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Retention of Under-represented Minorities in Drug Abuse Treatment Studies

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Abstract

Background—Differential attrition by minority participants can be as limiting to interpreting final results as poor initial recruitment of minority participants. This is especially important in drug abuse treatment studies, as minorities are over-represented in substance abuse clinical treatment programs.

Purpose—The specific aims of this secondary data analysis were to: (1) determine if there are differences in study retention rates by race/ethnicity and age, and (2) explore other client characteristics, as well as protocol and treatment program factors, that could account for differential retention rates.

Methods—We conducted a secondary analysis using data from 1737 participants in the first six clinical trials whose databases were locked in the NIDA Clinical Trials Network. Protocol level characteristics were also abstracted from these studies, and we used data from a study which assessed characteristics of community treatment programs that participated in these studies. Logistic regression was used to study the effect on retention of: client, protocol, and program characteristics.

Results—In the model of client characteristics, a significant age by race/ethnicity interaction term was detected based on a threshold of 0.1, with younger African Americans having the lowest odds of retention. Primary drug of abuse was also a significant factor in determining study retention, with heroin, methadone, and opiate users having the greatest odds of retention and polydrug users the lowest. Similar analyses testing treatment program characteristics found that only the presence of HIV risk screening and decreasing levels of female admissions (as a percent of total admissions) were related to study retention. In our final model, there was an effect of age, but not race/ethnicity, with younger participants having lower odds of retention. A multivariable model including protocol variables could not be developed due to the high correlation among protocol variables.

Limitations—We excluded those of multi-race/ethnicity and those from minority groups other than Hispanic or African American due to small numbers. Additionally, only three therapy types were represented among the six studies. Some potential variables that would influence retention, such as client housing, and client comorbidities, the race/ethnicity and gender of the staff who

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conducted study follow-up assessments, and reasons for loss to follow-up, were not collected by the CTN.

Conclusions—Although in our client model older African Americans and Caucasians had the greatest odds of retention and younger African Americans the lowest, in our final model, only age was significantly related to study retention. Additionally, primary drug of abuse, having HIV risk screening as a program benefit, and lower percentages of female admissions were significantly related to study retention. Efforts should be made to increase the study retention of younger participants to improve the validity and generalizability of drug abuse treatment study results.

Successful recruitment and retention of minority research participants is critical to addiction research and particularly for the National Institute on Drug Abuse (NIDA) Clinical Trials Network (CTN) whose goal is to disseminate efficacious research findings in front-line community treatment programs. The CTN framework consists of 16 university-based nodes linked with five or more community treatment programs (CTPs). By using front-line treatment settings as study sites, the CTN investigates the effectiveness of treatments which have demonstrated efficacy in academic medical settings. A core issue in effectiveness research is recruiting and retaining a heterogeneous study population so that the results will be generalizable to routine clinical practice.

Much has been written concerning recruitment of minority participants in research projects (e.g., [1-5]); however, less attention has been given to retention of minority participants. While retention is clearly related to recruitment (participants cannot complete a study unless recruited into it), recruitment and retention are still distinctly different components of the research process. Factors that influence a person to enroll in a research project may be different from those factors that influence a participant to drop out or stay in a project. It also should be noted that study retention is different from treatment retention. While clients who are retained in treatment may also be more apt to be retained in a research project, the two are not necessarily mutual. Some clients may be retained in a study for follow-up, but drop out of treatment, and vice versa. Under the intent-to-treat analytic approach to clinical trials, all patients randomized into the trial must be included in the primary analysis [6]. Differential attrition by minority participants can be as limiting to interpreting final results as poor initial recruitment of minority participants. For this reason, it is imperative to study factors influencing minority participant retention in research, as without data on actual study endpoints it is impossible to understand the effects of an intervention and generalize findings to the intended patient subgroups.

To date, the sparse data on reports of retention tend to support non-differential study attrition rates by minority status [7-10]. Studies that look at retention in substance abuse treatment research have mixed reports of retention by minority status. Milligan *et al.* [11] found that Caucasians were in treatment longer than African Americans (even though there were no treatment outcome differences) and hypothesized that several pre-treatment characteristics could potentially predict study drop-out. These included: lifetime major depression (more common among Caucasian participants); unemployment problems (more severe for African Americans); and greater problem severity with substance abuse and psychological issues (higher for Caucasian participants).

Retention issues may well be unique in research on substance use disorder (SUD) treatment, as SUDs are highly stigmatized conditions, and there are often legal, societal, and employment implications from being a person with a SUD as well as from undergoing treatment. The stigma of SUD treatment may be perceived differently by various ethnic/cultural groups. Furthermore, there may be differences in referral sources by race/ethnicity (e.g., forensic or family referrals), which may well influence both recruitment and retention. Other factors which could impact retention rates differentially by race/ethnicity include:

convenience and accessibility of treatment program, time of day, community and family pressures, special accommodations offered to participate (e.g., childcare, payment for transportation), ancillary services provided (e.g., HIV testing, medical care), and research participation incentives. The modality of the investigational treatment may have different meaning for different race/ethnic groups. For example, reactions to pharmacotherapy, psychosocial, or group treatment may differ in various ethnic/cultural groups. The race/ethnicity of the treatment provider may also be a factor. It should be noted that gender and socio-economic class could also influence retention in a similar manner.

To date, most studies have focused on individual participant characteristics as predictors of retention. A notable exception is a systematic review which identifies a number of active strategies (e.g., post card reminders, t-shirts with study logo, newsletters, encouraging study personnel to show empathy, etc.) that various studies have implemented to retain participants [12]. Studies with higher retention rates used more such strategies than studies with lower retention rates. Independent of active strategies, characteristics of specific sites that participate in studies (e.g., services offered, ethnic make up of staff) may be seen as more (or less) “minority” friendly, thus influencing study participation and completion. Additionally, characteristics of particular protocols (e.g., nature of the intervention, amount and kind of participation incentives) may also be seen as more (or less) conducive to minority participation and completion. Archived CTN data offer a unique opportunity to examine not only individual client level characteristics, but also protocol and site characteristics in relation to participant study retention.

The Resource Center on Minority Aging Research (RCMAR) at the Medical University of South Carolina (MUSC) includes a Community Liaison Core with the goal of assisting NIH-funded studies in addressing issues of minority recruitment and retention in older populations. RCMAR partnered with CTN investigators to design and conduct an analysis of secondary data from early studies conducted by the CTN. The specific aims of this secondary data analysis were to: (1) determine if there are differences in CTN study retention rates by race/ethnicity and age, and (2) explore protocol and treatment program factors and other client characteristics that could account for differential retention rates.

Methods

Our study was approved by the Institutional Review Board of the Medical University of South Carolina. Additionally, each of the lead investigators of the CTN studies included in this secondary analysis signed data sharing agreements.

Included in this analysis are data from the first six clinical trials whose databases were locked: CTN studies 1, 2, 5, 6, 7, and 11. We also made use of data from CTN study 8 which assessed characteristics of the community treatment programs that participated in the CTN. Appendix 1 shows the study title and principal investigator of each study. Participants were included in the retention analyses if they met study inclusion criteria and if they were randomized. The CTN data repository did not keep data on subjects who met eligibility criteria but were not randomized, nor did it collect data on reasons for loss to follow-up.

Retention

An indicator variable was created and was set to 1 if the subject completed the final study assessment at which the major outcome variable was collected (as defined by the respective study protocols) or 0 if otherwise. This indicator variable was then used as the outcome of interest to conduct logistic regression analyses in SAS 9.1 (SAS, NC, USA). Retention was operationalized (as per protocol) for each study as follows:

- CTN 1 and 2: Client completed study visit on day 13 or 14
- CTN 5: Client completed 12-week follow-up study visit
- CTN 6 and 7: Client completed 6-month follow-up study visit
- CTN 11: Client completed 13-week follow-up study visit

Reasons for study drop-out were not collected.

Client characteristics

For all subjects, we abstracted person-level data that were common to all protocols: race/ethnicity, gender, age, and primary drug of abuse. Primary drug of abuse was collapsed into the following eight categories: (a) heroin, methadone, opiates; (b) cocaine; (c) cannabis; (d) polydrug; (e) dual alcohol-drug; (f) alcohol; (g) other drugs (including barbiturates, sedatives, amphetamines, methamphetamine); (h) no problem or nicotine.

Protocol characteristics

Protocols were reviewed and categorized along the following dimensions: (a) nature of intervention (drug therapy, psychological therapy, and incentive therapy), (b) protocol structure (length of intervention, time of final assessment at which major outcome variable was collected), (c) maximum potential compensation for study participation, (d) assessment methods (ECG, blood draw, urine screen), and (e) whether sessions are recorded. It should be noted that aside from the financial compensation for study participation, there were no other formal retention strategies in place.

Program characteristics

Data describing each community treatment program (CTP) that participated in one of the target studies were obtained from the Baseline Survey protocol (CTN 8) [13]. This survey had been sent to all community treatment programs that were enrolled in the CTN as of January 2003. Participation in this survey was voluntary, and all responses were provided by staff at the community treatment program. This survey covered organizational factors, staffing levels, aggregate staff descriptive characteristics, and aggregate descriptive statistics of the patient population served. We used data from the specific treatment units within a community treatment program that participated in the protocol. The following dimensions were deemed potentially relevant and assessed in our statistical models: (a) whether a period of sobriety was required before individuals could be admitted to the program; (b) whether methadone or LAAM (levomethadyl acetate, also known as levo-α-acetylmethadol) was used at the facility; (c) whether inpatient and residential services were offered (inpatient or residential detoxification, residential care, halfway house/recovery home, therapeutic community, sober living facility/alcohol and drug free housing); (d) whether ambulatory services were offered (outpatient detoxification, outpatient methadone maintenance, outpatient LAAM (levomethadyl acetate) maintenance, outpatient drug free, intensive outpatient, day treatment/partial hospitalization); (e) the availability of other comprehensive services (primary medical care, hepatitis C viral testing, HIV risk screening, HIV testing, mental health counseling services, mental health medication services, specialized interventions for women including childcare); (f) treatment population (number of admissions, number of individuals served, percent admissions who are women, percent admissions who are minorities, percent admissions who are uninsured, percent admissions on parole); (g) language services (Spanish, other); (h) typical caseload for counseling staff; (i) program composition (approximately what percent of staff are in recovery); and (j) type of corporation.

Statistical analysis

Our primary interest was in understanding the relationship of race/ethnicity and age to retention. Thus we forced the two dummy variables representing the three racial/ethnic groups, along with age, and an age by race/ethnicity interaction term into every multivariate model and selection model. A chi-square test was used to compare retention rates among CTNs.

Logistic regression was used to study the effect on retention of three kinds of characteristics: client, protocol, and program characteristics. Clustering effects of node and study were taken into consideration using Proc Survey logistic in SAS. We fit a multivariable logistic model using all client characteristics listed in Table 1 and all two-way interaction terms except for primary drug of abuse. Those characteristics and interaction terms that were significant ($p < 0.05$ or $p < 0.1$ for interaction terms) were included in subsequent models. Since there were so many protocol and program characteristics, we did an initial screening by fitting a logistic model with each of the protocol or program characteristic adjusted for the significant client characteristics. We included those characteristics with p-values ≤0.15 in the multivariable model. We used a p-value of 0.1 as the criterion for including interaction terms. Where an interaction term was significant, the coefficients and p-values for the main effects are difficult to interpret and are omitted. Also, in the presence of a signficant age, race/ethnicity interaction term, we performed stratified analyses by race/ethnicity in order to understand more about the age relationships. We also assessed linearity in the log odds for those variables that were not binary and applied transformations or collapsed the data into a smaller number of categories as needed.

Results

In the six clinical trials, there were 1910 patients enrolled from 38 community treatment programs. Because few participants were from race/ethnic groups other than Caucasian, African American, or Hispanic, we excluded those of multi-race/ethnicity and other minorities, leaving 1737 Caucasian, African American, and Hispanic patients for analysis. Of the 38 community treatment programs that contributed data to our study, two did not complete the Baseline Survey; therefore, we excluded both of them and associated patients from all analyses that involved program-matic characteristics.

Statistical analysis: summary of model selection results

Client model

Table 1 shows the distribution of client characteristics by study. Looking at all the studies combined, 52% of the participants were Caucasian; however, there is considerable variation by study. CTN 7 had the highest proportion of minority participants (72%), while CTN 5 had the lowest (16%). In general, there were very few clients >50 years old (CTN 7 had the highest proportion with 12%), with 49% of all participants falling in the 36-50 year group. (It should be noted that none of the studies that we used included adolescents.) Most participants were male (58%); however, 55% were female in CTN 6. It was expected that primary drug of abuse would vary considerably by study, as inclusion criteria for some of the protocols were for specific drugs; thus, 97% and 99% of all participants in CTN 1 and CTN 2 reported heroin, methadone, or opiates as their primary drug of abuse, while the other studies had more variation in this characteristic.

The average study retention was 72%; percentages for each study were as follows: CTN 1 83%; CTN 2 80%; CTN 5 75%; CTN 6 59%; CTN 7 77%; CTN 11 72%. These differences were statistically significant ($p < 0.001$). Table 2 shows study retention percentages by

primary drug of abuse. The highest retention (79%) is for those who report heroin, methadone, or opiates as their primary drug, while the lowest retention is for those who report polydrug use (62%).

Of the interaction terms, only that between race/ethnicity and age was significantly related to retention in the multivariable client model ($p = 0.05$), with the odds of retention being less for younger African Americans than for older African Americans and Caucasians. Also kept in the client model was a set of dummy variables representing the primary drug of abuse. Those who reported heroin, opiates, or methadone as their primary drug of abuse had the highest odds of study retention, followed by those who reported alcohol as their primary drug of abuse; those who were polydrug abusers had the lowest odds of retention as compared to the reference group of those with no substance abuse problem or nicotine dependence. Owing to the presence of the significant interaction term, a separate logistic model was fit within each age category to further examine the effect of race/ethnicity on retention, adjusting for primary drug of abuse. Table 3 shows race/ethnicity distributions within age strata. In all three age strata (18-35, 36-50 and >50), a race/ethnicity effect could not be detected ($p \geq 0.5$). The client model is summarized in the upper part of Table 5. *p*-Values for main effects for age and race/ethnicity in the multivariable model are not given due to the presence of the significant interaction term.

Protocol characteristics

By an initial screening of all protocol characteristics adjusting for the variables selected from the client model, incentive therapy ($p = 0.06$), length of intervention ($p = 0.13$), and protocol-specified length to final assessment ($p = 0.15$) were significant using our screening criterion ($p \leq 0.15$). For the six studies, the correlation coefficient among protocol variables was high (>|0.7| for all pairs of variables), so we did not develop a multivariable model for protocol characteristics, but present a table of study retention rates by those significant protocol characteristics. The *p*-value for each protocol characteristic is obtained from a multivariate model including age, race/ethnicity, their interaction term, and primary drug of abuse from the client model. In all models the age, race/ethnicity interaction term remained significant (all *p*-values <0.1).

Table 4 provides a summary of retention percentages by protocol characteristics selected in the variable screening. It should be noted that maximum potential compensation for study participation and length of intervention are directly related in each study.

Program model

We examined the effects of program characteristics on retention. Using our screening criterion ($p \leq 0.15$), 14 variables were significant in models that include the variable selected in the client model. Those 14 variables were then categorized into four groups by program characteristics, and a separate logistic model including the variables from the client model was fit within each group to further select variables; seven variables were significant at the 0.15 level. A logistic model was then fit with those seven significant program variables and the client model variables. The only program variables selected were percent of female admissions ($p = 0.04$) and HIV risk screening ($p < 0.001$). We checked the linearity of percent of female admissions in log odds by plotting log odds vs. quintiles of percent of female admissions (≤20% ($n = 268$), 21%-40% ($n = 942$), 41%-60%($n = 236$), 61%-80% ($n = 26$), and > 80% (n 81)). The middle three quintiles were within 2 percentage points of each other for retention (71-73%); thus, we combined them leaving three groupings: ≤20%, 21%-80%, and >80%. The log odds were then linear for this grouping of percent female admissions. Adjusting for the significant client variables, we then fit a logistic model with those two significant program variables: percent of female admissions

and HIV risk screening. All variables were significant at 0.05 level except for the interaction term for age and race/ethnicity ($p = 0.11$) and race/ethnicity ($p = 0.09$). Thus, older patients had greater odds of study retention. Additionally, participants of programs that offer HIV risk screening had a greater odds of study retention (OR = 3.49; CIs: 2.51, 4.85) than participants in programs that did not offer screening. Clients in programs that have <20% or 21-80% female admissions had a greater odds of study retention than clients from programs with >80% female admissions (respectively OR = 5.21; CIs: 2.11, 12.91; and OR = 2.08; CIs 1.23, 3.5). Our final program model is summarized in Table 5.

Summary and discussion

Our findings indicate that older African Americans and Caucasians (both Hispanic and non-Hispanic) had a greater odds of study retention than younger African Americans when considering only client characteristics. Primary drug of abuse was also a significant factor in determining study retention. In considering factors related to the nature of study protocols, after adjustment for our client level factors, we were unable to develop a multivariable model due to high correlation among protocol variables. When we performed univariate analyses separately testing treatment program characteristics, we found that only the presence of HIV risk screening, decreasing levels of female admissions (as a percent of total admissions), were related to study retention. The age by race/ethnicity interaction term with a *p*-value of 0.11 was not significant by the criterion we chose (0.10). There appears to be some confounding with HIV risk screening, as without HIV risk screening, the interaction term was significant by our criterion in the client and protocol models.

Clearly, retention of study participants in drug treatment trials is a complex phenomenon. Person-level characteristics, age and substance of abuse, were enduring and remained significant even in the presence of protocol and program level variables. The finding associating retention with primary drug of abuse is not surprising. Previous studies have found high treatment attrition rates for individuals with polydrug and stimulant use disorders [14-16]. Individuals with heroin and opiate use disorders are often either receiving opiate replacement or detoxification services; thus, leaving treatment prematurely would result in adverse physical symptoms. Although these findings from the literature relate to treatment retention, they parallel our findings for study retention. Thus, studies 1 and 2, which were designed for opioid dependent subjects and had a short intervention (13 days), would be expected to have high study retention rates.

Unfortunately, in our analysis of protocol factors, we only had six different protocols to consider, and for protocols 1 and 2 as well as for protocols 6 and 7 the only differences were in setting - not procedures. Thus, our ability to study the impact of protocol variability was reduced. Nevertheless, the lack of a detectable association between either maximum potential compensation for study participation and its surrogate, length of study intervention and retention is intriguing.

More difficult to interpret are our program level findings. We were surprised that offering HIV risk screening was important. This service may be an indicator of more comprehensive services in general, or it may represent a need that is being filled for clients, and thus a programmatic approach that encourages retention. It is also possible that the presence of HIV risk screening is indicative of other ancillary services that encourage `one stop shopping,' thus providing multiple reasons for returning to the treatment center - again with a positive impact for study retention.

At the program level, we were also surprised to find that the programs with high annual percent of female admissions have relatively low retention rates. While gender itself (at the client level) was not a significantly related to retention, at the program level decreasing

percentages of female admissions were related to higher retention. We have no clear explanation for this finding.

A number of publications outline challenges in retention of minority participants in research projects, as well as strategies for improved retention (e.g., [17-23]). In a qualitative study of HIV positive drug users who were participants in a nutritional chemoprevention trial, Moreno-Black *et al.* [18] found that three themes emerged for continuation in the study: increased health awareness, personal enhancement, and sociability. It may be that treatment centers with HIV risk screening actually tapped into and enhanced participant health awareness, thus positively affecting study retention.

The strengths of this analysis are that it includes a large number of drug abuse treatment clients from geographically disperse areas throughout the United States. It also includes multiple studies representing different types of interventions. We had the ability to look at programmatic characteristics that might be influential in study retention. Thus, the ability to look at characteristics from these three levels (client, protocol, and program-matic) represents a major advance.

As limitations, only three therapy types were represented among the six studies, we did not have data on all programmatic variables that could influence retention, and there was limited variability among protocols. For example, number of intervention sessions may be important, but was not used in this study because we had one protocol that was conducted during an inpatient stay making it difficult to quantify this variable for that study. In addition, since protocol length and compensation were directly related, we could not study these variables separately. Importantly, we were not able to measure race/ethnicity or gender of the staff who actually conducted study follow-up assessments, and this may have been a key influence on study retention. We also had to drop from analysis minority groups other than Hispanic and African American and those who were of multi-race/ethnicity due to small numbers. It should also be noted that two protocols (CTN 6 and 7) published on an earlier retention endpoint (12 weeks) than the endpoint specified in the protocol due to poor study retention at the later time point. Since we were interested in retention, we used the protocol specified end point.

Future studies of retention could build off of these findings. Our data suggest, at least for substance abuse studies, that special attention needs to be paid to younger participants with a suggestion of a need for particular focus on young African Americans and that offering onsite HIV testing could be a useful incentive. Future studies including a wider range of minority groups, expanding the protocol types, and assessing additional programmatic features such as race/ethnicity of study interviewers would be useful in developing future retention interventions for all race/ethnicity groups.

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Appendix 1

CTN studies with locked database

CTN Protocol #	Title	Lead Investigator	# enrolled	# CTPs participating
1	Buprenorphine/naloxone vs. clonidine for inpatient opiate detoxification [24,25]	Walter Ling	113	6
2	Buprenorphine/naloxone vs. clonidine for outpatient opiate detoxification [24,25]	Walter Ling	232	6
5	Motivational interviewing to improve treatment engagement & outcome in subjects seeking treatment for substance abuse [26]	Kathleen Carroll	423	6
6	Motivational incentives for enhanced drug abuse recovery: Drug free clinics [27]	Maxine Stitzer	415	10
7	Motivational incentives for enhanced drug abuse recovery: Methadone clinics [28]	Maxine Stitzer	388	6
11	A feasibility study of telephone enhancement procedure (TELE) to improve participation in continuing care activities [29]	Robert Hubbard	339	4
8	Assessment of the National Drug Abuse CTN: A baseline for investigation diffusion of innovation [13]	Dennis McCarty	—	106

References

1. Swanson GM, Ward AJ. Recruiting minorities into clinical trials: toward a participant-friendly system. J Natl Cancer Inst. 1995; 87:1747–59. [PubMed: 7473831]
2. Napoles-Springer AM, Grubach K, Alexander M, et al. Clinical research with older African Americans and Latinos: perspectives from the community. Res Aging. 2001; 22:668–91.
3. McDougall GJ, Holston EC, Wilke P. Recruiting African Americans into research on cognitive aging. Ethn Dis. 2001; 11:124–33. [PubMed: 11289233]
4. Fisher B, Constantino J, Wickeham LJ, et al. Tamoxifen for prevention of breast cancer: report of the National Surgical Adjuvant Breast and Bowel Project P-1 Study. J Natl Cancer Inst. 1998; 90:1371–88. [PubMed: 9747868]
5. Gail MH, Costantino JP, Bryant J, et al. Weighing the risks and benefits of tamoxifen treatment for preventing breast cancer. J Natl Cancer Inst. 1999; 91:1829–46. [PubMed: 10547390]
6. Piantadosi, S. Clinical Trials: A Methodologic Perspective. John Wiley and Sons, Inc.; New Jersey: 2005.
7. Hypertension Detection & Follow-up Program Cooperative Group. Five-year findings of the Hypertension Detection and Follow-up Program. II. Mortality by race-sex and age. JAMA. 1979; 242:2572–7. [PubMed: 490883]
8. Connett JE, Stamlet J. Responses of black and white males to the special intervention program of the Multiple Risk Factor Intervention Trial. Am Heart J. 1984; 108:839–48. [PubMed: 6475754]
9. NINDS t-PA Stroke Study Data Set (on CD-ROM). Data file. National Inst. of Neurological Disorders and Stroke; Bethesda, MD: ProductType: Computer data file, NTIS Order Number: PB2006-500032
10. Tilley BC, Alarcon GS, Heyse SP, et al. Minocycline in rheumatoid arthritis: a 48-week double-blind, placebo controlled trial. Ann Intern Med. 1995; 122:81–89. [PubMed: 7993000]

11. Milligan CO, Nich C, Carroll KM. Ethnic differences in substance abuse treatment retention, compliance, and outcome from two clinical trials. Psychiatr Serv. 2004; 55:167–73. [PubMed: 14762242]
12. Robinson KA, Dennison CR, Wayman DM, Pronovost PJ, Needham DM. Systematic review identifies number of strategies important for retaining study participants. J Clin Epidemiol. 2007; 60:757–65. [PubMed: 17606170]
13. McCarty D, Fuller B, Kaskutas LA, et al. Treatment programs in the National Drug Abuse Treatment Clinical Trials Network. Drug Alcohol Depend. 2008; 92:200–207. [PubMed: 17875368]
14. Mertens JR, Weisner CM. Predictors of substance abuse treatment retention among women and men in an HMO. Alcoholism Clin Exp Res. 2000; 24:1525–33.
15. Fishman J, Reynolds T, Riedel E. A retrospective investigation of an intensive outpatient substance abuse treatment program. Am J Drug Alcohol Abuse. 2000; 25:185–96. [PubMed: 10395154]
16. Schmitz JM, Bordnick P, Kearney M, Fuller SM, Breckenridge JK. Treatment outcome of cocaine-alcohol dependent patients. Drug Alcohol Depend. 1997; 47:55–61. [PubMed: 9279498]
17. Grant JS, DePew DD. Recruiting and retaining research participants for a clinical intervention study. J Neurosci Nurs. 1999; 31:357–62. [PubMed: 10726244]
18. Moreno-Black G, Shor-Posner G, Miguez M-J, et al. “I will miss the study, God bless you all”: Participation in a nutritional chemoprevention trial. Ethn Dis. 2004; 14:469–75. [PubMed: 15724764]
19. Cooley M, Sarna L, Brown JK, et al. Challenges of recruitment and retention in multisite clinical research. Cancer Nurs. 2003; 26:376–86. [PubMed: 14710799]
20. Cassidy EL, Baird E, Sheikh JI. Recruitment and retention of elderly patients in clinical trials: Issues and strategies. Am J Geriatr Psychiatry. 2001; 9:136–40. [PubMed: 11316617]
21. Pruitt RH, Privette AB. Planning strategies for the avoidance of pitfalls in intervention research. J Adv Nurs. 2001; 35:514–20. [PubMed: 11529950]
22. Kavanaugh K, Moro TT, Savage T, Mehendale R. Enacting a theory of caring to recruit and retain vulnerable participants for sensitive research. Res Nurs Health. 2006; 29:244–52. [PubMed: 16676343]
23. Ford ME, Havstad S, Vernon SW, et al. Enhancing adherence among older African American men enrolled in a longitudinal cancer screening trial. Gerontologist. 2006; 46:545–50. [PubMed: 16921009]
24. Amass L, Ling W, Freese TE, et al. Bringing buprenorphine-naloxone detoxification to community treatment providers: The NIDA Clinical Trials Network field experience. Am J Addict. 2004; 13:S42–66. [PubMed: 15204675]
25. Ling W, Amass L, Shoptaw S, et al. Buprenorphine Study Protocol Group. A multicenter randomized trial of buprenorphine-naloxone versus clonidine for opioid detoxification: Findings from the National Institute on Drug Abuse Clinical Trials Network. Addiction. 2005; 100:1090–1100. [PubMed: 16042639]
26. Carroll KM, Ball SA, Nich C, et al. National Institute on Drug Abuse Clinical Trials Network. Motivational interviewing to improve treatment engagement and outcome in individuals seeking treatment for substance abuse: a multisite effectiveness study. Drug Alcohol Depend. 2006; 81:301–12. [PubMed: 16169159]
27. Petry NM, Peirce JM, Stitzer ML, et al. Effect of prize-based incentives on outcomes in stimulant abusers in outpatient psychosocial treatment programs: A National Drug Abuse Clinical Trials Network study. Arch Gen Psychiatry. 2006; 62:1148–56. [PubMed: 16203960]
28. Peirce JM, Petry NM, Stitzer ML, et al. Effects of lower-cost incentives on stimulant abstinence in methadone maintenance treatment: A National Drug Abuse Treatment Clinical Trials Network study. Arch Gen Psychiatry. 2006; 63:201–08. [PubMed: 16461864]
29. Hubbard RL, Leimberger JD, Lucas K, et al. Telephone Enhancement of Long-term Engagement (TELE) in continuing care for substance abuse treatment: A NIDA Clinical Trials Network (CTN) Study. Am J Addict. 2007; 16:495–502. [PubMed: 18058417]

Table 1

Client characteristics by study (*n* (%))

		CTN 1 *N* = 106	CTN 2 *N* = 226	CTN 5 *N* = 362	CTN 6 *N* = 388	CTN 7 *N* = 360	CTN 11 *N* = 295	Total *N* = 1737
Race/Ethnicity	Caucasian	63 (59)	92 (41)	304 (84)	149 (38)	98 (28)	189 (64)	895 (52)
	African American	22 (21)	85 (38)	42 (12)	175 (45)	194 (54)	103 (35)	621 (36)
	Hispanic	21 (20)	49 (22)	16 (4)	64 (16)	63 (18)	3 (1)	216 (12)
Age[a]	18-35	53 (50)	87 (39)	223 (63)	193 (50)	78 (22)	140 (47)	774 (45)
	36-50	46 (43)	119 (53)	122 (34)	184 (47)	233 (66)	136 (46)	840 (49)
	>50	7 (7)	20 (9)	17 (5)	11 (3)	44 (12)	19 (6)	118 (7)
Gender[b]	Male	63 (59)	162 (72)	211 (58)	176 (45)	202 (57)	187 (63)	1001 (58)
Primary drug of abuse[c]	No problem/Nicotine	0 (0)	1 (<1)	0 (0)	6 (2)	1 (<1)	79 (27)	87 (5)
	Alcohol	0 (0)	0 (0)	139 (38)	28 (7)	4 (1)	75 (26)	246 (14)
	Heroin, Methadone, and Opiates	102 (97)	224 (99)	12 (3)	6 (2)	151 (43)	21 (7)	516 (30)
	Cocaine	0 (0)	0 (0)	17 (5)	153 (39)	117 (33)	56 (19)	343 (20)
	Cannabis	0 (0)	0 (0)	49 (14)	9 (2)	1 (<1)	13 (4)	72 (4)
	Alcohol-drug dual	0 (0)	1 (<1)	72 (10)	52 (13)	9 (3)	42 (14)	176 (10)
	Polydrug	3 (3)	0 (0)	15 (4)	58 (15)	64 (18)	0 (0)	140 (8)
	Other drugs	0 (0)	0 (0)	58 (16)	76 (20)	8 (2)	8 (3)	150 (9)

[a] Five patients were missing age;

[b] One patient was missing gender;

[c] Seven patients were missing primary drug of abuse.

Table 2

Retention by primary drug of abuse

Primary drug of abuse	N[a]	%[b]
Heroin, methadone, and opiates	516	79
Cocaine	343	68
Cannabis	72	71
Other drug	150	71
Polydrug	140	62
Alcohol-drug dual	176	65
Alcohol	246	76
No Problem/nicotine	87	71

p-Value < 0.01 from logistic model including age and race/ ethnicity effects and their interaction term.

[a] Numbers exclude `other' race/ethnicity and those of multi-race/ ethnicity (n = 175); missing = 7;

[b] % retained.

Table 3

Retention by age-race/ethnicity

	18-35 years	N^a %^{b}	**36-50 years**	N^a %^{b}	**> 50 years**	N^a %^{b}	**Total**	N^a %^{b}
Caucasian	515	69	336	74	44	82	895	72
AfricanAmerican	132	63	427	74	62	85	621	73
Hispanic	127	71	77	71	12	83	216	72
Total	774	68	840	74	118	84	1732	72
p-Value^c	0.5		0.9		0.7			

[a] Numbers exclude `other' race (n = 173), missing = 5;

[b] % retained;

[c] Comparison of race/ethnic groups within age strata using logistic regression, adjusting for primary substance of abuse. Strata were separately analyzed as there was a significant age by race/ethnicity interaction term ($p < 0.05$).

Table 4

Retention by protocol variables

		N	% retention
Length of intervention	1 day (CTN 5)	362	75
	13 days (CTN 1 & 2)	332	81
	84 days (CTN 6, 7 & 11)	1043	69
			p-value = 0.13*
Incentive therapy	Yes (CTN 6 & 7)	748	67
	No (CTN 1, 2, 5 & 11)	989	76
			p-value = 0.06*
Time to final assessment	13 days (CTN 1 & 2)	332	81
	12 weeks (CTN 5)	362	75
	13 weeks (CTN 11)	295	72
	26 weeks (CTN 6 & 7)	748	67
			p-value = 0.15*

* From logistic model including age, race/ethnicity, age and race/ ethnicity interaction term, and primary substance of abuse. The interaction term was significant at $p < 0.1$ in all models.

Table 5

Summary of models

Models	Variable	Odds Ratio	95% C.L.	*p*-value
Model 1: Client	Race/ethnicity	—	—	—
	Primary drug of abuse[a]			< 0.001
	Heroin/methadone/opiates	1.4	0.65, 3.04	
	Cocaine	0.84	0.48, 1.47	
	Cannabis	1.2	0.62, 2.32	
	Other drug	1.04	0.63, 1.73	
	Polydrug	0.64	0.36, 1.14	
	Alcohol-drug duo	0.79	0.4, 1.55	
	Alcohol	1.21	0.64, 2.27	
	No problem or nicotine	1.0		
	Age	—	—	—
	Age by race/ethnicity	—	—	0.05
Model 2: Program-client	Primary drug of abuse			< 0.001
	Heroin/methadone/opiates	1.58	0.81, 3.08	
	Cocaine	0.87	0.49, 1.53	
	Cannabis	1.42	0.68, 2.2	
	Other drug	1.22	0.68, 2.2	
	Polydrug	0.63	0.37, 1.08	
	Alcohol-drug duo	0.72	0.4, 1.32	
	Alcohol	1.14	0.64, 2.03	
	No problem or nicotine	1.0		
	Age	_1.03	1.01, 1.04_	_< 0.001
	HIV risk screening			< 0.001
	Yes	3.49	2.51, 4.85	
	No	1.0		
	% female admissions			0.002
	≤20%	5.21	2.11, 12.91	
	21-80%	2.08	1.23, 3.5	
	>80%	1.0		

[a]We chose `no problem or nicotine' as the reference group for primary drug of abuse based on clinical relevance, as we were interested comparisons to the least serious drug of abuse group.