

Maximizing Follow-Up in Longitudinal Studies of Traumatized Populations

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Although longitudinal research is essential in understanding the nature and course of posttraumatic mental health problems, high rates of attrition often threaten the internal validity of such studies and make results hard to interpret. C. K. Scott (2004) developed an approach to minimizing attrition in longitudinal studies that consistently yielded retention rates in excess of 90% through to 2-year follow-up. In this article, the authors discuss the interface between trauma exposure and participation in longitudinal research, before describing in detail a model to address those effects. The effectiveness of the model is examined with reference to traumatic stress in a large community sample (N = 887) with eight waves of data over 2 years.

Researchers have increasingly recognized that many of the most important questions in trauma research can only be answered using longitudinal designs. These designs can be used to determine the longitudinal course of posttraumatic stress disorder (PTSD), including the onset of acute stress disorders, transition to PTSD, and the course of recovery or other outcomes. Although the strengths of longitudinal designs are clear, high rates of attrition often threaten their internal validity. High attrition rates do not guarantee that a study's results will be biased. However, if persons lost to follow-up are different from those not

lost to follow-up, and if those differences are related to the outcome, then studies with higher attrition rates will have results that are more biased than studies with lower attrition rates (Graham & Donaldson, 1993; Kristman, Manno, & Cote, 2005).

In recent years a number of sophisticated data analytic techniques have been developed to quantify the magnitude of bias, such as sensitivity analysis, or reduce the impact of the bias, such as weighting, imputation, and bias-modeling (Hernan, Hernandez-Diaz, & Robins, 2004; Kristman et al., 2005). In addition, newer approaches to analyzing

This work was done with support provided by the National Institute on Drug Abuse Grants No. R37 DA 11323 and No. R01 DA 15523, and National Institute of Mental Health NIMH Grant No. 5 R13 MH068798-04. The authors would like to thank Joan Unsicker, Stephanie Guetschow, Delyth Lloyd, and Melissa Ives for their assistance in preparing the manuscript. The opinions are those of the authors and do not reflect official positions of the government.

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© 2006 International Society for Traumatic Stress Studies. Published online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/jts.20186

longitudinal data such as growth-curve modeling and multilevel modeling can easily incorporate missing data into the data structure (King et al., 2006). Although those methods are important advances for those situations where attrition has occurred, they all require a variety of assumptions that may or may not be true. For example, imputation requires the assumption that the data are “missing at random,” but loss to follow-up is frequently not random (Kristman et al., 2005). Surprisingly, little attention has been paid to methods of minimizing the problem of attrition in traumatized populations.

Several approaches have been suggested as ways to improve follow-up rates in longitudinal research in a variety of fields, but for the most part the approaches have been presented as atheoretical collections of techniques based upon high follow-up rates in a single longitudinal study (Hunt & White, 1998). Scott (2004), however, developed an approach to minimizing attrition in longitudinal studies in the substance abuse field that was based on a theoretical model of the ways that substance users are lost to follow-up. Scott demonstrated that use of this model consistently resulted in follow-up rates over 90% across multiple studies involving more than 10,000 participants and 25,000 interviews. In this article, we examine the effectiveness of Scott’s follow-up model for trauma research. Our specific goals in this article are to (a) discuss the interface between the effects of exposure to trauma and the necessary components of an effective follow-up model for this subgroup of individuals, (b) describe the components of the model used to address these effects, and (c) compare the effectiveness of the proposed follow-up model for individuals with no or few trauma symptoms versus those with a high number of trauma symptoms.

BEHAVIORAL PATTERNS OF PERSONS EXPOSED TO TRAUMA: IMPLICATIONS FOR A MODEL OF LONGITUDINAL FOLLOW-UP

The first step in the development of a model to retain participants in longitudinal research is to identify the reasons why persons who participate in at least one wave of data

collection do not participate in follow-up waves. Common reasons include death; movement to another location or becoming homeless; refusal to participate (due to lack of trust, insufficient engagement with the research process or research team, inadequate recompense for time or inconvenience, and pain or suffering during previous waves of data collection); inability to participate due to employment or other obligations such as childcare, illness, injury, or institutionalization such as incarceration; incorrect contact information due to either false information provided by the participant or a change of locating information over time; and lack of alternative contacts who know how to reach the participant.

Scott (2004) developed a model for minimizing attrition in longitudinal research with substance abusers based on the reasons they are likely to be lost to follow-up as well as the opportunities for intervening to minimize loss to follow-up. She identified the following four predominant behavioral patterns of substance abusers that frequently impact attrition: mobility, the chronic and cyclic nature of addiction (relapse, recovery, and treatment), involvement with institutions, and social withdrawal. Substance use and certain types of trauma are intertwined (Jacobsen, Southwick, & Kosten, 2001) as substance users often report high rates of child maltreatment and interpersonal violence putting them at further risk for additional trauma due to impairment and violence in their social circumstances (Kendall-Tackett, 2002).

The sociodemographic characteristics and behavioral patterns of persons exposed to trauma, however, may be more heterogeneous than those who are substance abusers. For example, the characteristics and behavioral patterns that impact longitudinal follow-up for survivors of domestic violence are likely to be different from those for military personnel returning from combat, survivors of motor vehicle collisions, or persons uprooted from their homes due to a natural disaster or war. Nonetheless, there are likely to be important characteristics and patterns affecting attrition that are shared by at least some survivors of different types of trauma, and those characteristics and patterns can be used to develop a model to minimize attrition. In addition, the psychological and psychiatric sequelae of trauma,

such as the symptoms of PTSD, may themselves have an effect on attrition, and those sequelae are common across survivors of all types of trauma. The remainder of this section includes a discussion of some of the characteristics and patterns related to experiencing trauma that may have an impact on attrition. We use empirical research on the behavioral responses of trauma survivors to speculate about the potential effect that those patterns may have on attrition.

Difficulty Engaging With the Research Process and Research Team

Reexperiencing and arousal symptoms are frequently at their peak shortly after trauma (Peleg & Shalev, 2006). Survivors who are recruited shortly after exposure to trauma may have difficulty engaging with the research project if they are experiencing high levels of reexperiencing or arousal symptoms. With any sample being enrolled in a longitudinal study, the first contact with research participants is crucial in developing a relationship and generating a commitment to ongoing participation in the research. Yet the first contact with trauma survivors is likely to be at a time when those acutely exposed to trauma are still highly distressed (Peleg & Shalev, 2006). If they have impairments in social functioning, it may be difficult to develop the kind of relationship and commitment to the project that may promote retention over the longer term (McFarlane & Bookless, 2001). Survivors may participate in a baseline interview, shortly after the trauma, but may fail to connect in a meaningful way with the research team, thereby reducing the motivation for keeping follow-up appointments. Survivors of child maltreatment and more recent interpersonal violence may have difficulty engaging with the research team due to ongoing functional impairment, even when the research takes place years after the trauma (Cloitre, Miranda, & Stovall-McClough, 2005). Other survivors, such as refugees who felt betrayed by neighbors and friends, may also have significant problems with trust (Miller, 2004). Mistrust may make it difficult for survivors to establish or maintain an ongoing relation-

ship with a research team unless significant effort is devoted to activities designed to build and nurture trust. Given that the initial contact in most longitudinal studies is seldom adequate to maintain participants' trust and willingness to participate over time, a successful follow-up model needs to incorporate a communication protocol requiring staff to correspond or communicate regularly with participants.

These features suggest it is particularly important for the trauma research team to allow sufficient time during the initial interview for research staff to address any questions and/or concerns, including the potential for experiencing some anxiety. It may be useful to discuss options for dealing with participant anxiety during an interview ahead of time, including deep breathing, switching to a less anxiety-producing part of the interview or discontinuing the interview temporarily. It also suggests the research team should contact the participant shortly (e.g., weeks) after the initial interview, before any scheduled follow-up interviews, to reestablish contact. For research participants who had high levels of PTSD symptomatology when they were recruited shortly after exposure to trauma, this contact provides another opportunity to build on the trust established during the initial interview.

Mobility

Survivors of traumatic events that disrupt community infrastructure such as war or natural disasters are likely to be highly mobile (Adams, Gardiner, & Assefi, 2004; Fullilove, 1996). After fleeing their home or community, they may be relocated to temporary shelters or refugee camps, but those are unlikely to be their final destinations (Oliver-Smith, 2005). Refugees or persons relocated due to natural disaster may be sent initially to one location but then resettled elsewhere. They may move without warning and may not know their next destination. If they are moved without family members or close social contacts, no one else may know how to contact them (Ahearn, 2000). Survivors of domestic violence may be unpredictably mobile if they flee their home and move to a domestic violence shelter after an episode of violence

(Metraux & Culhane, 1999). Such unplanned and unpredictable moves can make it difficult for the research team to notify participants of upcoming research interviews and more difficult for participants to keep the interview appointment even if they know of it. Survivors of domestic violence may also be less mobile than other survivors if their abusers try to maintain domination and control by limiting their access to transportation (Gagne, 1992).

To minimize attrition in longitudinal studies in the trauma field due to problems with mobility, the research team should try to obtain contact information about family, friends, or professionals who might know how to contact the participant if such a move occurs. Scheduling routine contacts with participants at regular intervals between interviews to update locating information should also help minimize attrition. In addition, the research team should make sure research participants have a way of contacting the research team, such as a toll-free telephone number.

Concerns for Safety

Survivors of interpersonal violence may have real and compelling concerns about their safety that may impact on follow-up interviews (Marcus, 2005; Sullivan & Cain, 2004). Survivors of domestic violence may be reluctant to provide locating information and/or keep their interview appointments for fear of increasing the risk the perpetrators would find out about their involvement in the study (Sullivan & Cain, 2004). Alternatively, if participants do not want to displease the research team by refusing to share locating information, they may provide inaccurate contact information (Sullivan & Cain, 2004). Similar concerns are likely to apply to survivors of political violence and torture (Basoglu et al., 2005). Cases in which safety is a concern demand that the research team take great care in developing a communication plan that keeps participants safe while at the same time maximizing the likelihood that the team can maintain contact with them (Langford, 2000; Sullivan & Cain, 2004). The plan may need to include days and times to call and not call (Langford, 2000; Sullivan & Cain, 2004). It may require the use of a code name for the study.

It may stipulate that only a woman makes phone contact and that mail will be sent only to certain addresses (Sullivan & Cain, 2004). Extra time during the initial interview process should be taken to ensure participants' safety. Finally, the research team may consider seeking a Certificate of Confidentiality prior to initiation of the study to prevent disclosure of participants' confidential information to perpetrators who bring civil suits (Wolfe, Zandecki, & Lo, 2004).

Avoidance

The avoidance behaviors and emotional numbing that are a fundamental component of PTSD may increase the probability of research participants refusing to participate in follow-up interviews. There is strong evidence that participation in trauma-focused research interviews does not retraumatize participants and that many participants feel that they have benefited by participating in research (Newman & Kaloupek, 2004). However, those same studies suggest that 5% to 30% of participants may become anxious or upset during a trauma-focused interview (Newman & Kaloupek, 2004). Because avoidance symptoms in PTSD function to reduce the risk of aversive thoughts or feelings associated with trauma, survivors may develop avoidance behaviors linked to the initial interview. The potential for this link should be discussed openly during the initial interview, and the interviewer and participant should develop strategies to follow in the event that anxious feelings arise about the impending interview.

A model to minimize attrition in longitudinal trauma research can address this issue primarily by incorporating methods to minimize distress prior to and during research interviews. In addition, the research team should establish contact with the participant prior to the first follow-up interview, and maintain ongoing contact in-between further follow-up interviews. By linking correspondence and communications with the research team during non-interview times, which are less likely to induce anxiety than the interviews, it is possible that participants may be able to generalize their lack of anxiety to the research team to the subsequent interview.

A MODEL TO MINIMIZE ATTRITION IN LONGITUDINAL RESEARCH

Scott's model for minimizing attrition in longitudinal research encompasses six components: (a) delineation of staff roles and responsibilities; (b) engagement of institutions and organizations that interact with research participants; (c) development and use of appropriate written materials for education, consent, and tracking participants over time ("locator" forms); (d) development and implementation of the engagement, verification, maintenance, and confirmation (EVMC) protocol; (e) monitoring of staff compliance with the EVMC protocol; and (f) facilitation of regular case review meetings. These components are implemented at different time points in a longitudinal study; therefore, they must all be developed and ready to go prior to recruitment of the first research participant. We briefly describe each of these components here; see Scott (2004) for details on each component.

Research staff must be trained and managed in ways that maximize follow-up among research participants. Staff members should be educated about the goals and importance of the study, as well as ways to successfully engage research participants. Given that research participants' schedules often do not fall neatly within the 9–5 workday schedule, it is often necessary to adopt a flexible approach to staffing patterns. For example, some staff may need to work evenings or nights and others may need to work weekends to accommodate research participants' schedules.

Given that living arrangements and life circumstances often shift unexpectedly for individuals participating in longitudinal studies, a key component in building a successful infrastructure, is to identify the types of organizations and institutions that may either house or provide services to participants at the time of their follow-up. To allow staff from these institutions to share locating information with research staff, appropriate consents or releases must be developed and signed by participants at the time of study enrollment. Some institutions such as the criminal justice system may have specific procedures and policies of their own that must be accommodated. Accordingly, upon initial recruitment in addition to asking the participant for

consent to approach institutions, the research team should meet with executive personnel in those institutions and organizations with which research participants are likely to interact. This contact should be established prior to the start of the study because institutions have their own needs and their response to research requests can be slow.

The third component of the model is development of materials for educating, seeking consent from, and locating the research participant over the course of the study. Educating research participants about the purpose and procedures of the study can help the participant bond with the research team, and can provide motivation to continue in the study. Because study participants may believe that missing one or more follow-up appointments will lead to their termination from a study, it is important to let participants know that the research team maintains interest in their participation despite missed appointments. This message, however, should be balanced so as not to encourage participants to skip appointments. Consent must, likewise, be tailored to maximize ongoing follow-up. In addition to all of the standard issues required for ethical informed consent, the consent process should address authorization to contact family, friends, and institutions to ascertain their location if they move or cannot be located using the contact information that they provided. Finally, the information on locator forms developed specifically for the study is of key importance. In addition to standard demographic information, the following information should be considered for collection: nicknames, social security number, driver's license number, employer information, spouse or other family contact information, and parent's demographic information. It is important, however, for the staff to describe the relevance and potential use of the information collected. Finally, for highly mobile or homeless populations, it can be useful to ask specific and concrete questions about recent events in the participant's life, such as, "Where did you sleep last night?"

The fourth component of the model is the engagement, verification, maintenance, and confirmation (EVMC) protocol, which is a standardized proactive set of procedures used to manage all cases in a study. The protocol meets the following objectives: (a) maintains contact with

participants regardless of high mobility rates, (b) quickly detects when locating information is invalid, (c) allows adequate time to relocate participants, and (d) relies on the most efficient and cost-effective strategies. The timeframes for implementing the various components can be modified to accommodate different follow-up windows (e.g., annual follow-up, quarterly). Below is a brief description of each component of the EVMC protocol.

Engagement phase. Building trust, educating, and motivating participants are the main goals of the engagement phase. Taking the time to address participants' questions and concerns is critical to the success of the follow-up. The first set of tasks to complete during the engagement phase of the protocol includes (a) educating and motivating the participants, (b) collecting appropriate consents and locator data, (c) scheduling the next follow-up appointment, and (d) providing participants with a schedule card for the next follow-up interview. The schedule card should include (a) the date, time, and location of the next interview; (b) a toll-free number the participant can use to update locator information or check-in; and (c) the amount of money or type of compensation the participant would receive upon completion of the next interview.

Within 7 days of the interview, a staff person should mail thank-you cards to participants. This task serves three purposes. It communicates the team's gratitude to the participant for agreeing to participate, serves as a reminder of participation, and provides the first indication that the mailing address on the locator may be incorrect and that appropriate action should be taken (if returned). The engagement phase is a pivotal time that must be successfully completed before participants can proceed to the next stages.

Verification phase. The primary goal of this phase of the protocol is to verify the information on the locator within 7 to 10 days after a participant is enrolled in the study. To be classified as a verified locator, a member of the research team is required to confirm contact information for no less than three collaterals (e.g., a family member, friend or professional of the respondent). This is consistent with other research teams (Claus, Kindleberger, & Dugan, 2002;

Sullivan, Rumpitz, Campbell, Eby, & Davidson, 1996), who have concluded that obtaining three or more contacts at the recruiting interview was associated with lower attrition. In Scott's model, the ability to provide three verifiable contacts is not used to exclude participants but instead as a decision point for shifting the case to the field. Factors that increase the likelihood of collecting adequate and accurate locator data include a locator form with questions appropriate for the sample, well-trained staff, a full explanation of the ways in which the information will be used along with an explanation about how participants' confidentiality will be protected. In cases where information is difficult to secure, members of the research team should review the structure of their questions (e.g., too abstract, not relevant) and consider having a more experienced staff person make an additional attempt at collecting it. The failure to collect locator data is more often attributable to the questions, the manner in which they are phrased, and possibly the staff person asking the questions. Techniques used to verify locators include telephone directories, phone discs, directory assistance, Internet, telephone contact with the collateral, and field searches. Anglin, Danlia, Ryan, and Mantius (1996) developed a manual that includes detailed information about the use of the Internet and other agencies such as the Department of Motor Vehicles. Other variables to consider when verifying locating information include (a) the stability of the collateral (length of time at current address), and (b) frequency and recency of communication between the participant and the collateral. For cases in which a staff member is unable to verify information recorded on the locator form, staff should recontact the participant as quickly as possible either by phone or a face-to-face visit to review the information and ask for additional information. The difficulty and costs associated with locating participants increase as the time between collecting the information and using it increases. Even though the case has been transferred to the field for street outreach, the office staff member should continue to work the case via phone, mail, and other inexpensive techniques.

Maintenance phase. In general, the follow-up window (3-, 6-, 12-months post-intake), drives the timing for a series of

mailings and phone contacts designed to provide periodic reminders about the next interview, keep the participant engaged, and provide an ongoing mechanism for identifying cases in which the locating information has become obsolete. Returned mail triggers additional locating steps (e.g., field searches, online searches, searches of the criminal justice system) often allowing the team adequate time to relocate the participant if necessary.

Confirmation phase. Depending on the follow-up window, the confirmation phase typically begins 6 to 8 weeks prior to anniversary date. The protocol requires that for a case to transfer to confirmed status a staff person must speak directly with the participant to confirm the date, time, and location of the follow-up interview. A case is not classified as confirmed if a message is simply left on an answering machine, left with a significant other, or with a collateral—the staff member is required to speak directly with the participant. In most cases, starting 6 to 8 weeks in advance provides adequate time to leave messages that the participant will receive. During the confirmation phase, staff is required to complete some type of activity on each unconfirmed case multiple times each week until the case is confirmed. Even though the majority of participants in Scott's studies do not have phones, messages left with collaterals during the confirmation phase produced confirmation rates ranging from 70% to 95%. This timeline also provides adequate time to conduct field searches when necessary. When locating information failed to produce a successful confirmation 4 weeks prior to the follow-up appointment date, the field supervisor reviews the case, and then transfers the case to the field for street outreach. Office staff members continue to work unconfirmed cases using phones to leave messages with collaterals listed on the locator form; they check the Department of Corrections to determine whether a participant has been incarcerated. They also continue with mailings even though the case has been transferred to the field. Field staff is responsible for stopping by the locations listed on the locator, leaving flyers, stopping by homeless shelters, food pantries, searching parks, and other hang-out areas that participants may have listed on the locator form. During the field searches, the

outreach workers travel to participants' homes and leave flyers at the addresses listed on the locator. Once a case is confirmed, a confirmation letter is mailed to the participant to remind him/her about the interview date, time, and location. Finally, the confirmation phase requires a series of reminder calls often 28 days, 7 days, and 24 hours before the interview date.

Monitoring Compliance With the Protocol

An effective follow-up model will not singly or consistently produce follow-up rates over 90%. A mechanism for monitoring protocol compliance is necessary and provides staff and supervisors with the information they need to manage studies and individual cases. The tracking system needs to mirror the requirements outlined in the protocol for the study. It should track completion dates for the activities required in the protocol, as well as any activities completed in an attempt to satisfy the requirements of the protocol. Staff members need to document all events they complete regardless of outcome (e.g., called number but no answer, busy signal). Daily reports can be produced to help staff manage their cases (e.g., a list of participants to call for their 24-hour reminder call, 7-day reminder call, monthly mailing) and to help supervisors manage staff (e.g., a specific staff member's list of participants who did not receive their 24-hour reminder call, 7-day reminder call, monthly mailing).

Case Review Meetings

Follow-up case review meetings are modeled after clinical case reviews. Supervisors and staff review each case that is in the verification phase but not yet verified, those in the confirmation phase but not confirmed, and no shows. The team reviews the activities completed in each case during the prior week to locate participants and the outcomes of each contact. The team then identifies activities that are to be completed during or prior to the next case review meeting. All agreed-upon next steps are documented on a log and reviewed during the next meeting. Supervisors also use this log to check with staff during the interim period.

Scott's model is clearly articulated and shown to be effective in producing follow-up rates over 90% with individuals who have substance use disorders; however, it is not clear whether the model generalizes to other difficult-to-retain populations. The following sections provide data to support the effectiveness of this model among traumatized individuals.

METHODS

Data Source

To evaluate the extent to which Scott's (2004) follow-up model successfully minimizes attrition with individuals who report high levels of trauma, data from two experiments using this model were combined: Early Reintervention experiment 1 (ERI-1; Dennis, Scott, & Funk, 2003; Scott, Foss, & Dennis, 2005) and Early Reintervention experiment 2 (ERI-2; Dennis & Scott, in press; Scott & Dennis, 2006). Both studies were designed to evaluate the effectiveness of a public health model of ongoing monitoring and early reintervention to change the chronic nature of addiction. Participants were interviewed quarterly for 2 years.

Measures

Global appraisal of individual needs. Participant characteristics and primary outcomes were measured using the Global Appraisal of Individual Needs Interview (GAIN; Dennis, Titus, White, Unsicker & Hodgkins, 2003). The GAIN is a comprehensive, structured interview with eight main sections (background, substance use, physical health, risk behaviors, mental health, environment, legal, and vocational). The GAIN has over 100 scales, with the main ones having alphas over .9 in this data set and the subscales generally having alphas over .7. In both this and other data sets, the pathological symptom counts produce a stable four-factor solution (substance problems, internal distress, external behavior problems, crime/violence; Dennis & Scott, in press). Diagnoses based on the GAIN

have been shown to have good test-retest reliability for substance use disorders (Dennis et al., 2003) and to accurately predict independent and blind staff psychiatric diagnoses of co-occurring psychiatric disorders. The test-retest data were also generally good (.70 to .90) on both the scales and individual questions.

Trauma. Past-year traumatic stress was defined as high if participants scored positive for 5 or more of the 13 possible symptoms on the GAIN's Traumatic Stress Scale (TSS). This scale is a count of past-year traumatic stress symptoms based on the Civilian Mississippi Scale for PTSD that has been proven useful for identifying problems after combat exposure, natural disaster, interpersonal violence, and maltreatment (Hyer, Davis, Boudewyns, & Woods, 1991; Keane, Caddell, & Taylor, 1988). The TSS covers 13 past-year symptoms related to reexperiencing traumatic events (e.g., "When something reminds you of the past, you became very distressed and upset."); avoidance of stimuli related to traumatic event (e.g., "Sometimes you used alcohol or other drugs to help yourself sleep or forget about things that happened in the past."); emotional numbing (e.g., "You had a hard time expressing your feelings, even to the people you cared about."); and persistent symptoms of increased arousal (e.g., "You lost your cool and exploded over minor, everyday things."). Symptoms must be present for 3 months or more and cause clinically significant distress or functional impairment (e.g., "You felt like you could not go on."). This is only a subset of the items of the Civilian Mississippi Scale and does not include any of the reverse-coded items that have proven problematic in prior research (Bourque & Shen, 2005). Across the entire sample the TSS had an alpha of .96, suggesting it was a single dimension. Using recommended existing cut points (see Dennis, Titus, et al., 2003), 448 (55%) of people in the sample endorsed no trauma symptoms, 71 (8%) endorsed 1 to 4 symptoms and fell in the moderate range, and 327 (37%) endorsed 5 to 13 past symptoms and fell into the high range. Because there was insufficient sample size/power to further divide the middle group, we collapsed the first two groups into one no/low group.

Table 1. Participant Characteristics by Level of Trauma

Characteristics	TSS group ^a		Total (<i>N</i> = 887)
	No/Low (<i>n</i> = 559)	High (<i>n</i> = 328)	
Female (%)	50	56	52
Race: African American (%)	83	81	82
Age in years (<i>M</i>)	37	38	37
Past-month employment (%)	24	24	24
Past-month homelessness (%)	22	41*	29
Lifetime history of military service (%)	6	8	7
History of physical, sexual, or emotional victimization	65	87*	73
Any past-year internalizing disorder (%)	43	100*	64
Traumatic memories in the past 90 days (number)	12	98*	43
Suicidal thoughts (%)	13	41*	23
Any past-year externalizing disorder (%)	20	73*	39
Past-year substance use disorder (%)	85	99*	90
Any past-year crime/violence problems (%)	49	70*	57

Note. TSS = Traumatic Stress Scale group.

^aTSS group categorized as no/low for 0 to 4 past-year symptoms of posttraumatic stress and high for 5 to 13 past-year symptoms.

*Greater than no/low TSS group, $p < .001$.

Participants

In both studies, patients were recruited from sequential intakes at the largest substance abuse treatment program in Illinois. In the first study, 84% of eligible individuals agreed to participate, and 93% agreed in the second study. The participants were referred to a wide range of levels of care: 8% to outpatient, 19% to intensive outpatient, 26% to short-term residential, 47% to long-term residential, and 2% to detox/other. Descriptive data on the 887 individuals involved in the studies, broken down by level of traumatic stress, are shown in Table 1. Individuals in the no/low and high traumatic stress groups did not differ significantly on demographic variables but, as expected, the two groups differed significantly on several variables relating to traumatic experience and psychopathology.

Follow-Up Contacts

The number of contacts required to complete each interview was recorded. The type of contact ranged from faxing informed consents, dialing a telephone number and getting a busy signal to door knocking and tracking in the field.

Contacts did not include interviewing time, case review meetings, or transporting participants for their interview.

Follow-Up Completion

Follow-up rates were calculated for each wave by taking the total number of completed interviews divided by the total number of participants enrolled in the study minus those who died. Participants are not deducted from the denominator even if they are incarcerated and inaccessible, if they move out of state, if they cannot be found, or if they become incapacitated. In other words, once a participant was enrolled in the study, they remained in the denominator unless they died.

Analytic Procedures

To evaluate differences by level of trauma and the follow-up rate, we used a chi-square analysis. To evaluate the change in the mean number of contacts over waves of follow-up, we used a simplified time series analysis comparing the variance in sequential waves versus the variance of each individual wave from the grand mean across wave and

reported the difference as a z -score (see Dennis, Ingram, Burks, & Rachal, 1994). To evaluate the difference in the functional relationship between number of contacts and follow-up, we used a lifetime tables-based survival analysis (SPSS, 2005).

RESULTS

Table 2 shows the average number of contacts and follow-up rates by wave (columns) for the total sample and by level of trauma (rows). The average number of contacts per wave significantly decreased over time from 16.7 at the first 3-month follow-up to 8.3 at the last 24-month follow-up, $z = 2.25$, $p < .05$, with no significant change in the overall completion rate by wave (96% on average). There were no significant differences between the no/low and high trauma groups in the trend for reduced contacts over time, $z = 2.19$ versus 2.33, the mean range of contacts per wave (10.5 vs. 10.6) or the completion rates (96% vs. 97%).

DISCUSSION

In this article, we have proposed several strategies designed to assist in reducing attrition in longitudinal research with trauma survivors. The protocol has good face validity and, although requiring additional resources, is not difficult to implement. Importantly, the data presented here suggest that attrition can be reduced to remarkably low levels, even in traumatized populations, through to 24-month follow-up. The findings from earlier studies (Scott, 2004) on Scott's method of reliably producing over 90% follow-up were replicated in two new studies of traumatized populations, with eight waves of data collection in each. Not only did adopting this approach minimize attrition, but the data also demonstrated that even with individuals who have experienced trauma it is possible to complete the interviews on time. Around 94% of the interviews in this data set were conducted within 2 weeks of the target date. Given the earlier findings of Scott (2004), it is perhaps not surprising that the model works as well for traumatized individuals as for a population with substance use

Table 2. Number of Contacts Required at Each Wave, Interview Completion Rates (%) and On-Time Interview Rate (%) of Each Wave by Level of Traumatic Stress

Measure	TSS Group	Follow-up wave (months from intake)								Trend ^a	
		3	6	9	12	15	18	21	24	<i>M</i>	<i>z</i>
Number of contacts											
	Total (<i>N</i> = 887)	16.7	11.4	10.6	10.1	10.2	8.5	8.3	8.3	10.5	2.25*
	No/Low (<i>n</i> = 559)	16.8	11.1	10.6	10.3	10.1	8.5	8.2	8.3	10.5	2.19*
	High (<i>n</i> = 328)	16.6	11.8	10.7	9.9	10.4	8.5	8.5	8.4	10.6	2.33*
Completion rates ^b (%)											
	Total (<i>N</i> = 887)	97	95	96	96	96	96	95	97	96	
	No/Low (<i>n</i> = 559)	97	96	96	95	95	96	95	97	96	
	High (<i>n</i> = 328)	98	95	95	98	97	96	96	97	97	
On-time interview ^c (%)											
	Total (<i>N</i> = 887)	95	91	95	91	96	94	94	93	94	
	No/Low (<i>n</i> = 559)	95	91	94	90	96	94	94	92	93	
	High (<i>n</i> = 328)	95	93	96	93	97	94	93	93	94	

Note. TSS = Traumatic Stress Scale group.

^aChanges over time based on simplified time series analysis. ^bInterviews in wave divided by *n* minus any who had died. ^cInterviews done within 14 days of target date divided by interviews done.

* $p < .05$.

disorders: These two groups share many characteristics and behavior patterns. Although the groups may differ on the causative pathways that lead to those characteristics, the end result for the longitudinal researcher is the same.

The data demonstrated that the number of contacts decreased with the number of follow-up waves. Although an average of 17 contacts were required to ensure optimum participation rates at 3 months, this figure had dropped to only 8 contacts by 24 months. Presumably, participants became accustomed to the interviews, integrating the process into their lives. It is reasonable to assume that the strategies outlined in this article serve to engage participants in the research program, perhaps providing them with a sense of ownership in the research process and results, and enhancing a commitment to ongoing participation. As participants come to know the research team, it may be that a sense of altruism or obligation develops such that they are unwilling to "let the team down." Whatever the reason, it is clear that intensive resource allocation to this process in the early stages of the research will pay off in the longer term.

The number of contacts required did not differ significantly by level of traumatic stress within or across waves. One can speculate that individuals experiencing higher levels of distress would be more likely to drop out of research to avoid reactivating unpleasant memories. Interestingly, the data provided preliminary evidence that individuals with generally low traumatic stress, but increased emotional problems, did indeed require a greater number of contacts to achieve participation.

This study has several limitations. First, the sample included people presenting to substance abuse treatment on the west side of Chicago. Although illustrative, it is certainly not representative of all people entering treatment for substance abuse or who have experienced all types of trauma. Second, the GAIN's Traumatic Stress Scale is a useful dimensional screening tool but is only a self-report measure, not a full clinical diagnosis, and likely to suffer from some of the same limitations as the Civilian Mississippi Scale of PTSD on which it was based (see Bourque & Shen, 2005).

The strategies proposed in this article to reduce attrition in trauma research represent an important starting point; nevertheless, much work remains to be done. Very little reliable research is available to inform our understanding of factors that cause attrition from traumatic stress research or, indeed, how best to minimize that attrition. The model proposed in this article has been shown to work well in the past, particularly with substance abusing populations, but many questions remain unanswered. It is not clear whether all of the elements are necessary or whether certain aspects of the model are more effective with specific types of traumatized research participants. Because much research is conducted on a limited budget, it becomes crucial for the average researcher to understand which components of the model will provide best value for money in terms of minimizing attrition.

Only a few decades ago, survey research was viewed more as "art" than science. Since then, systematic analyses have been undertaken of all elements of survey research (e.g., whether incentives increase response rates; which approach to asking sensitive questions leads to the most truthful responses; how many response categories can respondents keep in their head when answering questions [Krosnick, 1999; Shuman & Presser, 1996; Tourangeau, Rips, & Rasinski, 2000]). Longitudinal research today is similar to where survey research was 30 years ago, and the same systematic approach to refining our methodology is required if we are to make serious and consistent gains in reducing attrition.

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