

The Effects of Case Management on Service Use Rates in 10 Adolescent HIV Care Models

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RUNNING HEAD: CASE MANAGEMENT AND SERVICE USE

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Abstract

Purpose. This paper studies the relationships of characteristics of 3,732 youth to their utilization of case management services in 10 national HIV service demonstration projects of the HRSA SPNS Program (HIV/AIDS Bureau).

Methods. Case management utilization was studied as a function of the total number of service episodes and client characteristics, including HIV status and client risk behaviors. The use of case management was also studied as a predictor of the utilization of other HIV services, including HIV counseling and testing, medical services, referrals to medical services, and other related issues.

Results. The effects of case management are linear in the prediction of service linkages; each new unit of case management added has about the same effect as the preceding unit. In contrast, the effects of case management on the retention of clients in the programs is monotonic, but not linear; increased case management leads to greater retention in care, but the first few sessions have more impact on program retention than do later ones.

Conclusions. The results suggest that only a few case management sessions are necessary to retain clients in the service continuum, but that continuing case management is necessary to ensure the use of a wide array of needed services are repeatedly used.

KEY WORDS: HIV/AIDS, adolescents, case management, community services, service demonstration projects

The Effects of Case Management on Service Use Rates in 10 Adolescent HIV Care Models

Introduction

In this paper, we empirically examine the characteristics of case management services provided to HIV-infected youth and those at risk for infection in 10 national demonstration projects. We examine the major ways client characteristics relate to the receipt of case management and the effects of case management on the use of other services and retention in care.

Review of the Literature

Adolescents and young adults living with HIV represent 25 percent of all new cases in the United States [1]. However, this same group is one of the most medically under-served populations in the United States. Research suggests that the utilization of case management effectively bridges gaps in communication between service providers and youth, facilitates appropriate service linkages and continuity of care and treatment, and increases retention rates of youth in services [2, 3].

Adolescents tend to be less likely than any other age group to receive continuous primary medical care [4]. Young people are typically unaware of available services and may be less likely to seek out medical care because of feelings of invulnerability and a generalized distrust of adults [5]. Adolescents' concerns about privacy and confidentiality minimize their willingness to seek health care for sensitive problems and tend to inhibit their communication with physicians [6, 7]. The Society for Adolescent Medicine had formally expressed the need for HIV-related services that are developed specifically for adolescents, and recommends that services be made available in settings where adolescents feel comfortable and that they be comprehensive, including social support and basic needs services [8]. Case management may prove to be an effective way to increase awareness of available services and trust in the service providers.

Case management also plays a pivotal role in helping young people navigate complex service delivery systems, many of which have been designed to meet the needs of adults. Advantages that case managers offer in negotiating service networks include the provision of support and counseling, an assessment of medical and psychosocial needs, designing an appropriate plan to all needs,

monitoring/tracking progress, advocating to ensure the existence of youth-sensitive services, and crisis intervention [2]. The case manager may use critical pathways and one-on-one interaction to facilitate the patients' progress through a medical system and to decrease delays and duplication [9].

To provide comprehensive care to adolescents with HIV/AIDS, a systematic approach to clinical management must be developed that involves a multidisciplinary and well-integrated care team. This involves case management by experienced health professionals, including elements such as conducting and initial evaluation and needs assessment, planning and brokering services, and ensuring continuity of intervention [10]. Results from a number of investigations suggest that the addition of a case manager to a youth's treatment team results in longer participation in services, use of a wider variety of services, fewer inpatient days, and more community-based services [11-14].

Case management has proven successful in targeting various adolescent populations in multiple settings. The utilization of case managers in programs targeting youth with drug or alcohol problems facilitates the treatment process by providing needed support, tracking and helping to prevent relapse, and connecting youth with school, work, and community resources [15, 2]. In one national demonstration project, case management was used as a mechanism for strengthening the linkages between substance abuse treatment and primary care systems [16]. In another example, an enhanced methadone maintenance treatment program with a strong case management component was associated with a higher probability of retention [17]. Case management has also proven effective in programs dealing with severely emotionally disturbed (SED) adolescents, juvenile offenders, and pregnant and parenting teens [18].

Case managers allow for the provision of a full continuum of appropriate services, enhance the relationships between health care providers and the young people they serve, and help to improve the overall health and quality of life of youth. The inclusion of case management elements in service programs for youth is extremely vital to the success of both the programs and the young people they target [3].

A National Demonstration Program for Adolescent Care Projects

A set of notable exemplars for adolescent case management services is provided by a group of national demonstration programs for youth with HIV and those at risk. Through its Special Projects of National Significance (SPNS) Program, the HIV/AIDS Bureau (HAB) of the Health Resources and Services Administration (HRSA) funds national demonstration projects for HIV/AIDS services. In 1993, HRSA awarded 10 grants to projects targeting HIV/AIDS services to adolescent and youth. These 10 projects were relatively heterogeneous in that their programs range greatly in scope and planned outcomes. Nonetheless, the 10 projects shared their target populations, specifically, adolescents and young adults who are either already infected with HIV or at high risk to become so, and their aim of building programs with the potential for wide replication throughout the United States. Case Management was a key component of each project.

As would be expected for a national services demonstration program, the 10 HRSA SPNS Program Adolescent Care Grantees differ from one another. Descriptions of the service models for the 10 Adolescent Care Projects are given in a special issue of the Journal of Adolescent Health [19, 20]. The projects include: Bay Area Young Positives, a San Francisco program by youth with HIV for youth with HIV that includes one-on-one support from Member Advocates and Peer Facilitators [21]; Children's Hospital of Boston [22], a comprehensive health services continuum supported by peers and professionals as they obtain social and medical services; Childrens Hospital Los Angeles [23], a comprehensive health services continuum with a special emphasis on social services that uses outreach and case management to link and retain youth in care; the Greater Bridgeport Adolescent Pregnancy Project [24], a Connecticut street outreach project, using a peer model, designed to move youth into HIV testing services; Health Initiatives for Youth [25], a San Francisco youth empowerment, advocacy, and leadership development program that addresses the need for innovative social and practical HIV services to complement comprehensive health care; the Indiana Department of Health [26], a program with outreach and expanded case management and referral services to identify new and existing resources for gay and lesbian youth in Indiana; the University of Alabama at Birmingham [27], an outreach and education

program for at-risk young women outside Birmingham, Alabama, designed to improve access to medical and psychosocial services through tracking of acute needs and referrals; the University of Minnesota Youth and AIDS Projects [28], a hybrid university and community-based organization whose mission is to prevent HIV infection in youth at risk and to care for youth living with HIV in Minnesota through services, research, and teaching; Walden House [29], a residential substance abuse facility in San Francisco providing enhanced treatment services to HIV-positive youth who are triply-diagnosed; and YouthCare [30], a Seattle program bringing services, including prevention and early intervention case management, to runaway, homeless, and sexual minority youth in venues where they congregate. All of the programs provide case management to young people. Whether or not the projects are directly providing tightly-linked systems of medical and psychosocial care, each is seeking to direct youth into such service models [19].

While the 10 projects differ from one another, an essential element that underlies each is its attempt to enroll needy youth in services of various kinds. Another important element that underlies each project is the development of innovative, model interventions and other programmatic elements for clients. The interventions are provided by sources that range from street outreach workers conducting acute crisis intervention to peer counselors who themselves are youth living with HIV to both primary and HIV specialist physicians. The interventions are supplemented with referrals to ancillary services such as social services that provide food and shelter, substance abuse programs, mental health therapy, and self-help or support groups. In most cases the programs offer a continuum of services that have been designed to be linked, cooperative, complementary, and easy for the youth to access in ways that are sensitive and appropriate. Case management plays an essential role in most, if not all of these projects. Although each project has its own service model, the 10 projects share an active case management component. Case management has been described as the “glue” that holds these youth-focused programs together [19]. As a group, the projects have identified energetic and charismatic case management of clients (and the program) as a key to ensuring that the flow of clients identified through outreach is consistently linked with services.

Within this context, the purpose of the present study is to empirically examine the nature of case management services provided in aggregate by the 10 Adolescent Care Projects. Two major questions are posed. First, what characteristics are predictive of using case management services? Are the demographic characteristics and risk behaviors related to the use of case management? Second, how does the use of case management influence the use of other services in these innovative HIV care models? Does the use of case management increase access to a full array of needed interventions?

Methods

Cross-cutting evaluation instruments and design. The 10 projects participated in a cross-cutting evaluation of their activities.² The cross-cutting evaluation includes five single-page forms. These forms used a fax-in system that allows data to be transmitted via fax from project sites in the field to a central data computer [31]. The data presented were collected using two forms, the Contact Form [32] and the Intervention Form [33]. Contact Forms were used to document characteristics of individuals reached by the Adolescent Care Projects, including demographic characteristics and patterns of HIV risk behaviors. These forms may be completed in the context of outreach, program enrollment, or to change or update information previously documented for individuals served by the projects. The data used in this paper are those from unique individuals, so information has been aggregated across individuals (who may have had one or more contacts during the course of the project). The analyses used to form the client characteristic indicators used here are presented in detail elsewhere (unpublished observations). Intervention Forms are used to record services provided to a given individual who is formally enrolled in care. This form codes services provided during the encounter, who provided the services, referrals made, and topics discussed. Analyses used to form the indicators of service intervention characteristics are presented elsewhere (unpublished observations).

Although each of the Adolescent Care Projects has its own service delivery model, the multi-site evaluation was designed for implementation across the 10 projects. In general, the single-page fax-in data

collection forms are completed at the time of each contact or service encounter, or shortly afterwards. Because service episodes are tracked across time, the utilization of various services provided by the projects and referrals made within and outside of those networks are tracked for as long as the youth is seen by the program.³

Measures of Client Characteristics

Typology of client characteristics. In this paper, a number of client characteristics are used to predict utilization of case management services. In addition to client demographics including gender, age, ethnicity, HIV status, and the site at which the client received services, eight behavioral indices were coded to provide indicators of HIV risk behaviors. These include Risky Sex with Men (representing a combination of any sex with males and unprotected sex with males), Risky Sex with Women (representing a combination of any sex with females and unprotected sex with females), Sex with an Injection Drug User (IDU), Survival Sex, Sex with an HIV-Positive Partner, having a Sexually Transmitted Disease (STD), Substance Abuse, and Injection Drug Risk (representing a combination of injection drug use and needle sharing.) High scores on these measures indicate a high level of current HIV risk [34]. Risk behavior indicators were dichotomous. For risky sex with men and risky sex with women, risk was coded as present if the youth was known to have unprotected sex in the last 30 days or prior to the last 30 days. For all other client behaviors, the risk was coded as present if the behavior had occurred in the last 30 days or prior to the last 30 days.

Typology of services. There are four basic characteristics of service episodes, coded by the 10 projects. These characteristics, substantiated by empirical analysis and rigorous statistical modeling methods (unpublished observations), are Type of Session, Topics Discussed, Referrals Made, and Items Provided. There are three Types of Sessions: a) HIV Testing Services including HIV risk assessment,

² The cross-cutting evaluation is coordinated by The Measurement Group and was developed in collaboration with the 10 Adolescent Care Projects and HRSA. These forms are available in various reports on these projects [34-36] and are also available on the Internet.

³ Human Subject Protection Committees at each site determined if informed consent for participation in the programs was required or if the data were collected as part of the usual quality improvement process, and hence

HIV pre-test counseling, HIV testing, HIV post-test counseling, and HIV prevention services; b) Peer Support and Counseling including individual counseling, group counseling, family counseling, crisis intervention, alternative therapy, information and referral, practical support, HIV support groups, peer support groups, 12-step groups, and recreation; and c) Medical Services including medical examinations, medical lab work (not HIV), medical walk-in services, medical appointments, medical emergency visits, family planning, and mental health/substance abuse screening. Topics Discussed consists of three main topic categories: a) Psychosocial Issues including discussion of assertiveness, youth empowerment, emotional problems, self identity, substance abuse, hassles, housing/jobs, living with HIV, alternative therapies, and public assistance; b) Medical Service Issues including discussion of medical services, health status, and family planning; and c) HIV-Related Issues including discussion of HIV risk factors, safer sex, HIV testing, risk reduction barriers, dating/sex, and HIV services. Referrals Made consists of three categories of referrals: a) Psychosocial Service Referrals, including referrals to educational/vocational training, mental health services, substance abuse services, self-help groups, food/drop-in centers, shelter/housing programs, or social services; b) Medical Service Referrals including referrals to a STD clinic, HIV testing, medical services, or family planning; and c) Collateral Service Referrals, including referrals to case management. There were two categories of Items Provided: a) Educational Materials and Supplies including informational materials such as brochures, other educational materials, referral lists/directories, and wallet cards, and risk reduction supplies such as condoms, dental dams, and bleach; and b) Basic Medical Support Needs including distribution of immunizations and medications, and items in support of medical services such as bus tokens/transportation and food or food vouchers. For the present analyses, the measure of Collateral Services Referral was not included because of its confound with Case Management Services.

Measures of case management services. Youth were defined as having received case management if they had a service episode that was denoted as primarily case management or if they had received

exempt. All data collection at all sites was voluntary for participants and providers and hence these data do have certain non-random patterns of missing observations.

services provided by a case manager. Note that in the cross-cutting evaluation of these projects, case management was defined at a fairly broad level, and typically includes the management of social, as well as medical, service issues.

Participants. The data used for these analyses were collected between December 1993 and March 1998. The participants were 1,710 young men and 2,022 young women who were enrolled in the 10 projects and for whom information about HIV risk behaviors was coded. Of the 1,710 young men, 329 were known to be HIV-positive. Of the 2,022 young women, 129 were known to be HIV-positive. The males were an average of 20.0 years of age (S.D. = 3.3 years) and the females were an average of 18.8 years of age (S.D. = 3.0 years) ($t(3730) = 11.62, p < .001$). Of the young men, 19.5 percent were African American, 3.7 percent were Asian American, 47.4 percent were Caucasian, 19.2 percent were Hispanic/Latino, 1.6 percent were Native American, 4.7 percent were multi-racial and 3.8 percent had an other or unknown ethnicity. Of the young women, 24.6 percent were African American, 2.9 percent were Asian American, 44.9 percent were Caucasian, 18.5 percent were Hispanic/Latina, 1.4 percent were Native American, 5.0 percent were multiracial, and 3.3 percent had an other or unknown ethnicity. The young men received a mean of 6.7 days of intervention services (S.D. = 16.0) and the young women received a mean of 4.3 days of intervention services (S.D. = 10.7). The young men received an average of 3.9 days of case management (S.D. = 13.5) and the young women received an average of 2.2 days of case management (S.D. = 8.3). Analyses are based on 3,732 complete cases.

Statistical models. A series of hierarchical planned setwise multiple linear regression and logistic regression models were used for studying service utilization. Multiple linear regression was employed for models with continuous dependent measures, while logistic regression was used in models with dichotomous dependent measures. Program retention was studied with Cox regression and Kaplan-Meier survival analysis methods. To differentiate these conceptually related methods, survival analysis is a way of looking at the curve of how many clients are retained in a particular state (in this case, in the state of

being treated by the program) after a certain number of days.⁴ The resulting analysis is the “survival curve.” Fairly straight-forward techniques contrast whether clients of one kind or another tend to be retained in the program longer. These methods are usually called “survival analysis” and the estimation method of Kaplan and Meier is the one typically used, especially when there are a limited number of factors thought to influence program retention or survival. Cox regression (also called event history analysis) may be thought of as an extension of survival analysis in which the tendency of the client to stay in the program is predicted from a number of factors considered simultaneously. In general, Cox regression is an analog to usual forms of multiple linear and logistic regression where the dependent variable is time duration rather than a continuous or dichotomous variable. In this paper we first present survival curves in the usual way using Kaplan-Meier analysis and then follow these analyses with Cox regression in order to test a more sophisticated model of the influences on time in program. It is very important to note that the Kaplan-Meier analyses specifically do not correct for the differences among programs while the Cox regressions do so by explicitly partialling out both the effects of being at a particular site and differences in the total number of intervention events.

In both the linear and Cox regression analyses, standardized regression coefficients are interpreted at each step. When a standardized regression coefficient is presented, the model from which it is derived is that where all effects “above” it in the table have been included, but all effects lower in the hierarchy of entry (or “below” it in the table) have not been included. For example, the effects given for the demographic variables at Step 2 control for all prior effects at Step 1 (that is, the site and length of service episode) but do not control for the effects which will later be entered into the model at Steps 3, 4, and 5. Similarly, the effects at Step 3 control for effects at Steps 1 and 2 but not those at Steps 4 and 5. Note that for all analyses we do not present individual regression coefficients for specific sites because in this cross-cutting evaluation individual sites are not explicitly compared.

⁴ In present analyses, cases were censored if they did not receive any services from the program within 120 days of the last date in the dataset.

Results

Utilization of case management services. What determines whether a client receives case management services? Table 1 presents a logistic regression model predicting the presence or absence of case management during the service episode, controlling for site effects. Only statistically significant individual model effects are shown. Being HIV-positive predicted the utilization of case management services, as did being in the program longest, and receiving a large number of service sessions. There were no statistically significant main effects of specific risk factors to predict the use of case management services, although there were significant interactions between gender and risky sexual behaviors. Note that all of these tendencies are found after controlling for the effects of project site. Indicators that did not significantly predict the presence or absence of case management during the service episode included: (at Step 2), gender, age, ethnicity; (at Step 3), gender by HIV status interaction, and age by HIV status interaction, HIV status by number of service dates interaction, and gender by number of service dates interaction; (at Step 4), main effects for all eight risk behavior measures; (at Step 5), gender by sex with injection drug user interaction, gender by survival sex interaction, gender by sex with an HIV-positive person interaction, and the two-way interactions of HIV status by each of the eight risk behaviors; (at Step 6), homelessness, runaway, criminal justice system-involved, mental health system-involved, and the two-way interactions of gender by homelessness, being a runaway, criminal justice system-involvement, and mental health system-involvement.

In general, in these programs (controlling for site effects) HIV status is the most important predictor of whether the client receives case management or not. The programs are designed to case manage HIV-positive youth, and they appear to meet this goal.

Insert Table 1 About Here

Table 2 shows two parallel regression models linking the number of case management sessions received during the course of treatment to client characteristics and behaviors. Table 2 contains two parts:

the first part (a) uses the raw number of case management sessions as the dependent measure, whereas the second part (b) uses the natural log transformation of the number of case management sessions as the dependent measure. Again, only statistically significant individual model effects are shown. Summarizing both sets of analyses, the number of case management sessions was predicted by HIV status (with HIV-positive youth receiving many more case management sessions) as well as the total number of services dates. The number of case management sessions was to a lesser degree predicted by the total time the youth were engaged in care by these projects. Risk factors were minimally predictive of whether an individual receives many or few case management sessions. There was a small, but statistically significant, tendency for involvement in survival sex to predict the use of more case management. There were statistically significant interactions between gender and same-sex risk behaviors, as well as between HIV status and risk behaviors.

About 80 percent of the variance in the number of case management sessions (or about 60 percent of the transformed variable) is predictable from site and service episode variables. While a large percentage of the dependent measure is predictable from site differences in implementing their service models, there are consistent, significant, across-site effects for HIV status and certain risk factors after controlling for the site and service episode effects.

 Insert Table 2 About Here

Effects of case management on other service utilization. Consider next how the utilization of case management is related to the utilization of other services provided by the 10 Adolescent Care Projects. A multiple linear regression strategy was again used in which variables are added in sets, and a statistical assessment of overall significance for the set was made after each was added. In these setwise analyses, we first added the variables related to the service site and the intensity of the service episode. Then, at the second step we added variables related to major client characteristics (age, gender, HIV status, ethnicity) and determined if these variables predicted the dependent measure better than just merely knowing the

site of service and how long the client was enrolled. Interactions among the background characteristics were included at the third step. At the fourth step, we added the number of case management sessions and the interactions between the number of case management sessions and major client characteristics of gender, HIV status, and age. Two alternate versions of this step are used: Step 4a includes the raw number of case management session received and the interactions of case management with gender, HIV status, and age. Because the distribution of the number of case management sessions is highly skewed (in which most people get very few sessions, but some get very many sessions), an alternate model is shown as Step 4b, in which a natural log transformation of the number of case management sessions was used as the predictor variable instead of the untransformed score. The dependent measures predicted the number of sessions at which various types of services were provided. The derivation of the main dependent variables is described in detail by Huba, Melchior, Woods, Panter, Feudo, Schneir, Trevithick, Wright, Martinez, Sturdevant, Remafedi, Greenberg, Tierney, Wallace, Goodman, Tenner, Marconi, Brady, & Singer (under review).

Note that the two variations in the prediction models contrasted say two quite different things about the ways in which case management is effective. In the model tested as Step 4a, we explicitly hypothesize that the effects of case management are linear, or that adding one more session for a client who has had two sessions of case management previously will produce the same extra effect as adding one more session of case management for a client who has previously had 20 sessions of case management. In the model tested as Step 4b, we alternately hypothesize that the effects of case management are nonlinear but monotonic or that there will be more effect from adding one more session of case management for a client who has had only two prior sessions of case management than there will be for adding one or more session of case management for a client who has already had 20 sessions. The linear model (Step 4a) says that each extra unit of case management produces the same effect while the monotonic model (Step 4b) says that there are decreasing returns for adding extra sessions of case management. Note that for this comparison we fit predictive models that include either Step 4a or Step

4b, but not both. The differential fit of these two variations allows us to further understand how case management affects service utilization.

Ten multiple regression analyses were conducted with site and service episode indicators, background characteristics, and case management service utilization measures used as predictors. In each of the 10 analyses, an indicator reflecting an aspect of service episodes in these projects was the dependent measure, based on the typology of services described above (unpublished observations). Table 3 presents the model summary for the 10 regression analyses. For all 10 service utilization variables studied (for example, utilization of HIV testing services or receipt of referrals to medical or psychosocial services), case management significantly predicted receiving those services during the service episode. The effects of case management are found after the effects of the site differences were controlled in the models. It appears that the overall result of case management is to get the client to utilize more services, whether these services are provided by the case manager or other psychosocial staff, or by medical or other professionals. The log-transformed case management indicators do not predict service utilization as well as the raw (untransformed) variables. We take these results to strongly support the importance of case management in these 10 adolescent service models. Case management appears to make an independent and significant contribution to increased use of other aspects of service.

 Insert Table 3 About Here

Note first that for the services, in all cases the raw number of sessions of case management (and its interaction with gender, age, and HIV status) is a better predictor of the total services used than is the logarithmic transformation of the total number of sessions. That is, consistently for all of the dependent variables of service type in Table 3, Step 4a increments the prediction of service more than does Step 4b. What this means is that each additional session of case management given to a youth – controlling for differences due to study site, age, ethnicity, age, HIV status, gender, total time in program, and total service dates of any kind – has about the same impact on the number of other linked services she or he

will received. Or, each additional unit of case management adds about the same to the outcome of service linkage. There does not appear to be decreasing returns from additional units of case management.

How much do service utilization rates change as a function of adding case management sessions?

Further interpreting the effects of Table 3, we can ask the degree to which adding case management sessions adds to the use of services for all youth in general, to males and females differentially, to HIV-positive and HIV-uncertain status youth differentially, and to younger and older youth differentially. That is, we can interpret the effects in the regression models of Table 3, which include the case management indicators. Since in each case the models with the raw number of case management sessions (that is Step 4a) fits the data better than the model with the logarithm of case management sessions (Step 4b), only the coefficients from the untransformed case management variable models are shown. Table 4 shows the unstandardized regression coefficients (B), the standard error of B, and the standardized regression coefficient (β) for each of the effects. For the different services, the estimated impact of each additional unit of case management can be estimated using the unstandardized regression coefficients (labeled B). For youth of different kinds, each unit of additional case management tends to have about the same effect as any individual unit preceding it temporally. As the interactions for various dependent variables illustrate, case management is more or less effective with HIV-positive as contrasted to HIV-uncertain youth, males as contrasted to females, and younger as contrasted to older youth depending upon the service being studied. But overall, case management (in the aggregate) has a positive effect on the service utilization of at least some of the clients for the various kinds of services.

Insert Table 4 About Here

Examining the section of Table 4 for HIV Testing Services, there is a significant effect for case management on the number of HIV Testing Services received. Note that the interaction of case management with gender indicates that the case management is more effective in providing increased linkage to other services for men. The interaction of case management with HIV status and the negative

coefficient means that more case management is actually effective for ensuring that youth who are already known to be HIV-positive are not tested, and the negative coefficient for the case management by age interaction means that the case management works better with younger than older youth in terms of getting them into HIV testing services. Considering linkage to Psychosocial Services, case management has its highest effects for youth of unknown HIV status, older youth, and women, although it is effective for youth in general. Considering linkage to Medical Services, case management is effective for linking those youth with HIV to such services, in linking younger youth, and in linking males. Increased case management sessions help all youth get more Referrals to Psychosocial Services as well as Referrals to Medical Services, particularly those who are younger and presumably less linked to the services systems.

Effects of case management on program retention. What role does case management play in retaining youth in these HIV care programs? In order to investigate the relationship between participation in case management services and the length of time youth remain engaged in services from these projects, a set of Kaplan-Meier survival analyses were conducted. Figure 1 shows total retention time in the program for those clients who got case management at some time during the treatment episode and those who did not. Clients who did not receive case management stayed in the program an average of 75.02 days (± 4.90 days as the standard error), with a median stay of 1 day. Participants who received case management stayed in their programs an average of 189.74 days (± 7.01) with a median stay of 15 days. The difference among the program retention curves for the two groups is significant; the chi-square values estimated under log-rank, Breslow, and Tarone-Ware assumptions were 182.70, 146.42, and 169.43 respectively, each with 1 degree of freedom, and each significant at $p < .001$.

 Insert Figure 1 About Here

To further examine the role of case management utilization on program retention, the sample was split into three mutually-exclusive groups based on the number of case management sessions received:

none, one, or more than one. Of the HIV-positive youth, 119 received no case management, 47 received one case management session, and 292 received more than one case management session. Of the youth with unknown HIV status, 1,380 received no case management, 927 received one case management session, and 967 received more than one case management session.

Kaplan-Meier survival analyses were run separately for youth of unknown and positive HIV status. Of the HIV-unknown youth, the no case management group had a mean retention of 70.62 days (standard error of ± 4.89 days) and a median retention of 1 day. Of the HIV-unknown youth with one case management session, the mean retention was 43.83 days (± 4.93 days) and a median retention of 1 day. Of the HIV-unknown youth with more than one case management session, the mean retention was 195.96 days (± 9.24 days) and a median retention of 36 days. The chi-square values under the log rank, Breslow, and Tarone-Ware assumptions were 513.35, 1021.58, and 837.14, all with 2 degrees of freedom and significant at $p < .001$. Figure 2 shows the retention curves for the three groups of youth with unknown HIV status based on the number of case management sessions.

 Insert Figure 2 About Here

Of the HIV-positive youth, those with no case management had a mean retention of 127.48 days (standard error of ± 24.05 days) and a median retention of 3 days. Of the HIV-positive youth with one case management session, the mean retention was 226.40 days (± 46.79 days) and a median retention of 52 days. Of the HIV-positive youth with more than one case management session, the mean retention was 621.39 days (± 27.23 days) and a median retention of 547 days. The chi-square values under the log rank, Breslow, and Tarone-Ware assumptions were 193.78, 243.38, and 230.02, all with 2 degrees of freedom and significant at $p < .001$. Figure 3 shows the retention curves for the three groups of HIV-positive youth based on the number of case management sessions. The curves do not correct for differences between

programs, but such adjustments can be made using Cox regression, an alternate method for survival analysis.

 Insert Figure 3 About Here

Turning to the Cox regression methodology, utilization of case management was found to significantly predict total retention in care. Because of the skewed distribution of the number of case management sessions, we calculated the Cox regression using both the raw number of case management sessions and the natural logarithm of the number of session (as separate analyses). Table 5 includes coefficients for all indicators in the models – those that are statistically significant and those that are not. The regression models employ the overall data analysis model used to study service utilization rates as shown above. The effects of case management are controlled for site effects, background characteristics, and the interactions of background characteristics. Even after controlling for site and client background effects, on a given day, clients receiving active case management are about one-third less likely to drop-out from the program than those receiving no case management.

In the Cox regression analyses summarized in Table 5, retention is significantly predicted by the project site and the number of days the youth come in for services. Youth who come to the programs more days are retained in care for a longer time. Beyond the effects of site and service dates, youth who are female, younger, and HIV-positive tend to stay engaged in care for longer. Ethnicity does not predict overall retention in care. After controlling for the effects of these client characteristics, the interactions of gender by HIV status, HIV status and service dates, and gender and service dates significantly predict program retention. HIV-positive males tend to stay longer in the programs, as do youth of unknown HIV status who come to the program on more days and females who come to the program on more days. There are no significant interaction effects for gender by age or for age by HIV status. Finally, after controlling for all these client characteristics, the number of case management services incrementally predicts the retention of these youth in care. Although youth who receive a greater number of case management

sessions are not significantly more likely to stay longer in the programs, using the raw number of case management sessions, there is an effect for the interaction of this measure of case management services with gender, in that young women who have more case management sessions tend to be retained longer. The interactions between case management and HIV status or age do not significantly affect overall program retention. The effects for the logarithmic transformation of the number of case management sessions shown in Table 5 are significant, as are the interactions of the transformed number of case management session with gender and age. What the results of Table 5 suggest is that the results of case management on retention are not linear in that each new session of case management does not necessarily lead to a corresponding increase in retention. Rather, having a few sessions of case management is most important for determining retention in services.

 Insert Table 5 About Here

Discussion

Case management has often been called the “glue” that holds social service programs together; in the case of these 10 innovative models of adolescent services the point has been made explicitly [19]. The 10 service models developed by these projects each attempt to use case management as a necessary device for engaging youth in the services continuum and keeping them there. Case management significantly impacts the ability of programs to get individuals into services and keep them there. Those youth who receive case management tend to receive more services and to be involved with these projects for a much longer period of time. The effects cut across the 10 different projects, and are present both for youth identified as having HIV and those for whom their serostatus is unknown.

A central finding in the present paper is the fact that the effects of case management on several linkages appear to be linearly increasing – that is, more case management does lead to better outcomes of getting linked to services and following through with them. The effects of increasing the dosages of case management are linear – that is, each additional dose of case management seems to have about the same

effect in achieving the outcomes of service linkages. In contrast, the effect of case management on program retention is monotonically increasing in that while increased dosages of case management lead to increased program retention, the initial sessions of case management have a far greater effect than later sessions. To put the finding succinctly, active initial case management appears to “bond” clients to programs and keep them enrolled. Continuing case management moves the clients into other services.

Across the 10 projects, it also appears that the effects of case management are greatest for those youth who have HIV, which is not surprising since these 10 projects are specifically focused on providing services to those youth identified as having HIV, and accordingly this result speaks to the fidelity of the implementation of the models. Of further interest, the case management effect on outcomes seems to be somewhat larger for younger youth which is probably indicative of the fact that the younger youth, newly identified and introduced into the services systems, are not well-linked and in fact may have difficulty negotiating a services system largely geared to older individuals who can manage their own schedules and linkages. For such younger individuals, case management is the introduction of the youth into the intricacies of the publicly-supported treatment system, its rules, and its benefits and barriers.

Case management may lessen the many barriers youth who are HIV-positive and at risk of HIV infection have in obtaining and continuing health care. Problems that discourage help seeking behavior such as lack of trust and awareness, confusion over complex health care systems, and unintegrated systems of care may be ameliorated through effective case management.

These findings suggest a number of questions for further research. Can the effects of different types of case management (i.e., medical versus social) be identified? Do the characteristics of the case manager have an effect on the nature of the case management provided? For example, a number of the 10 Adolescent Care Projects used youthful case managers, i.e. peers of the targeted clients. A peer case manager may be an excellent way to establish a bond with youthful clients. However, more complicated issues of case managing other youth with HIV may require a level of training, judgment, and expertise that comes with additional experience, education, and/or maturity.

The present findings have important implications for models of care for this population, especially in the context of managed care. It appears that the first few sessions of case management are most critical to engaging young people in care. However, to ensure that youth living with HIV and those at high risk receive the full array of needed services, continuing case management is warranted. Thus, case management appears to be a critical component in models of care for this population.

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References

1. Office of National AIDS Policy. Youth and HIV/AIDS: An American Agenda. Washington, DC: The White House; 1996.
2. Godley SH, Godley MD, Pratt A, et al. Case management services for adolescent substance abusers: A program description. *Journal of Substance Abuse Treatment* 1994;11:309-17.
3. Rotheram-Borus MJ. Serving runaway and homeless youth. *Family and Community Health* 1991;14:23-32.
4. D'Angelo LJ, Brown R, English A, et al. HIV infection and AIDS in adolescents. *Journal of Adolescent Health* 1994;15:427-434.
5. Goulart M, Madover S. An AIDS prevention program for homeless youth. *Journal of Adolescent Health Care* 1991;12:573-595.
6. Ford CA, Millstein SG, Halpern-Felsher BL, et al. Influence of physician confidentiality assurances on adolescents' willingness to disclose information and seek future health care. A randomized controlled trial. *Journal of the American Medical Association* 1997;278:1029-34.
7. Rosenfeld SL, Fox DJ, Keenan PM, et al. Primary care experiences and preferences of urban youth. *Journal of Pediatric Health Care* 1996;10:151-160.
8. Society for Adolescent Medicine. HIV infection and AIDS in adolescents: A position paper of the society for adolescent medicine. *Journal of Adolescent Health* 1994;15:427-434.
9. Weiman MG. Case management. A mean to improve quality and control the costs of cure in children with acute myelogenous leukemia. *Journal of Pediatric Hematology Oncology* 1995;17(3):248-253.
10. Mangos JA, Doran T, Aranda-Naranjo B, et al. Pediatric AIDS: systematic approach to patient management. *Texas Medicine* 1990;86(4):40-42.
11. Burns B, Farmer EMZ, Angold A, et al. A randomized trial of case management for youths with serious emotional disturbance. *Journal of Child Clinical Psychology* 1996;25(4):476-486.

12. Hamner K, Bryant D. Do client characteristic predict case management activity? *Evaluation and Program Planning* 1997;20(3):259-267
13. Siegal HA, Rapp RC, Kelliher CE, et al. The strengths perspective of case management: A promising inpatient substance abuse treatment enhancement. *Journal of Psychoactive Drugs* 1995;27(1):67-72.
14. Heflinger CA. Measuring service system coordination in managed mental health care for children and youth. *Evaluation and Program Planning* 1996;19(2):155-163.
15. Center for Substance Abuse Treatment. Comprehensive case management for substance abuse treatment. Treatment Improvement Protocol (TIP) 27, DHHS Publication No.: (SMA) 98-3222, Substance Abuse and Mental Health Services Administration, Rockville, Maryland; 1998.
16. Brindis C, Pfeffer R, Wolfe A. A case management program for chemically dependent clients with multiple needs. *Journal of Case Management* 1995;4(1):22-28.
17. Grella CE, Wugalter SE, Anglin MD. Predictors of treatment retention in enhanced and standard methadone maintenance treatment for HIV risk reduction. *Journal of Drug Issues* 1997;27(2):203-224.
18. Fischer RL. Evaluating the delivery of a teen pregnancy and parenting program across two settings. *Research on Social Work Practice* 1997;7(3):350-369.
19. Huba GJ, Melchior LA. A model for adolescent-targeted HIV/AIDS services: Conclusions from 10 adolescent-targeted projects funded by the Special Projects of National Significance Program of the Health Resources and Services Administration. *Journal of Adolescent Health* 1998;23 Suppl 2:11-27.
20. Woods ER. Overview of the Special Projects of National Significance Program's ten adolescent models of HIV of care. *Journal of Adolescent Health* 1998;23 Suppl 2:5-10.
21. Bettencourt T, Hodgins A, Huba GJ, et al. Bay Area Young Positives: A model of a youth-based approach to HIV/AIDS services. *Journal of Adolescent Health* 1998;23 Suppl 2:28-36.
22. Woods ER, Samples CL, Melchiono MW, et al. Boston HAPPENS Program: A model of health care for HIV-positive, homeless and at-risk youth. *Journal of Adolescent Health* 1998;23 Suppl 2:37-48.

23. Schneir A, Kipke MD, Melchior LA, et al. Childrens Hospital Los Angeles: A model of integrated care for HIV-positive and very high-risk youth. *Journal of Adolescent Health* 1998;23 Suppl 2:59-70.
24. Feudo R, Vining-Bethea S, Shulman LC, et al. Bridgeport's Teen Outreach and Primary Services (TOPS) Project: A model raising community awareness about adolescent HIV risk. *Journal of Adolescent Health* 1998;23 Suppl 2:49-58.
25. Bourdon B, Tierney S, Huba GJ, et al. Health Initiatives for Youth: A model of youth/adult partnership approach for HIV/AIDS services. *Journal of Adolescent Health* 1998; 23 Suppl 2:71-82.
26. Wright ER, Gonzalez C, Werner JN, et al. The Indiana Youth Access Project: A model for responding to the HIV risk behaviors of gay, lesbian, and bisexual youth in the heartland. *Journal of Adolescent Health* 1998;23 Suppl 2:83-95.
27. Sturdevant MS, Kohler CL, Williams LF, et al. The University of Alabama Teenage Access Project: A model for prevention, referrals, and linkages to testing for high-risk young women. *Journal of Adolescent Health* 1998;23 Suppl 2:107-114.
28. Remafedi G. The University of Minnesota Youth and AIDS Projects' Adolescent Early Intervention Program: A model to link HIV-seropositive youth with care. *Journal of Adolescent Health* 1998;23 Suppl 2:115-121.
29. Hymel MS, Greenberg BL. The Walden House Young Adult HIV Project: Meeting the needs of multi-diagnosed youth. *Journal of Adolescent Health* 1998;23 Suppl 2:122-131.
30. Tenner A, Trevithick LA, Wagner V, et al. Seattle YouthCare's Prevention, Intervention and Education Program: A model of care for HIV-positive, homeless and at-risk youth. *Journal of Adolescent Health* 1998;23 Suppl 2:96-106.
31. Huba GJ, Brown VB, Melchior LA. Fax-in forms as a technology for evaluating community projects: An evaluation of HIV risk reduction. *Education and Psychological Measurement* 1995;55(1):75-83.
32. Huba GJ, Melchior LA, the HRSA SPNS Program Adolescent Care Projects. Adolescent SPNS Contact Form 1994. Available from: URL: <http://www.TheMeasurementGroup.com>

33. Huba GJ, Melchior LA, the HRSA SPNS Program Adolescent Care Projects. Adolescent SPNS Intervention Form 1994. Available from: URL: <http://www.TheMeasurementGroup.com>
34. Enrolled clients in 10 adolescent-targeted projects for HIV/AIDS services: A cross-cutting evaluation of the Health Resources and Services Administration Special Projects of National Significance. Huba GJ, Melchior LA, Panter AT, et al. Technical Monograph Series from The Measurement Group Evaluation and Dissemination Center for the HRSA SPNS Models of Adolescent HIV/AIDS Care 1997. Available from: URL: <http://www.TheMeasurementGroup.com>
35. Interventions provided in 10 adolescent-targeted projects for HIV/AIDS services: A cross-cutting evaluation of the Health Resources and Services Administration Special Projects of National Significance. Huba GJ, Melchior LA, Panter AT, et al. Technical Monograph Series from The Measurement Group Evaluation and Dissemination Center for the HRSA SPNS Models of Adolescent HIV/AIDS Care 1997. Available from: URL: <http://www.TheMeasurementGroup.com>
36. Outreach activities in 10 adolescent-targeted projects for HIV/AIDS services: A cross-cutting evaluation of the Health Resources and Services Administration Special Projects of National Significance. Huba GJ, Melchior LA, Panter AT, et al. Technical Monograph Series from The Measurement Group Evaluation and Dissemination Center for the HRSA SPNS Models of Adolescent HIV/AIDS Care 1997. Available from: URL: <http://www.TheMeasurementGroup.com>

Table 1. Logistic Regression of Client Characteristics on Whether Case Management Was Received

Model Step	Model Summary	Significant Individual Model Effects				
	χ^2 Change	R	Wald Test	B	Odds Ratio	95% Confidence Interval for Odds Ratio
Step 1: Site and service episodes	$\chi^2(11)=1962.45^{***}$					
Site		---	---	---	---	---
Number of days in program		.08	31.78	.00	1.00	1.00-1.00
Number of service dates		.07	24.13	.04	1.04	1.03-1.06
Step 2: Background characteristics	$\chi^2(9)=27.19^{**}$					
HIV status		.07	16.31 ^{***}	1.02	2.77	1.69-4.54
Step 3: Background characteristics interactions	$\chi^2(5)=7.44$					
Gender by age		-.03	4.47*	-.07	.93	.88-1.00
Step 4: Client behaviors	$\chi^2(8)=12.25$					
Step 5: Two-way interaction with client behaviors	$\chi^2(16)=44.70^{***}$					
Gender by risky sex with men		.03	4.56*	.52	1.68	1.03-2.71
Gender by risky sex with women		-.04	6.12*	-.68	.51	.30-.87
Gender by STDs		.03	4.37*	.53	1.69	1.04-2.78
Gender by substance abuse		-.03	5.29*	-.57	.56	.35-.92
Gender by IDU risk		-.03	4.46*	-1.00	.37	.15-.93
Step 6: Other client characteristics and interactions	$\chi^2(8)=6.26$					

* $p < .05$, ** $p < .01$, *** $p < .001$ † $N = 3,732$

Table 2. Hierarchical Multiple Regression of Client Characteristics on the Number of Case Management Sessions

(3a) Number of Case Management Sessions						
Model Step	Model Summary			Significant Individual Model Effects		
	R^2	R^2 Change	F Change	B	β	t
Step 1: Site and service episodes	.81	.81	$F(11,3720)=1472.53^{***}$			
Site				---	---	---
Number of service dates				.77	.94	102.10***
Number of days in program				.00	-.08	-8.80***
Step 2: Background characteristics	.82	.01	$F(9,3711)=11.48^{***}$			
Age				-.06	-.02	-2.17*
HIV status				3.47	.10	9.47***
Step 3: Two-way interactions with background characteristics	.83	.01	$F(5,3706)=27.83^{***}$			
Gender by HIV status				1.44	.02	2.39*
Age by HIV status				-.39	-.04	-4.49***
HIV status by service dates				.09	.08	6.89***
Gender by service dates				-.12	-.07	-8.69***
Step 4: Client behaviors	.83	<.01	$F(8,3698)=2.12^*$			
Survival sex				.82	.02	2.93**
Step 5: Two-way interaction with client behaviors	.83	<.01	$F(16,3682)=4.13^{***}$			
Gender by risky sex with women				-1.08	-.02	-2.47*
HIV status by survival sex				2.32	.03	2.82**
HIV status by substance abuse				3.16	.05	5.29***
HIV status by IDU risk				-1.69	-.02	-2.00*
Step 6: Other client characteristics and interactions	.83	<.01	$F(8,3674)=1.92$			
(3b) Natural Log Transformation of the Number of Case Management Sessions						
Step 1: Site and service episodes	.60	.60	$F(11,3720)=513.87^{***}$			
Site				---	---	---
Number of service dates				.03	.42	30.90***
Number of days in program				.00	.23	16.68***
Step 2: Background characteristics	.62	.02	$F(9,3711)=19.62^{***}$			
HIV status				.67	.21	13.13***

(Table continues)

Table 2. Hierarchical Multiple Regression of Client Characteristics on the Number of Case Management Sessions

(3b) Natural Log Transformation of the Number of Case Management Sessions						
Model Step	Model Summary			Significant Individual Model Effects		
	R^2	R^2 Change	F Change	B	β	t
Step 3: Two-way interactions with background characteristics	.63	<.01	$F(5,3706)=6.68^{***}$			
Gender by age				-.02	-.02	-2.04*
Age by HIV status				-.05	-.06	-4.02***
HIV status by service dates				-.01	-.07	-4.02***
Step 4: Client behaviors	.63	<.01	$F(8,3698)=2.43^*$			
Survival sex				.10	.03	2.40*
Sex with an HIV-positive person				.10	.03	2.24*
Step 5: Two-way interaction with client behaviors	.63	<.01	$F(16,3682)=2.59^{**}$			
Gender by risky sex with women				-.15	-.03	-2.38*
Gender by survival sex				.18	.03	2.18*
HIV status by sex with an IDU				-.27	-.04	2.14*
HIV status by survival sex				.48	.06	4.11***
Step 6: Other client characteristics and interactions	.63	<.01	$F(8,3674)=1.31$			

* $p < .05$, ** $p < .01$, *** $p < .001$ † $N = 3,732$

Table 3. Regression Summary for Prediction of Service Measures by Case Management

Step	Predictors Added at Step	R^2	R^2 Change	F Change
A. Dependent measure: number of HIV service sessions				
1	Site and service episodes	.29	.29	$F(11,3720)=135.57^{***}$
2	Background characteristics	.33	.04	$F(9,3711)=23.42^{***}$
3	Background characteristics interactions	.42	.10	$F(5,3706)=127.15^{***}$
4a	Case management interactions (raw)	.52	.10	$F(4,3702)=185.15^{***}$
4b	Case management interactions (transformed)	.46	.03	$F(4,3702)=57.08^{***}$
B. Dependent measure: number of psychosocial and peer support sessions				
1	Site and service episodes	.95	.95	$F(11,3720)=6128.33^{***}$
2	Background characteristics	.95	<.01	$F(9,3711)=14.88^{***}$
3	Background characteristics interactions	.95	<.01	$F(5,3706)=8.31^{***}$
4a	Case management interactions (raw)	.96	.01	$F(4,3702)=95.62^{***}$
4b	Case management interactions (transformed)	.95	<.01	$F(4,3702)=19.94^{***}$
C. Dependent measure: number of medical service sessions				
1	Site and service episodes	.32	.32	$F(11,3720)=156.92^{***}$
2	Background characteristics	.36	.05	$F(9,3711)=29.67^{***}$
3	Background characteristics interactions	.42	.06	$F(5,3706)=70.37^{***}$
4a	Case management interactions (raw)	.45	.03	$F(4,3702)=50.99^{***}$
4b	Case management interactions (transformed)	.43	.02	$F(4,3702)=26.86^{***}$
D. Dependent measure: number of times psychosocial issues discussed				
1	Site and service episodes	.86	.86	$F(11,3720)=2145.35^{***}$
2	Background characteristics	.87	<.01	$F(9,3711)=10.45^{***}$
3	Background characteristics interactions	.88	.01	$F(5,3706)=69.13^{***}$
4a	Case management interactions (raw)	.89	.01	$F(4,3702)=50.29^{***}$
4b	Case management interactions (transformed)	.88	<.01	$F(4,3702)=4.84^{**}$
E. Dependent measure: number of times medical service issues discussed				
1	Site and service episodes	.80	.80	$F(11,3720)=1373.08^{***}$
2	Background characteristics	.82	.02	$F(9,3711)=33.55^{***}$
3	Background characteristics interactions	.84	.03	$F(5,3706)=114.80^{***}$
4a	Case management interactions (raw)	.85	.01	$F(4,3702)=55.55^{***}$
4b	Case management interactions (transformed)	.85	<.01	$F(4,3702)=19.87^{***}$
F. Dependent measure: number of times HIV-related issues discussed				
1	Site and service episodes	.59	.59	$F(11,3720)=495.14^{***}$
2	Background characteristics	.60	.01	$F(9,3711)=9.56^{***}$
3	Background characteristics interactions	.62	.02	$F(5,3706)=36.97^{***}$
4a	Case management interactions (raw)	.64	.02	$F(4,3702)=57.03^{***}$
4b	Case management interactions (transformed)	.63	.01	$F(4,3702)=17.72^{***}$
G. Dependent measure: number of psychosocial service referrals				
1	Site and service episodes	.62	.62	$F(11,3720)=540.26^{***}$
2	Background characteristics	.62	.01	$F(9,3711)=5.78^{***}$
3	Background characteristics interactions	.63	<.01	$F(5,3706)=8.79^{***}$
4a	Case management interactions (raw)	.64	.02	$F(4,3702)=41.55^{***}$
4b	Case management interactions (transformed)	.63	<.01	$F(4,3702)=9.96^{***}$

(Table continues)

Table 3. Regression Summary for Prediction of Service Measures by Case Management

Step	Predictors Added at Step	R^2	R^2 Change	F Change
H. Dependent measure: number of medical service referrals				
1	Site and service episodes	.46	.46	$F(11,3720)=286.06^{***}$
2	Background characteristics	.48	.02	$F(9,3711)=19.22^{***}$
3	Background characteristics interactions	.50	.01	$F(5,3706)=18.38^{***}$
4a	Case management interactions (raw)	.51	.02	$F(4,3702)=36.17^{***}$
4b	Case management interactions (transformed)	.51	.01	$F(4,3702)=20.71^{***}$
I. Dependent measure: number of sessions at which educational items distributed				
1	Site and service episodes	.33	.33	$F(11,3720)=163.01^{***}$
2	Background characteristics	.34	.02	$F(9,3711)=9.24^{***}$
3	Background characteristics interactions	.39	.05	$F(5,3706)=57.17^{***}$
4a	Case management interactions (raw)	.39	<.01	$F(4,3702)=5.53^{***}$
4b	Case management interactions (transformed)	.39	<.01	$F(4,3702)=4.56^{***}$
J. Dependent measure: number of sessions at which basic medical support items distributed				
1	Site and service episodes	.51	.51	$F(11,3720)=345.98^{***}$
2	Background characteristics	.53	.03	$F(9,3711)=22.57^{***}$
3	Background characteristics interactions	.54	.01	$F(5,3706)=11.72^{***}$
4a	Case management interactions (raw)	.62	.08	$F(4,3702)=188.69^{***}$
4b	Case management interactions (transformed)	.56	.02	$F(4,3702)=33.36^{***}$

* $p < .05$, ** $p < .01$, *** $p < .001$

† $N = 3,732$

Table 4. Regression Coefficients for the Effects of the Number of Case Management Sessions on Other Services

Dependent Measure	B	SE	β	Sig.
A. Number of HIV testing services				
Case management	.36	.02	.89	***
Case management by gender	-.13	.02	-.16	***
Case management by HIV status	-.38	.02	-.70	***
Case management by age	-.02	.00	-.13	***
B. Number of psychosocial services				
Case management	.53	.03	.21	***
Case management by gender	.08	.04	.02	*
Case management by HIV status	-.22	.04	-.07	***
Case management by age	.01	.00	.01	*
C. Number of medical services				
Case management	-.14	.03	-.25	***
Case management by gender	-.11	.03	-.10	**
Case management by HIV status	.20	.04	.26	***
Case management by age	-.04	.00	-.20	***
D. Number of times psychosocial issues discussed				
Case management	.48	.08	.12	***
Case management by gender	-.82	.11	-.11	***
Case management by HIV status	-.14	.11	-.03	
Case management by age	-.05	.01	-.03	***
E. Number of times medical service issues discussed				
Case management	-.10	.03	-.07	**
Case management by gender	.13	.04	.05	**
Case management by HIV status	.55	.05	.29	***
Case management by age	-.02	.00	-.04	***
F. Number of times HIV issues discussed				
Case management	-.28	.07	-.15	***
Case management by gender	-1.03	.09	-.28	***
Case management by HIV status	-.46	.09	-.19	***
Case management by age	-.07	.00	-.09	***
G. Number of psychosocial service referrals				
Case management	.12	.03	.14	***
Case management by gender	-.19	.04	-.12	***
Case management by HIV status	-.03	.04	-.03	
Case management by age	-.04	.00	-.11	***
H. Number of medical service referrals				
Case management	.09	.02	.19	***
Case management by gender	-.02	.03	-.02	
Case management by HIV status	.08	.03	.12	**
Case management by age	-.01	.00	-.07	***
I. Number of times educational items distributed				
Case management	.06	.03	.09	
Case management by gender	.03	.04	.03	
Case management by HIV status	-.12	.04	-.14	**
Case management by age	.02	.00	.06	***

(Table continues)

Table 4. Regression Coefficients for the Effects of the Number of Case Management Sessions on Other Services

Dependent Measure	B	SE	β	Sig.
J. Number of times basic medical support items distributed				
Case management	.25	.02	.40	***
Case management by gender	-.28	.03	-.23	***
Case management by HIV status	.10	.03	.13	**
Case management by age	-.03	.00	-.11	***

* $p < .05$, ** $p < .01$, *** $p < .001$

† $N = 3,732$

Table 5. Event History (Cox Regression) Analysis of Client Characteristics and Case Management Utilization on Retention: Raw and Log Transformation of the Number of Case Management Sessions

Model Step	Model Summary	Individual Model Effects				
	χ^2 Change	R	Wald Test	B	Odds Ratio	95% Confidence Interval for Odds Ratio
Raw Number of Sessions						
Step 1: Site and service episodes	$\chi^2(10)=1128.23^{***}$					
Site		---	---	---	---	---
Number of service dates		-.09	374.00***	-.07	.93	.93-.94
Step 2: Background characteristics§	$\chi^2(9)=60.81^{***}$					
Gender		-.01	8.81**	-.11	.90	.83-.96
Age		.01	8.25**	.02	1.02	1.01-1.03
HIV status		-.03	34.23***	-.56	.57	.47-.69
Asian American		.00	0.14	-.04	.96	.78-1.18
Caucasian		.00	0.00	.00	1.00	.90-1.11
Hispanic		.00	0.30	.03	1.03	.92-1.16
Native American		-.01	3.80	-.29	.75	.56-1.00
Unknown		.00	2.23	.15	1.16	.95-1.41
Multi-racial		.00	2.20	.14	1.14	.96-1.37
Step 3: Background characteristics interactions	$\chi^2(5)=176.71^{***}$					
Gender by age		.00	.51	-.01	.99	.97-1.01
Gender by HIV status		.01	4.42*	.34	1.40	1.02-1.92
Age by HIV status		.01	3.30	.04	1.04	1.00-1.09
HIV Status by service dates		.04	101.66***	.08	1.09	1.07-1.10
Gender by service dates		-.02	15.55***	-.03	.97	.96-.98
Step 4: Number of case management sessions	$\chi^2(4)=10.20^*$					
Case management		.00	0.01	.00	1.00	.97-1.03
Case management by gender		-.01	4.54*	-.03	.97	.94-1.00
Case management by HIV status		.00	0.20	-.01	.99	.96-1.02
Case management by age		.00	2.53	.00	1.00	1.00-1.01
Transformed Number of Sessions						
Step 1: Site and service episodes	$\chi^2(10)=1128.23^{***}$					
Site		---	---	---	---	---
Number of service dates		-.09	374.00***	-.07	.93	.93-.94
Step 2: Background characteristics§	$\chi^2(9)=60.81^{***}$					
Gender		-.01	8.81**	-.11	.90	.83-.96
Age		.01	8.25**	.02	1.02	1.01-1.03
HIV status		-.03	34.23***	-.56	.57	.47-.69
Asian American		.00	0.14	-.04	.96	.78-1.18
Caucasian		.00	0.00	.00	1.00	.90-1.11
Hispanic		.00	0.30	.03	1.03	.92-1.16

(Table continues)

Table 5. Event History (Cox Regression) Analysis of Client Characteristics and Case Management Utilization on Retention: Raw and Log Transformation of the Number of Case Management Sessions

Model Step	Model Summary	Individual Model Effects				
	χ^2 Change	R	Wald Test	B	Odds Ratio	95% Confidence Interval for Odds Ratio
Native American		-.01	3.80	-.29	.75	.56-1.00
Unknown		.00	2.23	.15	1.16	.95-1.41
Multi-Racial		.00	2.20	.14	1.14	.96-1.37
Step 3: Background characteristics interactions	$\chi^2(5)=176.71^{***}$					
Gender by age		.00	0.51	-.01	.99	.97-1.01
Gender by HIV status		.01	4.42*	.34	1.40	1.02-1.92
Age by HIV Status		.01	3.30	.04	1.04	1.00-1.09
HIV status by service dates		.04	101.66***	.08	1.09	1.07-1.10
Gender by service dates		-.02	15.55***	-.03	.97	.96-.98
Step 4: Natural log transformation of number of case management sessions	$\chi^2(4)=215.66^{***}$					
Natural log of case management		-.05	128.52***	-.44	.65	.60-.70
Natural log of case management by gender		.02	14.24***	.15	1.17	1.08-1.26
Natural log of case management by HIV status		.00	1.48	-.07	.93	.83-1.05
Natural log of case management by age		.02	16.27***	.03	1.03	1.01-1.04

* $p < .05$, ** $p < .01$, *** $p < .001$

† $N = 3,732$

‡ Negative values of B are associated with greater program retention.

§ Effects for ethnicity are compared to those for African Americans.

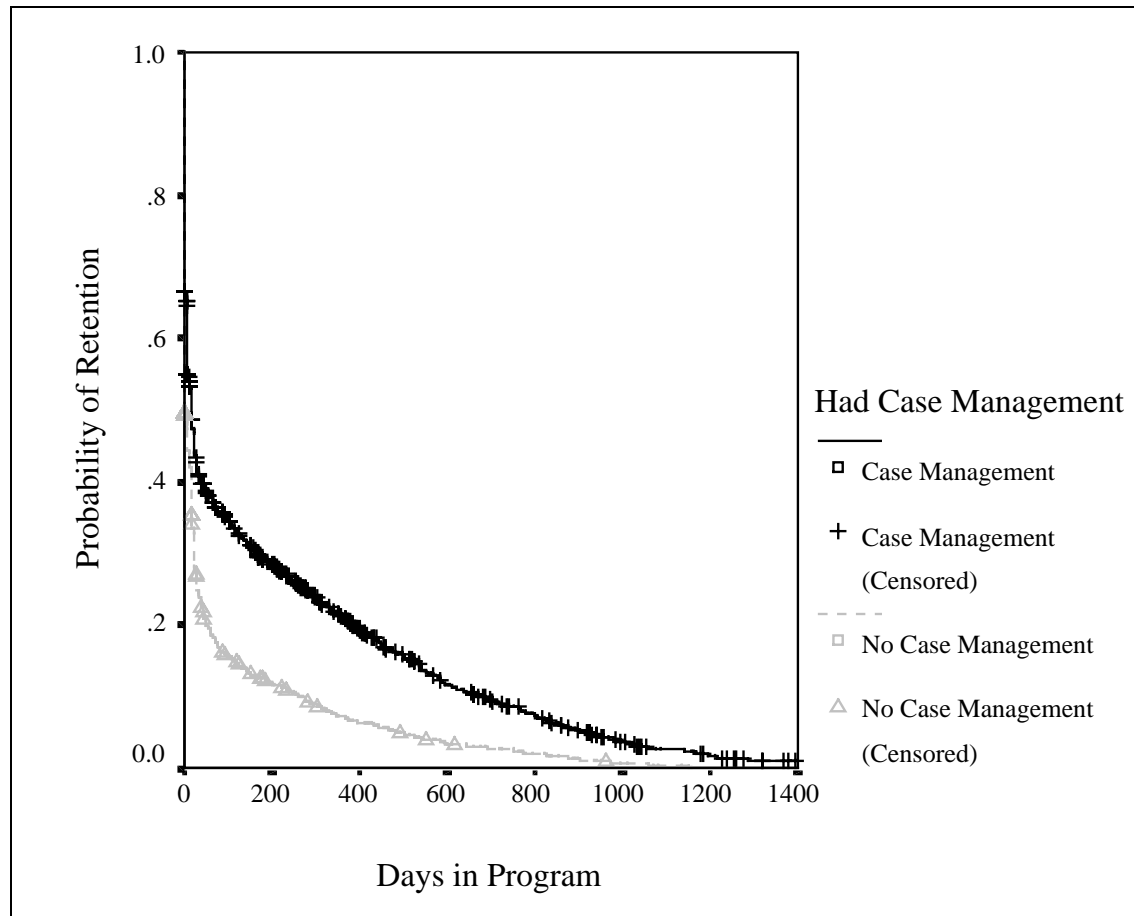


Figure 1. Probability of Remaining in the Program for the Indicated Number of Days as a Function of Whether or Not Case Management was Received.

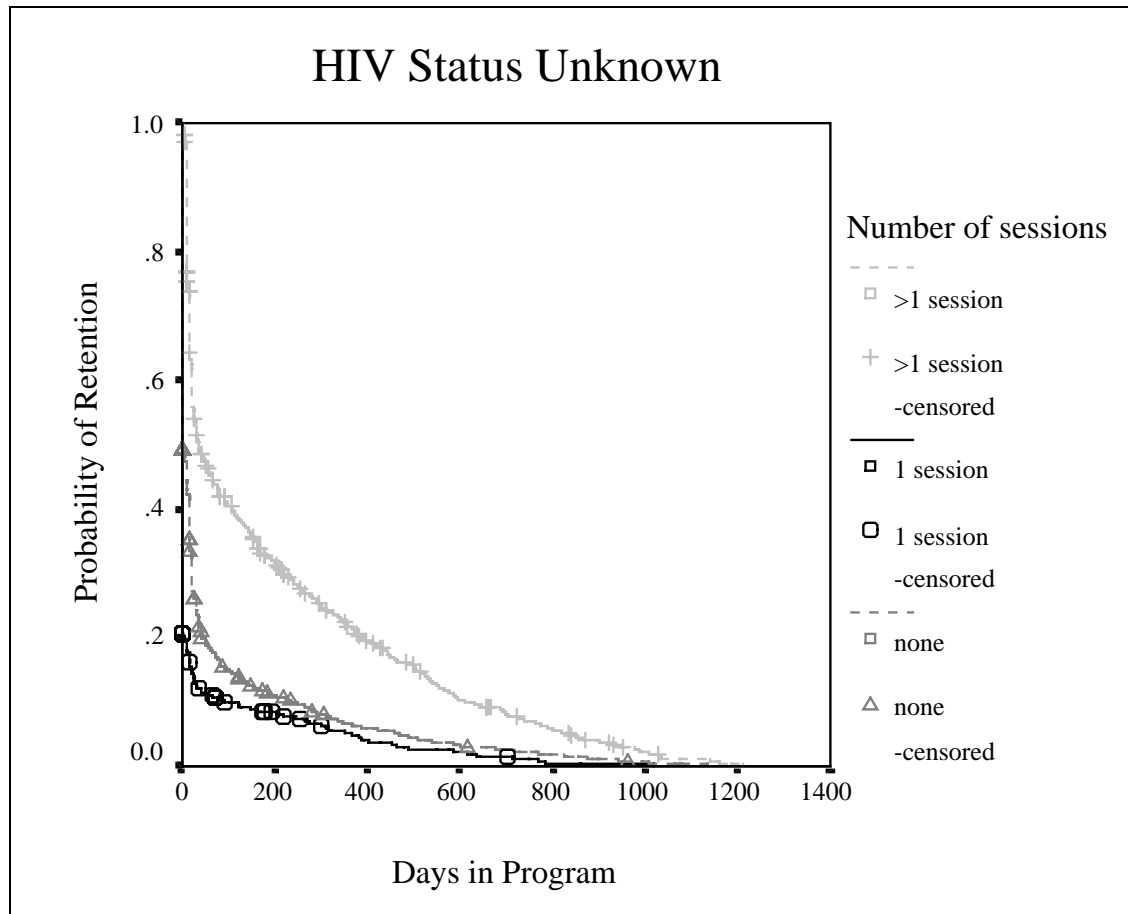


Figure 2. Probability of Retention for the Three Groups of Youth with Unknown HIV Status Based on the Number of Case Management Sessions

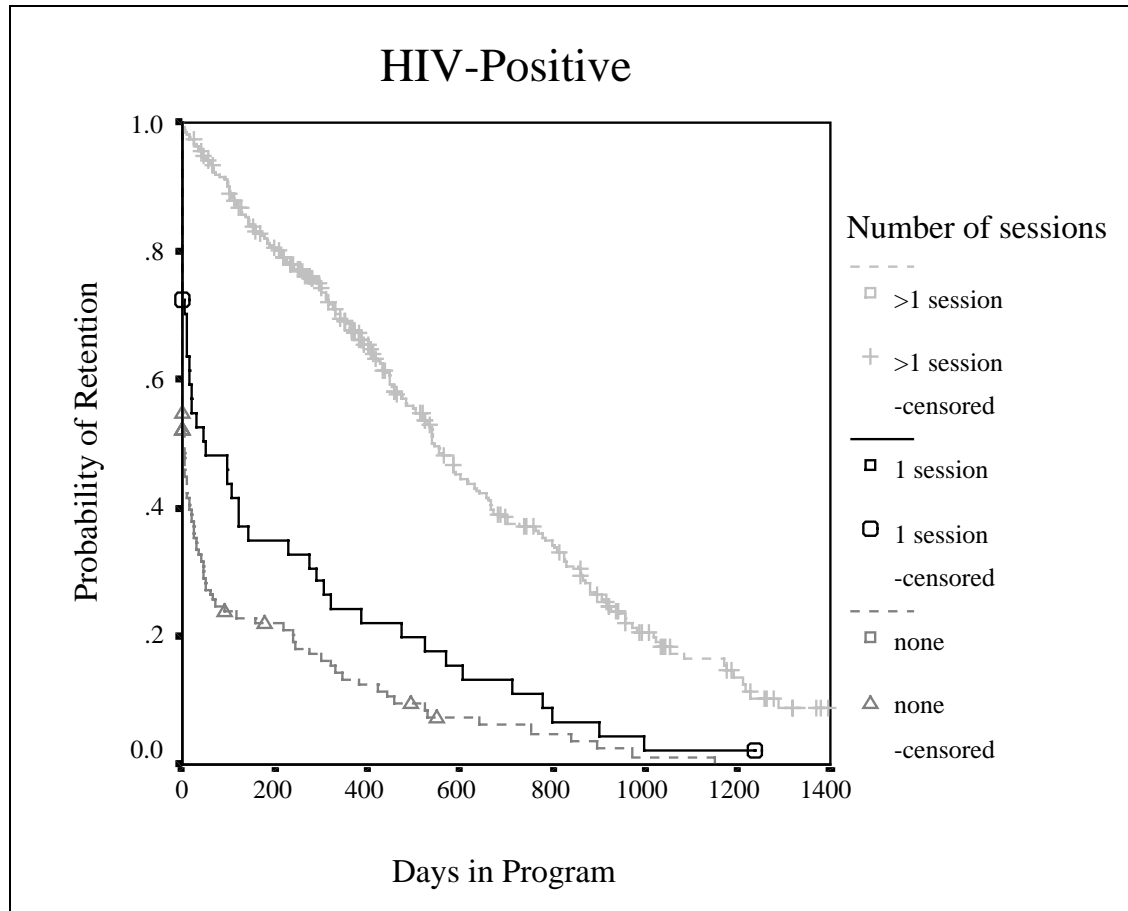


Figure 3. Probability of retention for the Three Groups of HIV-Positive Youth Based on the Number of Case Management Sessions