldsymbol{\beta}'\mathbf{x}))$$

Just as weighted least squares can be used in standard logit models, weighted least squares can also be used in the bimodal logit model. The weights in the bimodal logit model differ from those in the standard logit model however.



According to basic statistics, the expected value of the observed probability, P_i, is equal to the true probability, π_i. The expected value of the error term, ε_i, therefore is zero. The variance of the error term however depends on the probability itself and the number of observations, n_i. Specifically:

$$P_i = \pi_i + \varepsilon_i \qquad \text{where: } E[\varepsilon_i] = 0 \qquad \text{and} \qquad Var[\varepsilon_i] = \frac{\pi_i(1-\pi_i)}{n_i}$$

Consequently, the error terms from an ordinary least squares regression will not have constant variance (i.e. heteroscedascity will be present).

Greene (2000, p. 834-36) suggests a weighted least squares framework that we can use to correct for the heteroscedascity of the error terms. He uses the fact that the cumulative distribution (in our case: $\Lambda(\boldsymbol{\beta}'\mathbf{x})$) has an inverse (because it is a monotonically increasing function of $\boldsymbol{\beta}'\mathbf{x}$) to obtain the expected value and variance of the error terms.

The inverse of $\Lambda(\boldsymbol{\beta}'\mathbf{x_i}) = \pi_i$ is written as $\Lambda^{-1}(\pi_i) = \boldsymbol{\beta}'\mathbf{x_i}$. By the inverse function rule:

$$\frac{d\,\Lambda^{-1}(\pi_i)}{d\,\pi_i} = \frac{1}{d\,\pi_i / d\,\Lambda^{-1}(\pi_i)} = \frac{1}{d\,\Lambda(\boldsymbol{\beta}'\mathbf{x_i}) / d\,(\boldsymbol{\beta}'\mathbf{x_i})} \equiv \frac{1}{\lambda(\boldsymbol{\beta}'\mathbf{x_i})}$$

Greene's framework calls for us to take a Taylor series approximation to the function $\Lambda^{-1}(P_i)$ around the point where $P_i = \pi_i$

$$\Lambda^{-1}(P_i) \approx \Lambda^{-1}(\pi_i) + \frac{d\,\Lambda^{-1}(\pi_i)}{d\,\pi_i}(P_i - \pi_i)$$

to obtain the regression equation:

$$\Lambda^{-1}(P_i) \approx \boldsymbol{\beta}'\mathbf{x_i} + \frac{\varepsilon_i}{\lambda_i} \qquad \text{where: } \lambda_i \equiv \lambda(\boldsymbol{\beta}'\mathbf{x_i})$$

The form of the cumulative distribution function prevents us from estimating such an equation however because $\Lambda^{-1}(P_i)$ is not equal to the log of the odds ratio. Making use of the fact that:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \Lambda^{-1}(P_i)^3 + \gamma\,\Lambda^{-1}(P_i)$$

and rewriting Greene's equation as:

$$\Lambda^{-1}(P_i)^3 + \gamma\cdot\Lambda^{-1}(P_i) \approx \left(\boldsymbol{\beta}'\mathbf{x_i} + \frac{\varepsilon_i}{\lambda_i}\right)^3 + \gamma\left(\boldsymbol{\beta}'\mathbf{x_i} + \frac{\varepsilon_i}{\lambda_i}\right)$$

we obtain the bimodal logit regression equation:

$$\ln\left(\frac{P_i}{1-P_i}\right) = (\boldsymbol{\beta}'\mathbf{x_i})^3 + \gamma\,\boldsymbol{\beta}'\mathbf{x_i} + u_i \qquad \text{where:}\quad u_i \equiv \frac{\varepsilon_i}{\lambda_i}\left((\boldsymbol{\beta}'\mathbf{x_i})^2 + \gamma + 3\,\boldsymbol{\beta}'\mathbf{x_i}\frac{\varepsilon_i}{\lambda_i} + \left(\frac{\varepsilon_i}{\lambda_i}\right)^2\right)$$

The residual, u_i, is equal to zero in expectation, $E[u_i] = 0$, because $E[\varepsilon_i] = 0$.

The residual variance, $\mathrm{Var}[u_i] = E[u_i^2]$, depends on the second through sixth moments of ε_i. These moments can be obtained by making use of the moment generating function for the binomial distribution:

$$\psi(t) = \pi\,e^t + (1-\pi)$$

After replacing π_i with Λ_i, the residual variance simplifies to:

$$\begin{aligned}
\mathrm{Var}[u_i] = {} & \frac{1}{n_i\Lambda_i(1-\Lambda_i)} + \frac{6\,\boldsymbol{\beta}'\mathbf{x_i}(1-2\Lambda_i)}{\left(3(\boldsymbol{\beta}'\mathbf{x_i})^2+\gamma\right)^2 n_i^2\Lambda_i^2(1-\Lambda_i)^2} \\
& + \frac{\left(15\,(\boldsymbol{\beta}'\mathbf{x_i})^2 + 2\,\gamma\right)\left[1+3\,(n_i-2)\Lambda_i(1-\Lambda_i)\right]}{\left(3(\boldsymbol{\beta}'\mathbf{x_i})^2+\gamma\right)^4 n_i^3\Lambda_i^3(1-\Lambda_i)^3} \\
& + \frac{6\,\boldsymbol{\beta}'\mathbf{x_i}(1-2\Lambda_i)\left[1+2\,(5n_i-6)\Lambda_i(1-\Lambda_i)\right]}{\left(3(\boldsymbol{\beta}'\mathbf{x_i})^2+\gamma\right)^5 n_i^4\Lambda_i^4(1-\Lambda_i)^4} \\
& + \frac{1+5\,\Lambda_i(1-\Lambda_i)\left[5n_i-6+(24+n_i(3n_i-26))\Lambda_i(1-\Lambda_i)\right]}{\left(3(\boldsymbol{\beta}'\mathbf{x_i})^2+\gamma\right)^6 n_i^5\Lambda_i^5(1-\Lambda_i)^5}
\end{aligned}$$

Using the weighted least squares approach, each variable in the regression should be multiplied by:

$$w_i = \frac{1}{\sqrt{Var[u_i]}}$$

There are two difficulties in calculating this weight. The first difficulty is that we rarely received information on the total number of appointments scheduled, n_i. In cases where the total number was reported, it was positively correlated with the percentage of appointments that the client kept. To overcome this difficulty, we simply set $n_i = 1$ for all individuals.

The other difficulty is that we do not know the values of Λ_i and $\boldsymbol{\beta}'\mathbf{x_i}$ prior to running the regression.

To overcome this difficulty, Greene suggests a two-step procedure. First, we run an unweighted regression of the log of the odds ratio, which produces consistent but inefficient estimates of the vector of parameter values, $\boldsymbol{\beta}$. (In other words, the estimated parameters from the unweighted regression will lie close to their true values, but the large variance of the estimated parameters reduces our certainty that the estimated parameters lie close to their true values).

Nonetheless, the prediction of an individual's probability of keeping an appointment (obtained from the first-step parameter estimates), $\hat{\Lambda}_i^{(1)}$, should lie closer to the true probability, π_i, than the observed percentage of appointments kept, P_i. Therefore, we can replace Λ_i with $\hat{\Lambda}_i^{(1)}$. Similarly, the first-step's estimated parameter vector, $\hat{\boldsymbol{\beta}}^{(1)}$, can replace $\boldsymbol{\beta}$. These replacements yield a good approximation of the true weight, w_i, and the approximated weight, $\hat{w}_i$, can be used in the second-step regression equation:

$$\hat{w}_i \ln\left(\frac{P_i}{1-P_i}\right) = \hat{w}_i\left(\left(\boldsymbol{\beta}'\mathbf{x_i}\right)^3 + \gamma\boldsymbol{\beta}'\mathbf{x_i}\right) + \hat{w}_i u_i$$

Up to this point, we have not yet discussed the scalar γ. In principal, we can choose any positive value below 2.289 for γ, but a convenient value is $\gamma = \sqrt[3]{0.25} \approx 0.63$.

Define: $\hat{y}_i \equiv \ln\left(\frac{\hat{\Lambda}_i}{1-\hat{\Lambda}_i}\right)$, so that we can write: $\hat{y}_i = \left(\hat{\boldsymbol{\beta}}'\mathbf{x_i}\right)^3 + \gamma\,\hat{\boldsymbol{\beta}}'\mathbf{x_i}$. When $\gamma = \sqrt[3]{0.25}$,

$$\hat{\boldsymbol{\beta}}'\mathbf{x_i} = \frac{-3 + \sqrt[3]{9}\left(9\hat{y}_i + \sqrt{3 + 81\hat{y}_i^2}\right)^{2/3}}{3\sqrt[3]{6}\left(9\hat{y}_i + \sqrt{3 + 81\hat{y}_i^2}\right)^{1/3}}$$

The formula above allows us to obtain the value of $\hat{\boldsymbol{\beta}}'\mathbf{x_i}$ from the predicted value of the log of the odds ratio, which is sometimes easier than setting up the vector product $\hat{\boldsymbol{\beta}}'\mathbf{x_i}$ each time we need it.

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Table 1 – descriptions of the variables

variable	description
percentage of HIV primary care appts. kept (expressed as log of odds ratio)	natural log of the ratio of the percentage of HIV primary care appointments kept to the percentage of appointments not kept (source: “short forms”). The percentage is assumed to be 95 percent for clients who kept all appointments and 5 percent for clients who either did not keep any appointments or refused treatment.
percentage of mental health appts. kept (expressed as log of odds ratio)	natural log of the ratio of the percentage of mental health treatment appointments kept to the percentage of appointments not kept (source: “short forms”). The percentage is assumed to be 95 percent for clients who kept all appointments and 5 percent for clients who either did not keep any appointments or refused treatment.
client kept all SA treatment appts.	a dummy variable which is equal to one if the client kept all of his/her substance abuse treatment appointments and is equal to zero if the client either did not keep any appointments at all or refused treatment (source: “short forms”)
client required emergency housing (given that client moved)	a dummy variable which is equal to one if the client required emergency housing and is equal to zero if the client did not require emergency housing when he/she moved from one residence to another. The variable takes no value if the client did not move. (source: Factors database)
Met client	a dummy variable which is equal to one if the client is a client at Metropolitan Hospital (the control group)
client in pilot before move	a dummy variable which is equal to one if the client entered the pilot at least one month before he/she moved (sources: COBRA records and Factors database)
age	the client's age in years (sources: “short forms” and Factors database)
female	a dummy variable which is equal to one if the client is female (sources: “short forms” and Factors database)
family case	a dummy variable which is equal to one if the client's case is a family case (source: Factors database)
mother	dummy variable which is equal to one if the client is both female and has a family case (i.e. the product of the “female” dummy and the “family case” dummy)
non-English	a dummy variable which is equal to one if the client's primary language is not English and the client is not bilingual (source: “short forms”)
lives with adult	a dummy variable which is equal to one if the client lives with another adult (source: “short forms”)
needs SA treatment	a dummy variable which is equal to one if the client needs substance abuse treatment (source: “short forms”)
needs MH treatment	a dummy variable which is equal to one if the client needs mental health treatment (source: “short forms”)
needs financial mgmt. assistance	the degree of assistance the client needs to manage his/her finances. The variable is equal to zero if the client doesn't require any assistance, is equal to one if the client requires some assistance and is equal to two if the client requires total assistance. (source: “short forms”)

Table 2 -- summary statistics

	Metropolitan			pilot			all clients		
	total	average	std. dev.	total	average	std. dev.	total	average	std. dev.
Met clients	66 of 201	32.8%							
pilot clients				135 of 201	67.2%				
age		45.8	12.1		46.1	9.8		46.0	10.6
female	28 of 66	42.4%		68 of 135	50.4%		96 of 201	47.8%	
family case	15 of 63	23.8%		21 of 130	16.2%		36 of 193	18.7%	
mother	10 of 63	15.9%		20 of 130	15.4%		30 of 193	15.5%	
non-English	18 of 66	27.3%		36 of 135	26.7%		54 of 201	26.9%	
lives with adult	49 of 66	74.2%		108 of 135	80.0%		157 of 201	78.1%	
needs SA treatment	17 of 55	30.9%		34 of 126	27.0%		51 of 181	28.2%	
needs MH treatment	22 of 57	38.6%		52 of 124	41.9%		74 of 181	40.9%	
needs financial mgmt. assistance		0.030	0.246		0.125	0.421		0.091	0.371
percentage of HIV primary care appts. kept		58.1%	30.0%		76.5%	27.9%		69.5%	28.7%
percentage of mental health appts. kept		19.6%	27.2%		53.0%	27.6%		42.9%	27.5%
clients who kept all substance abuse appts.	5 of 17	29.4%		14 of 32	43.8%		19 of 49	38.8%	
clients who required emergency housing (given that client moved)	21 of 37	56.8%		28 of 53	52.8%		49 of 90	54.4%	
clients in pilot before move				22 of 53	41.5%				
pilot clients who required emergency housing				6 of 22	27.3%				

Table 3a
dependent variable: percentage of HIV primary care appts. kept (expressed as log of odds ratio)
two-step weighted least squares bimodal logit model

constant	**1.123 *****	**1.300 *****	**1.096 *****	**1.282 *****
std. error	0.271	0.330	0.251	0.286
Met client	**-0.578 ****	**-0.505 ****	**-0.580 ****	**-0.561 ****
std. error	0.259	0.214	0.250	0.232
age	**0.000**	**-0.003**	**0.001**	**-0.002**
std. error	0.005	0.004	0.005	0.004
female	**0.018**	**0.032**		
std. error	0.102	0.096		
family case	**-0.084**	**-0.089**		
std. error	0.213	0.271		
mother			**-0.110**	**-0.113**
std. error			0.193	0.222
non-English	**0.093**	**0.120**	**0.090**	**0.139**
std. error	0.113	0.104	0.112	0.102
lives with adult	**0.014**	**-0.045**	**-0.007**	**-0.097**
std. error	0.213	0.265	0.189	0.208
needs SA treatment	**-0.240 ****		**-0.258 ****	
std. error	0.121		0.122	
needs MH treatment		**-0.075**		**-0.061**
std. error		0.090		0.086
needs financial mgmt. assistance	**-0.108**	**-0.576**	**-0.101**	**-0.600**
std. error	0.156	0.573	0.147	0.621
std. deviation of dep. var.	0.979	0.996	0.981	1.004
std. error of regression	0.898	0.905	0.891	0.902
F-statistic	4.427	4.864	5.379	6.012
probability(F-stat.)	0.0% ***	0.0% ***	0.0% ***	0.0% ***
R-squared	20.5%	21.9%	21.4%	23.1%
adjusted R-squared	15.9%	17.4%	17.5%	19.3%
observations	146	148	146	148
predicted probability, Met client = 1	60.8%	63.3%	61.0%	62.2%
predicted probability, Met client = 0	87.3%	87.3%	87.7%	88.3%
marginal effect	**-26.5% *****	**-23.9% *****	**-26.7% *****	**-26.2% *****
std. error	8.7%	8.3%	8.6%	8.4%

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 3b
dependent variable: percentage of HIV primary care appts. kept (expressed as log of odds ratio)
two-step weighted least squares standard logit model

constant	**1.833**	**1.528**	**1.792**	**1.726**
std. error	1.127	1.112	1.086	1.075
Met client	**-1.337 *****	**-1.389 *****	**-1.385 *****	**-1.446 *****
std. error	0.404	0.401	0.405	0.403
age	**0.023**	**0.023**	**0.016**	**0.015**
std. error	0.020	0.020	0.020	0.020
female	**0.135**	**0.370**		
std. error	0.435	0.439		
family case	**-1.374 ***	**-1.329 ***		
std. error	0.731	0.701		
mother			**-0.960**	**-0.968**
std. error			0.774	0.737
non-English	**0.391**	**0.353**	**0.223**	**0.143**
std. error	0.492	0.475	0.493	0.478
lives with adult	**-0.783**	**-0.446**	**-0.420**	**-0.188**
std. error	0.755	0.730	0.715	0.689
needs SA treatment	**-0.533**		**-0.417**	
std. error	0.435		0.429	
needs MH treatment		**-0.430**		**-0.231**
std. error		0.403		0.393
needs financial mgmt. assistance	**-0.781 ***	**-0.800 ***	**-0.729**	**-0.699**
std. error	0.449	0.430	0.442	0.426
std. deviation of dep. var.	0.910	0.909	0.908	0.909
std. error of regression	0.906	0.900	0.910	0.906
F-statistic	1.153	1.350	0.910	1.134
probability(F-stat.)	33.2%	22.4%	50.1%	34.6%
R-squared	6.3%	7.2%	4.4%	5.4%
adjusted R-squared	0.8%	1.9%	-0.4%	0.6%
observations	146	148	146	148

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 4a
dependent variable: client required emergency housing (given that client moved)
binary logit model

constant	**0.247**	**0.575**	**0.783**	**1.090**
std. error	1.570	1.542	1.688	1.651
client in pilot before move	**-1.499 ****	**-1.445 ****	**-1.443 ****	**-1.396 ****
std. error	0.670	0.630	0.656	0.624
age	**0.007**	**0.015**	**0.006**	**0.012**
std. error	0.030	0.029	0.030	0.029
female	**0.035**	**0.111**		
std. error	0.623	0.592		
family case	**-0.030**	**-0.759**		
std. error	1.123	1.096		
mother			**-0.825**	**-1.354**
std. error			1.482	1.407
non-English	**-1.697 *****	**-1.476 ****	**-1.740 *****	**-1.613 *****
std. error	0.646	0.600	0.629	0.591
lives with adult	**0.132**	**-0.162**	**-0.330**	**-0.506**
std. error	1.094	1.103	1.183	1.144
needs SA treatment	**1.018**		**0.929**	
std. error	0.627		0.605	
needs MH treatment		**-0.089**		**-0.039**
std. error		0.559		0.543
needs financial mgmt. assistance	**-0.164**	**0.101**	**-0.120**	**0.143**
std. error	0.792	0.767	0.781	0.767
std. deviation of dep. var.	0.502	0.502	0.502	0.502
std. error of regression	0.457	0.470	0.453	0.464
likelihood ratio statistic	21.118 ***	17.717 **	21.435 ***	18.181 **
probability(LR stat.)	0.7%	2.3%	0.3%	1.1%
McFadden R-squared	20.4%	16.9%	20.7%	17.3%
observations with dep. var. = 0	35	35	35	35
observations with dep. var. = 1	40	41	40	41
total observations	75	76	75	76
predicted probability, pilot = 1	26.2%	31.6%	29.3%	34.0%
predicted probability, pilot = 0	61.4%	66.3%	63.8%	67.6%
marginal effect	**-35.2% ****	**-34.6% ****	**-34.4% ****	**-33.5% ****
std. error	13.9%	13.8%	14.1%	13.9%

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 4b
dependent variable: client required emergency housing (given that client moved)
binary logit model

constant	**0.973**	**1.098**	**1.566**	**1.688**
std. error	1.652	1.615	1.760	1.723
client in pilot before move	**-2.240 *****	**-1.937 ****	**-2.156 *****	**-1.905 ****
std. error	0.849	0.781	0.829	0.775
Met client	**-1.101**	**-0.753**	**-1.075**	**-0.782**
std. error	0.727	0.681	0.719	0.682
age	**0.007**	**0.015**	**0.007**	**0.012**
std. error	0.030	0.029	0.030	0.029
female	**0.009**	**0.119**		
std. error	0.636	0.601		
family case	**0.192**	**-0.658**		
std. error	1.151	1.106		
mother			**-0.755**	**-1.325**
std. error			1.474	1.394
non-English	**-1.661 ****	**-1.421 ****	**-1.685 *****	**-1.551 *****
std. error	0.656	0.604	0.641	0.596
lives with adult	**0.019**	**-0.234**	**-0.519**	**-0.629**
std. error	1.098	1.103	1.180	1.135
needs SA treatment	**1.196 ***		**1.073 ***	
std. error	0.653		0.627	
needs MH treatment		**-0.056**		**-0.016**
std. error		0.564		0.548
needs financial mgmt. assistance	**-0.483**	**-0.080**	**-0.432**	**-0.042**
std. error	0.856	0.808	0.843	0.811
std. deviation of dep. var.	0.502	0.502	0.502	0.502
std. error of regression	0.454	0.469	0.450	0.464
likelihood ratio statistic	23.558 ***	18.978 **	23.800 ***	19.544 **
probability(LR stat.)	0.5%	2.5%	0.2%	1.2%
McFadden R-squared	22.7%	18.1%	23.0%	18.6%
observations with dep. var. = 0	35	35	35	35
observations with dep. var. = 1	40	41	40	41
total observations	75	76	75	76
H0: coeff. client in pilot before move = 0				
likelihood ratio statistic	7.917 ***	6.729 ***	7.556 ***	6.554 **
probability(LR stat.)	0.5%	0.9%	0.6%	1.0%
H0: coeff. Met client = 0				
likelihood ratio statistic	2.441	1.261	2.366	1.363
probability(LR stat.)	11.8%	26.1%	12.4%	24.3%

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 4c
expected number of clients who will need emergency housing
based on a simulation run on 162 clients using the coefficients in Table 4a
(simulation assumes that all clients must relocate)

		if clients in pilot	if clients not in pilot
model #1	expected number	48	98
	standard error	5.5	5.7
	pilot reduces need by:	51%	
model #2	expected number	53	104
	standard error	5.7	5.8
	pilot reduces need by:	49%	
model #3	expected number	49	97
	standard error	5.5	5.7
	pilot reduces need by:	49%	
model #4	expected number	53	102
	standard error	5.7	5.8
	pilot reduces need by:	48%	

Table 5a
dependent variable: percentage of mental health appts. kept (expressed as log of odds ratio)
two-step weighted least squares bimodal logit model

constant	**0.338**	**0.116**
std. error	0.455	0.505
Met client	**-1.672 *****	**-1.638 *****
std. error	0.228	0.244
age	**0.006**	**0.005**
std. error	0.007	0.009
female	**-0.199**	
std. error	0.186	
family case	**-0.586 ****	
std. error	0.284	
mother		**-0.621 ****
std. error		0.285
non-English	**-0.126**	**-0.070**
std. error	0.168	0.170
lives with adult	**0.457 ***	**0.566 ****
std. error	0.253	0.279
needs SA treatment	**-0.578 ****	**-0.522 ****
std. error	0.223	0.237
needs financial mgmt. assistance	**-0.814 *****	**-0.825 *****
std. error	0.161	0.171
std. deviation of dep. var.	1.007	1.012
std. error of regression	0.719	0.754
F-statistic	8.235	7.867
probability(F-stat.)	0.0% ***	0.0% ***
R-squared	55.9%	51.0%
adjusted R-squared	49.1%	44.5%
observations	61	61
predicted probability, Met client = 1	4.5%	4.1%
predicted probability, Met client = 0	56.9%	55.7%
marginal effect	**-52.4% *****	**-51.6% *****
std. error	5.7%	5.6%

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 5b
dependent variable: percentage of mental health appts. kept (expressed as log of odds ratio)
two-step weighted least squares standard logit model

constant	**-2.970**	**-2.640**
std. error	2.024	1.827
Met client	**-2.522 *** **	**-2.567 *** **
std. error	0.895	0.883
age	**0.091 ** **	**0.090 ** **
std. error	0.040	0.040
female	**0.296**	
std. error	0.786	
family case	**-0.510**	
std. error	1.167	
mother		**-0.480**
std. error		1.149
non-English	**-1.680 ** **	**-1.707 ** **
std. error	0.781	0.774
lives with adult	**0.539**	**0.433**
std. error	1.110	1.071
needs SA treatment	**-2.216 *** **	**-2.307 *** **
std. error	0.761	0.713
needs financial mgmt. assistance	**-1.000**	**-0.934**
std. error	0.776	0.751
std. deviation of dep. var.	1.116	1.116
std. error of regression	1.031	1.021
F-statistic	2.297 **	2.686 **
probability(F-stat.)	3.4%	1.9%
R-squared	26.1%	26.2%
adjusted R-squared	14.7%	16.4%
observations	61	61
predicted probability, Met client = 1	10.2%	10.7%
predicted probability, Met client = 0	58.5%	61.0%
marginal effect	**-48.3% *** **	**-50.3% *** **
std. error	13.4%	12.8%

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 6
dependent variable: client kept all substance abuse treatment appts.
binary logit model

constant	**-1.014**	**-0.708**
std. error	2.390	2.143
Met client	**-0.100**	**-0.149**
std. error	0.741	0.722
age	**0.013**	**0.008**
std. error	0.046	0.043
female	**0.237**	
std. error	0.796	
family case	**1.165**	
std. error	1.406	
mother		**1.305**
std. error		1.325
non-English	**0.090**	**0.078**
std. error	0.867	0.865
needs MH treatment	**-0.364**	**-0.349**
std. error	0.726	0.724
needs financial mgmt. assistance	**0.016**	**0.047**
std. error	0.540	0.530
std. deviation of dep. var.	0.492	0.492
std. error of regression	0.530	0.522
likelihood ratio statistic	1.548	1.460
probability(LR stat.)	98.1%	96.2%
McFadden R-squared	2.8%	2.6%
observations with dep. var. = 0	26	26
observations with dep. var. = 1	16	16
total observations	42	42

* significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 7 – responses to client satisfaction survey

1) Did you have a need for EMERGENCY HOUSING?	Yes	17	No	28			total	45
a. If YES, are you STILL in emergency housing?	Yes	1	No	14			total	15
b. Who has referred you to permanent housing?	HASA	15	COBRA	13	Neither	3	total	27
c. How much assistance have you received from HASA?	a lot	18	a little	7	none	3	total	28
d. How much assistance have you received from COBRA?	a lot	23	a little	2	none	3	total	28
2) Do you want SUBSTANCE ABUSE treatment?	Yes	12	No	35			total	47
a. If YES, who referred you to treatment?	HASA	4	COBRA	6	Neither	7	total	16
b. Have you begun keeping treatment appointments more often since you enrolled in the pilot?	Yes	10	No	4	Unsure	1	total	15
3) Do you want MENTAL HEALTH treatment?	Yes	16	No	31			total	47
a. If YES, who referred you to treatment?	HASA	2	COBRA	7	Neither	9	total	18
b. Have you begun keeping treatment appointments more often since you enrolled in the pilot?	Yes	11	No	5	Unsure	3	total	19
4) A few questions about HIV PRIMARY CARE services:								
a. Who referred you to care?	HASA	9	COBRA	17	Neither	20	total	46
b. Have you begun keeping care appointments more often since you enrolled in the pilot?	Yes	32	No	8	Unsure	2	total	42
5) How COMFORTABLE were you with the:								
a. HASA staff?	very	32	somewhat	14	not at all	2	total	48
b. COBRA staff?	very	38	somewhat	7	not at all	1	total	46
6) Has the HASA/COBRA pilot improved your relationship with:								
a. HASA staff?	Yes	42	No	4	Unsure	1	total	47
b. COBRA staff?	Yes	42	No	5	Unsure	1	total	48
c. your primary care provider?	Yes	38	No	7	Unsure	1	total	46
7) In general, how SATISFIED are you with the services that you have received through the HASA/COBRA pilot?	very	44	somewhat	3	not at all	1	total	48