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Research Apprenticeship and its Potential as a Distinct Model of Peer Research Practice

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Community based participatory research (CBPR) is characterized by high levels of community engagement in all aspects of research(1–4). Strategies for involving community members in CBPR vary and tend to be specific to project needs(3,5–8). The term “peer researcher” has been proposed to designate “members of a research project’s target population trained to participate as co-researchers(9).”

Three models of peer research have emerged: advisory, employment, and partner. The Advisory Model entails provision of strategic guidance for research (e.g. advisory boards or steering committees). Responsibilities include decision-making on protocol implementation and input in the interpretation of findings without participation in operational aspects. Within the Employment Model, peer researchers are hired for specific tasks within an established project. They receive basic training in research skills and data collection methods, but tend to be excluded from data analysis and interpretation. Lastly, the Partner Model incorporates peers as leaders in all aspects of research providing for greater decision-making authority and leadership development (9).

Starting in 2004, the University of South Alabama (USA) Center for Healthy Communities committed to a participatory research approach to address health disparities(10,11), and has engaged peer researchers as Advisors, Employees, and Partners(10–12). In addition, we implemented a “Research Apprentice” prototype of peer research conceived as a post-secondary workforce development avenue for members of disadvantaged communities,

involving the ability to earn a salary while gaining proficiency in research related tasks(13–15).

Here, we explore the research apprenticeship as an emerging fourth model of peer research and discuss its potential to provide individuals with training and certification of a skill set leading to employment opportunities as skilled workers within the health research enterprise, while also enhancing a community's understanding of the methods and value of research. We also provide a vision of how the apprenticeship model can quicken the pace of health equity and/or translational research if institutionalized within the publicly funded research infrastructure. The paper proposes a 4th model of peer research, describes the model, and shares the findings of an internal assessment of our effort.

Background

The research apprenticeship concept originated from conversations between the USA Health Disparities Research Group (HDRG) and the Bay Area Women Coalition, Inc. (BAWC). The BAWC serves the Trinity Gardens neighborhood by providing affordable housing, working to create a safer and healthier community, building leadership and participation, and generating resources and support for this community (10). The HDRG is a multidisciplinary group of USA faculty, students and staff focused on CBPR as a vehicle to promote health equity(11).

Over a three-year period (2007–2010) with strengthened interaction between BAWC and HDRG, the concept of a research apprenticeship was formulated, and a process to apply the concept to practice was devised and tested within the “BAWC-HDRG Collaboration”. HDRG faculty introduced BAWC volunteers to basic health research methodology, supporting them in the design, fielding and analysis of a health survey among 138 randomly selected neighborhood households. The process and outcomes of the project have been described in detail(10).

The experience garnered through the BAWC-HDRG collaboration provided impetus to include research apprentices in the “Sentinel Surveillance to Monitor Progression of Health Equity” project which seeks to develop tools and procedures to track information on health behaviors, healthcare access and morbidity in three health disparate zip codes. Community participation is essential to the study. A seven member Community Advisory Board (CAB) provides strategic guidance and advises on matters of project implementation. Project execution relies on the work of research apprentices recruited among community members and those having cultural/familial ties to the community.

The concept of a research apprenticeship program to provide survey research skills to community members through on-the-job training was intrinsic to the Sentinel Surveillance study. However, a test of the model was not an intended component of the project. Apprentices were hired to perform study activities. The seminal element of transition to regular employment was not a part of the job offer. The progression from data collection to office-based data entry, management and analysis occurred gradually, as did the defining step of promotion of one apprentice to a research technician position. Likewise, the

opportunity to present at a community-academia partnerships conference led to the guided discussion that uncovered both positive and negative features of the apprenticeship. Feedback received at the conference fostered the implementation of a survey to explore the program's impact.

Research Methods

We describe the research apprenticeship program based on retrospective analysis of employment application forms, payment records, and training materials (agendas, notes, records, and tools created). Lesson learned were gleaned from individual personal statements provided by project staff and apprentices. The written statements were discussed at an open meeting and collated into a de-identified document. Three staff members reviewed the document and independently summarized themes. In a subsequent discussion, they reached consensus on key lessons realized. Impact of the program was explored through a survey aimed at documenting (among former and current apprentices) educational attainment, employment status, self-reported knowledge and skills gained, attitudes and perceptions of the apprenticeship, effect of the program on further employment and education, and whether they had discussed health disparities with fellow community member(s) (see Appendix I).

The two studies engaging research apprentices were approved by the USA Institutional Review Board (IRB). The protocol for secondary analysis of administrative records and of the internal assessment data was reviewed by the USA IRB and deemed exempt.

Description of the Research Apprentice Experience

Apprentices were recruited through study partners, CAB members, and word-of-mouth. Applicants completed a form detailing education and work history. They were selected to participate in the orientation and training sessions through an in-person interview by project staff. A job offer was contingent on their performance through the paid orientation and training, and no applicant was disqualified at this stage. The research apprentice position is part-time, temporary and contracted through an external human resources agency. Over a four-year period, we recruited and trained a total of twenty-nine research apprentices. Three apprentices did not return after training, and seven apprentices worked briefly (less than 40 hours, fewer than nine hours per week). Table 1 presents general characteristics of the research apprentices and a detail of their retention through the study period.

Research Apprentice Training

At the beginning of each data collection season, apprentices participated in a twenty-four hour classroom based orientation and training course covering administrative aspects of their work, human subjects' protections, and in-person interviewing techniques (see Table 2). All research apprentices received human subjects training certificates through the National Institutes of Health web-based course "Protecting Human Research Participants"(16).

During data collection, apprentices under the supervision of a full-time staff member set up data collection sites at approved locations in the focus area. When approaching individuals,

apprentices explained the project, gained informed consent, and assisted participants with completing the survey. If interviews were conducted at relative distance of the central set up, apprentices worked in teams of two or more.

After completing the first wave of data collection, apprentices were invited to work in the office and trained to do data entry. Starting in year two, those interested were also trained in survey coding. Further, apprentices demonstrating aptitude received training in data management tasks comprising the evaluation of double data entry compare listings (using Word®) and formulation of data repair programs in Excel®. The research coordinator provided training for these tasks, through group presentations and one-on-one coaching. Table 3 outlines the in-office training approaches.

Qualitative and quantitative goals (based on relative productivity and accuracy) were used to monitor in-office performance of apprentices. In two instances, we discontinued office-based employment due to low productivity. In one instance, we terminated employment due to insubordination during field work. In each case, we utilized the established procedures of the human resources agency through which apprentices were hired.

An apprentice with special computing abilities was tapped by the Principal Investigator (PI) for training in the use of Statistical Analysis Systems software (SAS®). Over the course of six months, the PI provided one-on-one coaching in the creation of datasets, the formulation of programs for compare procedures, and various techniques for data cleaning. The apprentice was soon addressing data management issues on his own and helped expand the PI's knowledge of practical applications of SAS®. After two years as an Apprentice, this individual transitioned to a full-time, regular Research Technician I position at the University, with duties including data collection, management and analysis. He quickly advanced to a Research Technician II position managing components of data organization and analysis with only strategic oversight by the PI.

Assessment

We used a survey and a guided discussion of the Apprenticeship to assess the experience of research apprentices and gauge the impact of the program.

Survey

Administered using REDCap(17), the online survey was sent to twenty-eight individuals who had worked as apprentices at any point in the four years of the project. We chose not to send the survey to an apprentice who had recently resigned due to disagreement with administrative policies invoked to resolve friction between this individual and a Research Assistant.

The overall response rate was 42% (twelve respondents). More than half of non-respondents (n=9) were apprentices who had participated in the orientation training only or had worked briefly. The response rate among the 18 apprentices who had fully participated in the program was 61%. Table 4 details results of the assessment survey.

In terms of skills gained, two thirds of respondents reported learning at least eight of the eleven skills involved. In terms of their assimilation within the research team, two thirds of respondents considered that their ideas had been respected and three fourths felt integral to the team. A majority reported increased confidence in their abilities and capacity, as well as increased interest in learning new skills. Half of respondents sought further education. Three (25%) traced their effort directly to their research apprentice experience.

While we can't provide a structured assessment of changes in employment status related to participation in the apprenticeship, at least two of nineteen apprentices (10.5%) gained full-time employment due to participation in the program. As previously described, one individual had transitioned to a full-time, regular position within the project. Another found a permanent placement within the human resources agency used to contract apprentices. At least one of these persons had been unemployed at the time of their application. Among the remaining six employed survey respondents, four were employed with the Sentinel Surveillance project (three of these also held additional jobs).

Furthermore, apprentices reported an understanding of health disparities. Asked to comment on what they appreciated most about their experience, one responded; "Made me think about things related to health." Another reported "Learning [about] the health disparities [experienced by] the people I talked to onsite in the neighborhoods". Eight of twelve respondents described having discussed health disparities with someone from their community during the past month; the remaining four had done so within the last six months to a year. All but one respondent reported having "learned how research helps improve health issues in the community." Fifty percent reported a better understanding of research design.

Guided discussion

Four current research apprentices, four staff members, and the PI provided a "personal statement about the research apprenticeship" through reflection on five topics: understanding of the model; value of the experience; message of the research apprenticeship; shortcomings; and areas of improvement. Subsequent discussion revealed three main lessons:

Lesson 1: Preeminence of the project itself over the research apprenticeship program—In response to the question, "How do I understand the research apprenticeship model?" five of the nine respondents wrote about the sentinel surveillance project and its focus on community needs. Only three outlined the research apprenticeship as a learning and skill development program. In our experience, the daily work of the project became the focus and superseded training to foster a broad understanding of research and wide-ranging professional skills. As a result, apprentices were proficient at tasks, but lacked a framework to discuss their work experience. In retrospect, we should have allowed for a two-hour session each week, focused on theoretical aspects of research and wider job skills training. Research groups attempting to build an apprenticeship program should dedicate both resources and time for comprehensive training.

Lesson 2: Staff members need to understand their role as mentors—The majority of staff members indicated lack of awareness of their role as mentors. Among

recommendations, one wrote, “Ensure staff understand their role in the research apprenticeship program and how they are to enhance the process of skill and knowledge transfer.” The PI recognized that the mentorship role had not been delineated as a condition for employment. It was a matter of luck that all four staff members were naturally inclined to share their expertise and had the organizational and communication skills that made them effective in training research apprentices. In developing a research apprenticeship program, the profile and training of staff needs to include a focus on their roles as mentors.

Lesson 3: Co-learning occurs between staff and research apprentices—The guided discussion revealed the relationships developed between staff and research apprentices as one strength of the model. These relationships generated conversations on ideas, activities, and fueled new skill development. The significance of these co-learning relationships cannot be overstated. One respondent affirmed: “The value in the research apprenticeship experience is having the ability to interact with people from different backgrounds while developing interpersonal relationships and demonstrating mutual appreciation for one another.”

Co-learning occurred at multiple levels: PI, staff and apprentices recognized the expertise and aptitudes each brought to the table while developing a natural camaraderie through hours of direct interaction and shared effort. Conversations occurred at many levels leading to effective methods to complete project components with suggestions from research apprentices given the same respect as those of the staff and PI. Often, apprentices outnumbered staff members and there was a clear recognition of their fundamental role in the study. Table 5 lists further recommendations to strengthen the Research Apprenticeship model garnered from our experience.

Discussion

We propose a research apprentice model of peer research engagement that would add a deliberate dimension of workforce development to the publicly funded research enterprise while contributing to realize the goals of capacity building, empowerment, and co-learning intrinsic to participatory and translational research(6,18–22). As envisioned, the model capitalizes on the widespread engagement practice of providing community members with training in core concepts, basic research methods, and miscellaneous job skills(5,9,20,23,24), but emphasizes comprehensive instruction to render the apprentice skilled both on broad and specific aspects of research, while fostering aptitudes needed for sustained workforce participation. Further, we propose that engaged research groups make up the equivalent to an “industry” capable of offering employment to graduates of apprenticeship programs, thus expanding occupational options for residents of marginalized communities.

We acknowledge that our experience in implementing the research apprenticeship program as auxiliary to the Sentinel Surveillance project, rather than as the focus of a testable intervention, does not illustrate all the possibilities inherent in the model. Resultant shortcomings include the lack of structured execution processes and of a formal outcomes evaluation. However, we demonstrated: 1) the feasibility of completing a health research

survey with substantive reliance on apprentices trained on the job; 2) the availability of positions within established research to allow for the transition of apprentices into the skilled research workforce; 3) some benefit for individuals, the community, and the broad health research effort.

Apprenticeship vs Employment

There are commonalities between the proposed apprenticeship model and the employment model of peer research engagement. Both rely on training and mentoring of peer researchers to promote their understanding of research and proficiency in study tasks(9). However, while the employment model includes capacity building as a by-product,(5,9,18,20,24) the apprenticeship model has capacity building as its main goal.

Community members from low resource communities have few opportunities to enhance their educational attainment and skill level(25,26). As “a job in which an individual is paid to learn a set of skills through on-the-job training” the apprenticeship offers respite to the twofold cost deterrent (tuition price and need to forgo income while pursuing instruction) to post-secondary education. Apprenticeships are a well-recognized pathway to higher earnings for individuals and to lower rates of unemployment for disadvantaged communities(15).

Value of the Research Apprenticeship model

A research apprenticeship program can provide members of marginalized communities a new avenue for educational progress and employment intrinsically rooted in the academia-community engagement process. By providing on the job training and subsequently hiring newly minted skilled workers, engaged research groups would realize aspirational principles of the participatory process (social responsibility, correction of knowledge imbalance, democratization of knowledge) (27,28) and offer a concrete benefit to the disadvantaged communities they engage(29,30).

Moreover, as the publicly funded research enterprise integrates the skilled workers generated through its apprenticeship programs, the potential for a diversified research workforce increases exponentially(13). James et al. (31) argue in favor of expanding the current pipeline model for minority participation in biomedical research and health care to include success at all post-secondary levels (in addition to graduate, professional, and post-graduate endpoints). Successful completion of a research apprenticeship would become an alternative endpoint within such an expanded view.

We propose that, when integrated into health research teams, skilled research workers from under resourced communities will facilitate the inclusion of the concerns of marginalized groups into scientific research; help research teams gain a clearer understanding of the context for health inequity; and provide expertise as brokers between the research team and their community. Multi-faceted co-learning occurs when persons of differing backgrounds interact in meaningful ways, such as in the pursuit of common work objectives. To bear its beneficial fruit, the interaction should occur in an environment where power differentials between academics and peer researchers are minimized (3,9,22,32), effectively moving the health research enterprise “from an ‘Us’ to a ‘We’ operation.”(21, 33)

While we implemented the apprenticeship model within a community survey project, its core principle of on-the-job training should be generalizable to more complex endeavors, such as cohort studies, clinical trials and wet lab research. In fact, translational science stands to both profit from and facilitate the diffusion of the research apprentice model. By definition, translational science strives to move the specialized knowledge attained in cutting-edge laboratories (T1) to limited trials in patients (T2), subsequent formal clinical trials (T3), leading to their ultimate application to enhance the health status of the general public (T4)(19,34). Embedding peer researchers as apprentices in basic science laboratories would result in a cadre of knowledge brokers that can “translate” to their communities their understanding of the complex biomedical science addressed in the labs (T1), ultimately enhancing the potential for progress from T2 to T4. The Clinical and Translational Science Consortium offers a formidable publicly funded biomedical research infrastructure (21,35), capable of offering a multitude of workforce entry points for peer researchers from marginalized communities turned skilled workers through research apprenticeships.

The research apprenticeship concept grew from the conviction that great indigenous capacity exists in underserved communities, an assumption verified in our experience with the Sentinel Surveillance project. Members of marginalized minority communities face daunting barriers to the pursuit of post-secondary education(15,31). However, intrinsic lack of capacity is not one of them. Structural racism has been defined as “the totality of ways in which societies foster racial discrimination through mutually reinforcing systems of housing, education, employment, earnings, benefits, credit, media, health care, and criminal justice... [which] in turn reinforce discriminatory... distribution of resources(36).” By offering an effective path to regular employment, the apprenticeship model of peer research can contribute to balance differentials in educational accomplishment, employment, and earnings. Thus its adoption by the publicly funded research infrastructure can promote the deliberate dismantling of structural racism within the biomedical sciences, as called for by Hardeman(37). Since structural racism is a potent mediator of health inequality(38,39), a resultant benefit of health equity would accrue.

Challenges to maturing the Research Apprenticeship model

Community engaged research groups, by definition, have both the motivation and competencies to promote the development and consolidation of the Research Apprenticeship practice. Many of the building blocks for training of community members on research methodology have been laid(9,40). To formally structure a research apprenticeship program specific apprenticeship outcomes must be defined to organize and streamline training so that job-specific skill sets are identified, content of training is standardized, appropriate curriculum is developed when necessary, and evaluation mechanisms are agreed upon. Once a more fully developed system to implement and evaluate research apprenticeships is in place, the granting of skill credentials to research apprentices will organically follow, with attendant long lasting personal and financial returns for workers from disadvantaged communities(41). Given its potential, we believe the model is worth formal testing and development.

Conclusions

The Research Apprenticeship expands the peer research model to include workforce development as a responsibility of community engaged research groups. Investment in programs to assist community members to develop skills and encourage educational progress enhances social capital in marginalized communities. In turn, academia-based researchers realize gains in access to community participation in research, workforce diversity, and opportunities to diminish structural racism within the biomedical research infrastructure.

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Appendix 1

Evaluation Survey

In which years did you work as a research apprentice?

☐ 2013 ☐ 2014 ☐ 2015 ☐ 2016

Please describe your work as a research apprentice by selecting the response that best represents your experience for each statement:

I learned how research helps improve health issues in the community.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I was a full part of the research team.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

My ideas were respected by other members of the research team.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I contributed to an important project in my community

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

As a research apprentice I learned (Mark all that apply)

-
- ☐ Research Ethics
 - ☐ Designing a research project
 - ☐ What "Informed Consent" is
 - ☐ What an IRB is
 - ☐ Interviewing skills
 - ☐ Survey coding
 - ☐ Basic data entry skills
 - ☐ Data management activities

- ☐ Data analysis activities
- ☐ How to talk about study results
- ☐ Organizational skills
- ☐ Other: _____

Describe your attitude after the research apprenticeship by selecting the response that best represents your opinion for each statement.

I feel more confident with job searching.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I realized I could take on a more challenging job.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I have more confidence in my abilities.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I am more interested in learning new skills.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

Are you currently employed?

- ☐ Yes
- ☐ No

If yes, please indicate you type of employment:

Retail	Fast Food
☐ Manager	☐ Manager
☐ Cashier	☐ Cashier
☐ Stocker	☐ Cook

☐ Other: _____	☐ Other: _____
Office/Administrative	Healthcare
☐ Receptionist	☐ Home Health Aide
☐ Administrative Assistant	☐ CNA
☐ Office Manager	☐ Medical Secretary
☐ Other: _____	☐ Other: _____
Research	Other: _____
☐ Research Technician	
☐ Interviewer	
☐ Lab Technician	
☐ Other	

Respond to the following statements by selecting the response that best describes your experience.

The research apprenticeship opened the door to my current job.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I applied for my job because of the research apprenticeship.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I use interviewing skills regularly in my current job.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I do data entry as a part of my job.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I explain the research process to people.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

I work in a health related field.

☐ Strongly Disagree ☐ Disagree ☐ Undecided ☐ Agree ☐ Strongly Agree

When was the last time you discussed health disparities with someone from your community?

☐ In the last month
☐ In the last six months
☐ In the last year
☐ Never

In the following list, please mark the items you think are health problems in your community?

☐ Hypertension
☐ Asthma
☐ Diabetes
☐ Arthritis
☐ HIV/AIDS
☐ Heart Disease
☐ Cancer
☐ Depression
☐ Other: _____

What did you appreciate most about the research apprenticeship?

What is your highest level of education?

☐ Less than High School
☐ GED
☐ High School Diploma
☐ Some College
☐ Vocational Degree/Certificate (Trade)
☐ Associate Degree
☐ Bachelor's Degree
☐ Graduate Degree

Did you seek further education or job training after working as a research apprentice?

☐ Yes
☐ No

Did working as a research apprentice encourage you to seek further education or job training?

☐ Yes
☐ No

What was your goal in seeking further education or job training?

Is there anything else you would like to share about your experience as a research apprentice?

Table 1

Research Apprentice Characteristics and Retention across a Four year Period.

	All (n = 29)		Worked >40 hrs. (n = 19)	
	No.	%	No.	%
Demographics				
Female	22	75.9	16	84.2
Reside in study area or close neighboring community	15	51.7	10	52.6
Reside outside the study area	13	44.8	8	42.1
Missing place of residence	1	3.4	1	5.3
Education				
Less than High School	2	6.8	2	10.5
High school or GED	8	27.6	5	26.3
Vocational Certificate	6	20.6	4	21.1
Some college	8	27.6	6	31.6
Associate's degree	2	6.8	1	5.3
Bachelor's degree	2	6.8	1	5.3
Missing educational level response	1	3.4	—	—
Last job held prior to employment as Research Apprentice				
Professional *	1	3.4	—	—
Skilled **	15	51.7	13	68.4
Semi-skilled ***	6	20.7	3	15.8
Unskilled ^d	3	10.3	3	15.8
Unemployed	1	3.4	—	—

	All (n = 29)		Worked >40 hrs. (n = 19)	
	No.	%	No.	%
Demographics				
Missing	3	10.3	—	—
Retention over four study years				
Attended training only	3	10.3	—	—
Worked one study year	12	41.4	6	31.5
Worked two study years	9	31.0	8	42.1
Worked three study years	4	13.8	4	21.0
Worked four study years	1	3.4	1	5.2
Study tasks undertaken				
Data collection only	10	34.5	4	21.1
Data collection and data entry	10	34.5	9	47.4
Data collection, data entry and data management	5	17.2	5	26.3
Data collection, data entry, data management & analysis	1	3.4	1	5.3
Only attended orientation & initial training	3	10.3	—	—

* Professional: Retired Nurse (1);

** Skilled: School teacher (1), Administrative (5), Claim examiner (2), Cook (2), Customer service representative (2), Substitute teacher (1), Teller (1), Traffic officer (1);

*** Semi-Skilled: Certified nursing assistant (1), Patient escort (1), Personal care assistant (1), Cashier (1) Sales Associate (2);

& Unskilled: Fast food worker (1), Custodial (2).

Table 2

Orientation and Training Course

Area of Training	Content	Training Type (Tools)
Administrative		
Office Etiquette	<ul style="list-style-type: none"> - Cell phone use - Reporting in - Reporting need to be absent - Dress code 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA * Manual)
Field Operations	<ul style="list-style-type: none"> - Timeline - Set-up - Responsibilities 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)
Timekeeping	<ul style="list-style-type: none"> - Procedures - Timelines - Responsibilities 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion - Practice of procedure (PowerPoint, RA Manual, sample timesheet, electronic record)
Human Subjects		
What is research?	<ul style="list-style-type: none"> - Definition - Purpose - Characteristics 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)
Overview of Human Subjects Research	<ul style="list-style-type: none"> - Ethics - Equipoise - Fairness - Confidentiality - Privacy - Autonomy 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)
History of Human Subjects Protections	<ul style="list-style-type: none"> - Historical cases of injustices to human subjects 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)
Codes and Regulations	<ul style="list-style-type: none"> - The Belmont Report 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion - Small group discussion (PowerPoint, RA Manual)
Respect for persons	<ul style="list-style-type: none"> - Personal dignity - Decision making - Special protections for certain groups 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)

Area of Training	Content	Training Type (Tools)
Confidentiality/Privacy	<ul style="list-style-type: none"> - Definitions - Importance 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)
Justice	<ul style="list-style-type: none"> - Benefits and burdens of research 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, RA Manual)
Survey Process		
Explanation of the survey process	<ul style="list-style-type: none"> - Informed consent - Survey flow 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion (PowerPoint, survey instrument)
Introduction of and practice with each survey instrument	<ul style="list-style-type: none"> - Review of survey types (e.g. access to care) 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion - Role-Play (Survey instrument)
How to respond to refusals to participate	<ul style="list-style-type: none"> - Respectful responses - No hard sell 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion - Role-Play (Survey instrument)
How to handle incomplete surveys	<ul style="list-style-type: none"> - Polite request for more information - Respect participant wish to end survey - Keep incomplete surveys 	<ul style="list-style-type: none"> - Presentation to group, question and answer, discussion - Role Play (Survey instrument)

* RA: Research Apprentice

Table 3**In-Office Tasks and Training Procedures**

Task	Training Type	Materials	On-going Feedback	Types of Feedback
Data Entry	<ul style="list-style-type: none"> - Presentation to large group - One-on-one coaching and feedback - Practice data entry sessions 	<ul style="list-style-type: none"> - Randomized survey list for entry - Process handout 	<ul style="list-style-type: none"> - Initial practice product reviewed & feedback provided - Focus on strengths while correcting errors 	-Quantitative and qualitative goals
Survey Coding	<ul style="list-style-type: none"> - Presentation to smaller group - One-on-One coaching - Practice coding with research coordinator 	<ul style="list-style-type: none"> - Randomized survey list for coding - Process handout 	<ul style="list-style-type: none"> - Initial practice reviewed - Random quality checks with feedback - Focus on strengths while correcting errors 	Qualitative Goals
Compare Double Data Entry Sets & Create repair programs in Excel®	<ul style="list-style-type: none"> - Pairing with a staff member - One-on-one coaching 	<ul style="list-style-type: none"> - Assignment list - Process handout 	<ul style="list-style-type: none"> - Consultation with paired staff member - Double check of all work with feedback 	Qualitative Goals

Table 4**Research Apprenticeship Assessment by Program Participants**

Skills learned	No.	%
Research Ethics	11	91.7
Designing a research project	6	50.0
What informed consent is	10	83.3
What an Institutional Review Board is	9	75.0
Interviewing skills	11	91.7
Survey coding	11	91.7
Basic data entry skills	11	91.7
Data management activities	7	58.3
Data analysis activities	8	66.7
How to talk about study results	9	75.0
Organizational skills	8	66.7
Other: working as a team	1	0.1
Number of skills learned *		
4 – 7 skills	4	33.3
8 – 9 skills	4	33.3
10 – 11 skills	4	33.3
Perceptions of the research apprentice experience		
Learned how research helps improve health issues in the community **	11	91.7
Felt as a full part of the research team **	9	75.0
Own ideas were respected by other members of the research team **	8	66.7
Made a contribution to an important project in my community **	11	91.7
Personal Impact of having worked as a research apprentice		
Feel more confident with job searching **	11	91.7
Realized capacity of taking on a more challenging job **	11	91.7
Have more confidence in own abilities **	10	83.3
Became more interested in learning new skills **	11	91.7

Skills learned	No.	%
Sought further education or training after working as a research apprentice	6	50.0
Seeking further education or training was a direct result of the experience as research apprentice	3	25.0
Current employment		
Employed, skilled job ***	6	50.0
Employed, unskilled job &	1	8.3
Employed, no job title provided	1	8.3
Unemployed &&	4	33.3

* The minimum number of skills learned was four out of a total 11 possible skills.

** Represents number of respondents who either agreed or strongly agreed with the statement, queried through a Likert scale including five possible degrees of agreement.

*** Skilled: Administrative (5), Research Technician (1);

& Unskilled: Cafeteria worker (1);

&& Unemployed: Questionnaire did not provide “retired” as an answer option and it is feasible that some respondents were retired rather than unemployed.

Table 5

Recommendations to Researchers Seeking to Establish Apprenticeship Programs

Theme	Specific Recommendation
<i>Vision</i>	<ul style="list-style-type: none"> • The goal of the research apprenticeship program as a workforce development strategy should be clearly stated • The need for research staff to act as mentors should be clearly communicated and understood
<i>Structure</i>	<ul style="list-style-type: none"> • Critical elements of the research apprenticeship structure would include: salary resources, regular work schedule, and formal workplace policies. • Provision of a structured learning environment is key • Understand that feedback regarding on-the-job training should incorporate day-to-day components as well as built in periodic assessments
<i>Outcome</i>	<ul style="list-style-type: none"> • Formal credentials arising from on-the-job training are highly desirable.
<i>Curriculum</i>	<ul style="list-style-type: none"> • Curriculum should include three fundamental elements: 1) theoretical background; 2) relevant research skills connected to on-going project; 3) career development
<i>Evaluation</i>	<ul style="list-style-type: none"> • Create benchmarks to measure research apprentice progress and to inform transition to more complex assignments • Develop evaluation procedures to measure research apprenticeship outcomes at three levels: 1) individual knowledge and skills; 2) subsequent workforce participation, and 3) impact on community understanding of research.
<i>Requisite Research Team Character</i>	<ul style="list-style-type: none"> • Research teams willing to incorporate apprentices need strong organizational planning, specific procedures, good communication skills, and the aptitude to be mentors.