Integrating Biological Data Collection and Retaining Survey Subjects in a Longitudinal Workplace

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Abstract
Large-scale longitudinal surveys that include biological data collection offer a host of unique challenges related to recruiting and training interviewers, implementing the study, obtaining high participation and retention rates, and collecting high quality data. Solutions must be tailored to the interview setting, study population, and interviewer characteristics. This paper reviews specific challenges and successes developed and implemented during multiple waves of data collection for the Work, Family & Health Study (WFHS). Collection is still ongoing, with over 12,300 computer-assisted interviews, 7,500 dried blood spot cards, and 13,000 saliva samples collected to date. The National Institutes of Health (NIH) and the Centers for Disease Control and Prevention (CDC) formed the Work, Family & Health Network (WFHN) to address a critical gap in the knowledge base supporting work versus family life policies. The WFHS is a longitudinal study collecting data from individuals in the workplace and in the home, designed to thoroughly assess effects of specific work-family interventions on work-family conflict and health outcomes. The data collection protocol includes computer-assisted interviews, basic health measures (height, weight, and blood pressure), blood collection (through both dried blood spots and the use of a point-of-care device to obtain an immediate HbA1c reading), and the participant wearing an actigraph watch to record sleep and wake behavior for a week. Interviewers also leave self-administered saliva collection kits with respondents. Information is collected from employees and their supervising managers at baseline and 6, 12, and 18 months post-baseline within two disparate workplace cohorts—a white-collar, high-tech industry and an extended-care services industry. This paper focuses on recruiting and training lay interviewers to collect biomeasures successfully, tailoring the biomeasure collection protocol for a worksite study to improve data quality, and obtaining high response rates while minimizing respondent burden.

Key Words: Biomeasure collection, longitudinal, dried blood spot, workplace study, interviewer, actigraphy, subject recruitment, subject retention, layperson, data quality, logistics

1. Background

This paper is based on research activities completed for the Work, Family & Health Study (WFHS) from 2009 to 2012. The WFHS is a longitudinal study investigating how work conditions affect the health and well-being of employees and their families, with data collected at four time points—baseline, 6 months, 12 months, and 18 months post-baseline. The study is assessing the outcomes of an innovative employer-initiated workplace program in a randomized field experiment. The workplace program focuses on increasing work flexibility, schedule control, and control over how and when work is done, and increasing the support of supervisors and coworkers for employees' work-family issues. Data are collected from employees and managers in the workplace on

company paid time and with employees, their spouse/partners, and children aged 9 to 17 in the home.

As a workplace survey that includes biomarker collection, the WFHS presented unique challenges for the researchers. Because of the longitudinal nature of the study, subject recruitment and retention were critical for the overall success of the study. With the addition of the biomarker collection, it became very important that the field interviewers not only be able to administer the computer-assisted personal interviewing (CAPI) survey correctly, but also to follow strict protocols when collecting health measures and blood. The protocols were designed to ensure precise measurements, high-quality blood specimens, and the safety of the respondent and interviewer.

The WFHS employed lay interviewers rather than trained phlebotomists to conduct the interview and collect all biomeasures. The use of lay interviewers led to several prestudy concerns:

1. Lay interviewers might be difficult to train on blood collection and provide poor quality samples.
2. Employees might have concerns with lay interviewers collecting their blood, which might diminish cooperation.
3. Blood collection rates might fall off after baseline.
4. A bad blood collection experience could jeopardize the entire study because of word of mouth spreading through the workplace environment.

It was very important that the field interviewers collect high-quality blood specimens that were sufficient for the required analyses to inform the research outcomes. To that end, particular attention was paid to the recruitment, training, and certification of the field staff. In addition, the study provided follow-up retraining and feedback once the interviewers were in the field.

Another source of concern prior to data collection was the logistics of blood collection in a workplace environment. Field interviewers were responsible for the following:

- reserving suitable space at the workplace;
- making optimal use of the space provided;
- conducting the daily setup, breakdown, and secure storage of blood collection materials;
- cleaning and sterilizing the blood collection space;
- properly disposing of biowaste;
- using a laptop computer (for barcodes, etc.) in a sterile collection environment; and
- processing and storing specimens until ready for shipment.

To address these concerns, study staff focused on training field interviewers on the appropriate protocols, working closely with the industry partners and site liaisons, and adapting procedures as necessary after data collection began.

2. Study Overview

For the WFHS data collection in the workplace, we purposely recruited two distinctly different industry partners—a large information technology company (company 1) with workers throughout the United States, and a large extended-care services company (company 2) with facilities across the United States. Company 1 has a higher wage-salaried workforce, working within a stressful environment with pressing project deadlines and after-hours on-call requirements, and it experienced a company merger and staff layoffs over the data collection period. Company 2 has a lower-wage, hourly workforce, with facilities operating 24 hours a day for 7 days a week. Employees and supervisors in company 2 work within a stressful environment with heavy on-the-floor work demands in caring for residents.

Within each company, we further recruited distinct worksites to participate in the study. In company 1, worksites were groups of employees who report to the same senior management team (roughly analogous to departments). Worksites in company 2 were geographically distinct extended-care facilities spread across six states. A total of 26 worksites in company 1 and 30 worksites in company 2 were selected to participate in the study. Within each designated worksite, we recruited approximately 50 employees and up to 8 managers to participate in data collection. Employees and supervisors in company 1 were eligible to participate if they were employed by the company in the two cities where data collection occurred and were classified as employees, rather than independent contractors, of the company. Employees and supervisors in company 2 were eligible to participate if they were normally scheduled to work at least 22.5 hours per week in direct patient care or in relevant positions within the nursing department, and they worked on the day or evening shifts (thus excluding night shift workers). All spouses and cohabiting partners of eligible employees and children (aged 9 to 17 years) including biological, step, and adopted children who lived with the employee for 4 or more days per week were also eligible to participate in the study. If there was more than one age-eligible child, the child closest to age 13 was selected.

3. Study Design

Data collection began in September 2009 and will continue through December 2012. For the baseline data collection, worksites were activated in pairs per industry on a rolling basis, with all data collection activities within a worksite completed within a 3- to 4-week window. Follow-up interviews at the worksites were attempted at the 6-, 12-, and 18-month anniversary dates of the baseline collection period with all employees and managers who participated in the study at baseline.

3.1 Subject Recruitment

Within each industry, company representatives worked with WFHS study staff to identify the best recruiting methods for gaining employee and manager participation. The recruiting methods were customized for each industry.

In company 1, an upper-level administrator sent an initial e-mail at the start of the study announcing the company's participation and encouraging managers and employees to participate. Then, approximately 6 weeks prior to data collection launch within each worksite, the same administrator sent another e-mail to staff as a reminder about the study. Between 4 and 6 weeks before data collection launch, project staff obtained a full

roster of employees and managers within the worksite including work e-mail addresses. Approximately 2 to 3 weeks prior to baseline data collection launch, project staff held in-person meetings with study group managers and work teams to provide in-depth information, answer questions, and encourage participation. Study brochures, frequently-asked-question handouts, and information pertaining to the spouse and child components were distributed during these meetings. At 1 to 2 weeks before launch, an e-mail was sent to all managers and employees in the worksite announcing that data collection would be starting shortly and to expect an appointment e-mail from RTI. RTI field interviewers e-mailed lead letters directly to employees and managers to schedule the in-person data collection appointments on company paid time. When necessary, the RTI field supervisor also e-mailed refusal conversion letters to employees and managers.

Recruitment in company 2 required a more hands-on approach to introducing the study to subjects within each worksite. Beginning 8 weeks prior to data collection launch at each extended-care facility, project staff (industry coordinator, site manager, and field supervisor) held a series of in-person meetings with key facility staff (Administrator, Director of Nursing, Scheduler) to review the study purpose, develop a roster of employees and managers to interview, discuss plans for providing study information to employees and managers, and plan for scheduling and completing data collection activities at the facility. A key focus of the meetings was discussion of study implementation logistics, including determining the best time slots per day to complete interviews and biomeasures, space availability at the facility to set up and complete the data collection, and the number of employees who could be scheduled to come off the floor at one time. Approximately 3 weeks prior to the baseline data collection activities, project staff began subject recruiting activities at each facility. To share study information with employees and managers, project staff put up colorful posters in key facility locations announcing the upcoming study. Project staff worked with each facility to place study flyers and brochures in employee mailboxes (if they had them) or attached to their paychecks/pay stubs. Also in preparation for the baseline data collection within each facility, project staff held multiple "meet and greets" across work shifts with employees that included food and beverages as means of meeting with as many employees as possible to share information about the study.

3.2 Data Collection Protocol

RTI field interviewers completed a CAPI interview and collected physical measures consisting of blood pressure (three readings), height, and weight with the supervising managers and employees at the worksite at baseline, 6, 12, and 18 months post-baseline. In addition, employees (both companies) and managers (company 2 only) were also asked to provide dried blood spots (DBS) by fingerstick and to wear an actigraph watch. The interview and physical measures averaged 60 minutes to complete, and an additional 30 minutes were spent completing the blood collection and placing the actigraph watch on the subject, all on company paid time. The blood pressure readings were collected with a wrist blood pressure monitor, height was measured using a stadiometer, and weight was measured using a digital scale. Up to five blood spots were collected on special filter paper with a 6-character alpha-numeric barcode, air-dried, and then sealed in a plastic bag for room-temperature shipment with desiccant for eventual storage at −86C until assay. Interviewers also collected a small (1 µl) blood droplet in a microtube for immediate measurement of hemoglobin (HbA1c) levels using a DCA Vantage point-of-care device. Following the DBS collection, employees and managers were asked to wear a 30 g actigraph with on-wrist detection and a watch face to discreetly record wrist

movement activity patterns and ambient light exposure for 1 week. Employees and managers received up to $60 for completing all worksite components at each wave.

At baseline, 12, and 18 months, additional data were collected from the employee and the employee's age-eligible child in the home. If the employee had an age-eligible child, the employee was asked to complete a 25-minute home interview and then received an additional $30 incentive. Children, with parental consent and their assent, completed a 60-minute home interview and health assessment and received $50. The child health assessment included blood pressure, height, and weight. At baseline and 12 months, spouses/partners were also asked to complete a 30-minute telephone interview and received a $20 check by mail.

The workplace interviews and biospecimen collection were completed in space reserved specifically for the WFHS. Depending on the site's available space to the study, the CAPI interview and biospecimen collection components could be collected all in the same room or in two separate rooms. Site space had to meet certain criteria to be deemed as interview space, including being reasonably private, having a comfortable room temperature (especially for blood collection), having an electrical outlet for equipment, and being a safe environment for both the interviewer and respondent.

For transport, storage, and easy access to blood collection supplies, the study provided field staff with rolling travel carts. The travel carts were very durable and had three removable sections with drawers and bins for organized storage of all supplies needed for the blood and actigraphy collection. The travel cart was fully stocked with supplies before starting fieldwork at a worksite, and field team leaders used a supply checklist to routinely monitor usage and request additional supplies when needed during the data collection period. Additional materials for DBS collection not housed in the cart included the DCA Vantage machine, sharps disposal containers, and biohazard waste containers.

3.3 Daily Set-Up of the Blood Collection Area and Materials

Certain parameters were required in choosing space used to collect blood spots. These included selecting an area not intended for eating, free of unrelated project equipment, with room for movement, and with privacy for interviews and blood collection.

All field interviewers were trained on how to properly set up the blood collection lab area to make sure efficient and valid collections could take place. Below is a picture of a typical lab area set-up (***Figure 1***).

Figure 1: Typical Lab Area Setup

Typically, the first interviewer at the worksite on a given day was responsible for setting up the lab station for any subsequent blood collections that day. Field training included a module on the step-by-step instructions interviewers must follow to safely arrange the equipment while practicing standard precautions and efficiency of collections.

As part of the lab area set-up, the DCA machine needed to be plugged in and allowed time to warm up. We asked the first interviewer on site each day to arrive 30 minutes earlier than the first appointment to allow sufficient time for everything to be set up and ready before the first participant arrived for his/her appointment. Once the collection of blood spots had been completed for the day, the last interviewer to collect blood broke down and decontaminated the area to make certain that passers-by would not be infected by bloodborne pathogens. To ensure field staff accurately followed each step in setting up the lab area, completing the blood collection, and safely breaking down and decontaminating the lab area each day, they were provided with laminated checklists to use at the worksite.

4. Study Processes/Implementation

4.1 Field Staff Recruiting

The WFHS protocol called for blood collection via fingerstick. Because this was less technically complex than vein puncture and to reduce costs, the study chose to hire lay field interviewers (rather than phlebotomists) to complete all aspects of the data collection. During recruitment, we focused on finding staff with previous field interviewing experience, strong multitasking and organization skills and attention to detail, and the ability to follow strict protocols. Prior blood collection experience was a plus but not a requirement for consideration. During the initial screening, we fully explained our data collection protocol to applicants, including the requirement to do fingersticks, asked about previous blood collection experience, and asked about their reaction at the sight of blood (i.e., do they get faint or nauseous). For those who passed the initial screening, we used an interviewer script that went into greater detail about blood collection, including safety protocols in collecting and disposing of blood, and the hepatitis B vaccine series. We gauged how comfortable applicants were being around blood and their willingness to learn and follow a strict protocol to collect the blood.

4.2 Field Staff Training

In fall 2009, we conducted a pilot study to assess the feasibility of implementation, specimen integrity and quality, and field response rates. The pilot study also allowed us to test out our training design. We designed our subsequent trainings based on our pilot study experience, in which we found that the blood collection in particular was something that was very stressful for the field interviewers; they had difficulty focusing on learning about the other interview components (such as the CAPI interview) if we introduced them first. We also determined that it was important to allow a great deal of practice time with the blood collection.

Field interviewer training covered biomeasures, and blood collection in particular, extensively. Training began with the home study that the field interviewers were required to complete before they arrived at training. Once at the in-person training, trainers used a variety of methods to present the material, all based on best practices for training adult learners. ***Table 1*** depicts the training topics covered and methods used during the 7-day training (with one additional day for Team Leaders).

Table 1: Work, Family and Health Study Field Interviewer Training

	Topics Covered	*Training Method(s)*	*Study Hall?*
Day 1	Workplace interview, including blood collection	Lecture Demo Round robin	No
Day 2	Biomeasure collection	Lecture Demo Paired practice	Yes
Day 3	Actigraphy	Lecture Demo Paired practice	Yes
Day 4	CAPI interviews	Lecture Round robin Paired practice	Yes
Day 5	CAPI interviews Site logistics Gaining cooperation	Certification Paired practice Lecture	Yes
Day 6	Data security Adverse events	Lecture	Yes
Day 7	All CAPI interviews, including biomeasure collection	Paired practice	No
Day 8	Team Leader training: • Specimen shipping • Actigraphy download	Lecture Demo Paired practice	No

There were several study hall opportunities throughout training, where interviewers were able to work one-on-one with a trainer. Trainers scored their blood samples for quality and provided feedback to the interviewers on the spot. Each interviewer was required to attend 2 hours of study hall for blood collection practice at a minimum.

4.3 Field Staff Certification

As a part of the training program, we developed a very strict certification. Only 40% of the field staff passed blood collection certification on their first attempt. For blood collection certification we asked our field staff to demonstrate the ability to

- follow proper sanitary procedures throughout the entire process;
- follow the blood collection process per protocol in the proper order;
- properly perform a fingerstick, milk the finger and obtain blood spots;
- properly use small microtube and DCA device to obtain an on-the-spot A1c reading; and
- complete the entire process within a set time frame.

The field interviewers were graded by a trainer and received points for each activity, including bonus points for obtaining two or more "full" spots and for completing the process in less than 10 minutes of time. Immediate feedback and retraining were provided to interviewers on their DBS demonstration.

One lesson learned at the initial training of field staff was that complex procedures like blood collection require additional training time after the initial certification attempt for any needed retakes. For this reason, certification on all biomeasure collection occurred on Day 5 of training.

All field interviewers were required to be certified before beginning work in the field.

4.4 Post-training feedback

4.4.1 Refresher Trainings

Blood collection training does not stop at certification for the initial training. Because the field interviewers were working in locations that were not local to the RTI office, it was important that they not only be trained well, but also that we continue to give them feedback on their collection techniques once they were working in the field on their own. Otherwise there was a risk that specimen quality might deteriorate or interviewers might violate study protocols.

With our longitudinal field design, we held several group refresher trainings with the field staff on blood collection, where we had staff convene for a day with the training team. When conducting refresher trainings in the field, attention needs to be given to coordination, travel, and labor costs; where to hold the refresher (such as a hotel conference room or the worksite); and schedule availability. We also held individual refreshers on worksite start-up days. In-person refreshers were best for hands-on critiques of field interviewer technique that may have become sloppy or where field interviewers may have developed bad habits. Sometimes field interviewers give each other "tips" in the field that a trainer would not endorse. In-person retrainings were also best for introducing new techniques or materials (such as a new lancet). For minor protocol issues, e-mail refreshers or reminders worked best.

4.4.2 Field observations

Field observations served as another means of providing additional feedback to field staff on their blood collection technique. These were done by field supervisors, trainers, and other project staff. Observers used a standardized form to record their notes and score field interviewers on each component of the workplace interview. Biomeasure collection feedback and coaching were provided on the spot to the field interviewer. The interviewer's supervisor also received general feedback to discuss with the field interviewer. Over the course of data collection, we completed over 175 field observations.

4.4.3 CAPI Reminder

In CAPI, field interviewers were asked to score themselves on whether they obtained "full" blood spots and how many spots were obtained. In training, we determined that field interviewers had trouble making this assessment. Therefore, we inserted a color picture (***Figure 2*** below) into CAPI that depicted a "full" blood spot, as well as spots with insufficient blood. This picture served as a good reminder and data quality tool for interviewers to see each time they collected blood.

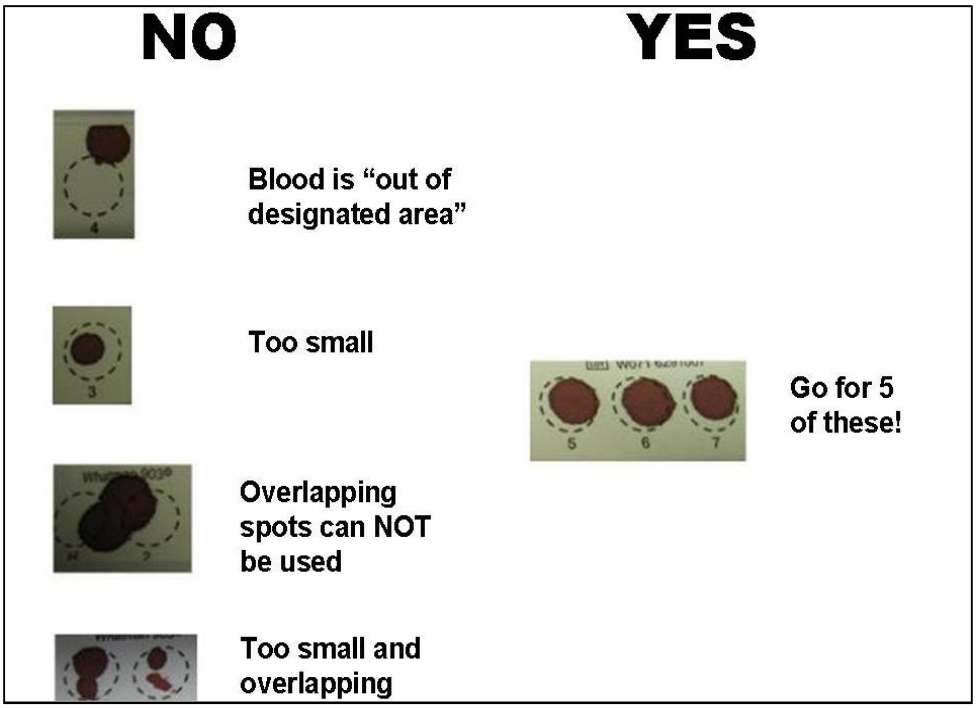


Figure 2: CAPI Reminder Screen for Blood Collection

4.5 Tailoring of Protocol to the Site

The study team communicated in advance with site liaisons at each worksite to review the logistics of completing the interviews and biospecimen collection and to identify and reserve appropriate workspace to complete the data collection activities. However, once data collection began, certain factors dictated that the interviewers be able to adapt and tailor the protocols at the worksite.

For the WFHS, interviewers collected data in two very different types of worksites. In addition to that, interviewers moved from site to site during data collection. Occasionally they were asked to change data collection locations at a site during the day if the office space was needed.

To prepare the field staff, they practiced the appropriate lab space set-up in training. Each field interviewer practiced setting up and breaking down the lab while at training so that he/she was comfortable doing this while following all proper sanitary procedures. They also practiced the proper packaging and storage of blood specimens.

Study protocol called for a stadiometer and digital scale to obtain height and weight. Accurate collection of height and weight with that equipment requires using a hard

surface, but once in the field, we learned that much of the workspace that was allocated to us was carpeted. When placed under the stadiometer or scale, an inexpensive floor tile allows for accurate measurement when on a carpeted surface. The study purchased some at a local home improvement store and each Team Leader was provided with one.

Through early field observations and feedback from the field, we determined that the cold temperature in the buildings seemed to be affecting the field interviewers' ability to collect sufficient blood. To alleviate that problem, we provided each site with hand warmers to offer the respondents.

At the company 1 (telecommunications) worksites, they had no existing need for biowaste disposal, so the study had to come up with its own safe and secure process. To that end, we located a company that offers a mail-back approach to biowaste disposal. The study purchased mail-back biowaste disposal kits that included everything we needed. Within the company 2 (extended-care) facilities, we were fortunate and able to add our biowaste to their existing biowaste for disposal at no additional cost to the project.

4.6 Maximizing Response Rates with Biomeasures

When using lay interviewers for something like blood collection, it is vital that potential respondents view them as professional and competent. Therefore, we provided our field interviewers with white medical lab coats. These served a dual purpose: the coats were part of the interviewer's Personal Protective Equipment (PPE), and they also gave the interviewers an aura of medical authority, even though they were laypersons.

At follow-up rounds, we discovered that employees were sometimes on temporary leave of absence from the company. In order to retain them as study subjects, we developed a travel lab kit. This allowed our field interviewers to go to their homes and conduct the worksite interview with them, including collecting the blood, if they were willing.

In order to maximize the respondent buy-in and incentive to provide biomeasure data, we provided employees and children with information from their health assessment. Interviewers recorded information on body mass index (BMI), blood pressure, and, for employees, HbA1c level, on a feedback card with an interpretation of the readings and recommended guidelines for participants.

Respondents received a separate incentive for each separate piece of the study that they chose to participate in: $20 for the CAPI interview and basic health measures, $20 for the DBS, $20 for actigraphy, and $30 for the home visit. This incentive approach allowed for much more flexibility in the interview process when the field interviewer was converting refusals and also motivated the respondents to participate in each piece.

In the extended-care environment in company 2, we found that asking the employees to complete both the CAPI and the lab (blood collection) in one appointment resulted in refusals. Both the employees and the schedulers at the facilities were reluctant to have them leave the floor and their patients for an hour and half. During the baseline round, we developed and began offering scheduling options to the facilities to allow for the full data collection protocol to be completed at one time (75 to 90 minutes off the floor) or to break up the protocol into two visits—an interview (up to 60 minutes) and DBS/actigraphy collection (up to 30 minutes). An Excel schedule template was prepared and used to pencil in subjects to time slots per day. The appointment schedule was

initially set at the start of data collection and often required tailoring as frequently as daily to accommodate the unexpected circumstances in working in the extended-care facility (e.g., medical emergencies, staff absent from work). We also modified the CAPI instrument to offer the interviewer flexibility with completing the activities in one or two appointments. The interviewer also had flexibility with the order in which the activities could be completed: the employee could complete either the lab or the CAPI interview first and then schedule a return visit at a later date to finish. This resulted in higher response rates, even though it did require two separate appointments.

For actigraphy collection, we developed two methods of increasing participation. First, when handing out the watches, we had field interviewers provide the respondents with a watch return card. This card was designed to increase compliance by listing several "Do's and Don'ts" of wearing the watch, such as making sure to dry off underneath the watch if it got wet when washing hands and to wear it night and day. It also provided the watch return date and the field interviewer's name and telephone number. Second, at company 2, field interviewers noticed that respondents were taking the watch and turning it back in without wearing it. We revised the consent language at 12 months to advise the respondents that the 18-month actigraphy incentive would be $40 instead of $20, but that to be eligible to receive the higher incentive, they were required to wear the watch for the full week at 12 months.

5. Results

To measure success with using lay interviewers to complete high-quality blood collection and maintain high cooperation rates, we analyzed several factors, including our ability to 1) identify and train nonmedical personnel to safely complete a complex blood collection protocol, 2) engage and retain the field staff (once trained) across the life of the project, 3) obtain respondent cooperation to the blood collection request at baseline and maintain high cooperation rates over the life of the study, and 4) obtain blood specimens of high quality and sufficient quantity to address study needs.

5.1 Interviewer Recruitment, Training, and Retention

In total, we hired 43 field interviewers and successfully trained and certified all but four of them to conduct the fieldwork and blood collection, with 80% of the interviewing staff having no previous blood collection experience. Over the 32 months of the project we have been successful with maintaining interviewer engagement, and our interviewer attrition rate has been low at 38%. As a result, the study has not had to hold any attrition trainings.

At the initial project and blood collection refresher training sessions, all interviewers were asked to provide anonymous feedback on training evaluation forms about the training format and content. The feedback received on the blood collection training was overwhelmingly positive, and the interviewers noted the required hands-on practice at the initial project training and blood collection refresher trainings while in the field as the keys to their success.

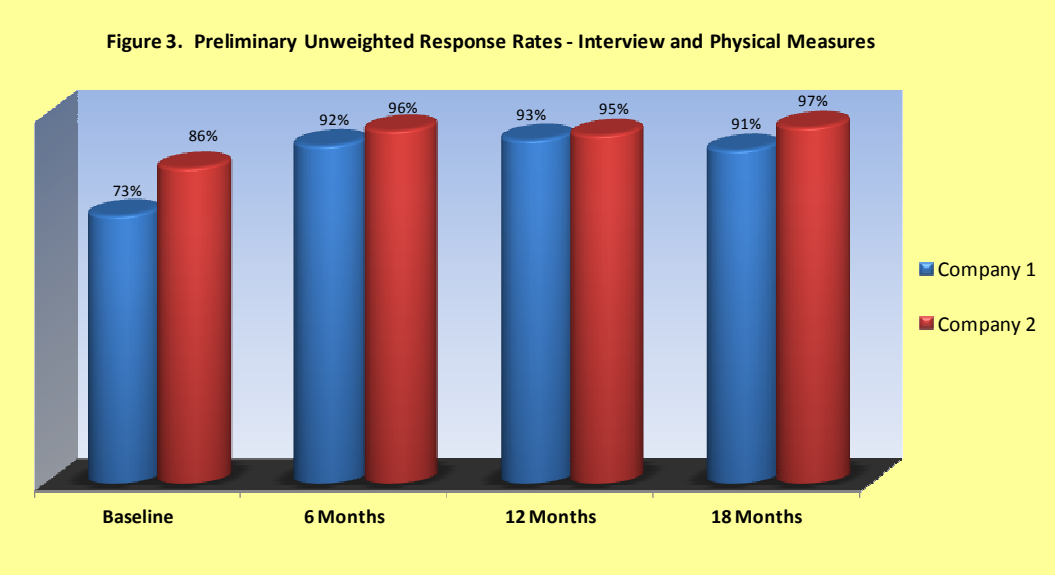
5.2 Respondent Cooperation at Baseline and Follow-Up Waves

For the WFHS, a staged consent process is implemented during which employees and managers are first asked to consent to and complete the interview with physical measures. Once this is completed, the DBS collection is introduced as the next study component,

and the subject can agree or refuse to consent for the blood to be collected. Following the blood collection, the actigraph watch component is introduced and the subject is offered the opportunity to agree to or refuse the watch collection.

We have finished all data collection activities in company 1, and the 18-month data collection activities are still in process in company 2. Across all waves we have completed over 8,900 computer-assisted interviews and collected blood samples from over 7,550 employees and managers at the worksites, and completed actigraphy collection with over 6,900 employees and managers. Listed in **Figures 3 through 5** are preliminary unweighted response rates [1] by company over the four waves of data collection, as indicators of the study's success at obtaining high cooperation rates at baseline and maintaining the cooperation during the follow-up waves.

Figure 3 shows unweighted response rates by company type for the interview with physical measures component for the employees and managers at the worksite. As displayed, the initial baseline interview response rate for company 1 (telecommunications) is approximately 13% less than for company 2 (extended-care), with interview response rates in subsequent waves exceeding 90% in both companies.



Interviewer performance with the blood collection was assessed by examining blood collection response rates at baseline and during the follow-up waves. **Figure 4** reflects unweighted response rates by company for the DBS collection with employees and managers at the worksite. As presented in **Figure 4**, the study has achieved blood collection response rates in excess of 90% at baseline in both companies, and these rates have increased in subsequent waves. The response rates achieved at baseline and the higher response rates at follow-up are indicative of a highly energized and well-trained interviewer team and a high degree of trust and comfort by respondents with the interviewing staff completing the blood collection activities at the worksite.

[1] The response rates are derived using the American Association of Public Opinion Research RR2 definition (AAPOR 2010). This is defined as the number of complete and partial interviews divided by the sum of the number of interviews (complete plus partial), plus the number of non-interviews (cases of refusals, inability to talk with respondent, etc.), plus all cases of unknown eligibility (cases where interviewer was unable to find the respondent in the housing unit or locate the sampled housing unit).

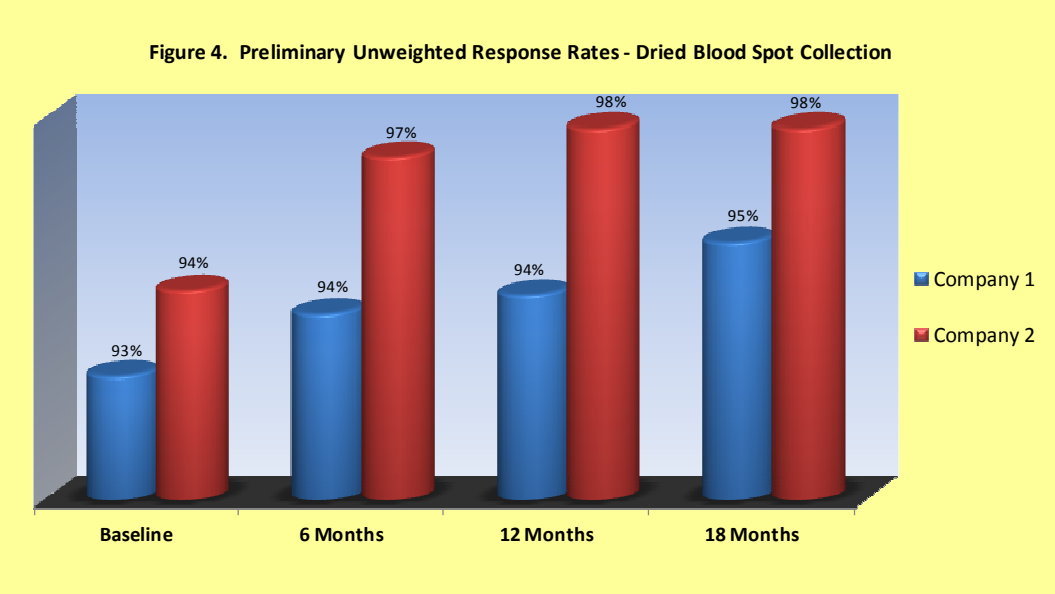
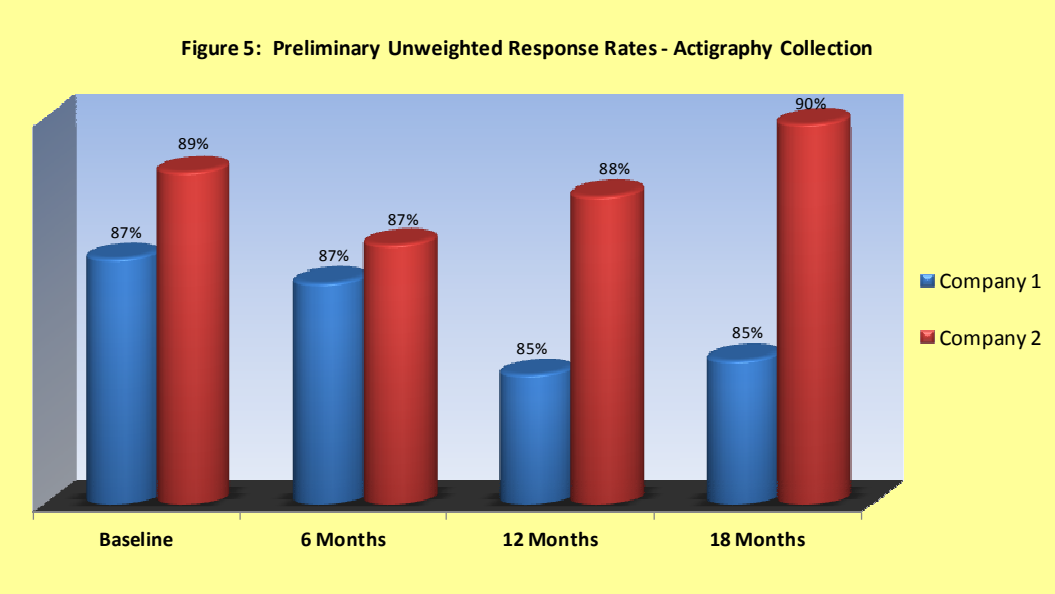
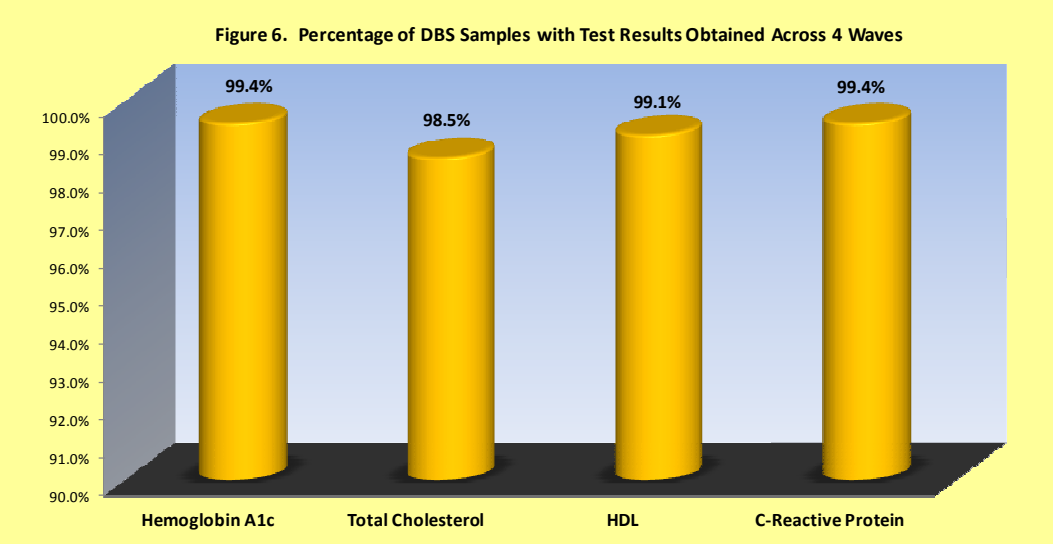


Figure 5 shows unweighted response rates by company for actigraphy collection with employees and managers at the worksite. For actigraphy collection, subjects are required to wear the actigraph watch for a full week. As shown in **Figure 5**, actigraphy response rates at baseline were at 87% and 89% for companies 1 and 2, respectively, and have remained steadily high across waves. For the actigraphy collection, there is a trend of a slight decline in response rates over time, because some subjects reported minor discomfort when wearing the actigraph watch, and some were unwilling to wear the watch for the additional week during the follow-up waves.



5.3 Obtaining Blood Specimens of High Quality and Sufficient Quantity to Address Study Needs

Another indicator of the lay interviewers' success with blood collection is the quality of the specimens collected and delivered to the laboratory for analysis. **Figure 6** includes data on the quality of the blood samples the interviewers have collected for which tests have been run. From approximately 7,500 cases with blood collected to date, field interviewers have obtained on-the-spot hemoglobin A1c readings using the DCA point-of-service device on over 99% of the cases. From the collected blood spot cards, tests have been run and results obtained over 98% of the time for all of the blood results of interest for the study: total cholesterol, high-density lipoprotein cholesterol, and C-reactive protein. The very high percentage of cases with blood results is an indicator of the quality and quantity of blood specimens obtained.



6. Discussion

Through our experience with the WFHS data collection, we were able to determine that lay interviewers are a good fit to collect DBS (i.e., one does not need to hire medically trained staff or phlebotomists). Interviewer characteristics like strong multitasking skills and attention to detail are essential. Previous field interviewing experience helps, but in several cases we found that prior blood-drawing experience (with no interviewing background) could be a hindrance. Those trainees did not follow the study protocols for blood collection because they felt they had their own method and already knew the "right way." They also sometimes had difficulty picking up other interviewing skills such as refusal conversion and CAPI interviewing. However, seasoned field interviewers were able to learn the blood collection protocols quickly because they were used to being taught strict project procedures.

The WFHS training was designed to maximize the interviewers' exposure to the biomeasure protocols from the beginning, even before they arrived at training. By using a variety of training techniques and introducing the subject very early, interviewers were able to absorb and retain the necessary knowledge. Offering lots of opportunities for hands-on practice, both during the regular training day and during study halls, is critical.

The more often interviewers are able to practice their technique and receive feedback from trainers, the more ingrained the protocols become. In addition, by holding the biomeasure certification in the middle of training, we ensured that there was time for retakes. Because many interviewers did not pass the strict certification the first time, this was important. Refreshers once out in the field are crucial so that the field interviewers do not lose their skills during downtime or become careless in their work.

Finally, adapting the data collection protocol to the environment is important, particularly in the workplace, where often things are out of a study's control. We had to be willing and able to tailor our procedures once we were in the field. One example is allowing for split appointments at our extended-care sites. By doing this, we not only increased study participation, but we also built goodwill with the site schedulers who were assisting us during data collection. Having a professional "look" and set-up (e.g., lab coats and proper technique) were also vital to us in getting buy-in from our study subjects and retaining them over the length of the study.

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