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TESTING A MODEL OF PARTICIPANT RETENTION IN LONGITUDINAL SUBSTANCE ABUSE RESEARCH: THE MODERATING ROLE OF PARTICIPANT CHARACTERISTICS

by

DEVIN GILMORE

Under the Direction of Gabriel P. Kuperminc

ABSTRACT

Longitudinal substance abuse research has often been compromised by high rates of attrition, thought to be the result of the lifestyle that often accompanies addiction. Several studies have used a standardized follow-up protocol to minimize attrition, however it is unclear whether this protocol is equally effective for participants struggling with varying levels of housing stability, support for sobriety, and substance abuse severity. The current study extends research supporting the effectiveness of this protocol by demonstrating the importance of two central aspects of the follow-up protocol: locator form completion and continual verification contacts. Results indicated that each additional piece of locator form information and verification contact significantly and independently increased the odds for completing a follow-up interview, and that these effects were not moderated by participant characteristics. Practical and theoretical implications for longitudinal substance abuse research are discussed.

INDEX WORDS: Attrition, Substance abuse, Longitudinal, Follow-up, Dropout, Retention

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by

DEVIN GILMORE

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Master of Arts

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Georgia State University

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Devin Gilmore
2012

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1. INTRODUCTION

Drug and alcohol addiction have long been recognized by the health care system as chronic, long-term conditions with multiple periods of relapse and recovery (Compton, Glantz, & Delaney, 2003). Accordingly, there have been increased calls from agencies such as the Institute of Medicine (Institute of Medicine, 1998) and National Institute on Drug Abuse (NIDA) (NIDA, 2004) for studies evaluating the short and long-term clinical and cost effectiveness of community-based drug treatment programs. These types of evaluations usually make use of longitudinal, repeated measures designs with pre-test and follow-up assessments to track change over time (Mowbray & Luke, 1996).

The validity of conclusions drawn from these studies is threatened by participant loss, or attrition (Claus, Kindleberger, & Dugan, 2002). If attrition is random, the only threat that results is a loss of statistical power (Howard et al., 1986). However, because the degree and direction of the bias resulting from high attrition rates often remain unknown, attrition typically presents threats to both the internal and external validity of longitudinal studies (Brown, 1990). As attrition rates rise it becomes more difficult to claim that changes in dependent variables of interest are the result of an intervention, and not differential attrition (Shadish, Cook & Campbell, 2002). Additionally, the external validity of such studies is threatened by attrition when participants who fail to complete one or more follow-up measures differ systematically from study completers (Hansen, Collins, Malotte, Johnson, & Fielding, 1985). For example, Scott (2004) examined the number of attempts required to reach study participants as a predictor of variability in participant characteristics and found that participants who took fewer attempts to reach differed substantially on outcomes such as drug use and illegal activity. This suggests that the results of the study would have been biased if the harder to reach group was not interviewed.

1.1 The follow-up process

Researchers undertake a range of tracking strategies to minimize participant attrition, including phone calls (Meyers, Webb, Frantz, & Randall, 2003), letters, internet searches (Zand, Thomson, Dugan, Braun, Holterman-Hommes, & Hunter, 2006), and street outreach (Scott, 2004). Historically, most longitudinal studies have not addressed causes of attrition specifically enough to draw firm conclusions about the effectiveness of different strategies (Hansen, Tobler. & Graham, 1990), however more recent studies have identified telephone calls as a more effective tracking strategy than letters, in-person contact (Nemes, Wish, Wraight, & Messina, 2002), and searches through agencies such as social security, credit information, and criminal justice (Cottler et al. 1996). These strategies may also differ in effectiveness as a result of participant characteristics. For example, in a longitudinal study of adolescents, Hobden, Forney, Durham, & Toro (2011) found that contact with friends and family members was the most effective strategy overall, and that letters and driver's record searches were more effective for reaching homeless participants than for reaching housed participants.

To maximize follow-up rates in studies with hard to reach populations, researchers often attempt to gather extensive contact information during the initial interview. This information typically includes the participant's own phone number and address, as well as information that can be used to locate friends, family members, or anyone else who might be able to locate the participant (Coen, Patrick, & Shern, 1996). The information is collected on a locator form, which is then used by the researchers during subsequent efforts to complete follow-up interviews.

For example, Wright et al. (1995) used locator forms to track 670 individuals who were homeless with substance use problems, and stressed the importance of verifying the information

quickly after it has been collected. The follow-up team verified the information by calling the phone numbers given within 24 hours to confirm the accuracy of the information with the participant. Cottler, Compton, Ben-Abdallah, Horne, and Claverie (1996) advised in a study of substance abusers that contact information be collected from participants at the very beginning of the study, before they become impatient or tired. In a four and a half year longitudinal study of homeless adolescents, Hobden, et al. (2011) collected contact information for four friends or family members of the participant at intake and verified this information at each point of contact with participants. Using this method, they found that numbers for friends and family members (collateral contacts) were the most important predictor of follow-up completion, and advised that as much contact information as possible be collected at intake.

In a longitudinal study of substance users, Scott (2004) stressed the importance of continual efforts to track participants. Letters and telephone contacts are used at regular intervals to keep in touch with participants. For example, researchers may send a letter every other month, and periodically contact participants by telephone to ensure that the team does not lose contact with participants. Research procedures employing these techniques yielded follow-up rates of 70% during a 21-month follow-up window, among participants in a court-mandated DUI program. Such periodic contacts aid in increasing follow-up rates only up to a certain point, however. Kleschinsky, Bosworth, Nelson, Walsh, and Shaffer (2009) found that after 40 telephone calls, the follow-up rate did not increase with continued attempts.

Most tracking procedures for hard-to-find individuals have strongly emphasized the following as important elements of an effective follow-up process: the importance of locator information (Dennis et al., 2002), that the maximum possible amount of locator data should be collected to ensure follow-up (Cottler, 1996), and maintaining contact throughout the study

(Scott, 2004). Hobden et al. (2011) found that only 2% of homeless and 9% of housed participants responded to letters, and that 80% of homeless participants changed their contact information at some point during the study, indicating that specific tracking procedures may vary as a function of participant characteristics.

1.2 Participant characteristics

An array of research among different populations has examined how participant characteristics affect the ability of researchers to locate individuals for follow-up. Analyses are often focused on understanding and correcting possible sources of biases resulting from attrition or item non-response. Drug-using participants in longitudinal studies are usually considered an especially difficult group to reach, for reasons such as housing instability and criminal activity (Bale, Arnoldussen, & Quittner, 1984), disconnection from friends and family (Ziek, Beardsley, Deren, & Tortu, 1996), unemployment (Cottler et al., 1996), and substance re-use after treatment (Nemes, Wish, Wraight, & Messina, 2002; Walton et al., 1998).

However, studies have often yielded contradictory results regarding one or more participant characteristics (Hobden et al., 2011). For instance, Bale et al. (1984) found that employed participants were more difficult to reach, while Cottler et al. (1996) found that unemployed participants were more difficult to reach. Nemes, Wish, Wraight, and Messina (2002) and Walton et al. (1998) found contradictory results for the effects of age, employment, and marital status, but both studies found that substance re-use after treatment was associated with increased contact difficulty.

For people struggling with drug abuse, the underlying mechanisms behind follow-up difficulty may not be fully explainable only in terms of participant-level factors. For example, drug-using participants undergoing treatment may cycle back and forth between a “clean”

network and a substance-using network (Scott, 2004), and the clean network may be more helpful and reliable for follow-up contact than the using network.

Further research is needed to more fully explore how tracking strategies might vary in effectiveness for participants who have different levels of substance abuse, access to housing, and support for sobriety. This information can be used to develop effective tracking strategies for different groups of participants, as well as to better understand and explain participant attrition in the context of each study's unique participants and processes.

1.3 Standardized tracking protocol for transient, drug-using participants

Some researchers have characterized the lifestyle that accompanies a person's struggle with addiction in terms of the challenges that lifestyle poses to the follow-up process. For example, individuals who are heavy drug users are often highly mobile and disorganized. At the same time, they have a basic desire to avoid detection. These characteristics are thought to contribute to high dropout rates in longitudinal studies with this population (Ziek et al., 1996). Scott (2004) developed the Engagement, Verification, Maintenance, and Confirmation (EVMC) protocol to manage participant tracking and data collection for several outcome studies for residential inpatient, intensive outpatient, and methadone maintenance programs. The protocol makes use of an extensive locator form interview to gather contact information and periodic contacts throughout the course of the study to continually update and refine this information. Each of these periodic contacts is referred to as a "milestone." A key feature of the protocol is that each failure to reach a participant for a given milestone triggers a set of intensive tracking procedures, such as street outreach and database searches, which continue until the milestone is completed.

The current study relied heavily on this protocol for guidance in designing and implementing the follow-up process, however some facets of the protocol were implemented differently from the procedures described in the EVMC protocol due to the practical and logistic considerations of the project. For example, because the same staff members were responsible for conducting the intake assessment, gathering locator information, and providing the appropriate intervention in a time-constrained emergency room setting, it was necessary to shorten the locator form in order to lessen the burden on staff. Adaptations to the EVMC model are described in Table 1.

The present study focused on the role of 3 key milestones in the EVMC protocol in predicting subsequent milestones: completion of locator form information, interim contacts with study participants to verify locator form information at two time-points (7-10 days after intake, and 3 months after intake), and completion of a follow-up interview. Other strategies used in the EVMC protocol, such as letters and internet searches, were not evaluated in the present study, because the success of those strategies is not always confirmable (e.g., it is not possible to confirm that a study participant actually received a letter that was mailed to him or her).

1.4 Hypotheses

Two hypotheses were examined. First, it was hypothesized that completing each milestone of the follow-up process is associated with an increased chance of completing subsequent milestones. Second, it was hypothesized that participant characteristics (substance abuse severity, housing stability, and support for sobriety) would moderate these associations. Specifically, it was hypothesized that the effect of each milestone on completion of the next milestone would be attenuated for participants with high substance abuse severity, low housing stability, and low support for sobriety. These characteristics were chosen based on previous

research linking them to attrition in longitudinal substance abuse research. Specifically, substance abuse severity is thought to contribute to housing instability and decreased connection with people who support sobriety (Ziek, Beardsley, Deren, & Tortu, 1996). In turn, some evidence suggests that housing instability plays a role in the effectiveness of some forms of participant tracking, such as letters (Hobden et al., 2011), and the importance of social connections to the tracking process has been highlighted by Scott (2004), recommending in the description of the EVMC protocol that contact information be collected for no fewer than 3 collateral contacts.

2. METHOD

2.1 Participants

Emergency room patients (N=463) at two large urban medical centers in the Southeastern U.S. were recruited for the study during Federal Fiscal Year 2010 (from October 1st, 2009 through September 30th, 2010). Of these, 66 participants were missing either their locator form, main survey, or tracking log and were removed from the dataset. Six participants had their interviews completed by an off-site follow-up team and their verification data was not available, so they were removed. Nine participants withdrew their participation at some point between intake and follow-up, and one participant died before their follow-up interview. These participants were also removed from the dataset, leaving data for 381 participants for analysis.

2.2 Procedure

The procedure for the present study is comprised of screening, treatment, and the follow-up process. Screening, treatment, locator form completion, and random selection were performed by Health Educators (HEs) at the two sites (Grady and MCCG), while most participant tracking procedures were handled by the evaluation team at Georgia State University.

The follow-up procedures used in the current study are based on Scott's (2004) EVMC protocol, which was adapted to meet the unique needs of the project (see Table 1).

Screening, treatment, and random selection. Participants were administered a brief screening tool measuring alcohol and drug use to determine their eligibility for treatment. Based on the screening score, patients received either a brief intervention (BI), brief therapy (BT), or a referral to treatment (RT) from HEs on site. The level of treatment provided was based on their score on the Alcohol, Smoking, and Substance Involvement Screening Test, version 3.0 (ASSIST 3.0; World Health Organization, 2006). A 10% random sample was drawn from patients who scored high enough to receive the lowest level of treatment, BI. Patients who were randomly selected and consented to participate in the follow-up study were given a full assessment, which includes the ASSIST and other measures such as support for sobriety.

Adaptation of EVMC protocol to the present study. As detailed previously, Scott's (2004) EVMC protocol has consistently demonstrated high follow-up rates among substance using participants across a variety of sample sizes (150-2862 participants) and settings, such as halfway houses, residential treatment, methadone maintenance, and intensive outpatient services. To suit the fast-paced emergency room environment a shortened locator form was used by HEs to record information on the friends and family members of participants, as well as in-depth contact information on participants with low housing stability.

An appointment card with the project's logo and contact information was given to participants by the HEs after their initial treatment session. After quickly receiving contact information from the two sites, the evaluation team was then able to periodically contact participants by phone to remind them of their participation while using the same logo on

subsequent mailings to participants with gift cards, birthday cards, and other regular mailings. These and other adaptations of the EVMC protocol to the present study are described in Table 1.

2.3 Measures

Locator form completion. Three spaces on the locator form were designated as home, cell, and work numbers for the participant. These were considered primary numbers. Several spaces for friends, family members, and institutional contacts were designated in the locator form. These were considered collateral numbers. Locator form completion was a continuous variable, calculated as the sum of primary and collateral telephone numbers provided at intake.

7-day verification. The first verification call completed up to 3 months post-intake was counted as a completed 7-day verification contact. During the verification call, participants were asked to confirm that the address they provided at intake was correct, and that a $5 gift card could be sent there. Then, they were asked to verify each additional telephone number and address that was provided on the locator form by confirming that the information was up to date and referred to the correct person. The verification was considered completed when contact with the participant was made and they confirmed the information (coded 0 = not completed; 1 = completed).

3-month verification. Any verification call completed between 3 and 5 months post-intake, or completed after the 7 day verification contact, was counted as a completed 3-month verification contact. The procedure for completing the 3-month verification was the same as the 7-day verification, except that no gift card was sent. This variable is dichotomous (coded 0 = not completed; 1 = completed).

Follow-up interview completion. If participants completed all or part of their follow-up interview, it is counted as completed for the purpose of this analysis (coded 0 = not completed; 1 = completed).

Housing stability. Previous studies have identified consistency and independence of housing as key factors underlying overall housing stability (Shinn et al., 1998; Bebout, Drake, Xie, McHugo, & Harris, 1997). A 4- point index scale (0 – 3) was calculated to assess housing stability by summing responses from the following questions on the locator form in reference to the address the participant provided:

Whose place is it? This item assessed whether the patient reported their primary address to be their own residence, or someone else's (0 = someone else's residence; 1 = patient's own residence). Staying at one's own residence is considered independent housing.

For about how long have you been at this address? This measure was derived from Shinn et al.'s (1998) definition of housing stability, and was used as a measure of residential consistency. Staying at the listed address for 1 year or more was rated as consistent, and any length of time less than 1 year was rated as inconsistent. The four answer choices were transformed to a dichotomous variable (coded 0-6 months or 6-12 months = 0; 1 year or more = 1).

Do you stay at this address every night? This variable is a dichotomous measure of residential consistency (coded 0 = no; 1 = yes).

Substance use severity. The ASSIST is a screening tool developed by the World Health Organization for use by health professionals in assessing a patient's level of substance-related risk. The ASSIST consists of 7 questions about frequency of and problems related to use of 10

different types of substances: tobacco, alcohol, cannabis, cocaine, opiates, inhalants, sedatives, hallucinogens (LSD, PCP, etc.), amphetamine-type stimulants, and "other" drugs that do not fit into the above categories (World Health Organization, 2006). The scores for each substance-specific question except for frequency of usage are summed and a numerical score is produced representing addiction severity and risk for each substance. This score is referred to as the Specific Substance Involvement score, or simply ASSIST score (Humeniuek & Ali, 2006). For the purposes of this analysis, the highest ASSIST score for alcohol or any drug except tobacco was used to represent overall substance use severity.

The ASSIST has shown good concurrent validity when compared with other established measures of substance abuse such as the Mini International Neuropsychiatric Interview (Sheehan, Lecrubier, & Sheehan, 1998), r=.76, p<.01, and measures of alcohol abuse such as the Alcohol Use Disorders Identification Test (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), r=0.82, p<.001. The ASSIST has been shown to have good internal consistency and construct validity was established by showing that individuals with disorders such as Antisocial Personality Disorder and Attention Deficit Hyperactivity Disorder scored significantly higher on the ASSIST than individuals who were not suffering from those disorders (World Health Organization, 2006). In the current study, internal consistencies for ASSIST subscales for the three most commonly used substances were as follows: alcohol (α = .75), cannabis (α = .69), and cocaine (α = .88).

Support for sobriety. Participants' perceptions of the support they receive in reducing their drinking or drug use were assessed with the question "How supportive are the following people in helping you reduce your drinking or drug use?" Participants were asked to rate the following people: Spouse/partner, parents, siblings, other family, friends, neighbors, and other

important people. Response choices were coded numerically as not at all (0), a little (1), and a lot (2). The sum of all responses was then taken to produce a score for overall support for sobriety. This scale is based on items from the Ecological Assessment of Substance-abuse Experiences, or EASE (Matto, Miller, & Spera, 2005). The scale demonstrated adequate internal consistency ($\alpha = .87$).

2.4 Plan of analysis

The follow-up process model tested the effects of each process step (locator form completion, 7-day verification, and 3 month verification) on subsequent steps in the model, controlling for previous steps and participant characteristics (support for sobriety, housing stability, and substance abuse severity) using regression analysis. All models controlled for possible effects of the following potentially confounding demographic variables: age, gender, race, and years of education.

Linear regression was used to test the effects of these participant characteristics on locator form completion. Subsequent models of 7 day / 3 month verification and follow-up completion, which were binary outcome variables, were tested using logistic regression. Moderation hypotheses were tested by creating interaction terms from mean centered independent variables, as described by Aiken, West, & Reno (1991). This procedure reduces collinearity between the interaction term and the variables that comprise it. These interaction terms were then added to the regression analysis when testing each step of the follow-up process model, as seen in Figure 1.

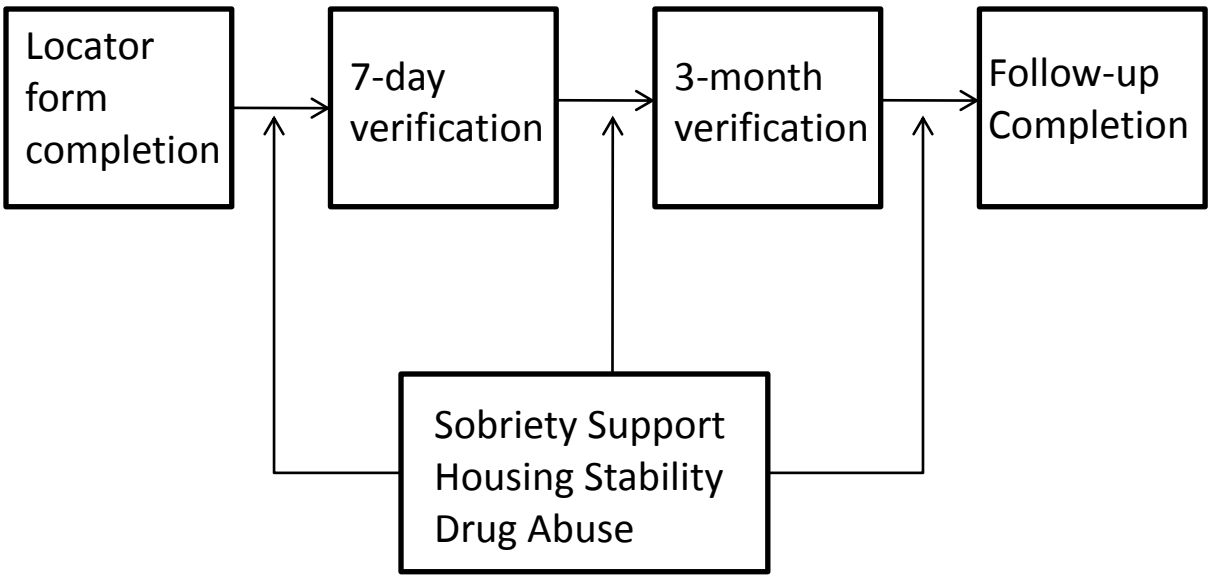

Figure 1. Moderators of the follow-up process.

Table 1.

Engagement, Verification, Maintenance, and Confirmation (EVMC) Protocol and its Adaptation

Step of EVMC Protocol	Adaptation to the Present Study
Obtain approval to contact institutions	• Contacted jails, homeless shelters, and inpatient treatment programs
Engagement, consent, and motivation to participate in the study	• HEs consent, motivate, and provide treatment • Liaison from evaluation team regularly attends HE meetings, provides additional support, materials, and technical assistance
Collecting locator information in in-depth interview with Participant	HEs completed a shortened locator form with: • Address, phone, & email for patient and collateral contacts • In-depth information on housing stability • Institutional contacts (treatment, workplace, shelter, etc.)
7-30 day verification	• 7-30 day verification
Maintenance phase: Contact participants once/month	• 3 month verification • Hard-to-find patients referred to intensive tracking phone or mail
Confirmation phase: Confirm follow-up date and time with participant 6 weeks before due date	Follow-up phase: • Participants contacted through all available means • Interviewers use discretion and past information to determine appropriate time and means for follow-up
Monitor compliance with follow-up protocol	Compliance monitored during weekly meetings: • Reports outlined contact attempts and milestones completed • Tracking data (participants jailed, no working number, etc.) • Discussion of pertinent issues with clinical supervisor

3. RESULTS

Missing data. Item nonresponse ranged from approximately 0 to 20%. Because the items with the highest rates of missing data (particularly the question ‘Do you stay there every night?’) were included in the housing stability scale, nonresponse on these items would have

severely hampered the statistical power and validity of analyses involving this variable due to a high loss of cases from each analysis. After examining the pattern of non-response, it appeared that some interviewers did not ask participants the question and left it blank on most of the intake surveys they completed. Since non-response on the item seemed to be in large part a function of interviewer choice, it seemed unlikely that the pattern of nonresponse was strongly correlated with participant characteristics, as would be expected if the missing data were the result of study attrition or some hesitancy in answering certain questions. To determine whether the missing data mechanism was not dependent on the observed variables, the data were tested using Little's (1988) Missing Completely at Random (MCAR) test. No evidence was found against the null hypothesis of MCAR (χ^2 = 1272.08, *df* = 1205, *p* = .088), so it seemed tenable to use missing data methods under the less restrictive missing at random (MAR) assumption. Accordingly, the multiple imputation method was implemented by creating 10 data sets in which missing data were imputed using Markov-chain Monte Carlo methods with Bayesian estimation in Mplus version 6.1 (Muthen & Muthen, 2010). All variables used in the analyses were included in the imputation model, and all variables used in scale construction were imputed before the scales were computed. Results using the data sets were averaged to produce the reported parameter estimates and confidence intervals.

Preliminary analysis. Of the 381 participants who completed an intake interview, 70% were contacted for the 7-30 day verification, 40% were contacted for the three month verification, and 68% completed their follow-up interview (see Table 2). Seven day verification was positively associated with three month verification and follow-up completion. Three month verification was also positively associated with follow-up completion. Participant differences by key study variables are listed in Table 3.

Predictors of locator form completion. Predictors of locator form completion were analyzed using linear regression (see Table 4). The regression equation explained 6% of the variance in locator form completion (R^2 = .06, p = .01). Each one-point increase in the support for sobriety scale was associated with .04 additional pieces of locator form information. African-Americans reported .24 fewer pieces of locator form information on average, and each year of age was associated with a .01 decrease in locator form information.

Predictors of 7-day verification completion. Predictors accounted for a significant proportion of the variance in 7-day verification completion (*Pseudo* R^2 = .15, p = .00). Each piece of locator form information increased the odds of completing a 7-day verification by 66%, each 1-point increase in the housing stability scale was associated with a 39% increase in the odds of completing a 7 day verification, and each point increase in the support for sobriety scale was associated with a 7% increase in the odds of completing a 7-day verification. African Americans were 74% more likely than White/other participants to complete a 7-day verification.

Predictors of 3-month verification completion. Predictors accounted for a significant proportion of the variance in 3-month verification completion (*Pseudo* R^2= .33, p = .00). Participants who were contacted for a 7-day verification were approximately 9 times more likely be contacted for a 3-month verification than those who were not, and each piece of locator form information increased the odds of a 3-month verification by 64%. No other predictors of 3-month verification completion were statistically significant.

Predictors of follow-up completion. Predictors accounted for a significant proportion of the variance in follow-up completion (*Pseudo* R^2= .49, p = .00). Participants were more likely to be reached for follow-up when they had been reached for the 7-day and 3-month verifications, while each piece of locator form information increased the odds of completing a follow-up

interview by 46%. African-Americans were almost two and a half times more likely to complete a follow-up interview than White/Other participants, while men were less than half as likely as females to complete a follow-up interview. After controlling for these effects, no other predictors of follow-up completion were significant.

Probability of Completing Milestones. The odds for completing a 7-day verification were converted into probabilities at varying levels of locator form completion, support for sobriety, and housing stability. As shown in Figure 2, the probability of completing a verification call for a participant with 4 telephone numbers was approximately 80%, regardless of housing stability and support for sobriety. However, the probability of completing a verification call was about 60% for participants with only 1 telephone number and low support and stability, and about 70% for participants with high support and stability. Figure 3 shows the probability of completing a follow-up interview at varying levels of locator form completion, 7-day, and 3-month verification completion. Participants with a 7 day and 3 month verification have an almost 95% probability of completing their follow-up interview, while participants with no verifications have a 60 – 75% probability of follow-up completion.

Moderation analysis. No interaction terms were statistically significant, so it was concluded that the effects of locator form completion, 7-day, and 3 month verifications did not vary based on hypothesized moderating variables (support for sobriety, housing stability, and substance abuse severity).

Table 2.

Sample Means, Percentages, and Zero-order Correlations (n=381)

	Mean / %	Age	Race (1=Black)	Gender (1=male)	Years of Education	Locator Form	Housing Stability	Support for Sobriety	Substance Abuse	7 day verification	3 month verification	Follow-up interview
Age (years)	41.83	1	.09	.13	-.04	-.12	.11	-.02	.14	.01	0	.05
Race (1=Black)	76%	-	1	-.01	-.06	-.13	.06	-.08	.01	.07	-.04	.12
Gender (1=male)	72%	-	-	1	-.06	-.03	-.04	-.06	.06	.02	.05	-.08
Years of Education	11.76	-	-	-	1	.02	-.04	.10	-.04	.08	.10	.03
Locator Form	1.82	-	-	-	-	1	.03	.19	0	.19	.26	.21
Housing Stability	2.06	-	-	-	-	-	1	.05	-.25	.15	.06	.13
Support for Sobriety	9.31	-	-	-	-	-	-	1	-.06	.18	.16	.18
Substance Abuse	16.96	-	-	-	-	-	-	-	1	-.05	-.08	-.10
7 day verification	70%	-	-	-	-	-	-	-	-	1	.40***	.52***
3 month verification	40%	-	-	-	-	-	-	-	-	-	1	.43***
Follow-up interview	68%	-	-	-	-	-	-	-	-	-	-	1

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

Table 3.
Percentage of participants endorsing study variables by follow-up completion

Variable	Follow-up complete (n=260) %		Follow-up not complete (n=121) %	
Locator form completion				
0 numbers	0		2	
1 number	39		57	
2 numbers	36		29	
3 numbers	19		12	
4 numbers	4		1	
5 numbers	2		0	
Support for sobriety	A little or a lot	Not at all	A little or a lot	Not at all
Spouse, partner, etc.	78	22	65	35%
Parents	83	17	67	33
Brothers or sisters	85	16	77	23
Other family members	70	30	73	27
Friends	70	30	56	44
Neighbors	54	46	40	60
Other important people	64	36	53	47
Housing Stability				
Stays at own residence	53		47	
1 year or more at residence	71		58	
Stays at residence every night	89		84	
Gender				
Male	69		77	
Female	31		23	
Education				
Less than 12th grade	34		36	
12th grade	41		42	
More than 12th grade	25		22	
Race				
Black or African American	79		68	
White / Other	21		32	

Table 4.

Predictors of locator form, 7-day / 3 month verification, and follow-up completion in linear and logistic regression (n=381)

	Locator form completion		7 day verification		3 month verification		Follow-up completion	
	B	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Locator form completion	--	--	1.66	[1.24, 2.23]	1.64	[1.26, 2.13]	1.46	[1.01, 2.10]
7 day verification	--	--	--	--	9.02	[4.53, 18.00]	6.55	[3.66, 11.74]
3 month verification	--	--	--	--	--	--	6.69	[3.19, 14.04]
Housing Stability	0.06	[-0.05, 0.16]	1.39	[1.06, 1.83]	.99	[0.74, 1.29]	1.08	[0.78, 1.51]
Support for Sobriety	0.04	[0.02, 0.06]	1.07	[1.02, 1.13]	1.03	[0.97, 1.09]	1.05	[0.98, 1.12]
Substance Abuse Severity	0.00	[-0.01, 0.01]	1.00	[0.97, 1.03]	.98	[0.96, 1.01]	.99	[0.96, 1.02]
Age (years)	-0.01	[-0.02, 0.00]	1.00	[0.99, 1.02]	1.01	[0.99, 1.03]	1.02	[1.00, 1.04]
Education (years)	0.00	[-0.06, 0.04]	1.11	[.99, 1.26]	1.10	[0.96, 1.25]	.93	[0.80, 1.09]
Gender (1=male)	-0.01	[-0.22, 0.20]	1.25	[0.75, 2.10]	1.38	[0.81, 2.35]	.44	[0.23, 0.85]
Race (1=Black)	-0.24	[-0.45, -0.02]	1.74	[1.02, 2.98]	.85	[0.48, 1.49]	2.41	[1.25, 4.66]

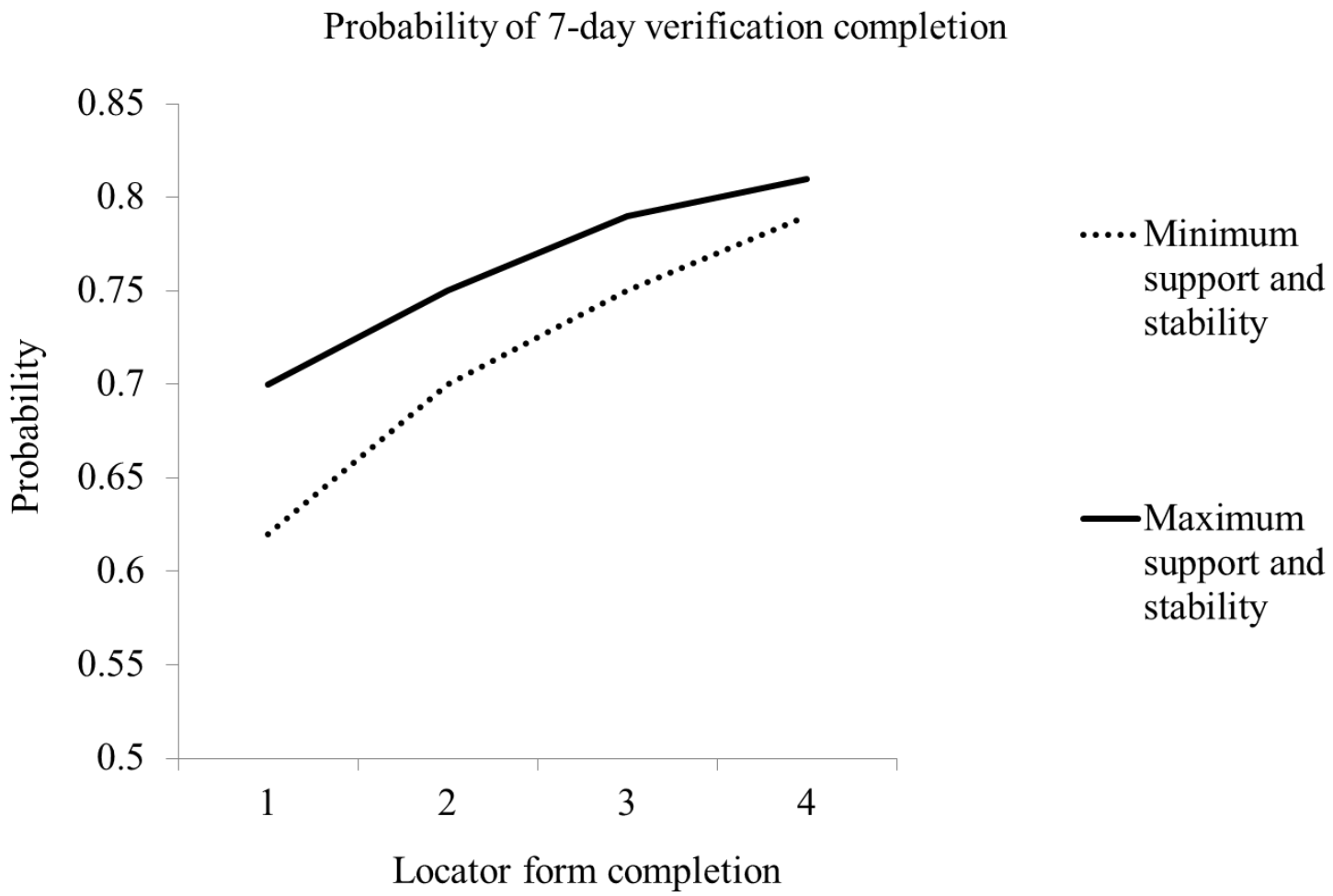

Figure 2. Probability of completing a 7-day verification contact by locator form completion, support for sobriety, and housing stability.

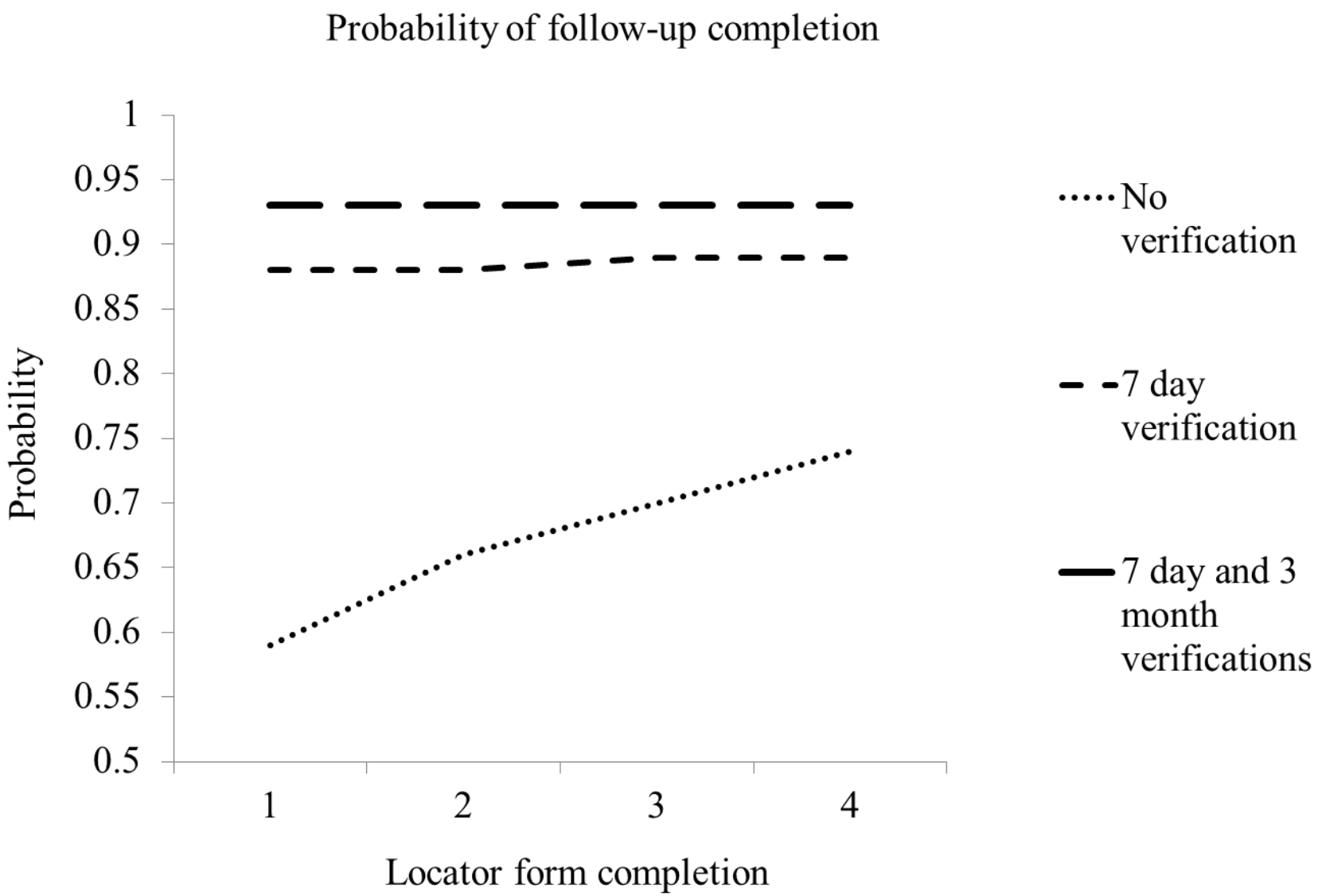

Figure 3. Probability of contacting participants at follow-up by locator form completion and number of verification contacts.

4. DISCUSSION

Individuals struggling with substance abuse are a difficult group to retain in longitudinal research, due in part to factors related to the substance abusing lifestyle, such as transience and social disconnection. Follow-up protocols have evolved to anticipate and prevent study attrition by emphasizing the collection of as much contact information as possible from participants at intake (Dennis et al., 2002) and continuing contact with them throughout the study (Scott, 2004; Wright et al., 1995). The present study lends empirical support to the effectiveness of these techniques. Specifically, each telephone number obtained at intake independently increased the odds of completing 7-day and 3-month verifications by about 65%, while these verifications each independently made completing a follow-up interview about five times more likely. Importantly, even after controlling for the effects of these verification contacts, each telephone number increased the odds of completing a follow-up interview by 46%. These effects were not moderated by support for sobriety, housing instability, or substance abuse severity. However, participants with high housing stability were more than twice as likely to be reached for their 7-day verification as those with low stability, and participants with high support for sobriety were also about twice as likely to be reached for their 7-day verification as those with low support, and provided .56 additional telephone numbers at intake. In summary, this study provides evidence that comprehensive locator form information and continual verification contacts are critical to completing follow-up interviews with hard-to-reach participants, and the effects of locator form information and verification contacts do not seem to differ based on housing stability, support for sobriety, or substance abuse severity.

4.1 Practical implications for substance abuse research

These findings indicate that the collection of locator form information drives each step of the follow-up process, even for participants who are unstably housed and possess little support for sobriety. As seen in Figure 2, if a participant provides four telephone numbers on their locator form, their levels of housing stability and support for sobriety make little difference in the probability of contacting them for their 7-day verification. Figure 3 illustrates the increase in the probability of a follow-up interview as more locator form information is collected and more verification contacts made. With both verification contacts completed, the probability of follow-up completion approaches 95%, independent of the amount of locator form information collected. Taken together, these findings reveal the crucial importance of active, comprehensive efforts to motivate and engage participants throughout the study. For example, if a participant is reluctant to provide telephone numbers for friends or family members, this could indicate that they do not understand some part of the study (confidentiality, compensation, time commitment), or are simply not interested in participating. Given the critical nature of locator form information, the initial engagement, motivation, and informed consent stage of the study warrants a considerable investment of time and resources.

Future research with hard-to-reach populations should ensure that engagement, motivation, consent, locator form completion, and verification procedures fit into a cohesive follow-up process. For example, the logistics of screening and treatment procedures in the present study prevented the evaluation team from having a direct role in the initial contact with participants, placing the motivation, consent, and locator form completion procedures under the responsibilities of the treatment staff. So, it was necessary to dedicate substantial effort to maintaining full contact and coordination between the sites and the evaluation team, as well as

ensuring that procedures were being followed. While this type of cooperation is feasible, treatment staff may have different priorities from the follow-up team, and aligning these priorities to a common purpose may be difficult if two (or more teams) under different management must cooperate.

As described in the EVMC protocol (Scott, 2004), continual monitoring and feedback is required to manage the follow-up process effectively. However the follow-up process is configured, effectively managing it requires continual information on all aspects of the process from locator data collection to verification calls and housing status. Each step of the process is important; it is not enough to complete a full locator form but fail to verify the information later in the study. In the present study, the team had weekly updates on hard-to-find participants, their statuses (incarcerated, no working number, homeless, etc.), as well as a detailed description of recent efforts to track participants. These efforts are critical to ensure the follow-up process is being implemented effectively and that participants are not "slipping through the cracks" at some point in the process.

4.2 Race and gender effects

Past research has attempted to determine the associations between demographic variables and contact difficulty, with mixed results. No clear consensus exists as to whether men or women are more difficult to reach, and race is rarely found to be predictive of contact difficulty. This is likely due to the heterogeneity across the different settings and geographic areas in which studies are conducted. In the present study, despite providing less information on the locator form, Black/African American participants were more likely to complete a 7-day verification and a follow-up than White/Other participants. Men were about half as likely to complete their follow-up interview as women, but no more or less likely to complete verification calls.

The effects of race found in this study should be interpreted with caution. Examination of the confidence intervals reveals a high level of unexplained variability in the estimates for the effects of race on 7-day verification completion and follow-up completion. The lower bound for the effect of race on 7-day verification approaches non-significance, and the interval for follow-up completion is very wide. These results indicate that some other factor or factors contribute to the effect of race on follow-up and verification completion. For example, there may be differences in overall social support (as opposed to support for sobriety) for drug-using individuals in different racial/ethnic groups that could ultimately impact whether a person is reachable by the follow-up team.

Why were women easier to reach for their follow-up interview, despite having provided the same amount of locator form information as men, and being no more likely to complete 7-day or 3-month verifications? While many substance abuse treatment studies have lacked a sufficiently large sample of women to make valid gender comparisons (Hser, Huang, Teruya, & Anglin, 2003), there is some evidence that men and women differ in their patterns of substance abuse and recovery. For instance, Wallen (1992) found that women with substance abuse problems experienced more affective disorders than men, while men with substance abuse issues have been found to be more likely than women to engage in criminal activity, and come under some form of criminal justice supervision such as incarceration or probation (Hser, Anglin, & McGlothlin, 1987; Anglin, Hser, & Booth, 1987). Furthermore, Lewandowski and Hill (2009) found that emotional support from friends and family members can increase women's likelihood of completing drug treatment. Given the array of factors at play, the effect of gender on attrition is likely best explained by gender-specific factors, such as different forms of social support, criminal activity, symptoms of emotional disorder, and recovery from drug addiction. For

example, women with high levels of social support should be easier to reach, while men who are involved in the criminal justice system should be more difficult to locate. These considerations may aid researchers in identifying hard-to-reach cases at the outset of a study.

4.3 Limitations

Some aspects of the present study were limited in scope. For example, many intensive follow-up procedures were not measured in the current analysis. It has been our experience that internet searches, letters, and street outreach contributed to successful contact with participants, but it is difficult to determine whether a letter was actually received by a participant, unless the participant mentions the letter at some point or the letter is returned unopened. One approach taken by Hobden (2011) is to assign importance ratings to these different methods to determine how helpful each technique is for different groups of participants. This technique is promising, since more than one technique may contribute to follow-up success, and different raters can describe the relative priority of each. Irrespective of the research method used, the effective study of the follow-up process requires systematic documentation of processes such as calls, letters, and internet searches, as well as outcomes such as verification calls, completed interviews, and contact with friends/family. Researchers focused explicitly on studying the follow-up process methodologically should plan ahead for the difficulties in measuring these outcomes, and be able to account for the unique or unexpected events that occur during the follow-up process.

The use of an abbreviated locator form in the present study means that the results do not replicate a fully-implemented EVMC protocol (Scott, 2004). Researchers may consider implementing the full-length locator form in future studies with hard-to-reach populations. This may be more feasible in settings where contact with participants is more frequent and of greater

duration, such as an inpatient or residential program. It also may be useful to test different locator forms of varying length and content, to determine the best compromise between the type and quality of data obtained and the time expended in its collection. The present study illustrated that a shortened locator form can still produce high follow-up rates, but it would be useful to know the relative effectiveness of a longer locator form interview.

4.4 Future directions

Given the pivotal importance of locator form information, future research should focus in greater detail on the quality of this information and its effect on contact difficulty throughout the follow-up process. For instance, a participant may provide two telephone numbers at intake, but these numbers may be disconnected just days after enrollment. Alternatively, the numbers could be valid ways to contact friends and family, who in turn have no contact with the participant. These qualities of the locator form information are best addressed by analyzing these processes over time. For example, how quickly does a number become disconnected for different groups of participants? Which participants are likely to lose contact with their friends and family members? Beginning with a qualitative analysis may be useful, because each contact attempt has its own unique disposition. Consider some possible dispositions for a telephone call: wrong number, disconnected, straight to voicemail, voicemail box full. When considering the response of collateral contacts, the possibilities for different responses increase considerably. However, with enough time and participants, trends should emerge that may better illustrate the role of locator form information in the follow-up process.

Since findings from the present study indicate a direct effect, but no moderating effect, for some participant characteristics at some points in the follow-up process, further research may explore tests of mediation that better account for the effects of these factors. For example, if the

effect of support for sobriety on verification completion was mediated by locator form completion, this would suggest that these participants are easier to reach because they provide more telephone numbers. A lack of an effect of housing stability on 7-day verification through locator form completion would imply that unstably housed participants are so mobile that even additional locator form information is of little use in contacting them. Understanding these mediating effects may help better explain the influence of individual factors in the follow-up process.

Focusing on the quality of verification contacts will also provide more information about the different "types" of verification contact that can occur. For example, a participant may provide one number at intake, and then add three new numbers during a 3-month verification. Another participant might update their contact information, changing the original two numbers they provided to two new numbers. This is a critical aspect of the follow-up process that was not measured in the present study. Analysis of additional information provided during these verification contacts might shed new light on the effectiveness of these procedures, as well as their relative efficacy for different groups of participants.

4.5 Conclusion

In conclusion, the present study has provided empirical evidence supporting the effectiveness of a standardized follow-up protocol when implemented in an abbreviated format in a hospital emergency room setting. These findings demonstrate that the EVMC protocol (Scott, 2004) can perform effectively at minimizing attrition even when participants have low support for sobriety and are unstably housed, but extra effort may be required to reach the participants with extreme social disconnection and transience. This extra effort should entail collecting more information on the locator form and paying special attention to participant

engagement throughout the study. By adapting the follow-up protocol to suit specific settings and participants, researchers can analyze different aspects of the process over time to better understand the interaction between the follow-up process, participants, and their social networks.

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