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Adapting an evidence-based model to retain adolescent study participants in longitudinal research

Erin Davis [a,*], Hilary Demby [a], Lynne Woodward Jenner [a], Alethia Gregory [a], Marsha Broussard [b]

[a] The Policy & Research Group, 8434 Oak Street, New Orleans, LA 70118, USA
[b] Louisiana Public Health Institute, 1515 Poydras Street, Suite 1200, New Orleans, LA 70112, USA

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ABSTRACT

Maintaining contact with and collecting outcome data from adolescent study participants can present a significant challenge for researchers conducting longitudinal studies. Establishing an organized and effective protocol for participant follow-up is crucial to reduce attrition and maintain high retention rates. This paper describes our methods in using and adapting the evidence-based Engagement, Verification, Maintenance, and Confirmation (EVMC) model to follow up with adolescents 6 and 12 months after implementation of a health program. It extends previous research by focusing on two key modifications to the model: (1) the central role of cell phones and texting to maintain contact with study participants throughout the EVMC process and, (2) use of responsive two-way communication between staff and participants and flexible administration modes and methods in the confirmation phase to ensure that busy teens not only respond to contacts, but also complete data collection. These strategies have resulted in high overall retention rates (87–91%) with adolescent study participants at each follow-up data collection point without the utilization of other, more involved tracking measures. The methods and findings presented may be valuable for other researchers with limited resources planning for or engaged in collecting follow-up outcome data from adolescents enrolled in longitudinal studies.

1. Introduction

Longitudinal randomized controlled trials are the most effective method to determine the impact of health programs over time (Boys et al., 2003; Singleton & Straits, 1999; Tobler & Komro, 2011); however, maintaining contact with hard-to-reach study participants in order to collect outcome data presents a challenge for researchers working with adolescent populations (Santelli et al., 2003; Seibold-Simpson & Morrison-Beedy, 2010; Stephens, Thibodeaux, Sloboda, & Tonkin, 2007). High retention rates play a crucial role in longitudinal research as they are necessary to maintain statistical power and accurately assess outcomes, as well as preserve the validity of the study. Sample attrition, which can occur for a number of reasons, can compromise both the internal and external validity of a study, weakening researchers' abilities to determine the effects of an intervention, as well as draw generalizable findings from study results (Gebreselassie, Stephens, Maples, Johnson, & Tucker, 2013; Meyers, Webb, Frantz, & Randall, 2003; Prinz et al., 2001; Seibold-Simpson & Morrison-Beedy, 2010; Yeterian, Dow, & Kelly, 2012).

Problems arise when systematic differences separate responders (i.e., study participants who provide outcome data) from non-responders, inserting bias into the sample (Desmond, Maddux, Johnson, & Confer, 1995; Gebreselassie et al., 2013; Meyers et al., 2003; Yeterian et al., 2012). Bias can leave researchers unsure whether findings can be attributed to the independent variable being evaluated or other apparent differences between those participants who responded versus those who did not. In a 2003 study of adolescents enrolled in behavioral health treatment programs, Meyers et al. found that six months post treatment, difficult-to-retain youth reported higher levels of illegal drug use and delinquent behavior and were less likely to be enrolled in school when compared to easy-to-retain youth. Similarly, Tobler and Komro (2011) found that participants who reported greater

* Corresponding author. Tel.: +1 504 8651545; fax: +1 504 865 0293.
E-mail addresses: ecdavis4@illinois.edu (E. Davis), hilary@policyandresearch.com (H. Demby), ljenner@policyandresearch.com (L.W. Jenner), alethia@policyandresearch.com (A. Gregory), mbroussard@lphi.org (M. Broussard).

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instances of alcohol use and violence at baseline were less likely to complete subsequent surveys. They also found that African American and Hispanic participants were less likely to complete the survey than White participants. Scott (2004) reviewed the number of contacts required for participants to complete a follow-up interview in two study samples that reported completion rates of 96% and 93%. After ranking responders based on the number of contacts, Scott found significant variance between the first 70% and the last 30% of ranked responders. Analysis showed, in one study, notable differences in the days of alcohol and cocaine use. Likewise, in the second study examined, days of opioid use and days of illegal activity varied among the two groups of responders (Scott, 2004). Therefore, substantial bias would have been present in both samples had researchers not been successful in following up with the latter 30% of respondents.

In order to minimize respondent attrition, researchers have noted the importance of a detailed and well-executed follow-up and tracking protocol (Desmond et al., 1995; Gebreselassie et al., 2013; Scott, 2004; Vincent et al., 2012). In 2004, Christy Scott published the Engagement, Verification, Maintenance, and Confirmation (EVMC) model as a structured approach to address the issue of attrition in longitudinal studies with individuals with substance abuse disorders. Use of the EVMC model protocol produced a 95% overall completion rate in seven different studies with over 5000 participants and over 12,000 interviews. Follow-up periods in these studies ranged from three months to six years; 90% of interviews were completed within two weeks of the interview due date and incentives offered in each study ranged from $20–40 (Scott, 2004). Two of the seven studies were conducted with adolescent populations, one with those discharged from residential treatment and the other with adolescents who used cannabis. In both studies, research staff were able to achieve completion rates of at least 94% at all data collection points, with the second study maintaining 95% retention at 12-month follow-up (Scott, 2004). Other researchers have also found success in adapting the EVMC model to work with different populations. Yeterian et al. (2012) used a modified version of the protocol to achieve follow-up rates of 91.3%, 84.3%, and 87.4%, at one, three, and six months, respectively, in a study of adolescents with substance use disorders. Additionally, in an effort to achieve high retention rates in their randomized controlled trial of an HIV-prevention intervention with adolescent females, Seibold-Simpson and Morrison-Beedy (2010) applied the EVMC model to their recruitment and retention activities. After making necessary modifications to account for their adolescent population, they were able to retain 80% of participants after enrollment.

There are several documented barriers to achieving high follow-up rates with adolescents (Boys et al., 2003; Seibold-Simpson & Morrison-Beedy, 2010), in particular those of minority and urban populations (Ribisl et al., 1996). As researchers with limited staffing resources, an enrollment goal of 1000 study participants, and two follow-up data collection points spanning one year post-program (at 6 and 12 months), we recognized that establishing an organized and effective participant follow-up and tracking plan would be crucial for the success of the study. The current paper extends previous research by presenting two key findings in our experience adapting the EVMC model to work with adolescents within the current communication environment: (1) the central role of cell phones in tracking and maintaining contact with teens and their parents throughout the EVMC process; and, (2) the need for flexibility and responsive two-way communication in the confirmation phase to increase the likelihood that busy teens not only respond to contacts, but also complete data collection.

In 2004, when the EVMC model was originally published, the article stated that "the majority of the participants in our studies do not have phones" (Scott, 2004, p. 26). In the eleven years since, cell phone ownership and use has increased dramatically. A 2013 Pew Research Center survey estimated that 91% of adults have a cell phone, up from 65% in 2004; and, a 2012 teen survey estimated that 78% of youth ages 12–17 have a cell phone, and 37% have a smartphone (Rainie, 2013). Additionally, a 2012 report from Pew described 75% of all teens as text users, with 63% of teens reporting that they communicate via text on a daily basis (Lenhart, 2012). While more recent data are not available, it is likely that cell and smartphone ownership and texting frequency has continued to rise. Pew researchers argue that "the cell phone is the most quickly adopted consumer technology in the history of the world" (Rainie, 2013). This massive shift in how we communicate has fundamentally changed the way that researchers can reach and follow-up with adolescent study participants. In our experience, the use of cell phones and texting was integral in the execution of the EVMC follow-up model, from the collection of tracking information, to calling to confirm and/or reschedule data collection appointments, to texting data collection reminders.

Additionally, we found that, in the confirmation phase, simply informing the youth of a set appointment date and time was not effective and resulted in many "no shows." What was required was an ongoing negotiation and communication between the participant (and/or parents) and study staff who provided them with flexibility in the location, time, and mode of data collection. This involved confirming appointments and texting reminders, rescheduling appointments as conflicts arose, offering a variety of locations and times (including nights and weekends), and providing tiered phases of data collection modes, starting with the preferred in-person collection of the self-administered questionnaire, followed by online administration, a mailed questionnaire, and, finally, a shortened phone interview administration.

The purpose of this paper is to describe our adaptations to Scott's EVMC model within two key areas: the integral role of the cell phone in the model and the extension of the "confirmation phase" to a flexible, back and forth "negotiation phase".

2. Background

2.1. Study overview

Contracted as the external evaluators, we implemented a longitudinal randomized controlled trial design to assess the effectiveness of a teen pregnancy prevention curriculum. Youth were recruited through an existing city-sponsored summer youth employment program. Three cohorts of study participants, ages 14–18, were recruited over three summers, totaling 850 study participants. A self-administered 116-item questionnaire, designed to gather information on study participants' knowledge, belief of risk of harm, attitudes, self-efficacy, and behaviors related to safe sex practices, was collected at four time points: (1) baseline, which took place just prior to the first program session; (2) post-program, which took place immediately following the last (eighth) session; (3) 6-month follow-up, which began six months after the last program session; and (4) 12-month follow-up, which began 12 months after the last session. Study participants were allowed to complete 6- and 12-month follow-up questionnaires for a full six months after each follow-up data collection window opened. Four modes of data collection were 'phased in' throughout the six-month periods, starting with the preferred in-person collection of the self-administered questionnaire, and then online, mail, and phone interview options were offered at specified times later within the window. All participants were provided with a $20 gift card for completing the 6- and 12-month follow-up questionnaires ($40 total) and were entered into a raffle for an iPod Touch (or equivalent

prize) each time they completed a questionnaire. One additional $15 gift card incentive was also offered later in the data collection window (starting in month five at 6-month follow-up and month four at 12-month follow-up) to encourage late responders to complete the questionnaire. Incentive amounts were similar to those used in the seven studies cited by Scott (2004). We received Institutional Review Board approval for all study protocols, including incentives and modes of data collection, prior to their implementation. Though the full study sample is comprised of 850 participants, for this paper, we will only be presenting methods and combined results from the first two study cohorts, which contain 621 study participants; data collection for the third cohort is still ongoing.

2.2. The EVMC model

In an effort to achieve the highest retention rates possible at 6- and 12-month follow-up data collection points, we adopted the evidence-based EVMC model (Scott, 2004). Scott's four-phase follow-up protocol aims to educate and engage study participants, collect and verify sufficient participant contact information, maintain contact with study participants between follow-up data collection points, detect and correct invalid contact information in a timely manner, and schedule and confirm follow-up appointments with participants.

As Scott (2004) recommends, we planned for implementation of the model well before enrolling the first study participant. Based on the planned program and study design, we were mindful of several unique challenges that we would face in retaining participants at follow-up data collection points. First, the study was conducted as part of a summer youth employment program which recruited disparate adolescents from all over the city; our adolescent study sample was unassociated with any particular school, institution, treatment facility, or even each other. Second, the program had discrete enrollment and end dates for each summer's cohort of youth (334 youth in 2012 and 287 in 2013). This meant that, unlike a study with a 'rolling' enrollment and follow-up structure, for our study, all participants (roughly 300) in each cohort became eligible for 6- and 12-month follow-up data collection at the same time. Lastly, we had limited staffing resources with which to implement our detailed follow-up and tracking procedures; our study staff dedicated to follow-up consisted of one full-time follow-up coordinator and, generally, two part-time research assistants who helped during high-volume data collection times (usually about four weeks total, lasting from one week before to three weeks after each data collection period opened).

3. Methods

In an effort to minimize attrition, we employed most of the methods outlined in the original EVMC model and also adapted the protocol by using some additional strategies to meet the challenges posed by our unique adolescent sample and study design. Our modifications include: (1) incorporating the use of cell phones and texting to maintain contact with study participants throughout the EVMC process; and (2) responsive two-way communication between study staff and participants and flexible administration modes and methods in the confirmation phase. These strategies have resulted in very high retention rates at each follow-up data collection point without the utilization of other more involved tracking measures, such as government databases, social service agencies, street outreach, or USPS. Below, we detail these modifications to the engagement, verification, and confirmation phases of the model.

3.1. Engagement

We developed Locator Forms to collect detailed contact information from study participants, including home, cell, and any alternate phone numbers; email address; date of birth; current as well as future mailing addresses (if known); names of others residing in their household; and name of school. Participants were also asked to list full contact information for three family members *and* three alternate contacts (collaterals), which could be other relatives, friends, boy/girlfriends, etc. We encouraged participants to use their cell phones while completing the forms to obtain as much contact information as possible. Some of the program sites had policies prohibiting youth from using or having their cell phones during program hours. To ensure youth had their phones available to help complete the form, we worked with the site coordinators to schedule Locator Form data collection prior to the collection of the phones or to allow short-term use of the phones for data collection purposes.

3.2. Verification

Next, we used phone contact to verify at least three phone numbers for at least three different people listed on the Locator Form. We called each number, confirmed the contact's identity, and informed the contact that he/she had been listed to reach the youth after the summer program ended and would only be contacted in the future if we were unable to reach the participant on his/her personal cell phone. All verification phone calls were made from cell phones as opposed to landlines because, often, participants and their collaterals would not answer the call if they were unfamiliar with the phone number. Rather, they would send a text message back to the number asking who the caller was. In this type of 'call screening' situation, we attempted to verify the phone number via text. Cell phones used by staff during the verification and confirmation (described below) phases were owned by the evaluation firm and used exclusively for study-related, non-personal purposes. No participant information was stored in any of the cell phones (i.e., no phone numbers, participant names, or those of their family members were stored in the phone's contact list). Participant outcome identification numbers were never sent over text messages, and only first names were used in text messages addressing participants or their collaterals.

3.3. Confirmation

Our most significant modifications to the EVMC model appear in the confirmation phase. In her research, Scott (2004) noted that the confirmation phase began six weeks prior to follow-up, with staff members contacting those participants who had not confirmed an appointment every 24–48 h. She explains that this is done to allow sufficient time to contact collaterals or update contact information if necessary. Street outreach was employed if no appointment had been confirmed four weeks before the follow-up appointment date, but staff also continued previous phone and mail tracking activities. Once staff confirmed an appointment with a participant, a letter was mailed containing necessary appointment information, and reminder calls were made 28 days, 7 days, and 24 h before the appointment. In the last step of the confirmation phase, when a participant was considered lost to contact, the research team employed a standardized set of intensive case tracking procedures, which were conducted continually until the person was located (Scott, 2004).

In our study, we were able to maintain phone contact with the vast majority of study participants throughout both follow-up data collection periods (over 97% at 6- and 12-month follow-ups). This

is, in part, likely due to the large and diverse amount of locator data collected and the pervasiveness of study participants and their parents who used cell phones (and texting) as a primary method of communication. Thus, field outreach and other more cumbersome tracking procedures were not necessary to find these youth. Our primary challenge in obtaining follow-up data was not reaching the participant, but, rather, getting him/her to actually meet with study staff to complete the questionnaire once contact had been made and an administration appointment had been scheduled. There are many reasons adolescents attrite from research studies, including constantly changing schedules, extracurricular activities, parent and participant work schedules, unreliable transportation, and a general lack of motivation to continue with the research. Recent research suggests that follow-up rates can be improved when researchers remain flexible to study participants' unique schedules and preferred locations and modes of data collection (Bailey, Bieniasz, Kmak, Brenner, & Ruffin, 2004; Booker, Harding, & Benzeval, 2011; Hanna, Scott, & Schmidt, 2014; Meyers et al., 2003; Prinz et al., 2001; Seed, Juarez, & Alnatour, 2009; Seibold-Simpson & Morrison-Beedy, 2010). We employed a combination of diverse questionnaire administration and communication modes and methods designed to follow up with and meet study participants where and when was most convenient for them. Below, we describe our strategies in the confirmation phase to maximize participant retention.

3.3.1. Communication timing and methods

We attempted to contact all participants to schedule and confirm questionnaire administration appointments; however, unlike Scott (2004), these communications didn't begin until one week prior to the opening of the 6- and 12-month data collection periods. Due to frequent changes in adolescents' schedules, it proved unproductive to schedule appointments with this population too far in advance. Contacts with participants were usually made by calling and texting participants' and/or their parents' cell phones on an ongoing basis until a follow-up questionnaire was completed or the participant refused to complete the questionnaire. Cell phones, and text messaging in particular, were the primary means of communication with study participants during this process, though, we also communicated with participants by email and mail. Whenever possible, the same study staff person who maintained contact with participants throughout the maintenance phase also called to schedule/reschedule data collection appointments during the confirmation phase.

3.3.2. Administration locations, hours, and modes

In-person collection of the self-administered questionnaire was the preferred and primary method of data collection because it provided us with the most control over the administration environment, allowing us to ensure the identity of the youth completing the questionnaire and that the questionnaire was completed without disruption or outside influence. Prior to contacting the participants, we reviewed zip code data from Locator Forms to identify areas of the city most densely populated by participants. We then reserved meeting rooms at public libraries in these geographic locations to serve as group administration sites. In addition, we occasionally used partner organizations' facilities (where participants took the program during the summer), other public libraries, or met youth at coffee shops and restaurants near their homes or schools if these locations were preferable. Administrations were offered after school, in the evenings, and on weekends. Upon arriving at the administration site, trained study staff provided participants with instructions on how to complete the self-administered questionnaire, reminded them of the importance of the research and that their participation was voluntary and confidential, and provided them with their gift card incentive upon completion.

Though we always encouraged participants to complete the questionnaire in person, as we progressed further into each follow-up period, participants were also offered the opportunity to complete the questionnaire via other modes, including online, mail, and phone interview. Though less desirable (because they reduced our control over the administration setting), these alternate modes helped to accommodate busy schedules and capture initial non-responders.

3.4. Confirmation protocol

As previously noted, we allowed study participants to complete 6- and 12-month follow-up questionnaires for a full six months after each follow-up data collection window opened. To formalize our contact and administration methods during the confirmation phase of each six-month-long follow-up data collection period (6 and 12), we developed a detailed confirmation protocol with all activities divided by month. Over time, the protocol has been modified as new strategies were tested and deemed successful or ineffective. The activities that take place in each month of the follow-up periods are detailed below and summarized in Table 1.

3.4.1. Month one

Confirmation calls to schedule administration appointments with participants started five days prior to the start of follow-up data collection periods. On these calls, we identified the most convenient location and time for questionnaire completion and scheduled participants for group appointments at pre-reserved library locations or individual appointments, if group sessions were inconvenient. Whenever individual appointments were scheduled, we attempted to 'snowball schedule' other participants needing individual appointments at the same locations and times in order to best utilize staff time. Though the original EVMC model requires direct contact with the study participant in order to signify an appointment as 'confirmed' (Scott, 2004), we also contacted and confirmed appointments with participants' parents or guardians. Most parents were still in charge of their child's transportation and schedule and were more familiar with administration locations. After an initial appointment time was confirmed, we sent personalized reminder texts to participants and parents the evening before and the day of the administration appointment; they included the appointment location, date, and time, and the name and phone number of the staff member who would administer the questionnaire. While following up with the 2012 cohort, we used a mass text messaging service to deliver reminder texts. As will be explained later in this paper, this method proved unsuccessful. For the 2013 cohort, we moved on to sending individual text messages from a staff cell phone.

Additional part-time study staff were tasked with making confirmation calls during high-volume scheduling times. These staff were trained and provided with suggested phone scripts that outlined the scheduling process and participant contact lists, which included participants' home and cell phone numbers, two alternate numbers, the relationships of the alternates to the participant, and a space for the staff person to note the result of the calls (these data were later entered into a *Participant Contact Log*). Staff were instructed to include as much detail as possible in call notes, including the participant's preferred geographic area for administration, any extracurricular activities or scheduling barriers, and the best times for the participant to schedule an appointment. With such a large number of participants being contacted, these notes helped us to target rescheduling efforts and eliminated redundant and lengthy phone conversations. Contact lists were updated several times per week by the follow-up coordinator.

Table 1
Summary confirmation protocol for 6- and 12-month follow-up data collection periods.

Month of follow-up window	Activities
One week prior to follow-up	Initial phone call to youth participant and/or parent/guardian to schedule/confirm in-person data collection appointment
Month one	Continue to call parents/participants to schedule appointments Reminder text day before and day of appointment Begin to contact collateral contacts if participant is unresponsive in weeks 1–3
Month two	Confirmation/scheduling phone calls to unresponsive participants and parents Phone call to alert participants of online questionnaire option, provide online instructions, and confirm email address Email online questionnaire (once per week) Reminder texts about online questionnaire (2–3 days after initial email and then once per week) Reminder calls about online questionnaire (once per week) If Locator Form information is not viable, check all other program-related datasets containing participant contact information for valid numbers Email parents with a valid email address on file to update contact information If valid participant email address but no valid contact numbers, send email with online questionnaire and mail letter with Locator Form If no valid email address and no valid contact numbers: mail letter with Locator Form Mail reminder letters with shortened Locator Form to all unresponsive youth (even those with viable phone numbers)
Month three	Continue phone calls for unresponsive youth Call, text, email once per week about online questionnaire Mail paper questionnaire and Locator Form to participants with no valid email address Send email containing online questionnaire to all participants with a valid email address Mail paper questionnaire and Locator Form to all remaining participants who have not completed a questionnaire (after 2 emails) Reminder texts, calls, and letters asking participants to mail back paper questionnaire or complete online questionnaire
Month four	Continue phone calls; try previously disconnected numbers Call/text participants once per week to remind about online questionnaire or mailed questionnaire Email online questionnaire twice per week to all participants with a valid email Mail reminder letters to unresponsive participants every 2–4 weeks Begin to offer the additional $15 gift card during 12-month follow-up
Month five	Participants offered option to complete shortened version of the questionnaire by phone interview Continue all previous contact and administration methods for participants who do not wish to complete the phone interview Begin to offer the additional $15 gift card for 6-month follow-up Continue to offer the additional $15 gift card for 12-month follow-up
Month six	Same as month five for 12-month follow-up Discontinue contact attempts during month six of 6-month follow-up period to provide break before start of 12-month follow-up

Collateral contacts (other family members and friends listed on the Locator Form) were only contacted after three to four weeks of unsuccessful attempts to reach a participant or a parent/guardian on primary phone numbers. We only offered another mode of questionnaire completion beyond in-person administration during month one if we confirmed that a participant had moved outside of the city's metropolitan area since programming concluded; participants in this circumstance were immediately offered the opportunity to complete the questionnaire online.

3.4.2. Month two

In the second month of data collection, we continued to use phone and text contacts to schedule and confirm in-person individual appointments; however, if a participant was unwilling or unable to complete the questionnaire in person, we offered him/her the opportunity to complete the questionnaire online. The online questionnaire could be accessed through a link that was emailed to the participant along with specific administration instructions. We would verbally (by phone) confirm the participant's email address and provide instructions on how to complete the online questionnaire prior to emailing the link. Occasionally, for participants who did not answer the phone, this communication would happen over text message, or, if they could not be reached after multiple calls, we would communicate these instructions to parents. In general, we tried to call, text, and email 'friendly reminders' to each participant who agreed to take the online questionnaire once per week. Upon completion of the online questionnaire, or any other mode of data collection beyond in-person administration, research staff verified the participant's address and mailed the incentive. For participants with an email address but no viable phone numbers, the online questionnaire was emailed, and a letter containing the follow-up coordinator's contact information, a shortened Locator Form, and a return envelope were mailed to the address on file. If no valid email address was available, only the letter was sent. After the data collection window had been open for six to seven weeks, we mailed reminder letters containing a shortened Locator Form to *all youth* who had been hard to reach, regardless of working phone numbers.

3.4.3. Month three

In month three, we continued to call participants to schedule in-person appointments or verify an email address to send the link to the online questionnaire. At this time, we also emailed instructions and the online questionnaire link to *all participants* with a valid email address, even those with valid phone numbers. If a participant had no valid email address, we mailed him/her a paper questionnaire and a letter explaining how to complete and return the questionnaire, along with a shortened Locator Form and pre-stamped and addressed envelope. Once participants who had a valid email address were emailed the online questionnaire twice without completion, a paper questionnaire packet was also mailed to this group. Letters reminding participants to mail the questionnaire back or complete it online were sent out two weeks after the initial questionnaire packet was mailed and then again every two to four weeks to non-responders. The letters and emails always contained the follow-up coordinator's contact information and incentive information. At this point, if participants began to consistently hang up or purposely ignore phone calls, we

discontinued contact for one to two weeks to give them a break from communications.

3.4.4. Month four

During month four of the data collection periods, participants were still encouraged to make in-person appointments, but now had the option to complete the questionnaire online or by mail. They were emailed the online questionnaire twice per week in addition to weekly phone calls and texts. Reminder letters continued to be mailed out to non-responders every two to four weeks, informing them that they could mail back the paper questionnaire or complete it online. Additionally, we attempted to call phone numbers that were previously noted in the *Contact Log* as disconnected because these numbers were often reconnected after several weeks or months. In month four of the 12-month follow-up data collection period, we began to offer participants who had not yet completed the questionnaire an extra $15 gift card, in addition to the original $20 gift card, to complete the questionnaire. We continued to offer both gift cards as incentives through month six of the 12-month follow-up period to all participants who had not yet completed a questionnaire.

3.4.5. Months five and six

In month five, we employed our last mode of data collection. Participants were offered the option to respond to a shortened, 25-item version of the questionnaire that collected limited, essential outcome data via a phone interview with a study staff member; the length of the full questionnaire (116 items) and limited staff prohibited us from obtaining all data using this mode. The phone interview was a valuable option because it did not require participants to take the extra step of opening their email to start the online questionnaire or take the initiative to complete and mail back the paper questionnaire. Due to the sensitive nature of some of the questions, same-gender questionnaire administrators who had not had any regular contact with participants up to this point were tasked with completing the interviews. Each interviewer received training prior to contacting participants, which included an overview of the study; interviewing procedures and techniques; review of the specific questionnaire administration protocol; and supervised practice in conducting the interview and recording data. Phone interviewers were provided with detailed contact notes for each participant, including the best times and numbers to attempt contact and the reason(s) the participant had not yet completed the questionnaire. The interviewers handled the majority of participant contact during months five and six; however, if participants did not wish to complete the phone interview, the interviewer reminded them of the other options for completion and alerted the follow-up coordinator to the participant's preferences. Previously disconnected numbers as well as collateral contacts were called again for hard-to-reach participants.

Starting during month five of the 6-month follow-up period, an extra $15 gift card, in addition to the original $20 gift card, was offered to participants who had not yet completed the follow-up questionnaire. We did this only at the very end of the 6-month follow-up period to have as few participants as possible expect the additional incentive for 12-month follow-up and to limit the number of participants who might relay this information to their friends. All contacts with participants stopped during the sixth month of the 6-month follow-up data collection period in order to give participants a break before the start of 12-month follow-up efforts; however, for the 12-month data collection period, contact attempts continued for a full six months, with the tracking procedures for the sixth month remaining the same as those implemented in month five.

4. Results

4.1. Questionnaire completion rates, modes, and timing

As is illustrated in Table 2, our use of and adaptations to Scott's EVMC model resulted in high overall follow-up rates for adolescent participants enrolled in the study. Over 87% of study participants were retained at 6-month follow-up and 91% were retained at 12-month follow-up. As intended, the majority of participants (68.3% at 6-month and 58.5% at 12-month) met with study staff at an administration site to complete a paper questionnaire. In-person follow-up questionnaires were administered at 28 different sites throughout the city. About one third of participants opted to complete the questionnaire online, with a slightly larger percentage utilizing this mode of administration at the 12-month follow-up compared to 6-month follow-up. Very few respondents submitted their questionnaire by mail. The phone interview option, which was offered during month five of the 6-month period (2013 cohort only) and months five and six of the 12-month period (2012 and 2013 cohorts), was used by 0.6% of respondents at 6-month and 4.4% of respondents at 12-month.

In Table 3, we present the number and percentage of respondents who completed the questionnaire over time at each follow-up data collection period. Data in this table show that of participants who completed the questionnaire, the proportion who completed within each month of the six-month-long data collection periods is approximately the same for both 6- and 12-month follow-up periods. Roughly two thirds of participants completed the questionnaire within the first month of the data collection window and just over one-fifth completed the questionnaire in month two. In total, 84.3% of respondents at 6-month follow-up and 78.5% at 12-month follow-up completed the questionnaire by the end of the second month of the data collection period; these participants are the 'early responders'. About 10% of respondents completed in month three and the remainder completed questionnaires in months four through six; participants in this group are the 'late responders'.

4.2. Confirmation contact efforts

In Table 4, we present the total number and percentage of study participants who *did not* complete the questionnaire at 6- and 12-month follow-up and list the reasons for non-completes. Although

Table 2
Questionnaire completion rates at 6- and 12-month follow-up, overall and by mode of data collection.

Questionnaire type	Overall		In-person		Online		Mail		Phone interview	
	%	Number	%	Number	%	Number	%	Number	%	Number
6-month follow-up *(n = 620)*	87.6	543/620	68.3	371/543	28.6	155/543	2.6	14/543	0.6	3/543
12-month follow-up *(n = 620)*	91.0	564/620	58.5	330/564	33.9	191/564	3.2	18/564	4.4	25/564

Note: Questionnaire completion rates in this table include participants from both the 2012 and 2013 cohorts and are based on the number of completed questionnaires divided by the number of living participants; the denominator used to calculate follow-up rates in this table excludes one participant who was deceased prior to the start of follow-up data collection. We do not define retention as continuous participation throughout the study, but rather calculate retention rates using the number of follow-up questionnaires completed during each individual data collection window.

Table 3
Number and percentage of respondents completing questionnaire over time at 6- and 12-month follow-up data collection periods.

Data collection period	Month one	Month two	Month three	Month four	Month five	Month six	Total
6-month follow-up	343 (63.2%)	115 (21.2%)	51 (9.4%)	15 (2.8%)	18 (3.3%)	1 (0.2%)	543
12-month follow-up	325 (57.6%)	118 (20.9%)	60 (10.6%)	23 (4.1%)	13 (2.3%)	25 (4.4%)	564

Note: Questionnaire completion rates in this table include participants from both the 2012 and 2013 cohorts.

12.6% and 9.2% of study participants did not complete the 6- and 12-month follow-up questionnaires, respectively, only 16 participants were completely lost to contact at each data collection point. We define this as a participant for whom we have no valid phone contact information and who is unresponsive to mail or email contact efforts. At both follow-up data collection points, we maintained contact with 97.3% of participants, negating the need for the more comprehensive outreach and tracking efforts employed by Scott (2004). Of the participants with whom we maintained contact, 89.9% and 93.4% completed the questionnaire at 6- and 12-month follow-up, respectively. The majority of participants who did not complete follow-up questionnaires were simply unresponsive to data collection requests.

In Table 5, we present the average number of contacts with the 2013 cohort of study participants from the start of the 6- and 12-month data collection periods to the month of questionnaire completion[1]. Contacts data in this table also include reminder texts sent and confirmation calls made the week before the data collection window opened. The number of study participants who completed the questionnaire and the average total and type-specific contacts in months one and two (the early responders) was roughly the same for both 6- and 12-month data collection periods. Phone calls and texting were the most frequent types of contacts with this group. Though the average number of contacts is relatively low compared to later months, the greatest proportion of the sample completed the questionnaire during months one and two, making this a high-volume time period for both contacting participants and their parents and meeting them at administration sites. Average contact data for months three through six represent our communication efforts with late responders. During these months, phone calls, text messages, and email were our most frequent modes of contact. As expected, though participants who completed their questionnaires during these months represented just 13.1% of the 2013 cohort's respondents at 6-month follow-up and 16.1% of respondents at 12-month follow-up, the average level of effort to obtain these data was substantially greater.

5. Discussion and lessons learned

5.1. Use of cell phones in the EVMC model

Cell phones proved to be an essential source of contact and locator data during the engagement phase. Most participants did not have family members' or collaterals' contact information memorized and would have been unable to adequately complete the Locator Form without their cell phones. It's important when enrolling participants or collecting any type of locator data to make sure that participants (and/or their parents/guardians) have their cell phones accessible to help ensure the completeness and accuracy of locator data.

We also realized the importance of using a cell phone rather than a landline when verifying participant and collateral contact information. Most of the phone numbers being verified were for cell phones, which display incoming phone numbers; many people did not answer their phone if the caller was unknown to them but would send a text message asking for the identity of the caller. For this population of collaterals, it is unlikely we would have verified contact information had we placed the calls from a landline, or it would have taken significantly more effort to do so.

Adolescents who participated in a focus group during the study's pilot phase indicated that they were most likely to respond to text messages and do not normally answer their phones unless they know who is calling them. These findings were representative of our experiences, as text messaging indeed appeared to be the preferred method of communication for most study participants, particularly when conversing about scheduling or rescheduling in-person appointments and reminding them to complete the online questionnaire. Participants were also responsive to phone calls, especially after they came to know the primary study coordinator's cell phone number, which was also the main contact number for the study.

With the start of follow-up for our first (2012) cohort, we used a mass text messaging service to simultaneously send appointment reminder texts to a multitude of participants. This strategy was ultimately unsuccessful; some participants' cell phone providers automatically blocked the messages because they came from a short code number, and all 'reply' text messages from participants were sent to the text service's online inbox; therefore, they were not immediately received by staff. These issues resulted in missed communications and appointments. As a result, with the second cohort (2013), all reminder texts were individualized and sent directly from the primary follow-up coordinator's cell phone. Though more time-intensive, individual reminder texts allowed for quick and responsive two-way communication between the participant and study staff, especially in the event that participants had a question, were running late, or had to cancel an appointment. Reminder texts were also useful because the appointment information was then stored in the recipient's phone for quick reference.

Table 4
Reasons for non-completes at 6- and 12-month follow-up.

Reasons for non-completes	6-month follow-up	12-month follow-up
Valid contact information but youth not responsive to data collection requests	50	29
Youth refused to take questionnaire	9	9
Youth incarcerated	2	2
Deceased	1	1
No valid contact information	16	16
Total percentage and number of non-completes	**12.6% (78/621)**	**9.2% (57/621)**

Note: Data in this table include participants from both the 2012 and 2013 cohorts. Of the 16 non-completes at each data collection period due to no valid contact information, nine participants did not complete the questionnaire at both 6-month and 12-month follow-up; the other 14 participants (7 unique participants at each data collection point) either completed the questionnaire at the other data collection point, or they did not complete but for a different reason (i.e., we had valid contact information but the youths either refused or were not responsive to data collection requests).

[1] Contact data from the 2012 cohort are excluded from the table as they were deemed incomplete and are therefore not representative of our contact efforts for that cohort.

Table 5
Average number of contacts with 2013 cohort of study participants from start of 6- and 12-month data collection periods to month of questionnaire completion, by contact type.

2013 6-month follow-up	Month one ($n=176$)	Month two ($n=49$)	Month three ($n=21$)	Month four ($n=4$)	Month five ($n=8$)	Month six ($n=1$)
Phone calls to participants and/or parents/guardians	1.82	5.47	10.10	8.50	12.13	19.00
Text messages to participants and/or parents/guardians	1.76	2.78	3.67	6.25	3.38	11.00
Emails to participants and/or parents/guardians	0.01	0.67	5.00	10.25	17.63	19.00
Non-responder or reminder letter	0	0.02	0.14	0.25	1.75	2.00
Mailed paper questionnaire	0	0	0.81	1.00	0.88	2.00
Average total contacts	3.59	8.94	19.71	26.25	35.75	53.00
2013 12-month follow-up	($n=176$)	($n=43$)	($n=13$)	($n=9$)	($n=5$)	($n=15$)
Phone calls to participants and/or parents/guardians	2.04	5.86	11.08	15.44	21.20	15.47
Text messages to participants and/or parents/guardians	2.30	2.79	3.92	5.67	10.40	2.00
Emails to participants and/or parents/guardians	0.02	1.49	3.38	6.56	19.80	9.53
Non-responder or reminder letter	0	0.19	0.46	1.67	2.00	1.67
Mailed paper questionnaire	0	0	0.69	1.11	1.00	1.07
Average total contacts	4.36	10.33	19.54	30.44	54.40	29.73

Note: Data in this table only reflect contacts with participants from the 2013 Cohort; Contact Log data from the 2012 Cohort was incomplete and therefore excluded from this analysis. Counts represent study staff members' *attempts* to contact study participants; they do not reflect actual interaction/confirmed reception of message by participant.

We were able to maintain contact with the vast majority of study participants, making more complex tracking procedures unnecessary. Only 16 participants were truly lost to contact at each data collection point. The use of cell phones and individual texting to schedule or reschedule appointments and send reminders appeared to be extremely valuable in maintaining contact with participants. If it appears that a number is disconnected, it's important to re-try that number at a later date, as numbers were often reconnected after several weeks or months.

5.2. Appointment scheduling strategies

Throughout the follow-up process, we learned that being as flexible as possible with scheduling and presenting each follow-up as a personalized event for participants rendered the best chance for questionnaire completion. The lives of adolescents are hectic and full of extracurricular activities, part-time jobs, and schoolwork, among other circumstantial factors. Having staff appear flexible from the beginning of the follow-up process helped to facilitate the scheduling conversation with participants and parents. Rather than giving one date or time for participants to complete a questionnaire, offering several location options and appointment times seemed to help demonstrate the investment of the research staff in meeting participants where and when was convenient for them. Effective scheduling requires that study staff are willing and able to adapt their work schedules to accommodate participants' schedules. Research supervisors should alert staff in these positions that this will be a required component of the job; most youth and parents are in school or work during the day, so the bulk of confirmation calls, reminder calls, and in-person data collection must take place in evenings and on weekends.

Although we did attempt to maximize staff time by scheduling multiple group questionnaire administration sessions, study staff should always schedule an appointment with a participant as soon as he/she is available, despite the inconvenience it may cause. Phone numbers became disconnected on a daily basis, and the longer we took to the schedule the appointment, the more likely it was that contact numbers on file became invalid. Given the age of our study participants, it was generally most productive to schedule appointments with parents or grandparents of study participants; they were often more familiar with follow-up locations and were generally in charge of the youth's transportation. Moreover, participant contact efforts in the confirmation phase are an on-going process, and staff must be persistent in their efforts to both schedule and actually obtain questionnaire data; it will likely take multiple phone calls and/or texts to schedule an initial appointment, as well as numerous contacts and reschedules to complete a follow-up appointment. Staff should employ multiple methods of contact to reach participants; however, they also need to have the ability to recognize if participants are getting irritated or nonresponsive and adjust contact frequency and/or techniques when necessary.

Due to our limited staff, large cohorts with the same discrete data collection open and close dates, no central location associated with the program where we could access participants (i.e., one school or treatment center), and participants' busy school and activity schedules, we could only contact, schedule, and conduct administration sessions with a certain number of participants each week. As a result, during the first few weeks of each data collection period, we had to deliberately group and space out when we contacted and met with participants; it would have be unproductive to attempt to schedule appointments with all participants right as the window opened when we did not have the ability to meet with them immediately. These challenges may, in part, explain why some participants did not complete the questionnaires as quickly as the studies cited by Scott (2004). It is notable, however, that we were able to obtain follow-up data from roughly 60% of our 2013 sample with, on average, fewer than five contacts, and another 15% with about 10 contacts on average. This reflects a fewer number of contacts than the two studies (Chicago Target Cities and Drug Outcome Monitoring Study) presented by Scott, which required 10 or fewer contacts to capture roughly 33% of participants and 23 or fewer contacts to reach 70% of study participants; however, it's important to note that we did not employ many of the earlier confirmation calls suggested in the original EVMC model, which could partially account for the smaller number of contacts.

5.3. Staff continuity

As Scott (2004) recommends, and as has been noted by other researchers (Prinz et al., 2001; Vincent et al., 2012; Yeterian et al., 2012), it was extremely helpful to have one consistent, primary staff person responsible for contacting participants during the maintenance phase and calling to schedule/reschedule data collection appointments during the confirmation phase. Sending all communication from one person and one phone number, while more time intensive, helped to develop personal relationships with participants and their parents/guardians and engendered recognition of

the study over the year-long follow-up period. In addition, after participants came to know the follow-up coordinator and her phone number, they could contact her on their own accord with questions or to schedule an appointment.

From an administrative perspective, having a consistent, primary staff person oversee the implementation of the EVMC model and follow-up efforts for the duration of the study has been extremely beneficial. The follow-up coordinator's long-term management of these processes has resulted in valuable ideas and insights as we have tested new strategies and made subsequent modifications to the follow-up protocol. Participant retention has clearly improved as the study has progressed. One possible explanation for this may be not only the consistency that the coordinator has provided for the participants, but also the congruency for other study staff and overall data collection processes. The coordinator's knowledge of what works and does not work in contacting and following up with participants has helped to refine protocols over the years. Requiring study staff to keep detailed logs of tested and successful follow-up strategies is extremely important to ensure continuity of study methods in the event of staff turnover.

5.4. Multiple data collection modes and length of data collection periods

Although we, in most cases, made every effort to be as flexible in appointment scheduling as possible, inevitably, there were participants who were unable to complete a questionnaire in person. Extracurricular activities, long commutes home after school, parent work schedules, schoolwork, and a lack of transportation appeared to be the most common reasons hindering participants from being able to schedule or attend an in-person appointment. The online questionnaire option, which opened in month two of the windows, proved to be a very helpful and low-resource method for this population of participants. The participants could complete it at their convenience, and their incentive was mailed upon completion. About one third of participants opted to complete the questionnaire online.

While online data collection was a preferred option for many participants who experienced barriers to meeting study staff in person, some participants did not have internet access at home or a valid email address. Others had access to the internet at school, but it was generally not a setting conducive to completing this questionnaire because of the length of time necessary, as well as the sensitivity of the questions. Mailing a paper questionnaire package to this small sub-group proved to be a successful, though somewhat more costly method. The questionnaire package was also a useful option with participants for whom research staff no longer had any valid contact phone numbers. Interestingly, it also became apparent through conversations with participants that a portion of participants who *did have a* working email address, as well as internet access at their homes, still preferred to complete the paper questionnaire and return it via mail. Mailed questionnaires, which began to be offered during month three of the data collection periods, were collected from 14 participants at 6-month follow-up and 18 participants at 12-month follow-up.

The phone interview mode of data collection, which was offered during month five of the 6-month period and months five and six of the 12-month period, was used least frequently, but was also available to participants for the least amount of time of any of the modes; only three participants at 6-month follow-up and 25 participants at 12-month follow-up used this mode of data collection. While the numbers are modest, this last mode allowed us to collect essential outcome data from at least a small portion of the very hard to reach population of participants who had not responded to our follow-up efforts in months one through four. The length of the full questionnaire (116 questions) and limited staff prevented us from obtaining all data via phone interview.

We had various reasons for 'phasing in' each mode of data collection at specific times throughout the data collection periods. We concentrated on in-person administrations first because we wanted as many participants as possible to complete the questionnaire in a controlled environment where we could confirm that they completed the questionnaire themselves without any outside influence and with limited distractions. We then offered it online, the most time and cost-efficient mode; later, we used mail and phone interview options, which were more expensive (postage and staff time), and, in the case of the phone interview, provided us with fewer data. Though using all methods immediately at the start of the window could have potentially resulted in a greater proportion of questionnaires completed in a shorter amount of time, limited resources and our desire to obtain data in person led to our tiered introduction of subsequent modes of data collection.

We also made the decision to allow study participants to complete 6- and 12-month follow-up questionnaires for a full six months after each window opened. Though we recognize this method is not appropriate for all studies and that a narrower window is generally preferable, due to the competing pressures of selection bias and limited resources (time, money, staff), we made the decision to lengthen the timing of the follow-up window and use sensitivity analyses to investigate whether outcomes were different for early and late responders or by mode of administration. Additional analysis shows that for the vast majority of the sample (85%), regardless of when within the windows they completed the questionnaires, the length of time between 6- and 12-month follow-up data collection observation points ranged from five to seven months.

Our results indicate that if we had not offered additional data collection modes and continued to collect data for six months, our retention rates would likely have dropped substantially. In total, 84.3% of respondents at 6-month follow-up and 78.5% at 12-month follow-up completed the questionnaire by the end of the second month. The length of the data collection period and multiple modes of administration appeared to be crucial in collecting data from the remaining 15-20% of respondents, who may be different in known and unknown characteristics from the early responders. Although our follow-up rates were not as high or achieved in as short of a period of time as other studies that have employed the EVMC model, we were still able to maintain contact with the majority of our study participants and collected data from a large enough portion of our adolescent sample to avoid selection bias. Preliminary impact analysis of 6-month follow-up data indicate no difference in substantive findings for our primary outcomes with and without late responders or by mode of data collection.

5.5. Limitations

We recognize that our study has long follow-up data collection periods, and that, coupled with the multiple modes of questionnaire administration, could complicate results. We will, as part of the impact analysis, conduct a sensitivity analysis to examine the extent to which these variations influence our results–and in particular whether study participants who respond later or via different modes report different outcomes; our preliminary analysis of primary outcomes at 6-month follow-up suggests that this is not the case. In addition, though our methods proved successful in meeting retention goals for our specific study sample, they may not be appropriate or feasible for other populations or geographic locations. Further, and as Scott (2004) also notes, we cannot know which specific elements or components of the model and our adaptations (e.g., number of contacts, use of cell phones, modes of administration, incentives) are responsible for its success.

6. Conclusion

There are many barriers that can make adolescents a difficult population to reach for follow-up data collection in longitudinal research. The EVMC model provides an effective, evidence-based framework to standardize retention protocols. Our use of this model, combined with adaptations for diverse questionnaire administration and communication methods, has allowed us to successfully meet retention goals. Within the framework of the EVMC model, it's important to test many different strategies to find what works best and to change and adapt protocols to fit the trends demonstrated by your study population. Study staff must be persistent, flexible, and mobile to accommodate participants' schedule, location, and administration and communication preferences. Further research on successful data collection strategies with large, out-of-school cohorts of adolescents with discrete data collection periods would be valuable for other researchers implementing studies such as ours. Additionally, studies exploring utilization of other methods to contact participants in order to obtain follow-up data would provide crucial information as technology trends continue to evolve, especially amongst the adolescent population.

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Erin Davis works as a Junior Research Analyst at The Policy & Research Group. Davis manages the evaluation of an after-school program and also contributes to research and evaluation projects by coordinating follow-up efforts for a large randomized controlled trial. She executes extensive follow-up protocols and manages and cleans the data. She has a Bachelor of Science degree in Exercise Science with an emphasis in Scientific Foundations from the University of South Carolina.

Hilary Demby is a Senior Research Analyst at The Policy & Research Group. Demby oversees data collection processes and methods for all research and evaluation projects. She has managed and implemented evaluations of programs that address a range of topic areas, including teen pregnancy prevention, homelessness, disaster recovery and emergency readiness, substance abuse and HIV prevention, and school safety. She has a Master of Public Health degree, with a concentration in health education and communication, from Tulane University School of Public Health and Tropical Medicine.

Lynne Jenner is the Director of Projects at The Policy & Research Group. She has 20 years of experience in project management. Jenner has been an invited speaker on capacity building and program evaluation at national conferences, and has taught university-level courses. Her areas of interest include program development, program evaluation, and management. Jenner is the director of the project management team. Her responsibilities include client relations, development, and the management and administration of PRG projects. Jenner received her MA degree in organizational communication from Louisiana State University.

Alethia Gregory is a Research Analyst at the Policy & Research Group. Gregory's work focuses on the execution of two randomized control trials to evaluate the effectiveness of teen pregnancy prevention curricula as well as a project to improve the social and emotional well-being of children, in the foster care and family services systems, who have mental and behavioral health needs. She has a Master of Social Work degree from Louisiana State University.

Marsha Broussard is the Orleans Teen Pregnancy Prevention Project Director, and also serves as the Director of School Health Connection at the Louisiana Public Health Institute. She has extensive experience implementing adolescent health and wellness and risk reduction programs as well as building coalitions for sustainability among local and state partners across various states and agencies. Broussard has a Master of Public Health degree from the University of Michigan School of Public Health and received her Doctor of Public Health degree from the Tulane University School of Public Health and Tropical Medicine, Department of Community Health Sciences.