

**Adolescent Immunizations: Can School-Based Programs
Increase Immunization Coverage Rates?**

By

Cynthia Simmons

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Advisor signature/printed name

Second Reader Signature/printed name

Date

Abstract

Adolescent immunization rates in North Carolina fall below the state average and in Brunswick County the rates fall significantly lower than those of North Carolina. In an effort to improve the adolescent immunization rates within the county, the health department researched efforts based on previous evidence-based school immunization initiatives to determine if utilization of these resources would improve the rates of adolescent immunizations. Significant collaborative efforts were necessary in order to achieve this goal within the community. The purpose of this paper is to review the evidence based practices in the literature for increasing adolescent immunization rates. This paper will also explore leadership principles and how their applications in Brunswick County's local public health system led to improved immunization rates.

Introduction

Can the utilization of schools as immunization clinic sites improve adolescent immunization rates? Brunswick County, NC Health Department viewed this as a priority, especially in a large rural county which has 65% of its children eligible for Medicaid. According to United States Census records, 19.45% of Brunswick County families are below the poverty level (United States Census Bureau, 2000) and transportation is a significant problem based on United States Census data which indicates that Brunswick County has 1,746 occupied units with no available vehicle. The average travel time to work within the county is 24.6 minutes (United States Census Bureau, 2000). The county has started a bus system but services are limited and appointments must be made two days in advance.

Schools offer a unique opportunity to vaccinate children who may not otherwise have opportunity to receive these preventative health services (Findley, Sanchez, Mejia, Ferreira, Pena, & Matos, 2009). In order for such a program to be successful at the local level, school and health priorities must be created in collaboration with one another. Partnering with the schools requires soliciting buy-in from stakeholders at district and school levels and signifies the commitment to further the partnership that will be responsible for program implementation which includes principals, teachers, school health staff, health advisory councils, and parent or community organizations (Lindley, Boyer-Chu, Fishbein, Kolasa, Middleman, & Wilson, 2008).

Compulsory or mandated vaccinations for school entry have been credited with helping the US achieve high childhood vaccine coverage rates which subsequently translates to low rates of vaccine-preventable diseases among children. Although school mandates prove to be an effective public health tool, they have also generated a great deal of concern and much debate about parental choice. In 1996, the Advisory Committee on Immunization Practices (ACIP) recommended a preventive visit for adolescents to encourage parents to visit their primary care so that adolescents may receive the recommended vaccines -- Tetanus-diphtheria (Td) booster, the second dose of measles vaccine, three doses of Hepatitis B, and one varicella given no history of disease (National Vaccine Advisory Committee, 2008).

Since that time, many new vaccines have been licensed and recommended including tetanus and diphtheria toxoid with acellular pertussis (Tdap), tetravalent meningococcal conjugate vaccine (MCV4), and human papillomavirus (HPV). A booster dose of varicella is now recommended as

well. The preferred age for adolescent vaccinations is 11-12 years of age. Catch up vaccinations are recommended for older adolescents that were previously unvaccinated (National Vaccine Advisory Committee, 2008).

Literature Review

Adolescents and young adults make up 21% of the population of the United States. The leading causes of death and illness in this age group are largely preventable (Centers for Disease Control and Prevention, 2012). Many parents are unaware that childhood vaccine protection wears off and adolescents may need booster vaccinations. As a child gets older, they are more at risk for contracting certain diseases such as meningitis due to sharing drinks, food, or kissing (Middleman, A.B., 2006). The recommended vaccine schedule is updated every six months and parents and providers should know the current information that is available. Increasing vaccination rates of adolescents helps prevent disease and helps to achieve the Healthy People 2020 goals of decreasing school absenteeism and increasing the proportion of adolescents who have had a wellness checkup in the past 12 months (Centers for Disease Control and Prevention, 2012). School-based health initiatives can be an effective way to immunize students who would not otherwise have an opportunity due to funding or lack of a medical home (Lindley, et. al., 2008).

Effective strategies to increase rates of adolescent immunizations include: educating parents and adolescents about the need for the vaccines, implementing reminder/recall systems, reducing out of pocket costs to parents for vaccines, and lobbying for immunizations to be required for school

entry (Humiston & Rosenthal, 2005). During the transition from childhood to adulthood, adolescents establish patterns of behavior and make lifestyle choices that affect their current and future health.” These choices are often influenced by family members and friends as well as community, school and work environments” (Centers for Disease Control and Prevention, 2012). This is an excellent time to include these adolescents in the education and decision making processes to promote their own positive health behaviors. Despite progress in nationwide immunization coverage, disparities still persist for children in communities of color. The most effective strategies for reducing immunization disparities are multifaceted programs that include provider reminders, tracking, and community outreach (Findley, Sanchez, Mejia, Ferreira, Pena, Matos, Stockwell, & Irigoyen). Community or school programs are shown to be widely accepted by lower income groups and minority communities. This may be due to a lack of resources for these families, such as a medical provider, or transportation.

Parental trust in their health care provider plays a vital role in the decision making about vaccines. Recommendations from healthcare providers help increase patient and parent acceptance of vaccines (Dorell, Yankey, & Strasser, 2009). Incentives are highly effective and efficient at motivating students to participate in the immunization program, particularly in the lower income area studied (Luthy, Thorpe, Dymock, & Connelly, 2011).

For population-focused services, Rogers diffusion of innovation theory or the resulting increase or curve will be evident if the population adopts a new behavior which is part of the effect theory. The rate will be variable depending on the acceptance of the service and the audience (Issel, M., 2004). A Washington pharmacy utilized this theory to implement immunization

services by contracting with an external workforce. Their study survey results show preference for continuing to provide the immunization services with the external workforce instead of progressing to providing services themselves or digressing and not offering the service (Westrick, S., 2010).

The influenza program that was conducted in Japan in 1957 during the H2N2 pandemic was an effective school-based immunization program. Japan experienced the largest death toll in its history which reached 8,000, by far the largest number of attributed deaths to influenza in its history. In the aftermath, official policies were changed for influenza vaccination which prompted the start of their school-based flu vaccination program. “Because schoolchildren are disseminators of the disease, they should be immunized (Reichert, Sugaya, Fedson, Glezen, Simonsen, & Tashiro, 2001, p.889).” In 1962, school vaccination programs began and in 1977 legislation was enacted that made vaccination mandatory. From the mid 1970s to the 1980s the influenza coverage rates among Japanese school children ranged from 50 to 85 percent. In 1987, new legislation allowed parents to refuse to vaccinate their children; and in 1994, the government discontinued the program due to growing doubts about the effectiveness of the vaccine and concern about side effects. The coverage rates of influenza vaccine fell to very low rates (Reichert, et. al., 2001). The study showed that the vaccination of Japanese children prevented about 37,000 to 49,000 deaths per year, or about 1 death for every 420 school children immunized. Vaccination of the school children stopped the spread of influenza to the elderly population (Tran, McElrath, Hughes, Ryan, Munden, & Castleman, 2010). When the Japanese government discontinued the mandatory immunization program, coverage rates fell to very low levels. The excess mortality from pneumonia and influenza were similar in the US and Japan. In

the United States this rate was constant over time. With the initiation of the school vaccination program in Japan, mortality rates dropped from values three to four times those in the United States to values similar to those of the United States. As the vaccination program was discontinued in Japan, the mortality rate increased (Reichert, et. al., 2001).

Although school-required immunization laws have generally increased compliance and have decreased the occurrence of vaccine-preventable diseases, immunization compliance remains difficult for adolescents since they rarely visit a health care provider (Luthy, Thorpe, Dymock, & Connely, 2011). School-located immunization programs take immunizations to the place that adolescents spend most of their waking hours. Successful Hepatitis B programs immunized many children in the mid 1990s and included improving school level factors to improve program success such as teacher involvement, especially in the enrollment and the returning of consent forms during immunization initiatives. Student involvement also empowered students to encourage others to participate in the program (Tung & Middleman, 2005).

More recently noteworthy programs have implemented school-based immunization programs, such as in Knox County, Tennessee. The public health department was able to administer either live attenuated influenza vaccine (LAIV) or inactivated influenza vaccine to the public school system. The coverage rates achieved for students were 56% for the elementary school, 45% for the middle school, and 30% at the high school level. Coverage rates were only collected for students and no previous data existed on coverage rates for this group. The schools district consists of 81 schools with a total enrollment of 53,420 students. Questionnaires were sent out in advance to 622 primary care physicians to inform them about the campaign and the need to

recommend vaccination to their client (Carpenter, Lott, Lawson, Hall, Craig, & Schaffner, 2007). Current surveys conducted by a group of physicians at Baylor College of Medicine determined that parents of primarily lower income, Hispanic middle school adolescents indicate 47% were willing to utilize school-located immunization programs, despite parents lack of exposure to such things in the past (Middleman, Guajardo, Sunwoo, & Sansaricq 2002). A study of elementary school parents indicated 75% would allow their child to be vaccinated at school (Allison, Reyes, Young, Calame, Sheng, & Weng, 2010).

The most effective strategies vaccinating adolescents were published in studies conducted by the Community Preventive Task Force and were funded by the Centers for Disease Control and Prevention (Humiston & Rosenthal, 2005). The recommendations from the Task Force include reducing out of pocket costs, expanding access to immunizations, and implementing vaccination programs in schools. Effective provider-based interventions include immunization rate assessment with feedback to staff, patient reminders, and standing orders. Client recall reminders, education, and school entry requirements are also effective ways to improve immunization rates (Humiston & Rosenthal, 2005). Participating in registries and implementing clinical practice guidelines to use reminder/recall systems to prompt parents, patients, and providers when immunizations are due also increases series compliance rates. Recall systems can be an effective strategy in improving quality assurance within a practice. Practices that use an immunization recall system had error rates of 1-6% as compared to practices that did not initiate the recall system and had error rates of 2-44% (Saville, Albright, Nowels, Barnard, Daley, &Stokley, 2011).

The 2008-2009 National Immunization Survey – Teen analyzes data to estimate human papilloma virus (HPV) vaccination coverage among girls age 13 to 17 years of age. The survey reported that <1% of parents reported concerns about increased sexual activity after vaccination (Dorell, et. al., 2011) This is important because some believe that this vaccination gives adolescents permission to engage in sexual activity since it prevents several types of HPV that cause genital warts and cervical cancer. However, among unvaccinated adolescent girls, 40% of parents reported that they were unlikely to have their daughters vaccinated in the next 12 months and 10% were unsure (Dorell, et. al., 2011). The lack of knowledge about the HPV vaccine and reports of daughters not being sexually active demonstrate the need for parental education on adolescent risks for HPV infection, stressing the benefits of vaccination and promoting the importance of vaccination before exposure.

In the early 1990s, the state of North Carolina sought to improve its childhood immunization rate by addressing financial barriers to vaccines. To accomplish this goal, the state established a Universal Purchase (UP) vaccine program under which the state purchases vaccine for all children and distributes it free to all participating providers. Providers may not charge for the vaccine itself, but are permitted to charge a state-determined administration fee (Freed, G.L., 1999). The North Carolina UP program is effective in decreasing patient immunization charges and reducing referrals to public clinics. However, UP does not eliminate cost as a barrier to immunization, nor does it enable all children to remain in their medical homes. Underinsured adolescents still may face considerable barriers to immunization (Freed, Clark, Pathman, Konrad, Biddle, Schectman, 1997).

In 2010, North Carolina changed status from being a UP state, but still provides vaccines to providers at no cost for children who have Medicaid, are uninsured or underinsured, are Alaskan native, or American Indian (North Carolina Department of Health and Human Services, 2012). The change made by North Carolina to no longer be a Universal Provider state for childhood immunizations will require parents to rely on individual insurance coverage for vaccines that often requires a co pay, coinsurance, and deductibles that can make costs significant. Health departments that previously offered free immunizations, often do not do so now unless it is a mandated vaccine or the state has a universal vaccination program for that particular vaccine (Freed, et al., 1997). These are all barriers, financial in nature, to the adolescents receiving the vaccines. The mean costs of adolescent vaccines, according to one study, reports the following costs: HPV is \$120.06 per dose, meningitis is \$86.61 per dose and Tdap is \$34.52 per dose. A wide range of prices is paid for the same vaccine product and reimbursement for vaccines administration fees by payers also varies significantly. The variation underscores the need for practices to be cognizant of their own costs and reimbursements for vaccines and to actively seek opportunities to lower expenditures and increase reimbursements (Freed, Cowan, Gregory, & Clark, 2009). Some ideas to assist practices to have the best financial outcome is to have the practice set rates based on reimbursement rates of the top three most common non-medicaid payers. The office managers may also be able to negotiate a higher rate with particular insurance companies. The cost of vaccines should be closely examined to reduce costs, such as ordering the lowest cost vaccine, Tdap. The practice would have a choice between brands.

Medical homes is defined as the “approach to providing comprehensive primary care for children, youth and adults that facilitates partnerships between individual patients, their personal

physicians, and when appropriate, their family”(American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, American Osteopathic Association, 2007). The lack of a medical home is one barrier that adolescents face in obtaining immunizations. More problems can be attributed to adolescents having fewer office visits than younger children, scheduling difficulties posed by school and extracurricular activities, and the lack of transportation (Painter, Sales, Pazol, Grimes, Wingwood, DiClemente, 2010). Additional barriers that may lead to delays or refusal by parents to immunize their adolescent age children include missed opportunities by providers who fail to mention vaccinations during sports physicals, lack of providing adolescent immunizations within a practice, or misunderstood contraindications which lead to failure to immunizations during sick visits (Smith, Humiston, Marcuse, Zhao, Dorell, & Howes, 2011). Other provider visits include lack of time during visit, reimbursement concerns, not seeing enough adolescents, difficulty accessing and verifying past immunizations, (Cawley, Hull, & Rousculp, 2010) and lack of confidence in addressing adolescent issues (Kia-Keating, Dowdy, Morgan, & Noam, 2011).

Adolescence is the transitional period between childhood and adulthood and is a time when young people develop the skills to lead responsible lives, including taking charge of their own healthcare (Humiston & Rosenthal, 2005). Ten to twelve year olds are making developmental transitions including physical development, identity and self concept, establishment of health habits, and increased autonomy from parents and family. This age group is beginning to have a more sophisticated view of health, and school still influences and shapes beliefs. Based on Piaget’s theory of cognitive development, preteens are undergoing the transition from concrete operational thinking to abstract thinking patterns (Glik, Macpherson, Todd, Stone, Ang, &

Connell Jones, 2004). By age 14, adolescents have been shown to have decision-making skills similar to those of adults. In the past, age-related vaccinations, which are those that are recommended for all adolescents within an age group, recommendations have been more effective than risk-related vaccinations. Risk-related vaccinations, which are specific vaccines offered to adolescents with high risk behaviors, often do not work, because people may choose not to be identified with the target group i.e.: sexually active, IV drug user, or may not conceptualize themselves as belonging to the targeted group (Humiston & Rosenthal, 2005). Age-based recommendations are less socially stigmatizing and may increase vaccination of individuals that may have otherwise been exposed. If a vaccine is offered to all adolescents within an age group then coverage is generally accepted, and no one group feels singled out and protection is provided for those at risk as well as those who may not be at risk now. It also allows the protection of an entire cohort prior to risk exposure, such as the Hepatitis B program for 6th graders; it was given hopefully before these adolescents engaged in risky behaviors.

Consent can pose as a barrier to immunizing the adolescent population, especially considering the variance of state laws allowing minors to consent for their own treatment. In North Carolina, a minor may consent to all vaccines that protect against reportable communicable diseases and sexually transmitted infections (North Carolina General Assembly, 2010). However, the provider should strive to educate the adolescent and the parents on the risks of the vaccine preventable diseases which are often underestimated, and obtain mutual consent (Clevenger, Pyrzanowski, Curtis, Bull, Crane, & Barrow, 2011). The vaccine provider should also be able to overcome issues which reduce vaccination rates such as lack of confidence in the vaccine, misperceptions about vaccine safety, needle phobia, and fears of needing an extra dose (Blackford, J.K.,

2001). To adequately respond to parental concerns, providers should be aware of the historical impact of vaccine safety issues and vaccine-related fears that are common at the present time. Scientifically accurate information should be communicated to families so that accurate risk – benefit concerns can be addressed, informed decisions made, and barriers overcome (Blackford, J.K., 2001).

Data from the National Immunization Survey Teen, which determines coverage in US adolescents age 13 to 17, were analyzed for 2006-2009. The results showed that Tdap (tetanus, diphtheria, and pertussis) and Meningococcal (MCV4) increased from 11% to 56% and 12 % to 54% respectively. Between 2007 and 2009 human papilloma virus (HPV) coverage for girls increased from 25% to 44%; between 2008 and 2009 the third dose of HPV coverage increased from 18% to 27%. The survey indicates the increase in coverage rates may be due to physician recommendations, increased access to care for the survey participants, and parent attitudes toward immunizations have improved (Dorell, Yankey, Santibanez, & Markowitz, 2011). In 2009, vaccination coverage rates could have been >80% Tdap and meningococcal and as high as 74% for the first HPV dose if providers administered all recommended vaccines during the same vaccination visit.

For all years, the top reported reasons for not vaccinating against Tdap, MCV4, and HPV:

- Lack of knowledge about the vaccine,
- Provider did not recommend,
- Adolescent is not sexually active
- Vaccine is not needed/necessary not required for school

- Child does not have risk factors
- Parents do not believe in vaccinations
- Parental denial about child being at risk

(Stokley, Cohn, Dorell, Hariri, Yankey, & Messonnier, 2011).

Collaboration with key stakeholders within a community is vital within a community in establishing plans to protect the public's health, such as establishing school-located vaccination clinics for use in mass clinics. Collaboration should involve a broad-based section of the community with all demographics represented, each member must be engaged and understand the processes, the decisions must be grounded in good science, barriers must be identified and possible solutions, and a resilient community is one that carries out activities that is least disruptive to the society (Gupta, R., 2011). The history of collaboration in some communities can influence resources and interpersonal and organizational connections available for planning and implementation. Community politics and history can affect which segments which segments of the community participate in the planning process, what is prioritized, and which partners are willing to help. Some community norms bring people together and others limit involvement from certain groups. Community demographics and economic conditions may shape priorities and strategies. Geography can play a role in assessment methods, priority selection, partners available, and participation in events. Results suggest that community context plays a substantial role in how community based health promotion unfolds (Kegler, Rigler, & Honeycutt, 2011).

The Institute for Healthcare Improvement uses the Model for Improvement as the framework to guide improvement work. The fundamentals of the Models for Improvement and testing change on a small scale using Plan-Do-Study-Act (PDSA) cycles. The steps include: forming the team,

setting aims, establishing measures, selecting changes, testing changes, implementing changes, and spreading changes (Institute for Healthcare Improvement, 2012). A project manager should have leadership skills. While a manager is only concerned with systems and control, a leader has vision which guides growth and change, while motivating and inspiring others (Dignam, Duffield, Stassa, Gray, Jackson, & Daly, 2012). A tenet of the Model of Improvement is after the generation of ideas for changes, uses rapid PDSA cycles to test a change or group of changes to see if they result in improvement. If they do, expand the tests and gradually incorporate larger samples until you are confident the changes should be adopted more widely. Establishing key measures will help your team determine if the changes you are implementing are leading to improvement (Langley GL, Nolan KM, Nolan TW, Norman CL, Provost LP, 2012).

The increased knowledge in medicine and technology in the last 60 years has led to the adaptation of total quality management (TQM) approaches from industry. CQI was applied in the 1980s in several healthcare settings. CQI is simultaneously two things: a management philosophy and a management method. It is distinguished by the fact that customer requirements are the key to customer quality and the requirements will change over time due to education, economics, technology, and culture. Such changes require continuous improvements in that affect the quality of patient care. In CQI terms, “customer” is a generic term referring to the end user of a group’s product or output, and can be internal or external in nature. Health care literature indicates several benefits for the use of continuous quality improvement (CQI). These benefits include customer satisfaction, profitability, employee satisfaction, reduced costs, improved patient survival, and better continuity of care (McLaughlin, C.P., & Kaluzny, A.D. (2006)). These benefits will improve adolescent immunization rates since reduced costs and

profitability for the provider can be passed on to the patient thus reducing their out of pocket costs, better continuity of care assures that the adolescent will get the needed vaccinations on the recommended schedule, not receive extra doses, or have missed opportunities. Employee satisfaction will result in well trained staff that knows the adolescent vaccination schedule and the reminder recall system to assure that patients get the needed vaccines.

Brunswick County, NC Experience

Implementing school-based immunizations required collaboration between public health and the school nurses who work for the local school system. The federal recommendation for ratio of students to school nurses is 1:750, but the North Carolina average is 1:1200 (North Carolina Department of Health and Human Services, 2011). Brunswick County now has a ratio of 1:1100 and each school nurse serves two schools. Communication between the school system and the health department is excellent which allows for collaboration and sharing of resources and knowledge. Some examples of the collaboration between the school nurses and the health department include:

- Training and implementing a program to include school nurses on the North Carolina Immunization Registry;
- Distributing and educating of supplies of potassium iodide (KI) for all schools that are within a 10 mile radius of the nuclear power plant to keep in stock;
- Offering of continuing education classes including diabetes education for school staff;
- Attending school health advisory committee meetings;
- Collaborating on childhood obesity initiatives;

- Implementing head lice policy
- Establishing staff vaccination clinics.

The table below gives a comparison of North Carolina immunization rates to the rates of the United States. NC falls below the US rate with Tdap and Meningitis, but is above the US rate for HPV.

Table 1: Immunization Rate Data 2010

	NC Coverage Rates*	US Coverage Rates*
Tdap	77.8%	81.2%
Meningitis	52.4%	62.7%
1 dose of HPV	51.9%	32%
3 doses of HPV	80.2%	69.6%

*Centers for Disease Control, 2010

Several evidence based strategies were implemented in the school-based adolescent initiative in Brunswick County. The literature was reviewed and based on the research; the following ideas were incorporated into the Brunswick County initiative:

- a. Schools offer a unique opportunity to vaccinate children because it allows for students to not miss school and school is where adolescents spend the majority of their day. Based on the statistics which indicate that 1 in 5 Brunswick County families live below poverty level(United States Census Bureau, 2000), and that transportation is a significant issue within the county for many families, schools offer an excellent alternative to these families. Creating the school-based immunization program for Brunswick County offered an excellent alternative. Research articles further demonstrate that adolescents do not get regular well child

visits, and that lower income and minority families are accepting of the program (Middleman, et. al., 2002).

- b. Brunswick County Health Department educates parents and adolescents about the need for the vaccines by creating a packet of information that goes home with every middle school and high school student and includes the vaccine information statement (VIS) for each vaccine. Packets are also available at PTA meetings and provide school nurses with information to hand out to any student or parent with any questions. The Health Department nurses contacted all local providers and informed them about the schedule of the school-based immunization program so that they can inform their clients and be sure to give their recommendations.
- c. Brunswick County Health Department implemented a reminder/recall system by keeping forms in binders divided by schools, sending letters home to parents about the Health Department's return to the school for vaccine series completion, and the use of the North Carolina Immunization Registry (NCIR) to assist with Reminder/Recall for parents. Each immunization given was entered into the registry, and the permission form was retained in the binder for the school.
- d. Brunswick County reduced out of pocket costs to parents for vaccines by providing the vaccine to students without charging the insurance and office visit or requiring co-pay.
- e. Brunswick County did not specifically lobby for immunizations to be required for school entry, but does follow all of the state recommendations and encourages parents and providers to adhere to the guidelines.

- f. Brunswick County includes adolescents in the education and decision making, by encouraging students to read the packet sent home from the Health Department, and discuss with parents so decisions can be made at home. School nurses also go to classrooms to educate the students on the need for the vaccines.

As reported in the literature, collaboration fosters coordination and shared decision making among a wide range of stakeholders within the community (Gupta, R., 2011). The Brunswick County Health Department collaborated with Brunswick County Schools on implementing the state 6th grade Hepatitis B program which was offered at the middle schools. Following the end of the program, positive relationships developed and ongoing collaboration which resulted in expansion of the program into other needed vaccinations within the school setting. Collaborating to improve immunizations across the school and public health system was a challenge since the health department does not employ the school nurses and does not have a school based health center. Once the school-based immunization idea was approved by the health director and the superintendent, the program needed the support of school staff including the school nurses. This program proved to be successful as evidenced by the improved rates of immunizations in Brunswick County and participant numbers which have improved every year. In order to encourage participation, the classroom teacher with the most returned forms was given the incentive of a gift card to use for classroom supplies since budgets have been restrictive for schools.

Table 2: Brunswick County Immunization Rates for Adolescents

	% up to date 2008*	% up to date 2009*	% up to date 2010*
HepB3, Meng1, MMR2, Tdap1	5%	13%	21%
Tdap 1	10%	29%	42%
MMR 2	58%	60%	62%
Meningitis 1	11%	20%	29%
HepB 3	64%	68%	72%
Varicella 1	31%	29%	47%
Varicella 2	15%	20%	25%
HPV 1	14%	25%	31%
HPV 2	8%	17%	24%
HPV 3	3%	10%	15%

*North Carolina Immunization Registry Benchmark Reports

Leadership is essential to the Brunswick County immunization program. The project manager displayed clear leadership skills by creating and convincing the Health Director and Superintendent that this program was needed due to the influenza-like illness rate in North Carolina. Starting this program could decrease absences during flu season. This was demonstrated by providing them with the results from the Japanese Influenza School Program which showed them how successful school programs could be. Along with this data, the program manager provided them with a concise plan on how the project should be developed. The Health Director and Superintendent also have leadership ability by the willingness to accept a new program, each having governing boards to whom they must answer. Each leader empowered their staff by serving as democratic style leaders and change agents to allow the ideas to be created, developed, and brought to the team, which facilitates innovative ideas such as the school-based immunization program. All levels of an organization can have leaders; they do not always need to be at the top. Several school nurses were leadership “champions” of the project, made multiple calls to parents to inform them of the program, and tracked down immunization records to assure that each child had the needed vaccinations. This is a style of

servant leadership which in this situation could be overlooked but is an integral part of the team and which helped to make this program successful. Many local physicians directly recommended to their patients the need for the vaccinations which is another form of leadership by supporting the program.

Managing and understanding change is an important part of a successful improvement initiative.

In Rogers' Diffusion of Innovations Model the four main elements include:

- innovation-- such as the new immunization program;
- communication channels-- such as the permission forms, PTA meetings, telephone calls to parents, written communication to parents, fliers in the community;
- time-- this would include the planning phase of the project, time with which parents and adolescents accepted the program,
- implementation and social system-- this includes the community that involves families and key stakeholders needed to make the program successful and to assist families in making informed choices.

(Rogers, E.M. (1962)).

The diffusion of innovation theory was utilized to guide the development of study of community pharmacists in Washington State. The study sought to determine the best plan for providing immunization services to the customers within the pharmacy setting. The innovation theory states that adoption decisions are not made once and for all; instead, organizations regularly review and make decisions to continue or reject an innovation after having previously adopted it. According to Rogers, organizations may reject a previously adopted innovation because of two reasons, disenchantment or replacement. Disenchantment discontinuance is a decision to reject

an idea as a result of dissatisfaction with the innovation's performance. In contrast, replacement discontinuance is a decision to reject an idea to adopt a better idea that supersedes it. After adopting a new idea such as outsourced services, the community pharmacies must decide to: 1) continue offering outsourced services, 2) reject outsourced services without adopting in-house services, or 3) replace outsourced services with a superior innovation, in this case, in house services. In this model, pharmacies that continue to offer outsourced services are considered "fence sitters". Fence sitters are reluctant to make significant commitments to the new services. Next, pharmacies in the next group are considered "backward movers". Backward movers are those that abandon outsourced services and do not engage in in-house services. Finally, "forward movers" describe pharmacies that replace outsourced services with a superior innovation, in-house services. This transition to in-house services is considered to be a forward movement because in-house services signify the commitments to the new services (Westrick,S.C., 2010).

The Diffusion of Innovation Theory is applicable to the school-based immunization program that was implemented in Brunswick County. There are five stages within the Diffusion of Innovation Theory. The stages include knowledge, persuasion, decision, implementation, and confirmation. During the knowledge phase, nurses and school staff educated parents about the program, PTA meetings were held, written materials including letters and vaccine information statements went home to parents, and phone calls reminded parents how to obtain more information. During the persuasion phase the parents or students had ample opportunity to ask the school nurse or faculty questions, call the health department, or go to the website for either agency to obtain more information. During the decision phase parents or guardians make the decision about signing the permission form. The implementation phase involved the actual establishment and running of the

immunization clinic. To eliminate a potential barrier, late consent forms were accepted. The period in which a person finalizes the decision is the confirmation phase, and for some it may be a final question first or others simply once signed it is confirmed (Rogers, E. (1962)).

Understanding the phases of innovation is helpful because this process is a type of decision making which occurs over a period of time among the members of a similar social system. An individual may reject an innovation at any time before or after the adoption process. The Health Department implemented a new service in providing immunizations on-site at the schools. The immunizations that are offered include all of the recommended adolescent vaccinations, as well as the Tdap vaccination which is a 6th grade school entry requirement. This program is continually under review by the department's Management Team who make decisions based on the program costs, number of vaccinations given, and effectiveness of the effort. Decision about whether the program should continue on an annual basis is also considered and is the case for all nonessential health department services. Providing immunizations to everyone is an essential part of public health, however providing vaccines in a school setting is not required and is therefore non-essential. The customers are considered in the decision making process and can be internal or external to the system, such as in the school-based program where the customers were the adolescents being vaccinated, the parents that signed consent for their children, the school that hosted the immunization clinic site, the colleagues that participated in assuring that the clinic happened, the vaccine payers, the state VFC program, and the citizens of Brunswick County.

Roger clearly defines the roles in which an agency can be categorized: innovators, early adopters, early majority, late majority, and laggards. These roles may change as the agency

reviews the needs of the community. In the beginning of our program, the health department utilized some contract staffing to achieve necessary goals which would make Brunswick staff “fence sitters”. As the program and needs flourished, resources had to be allocated specifically for school-based immunizations which would eliminate outsourcing and is considered more in line with “forward movers” (Westrick,S.C., 2010).

In 2008 the overall up to- date vaccine coverage rate of adolescents in Brunswick County, was 5%. The following increases in immunization rates contributed to the overall increase. In 2011 after the implementation of the school based adolescent immunization program, the immunization coverage rate increased to 33%. The rate of human papilloma virus (HPV) coverage rates in 2008 for girls who received dose one was 14%, but had increased to 31% by 2011. In 2008 girls that had completed the HPV series coverage rate for Brunswick County was a dismal 3%. By 2011, this rate has increased to 20 % (North Carolina Immunization Registry, 2008-2011). This is clearly a significant increase and proof that great strides have been taken to improve the adolescent access to care. However, there is still much work to be done to improve these rates.

The Institute for Healthcare Improvement uses the Model for Improvement as the framework to guide improvement work. The fundamentals include: introduction, forming the team, setting aims, establishing measures, selecting changes, testing changes, implementing changes, and spreading changes .When forming the team, it is critical to include the right people on the improvement team. The Brunswick Team included members of the Brunswick County Health Department Management Team and the School Health Advisory Council (SHAC), which

allowed access to expert advice from both agencies while maintaining a singular project manager. The aim that was established was the creation of a school-based immunization program for adolescents which was clear and concise for all involved. The measures were reported in a run chart to track progress of the number of immunizations given at each school. (Chart 3 and 4)

Chart 3: Adolescent Immunizations in 2010

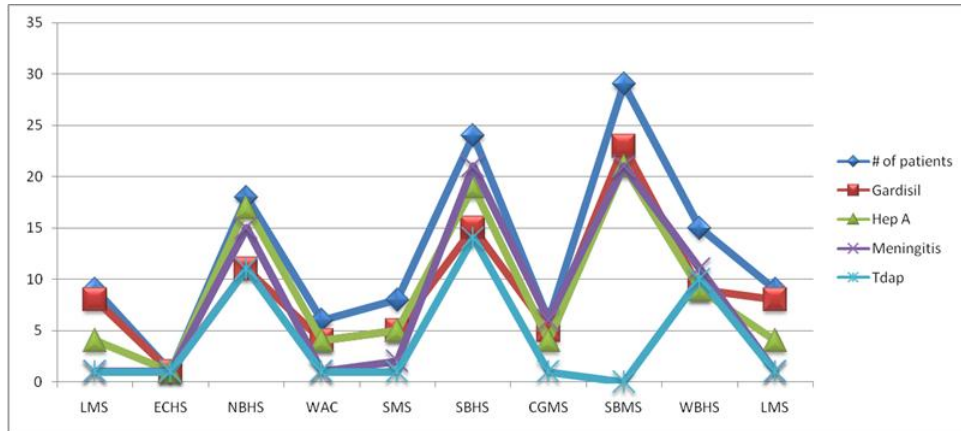
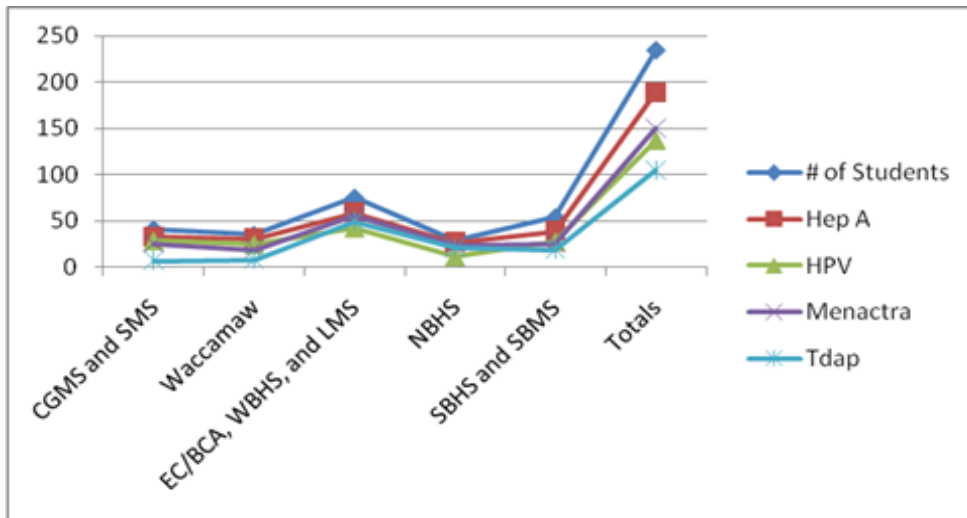


Chart 4: Adolescent Immunizations in 2011



Customer satisfaction surveys were distributed at the conclusion of each program to participants including school staff if they chose to participate (see appendix A). The results were tallied and discussed with the SHAC team so that changes could be proposed and implemented if needed. Based on the results of the “Satisfaction Survey” the BCHD implemented a letter that was sent home after vaccines were given, reviewed immunization records on NCIR and rewrote our cover letter explaining possible out of pocket costs. Any changes made by and established by this council must be approved by the Health Department Management Team before implementation since the funding and resources mainly involve health department staff and supplies. After each immunization initiative, the council reviews the process to discuss successes and improvements in a PDSA cycle.

Improvements that have been suggested and implemented as a result of SHAC reviews include the need to print triplicate forms for the Tdap vaccine so that one copy can be given to the student to take home to the parent, one copy can be placed in the student record, and one can be retained by the health department for entry into the North Carolina Immunization Registry. Another suggestion that was implemented was the creation of a notebook for each school to keep permission forms decreasing possible errors that may occur, and helping staff answer questions from parents as to what occurred the day of clinic. These are retained even if the immunizations are declined. Each grade is alphabetized and a form is kept in the front with a log of calls from parents in case they call to ask questions or change their minds about vaccinations. This prevents errors i.e.: student getting a vaccine when parent did not authorize, keeps forms in one place, assures all billing is done since forms are all together, and the notebook is easily taken to the

school as one unit and assures that subsequent doses are not missed Another change is to have private vaccine in one cooler and VFC vaccine in another to prevent errors.

Recommendations/Conclusions

School-based health initiatives can be an effective way of immunizing adolescents since the current immunization schedule has dramatically changed within the past few years. Many parents are not aware of the need to vaccinate their adolescent children and this population does not go to the physician as often as younger children do. The literature clearly shows that school-based immunizations are effective at increasing immunizations, but many other factors make adolescents a more challenging group. Some of the more challenging factors include the lack of medical visits made by this age group, lack of a medical home, scheduling conflicts due to extracurricular activities, and lack of parent and adolescent knowledge of need for the vaccine. Some recommendations from the experiences that our program has had include: education of the parents and adolescents about the vaccines and importance of receiving them, simultaneous administration of all vaccines, reduced costs to parents by not charging office visits or co-pays, utilizing the NCIR as a recall/reminder system for future vaccinations, and preparing all nurses to have a reassuring attitude to reduce fear and needle phobia which can be common with this age group.

In order to reach these parents, it is important to hold parent meetings, send home information, and even call parents who are ultimately the decision makers for these children to let them know that their child is in need of a vaccine and that an opportunity for a clinic is coming up in which

their child can be vaccinated. The role of the nurse can be vital in maintaining immunization compliance among school age children. While the task of contacting parents and guardians to promote immunization compliance may encompass many hours of work, the process of contacting responsible adults regarding a child's immunization compliance versus excluding children from school due to noncompliance contracting vaccine preventable disease is an effective alternative (Luthy,et al., 2011).

Physician recommendations are an important factor in decision making for parents in deciding what is best for their children. The ACIP recommendations clearly state the immunizations that are recommended for children, but some providers' perceptions of disease risk for their patients may be a barrier to vaccinating. Some providers delay recommending the HPV vaccine, preferring to vaccinate only the older female adolescents, perceiving that younger girls are not sexually active. Additionally, some providers support waiting until older adolescence to vaccinate against meningococcal disease believing that risk is more likely after college entry and because of concerns of waning immunity. Continued education of health care providers on recommendations is needed to further influence provider decisions to recommend adolescent vaccines (Dorell,et. al. 2011).

In the US, school mandates for immunization are created and enforced at the state level either through legislative or regulatory mechanisms. The first vaccine mandates in the United States were in 1809 and required the general public of Massachusetts to be vaccinated for smallpox. Several years later school mandates appeared since it was noted that frequent and close contact left children particularly vulnerable in the school settings. At the time, smallpox was the only

vaccine preventable disease. Since that time, other mandates have been added would clearly have a dramatic affect on the increase in immunization coverage rates of adolescents much as the 6th grade Tdap vaccine which states that all rising 6th graders or those who will reach 12 years of age on or after August 1 to receive a dose of Tdap (National Vaccine Advisory Committee, 2008). Parents and concerned citizens should contact legislators to encourage funding for vaccine programs related to school mandates that would increase rates of immunization coverage.

In the United States, vaccines are funded with a combination of federal state and private money. For children through 18 years of age, there are usually five sources of funding: the federally funded VFC (Vaccines for Children) program, state budget allocations, federal budget allocations made under 317 of the Public Health Service Act (known as “Section 317” funds), private insurance, and out of pocket expenses. It is estimated that 46% of US children receive vaccine funded through the VFC program, and 45% receive vaccine paid by insurance or out of pocket spending. However, the remaining 9% is dependent on variable levels of section 317 funding, appropriated through congress every year (National Vaccine Advisory Committee, 2008).

Incentives can be effective at increasing compliance rates for vaccination according to a study that was done in Utah. The study was done for the Tdap program and all of the students that received the vaccination or an approved exemption received a pencil and an eraser. The students were also entered in a drawing to receive a Rip stick or an iPod. The teacher with the highest percentage of returned forms received a \$50 gift certificate for school supplies. The compliance rate increased 4% during the study period (Luthy,et al., 2011). Other articles touted success in

providing ice cream and pizza parties for the highest class participation. The important part is to involve the teachers, students, nurses, and school staff with the program and make them want to be a part. If there is incentive in some way for them to participate and they can understand what benefit they will receive, then the program will be more successful (Painter, Sales, Pazol, Wingwood, Windle, & Orenstein, 2010).

The school-based program eliminated existing barriers by taking the vaccinations to the schools, educating parents to reduce fears, educating and informing local MDs about initiative, and conducting clinic in a group so that peer group will be a support group for one another. School-based immunization initiatives have proven to be effective evidence-based practice that has increased immunization rates in other settings and this plan has addressed all of the necessary components to assure a successful program. It has been wonderful to work in collaboration on a public health goal at the population level, and to feel that the work will truly make an impact.

With appropriate resources and partnerships, every school has the potential to carry out some form of vaccination activity, whether it is educating parents, students, and communities about adolescent immunizations, or to serve as a site for immunization clinics. Although many parents are becoming more accepting of school-located clinics, we should use every opportunity to educate adolescents and to not allow any of them to fall between the cracks. (Middleman, A.B. , 2011).

With the introduction of the North Carolina Immunization Registry (NCIR) in North Carolina, it is an extremely beneficial tool in collecting and retrieving the immunization records of the

citizens of North Carolina. It is extremely helpful in assuring that those in the adolescent population are properly immunized and will also assist them in maintaining their documentation. When trying to obtain immunization records for children, it is often a challenge since many families have difficulty in locating their copy which is another reason these registries is such an excellent idea. The schools serve as an excellent resource in obtaining the last known record or the last medical home for the child Issues have arisen when school records have been combined so that the immunizations are with the health and school records which make it subject to FERPA (Family Educational Rights and Privacy Act) law and require a parent signature for a release This is a potential barrier which slows down the process since immunization records are exempt from HIPAA (Health Insurance Portability Accountability Act) law and can be sent to any health department in North Carolina without the parental consent. This process can be difficult to explain and get buy in from all schools when you are trying to conduct clinics and immunize children (Lindley,et al. 2008).

A significant strategy that would eliminate barriers to obtaining immunization records for students that are enrolled in the public school system would be a NCIR-NCWISE (North Carolina Window Student Education) computer interface. If this software were created and implemented it would allow all of the children enrolled in a public school in North Carolina to be in the Immunization Registry, which would give the state and county a more accurate assessment of coverage criteria as well as ability to track those with exemption. If an outbreak were to occur, this would be the ideal situation because the records would be computerized and accurate and would be available to the school system, health department, and the state immunization branch. According to North Carolina General Statute 130A-155, the state and health departments already

have access to these records; this would just modernize and update the processes (North Carolina General Assembly, 2002).

The state mandates that make an immunization necessary such as the 6th grade Tdap requirement clearly increase compliance rates. If states would consider making additional vaccinations mandatory, it would be much easier to assure that the adolescents received the vaccines and decrease the incidence of disease within these communities. This of course would require additional funding for immunizations in order to undertake the challenge of immunizing an entire segment of a community. Funding for immunizations would clearly allow and encourage many to immunize their children since cost can be prohibitive to many parents.

If physicians make clear recommendations to their clients that they should receive the adolescent vaccinations and the community collaborates on assuring that the adolescents receive these vaccinations at the best site for the family, whether that is in the physician's office or at a school-based clinic, adolescent immunization rates should improve dramatically. The most important thing is to assure that the adolescent receives all of the needed doses of the vaccine, the doses are entered into the NCIR and the medical providers are working collaboratively to protect the public health of the community.

Establishing health partnerships with schools requires going through proper channels and obtaining buy in from local authorities such as district superintendents and school principals. Partnerships also require collaboration with key stakeholders with school staff that will be responsible for program implementation including school nurses, teachers, administrative and support staff, parent teacher organizations, and volunteers. Incentives to enhancing participation

rates are effective for school-based immunization programs. Some programs that have previously been used include ice cream and pizza parties for the most participation or school supplies and gift cards for teachers that have returned the most completed forms. One program entered immunized students in a drawing for a rip stick and a bicycle. The rate of returned forms that year increased so incentives clearly are an effective way to increase immunization rates in this setting (Luthy, et al., 2011).

Since our school-based program began, we have started receiving calls from other counties in North Carolina for assistance to implement their immunization program and requests for several speaking engagements in which groups were interested in implementing immunization programs. The University of North Carolina at Chapel Hill is documenting our immunization model in a white paper as a training model for utilization by others that desire to implement similar programs. Several school-based health centers were starting to implement some programs, and since the requirement for Tdap, many counties have started working more closely with the school systems. This is an excellent opportunity while immunizing for one vaccine to offer the entire adolescent series.

School-located vaccinations have been shown to be cost effective and cost saving, and represent a promising way to achieve the Advisory Committee on Immunization Practices (ACIP) expanded recommendation for adolescent vaccinations. This paper serves to show the effectiveness of school-located immunization programs, as is the case with Brunswick County which was able to increase adolescent immunizations from 5% to 33% for the years 2008 to 2011 (North Carolina Immunization Registry, 2008-2011) by implementing a school-based

program. Strategies that can be included in the efforts to improve the best practices include incentives, education, and follow-up that can increase parental consent and number of forms received. Minimizing out of pocket costs and using reminders can increase vaccination coverage among those whose parents consented. Finally, organization, communication, and planning can minimize logistical challenges. Adhering to lessons from the scientific literature can assist public health officials and schools provide the greatest benefit for the lowest cost.

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Appendix A

Customer Satisfaction Surveys

	Excellent	Good	Needs Improvement	Poor
Notification of need of vaccine	50	70	25	
Time vaccines offered	120	35		
Vaccines Offered	150	25		
Notification of vaccines received		35	100	20

1. Suggestions:

- a. Need to know what vaccines my child received
- b. Why didn't my child get vaccinated?
- c. Can you provide the flumist on a Friday so my children do not have to miss school?
- d. Can I be there with my child?
- e. How will child's physician get record of vaccines provided?
- f. Will I have to pay anything?