

**Evaluation of Two Adolescent Vaccination Interventions: School Health Center Study and
the North Carolina Assessment, Feedback, Incentives, and eXchange Intervention**

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Abstract

Background. Each year in North Carolina (NC), more than 370 women are diagnosed with cervical cancer (CCFNC, 2003). It is estimated that 70% of cervical cancer cases are caused by the human papillomavirus (HPV). Although cervical cancer can be prevented through the human papillomavirus vaccination, rates among adolescents in NC remain low (CCFNC, 2011).

Methods. To improve adolescent HPV vaccination rates across NC, we assisted with the evaluation of two adolescent vaccination interventions including the Rockingham County School Health Center Program and the Assessment, Feedback, eXchange, and Incentives (AFIX) Program. For the School Health Center Program, we completed 48 phone interviews with parents and guardians of adolescents attending Rockingham County high schools regarding their satisfaction with the SHC program. For the AFIX Project, we analyzed baseline and follow up data for 91 NC immunization providers to determine the efficacy of the AFIX intervention.

Results and Discussion. The results for both projects were not finalized before the submission of this assignment.

Major Deliverables:

AFIX Project:

- Research-to-Practice Report: Summary report on the AFIX intervention of North Carolina health practices
- Introduction section of two draft Manuscripts: AFIX

SHC Project:

- Research-to-Practice Report: Summary report on the School Health Center’s adolescent vaccination program
- Methods section of draft manuscript

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List of Abbreviations

AFIX	Adolescent Assessment, Feedback, Incentives, and Exchange
CCFA	Cervical Cancer-Free America
CCFNC	Cervical Cancer-Free North Carolina
CDC	Centers for Disease Control and Prevention
CoCASA	Comprehensive Clinic Assessment Software Application
FDA	Food and Drug Administration
HBHE	Health Behavior and Health Education
HBM	Health Belief Model
HEP	Hepatitis
HPV	Human Papillomavirus
MMR	Measles, Mumps, and Rubella
MPH	Master's of Public Health
NC	North Carolina
NC-DHHS	North Carolina Department of Health and Human Services
NCIR	North Carolina Immunization Registry
SEF	Social Ecological Framework
SHC	School Health Center
SHCs	School Health Centers
SPH	School of Public Health
STI	Sexually Transmitted Infection
Tdap	Tetanus, Diphtheria, and Pertussis
UNC-CH	University of North Carolina-Chapel Hill
US	United States
VFC	Vaccines for Children

Introduction

Purpose of our Capstone Project

Each year in North Carolina (NC), more than 370 women are diagnosed with cervical cancer (CCFNC, 2003). It is estimated that 70% cervical cancer cases are caused by the human papillomavirus (HPV). Although cervical cancer can be prevented through the HPV vaccination, the rates of HPV vaccination uptake, or the initial dose of a vaccine series, among adolescents remain low in NC (CCFNC, 2011). To improve rates of HPV vaccination uptake among adolescents in NC, three Masters of Public Health students collaborated with Cervical Cancer-Free NC (CCFNC) to evaluate two adolescent vaccination interventions. This work was completed during the 2011-2012 academic year through the Capstone program in the Department of Health Behavior (HBHE) at the University of North Carolina at Chapel Hill (UNC-CH) Gillings School of Global Public Health. The goals of HBHE's Capstone program are to 1) provide students with mentored, real-world learning opportunities, 2) provide services to local organizations that do public health-related work, and 3) produce products that have a positive impact on public health. By evaluating interventions that aim to increase HPV vaccination uptake among adolescents, our efforts will contribute to the evidence-base regarding cervical cancer prevention. Our Capstone project allowed us to demonstrate our analytical and interpretive skills, and served as a culminating experience of what we have learned in the HBHE Master's program.

Capstone Partner

Our Capstone partner, CCFNC, is a statewide initiative that was launched in 2010 to eradicate cervical cancer in NC (CCFNC, 2011). Located within the UNC-CH School of Public Health (SPH), CCFNC is a collaboration of researchers, public and private organizations, and community agencies that work together to promote the HPV vaccination for adolescents as a primary prevention strategy for cervical cancer. To accomplish the agency's mission of promoting HPV vaccination, CCFNC initiated two interventions, the Rockingham County School

Health Center (SHC) Intervention and the Assessment, Feedback, Incentives, and eXchange (AFIX) Intervention. The SHC and AFIX interventions also work to increase uptake rates for the Measles, Mumps, and Rubella (MMR), Tetanus, Diphtheria, and Pertussis (Tdap), and Meningococcal vaccines in addition to the HPV vaccine. However, because preventing cervical cancer is the primary goal of CCFNC, we will focus on the SHC and AFIX intervention's impact on HPV vaccine uptake rates for the purposes of this report.

While both interventions aim to increase HPV vaccination rates, the SHC and AFIX interventions are two completely separate programs. One Capstone team member, Kea Turner, worked on the SHC intervention, and two Capstone team members, Turquoise Griffith and Alicia Sparks, worked on the AFIX intervention. The SHC and AFIX interventions will be discussed separately throughout this report.

Overview of SHC and AFIX Programs and Goals of Our Capstone Project

The School Health Center Intervention

The mission of the Rockingham County SHCs, a network that includes four SHCs, is to provide comprehensive and affordable health care to their students through education, prevention, treatment, and referrals. CCFNC has collaborated with the Rockingham County SHCs to launch a school-based, HPV vaccination initiative. The goals of the SHC intervention are to increase the availability of the HPV vaccine at the four SHCs, to increase parental consent for the vaccine, and ultimately to increase vaccine rates among high school adolescents through a multi-component, sustainable intervention (CCFNC, 2011). Vaccination rates are measured in two ways: by vaccine uptake, which is considered the first dose of the vaccine series, and vaccine completion, which is considered completion of all doses required for a vaccine series. The Capstone team entered the SHC project during the second year of the three-year intervention and assisted with conducting a process evaluation regarding parents' satisfaction with the SHC HPV vaccine intervention. To disseminate the findings of the process evaluation, Kea produced a research-to-practice report, designed to communicate the

evaluation findings in a brief 5-7 page report for practitioners, and wrote the methods section of a manuscript draft.

The Assessment, Feedback, Incentives, and eXchange Intervention

CCFNC has also partnered with the North Carolina Department of Health and Human Services (NC-DHHS), who launched the AFIX study in May of 2011, to increase vaccination uptake among adolescents, ages 11 to 18. The NC-DHHS AFIX program is a four-part healthcare quality improvement strategy that: 1) assesses a provider's vaccine coverage levels, 2) provides feedback to providers regarding their vaccine coverage levels, 3) provides incentives to improve provider's performance, and 4) provides training for providers (CDC, 2011). The intervention consists of 91 randomly selected private practices located in the state of North Carolina: 30 practices that served as the control group and did not receive any intervention component, 31 practices that received trainings via webinar, and 30 practices that received in-person visits from the NC-DHHS Immunization Branch director.

The role of CCFNC in the AFIX intervention was to help conduct an outcome evaluation in order to determine the intervention's effects on vaccination coverage levels. The Capstone team entered the project at the end of the one-year program, after all providers in the intervention group had received training. During the year, the Capstone team collaborated with NC-DHHS by running reports on vaccination rates of the 91 clinics, assisting with the evaluation process, and writing a report with the data collected. The goal of the AFIX intervention in North Carolina is to raise immunization coverage levels and improve standards of practices at the provider level. Capstone efforts resulted in a research-to-practice report and introduction sections of two manuscript drafts focusing on baseline characteristics and outcomes of the AFIX project.

Overview of Summary Report

The goal of this summary report is to provide an overview of our Capstone project. The summary report begins with a literature review that will assess the available research on SHC and AFIX interventions and their effectiveness in reducing HPV transmission among adolescents and describe the target population for the research study. The report then describes the methods of our Capstone project, which includes a logic model for each program, an assessment of the sustainability of our project, a summary of our engagement and assessment activities, and a description of our Capstone deliverables. The results section discusses the sustainability findings and summarizes the completed deliverables. The final part of the summary report provides a discussion on the strengths and limitations of our engagement and assessment activities, the potential impact and benefits of our work, the lessons learned and challenges faced, and our recommendations for sustaining each intervention. We conclude with our recommended next steps for our Capstone partner, CCFNC.

Background/Literature Review

Health Issue

It is estimated that over 20 million Americans are currently infected with HPV (CDC, 2010). Each year, an additional six million people become infected, making HPV the most common sexually transmitted infection (STI) (CDC, 2010). Most people infected with HPV never develop symptoms, but in some cases, HPV can lead to serious health problems, including genital warts and cervical cancer (CDC, 2010). Fortunately, these HPV infection outcomes are considered highly preventable by existing vaccinations against the virus. Currently, the Food and Drug Administration (FDA) has approved two HPV vaccines, Gardasil and Cervarix, which protect against high-risk HPV strains HPV-16 and HPV-18, known to cause roughly 70% of cervical cancer cases (CDC, 2007).

Research has demonstrated that HPV infection frequently occurs early in life, around the time of an individual's first sexual intercourse (CDC, 2007). Therefore, the HPV vaccination is

most effective when administered prior to an individual's sexual debut, typically during adolescence (CDC, 2010). Despite its proven effectiveness among both boys and girls, HPV vaccination remains under-utilized by adolescents (CDC, 2009). In NC, 50.3% of adolescents ages 13 to 17 have received the initial dose of the HPV vaccine since the FDA approval of the vaccination series in 2007 (CDC, 2009). However, only 10% of NC adolescents have completed all three doses of the vaccination series (CCFNC, 2011).

Target Populations

Based on the evidence described above, the ideal target population for HPV vaccination interventions is female and male adolescents, ages 11 to 18. The SHC intervention aims to increase HPV vaccination rates among high school adolescents by increasing HPV vaccine acceptability among parents and guardians, who are required to give consent for their adolescents' HPV vaccination (CCFNC, 2011). Therefore, the target population for the SHC intervention are parents and guardians of adolescents ages 11 to 18. The AFIX intervention seeks to increase adolescent HPV vaccination rates by increasing providers' knowledge of reminder and recall systems, a proven effective strategy for increasing adolescent vaccination rates (Brewer & Fazekas, 2007) by reminding parents of adolescents to bring their child to the appointment to receive their vaccine. Therefore, the target population of the AFIX intervention are medical providers who administer vaccines to adolescents.

Approach/Plan of Action

The Community Guide, produced by the Task Force on Community Preventive Services, ranks the effectiveness of public health interventions based on a systematic review process (Community Guide, 2011). Given how recently the HPV vaccination has been approved for use, in 2007 for females and 2009 for males (CDC, 2010), there is currently no compendium ranking the effectiveness of interventions specifically targeting HPV vaccination rates (CDC, 2011). However, The Community Guide does include a general analysis of vaccination interventions, which have been applied to HPV vaccination interventions. The Community Guide divides these

recommended interventions to improve vaccination uptake and coverage into three core components: (1) those that increase community demand for vaccinations, (2) those that enhance access to vaccination services, and (3) provider- or system-based interventions. Both the SHC and the AFIX interventions use evidence-based principles recommended by the Community Guide but in very different ways. Therefore, we will discuss the approach and plan of action for each intervention separately.

School Health Center Intervention

The Community Guide recommends vaccination programs in school-based settings as an effective means to enhance access for vaccination services (Community Guide, 2011). Bringing vaccination services into school settings has been identified as a promising intervention for increasing adolescent HPV vaccination rates in the United Kingdom, Australia, Sweden, and Canada (Brotherton et al., 2008; Ogilvie et al., 2010; Reeve, De La Rue, Pashen, Culpan, & Cheffins, 2008; Stretch, 2008; Tegnell, Dillner, & Andrae, 2009; Watson, Shaw, Molchanoff, & McInnes, 2009). Although research on the effectiveness of HPV vaccination interventions in school settings in the United States (US) is less developed, several notable studies support SHC interventions' effectiveness in the US. For example, research has demonstrated that adolescents who receive the HPV vaccination in a school setting are more likely to complete the three-dosage HPV vaccination series (Tan et al., 2011). Using data from the NC Immunization Registry (NCIR) (n= 138,823), researchers found that 70.1% of the adolescents who received the HPV vaccination in a school setting completed the vaccination series versus 61% from a health care provider and 39% from the public health department (Tan et al., 2011). The past research of CCFNC has demonstrated similar findings. A study of five SHCs in NC during the 2009-2010 school year found that while uptake of the first dose of the HPV vaccine ranged from 2-19%, the completion rates of the three doses ranged from 78-96%-- a very high completion rate (Hayes et al., 2011). The available research provides evidence that

offering HPV vaccination services in school settings can increase HPV immunization rates among adolescents.

Assessment, Feedback, Incentives, and eXchange Intervention

The AFIX intervention utilizes several strategies recommended by the Community Guide to improve vaccination services, including improving quality of care among providers and improving reminder and recall systems. The Task Force on Community Preventive Services considers AFIX to be an evidence-based intervention due to the large body of research that supports AFIX's effectiveness in increasing immunization rates (CDC, 2011). Developed in 1986, AFIX originated as a statewide intervention implemented by the Georgia Department of Public Health to raise vaccination coverage levels by conducting annual assessments of immunization records at local public health departments (CDC, 2011). According to the CDC (2011), immunization coverage levels in Georgia public clinics increased from 40% to 91% between 1986 and 2011 as the result of the implementation of AFIX. Since then, AFIX has served as a national model for improving immunization rates and has been replicated by state and local health departments all over the country.

Since its inception, AFIX has been extensively evaluated for most universally recommended vaccines for adults and children. During its development, from 1987 to 1997, 14 studies examined the effects of AFIX and found an increase in vaccination coverage of 16 percentage points (CDC, 2011). In 2007, the Task Force on Community Preventive Services updated its review of AFIX, including 19 additional studies from 1997 to 2007, and found an increase in vaccination coverage of 9 percentage points (CDC, 2011). The difference in effect size was attributed to the advances made in medical record keeping and stronger methodology of the studies featured in the second review. Although the AFIX intervention has not been specifically evaluated for adolescent vaccinations, the Task Force considers there to be sufficient evidence to recommend the AFIX intervention for improving vaccination coverage rates among adolescents (CDC, 2011). Overall, there are a large number of studies that support

AFIX and demonstrate consistency in effect size, or the strength of the relationship between two variables, which contributes to a strong evidence-base for the AFIX intervention (CDC, 2011).

Methods

Logic Models

A logic model is an important tool that demonstrates how programs are intended to work. Below are the SHC and AFIX logic models for our Capstone project. The logic models present the necessary inputs or resources going into each program, the intended activities, and the immediate outputs, or deliverables, that will be produced directly from the activities. These models provide a systematic and visual way to reflect the work of the Capstone team and CCFNC. Logic models can be effectively used to demonstrate the intricacies of the intervention to all involved stakeholders, help secure investment and resources, and work to ensure overall program success (W.K. Kellogg Foundation, 2004). In addition, the logic models that follow illustrate the short-term outcomes, the proximal and intermediary outcomes, and then finally, the long-term impact, that we anticipated based on the SHC and AFIX intervention outputs.

School Health Center Logic Model Description

The logic model for the SHC intervention provides a brief overview of the Capstone team’s training, activities, and the resulting deliverables (see **Figure 1**). The model demonstrates that the SHC intervention was designed to increase parental acceptability for vaccinations, which led to increased parental consent rates for vaccination, thus impacting the ultimate goal of increasing adolescent vaccination rates.

Figure 1: School Health Center Logic Model				
Inputs	Activities	Outputs	Outcomes	Impacts
CCFNC, Capstone team, and SHC Staff	Train Capstone team member in interview guide	Adolescent vaccine information packets delivered to	Increase parental acceptability for adolescent HPV, MMR, Tdap, and	Increase adolescent HPV, MMR, Tdap, and Meningococcal Vaccination

CCFNC, Capstone team, and SHC Time	Train Capstone team member in creating codebook	School Health Centers	Meningococcal Vaccines	Uptake rates
CCFNC AND SHC Funding	Put together and deliver adolescent vaccine information packets	47 parent interviews completed	Increase parental consent for adolescent HPV, MMR, Tdap, and Meningococcal Vaccines	
Secure phone line		Research-to- practice report		
Computers		Assigned section of publishable manuscript		
Office space Locked cabinet	Call 68 parents and guardians who consented to an interview			
	Interview 47 parents and guardians			
	Please note: activities for research-to- practice report and manuscript are undecided			

AFIX Logic Model Description

The logic model for the AFIX intervention provides a brief overview of the Capstone team’s inputs (resources), activities; the outputs (deliverables) of the intervention, and finally the outcomes (see **Figure 2**). By influencing provider motivation and knowledge, the intervention changed physician behavior and office practices and policies, decreased missed vaccination opportunities, and increased HPV vaccination rates among adolescents.

Figure 2: AFIX Intervention				
Inputs	Activities	Outputs	Outcomes	Impacts
Funding	Develop AFIX protocol	AFIX Protocols	Increased provider knowledge	Decrease of missed opportunities to offer vaccinations
CoCASA software	Train AFIX staff	Trained staff		

CCFNC, Capstone team, Immunization Branch Time	Set up provider visits Review provider records & assess coverage level	Providers visited Coverage assessment Summary of Recommendations	Increased provider motivation Change in office practices and policies	Decrease of invalid doses Increase of timely vaccine receipt Increase HPV, Meningococcal, Tdap, Hep B, and MMR vaccination uptake rates among adolescents
CCFNC, Capstone team, Immunization Branch Staff	Provide feedback and recommended strategies for improvement	Rewards provided Data in database	Change in physician behavior	
Computers Office space	Acknowledge and reward improved performance Document outcome of visits in database (CoCASA) Promote information exchange	Information exchanged		

Planning for Sustainability

Before engaging in the activities described in the logic models above, we assessed the sustainability of our Capstone project. Sustainability has been defined as a program’s ability to deliver its intended benefits over the long-term, often beyond the life of the program (Shediac - Rizkallah & Bone, 1998). Evaluating the sustainability of a program early in the planning process is important for two key reasons. To maximize the health benefits of an intervention, it is essential to ensure that there is an adequate funding source to see the program to its finish. Furthermore, to ensure community support for an intervention, it is crucial to plan for the long-term and consider what is best for a community’s future development (Shediac -Rizkallah & Bone, 1998).

To evaluate the sustainability of our Capstone project, we considered the following factors: program design and implementation factors, organizational features, and community and contextual factors (Shediac -Rizkallah & Bone, 1998). The influence of these factors on our Capstone projects' sustainability is discussed in the results section of this paper.

Assessment and Engagement Activities

In order to sustain the projects, it was necessary to engage the community to encourage buy-in and stakeholder engagement. Community engagement has been defined as “the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people” (CDC, 1997). Community engagement is essential for establishing trust and building resources and allies among community partners (McCloskey, 2011). Involving key stakeholders also ensures that interventions are relevant, by incorporating local expertise, and sustainable, by building community capacity and support.

Community can be perceived in different ways—ranging from a social perspective, which examines the social ties among individuals, to a systems perspective, where community is seen as a well-connected sector that has shared goals and strategies for resolving health problems (McCloskey, 2011). Since our Capstone project was focused on healthcare systems, such as school-based healthcare and provider care, we used a systems-based definition of community.

In order to engage communities, it is essential to conduct a community assessment to gain an understanding of the health issue at hand and the underlying behavioral and environmental determinants of that health issue (Green & Kreuter, 2005). To define community assessment, we relied on Green and Kreuter's PRECEDE-PROCEED model, which maintains that community assessments should gather objective and subjective sources of information, involve community partners, and examine multiple levels of influence, such as community- and environmental-level factors (Green & Kreuter, 2005). Below we describe our community

assessment efforts and our community engagement efforts first from the perspective of the SHC intervention and then from the perspective of the AFIX intervention.

Community Assessment for the School Health Center Intervention

To gain a greater understanding of the benefits and challenges of providing vaccinations within a school setting, the Capstone team conducted a field visit to all four Rockingham County School Health Centers. The Capstone team had the opportunity to ask school health center staff about the types of services provided at each school health center, the number of children served, the sources of funding for the school health center, and the logistical challenges associated with providing vaccination services in a school health center. The Capstone team also had the opportunity to observe the process of checking students in to the school health center.

In addition to the field visit, the Capstone team assessed the social context of the SHCs by examining county-level variables such as poverty rate, unemployment rate, demographics, and education completion rates on the U.S Census website. The Capstone team read the Rockingham County Health Assessment Report to gain a greater understanding of the availability of healthcare in Rockingham County, including provider-to-patient ratios, and the overall health of the county, such as STD rates (Rockingham County Health Assessment, 2011). The Capstone team also read the 2010-2011 Capstone team's research-to-practice report, which examined the challenges associated with providing vaccination services in the school setting. The previous Capstone team's summary report also helped our team understand the extensive assessment undertaken in the previous year that led to the intervention that we were responsible for evaluating.

Community Assessment for the Assessment, Feedback, Incentives, and eXchange Intervention

To assess the NC Immunization Branch, the Capstone team went on a field visit to the NC State Health Department before the Capstone project started. The physical layout of the

workplace was analyzed, as were the relationships between colleagues and the office culture. The purposes of this visit were to understand where we would be working and to visit our partner organization. In addition, we wanted to learn about the assets of the community partners and their clientele. Members of the Capstone team spoke with all employees involved in the AFIX program to understand the different aspects of the project and the delegation of responsibility for each component. This assessment provided contextual background information for the project that helped our team navigate our work at the immunization branch.

Community Engagement for the School Health Center Intervention

To engage key stakeholders of the Rockingham County School Health Center, we conducted 68 structured phone interviews with parents and guardians regarding their satisfaction with the vaccine information packets they received. The interview questions examined the clarity of the vaccine information, any potential concerns parents had regarding the vaccine, ease of the vaccine consent process, and parent demographics such as insurance coverage. The findings of the interviews were then compiled into a research-to-practice report that was shared with each of the participating SHCs as well as other SHCs throughout the state.

Community Engagement for the Assessment, Feedback, Incentives, and eXchange Intervention

We had less contact with the stakeholders and beneficiaries of the AFIX intervention study, including the providers and adolescents receiving the intervention. Instead, the Capstone team engaged directly with the staff members of the Immunization branch. By collaborating with the NC-DHHS Immunization Branch, we gained a better understanding of the operations of a state health department and how the health department engaged the immunization providers. Although we did not engage directly with the immunization providers, the parents of the adolescents, or the adolescents affected by the intervention, our relationship with the immunization branch provided us with the opportunity to engage with public health practitioners.

Work Plan Deliverables

Based on our community assessment and engagement activities, as well as the available research regarding adolescent HPV vaccination interventions, our Capstone partner chose to evaluate two interventions that would fulfill a substantial research need. Since the available data of the effectiveness of HPV vaccination interventions in school-settings in the U.S is limited, the evaluation of the SHC intervention is an important contribution to the vaccination literature. Similarly, because the evidence regarding the use of the AFIX intervention for adolescent vaccinations is also limited, the evaluation of the AFIX intervention will make a valuable contribution to the body of evidence. Therefore, the collective purpose of our Capstone project, and the resulting deliverables, including research-to-practice reports and manuscripts, was to help build upon the existing evidence for adolescent HPV vaccinations in the US. The specifics for each deliverable will be discussed in more detail in the section below.

Results Sustainability Findings

While it is important to consider the role of our work in contributing to the literature on adolescent vaccinations, it is also important to examine the sustainability of the SHC and AFIX interventions. We will discuss the sustainability of each of these projects below.

Rockingham County School Health Center Intervention

The primary goal of the Rockingham County SHC Intervention was to increase HPV vaccination uptake among high school adolescents. While the results of the outcome evaluation that will determine whether this project is sustainable are not available at this time, we will discuss how the study design and several programmatic, organizational, and contextual features will impact the sustainability of this intervention.

As part of the study design, there are measures in place to ensure the project materials and results are disseminated, including a research-to-practice report for practitioners and a

manuscript for researchers, describing the effectiveness of the intervention. If the SHC intervention proves to be effective in achieving its outcomes, CCFNC staff will also produce an implementation guide and publish the project materials on the organization's website. Similarly, if the SHC center intervention proves effective, CCFNC staff has offered to provide assistance to other school health centers interested in implementing the intervention. CCFNC will also send monthly emails to the statewide CCFNC coalition to keep them updated on progress and help disseminate the intervention on a national scale, should it prove successful.

As part of the study design, CCFNC ensured the possibility of replication by documenting all hours expended and expenses incurred to give an accurate representation of the resources necessary to implement this intervention. Having a detailed and accurate account of the inputs, or resources, needed to implement the intervention and the activities needed to sustain the intervention will help other SHCs assess the feasibility of implementing a similar intervention at their school site. Similarly, by making the process evaluation tools publically available on the web, CCFNC will increase the *trialability* of the intervention, or how easy it is for other organizations to test the intervention, which will increase the sustainability of the intervention (Oldenburg & Glanz, 2008).

There are also several programmatic and organizational factors that will influence the sustainability of the SHC intervention. For example, the SHC vaccination program is integrated within several existing services provided by the school health center such as check-ups, health education, and counseling. The program has received a significant level of support among school leadership and has a strong champion in the Director of the Rockingham County SHCs. In addition, the HPV vaccination program was established as a collaborative effort between the Rockingham County School Health Centers and CCFNC. Prior to our joining the CCFNC Capstone team, CCFNC interviewed 53 school health centers that provided the HPV vaccine to learn the best way to implement the intervention in this setting. Throughout the design process, CCFNC was in close communication with the Rockingham County SHC to modify the

intervention based on the school health center's needs. The integration of the community partners' feedback in the intervention design, the support of an intervention champion, and the collaboration among key stakeholders are all key components that enhance intervention sustainability (Shediac -Rizkallah & Bone, 1998).

There are several contextual factors to consider that may influence the intervention's sustainability. The intervention has diverse funding sources to support it including: insurance company reimbursements for the vaccines, a portion of the per-pupil-expenditure is provided by the NC State Fund, and grant funding. Diversified funding sources are instrumental in enhancing the sustainability of an intervention (Shediac -Rizkallah & Bone, 1998). As stated, a portion of the funding for the SHC intervention is provided by the NC State Fund, which is under review by the NC General Assembly, and may receive a budget reduction due to national economic recession (NCDPI, 2011). Currently, there is no formal plan in place if there is a reduction in the NC State Fund budget; however, CCFNC has informally discussed several alternative-funding options including additional grant funding. School health programs are often vulnerable to change in times of recession, when political priorities may shift from areas like education and health to areas such as job growth. These are important considerations regarding the sustainability of the SHC Intervention.

The Assessment, Feedback, Incentives, and eXchange Intervention

The goal of the Adolescent AFIX Intervention is to increase provider recommendations for the HPV, Tdap, MMR, Hep B, and Meningococcal vaccines with the ultimate goal of increasing adolescent vaccination rates. However, as this project had not been rigorously evaluated with this population, the Capstone team prioritized an outcome evaluation to determine if the AFIX intervention merited sustaining. To complete this evaluation, we created summary reports for providers involved in the intervention that included changes from baseline to five-month follow-up in immunization rates per provider, county rankings for each provider, and comparisons between the control group and the intervention groups. We then disseminated

this data through a research-to-practice report that was published on the CCFNC website and distributed to interested immunization providers in North Carolina. In addition, we assisted in writing the introduction of two draft manuscripts that contribute to the evidence regarding the AFIX intervention for practitioners and researchers. These manuscripts will be published in peer-reviewed journals as well as posted on the CCFNC website. The wide number of channels used to disseminate the findings, such as the CCFNC's website and research-to-practice reports for providers, will increase the sustainability of the intervention. If the evaluation finds the intervention merits replicating, disseminating the results will increase the *observability*, or the opportunity to observe the results prior to implementation, of the intervention among other practitioners and researchers. The NC-DHHS Immunization Branch has also documented the cost and time required for implementation in order to provide an accurate representation of the resources necessary to implement this program. The AFIX intervention is funded through the federal Vaccines for Children (VFC) grant, awarded to NC-DHHS, which might have the potential to provide future funding for scaling up this intervention. However, it is important to remember that NC-DHHS and federal grants are subject to budget cuts, which could influence the sustainability of the project given the current economic and political climate.

In addition, there are several organizational and contextual factors that contribute to the sustainability of the AFIX intervention. CCFNC and NC-DHHS have worked closely to build consensus regarding the AFIX intervention. The organizations worked collaboratively, openly discussing their ideas and goals of the project, assigning clear roles and tasks to each organization and conducting bi-weekly conference calls. CCFNC has been very responsive to the needs of NC-DHHS and has modified the Capstone team's work to address their needs, including adding summary reports for internal use by NC-DHHS. Collaboration between NC-DHHS and CCFNC is an essential component of the sustainability of the AFIX intervention. Furthermore, NC-DHHS serves as a valuable champion for the AFIX intervention and is dedicated to sustaining the AFIX project. For example, NC-DHHS has committed to hold future

in-person site visits and/or webinars for other immunization providers in NC, if the intervention proves effective. Having NC-DHHS as an organizational champion, having a strong collaboration between CCFNC and NC-DHHS, and having the AFIX intervention housed within NC-DHHS, have greatly contributed to the sustainability of the intervention.

Engagement and Assessment Findings

School Health Center Intervention: Community Assessment Findings

Through our field visit to the four Rockingham County SHCs, we gained a greater understanding of the assets and challenges faced by our community partner, the SHCs. In terms of assets, the SHC staff we spoke with demonstrated an enthusiasm for their jobs and a commitment to improving student health. Furthermore, the SHC staff included a team of school health nurses with more than ten years of experience working in school health and familiarity with the challenges associated with providing vaccinations in a school setting. A challenge faced by our community partner is that the SHCs were very small, which only allowed 1-2 students to be seen at a time. This limited capacity slowed the vaccination process.

School Health Center Intervention: Community Engagement Findings

Based on the phone interviews conducted with parents regarding their satisfaction with the SHC intervention, we learned about several strengths and weaknesses regarding CCFNC and the Capstone team's engagement with the community partner, the Rockingham County SHC. In the interviews, parents expressed confusion and frustration that their male children had been given an HPV vaccination. Parents were unaware that the HPV vaccination had been approved for boys and did not understand the biological need for vaccinating boys, such as prevention of genital warts and preventing the transmission of HPV to girls. Parents were also upset that more information was not provided about the cost of the vaccination. Parents with private insurance, for example, did not know how much the vaccination would cost, and many parents complained that the vaccination cost was higher at the SHC than at other local providers. These weaknesses indicated that greater input was needed from parents, prior to

intervention implementation, on what information should have gone into the information packets that were mailed home.

From the phone interviews with parents, we also discovered the strengths of our community engagement activities. Parents, for example, were thankful for receiving the vaccine information packets because the packets served as a reminder to get their child vaccinated and gave them information on adolescent vaccinations. Many parents explained that they were unaware that high school aged children still needed to get vaccinations. Parents were also appreciative that we called them for an interview because they were confused about several components of the intervention including: cost, HPV vaccination for boys, the vaccination schedule, and the immunization record keeping. For example, parents were unaware of when vaccines were administered and did not know if the school knew which vaccines had been given to their children prior to the intervention. Parents were worried children would be vaccinated twice. Parent interviews allowed us to identify these issues and provide parents with a number to call to get their questions answered.

Assessment, Feedback, eXchange, and Incentives Intervention: Community Assessment Findings

Through our initial meeting and tour of the NC Immunization Branch, we gained a greater understanding of the assets and challenges faced by one of the study partners, the staff at the NC Immunization Branch. In terms of assets, the Immunization Branch staff works collaboratively and efficiently to reduce vaccine-preventable diseases by raising immunization coverage throughout the state. In addition, staff members attend trainings and meetings and take part in committee workgroups to incorporate, learn, and implement successful immunization activities into their organization. In terms of challenges, staff mentioned that budget cuts affected the services that the Immunization Branch could offer throughout the state.

Assessment, Feedback, eXchange, and Incentives Intervention: Community Engagement Findings

As part of the AFIX intervention, a staff member of the NC-DHHS Immunization Branch went to meet with the health care professional either in-person or via the internet regarding the NCIR system and how to increase vaccination uptake in that clinic. The health care staff at each provider clinic completed a survey before and after the AFIX intervention regarding health care staff's satisfaction with the AFIX intervention. This survey highlighted several strengths and weaknesses from the perspective of CCFNC and the Capstone team's intervention beneficiaries - health professionals.

Some of the weakness learned from the survey included that many health professionals did not use the NCIR reminder and recall system to remind parents/guardians that their child was due for a vaccine. Some of the health professionals surveyed believed that they did not have time to use the NCIR and preferred to remind parents/guardians to bring their child back either over the phone or during the current visit. Other health care providers tried to check the patient's medical record before the appointment to make sure they maximized on an opportunity to discuss vaccination during their visit as an alternative method to the NCIR system. More importantly, a majority of health care providers reported that they were somewhat confident or not very confident in using the NCIR reminder and recall system. These weaknesses mentioned above indicated that the NC Immunization Branch needed to provide more training and mentorship on using the NCIR reminder and recall system. In addition, the NC Immunization Branch needed to frame the NCIR system as a positive addition to standard operational procedures instead of something that was tedious and difficult to learn, which appeared to be the consensus of the providers during their baseline survey.

We also learned many health care provider strengths, such as their willingness and enthusiasm to increase vaccination rates. Most providers knew that their vaccination rates were below the state and county average and welcomed the training on various ways to increase the clinic's vaccination rates. Health care providers were also thankful for the training that the staff member of the NC Immunization Branch provided regarding strategies to reduce missed

vaccination opportunities. Many health care providers explained that they never had an opportunity to brainstorm ways to lower missed opportunities to increase vaccination rates at their health care agency.

Summary of Deliverables

The Capstone team assisted in producing research-to-practice reports and assigned portions of a draft manuscript for both the SHC and AFIX interventions. The details are described below in **Figure 3**.

Figure 3: Summary of Capstone team deliverables

Deliverable 1: Research-to-Practice Report: Summary report on the School Health Center's adolescent vaccination program	
<i>Purpose:</i> The purpose of the research-to-practice report is to disseminate the results of the process evaluation regarding parent satisfaction with the Rockingham County School Health Center intervention.	
<i>Timeline:</i> March to April 2012	
Methods	Key Findings
Receive training on interview guide Conduct parent interviews (n=47 out of 62 parents who consented to being interviewed) Create codebook for parent interviews Enter data into SPSS database Assist with quantitative and qualitative data analysis Write up key findings in 5-page report Disseminate report	Parents of boys need additional information on the approval of the HPV vaccination for boys and its purpose. There needs to be a procedure in place for helping parents with private insurance estimate what the cost of the HPV vaccine will be. Parents need better communication from the school regarding the vaccination schedule and medical record keeping.

Deliverable 2: Methods Section of Draft Manuscript: School Health Center	
<i>Purpose:</i> The purpose of the methods section of the draft manuscript is to describe the parent interview methodology in preparation for a draft manuscript.	
<i>Timeline:</i> March to April 2012	
Methods	Key Findings
Conduct literature review on other process evaluation papers to examine how methods sections were written	Methods for process evaluation papers often include the description of the intervention, a description of the process evaluation goals,

Drafted description of the methods used for the process evaluation	and a description of each of the measures
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Deliverable 3: Research-to-Practice Report: Summary report on the AFIX intervention of North Carolina health practices	
<i>Purpose:</i> The purpose of the research-to-practice report is to disseminate the results of the key findings, process evaluation, and the costs associated with the AFIX intervention.	
<i>Timeline:</i> March to April 2012	
Methods	Key Findings
Run CoCasa reports for 5 month follow up as well as adjusted baseline (n=180)	TBD
Write methodology of the AFIX intervention	
Assist with quantitative and qualitative data analysis	
Write up key findings in 5-page report	

Deliverable 4: Introduction Section of Two Draft Manuscripts: AFIX	
<i>Purpose:</i> Two introduction sections will be written: one for a baseline data manuscript and one for an outcome evaluation manuscript.	
<i>Timeline:</i> March to April 2012	
Methods	Key Findings
Conducted literature review on vaccination uptake among adolescents	TBD
Worked with faculty advisor and community partner on revisions and discussions	

Discussion

Strengths and Limitations of Engagement and Assessment Activity

Based on our completed deliverables, we believe that engagement could be improved in both interventions. In order to improve future community engagement for the SHC intervention, we recommend that the student health centers interact more directly with the parents of students at their schools. Suggestions to increase SHC and parent engagement include having

the school offer a School Health Information night where school nurses would prepare a presentation on the services the SHC provided and allow parents to ask questions, including any questions parents have regarding recommendations of the HPV vaccine for boys. Similarly, the school website could provide parents with resources to learn more about vaccinations. The SHCs could also send a letter home explaining procedures, such as how the school maintains their child's immunization record or when vaccinations will be administered. This would allow for more input from the parents as well as a greater collaboration between all involved organizations.

Concerning the AFIX intervention, we believe there could be a greater level of communication and collaboration between CCFNC and NC-DHHS that would allow for a shared decision-making process rather than the current non-collaborative process regarding analyzing and writing up the results into manuscripts for publications. Creating a stronger partnership, such as collaboration on evaluation indicators and methods, and more regular communication between the two organizations would allow for greater information exchange and a more tailored intervention.

Potential Impacts and Benefits

Overall, our Capstone project will have a significant impact on public health research and practice. With regard to research, the two evaluations conducted by the Capstone team helped advance the field of public health's understanding of HPV vaccination interventions for adolescents in the US. By addressing two research needs, vaccination interventions in school settings and the use of AFIX for adolescent vaccinations, our Capstone project helped determine whether these interventions merit sustaining. Our work helped build upon the evidence needed to secure future funding for SHC and AFIX interventions and to scale up the interventions.

Our Capstone project also contributed substantially to the practice of public health. By conducting both process and outcome evaluations of the AFIX intervention and disseminating the results through a research-to-practice report, our Capstone team helped provide the tools and information needed for other immunization branches around the country. Our work provides a unique perspective on the effectiveness of AFIX on adolescent vaccinations, as well as specific ways to improve use of the NCIR among providers and information on the total cost of the intervention. Our work with the SHC intervention also significantly impacts practice by providing other school health centers with a brief, easy-to-read report that provides an estimate of the cost and resources needed to implement a vaccination intervention. The report also provides valuable information on the logistical challenges associated with implementation of a vaccination intervention, such as obtaining reimbursement from private insurers and ensuring that parents are well-informed to make decisions for their children.

In addition, our Capstone work provides a valuable service to our Capstone partner, CCFNC. We were able to assist CCFNC with data collection for the AFIX and SHC interventions. We were also able to help CCFNC translate the research findings from the AFIX and SHC interventions into practice-based reports that can be utilized by other practitioners. By helping to disseminate the findings from these evaluations, the Capstone team helped build support for the SHC and AFIX interventions, which is beneficial to CCFNC and could help CCFNC secure additional community partners in the future.

Lessons Learned and Challenges

Our Capstone project provided us with an invaluable view into the research process from three distinct angles: an academic research organization, a state health department, and a school health center. Working with and within each of these organizations allowed our team to recognize the challenges and strengths of maintaining academic and public sector partnerships, and better understand the research process in general.

We learned that communication was imperative in any working environment, especially in a project that involved many organizations. The establishment of communication preferences and techniques within our Capstone team at the beginning of the project allowed us to function smoothly and efficiently throughout the year, tackling many issues and challenges quickly and collaboratively. This approach also helped our team work with the various stakeholders involved in our project, from the multiple individuals involved with CCFNC to the NC Immunization Branch to the parents we surveyed for the SHC project.

A key challenge for our Capstone team was the human resource turnover throughout our project. Losing a member of our Capstone team at the beginning of the academic year forced us to re-evaluate our roles and responsibilities going forward as a three-person team. This was followed by losing two key personnel at CCFNC, which left us without the mentorship and guidance we would have liked during the initial phase of our Capstone process. At the NC-DHHS Immunization Branch, the key champion and leader of the AFIX intervention went on maternity leave soon after the start of the Capstone project, leaving a large gap in knowledge of the Capstone process at NC-DHHS. Each of these changes presented unique challenges, but also taught our team how to be independent and self-motivated.

Another key challenge for our team was the nature of our Capstone project and its evaluation focus. We found that this made it more difficult for us to connect with other Capstone teams in our program as well as match our deliverables to the goals and expectations of the Capstone program. We found that this taught us to negotiate with both our community partners as well as the Capstone teaching team to navigate the competing demands and expectations.

A final challenge our team experienced was the disconnect between research and practice. Both projects were working directly with organizations that focused more on the on-the-ground work, as opposed to research, which made implementing a scientifically-designed study more difficult. We saw that changes to the intervention were made without considering how it affected the data and data analysis process, which would have to be compensated for in

the later stages of evaluation. We recognize that improving communication between key partners could have mitigated this challenge.

Our team learned a number of new and valuable skills, including how to use CoCASA, how to create codebooks for data analysis, and how to conduct process and outcome evaluations. We were also able to learn about the data analysis process from key researchers in the field as a direct result of our Capstone project and our collaboration with our community partner and faculty advisor.

Overall, the most important lesson learned by our team throughout the Capstone experience was how to collaborate effectively. For us, this incorporated many of the challenges and strengths discussed above. This made us better teammates, communicators, partners, and researchers, and we were fortunate to have these qualities modeled for us by those involved in our project. We believe that these skills, while not project deliverables, will serve us well in our future endeavors.

Considerations for Sustainability

The sustainability of these projects is largely contingent upon the evaluation reports disseminated at the end of the project. We worked to ensure that this information is not received only at the academic level, but also at the community and organizational levels. This was a unique and crucial approach to assuring that practitioners, community organizers, public health workers, and researchers were aware of the successes and challenges of the SHC and AFIX interventions. More importantly, we wanted to provide detailed implementation guides to help private practices, organizations/agencies, and SHCs replicate these projects. We also recognize that collaboration of CCFNC with the Rockingham County SHCs and NC-DHHS is essential to sustaining the SHC HPV vaccine intervention and the AFIX intervention. Moving forward, we would highly recommend greater collaboration on choosing evaluation indicators, choosing evaluation methodology, and more regular communication.

Additional Considerations

Vaccination is a politically contentious issue that has been continuously discussed in the media over the past few years. The consequences of a fraudulent 1998 study published in the British Medical Journal (Wakefield et al., 1998) that linked vaccinations to autism are still being felt: there are a number of organizations and individuals (including public figures) devoted to reducing vaccination rates. In addition, during a Republican presidential debate in September 2011, Republican Michele Bachmann described the HPV vaccine as “potentially dangerous” and stated that it could lead to mental retardation. Despite the discrediting of these findings in scientific literature and media, many Americans continue to fear having their children immunized.

A separate but equally important debate has arisen over the HPV vaccine specifically. Because HPV is sexually transmitted, many Americans are concerned that vaccinating their adolescent children against the disease will lead to promiscuity and increased sexual activity. According to Casper and Carpenter (2008), a 2003 study showed that over 60% of parents were in favor of the HPV vaccine being available; by 2007, that number had dropped to 44%. In this survey, parents cited both concerns about the safety of the vaccine and the potential for vaccination to lead to increased sexual activity. While both of these issues continue to be debated on the national political scene, it is likely that fluctuations in vaccine uptake will continue and sustainability may be challenged.

Conclusions and Recommended Next Steps

In summary, we offer several recommended next steps for CCFNC to continue its efforts in increasing HPV vaccination rates among adolescents. To build upon the work conducted by the Capstone team, we recommend that CCFNC use the process evaluation data collected by the Capstone team to improve the design and implementation of future SHC and AFIX interventions. Secondly, we recommend that CCFNC disseminate the research-to-practice

reports produced by the Capstone team through the statewide CCFNC coalition. Furthermore, we recommend that CCFNC create an implementation guide for the SHC and AFIX interventions to assist with the expansion of these efforts across other immunization branches and school health centers.

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Appendix A

Cervical Cancer Free North Carolina Capstone Workplan 2011-2012

A. Capstone Team Members

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B. Working Title

Please provide a working title that describes the population, setting, health topic(s), and major deliverable(s) you will be working on. E.g., Evaluation and Adaptation of a Reproductive Health Peer Education Curriculum for NC Latino Youth.

Working Title: Evaluation of Two Adolescent Vaccination Interventions: Rockingham County Student Health Centers Intervention and the North Carolina (NC) AFIX (Assessment, Feedback, Incentives, and eXchange) Intervention.

C. Capstone Project Description

*In narrative format, please describe the significance of the **health problem(s)** the Capstone project aims to address. Describe the **population** that will benefit from the Capstone project work. Describe the **setting** that will be impacted by the Capstone project work. Describe the **methods** that the Capstone Team will use to address the health problems. (1-2 paragraphs)*

Health Problem: It is estimated that over 20 million Americans are currently infected with HPV (CDC, 2010). Each year, an additional six million people become infected, making HPV the most common sexually transmitted infection (STI). Most people infected with HPV never

develop symptoms, but in some cases HPV can lead to serious health problems, including genital warts and cervical cancer. Fortunately, these HPV outcomes are considered highly preventable by existing vaccinations against the virus. Currently, the Food and Drug Administration (FDA) has approved two HPV vaccines, Gardasil and Cervarix, which protect against high-risk HPV strains HPV-16 and HPV-18, known to cause roughly 70% of cervical cancer cases (CDC, 2007). Despite its proven effectiveness among both boys and girls, HPV vaccination remains under-utilized by adolescents (CDC, 2009). In North Carolina, 50.3% of adolescents, ages 13 to 17, have received the initial dose of the HPV vaccine since the approval of the vaccination series (CDC, 2009). However, only 10% of adolescents have completed all three doses of the vaccination series (CCFNC, 2011). **Population:** Therefore, the target population for our Capstone project is adolescents, ages 11 to 18 in NC.

Setting and Methods: Specifically, the Capstone Team will conduct a process evaluation for the Rockingham County School Health Center Intervention, an adolescent vaccination intervention. The Capstone Team will also conduct a process and outcome evaluation for the AFIX intervention, a quality improvement intervention within the NC Immunization Branch. The efforts of the Capstone team will result in summary reports, research-to-practice reports, and manuscripts for publication. We believe these efforts will add to the evidence base, help bridge the gap between research and practice, and aid in eliminating cervical cancer for future generations.

D. Deliverables & Activities

Please list all Capstone deliverables and their purposes; the activities necessary to complete them; and the timeline for completing them.

Project One Description: School Health Center Intervention

The first project will evaluate parent and guardian satisfaction with an adolescent vaccine intervention conducted by the Rockingham County School Health Center at four high schools: Morehead High School, McMichael High School, Reidsville High School, and Rockingham High School. The intervention will provide vaccination information packets and consent forms to parents regarding the HPV vaccine, the T-dap vaccine, the Measles, Mumps, and Rubella (MMR) vaccine, and the flu vaccine. The Capstone team will assist with putting together and delivering the information packets, conducting interviews with parents and guardians regarding their satisfaction with the packets, and disseminating the results through a research-to-practice report and a publishable manuscript. Details regarding each specific deliverable are provided below.

Activity 1: Vaccine Information Packets and Mailings

The purpose of the vaccine information packets is to provide parents and guardians of adolescents attending Rockingham County high schools with detailed information regarding the flu, meningitis, HPV, and the tetanus, diphtheria, and pertussis vaccines. The packet will also include a vaccination consent form, and a stamped envelope to provide parents and guardians with an easy way to return the form. Kea Turner, a member of the Capstone Team, will assist with putting together 3,276 vaccine information packets during the week of September 5-9, 2011. Kea and Turquoise Griffith, another member of the Capstone Team, will help deliver the packets to the four school health centers on September 9, 2011. Kea will also assist with putting together 100 mailings regarding vaccine cost information to parents whose children are privately insured on October 16, 2011. Kea will also assist with putting together 300 mailings regarding HPV vaccination for male adolescents on November 30, 2011.

Activity 2: Structured Parent and Guardian Interviews

The purpose of the structured parent and guardian interviews is to collect information regarding parents' satisfaction with the vaccine information packets and the ease of the vaccine consent process. Kea will conduct 68 structured interviews with parents who returned the vaccination consent form included in the packet of materials and indicated that they were willing to be contacted for an interview. Kea will be trained on the interview guide and be asked to practice the guide at a minimum of five sessions with CCFNC staff. The interview guide, developed by CCFNC staff, will be read verbatim. The interviews will take approximately 20 minutes each. The questions will include details regarding whether the information from the packets was helpful, what information was confusing or unclear, whether information regarding cost of vaccines was clear, and demographic variables of parents such as race/ethnicity, age, and child's insurance status. Kea will also create a codebook for the interview that will include: item numbers, variable names, questions, and values for each response in a given item. Noel Brewer, faculty advisor, and Melissa Gilkey, a post-doctoral fellow working with CCFNC, will review the codebook. Kea will revise the codebook based on their feedback. CCFNC staff will create a qualtrix database for data entry during the phone interviews, and Kea will be responsible for entering the data via the qualtrix database during the phone interviews. Kea will also be responsible for maintaining a call log for each phone call made including: date and time of call, and notes regarding the call including any voicemails left, any disconnected numbers, or any rescheduled interview dates. Kea will also be responsible for converting the qualitative qualtrix data into an excel database and the quantitative qualtrix data into an SPSS database. With guidance and support from the CCFNC manager and the faculty advisor, Kea will conduct data analyses to evaluate parents' satisfaction with the vaccine information packets. Kea will review the qualitative data and look for emerging patterns regarding parents' experiences with the information packets. At this time, it has not been determined who will lead the quantitative data analysis. Kea will provide assistance to whoever is analyzing the quantitative data through data management and assistance with summary descriptive statistics.

Deliverable 1: Research-to-practice report

The purpose of the research-to-practice report is to disseminate the results of the process evaluation regarding parent satisfaction with the vaccine information packets to the Rockingham County school-health centers as well as other school-health centers and practitioners throughout the state. The format of the research-to-practice report as well as the activities involved have not been established at this time.

Deliverable 2: Draft manuscript of the intervention evaluation

The purpose of the manuscript is to disseminate the results from the process evaluation regarding parent satisfaction with the vaccine information packet among scientific audiences, which will add to the evidence base regarding adolescent vaccination in school health centers. The format of the manuscript, who will be leading the manuscript, and the activities involved in the manuscript is undecided at this time.

Activities/Timeline: See table below

ACTIVITIES	DUE DATES
Activity 1: Vaccine Information Packets and Mailings	

Assist with putting together 3,276 adolescent vaccine information packets for four school health centers in Rockingham County, NC	Complete (9.9.11)
Assist with delivering the 3,276 adolescent vaccine information packets to the four school health centers in Rockingham County, NC	Complete (9.9.11)
Assist with putting together 100 letters regarding vaccine cost information for parents whose children are privately-insured	Complete (10.16.11)
Assist with putting together 300 letters regarding HPV vaccine information for parents of male adolescents	Complete (11.30.11)
Activity 2: Structured Parent and Guardian Interviews	
Assist with submission of an IRB modification for parent interview guide	Complete (10.12.11)
Complete interview guide training: 5 sessions	Complete (10.15.11; 10.21.11; 11.10.11; 11.12.12; 11.21.11)
Create a codebook for the parent interview guide	Complete (11.8.11)
Revise codebook for the parent interview guide	Complete (11.13.11)
Create an excel sheet call log for parent interviews	Complete (11.14.11)
Interview 68 parents in Rockingham County to evaluate the intervention process	Complete (1.20.12)
Create SPSS database	Complete (1.20.12)
Convert qualitative qualtrix data into excel sheet	Complete (1.20.12)
Convert quantitative qualtrix data into SPSS database	Complete (1.20.12)
Analyze qualitative data to look for emerging patterns	Complete (2.20.12)
Assist with analyzing quantitative data and preparing descriptive statistics	Complete (2.20.12)
Deliverable 1: Research-to-practice report	
Update and expand upon a literature review regarding adolescent vaccination in school health centers	Complete (3.20.12)
Prepare a research-to-practice report (PLEASE NOTE: specific activities have not yet been established)	Complete (4.18.12)

Deliverable 2: Assigned Section of Manuscript	
Prepare method section of School Health Center manuscript	Complete (4.18.12)

Project Two Description: AFIX Intervention

The second project arises out of a NC Immunization Branch study to evaluate the efficacy of adolescent AFIX in North Carolina. Adolescent AFIX is a CDC-funded quality improvement strategy that the NC Immunization Branch has adopted to raise immunization coverage levels among NC providers with high proportions of adolescent patients.

In the spring and summer of 2011, the Immunization Branch delivered adolescent AFIX training to 61 randomly selected providers throughout the state, using an experimental design to evaluate the program’s success. For the AFIX program, one group of providers will receive education via webinar; one group will receive in person site visits from a representative from the NC Immunization branch, and the last group will be a control group. During this visit, the provider received: 1) reports of their current vaccination rates, 2) an analysis of missed opportunities and a list of patients who are missing immunizations, 3) strategies on how to improve adolescent rates, and 4) training on how to use the request/reminder function in the North Carolina Immunization Registry. The 30 providers randomly assigned to the webinar group received this same information via web conferencing. For the 30 providers in the control group, the Immunization Branch ran reports of vaccination rates and missed opportunities but did not communicate results to the provider.

Turquoise Griffith and Alicia Sparks two members of the Capstone Team will assist the Immunization Branch in running five-month follow-up and adjusted-baseline reports for the selected providers and conducting data analysis. With guidance and input from the CCFNC Director and Manager and a post-doctoral fellow, these students will also summarize the results of the AFIX evaluation in a manuscript to be submitted for publication. Turquoise and Alicia will be based at CCFNC but will work primarily at the NC Immunization Branch office in Raleigh during the fall and winter. They will return to the CCFNC office in the spring to work on manuscript preparation.

Activity 3: 5-month AFIX follow-up reports

The purpose of the 5-month follow-up report is to measure the impact of the AFIX intervention on adolescent vaccination rates among selected healthcare providers in North Carolina. The reports will be disseminated to providers in the intervention. The follow up reports consist of the following:

- For 11-12 and 13-18 year old patients, we run separate reports on the following vaccinations:
 - The three series Hepatitis B vaccination, the one Tetanus/Diphtheria combination vaccination, the two series Measles, Mumps, and Rubella vaccination, and the one Meningococcal vaccination
 - The first Varicella vaccination and the first HPV vaccination
 - The second Varicella vaccination and the second HPV vaccination
 - The third HPV Vaccination
- The purpose of these reports is to look at the number of patients who are up-to-date and what percentage of the clinic these patients make up. These rates are then compared with baseline rates that were run before the intervention. These reports are run for the control, webinar, and in-person groups in order to determine efficacy of the AFIX training and rates of change as a result of the intervention.

- We also run list of every patient (ages 11-18 years old) missing any immunization. These reports, exported to Excel, are saved on the North Carolina- Department of Health and Human Services (NCDHHS) shared drive and are available if a provider calls and asks for them. They otherwise are not disseminated.
- We have added running adjusted baseline reports to our workplan as a result of the realization that the AFIX training teaches providers how to delete inactive or duplicate patient charts from their database. Because this would change the number of patients in each clinic, it is possible we would see inflated rates of change that is in actuality a result of the deletion of inactive patients. For that reason, we will run adjusted baseline reports with the date of the original baseline assessment to account for possible patient chart deletions. This will ensure that our analysis is not impacted by potential confounding variables.

Deliverable 3: Research-to-practice report

The purpose of the research-to-practice report is to disseminate the results of key findings, process evaluation, and cost associated implementing the AFIX intervention through the state of North Carolina. These reports will allow CCFNC and the NCDHSS to disseminate key findings to practitioners throughout the state. The format of the research-to-practice report as well as the activities involved has not been established at this time.

Deliverable 4: Draft manuscript for AFIX intervention

The purpose of the publication-ready manuscript is to disseminate the results of the AFIX intervention evaluation which will add to the evidence base regarding the effectiveness of adolescent AFIX in increasing vaccine uptake. At this point, the team has not discussed the direction or aim of the manuscript with our faculty advisor or community partner. This will occur in January or February after the team has seen all of the data and begun to discuss analysis plans. Once our focus has been determined we will conduct a literature review using PubMed and other databases in order to determine what peer-reviewed articles on our subject have already been published and create a body of evidence for our claim. The data analysis will be led by Melissa Gilkey, PhD, who will mentor us in the analysis process.

Activities/Timeline:

ACTIVITIES	DUE DATES
Activity 3: 5-month CoCASA follow-up reports	
Attend training on CoCASA software and orientation to NC Immunization Branch	Complete (9.9.11)
Run 5 month follow up reports from the control and two intervention groups to evaluate AFIX intervention including immunization uptake rates, and pre and post survey analysis.	Complete (11.18.11)
Attend training on running adjusted baseline reports	Complete (12.2.11)
Run adjusted baseline reports on control and two intervention groups to evaluate the AFIX intervention in	Complete (1.10.12)

change in baseline data.	
Run adjusted baseline reports on control and two intervention groups to evaluate the AFIX intervention in change in baseline data.	Complete (1.10.12)
Deliverable 3: Research to Practice Report	
Create reports summarizing evaluation results from AFIX intervention	Complete (12.15.11)
Create reports summarizing pre-visit baseline survey results	Complete (12.15.11)
Create reports summarizing change in vaccine uptake rates between adjusted baseline and 5 month follow up	Complete (2.1.2012)
Write Research to Practice Report for CCFNC to disseminate	Complete (4.18.12)
Deliverable 4: Preparation of publication-ready manuscript for AFIX intervention	
Conduct data analysis in consultation with UNC Lineberger Postdoctoral Fellow Melissa Gilkey	Complete (4.18.12)
Conduct a literature review on AFIX for adolescent vaccines	Complete (2.1.12)
Prepare assigned section of publication-ready manuscript	In Progress
Potentially assist with one year follow-up CoCASA reports	N/A

E. Important HBHE Principles

a. Theory-Grounded

Please explain how the Capstone project work will be grounded in theory.

Studies of vaccination behavior have used the health belief model (HBM) to examine the impact of beliefs on vaccination uptake and completion (Glanz, Rimer, & Viswanath, 2008). Research on vaccinations, including research on the influenza vaccine, has demonstrated that perceived barriers to vaccination and cues to action are important factors in prediction vaccination behaviors (Brewer et al., 2007). Key perceived barriers for HPV vaccination often include cost, availability, and accessibility (Brewer & Fazekas, 2007). School health clinics remove the barrier of accessibility, which has the potential to increase vaccination rates (Federico, Abrams, Everhart, MelinKovich, & Hambidge, 2010). Cues to action including physician reminders have shown to increase parental acceptability of HPV vaccination (Brewer & Fazekas, 2007) and increase vaccination rates (CDC, 2011). Therefore, the AFIX intervention targeting provider recall and reminder systems will likely increase physician reminders and potentially impact vaccination rates.

b. Evidence-Based

The School Health Center Project

The Community Guide, produced by the Task Force on Community Preventive Services, ranks the effectiveness of public health interventions based on a systematic review process (CDC, 2011). The Community Guide divides its recommended interventions to improve vaccination coverage into three core components: (1) those that increase community demand for vaccinations, (2) those that enhance access to vaccination services, and (3) provider- or system-based interventions. School health centers utilize several evidence-based principles including: increasing community demand for vaccinations, and enhancing access to vaccination services. Bringing vaccine services into school settings has been identified as a promising intervention and can reduce barriers such as healthcare access and transportation (Federico et al., 2010; Hayes et al., 2010). There have been notable successes in international settings in increasing HPV vaccination rates with school health clinics, specifically, in England, Australia, and Canada (Brabin et al., 2008; Brotherton et al., 2008; Ogilvie et al., 2010). Results in the United States regarding vaccination in school health clinics has been mixed. A study of five school health vaccine clinics in the United States, including one held in Guilford County, NC, during the 2009-2010 school year, found that uptake of the first dose of HPV vaccine ranged from 2%-19%; however, among female students receiving the first vaccine dose, a range of 78%-96% completed the three-dose series (Hayes et al., 2010). Based on this literature, we believe that, by providing the HPV vaccine at school health centers, there is a potential to increase vaccine uptake and completion rates among adolescents.

The AFIX Project

The AFIX program meets the third criteria presented by Task Force on Community Preventive Services criteria for effective interventions, provider- or system- based interventions, in two ways: by working with providers to increase their vaccination coverage and by improving coordination between local health departments and healthcare providers. The AFIX intervention has also received endorsement from the Task Force on Community Preventive Services (CDC, 2011).

As part of the AFIX project, representatives from the North Carolina Immunization Branch conducted site visits and webinars with a randomly selected group of providers. These sessions educate providers on how to use evidence-based reminder recall systems that work directly with the North Carolina Immunization Registry in order to increase vaccine uptake rates in the state. There is clear evidence of the effectiveness of recall and reminder systems to increase vaccine uptake; a review by the Cochrane Collaboration found that reminders by postcards, letters, autodialer calls, and telephone all increased vaccination rates for both childhood and adult vaccines (Jacobson & Szilagyi, 2005). In North Carolina, however, there is inconsistency in use of reminder and recall systems for HPV vaccination across providers. A survey of medical practices in Eastern NC in 2007 found that 41% had no reminder system in place for the second and third doses of HPV vaccine (Gottlieb, Brewer, Smith, Keating, & Markowitz, 2009). This evidence demonstrates the importance of the AFIX intervention.

c. Participatory

Please explain how the Capstone project efforts will involve the intended audience.

To engage our key stakeholders of the Rockingham County School Health Center Intervention, we will interview parents and guardians regarding their satisfaction with the vaccine information packets that our community partner CCFNC has prepared. The feedback obtained in the interviews will be used to improve future vaccine information packets prepared by CCFNC and will be disseminated through a research-to-practice report and a publishable manuscript to share the findings with our potential stakeholders including other school health center leaders, and researchers interested in adolescent vaccination interventions.

For the AFIX program, the NC Division of Public Health worked directly with vaccination providers during the summer. Therefore, the Capstone team did not have a chance to interact with these providers when conducting the evaluation. Instead, we will focus our engagement on the immunization branch and work directly with members of the state health department as one beneficiary of our evaluation efforts.

d. Public Health-Oriented

Please explain how the Capstone project work will impact public health.

The Association of Schools of Public Health defines public health as the “art and science of protecting and improving the health of communities through health promotion and disease prevention” (Gottlieb et al., 2009). CCFNC seeks to eliminate cervical cancer in North Carolina through the primary prevention strategy of HPV vaccination (CCFNC, 2011). This effort will also impact public health by improving access to vaccinations among adolescents in Rockingham County, NC through school health centers. This will help reduce disparities in vaccine uptake among adolescents who may not have a primary care provider or lack physical access such as transportation to a provider or health clinic. Our efforts will also help bridge the gap between researchers and practitioners by assisting school health centers and the NC Immunization Branch with evaluation of their efforts. We will also impact future efforts regarding adolescent vaccination by disseminating evaluation reports to schools and key stakeholders and producing manuscripts that will add to the evidence base regarding adolescent vaccination interventions.

e. Attention to the Potential for Sustainability and Dissemination

Which project outputs should be sustained after the Capstone project ends, how, and by whom? How will you share outcomes with stakeholders, relevant institutions, organizations, and individuals?

At this point in time, we do not know which project outputs should be sustained after the project ends. Our goal is to conduct an evaluation of both the School Health Center Project and the AFIX Project to determine what outputs are having an impact on increasing adolescent vaccination uptake.

The school health center intervention was designed to be low cost, flexible, and easy to implement so that it could be replicated in other school health centers in NC and adapted for use in school-based mass vaccination efforts if found to be effective. CCFNC will work closely with the North Carolina School Community Health Alliance to disseminate a research-to-practice report on the intervention among NC school health centers. CCFNC will also disseminate the report through its website and a monthly email to the statewide CCFNC Coalition.

The goals of the AFIX project are to evaluate the program’s effectiveness in increasing adolescent vaccine uptake and to determine whether AFIX visits conducted via webinar are as effective as in-person visits, which are more costly and time-consuming. Results of the AFIX

evaluation will enable the NC Immunization Branch to make a determination about which components of the program it will sustain. If the AFIX intervention proves to be effective, CCFNC and NC-DHHS will create a research-to-practice report and disseminate result through the their websites.

F. IRB Implications

Will you be conducting secondary data analysis or primary data collection? Do you plan to pursue additional activities with the same information for dissemination (e.g., conference paper, article)? Please refer to the IRB Guidance for Student Research and Class Projects document to determine whether or not you will need to do an IRB.

We will be added to the existing IRB for the school health center project, as well as the AFIX project by September 2011.

G. Roles & Responsibilities

The Capstone has four stakeholder groups: students, community partners, faculty advisers, and the HBHE Department, as represented by the Capstone teaching team. The roles and responsibilities for each of these groups are outlined in Appendix A. The student team has identified the following team members for the roles listed below:

- a. Teaching Team Liaison: Kea Turner
- b. Mentor (Community Partner and Faculty Adviser) Liaison: Alicia Sparks
- d. AFIX Liaison: Turquoise Griffith

H. Resources

- a. Capstone Site Resources

What materials/resources will the Capstone partner supply to support this Capstone project (e.g., work space; transportation costs; long distance phone and faxes; data sources; data processing; printing; postage; clerical support; supplies for focus groups/meetings; etc.)? Does this Capstone team have all of the resources (e.g., money, space, technology, etc.) necessary to produce the deliverables outlined in the work plan? If no, explain how the resources will be obtained.

The HBHE department will reimburse up to \$100 of expenses relating to the direct activities necessary to carry out the established deliverables of the Capstone Team. The CCFNC will provide workspace, transportation cost, data sources, processing, printing, and supplies.

- b. Capstone Partner Key Personnel

Please use the table below to identify key personnel (besides the community partner) at the Capstone organization/agency who will interact with the Capstone team.

Name, Degree(s)	Title	Relationship to Capstone Team	Communication Plan
Amanda Dayton, MPH	Adolescent Immunization Coordinator	State Liaison	In person visits, emails, and phone
Melissa Gilkey, PhD	Post-Doctoral Student	Biostatistics	In person visits, emails,

		Consultant	and phone
Schatzi McCarthy, MPP	CCNFC Project Coordinator	School Health Center Partner	Weekly meetings

c. Consultants on Call

Do you require any special expertise beyond what will be provided by your community partner, faculty, adviser, and the teaching team? If so, please use the table below to identify any faculty, adjunct faculty, alumni, PhD students, or other public health professionals who might be able to lend their expertise to the project.

Name, Degree(s)	Title	Area(s) of Expertise
Jennifer Moss	PhD Candidate	Data Management

I. Logistical Considerations

a. Timing

Are there any timing considerations that will be important for the student team to be aware of when working on this project and its deliverables?

To facilitate project planning and implementation, CCFNC asks that students promptly read and reply to project emails. This will also aid in scheduling project meetings and ensuring good communication among the large number of people involved in the Capstone projects.

b. Travel

What special travel considerations exist for the student team? If travel is required, who is covering that expense?

The Capstone team made one trip to the school health center in Rockingham County that was covered by CCFNC. Two students also travel to the NC-DHHS immunization branch once weekly to run Cocasa reports. Travel expenses are covered by CCFNC. In the spring semester we expect to do less traveling and be based primarily out of the CCFNC offices in Rosenau Hall on UNC's campus.

c. Other

Are there any other important issues that the Capstone team (students, faculty adviser, and community partner) or teaching team should know about this Capstone project and/or the deliverables?

No there are no other important issues that the Capstone team needs to be aware of.

J. Permissible Uses of Information

a. Ownership of the Deliverables

The Capstone partner owns the final deliverables. However, HBHE reserves the right to publicly list the organization as a Capstone partner, to keep copies of all Capstone teams' final deliverables for review by the HBHE community, and to include a brief project description in Capstone promotional materials. Please explain the degree to which students will be allowed to use the work produced in pursuit of their educational or professional careers (e.g., thesis, dissertation, manuscript). Describe the procedures for obtaining approval to disseminate the Capstone project deliverables. If there are certain data or products that cannot be disseminated, please list them here.

We will be allowed limited use of the work produced in pursuit of our educational and professional careers. Dissemination in any form (including a publication or abstract) will require approval by the faculty advisor.

b. Authorship

What are your plans for authorship if you produce publishable materials?

If published, the lead Capstone student team member assigned to the specific deliverable will be included as co-author, if her work is of suitable quality. Other Capstone student team members could potentially receive co-authorship for a publication that they did not lead, if their contribution warrants authorship.

c. Use of Recorded Materials

Who (e.g., Capstone partner, HBHE, students) can use the photographs, recordings, interviews, or auditory recording created by HBHE MPH Students during their Capstone projects?

In accordance with IRB requirements, IRB-approved staff will have access to these materials for project purposes only.

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