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Adolescent Knowledge, Attitudes, and Beliefs toward Vaccination

Richard Brendan Noggle

ABSTRACT

Brendan Noggle
ADOLESCENT KNOWLEDGE, ATTITUDES, AND BELIEFS TOWARD VACCINATION
(Under the direction of Karen Gieseker)

Vaccination, one of public health's greatest disease prevention tools, is broadening to focus on adolescents. Now that there are more vaccines targeted specifically for adolescents, it is time to give more focus to vaccine delivery in this population. This research will increase the knowledge base to support informed changes in adolescent vaccine delivery by identifying knowledge and attitudes of adolescents toward vaccination within the context of barriers and solutions. Perceived susceptibility to disease, benefits and barriers to vaccination and other constructs were collected through a survey to 1368 high school students. In this population, a scheduled adolescent healthcare visit is feasible, vaccine education can diminishes health misconceptions, and vaccination mandates are ways to reach some students.

INDEX WORDS: adolescent, vaccination, behavior, perceptions, Health Belief Model

ADOLESCENT KNOWLEDGE, ATTITUDES, AND BELIEFS TOWARD VACCINATION

by

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APPROVAL PAGE

ADOLESCENT KNOWLEDGE, ATTITUDES, AND BELIEFS TOWARD

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TABLE OF CONTENTS

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure | Page

LIST OF ABBBREVIATIONS

AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
ACIP	Advisory Committee on Immunization Practices
AMA	American Medical Association
ANOVA	Analysis of Variance
CDC	Centers for Disease Control and Prevention
χ^2	Chi square
CMV	Cytomegalovirus
FERPA	Family Educational Rights and Privacy Act
FDA	Food and Drug Administration
DHR	Georgia Department of Human Resources
Hib	*Haemophilus influenza* Type B
HPV	Human Papillomavirus
HSV2	Herpes Simplex Virus Type 2
MCV4	Tetravalent Meningococcal Conjugate Vaccine
MMR	Measles, Mumps, Rubella
NIP	National Immunization Program
SAM	Society of Adolescent Medicine
SCHIP	State Child Health Insurance Program
Tdap	Tetanus-Diphtheria-Pertussis Booster
VFC	Vaccines for Children

Chapter I-Introduction

Vaccines are cited as one of the top ten greatest disease prevention tools of recent history [1]. The increase in vaccines recommended specifically for adolescents is a relatively new development; therefore the process of vaccine delivery specifically for adolescents needs to develop as well. Now that there are more vaccines targeted specifically for adolescents, focusing on vaccine delivery to this population will help to improve chances of successful prevention of disease and to meet the goals of improving vaccination rates, erasing disparities, and preventing disease [2].

Vaccinating adolescents, that is, individuals from age 13 to 18, before they enter adulthood is vital because as adolescents enter adulthood vaccination rates drop [3]. Timing is important because many of the current and future adolescent vaccines are for sexually transmitted infections and are only efficacious if they are administered before exposure to the pathogen and therefore before the beginning of sexual activity [4]. National surveys have shown that in general, adolescent healthcare usage patterns are somewhat conducive to vaccine delivery [5]. These surveys revealed that most adolescents under 18 had a usual source of healthcare, but Asians, Hispanics, and those near or below the poverty line had less access. Of adolescents that had a source of healthcare to visit, fewer actually visited their healthcare provider. Furthermore, people of non-majority ethnicities and those near or below the poverty line visited their healthcare provider even less [5]. This was important because if there were no visits to a healthcare provider there were fewer chances for immunization or recommendation for vaccination.

Vaccines currently recommended for adolescents by the federal advisory panel the Advisory Committee on Immunization Practices (ACIP), in addition to missed routine childhood immunizations, are the meningococcal, human papillomavirus (HPV), and acellular pertussis vaccines. The meningococcal vaccine offers protection from four of the most prevalent five serogroups of the bacteria that causes bacterial meningitis [6]. This vaccine (or at least education about the disease) is required in Georgia for college freshman who will live in campus housing. The HPV vaccine can be very effective at preventing the foremost cause of cervical cancer [7]. Acellular pertussis prevents whooping cough, one of the only diseases that are on the increase in adolescents [8, 9]. With all of these diseases the main strategy for prevention is vaccination [10].

Future vaccines for adolescents include herpes simplex virus type 2 (HSV2) and another for cytomegalovirus [11, 12]. HSV2 has been shown to be prevalent in the United States and globally and causes painful genital skin lesions [13-15]. Cytomegalovirus (CMV) can cause death and disability if passed from mother to baby and also was found to be highly prevalent in the United States [16, 17]. Due to their prevalence, vaccines make good prevention options for both CMV and HSV2.

While vaccinations could be the prevention answer for all of these diseases, barriers exist which prevent some adolescents from receiving all recommended vaccinations. These barriers include non-utilization of healthcare, cost, not knowing about the seriousness of a disease or vaccine recommendation, fear of adverse events, distrust of medicine, or other social barriers [4, 10, 18-21]. Fortunately, many solutions have been offered for these barriers, and the most successful interventions were multifaceted and identified areas where vaccination opportunities have been missed [3]. Solutions include creating and promoting a set of health and vaccination visits for adolescents, similar to the infant and child schedule [10, 18], and creating standard of care endorsements by professional organizations for healthcare practitioners to increase attention of providers to recommend vaccines [19]. An effective way of improving vaccination rates is through school entry laws [20]. These laws require certain vaccinations before the child can be admitted into school and, for some, have been the only reason vaccination occurred [21].

Despite a good rationale for vaccination, gaps in vaccination coverage remain among adolescents. These gaps should be targeted for further study to identify ways to improve coverage. This especially holds true for adolescents, as coverage rates of recommended vaccines decline as children enter this age group. Vaccination of adolescents is critical before they progress to adults and are even more difficult to reach [3].

Despite clear interventions targeting adolescents to increase vaccine rates, effectiveness of some techniques were found to be minimal, only partially understood, or effective only for certain groups [20, 25-27]. Douglas County, Georgia high school students were invited to fill out a survey to increase understanding of characteristics that may be associated with vaccination rates and explore factors contributing to acceptance of vaccines and their knowledge, attitudes, and beliefs toward vaccination. By identifying characteristics, attitudes, and motivation of high school students toward vaccination, this research aimed to identify areas of improvement to adolescent vaccine campaigns. In addition, this research will study a population of students that could have received an educational presentation on meningococcal disease, the main cause of bacterial meningitis, and had an opportunity to be a part of a study to determine the serogroup specific effectiveness of the tetravalent meningococcal conjugate vaccine (MCV4). Study participation and survey responses will be compared between student groups, such as demographic characteristics. Specifically, motivations and attitudes toward vaccination against bacterial meningitis was a good case study for vaccine preventable disease as a whole because the meningococcal vaccine is recommended by ACIP [22], prevents a rare but severe disease in adolescents [23], and vaccination coverage rates are under review [24].

Socio-demographic population characteristics and beliefs were explored among students to determine if differences exist between schools or student groups using the framework of the Health Belief Model. The purpose of this research was to use applicable constructs of the Health Belief Model to identify perceptions and beliefs of adolescents toward vaccination that could be modified or addressed to improve vaccine coverage. Similarities and differences in the beliefs among socio-demographic groups were investigated so that intervention strategies could be focused to benefit those with greater barriers to vaccination. Research results were used to produce recommendations to direct adolescent vaccination campaigns.

Research Questions

The following research questions and hypotheses were tested during this study.

1. How do students who have been to a health provider within the past year differ from those who have not with respect to demographic characteristics and beliefs /attitudes about vaccination?

    Hypothesis A: A higher percentage of students who pay full price for lunch compared to those who get free or reduced lunch will at least one visit to a healthcare provider in the past two years.

    Hypothesis B: A higher percentage of female students compared to male students will have at least one visit to a healthcare provider in the past two years.

2. Are student demographic characteristics and beliefs about vaccination associated with perceived risk? Will different groups have varying perceptions of disease risk?

    Hypothesis A: College preparatory track students will perceive a higher risk for meningococcal disease than technical/career track students.

    Hypothesis B: Females will perceive a higher risk for meningococcal disease than males.

3. Is knowledge of vaccine recommendations associated with student exposure to various information avenues (operationalized as education assembly, college track, and healthcare provider)? Are student demographic characteristics and beliefs about vaccination associated with knowledge of college vaccine requirements?

    Hypothesis A: Recent healthcare users will know more about college vaccine requirements than other groups.

    Hypothesis B: College preparatory track students will know more about college vaccine requirements than other groups.

    Hypothesis C: Students who saw the educational assembly will know more about college vaccine requirements than those who did not.

4. Are health care provider beliefs about vaccination related to student and parent beliefs about vaccination?

    Hypothesis A: The belief that the healthcare provider advocates vaccination will be correlated with adolescent's individual belief that they should be vaccinated.

    Hypothesis B: Females will believe that their doctor advocates vaccination more than males.

5. Are student demographic characteristics associated with perceived decision making autonomy? Do students perceive that their parents let them make vaccine decisions? If so, who is more likely to believe this?

    Hypothesis: Older students will feel they have more vaccine decision making authority than younger students.

6. Are student demographic characteristics associated with worry about vaccine side effects? Do some groups fear a vaccine side effect?

    Hypothesis A: White students fear a serious side effect less than other students.

    Hypothesis B: Students who pay full price for lunch will fear a serious side effect less than other students.

7. Are student demographic characteristics associated with parent belief that vaccines are dangerous? Do some groups feel a mistrust of medicine (as operationalized by parent belief that vaccines are dangerous?)

    Hypothesis: White students perceive that vaccines are less dangerous than other populations

8. Does attendance at a presentation about vaccination have an effect on beliefs about the meningococcal vaccine and vaccines in general? Does remembering a presentation and video on meningococcal disease have an effect on knowledge and beliefs?

    Hypothesis A: Students who remember the presentation will agree that meningococcal disease is a serious illness more than those who did not see the presentation.

Hypothesis B: Students who remember the presentation will agree that teens and young adults are at risk to catch disease more than those who did not see the presentation.

Hypothesis C: Students who remember the presentation will agree that the meningococcal vaccine is effective more than those who did not see the presentation.

Hypothesis D: Students who remember the presentation will agree that getting a vaccination helps others as well more than those who did not see the presentation.

Chapter II-Review of Literature

Procedures for vaccinating the young and the old have been developed from the beginning of vaccination history because vaccines have been focused and targeted for these age groups. However, this is not the case for adolescents, where, until recently, the lack of new vaccines to administer to this age group has not necessitated a maturing of the vaccination delivery process. The number of vaccines available to adolescents is increasing and has the potential to double in the near future.

Adolescence is a critical time in terms of healthcare contact. Two major United States organizations, the National Immunization Program (NIP) and the Society of Adolescent Medicine (SAM), identified adolescents as a population that should be the focus of disease prevention through vaccination [3, 10]. NIP recognized that adolescents, as a population group, fell short of their immunization goals and programs and processes should evolve to meet this need. Reaching adolescents before the end of high school is important because filling vaccination delinquencies in young adults is more difficult [3]. Rand described that adolescents aged 11 to 14 visited preventive care facilities three times more often than individuals aged 18 to 21 (p-value <0.001) [25]. The immunization policy of the American Academy of Pediatrics (AAP) recognized special care should be given to the poor, members or racial or ethnic communities, and those who live in inner city or rural location, as these groups tend to have lower vaccination coverage [26]. Additionally, SAM recognized that among adolescents, healthcare visits are highest in younger individuals and lowest in older individuals. This is important because without a healthcare visit, vaccinations are unlikely to occur. Importantly, if adolescents are seen by a health provider before the teen years are over they may be eligible for government assistance with the cost of vaccine.

SAM advocates a comprehensive preventive health strategy, utilizing all available methods including vaccination and effective health education [10].

Multifaceted interventions have been successful, especially when modeled after public health theory. In this case, adolescent health behavior was framed within the Health Belief Model. The Health Belief Model presumes that an individual's health related behavior is an interaction of perceived susceptibility and severity of disease, barriers, prevention benefits, self-efficacy, and cues to action [27]. By investigating the problem of low adolescent vaccination coverage rates using a structured approach such as the Health Belief Model, it is more likely that the desired outcome of improved adolescent health will be achieved.

Adolescent Healthcare Use - Precursor to Vaccination

Recent national surveys have described healthcare utilization and vaccination rates in children [5]. The National Center for Health Statistics, a part of the Centers of Disease Control and Prevention (CDC), compiled many of these population-based surveys and gave a more complete picture of vaccination correlates in the United States. Their summaries, of the past decade, identified trends for healthcare utilization for persons with no usual source of healthcare and no healthcare visits, both of which could be considered vaccination barriers with the Health Belief Model.

According to the summaries for the years 2001- 2004, less than 7% of children aged 6-17 years had no usual source of healthcare [5]. In addition, these summaries identified specific pediatric population groups with varying degrees of the barrier to vaccination: lacking a source of healthcare. Disparities between race categories were generally low and amounted to only a few percentage points, except for Asians who had less access. See Table

1. However, when ethnicities were compared, about 4% of non-Hispanics had no usual source of healthcare while Hispanics followed about 10 percentage points behind. Differences were greater when using percent of poverty level income as a classification rather than ethnicity. Of those who had incomes at 200% of poverty level or above, 4% had no usual source of healthcare. Of those below poverty level, 13 to 14% had no usual source of healthcare [5]. These statistics are interesting because most families, regardless of ethnicity, with incomes less than 200% of poverty level can receive low cost medical care through Medicaid or the State Children's Health Insurance Program (SCHIP). Therefore other barriers beyond income level must have affected sources of healthcare in these groups.

Table 1. Percent of children without a usual source of healthcare by demographic group and health insurance status.

Group	Characteristic	2001-2002	2003-2004
All		6.8%	6.4%
Race	White	5.8%	6.1%
	Black	8.0%	7.2%
	Asian	13.2%	9.3%
Ethnicity	Hispanic	16.0%	13.7%
	Non-Hispanic	3.7%	3.9%
Income	Below 100% of poverty level	13.7%	13.1%
	200% of poverty level or above	3.8%	3.5%
Health Insurance	None within the last 12 months	38.1%	38.8%

Adapted from: Centers for Disease Control and Prevention. Health, United States, 2006. Table 76. [5]

In addition to having a source of healthcare, actual visits were also studied. See Table 2. Not visiting a healthcare provider poses another barrier to vaccination, as most vaccination takes place at a healthcare facility. According to the CDC summary from 2001 to 2004, almost 15% of all children had no visit to a healthcare practitioner that year. By race, 14% of Whites, 17% of Blacks or African Americans, and 21% of Asians, Native Hawaiians, or Pacific Islanders had no visit to a healthcare practitioner that year. Differences in healthcare visitation were greater when using percent of poverty level as a classification. About three out of four people who had income at poverty level or lower visited healthcare within the last year, while about seven out of eight people with incomes 200% above poverty level had a healthcare visit.

Table 2. Percent of children without a visit to healthcare by demographic group and health insurance status.

Group	Characteristic	2001-2002	2003-2004
All		14.9%	14.8%
Race	White	13.9%	14.4%
	Black	16.8%	14.8%
	Asian	20.5%	22.2%
Ethnicity	Hispanic	24.0%	24.1%
	Non-Hispanic	13.0%	12.7%
Income	Below 100% of poverty level	21.8%	20.8%
	200% of poverty level or above	11.7%	11.5%
Health Insurance	None within the last 12 months	45.3%	46.0%

Adapted from: Centers for Disease Control and Prevention. Health, United States, 2006. Table 79. [5]

According to CDC data, health insurance status for adolescents was a powerful correlate with healthcare visits within the last year. Almost half of those who did not have health insurance during the previous year did not have a healthcare visit [5]. With the exception of the uninsured, most children had a healthcare visit within the last year. This time spent with the doctor or nurse during one of these visits could be used as a cue to action by recommending vaccination. In addition, discussion between the healthcare provider and the adolescent can be used to increase patient knowledge of susceptibility and severity of vaccine preventable diseases.

Vaccination Goals and Strategies

The scientific and public health communities have evaluated information from vaccination surveys and have set benchmarks to measure improvement and goals achievement. The Healthy People 2010 initiative is a set of goals that are national in scope and set a strategy for “promoting health and preventing illness, disability, and premature death” for all people in the United States [2]. Adolescent vaccine-related 2010 goals include increasing routine vaccination coverage levels of hepatitis B, measles-mumps-rubella (MMR), tetanus-diphtheria-pertussis booster (Tdap), and varicella to 90 percent. At the halfway mark, in 2005, the United States was progressing towards the goal of achieving 90% coverage for hepatitis B and varicella, and had already met the 90% target for MMR and Tdap (Table 3) [28]. Similarly, the goal of NIP is to “increase to 90% routine vaccination coverage levels for adolescents in the United States for each vaccine and [erase disparity by] achieving and sustaining 90% coverage for each racial, ethnic, and socioeconomic group in the United States for all vaccines.” While these goals are lofty, NIP feels they are achievable and can be reached with a mix of traditional and innovative strategies [3].

Table 3. Healthy people 2010 goals, progress, and targets.

Objective	Increase in Vaccination Coverage Levels for Adolescents Aged 13 to 15 Years	1997 baseline	2005 Midcourse status	2010 Target
14-24b.	Adolescents aged 13 to 15 years who receive the recommended vaccines	no data were available to assess progress		
14-27a.	3 or more doses of hepatitis B	48%	Achieved 79% of target	90%
14-27b.	2 or more doses of measles, mumps, rubella	89%	Met target	90%
14-27c.	1 or more doses of tetanus-diphtheria booster	93%	Met target	90%
14-27d.	1 or more doses of varicella (excluding children who have had varicella)	45%	Achieved 71% of target	90%

Adapted from: U.S. Department of Health and Human Services, Healthy People 2010 Midcourse Review: Immunization and Infectious Diseases. [28]

Another strategy used to vaccinate children and adolescents is a school entry law, which requires certain vaccinations before the child can be admitted into school. When placed in the framework of the Health Belief Model, school entry laws create a perceived benefit of vaccination, in that when vaccination requirements are met, adolescents can attend school. The state of Massachusetts passed the first law in 1855 that required smallpox immunization before entry into school. Now, all 50 states have followed Massachusetts' lead and instituted state school entry laws [29]. In Georgia, high school students must have Tdap, hepatitis B, polio, MMR, and varicella vaccinations, or a religious exemption before entrance into school [31]. Students attending any college or university in Georgia are required to have a meningococcal conjugate vaccine, or at least information about meningococcal disease and the vaccination, in addition to the vaccines required in high school [32, 33]. Private colleges and universities must enforce the meningococcal requirements and can enforce other immunization requirements as well if seen fit [31]. Today, as a result of school entry laws, high school age adolescents receive vaccines, such as MMR, Tdap, *Haemophilus influenza* type b (Hib), or hepatitis B, not because they were recommended specifically for their age group, but because they were missed earlier in life. In general, adolescent vaccines are so new that school entry laws have yet to be written and continue to be debated as science continues to determine the vaccine's effectiveness and safety. The American Academy of Family Physicians (AAFP) will recommend a HPV immunization mandate before school admission only after "long term safety with widespread use, stability of supply, and economic issues have been clarified [34]."

Current Vaccines for Adolescents

Currently, three vaccines are recommended by ACIP specifically for high school adolescents. ACIP is a federal advisory committee with members from federal organizations, such as the Department of Defense, Food and Drug Administration (FDA), and National Institutes of Health, and professional organizations such as the AAFP, AAP, American College of Obstetricians and Gynecologists, and the American Medical Association (AMA), among others. ACIP is the only federal organization to make vaccine recommendations in collaboration with numerous external organizations; these recommendations represent broad interests and are considered good standard of care [35].

One of the first vaccines recommended for adolescents was a polysaccharide vaccine to protect against four serogroups of *Neisseria meningitidis*. An updated version of this vaccine, MCV4, protects against four of the most prevalent five serogroups of *N. meningitidis*, A, C, Y, and W-135. In the United States, *N. meningitidis* is the leading cause of bacterial meningitis. Although it is a rare disease with an incidence rate of 0.5 to 1.1 cases per 100,000 people; the case fatality rate was 10 to 14%. Of those that survived invasive meningococcal disease, 11 to 19% had lasting side effects such as neurologic or physical disability [22]. Due to the high morbidity and mortality associated with bacterial meningitis, MCV4 is recommended by ACIP for previously unvaccinated adolescents over 11 and students who will attend colleges or universities [6]. FDA has recently licensed MCV4 for children as young as 2 years of age, although ACIP has not yet discussed recommendations for children under 11 [36].

The vaccination for HPV, the foremost cause of cervical cancer [37], has been a part of the adolescent immunization schedule since 2006 [6], and is recommended by ACIP for women from 9 through 26 years of age [35]. An estimate by Weinstock in 2004 revealed that HPV had the highest incidence of all sexually transmitted diseases in the United States [13, 38-40]. HPV infections can cause genital warts, cervical, or anal cancer [39]. Merck & Co, Inc., the maker of the only HPV vaccination currently licensed and recommended by ACIP, announced that multi-year clinical trials showed 100 percent efficacy in prevention of serogroup specific (6, 11, 16, 18) HPV disease among subjects that received the vaccine exactly as prescribed and who were HPV disease free at the time of vaccination [7]. The HPV vaccine does not, however, offer much protection against cervical cancer in persons who received the vaccine after they were infected with vaccine serogroups of HPV [7]. Despite the efforts of many in public health education, the fact that HPV is a sexually transmitted infection has prevented many parents from accepting the vaccine and consenting to vaccination of their adolescent [19, 41].

Less controversial is the acellular vaccine for prevention of pertussis, more commonly known as whooping cough. This vaccine is given along with a tetanus and diphtheria booster and is recommended for individuals from 10 to 65 years of age [35]. In the United States, from 2001 to 2003, incidence of pertussis increased substantially in the adolescent age group from 5.5 cases to 10.9 cases per 100,000 persons [8, 42]. Waning immunity from the pertussis vaccination given in childhood has been shown to leave individuals less protected from and more likely to catch and spread pertussis [43]. Early pertussis symptoms are similar to a cold but can progress into severe cough, fatigue, and more serious symptoms which can last over a month. Treatment after the first few weeks of disease does little to reduce symptoms so the main strategy for containment is prevention through vaccination [10]. Most importantly, some researchers believe that pertussis could be eliminated through a rigorous adolescent and adult booster vaccination program [43].

Future Vaccines for Adolescents

Two new vaccines, one for HSV2 and another for cytomegalovirus, soon may be available if the FDA finds them safe and effective [11, 12]. The vaccine is currently being tested in a phase III trial to determine its effectiveness. HSV2 can cause painful genital skin lesions and infection is widespread in the United States and globally [13-15]. As with the HPV vaccine, the HSV2 vaccine faces the same sexually-transmitted-infection-vaccine stigma challenges; potential acceptance is currently under study [44, 45].

The CMV vaccine is currently in phase II trials. CMV is a human herpesvirus that is usually harmless to adults but can lead to death, or disability such as vision or hearing loss and mental retardation when passed from mother to baby. Overall yearly prevalence of congenital CMV is 640 cases per 100,000 persons (0.64%) in the United States (40,000 children in the United States) and the rest of the world making a vaccine a strong prevention option [16, 17]. See Table 4 for a summary of current and future vaccine for adolescents.

Barriers to Vaccination

As introduced through discussion of healthcare utilization, barriers to adolescent vaccination exist. Additional reasons for non-vaccination can include an unawareness of the vaccine, its necessity and recommendations, or personal and cultural beliefs against vaccination [38, 46-49]. Adolescents' vaccination behavior is dependant on many individual internal and external factors in addition to those of their parents. Vaccine barriers addressed in this study were framed within the constructs of the Health Belief Model and included non-utilization of healthcare, cost, education of disease risk and recommendations, fear of a side

Table 4. Current and future vaccines for adolescents, disease agent, symptoms, doses needed for full regimen, and private sector cost per dose.

	Vaccine	Abbr.	For Prevention of…	Disease Symptoms	# Doses	$ / Dose
Current Vaccines Recommended by ACIP for Adolescents	Tetravalent Meningococcal Conjugate	MCV4	*Neisseria meningitidis* serogroup A,C, Y, W135	Meningitis, sepsis, pneumonia	1	$89
	Quadrivalent Human papillomavirus	HPV	Human papillomavirus serogroup 6, 11, 16, 18	Cervical dysplasia, genital warts	3	$120
	Pertussis (with a tetanus and diphtheria booster)	Tdap	*Bordetella pertussis*	From cold-like to persistent whooping cough	1	$37
Potential Future Vaccines	Herpes Simplex virus type 2	HSV2	Herpes Simplex virus type 2	Genital skin lesions	--	--
	Cytomegalovirus	CMV	Cytomegalovirus	Mild to disability and death in newborns	--	--

effect, social barriers, and mistrust of medicine. Individual barriers, as well as the cumulative effect of multiple barriers, have the potential to negatively affect self-efficacy, the feeling that the individual has the ability to make a behavioral change that leads to a positive health outcome.

Non-utilization of Healthcare

One formidable barrier to adolescent immunization is non-utilization of preventive (or any) healthcare [10]. Within the framework of the Health Belief Model, if vaccine education occurs during healthcare visits, there is the opportunity to affect perceived susceptibility and severity of disease, and perceived benefits of vaccination. The AMA recommends three visits during adolescence; one early visit for ages 11-14, one middle visit for ages 15-17, and one late visit for ages 18-21 [46]. It is under debate as to what visit adolescent vaccinations should be administered. Current recommendations match potential healthcare visits to utilization patterns accounting for the number of vaccine doses needed to create immunity and reduce carriage. In general, it is thought that vaccines should be administered at the earliest healthcare visit possible to maximize the chance that the adolescent will complete the vaccine series [25]. Early vaccination is better because it also reduces the time period that adolescents could be in contact with infectious diseases through sexual activity or close personal contact.

Utilization often is unequal across races, ethnicity, insurance status, and family income with highest contact among non-Hispanic Whites, those with health insurance and higher income [47]. Within the framework of the Health Belief Model, lack of healthcare utilization reduces potential cues to action, or recommendations about vaccination by a healthcare practitioner. Also, adolescents over 15 years of age were less likely than younger ones to have health insurance, and thus were less likely to receive healthcare [47]. Overall outpatient visits to any healthcare provider decreased in males after age 11 but increased in females. After this age, preventive healthcare visits (well-child visits) to pediatricians or family practice physicians declined sharply for males and slightly less sharply for females [25]. The increases in outpatient visits and less sharp decrease in well-child visits in females were due to an increase in visits to obstetrician/gynecologist physicians during this age. Reasons why adolescents do not visit a healthcare practitioner may include a lack of health insurance, no geographic access, perceived good health, rejection of the type of care offered, or cost [25].

Cost

Many vaccines are expensive, some over one hundred dollars a dose [48]. When multiple doses of these vaccines are needed, such as with the three dose series HPV vaccine, cost can become a major barrier. Within the Health Belief Model, perception of inability to pay for vaccines will reduce the likelihood that vaccination will occur. The entire cost of childhood immunization could be over $700 [49]. Cost as a barrier also extends beyond the retail price of vaccine. The cost of missed working hours for the parent, or transportations costs to and from the doctor also must be considered. This problem is compounded by the fact that many adolescents do not have private health insurance, or alternatively, do not take advantage of public programs such as Medicaid, SCHIP, or the Vaccines for Children (VFC) program. Medicaid and SCHIP are federally mandated programs but allow individual states to set their own guidelines and eligibility criteria while meeting certain minimum requirements.

To reduce cost as a barrier, state Medicaid programs attempt to offset the cost of health services by offering healthcare and vaccination services to children under 6 years of age whose family is living at or below 133% of the poverty level, and to children from 6 to 19 years of age who are at 100% of poverty level, including children in other categories such as the medically needy [50]. Even though the cost of insurance is covered through one of the aforementioned programs, persons with income <100% of poverty level are least likely to use preventive care, so other components of cost (lost wages, transportation) may need to be considered [51]. SCHIP offers services to children up to age 19 with a family income above that which would include them in Medicaid but below an income that would allow them to afford private medical insurance. SCHIP benefits include healthcare and vaccinations for enrolled children [50].

In addition to government programs that attempt to provide general healthcare for low income or medically needy populations, the VFC program attempts to lessen the cost barrier for vaccines specifically. VFC provides free vaccines to public and private providers by purchasing large amounts of vaccine, giving that vaccine to providers at no cost who in turn administer them to qualifying children less than 19 years of age for free or at low cost [52]. In Georgia, VFC eligibility includes children that are uninsured, underinsured (i.e. vaccinations are not covered by private insurance), American Indian or Alaska Native, or Medicaid-eligible. In Georgia, costs to the patient may not exceed $14.81 per injection plus an optional office visit fee that can vary by provider [53]. The idea behind VFC is to prevent private providers from sending un- or underinsured children to other facilities to receive free vaccine by shifting the cost from private providers to the government so that the patient can be seen by their provider of choice. Interestingly, children who are eligible for the VFC can often receive vaccines more easily than children with private insurance. This is because healthcare offices that participate in the VFC program get VFC vaccines for free for VFC qualifying children; for non-VFC children, healthcare providers have to buy them up front and wait for reimbursement from their patient's private insurer. This up front cost and associated financial risk is often large and limits availability of vaccines for non-VFC children [54].

These federally funded and mandated programs provide a framework that provides necessary healthcare services to those who might not otherwise be able to afford them, helping to remove cost as a barrier to vaccination. However, their federal funding can be their fundamental flaw. If for some reason the executive or legislative branches of government do not come to an agreement on funding or management of the programs, the healthcare benefits for the children and adolescents they are designed to serve may cease rendering these children without healthcare [49].

Lack of Education

Lack of education of the need for vaccinations represents another barrier to vaccination. Keeping within the framework of the Health Belief Model, vaccine education can contribute to an individual's perceived severity and susceptibility which could lead to vaccination. A survey of physicians noted that about half to two-thirds of adolescents were not aware of the need for vaccinations. Also, half of physicians responded that the adolescent's underestimation of the risks of vaccine preventable disease is the primary barrier of vaccination [55]. General education level of the parents of adolescents played a role in whether or not their adolescent gets vaccinated. If an adolescent's parent was without a high school degree, the child was half as likely as other adolescents to utilize healthcare and thus have an opportunity for vaccination [51]. Herd immunity is the ability of a vaccine to protect close contacts, such as friends and relatives, because of the reduced risk of transmission of the disease from the vaccinated person and is an added perceived benefit of vaccination. Without this knowledge, one might not feel vaccinations are as important.

Often the timing of vaccination is important. Adolescents and adults need to be made aware that the HPV vaccine is most effective before exposure to HPV, which often comes shortly after the onset of sexual activity [45]. Physicians, parents, and adolescents must learn about what vaccinations are needed at what specific time or age for the greatest chances of vaccination and disease prevention [4].

A perceived barrier to vaccination was the risk of adverse events that was often associated with vaccinations [4]. Recently, questions had arisen concerning the safety of vaccines. An internet search on “vaccination” yielded results from CDC and NIP as well as anti-vaccine groups that propagated misconceptions and misinformation about vaccines. Parents have reported feelings that children received more vaccines than were good for them, or that vaccines weaken the immune system [56]. Common vaccine side effects were redness, swelling, or soreness at the injection site. More serious reactions do occur but were rare, such as the increased risk of Guillain-Barré syndrome amongst MCV4 recipients [57]. Knowledge of the real risk a vaccine poses to the adolescent is often not relayed by a reputable source. Parents and adolescents must be educated that for ACIP to recommend a vaccine, the risk of acquiring the disease must greatly outweigh the risk of a vaccine related adverse event.

Vaccine acceptance can be hindered by social barriers. One issue that arises during adolescents is sexual intercourse. HPV, HSV2, and to a small extent, CMV are spread sexually. Parents often take strong and diverse stances on the issue. The views of parents fit within the framework of the Health Belief Model in that rejection of vaccine creates barriers while perceived benefits of vaccination make vaccination more likely in their adolescent. Due to the association of HPV as a sexually transmitted infection, parents may have felt that accepting the vaccine is tantamount to accepting or promoting risky sexual behaviors [38]. While some parents accepted these vaccines as a result of a desire to protect children, other parents had the perception that their child was not susceptible to acquiring these diseases. However, the desire to protect usually took precedence [45]. One study showed that written parent educational materials on the risks of HPV improved knowledge of the disease but were not enough to convince the parent to accept child vaccination [58]. This finding was opposed in another study [59], implying that reason does not always affect health decisions. Parental consent is required for most vaccinations, thus parental attitude toward vaccines is a strong determinant of child vaccination. Additionally, parental attitude toward vaccination was a strong predictor of adolescent attitudes [45].

Additional social barriers included a distrust of medicine or medical technology [60] and these concerns seemed to vary between racial and ethnic groups. Within the Health Belief Model, this distrust is a barrier to vaccination. Focus groups with African American participants have uncovered concerns such as ingredients of the vaccination, un-consented experimentation, rushed medical visits coupled with a long wait at healthcare facilities, poor treatment in general, and a healthcare provider who was not easy to talk to [21, 60, 61]. Hispanic parents were concerned about vaccine ingredients more than White parents. African Americans were more likely than Whites to cite vaccination as a high level concern and did not think their health care provider always acted in the adolescent's best interest [21, 56]. The communication with the healthcare practitioner necessary to help solve these issues can be absent or difficult for the uneducated as well as the poor, who may have less continuity with providers [21].

In addition to vaccine acceptability, feelings of invincibility may influence vaccine coverage rates. Adolescents may have low perceived susceptibility towards disease, and many think that people in general might acquire a disease but just not them. Feelings of invulnerability also can extend to contained communities, religious or otherwise. These communities with little contact with the outside world may or may not advocate vaccination to their residents because they do not feel like disease is a risk to them. These feelings remain despite periodic outbreaks of vaccine preventable disease inside and outside of these communities [9, 61, 62]. Moreover, laws exist that allow people to avoid legally mandated vaccinations on religious or moral grounds.

Of those that have nothing against vaccinations but just don't know about vaccines or recommendations, one of the most cited reasons for not knowing about a recommended vaccination was lack of physician advisement on the issue [55]. There were many additional vaccine delivery factors that determined adolescent immunization. One of the first was optimizing the immunization schedule to advise when adolescents should be vaccinated. This decision took into account assuring vaccination before exposure and adolescent healthcare visit feasibility considering cost and needed immune response [3].

Many of these barriers have simple solutions, while others are complex. Some straightforward barriers can be remedied through education. Many of the other complex barriers to vaccination are the same as those that are at the root of social disparities. As framed in the Health Belief Model, one should not view barriers as independent, but instead as components that converge to yield the final decision to vaccinate or not. As measured by progress toward meeting the Healthy People 2010 goals, improvement is occurring. To ensure that vaccine coverage disparities do not exist and universal coverage is achieved, the solutions to these barriers put forth by experts must be put into action and tailored to meet the lifestyle of adolescents, where possible. Understanding the vaccination knowledge, attitudes, and beliefs of the adolescent population is critical to overcoming these barriers and improve vaccination process. Focusing on issues that impact adolescent's perceived susceptibility and severity of vaccine preventable disease as well as adolescent's perceived benefits and barriers to vaccines are critically important as the list of vaccines for this age group expands.

Chapter III-Methods and Procedures

Study Population

The study population included adolescents that were students in grades 9 through 12 during the first week of May, 2007 from the four Douglas County, Georgia public high schools. Douglas County had an estimated overall population of 119,557 persons in 2006 and is a part of the Atlanta Metropolitan Statistical Area. In 2005, 60.8% of the Douglas County population were White non-Hispanic, 31.6% were Black, 4.9% were Hispanic, and 1.3% were Asian. The last recorded median household income was $49,964 in 2005. These population statistics closely approximated those of Georgia as a whole [62]. Three of the schools, Alexander, Douglas County, and Lithia Springs, were within two miles of the I-20 corridor, while the fourth school, Chapel Hill was within four miles. See Figure 1 for a map of Douglas County, Georgia.

Figure 1. Map of Douglas County, GA. B-Douglas County HS, C-Alexander HS, E-Chapel Hill HS, G-Lithia Springs HS. ©2007 Google Map.

The Douglas County School system student population was unique from other metro Atlanta school systems because they had an opportunity to participate in a study concerning the serogroup specific effectiveness of MCV4, the tetravalent meningococcal conjugate vaccine produced by Sanofi Pasteur (hereafter the MCV study). The study's purpose was to compare differences in serogroup-specific carriage of *N. meningitidis* between control and intervention schools (initially vaccinated and unvaccinated) to determine MCV4 vaccine effect on carriage. This study occurred from October 2006 to March 2007 on school grounds and involved about 25% of Douglas County High school students. Informational posters and announcements were present in each school involved. During the recruitment phase of that study, students also received education on meningococcal disease through an assembly style presentation. The education that most students received was framed in the Health Belief Model and could have affected the knowledge and beliefs studied in this research since this research occurred at the end of the school year.

The MCV study was a result of a collaboration of the Division of Public Health of DHR, CDC, and the Douglas County, Georgia school system. It was undertaken to evaluate the effect of MCV4 on serogroup-specific carriage of *N. meningitidis*. After an educational assembly on meningococcal disease, about one quarter of the student body decided to participate in the MCV study, which involved three throat swabs to culture *N. meningitidis*, and MCV4 vaccination if they had not been vaccinated previously. Students were paid $10 for each of the three swab sessions for that study. The study involved interaction with over 1800 volunteer student participants from four diverse high schools in Douglas County during three study days, once in October 2006, once in January 2007, and once in April 2007.

Research Design

For this study, a cross section of adolescent students were surveyed during the first week of May 2007 during a classroom, homeroom, or advisement type session to gain an understanding of characteristics that may be associated with vaccination rates and explore factors contributing to acceptance of vaccines and the knowledge, attitudes, and beliefs regarding vaccination. The survey questions fell into two main categories: questions concerning meningococcal disease and the meningococcal vaccine, and questions about vaccines in general. The meningococcal related questions concerned disease risk, vaccine effectiveness, recommendations, and other questions that related to the education received earlier at the school during the MCV study. The general vaccine questions asked about internal feelings and external influences that may affect the decision for an adolescent to receive a vaccine. The survey consisted of 22 Likert-style questions, one yes/no/don't know question, and one question on years since the most recent healthcare visit. Additionally, basic demographic information was collected. The survey responses and other vaccine information gained from the MCV study were compared to demographic indicators such as race/ethnicity, college track, and participation in free or reduced lunch. The race/ethnicity indicator was used to determine differences in vaccination beliefs in race and ethnicity categories. The college track variable was used to determine differences in students that did and did not plan on attending secondary education, and was used as a weak social status indicator. The free or reduced lunch variable was a direct measure of economic status and was used to determine differences in vaccine beliefs in students from families that did and did not have low income. Questions on topics that approximate the barriers and facilitators of vaccination were treated as dependant variables. These included years since last healthcare contact, perceived risk and severity, and adolescent decision-making capability. Independent variables included race, ethnicity, gender, age, participation in free or reduced lunch, degree program, and others. The survey was developed by the author and reviewed by members of the Georgia Department of Human Resources (DHR) epidemiology branch notifiable disease section, with a final review by Walter Orenstein, MD. The survey as it was administered to students can be viewed in Appendix A.

Data Collection

Data for this thesis project came from the survey just described and secondary (MCV study) data from the same student population with individual level student administrative information, such as race/ethnicity, degree track, and free or reduced lunch status. To facilitate survey delivery by classroom teachers, packets for every classroom of each school were compiled. These packets contained an instruction sheet for the administrators. For each student, the packets contained a parent information sheet which was designed to go home with the student to inform the parents of the study, a student assent form, a survey, and a Pearson NCS answer sheet. Every student in Alexander, Chapel Hill, and Douglas County high schools had an opportunity to complete a survey. Lithia Springs High School surveyed only MCV study students. Once the surveys were administered, the answer sheets were collected and the student assent form went home with the student. The answer sheets were scanned by the Georgia State University Testing Office and converted to a text file. These files were then imported into a Microsoft Access database to be merged with other data sources.

With the consent of school authorities, survey responses were merged with student race/ethnicity, degree track, and participation in free or reduced lunch information collected at the board of education, and the database was anonymised. Student records used for analysis were those that matched successfully based on first name, last name, birthdate, and school. To assure student confidentiality, the match occurred on the Douglas County Board of Education premises and student personal identifiers name and birthdate were deleted before leaving, but after birthdate was replaced by age at the time of the survey for all students.

DHR and CDC have agreed that data from this study can be used for thesis purposes. This study was approved by the Georgia State University and DHR Institutional Review Boards numbers HO7311 and 060702, respectively. Clearance to administer the survey from the Douglas County school system's office of the superintendent followed the approval of a Family Educational Rights and Privacy Act (FERPA) compliant student confidentiality plan.

Statistical Analysis

Most survey answer choices used for this study were ordinal, with the exception of the question: "how many years has it been since you went to the healthcare provider (out side school) for a checkup," which was considered interval scale. These responses were stratified against demographic measures such as student age, an interval measure, and other nominal measures, such as sex, race/ethnicity, degree track, and lunch payment status to test for statistical difference.

Chi square (χ^2) analysis was used to measure the difference in the dispersion of responses for ordinal data such as sex or lunch payment status and nominal or ordinal data. The one way analysis of variance (ANOVA) was used to measure differences in ordinal categories against interval measures, such as age. The Mann-Whitney U and the Wilcoxon

Signed Ranks are nonparametric tests that determine the magnitude of the difference between two populations using ranks instead of normal parameters. The Mann-Whitney U test was used to determine differences in the median values of categorical survey responses, such as vaccine related beliefs, against a dichotomous variable, such as viewing a presentation or not. The Wilcoxon Signed Ranks Test was used to determine differences in survey responses between paired groups of questions for a related sample, such as disease risk with and without vaccination. The Pearson correlation coefficient was used to determine association between vaccine-related beliefs, such as the correlation between parent and doctor beliefs.

Data Management

In the Douglas county school system administrative records, race and ethnicity were recorded in a single variable. Valid values included Asian, Black, Hispanic, Multiracial, and White. For this analysis, this grouping was separated. Race categories were considered White and all others. Ethnicity categories were considered Hispanic and all others. Degree track programs included a college preparatory track, a technical/career oriented track, and both college preparatory and technical/career oriented option. In results tables, these divisions were named: College Prep, Technical/Career, and Both. Please see Appendix A. for all questions asked.

Research Questions and Hypotheses

The main goal of this research was to determine population groups that may need extra emphasis and attention to reach vaccination goals and identify avenues to reach them using applicable constructs of the Health Belief Model. Answering the research questions could inform decision makers of potential solutions to improve adolescent vaccination rates.

1. Healthcare Contact

How do students who have been to a health provider within the past two years differ from those who have not with respect to demographic characteristics and beliefs /attitudes about vaccination?

Hypothesis A: A higher percentage of students who pay full price for lunch compared to those who qualify for free or reduced lunch will have had at least one visit to a healthcare provider in the past two years.

Hypothesis B: A higher percentage of female students compared to male students will have had at least one visit to a healthcare provider in the past two years.

2. Perceived Disease Risk

Are student demographic characteristics and beliefs about vaccination associated with perceived risk? Will different groups have varying perceptions of disease risk?

Hypothesis A: College preparatory track students will perceive a higher risk for meningococcal disease than technical/career track students.

Hypothesis B: Female students will perceive a higher risk for meningococcal disease than male students.

Hypothesis C: Individuals will perceive a higher risk for meningococcal disease for teens in general than for their own individual risk.

3. Knowledge of Recommendations

Is knowledge of vaccine recommendations associated with student exposure to various information avenues (as operationalized as education assembly, college track, and healthcare provider)? Are student demographic characteristics and beliefs about vaccination associated with knowledge of college vaccine requirements?

Hypothesis A: Recent healthcare users will know more about college vaccine requirements than non healthcare users.

Hypothesis B: College preparatory track students will know more about college vaccine requirements than students on the technical/career degree track.

Hypothesis C: Students who saw the educational assembly will know more about college vaccine requirements than those who did not see the assembly.

4. **Effect of the Healthcare Practitioner, Parent, and Individual's Beliefs**

Are health care provider beliefs about vaccination related to student and parent beliefs about vaccination? Do the beliefs of others impact the beliefs of the adolescent?

Hypothesis A: The belief that the healthcare provider advocates vaccination will be correlated with adolescent's individual belief that they should be vaccinated.

Hypothesis B: Females will believe that their doctor advocates vaccination more than males.

5. **Who Makes Vaccine Decisions**?

Are student demographic characteristics associated with perceived decision making autonomy? Do students perceive that their parents let them make vaccine decisions? If so, who is more likely to believe this?

Hypothesis: Older students will feel they have more vaccine decision making authority than younger students.

6. Vaccine Related Injury

Are student demographic characteristics associated with worry about vaccine side effects? Do some groups fear a vaccine side effect?

Hypothesis A: White students fear a serious side effect less than students of other races.

Hypothesis B: Students who pay full price for lunch will fear a serious side effect less than students that qualify for free or reduced lunch.

7. **Mistrust of Medicine and Providers**

Are student demographic characteristics associated with parent belief that vaccines are dangerous? Do some groups feel a mistrust of medicine (as operationalized by parent belief that vaccines are dangerous?)

Hypothesis: White students perceive that vaccines are less dangerous than students of other races.

8. Benefit of Education via Assembly and Movie

Does attendance at an oral and video presentation about vaccination have an effect on beliefs about the meningococcal vaccine and vaccines in general? Does remembering a presentation and video on meningococcal disease have an effect on knowledge and beliefs?

Hypothesis A: Students who remember the presentation will agree that meningococcal disease is a serious illness more than those who did not see the presentation.

Hypothesis B: Students who remember the presentation will agree that teens and young adults are at risk to catch disease more than those who did not see the presentation.

Hypothesis C: Students who remember the presentation will agree that the meningococcal vaccine is effective more than those who did not see the presentation.

Hypothesis D: Students who remember the presentation will agree that getting a vaccination helps others as well more than those who did not see the presentation.

Chapter IV-Results

At the time the survey was delivered, 7349 students attended Alexander, Chapel Hill, Douglas County, and Lithia Springs High Schools, according to the Douglas County Board of Education Administrative records. Of these students, 1629 (22%) completed a survey. Of those who completed a survey, 1392 (85%) were able to be matched by name, grade, school, and date of birth with school administrative records. At Lithia Springs High School, only students involved in the MCV study were sampled. These students were excluded thereby reducing the total number of participants to 1368. For reference, Alexander, Chapel Hill, Douglas County, and Lithia Springs High School students that took the survey and were also a part of the MCV study numbered: 215, 100, 93, and 24, respectively. See Table 5 for a description of the student sample.

Table 5. Description of the student sample.

Characteristic		n	%
All		1368	100.0
Sex	Male	605	44.2
	Female	763	55.8
Lunch Payment	Full pay	860	62.9
	Reduced	122	8.9
	Free	386	28.2
Ethnicity	Hispanic	67	4.9
	Non-Hispanic	1301	95.1
Race	White	744	54.4
	Other	624	45.6
Degree track	College Prep	1223	89.8
	Both	98	7.2
	Technical/Career	41	3.0
Saw Presentation	Saw	925	67.6
	Missed	245	17.9
	Excluded/ Don't Know	198	14.5
Mean (median) age		1368	16.5 (16)

Healthcare Contact

Students were asked: "how many years has it been since you went to a healthcare provider (outside school) for a checkup?" As noted in Table 6, four out of five (80.4%) students visited a healthcare provider within last two years, the same time span as the healthcare visit schedule recommended by AAP and SAM. The results varied based on demographics and potential influences. Within the last two years, more females than males visited a healthcare provider, 84.3% versus 75.5%, respectively (p-value <0.001). More students who paid full price for lunch had visited a healthcare provider more frequently than students with reduced or free lunch, 83.1% versus 71.6% and 77.0%, respectively, (p-value 0.003). It was slightly more likely for White and Hispanic students to visit healthcare more recently, (p-values 0.02 and 0.03).

Table 6. Differences in demographic characteristics between students that had and had not visited a healthcare provider within the last two years. Chi-square tests were performed unless otherwise specified.

		n	% <2 year	% > 2 year	χ^2	p-value
All		1261	80.4	19.6		
Sex	Male	556	75.5	24.5	15.0	<0.001
	Female	705	84.3	15.7		
Lunch Payment	Full pay	804	83.1	16.9	11.6	0.003
	Reduced	109	71.6	28.4		
	Free	348	77.0	23.0		
Ethnicity	Hispanic	66	90.9	9.1	4.9	0.03
	Non-Hispanic	1195	79.8	20.2		
Race	White	695	82.9	17.1	6.0	0.02
	Other	566	77.4	22.6		
Degree track	College Prep	1125	80.6	19.4	0.43	0.8
	Both	97	79.4	20.6		
	Technical/Career	34	76.5	23.5		
Age[#]		1261	16.6	16.6		0.7

[#]Mean age. T-test performed

Students who visited healthcare within the last two years agreed more often that "Regardless of what others say, I think I should be vaccinated" (p-value <0.001). Students who disagreed that their parents think vaccines are dangerous visited healthcare more recently (p-value <0.001). Recent healthcare users agreed more than less recent users that "My parents / guardians want me to receive all recommended vaccines" (p-value <0.001). See Table 7 for full results.

Table 7. The effect of a recent healthcare visit on vaccine-related beliefs. Mann-Whitney U test was used to determine differences in beliefs between students who had and had not visited the Healthcare provider in the last two years.

Question*	<2 year		>2 year		p-value
	Median response	Mean	Median response	Mean	
Regardless of what others say, I think I should be vaccinated	2-Agree	2.21	3-Uncertain	2.55	<0.001
My doctor / healthcare provider thinks I should be vaccinated	3-Uncertain	2.35	3-Uncertain	2.67	<0.001
My parents / guardians think vaccines are dangerous	4-Disagree	3.79	3-Uncertain	3.37	<0.001
My parents / guardians want me to receive all recommended vaccines	2-Agree	2.12	3-Uncertain	2.38	<0.001
My parents / guardians let me decide if I should be vaccinated	3-Uncertain	2.96	3-Uncertain	2.96	0.9
The meningococcal vaccine is recommended for students who plan to go to college	2-Agree	1.98	2-Agree	2.26	<0.001
The meningococcal vaccine is required for students who plan to go to college	2-Agree	2.24	2-Agree	2.40	0.04

*Valid responses: 1-Strongly Agree, 2-Agree, 3-Uncertain, 4-Disagree, 5-Strongly Disagree.

Disease Perceived Risk

Overall, most students strongly agreed that meningococcal disease was a serious illness (61.4%). Females, more often than males, strongly agreed that meningococcal disease was serious, and that teenagers, young adults and they themselves were at risk (p-value <0.001, for all). Students who agreed that teenagers were at risk also tended to be younger than those who did not (p-value 0.03). Technical/career degree seekers strongly agreed less than college preparatory degree track students about disease risk, but these values failed to reach significance (p-value <0.35). See Tables 8 and 9.

Table 8. Differences in demographic characteristics between students and their belief that meningococcal disease is a serious illness.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		61.4	24.4	12.4	1.2	0.5		
Sex	Male	53.0	27.9	16.3	1.8	1.0	39.1	<0.001
	Female	68.1	21.8	9.4	0.7	0.1		
Lunch Payment	Full pay	61.2	25.8	11.5	0.9	0.6	6.7	0.6
	Reduced	61.5	20.5	15.6	2.5	0.0		
	Free	62.0	22.7	13.5	1.3	0.5		
Ethnicity	Hispanic	53.0	31.8	15.2	0.0	0.0	3.9	0.4
	Non-Hispanic	61.9	24.1	12.3	1.2	0.5		
Race	White	61.7	25.8	10.6	1.4	0.5	6.2	0.2
	Other	61.1	22.8	14.6	1.0	0.5		
Degree track	College Prep	61.9	24.2	12.3	1.1	0.6	12.0	0.2
	Both	66.0	21.6	11.3	1.0	0.0		
	Technical/ Career	42.5	37.5	15.0	5.0	0.0		
Mean Age		16.6	16.5	16.4	17.1	16.6	1.6*	0.7

*F statistic

Table 9. Differences in demographic characteristics between students and their belief that teenagers are at risk to catch meningococcal disease.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		40.1	42.0	15.2	2.1	0.5		
Sex	Male	31.7	43.9	20.3	3.5	0.7	47.7	<0.001
	Female	46.8	40.6	11.2	1.1	0.4		
Lunch Payment	Full pay	41.6	41.9	14.1	2.0	0.5	11.4	0.2
	Reduced	28.7	50.8	18.9	1.6	0.0		
	Free	40.4	39.6	16.6	2.6	0.8		
Ethnicity	Hispanic	31.8	47.0	21.2	0.0	0.0	5.1	0.3
	Non-Hispanic	40.5	41.8	14.9	2.3	0.5		
Race	White	41.7	42.8	13.4	1.8	0.4	6.3	0.2
	Other	38.2	41.1	17.4	2.6	0.7		
Degree track	College Prep	39.9	42.6	14.9	2.1	0.5	11.4	0.2
	Both	47.4	37.1	14.4	1.0	0.0		
	Technical/ Career	30.0	37.5	25.0	5.0	2.5		
Mean Age		16.7	16.5	16.4	16.6	16.2	2.5*	0.03

*F statistic

Most students understood that their risk for meningococcal disease decreases if they received the vaccine. This was shown in two sets of questions in this study: “with and without the meningococcal vaccine, I am still at risk to catch meningococcal disease” [valid answers strongly agree to strongly disagree] and “with and without the meningococcal vaccine, my risk to catch meningococcal disease is…”[valid answers very high to very low]. For each set of questions the median response was one to two units, respectively, in the lower risk direction for persons who have been vaccinated (p-value <0.001, for both). See Table 10.

Table 10. Perceived efficacy of vaccination. Wilcoxon Signed Ranks Test.

	Question	Median	Mean	p-value
Pair 1*	Without the meningococcal vaccine, I am at risk to catch meningococcal disease	2-Agree	1.98	<0.001
	If I get the meningococcal vaccine, I am at risk to catch meningococcal disease	3-Uncertain	2.91	
Pair 2#	Without the meningococcal vaccine, my risk to catch meningococcal disease is:	2-High	2.37	<0.001
	If I get the meningococcal vaccine, my risk to catch meningococcal disease is:	4-Low	3.65	

*Valid responses for pair 1: Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree.
Valid responses for pair 2: Very High, High, Uncertain, Low, Very Low.

Knowledge of Recommendations

In Georgia, all colleges require that students living in campus housing receive the meningococcal vaccine or at least receive information about meningococcal disease. In general, most students strongly agreed or agreed that the meningococcal vaccine was recommended (68.9%); fewer agreed that it was required (55.4%). Females strongly agreed or agreed more than males on the presence of a recommendation or requirement (72.8% versus 64.0%, p-value <0.001 and 59.4% versus 50.1%, p-value 0.004, respectively). A decreasing trend in recommendation agreement was evident with decreasing income (as represented by lunch payment amount). Those who agreed about a recommendation were more frequently White (p-value 0.01). Students in the college preparatory degree track had greater agreement of the presence of recommendations or requirements than technical/career degree seekers (40.2% versus 30.0%), but this was not significant. See Tables 11 and 12.

Table 11. Differences in demographic characteristics between students and their knowledge that the meningococcal vaccine is required for students who plan to go to college.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		33.3	22.1	31.9	9.0	3.7		
Sex	Male	28.0	22.1	35.1	10.4	4.4	15.6	0.004
	Female	37.4	22.0	29.4	8.0	3.2		
Lunch Payment	Full pay	35.5	22.1	30.9	8.4	3.2	15.2	0.06
	Reduced	23.8	30.3	34.4	8.2	3.3		
	Free	31.4	19.3	33.5	10.8	5.0		
Ethnicity	Hispanic	34.8	19.7	30.3	13.6	1.5	2.8	0.6
	Non-Hispanic	33.2	22.2	32.0	8.8	3.8		
Race	White	34.1	22.2	30.2	9.3	4.2	3.1	0.5
	Other	32.2	22.0	34.0	8.8	3.1		
Degree track	College Prep	32.6	21.6	32.9	9.1	3.7	13.1	0.1
	Both	43.3	27.8	18.6	8.2	2.1		
	Technical/ Career	30.0	22.5	32.5	7.5	7.5		
Mean Age		16.7	16.6	16.5	16.4	6.3	3.4*	0.008

*F statistic

Table 12. Differences in demographic characteristics between students and their knowledge that the meningococcal vaccine is recommended for students who plan to go to college.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		40.2	28.7	21.1	5.8	4.3		
Sex	Male	34.6	29.4	25.5	6.9	3.7	21.7	<0.001
	Female	44.6	28.2	17.5	4.9	4.8		
Lunch Payment	Full pay	43.0	29.9	18.1	4.9	4.0	22.7	0.004
	Reduced	38.5	30.3	23.0	5.7	2.5		
	Free	34.4	25.4	27.0	7.7	5.6		
Ethnicity	Hispanic	36.4	40.9	18.2	1.5	3.0	6.6	0.2
	Non-Hispanic	40.4	28.1	21.2	6.0	4.4		
Race	White	42.3	29.7	18.0	5.0	5.0	13.2	0.01
	Other	37.6	27.5	24.8	6.7	3.4		
Degree track	College Prep	40.2	28.6	21.6	5.6	4.0	11.8	0.2
	Both	45.9	28.6	11.2	6.1	8.2		
	Technical/ Career	30.0	30.0	30.0	5.0	5.0		
Mean Age		16.7	16.5	16.4	16.3	16.7	5.4*	<0.001

*F statistic

Effect of the Healthcare Practitioner, Parent, and Individual's Beliefs

It is assumed that a doctor's advice has an impact on patients. More females than males felt that their doctor thinks they should be vaccinated (p-value 0.004). With race and degree track, differences in the dispersion of values were significant, but the values did not follow a discernable trend. See Table 13.

Table 13. Differences in demographic characteristics between students and their belief that their doctor thinks that they should be vaccinated.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		22.3	22.8	47.6	4.6	2.8		
Sex	Male	18.5	21.0	51.9	5.1	3.6	15.6	0.004
	Female	25.4	24.2	44.2	4.1	2.1		
Lunch Payment	Full pay	23.9	23.6	45.9	4.3	2.4	8.0	0.4
	Reduced	16.1	23.7	52.5	5.1	2.5		
	Free	20.7	20.7	49.7	5.1	3.7		
Ethnicity	Hispanic	21.2	28.8	45.5	3.0	1.5	1.9	0.7
	Non-Hispanic	22.4	22.5	47.7	4.6	2.8		
Race	White	25.6	23.8	44.3	3.4	2.9	17.1	0.002
	Other	18.3	21.5	51.6	6.0	2.6		
Degree track	College Prep	21.5	22.5	48.8	4.5	2.7	23.8	0.002
	Both	35.1	27.8	30.9	2.1	4.1		
	Technical/ Career	15.4	17.9	51.3	12.8	2.6		
Mean Age		16.8	16.5	16.5	16.7	16.9	4.9*	0.001

*F statistic

Also, the belief that their doctor thinks they should be vaccinated was correlated significantly with agreement that the individual student should be vaccinated (0.34, p-value <0.001). The belief of the doctors also significantly correlated with the belief that their parents think the students should be vaccinated (0.39, p-value <0.001). See Table 14 for full results.

Table 14. Correlation of the student's belief that their doctor thinks that they should be vaccinated and other individual beliefs. Pearson correlation coefficient was used

Question*	Pearson correlation coefficient	P-value
Regardless of what others say, I think I should be vaccinated	0.34	<0.001
My parents / guardians want me to receive all recommended vaccines	0.39	<0.001
My parents / guardians think vaccines are dangerous	-0.20	<0.001

*Valid responses: Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree.

The majority of students (60.2%) strongly agreed or agreed that they should be vaccinated, regardless of what others say. Conversely, 11.6% disagreed or strongly disagreed that they should be vaccinated. See Table 15. Similarly, 61.3% of students strongly agreed or agreed that their parents think the students should be vaccinated. 10.1% of students disagreed or strongly disagreed that they think their parents want them vaccinated. See Table 16.

Table 15. Differences in demographic characteristics between students and their belief that they should be vaccinated, regardless of what others say.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		26.5	33.7	28.2	8.3	3.3		
Sex	Male	21.6	34.5	31.3	8.8	3.7	14.5	0.006
	Female	30.4	33.0	25.7	7.9	2.9		
Lunch Payment	Full pay	27.3	34.2	26.5	8.4	3.4	5.8	0.7
	Reduced	21.2	38.1	29.7	7.6	3.4		
	Free	26.4	30.9	31.5	8.3	2.9		
Ethnicity	Hispanic	18.2	56.1	18.2	7.6	0.0	17.0	0.002
	Non-Hispanic	27.0	32.5	28.7	8.4	3.5		
Race	White	27.4	34.1	26.0	8.6	4.0	5.6	0.2
	Other	25.5	33.2	30.8	8.0	2.5		
Degree track	College Prep	25.4	34.3	28.3	8.5	3.4	13.0	0.1
	Both	41.2	27.8	23.7	5.2	2.1		
	Technical/ Career	25.6	28.2	33.3	10.3	2.6		
Mean Age		16.7	16.6	16.5	16.5	16.3	2.0*	0.9

*F statistic

Table 16. Differences in demographic characteristics between students and their belief that their parents think that they should be vaccinated.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		34.0	27.3	28.6	7.6	2.5		
Sex	Male	28.9	26.9	32.8	8.1	3.4	17.9	0.001
	Female	37.9	27.7	25.3	7.2	1.9		
Lunch Payment	Full pay	35.2	28.5	26.6	7.6	2.1	7.1	0.5
	Reduced	30.6	27.3	31.4	7.4	3.3		
	Free	32.2	24.7	32.2	7.7	3.2		
Ethnicity	Hispanic	40.9	31.8	25.8	1.5	0.0	6.8	0.1
	Non-Hispanic	33.6	27.1	28.7	7.9	2.7		
Race	White	34.8	29.8	25.8	7.5	2.2	9.1	0.06
	Other	32.9	24.4	32.0	7.7	3.0		
Degree track	College Prep	32.7	27.3	29.7	7.9	2.3	29.5	<0.001
	Both	52.6	27.8	10.3	4.1	5.2		
	Technical/ Career	27.5	22.5	40.0	7.5	2.5		
Mean Age		16.7	16.5	16.4	16.3	16.9	5.2*	<0.001

*F statistic

Who Makes Vaccine Decisions?

While parents need to give permission for adolescents under age 18 to receive vaccines, in general, adolescents have an opinion on the matter. In the survey population, almost 40% of students agreed or strongly agreed that their parents let them decide if they should be vaccinated. As Figure 2 shows, agreement increased with age, until age 19. The mean age of students who agreed that they have decision making authority was greater than for those that do not (F statistic p-value <0.001). Over half of students on the technical/career degree track agreed that they had vaccination decision making authority. Fewer college prep track students agreed (p-value 0.03). See Table 17.

Figure 2. A graph of percent of students that feel they have vaccine decision making authority, by age.

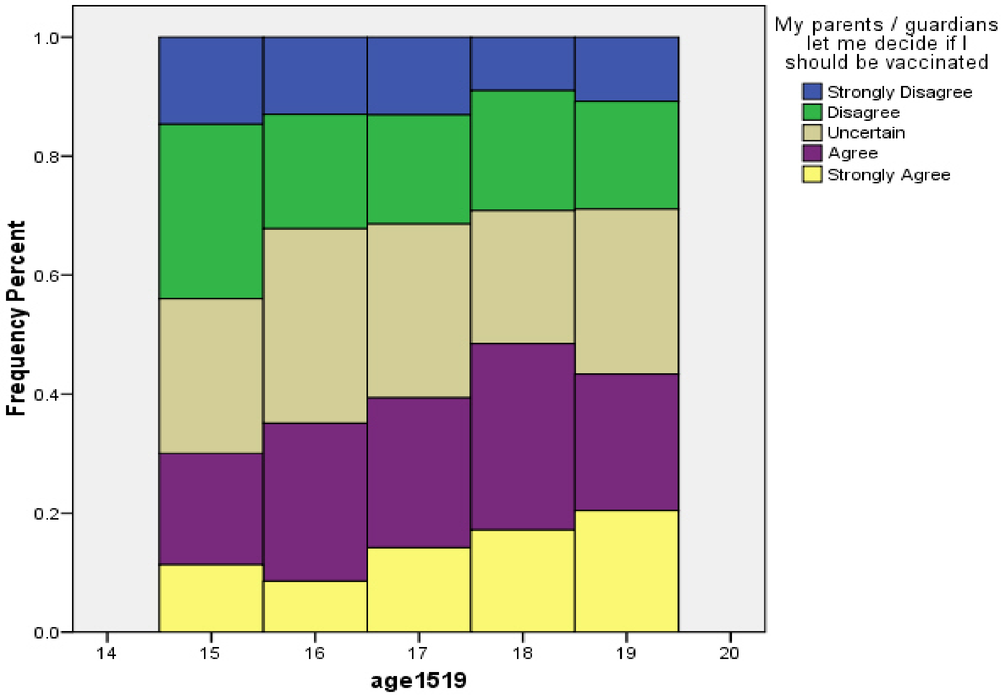

Table 17. Differences in demographic characteristics between students and their belief that they have the authority to decide if they are to be vaccinated.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		12.7	25.0	28.7	21.1	12.5		
Sex	Male	12.5	24.7	34.0	19.6	9.1	21.2	<0.001
	Female	12.8	25.2	24.5	22.3	15.2		
Lunch Payment	Full pay	11.5	25.1	28.9	21.3	13.2	10.3	0.2
	Reduced	12.7	26.3	21.2	27.1	12.7		
	Free	15.4	24.2	30.6	18.9	10.9		
Ethnicity	Hispanic	9.1	34.8	24.2	18.2	13.6	4.2	0.4
	Non-Hispanic	12.9	24.5	28.9	21.3	12.5		
Race	White	12.6	26.1	28.0	20.9	12.4	1.2	0.9
	Other	12.7	23.6	29.6	21.3	12.7		
Degree track	College Prep	11.9	24.8	29.2	21.4	12.8	16.9	0.03
	Both	16.3	27.6	19.4	23.5	13.3		
	Technical/ Career	28.2	23.1	33.3	10.3	5.1		
Mean Age		16.8	16.7	16.5	16.4	16.4	5.2*	<0.001

*F statistic

Vaccine Related Injury

Perceptions of fear of vaccine induced injury were estimated by the questions: “I worry about mild vaccine side effects (sore arm, fever, muscle aches) from the meningococcal vaccine,” and “I worry about a very serious side effect from the meningococcal vaccine.” The median selection for each was 3-Uncertain, and about 40% of all surveyed students agreed that they worry about any vaccine-related injury. More females than males worried about mild and serious side effects (p-value <0.001 and 0.02). Minority and Hispanic students had more overall agreement that they were worried about mild and serious side effects more than White and non-Hispanic students (p-value <0.001 and 0.002, for both). Technical/career track students worried more about mild and serious side effects than college prep students (p-value 0.02 and 0.04). Students who paid full price for lunch had less overall agreement that they were worried than students with reduced or free lunch (p-value 0.001 for mild and 0.002 for serious). Students who were more worried about mild side effects had a tendency to be slightly younger (p-value 0.03). See Tables 18 and 19 for full results.

Table 18. Differences in demographic characteristics between students and their belief that they worry about a mild vaccine side effect.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		13.6	26.1	23.4	26.1	10.8		
Sex	Male	10.8	19.5	28.7	27.4	13.6	45.4	<0.001
	Female	15.9	31.2	19.2	25.1	8.6		
Lunch Payment	Full pay	12.1	23.9	22.6	29.2	12.2	25.6	0.001
	Reduced	10.7	32.8	24.6	22.1	9.8		
	Free	17.9	28.8	24.8	20.6	7.9		
Ethnicity	Hispanic	7.6	39.4	34.8	12.1	6.1	17.2	0.002
	Non-Hispanic	13.9	25.4	22.8	26.8	11.1		
Race	White	9.9	20.1	21.2	34.6	14.1	102.9	<0.001
	Other	18.0	33.2	26.0	15.9	6.8		
Degree track	College Prep	13.6	25.6	23.7	26.7	10.3	17.6	0.02
	Both	11.3	25.8	17.5	25.8	19.6		
	Technical/ Career	22.5	37.5	22.5	12.5	5.0		
Mean Age		16.4	16.5	16.5	16.6	16.8	2.8*	0.03

*F statistic

Table 19. Differences in demographic characteristics between students and their belief that they worry about a very serious vaccine side effect.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		19.3	23.0	25.3	23.1	9.3		
Sex	Male	16.7	21.2	29.1	22.9	10.1	12.3	0.02
	Female	21.5	24.4	22.3	23.2	8.7		
Lunch Payment	Full pay	17.3	20.6	25.7	25.9	10.6	24.2	0.002
	Reduced	21.3	24.6	27.9	18.9	7.4		
	Free	23.4	27.9	23.4	18.1	7.2		
Ethnicity	Hispanic	27.3	36.4	24.2	9.1	3.0	16.5	0.002
	Non-Hispanic	18.9	22.3	25.3	23.8	9.7		
Race	White	13.6	21.0	23.8	28.8	12.8	75.8	<0.001
	Other	26.2	25.4	27.0	16.1	5.2		
Degree track	College Prep	19.6	22.7	26.0	22.7	9.0	16.4	0.04
	Both	15.5	20.6	16.5	32.0	15.5		
	Technical/ Career	22.5	35.0	22.5	15.0	5.0		
Mean Age		16.6	16.5	16.5	16.5	16.8	1.1*	0.3

*F statistic

Mistrust of Medicine

Students were asked if they thought their parents felt that vaccines were dangerous. While agreement was infrequent, minority students agreed more than White students that their parents think vaccines are dangerous (p-value <0.001). The less students paid for lunch, the more the students felt that their parents thought that vaccines were dangerous (p-value <0.001). Technical/career track students believed their parents had the greatest fears towards vaccines when compared to college prep students (p-value 0.007). See Table 20 for more results.

Table 20. Differences in demographic characteristics between students and their belief that their parents think vaccines are dangerous.

Characteristic		Strongly Agree %	Agree %	Uncertain %	Disagree %	Strongly Disagree %	χ^2	p-value
All		4.6	6.9	28.9	32.9	26.6		
Sex	Male	5.6	7.4	34.3	28.1	24.5	22.3	<0.001
	Female	3.9	6.5	24.7	36.7	28.3		
Lunch Payment	Full pay	3.1	5.4	26.7	33.8	31.0	46.9	<0.001
	Reduced	5.9	5.0	37.8	30.3	21.0		
	Free	7.7	10.9	31.1	31.6	18.6		
Ethnicity	Hispanic	1.5	10.6	22.7	30.3	34.8	5.6	0.2
	Non-Hispanic	4.8	6.7	29.3	33.0	26.2		
Race	White	3.1	5.4	25.2	35.2	31.0	35.6	<0.001
	Other	6.4	8.7	33.5	30.0	21.3		
Degree track	College Prep	4.3	6.8	29.8	32.9	26.3	20.9	0.007
	Both	5.2	7.2	16.5	32.0	39.2		
	Technical/ Career	10.0	7.5	37.5	37.5	7.5		
Mean Age		16.7	16.6	16.5	16.6	16.6	0.9*	0.4

*F statistic

Benefit of Education via Assembly and Movie

Many of the students received education delivered by a member of DHR and a video presentation. Many of the beliefs that were estimated by the survey could have been modified by the educational experience because the presentation and the survey covered much of the same content. In fact, viewing the presentation was associated with differences in beliefs with these students. If students saw the presentation, they more often agreed that meningococcal disease was a serious illness and that teens and young adults are at risk to catch disease (p-value <0.001, for both). Both of these topics were covered extensively in the presentation. Also, students who saw the presentation agreed that there were at least recommendations for meningococcal vaccination before entry into college housing (p-value <0.001, for both). Students who saw the presentation also agreed more on average that they thought the meningococcal vaccine is effective and that they should be vaccinated, regardless of what others think. Lastly, although herd immunity was not emphasized in the presentation, students who saw the presentation agreed more than those who did not that getting a vaccination helps others as well, although results were not significant (p-value 0.6). See Table 21 for complete analysis. Median results revealed that students who saw the presentation were more likely to feel that their risk was higher and that the meningococcal vaccine more effective than those who did not see the presentation (p-values 0.002 and 0.001). See Table 22.

Table 21. The effect of an educational presentation and video on student vaccination beliefs. Chi-square tests were performed. Students who were unsure if they saw the presentation were excluded.

Survey question	Response*	% Saw the presentation	% Missed the presentation	χ^2	p-value
Meningococcal disease is a serious illness	SA	72.0	42.6	99.2	<0.001
	A	21.6	33.6		
	U	5.4	21.7		
	D	0.9	1.2		
	SD	0.1	0.8		
Teenagers and young adults are at risk to catch meningococcal disease	SA	47.0	26.1	97.9	<0.001
	A	44.5	42.9		
	U	7.0	28.2		
	D	1.2	2.4		
	SD	0.2	0.4		
Regardless of what others say, I think I should be vaccinated	SA	31.4	18.4	29.0	<0.001
	A	36.5	34.7		
	U	21.6	33.1		
	D	8.2	7.9		
	SD	2.4	5.9		
The meningococcal vaccine is recommended for students who plan to go to college	SA	48.1	25.0	89.9	<0.001
	A	29.9	27.9		
	U	12.2	36.5		
	D	5.5	6.6		
	SD	4.2	4.1		
The meningococcal vaccine is required for students who plan to go to college	SA	39.7	18.4	44.7	<0.001
	A	22.6	25.8		
	U	25.4	40.2		
	D	9.3	9.8		
	SD	2.9	5.7		
Without the meningococcal vaccine, I am at risk to catch meningococcal disease	SA	45.7	23.8	54.6	<0.001
	A	35.7	38.5		
	U	13.4	26.2		
	D	4.0	9.0		
	SD	1.2	2.5		
When I am vaccinated, it protects people around me	SA	22.8	17.9	2.9	0.6
	A	31.3	33.3		
	U	28.9	30.0		
	D	9.6	11.3		
	SD	7.3	7.5		

* Valid responses: Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree.

Table 22. The effect of an educational presentation and video on vaccine-related beliefs. Mann-Whitney U test was used to determine differences in beliefs between students who did and did not see the presentation.

Question	Saw the presentation		Missed the presentation		p-value
	Median response	Mean	Median response	Mean	
Without the meningococcal vaccine, my risk to catch meningococcal disease is:*	2-High	2.28	3-Uncertain	2.49	0.002
How effective is the meningococcal vaccine in preventing disease?#	2-Agree	2.20	3-Uncertain	2.40	0.001

*Valid responses: Very High, High, Uncertain, Low, Very Low

Valid responses: Strongly Agree, Agree, Uncertain, Disagree, Strongly Disagree.

Chapter V-Discussion and Conclusion

Responses from this survey described a population that had diverse perceptions toward vaccination. Many students' responses described a profile of a likely vaccinee, while other student's responses indicated they were not likely to be vaccinated without changes to the current vaccine delivery system.

Healthcare Contact

In order for a person to be vaccinated, there must be contact with a healthcare professional; therefore, healthcare contact is vital to adolescent health. Results of this study indicated most students have visited a healthcare provider within the last year. It is important to note that the healthcare seeking behavior of four out of five of these adolescents already met the proposed recommendations that adolescents visit a healthcare source every two years, a result supported by other population based studies [25]. Though healthcare contact is a vital component of assuring vaccination in youth, merely having a healthcare visit does not necessarily guarantee that vaccination will occur. It was important to reveal the characteristics of students who have not had a recent healthcare visit in order to focus efforts to improve vaccination rates for these students. The characteristics of these students follow.

As expected based on previous research, there were differences among socio-demographic groups with regard to healthcare visits within the past two years. When analyzing study outcomes, it was apparent that males and poorer students were less likely to visit a healthcare source than other adolescents. As described previously, healthcare contact can be a cue to action where education of perceived susceptibility and severity can be addressed. If these adolescents do not visit a healthcare provider, then a possible solution is to have the healthcare provider come to the adolescent. In previous research, school-based hepatitis B programs were, in addition to being an opportunity for vaccination, cost effective [63, 64]. Additional educational contacts could occur through school either through sports team related physicals or through presentations in health classes. These opportunities could be utilized to inform the student about health or vaccine recommendations and disease related risks.

The study population indicated that there was a gender difference between males and females with regard to visiting a healthcare provider within the past two years (84.3% for females and 75.5% for males). Based on previous research, it was expected that the differences in healthcare visitation by gender were attributable to increases in female visits to the obstetrician/gynecologist [25]. Most current and future adolescent vaccines are targeted to women; therefore a logical choice to expand vaccine delivery methods is in the obstetrics/gynecology practice. If every woman in this study who visited a healthcare facility received a recommended vaccine, then within two years an 84% coverage rate would be achieved.

Doctor and Parent Beliefs

Vaccination recommendations must be shared by healthcare providers when an adolescent makes contact. This study showed that a healthcare professional advising vaccination was correlated with individual adolescent and parental acceptance of vaccination (Table 14). The importance of a doctor's recommendation was revealed by student responses that showed those who think their doctor wanted them vaccinated had a healthcare visit recently and thus a potential opportunity to be vaccinated. This study showed that both the healthcare visit and the healthcare provider's recommendation decreased the level of the adolescent' perceived barriers and increased perceived benefits of vaccination. In this study population, more females than males agreed that their doctor thinks they should be vaccinated. This may be due to more healthcare contact in women and more opportunities for the doctor to share vaccination beliefs.

Though direct discussion and education between healthcare providers and adolescents is important, it is clear that education must extend beyond the adolescent to their parent as well. The survey responses indicated that the beliefs of the parent played as large a part as the doctor's when impacting vaccination in adolescents. Therefore education of parents is important and could occur via dispersement of standardized written material within healthcare facilities. This material had the opportunity to reduce barriers identified through the Health Belief Model. To maximize the potential of this form of education, written material could be provided both in pediatric offices as well as in clinics serving adults. In doing so, parents would have the potential to encounter such material both at their own healthcare visits and also during visits with their children to the pediatrician. Though providing improved and standardized education during healthcare visits would facilitate improvements in vaccination rates, 19.6% of adolescents surveyed do not regularly see a healthcare provider. Therefore, it may be helpful that education be provided to parents and adolescents outside of the healthcare setting. Possible avenues to consider for educational opportunities beyond healthcare offices may include providing information during health classes in high school or middle school and direct-to-consumer marketing of ACIP recommended vaccines.

Perceived Disease Risk

As a core component of the Health Belief Model, perceived severity and risk of disease contribute to health behavior. That 86% of students agreed meningococcal disease was serious indicated that the students believed there was a reason to avoid illness. Almost as many agreed that teens were at risk to catch the disease, but did not agree as strongly. Even fewer students felt that, even if unvaccinated, they were at risk as individuals. Although the difference was slight, this was evidence that teens might recognize a problem but not recognize that the problem could effect them as equally. Using the Health Belief Model framework, adolescents who feel invulnerable to disease have low perceived susceptibility. Interventions designed to increase knowledge of risks of disease can improve these perceptions. Students also agreed that their disease risk was lower if vaccinated; they indicated they felt that their risk was reduced from high to low after vaccination. With these results, one could assume the students understand vaccinations decrease disease risk. Vaccination campaigns should capitalize on this belief as rationale for vaccination.

Vaccine Related Injury

The opposing risk of vaccine related injury could be a barrier to vaccination for many. Using the Health Belief Model, if a disease prevention method comes at too high a cost, such as risk of injury because of vaccination, the likelihood that the adolescent would decide to pursue the healthy behavior of vaccination would decrease. Since a large proportion of students surveyed were worried about both mild and very serious vaccine side effects, healthcare practitioners should convey appropriate risk-related information to adolescents so that they can judge their personal risk more accurately. In this study, when comparisons are made between income and race groups, differences in beliefs were found. Students who qualified for free lunch indicated that they strongly agree or agree that their parents believe vaccines are dangerous twice as often as students who paid full price for lunch (8.5% verses 18.6%, p-value <0.001). In addition, survey responses indicated that non-White students strongly agreed or agreed that their parents think vaccines are dangerous more often than did white students (8.5% verses 15.1%, p-value <0.001). These differences in groups may have important implications when designing vaccine interventions.

As with disease perceived risk, females felt more worry about side effects than males. Special emphasis on appropriate risk related information needs to be delivered to females, minority groups, and poorer students who expressed greater anxiety regarding possible side effects than did their counterparts.

Vaccination Decision Making

One component of adolescent vaccine research that had not yet been confirmed is the effect that adolescent attitudes have on actual vaccine delivery and if the adolescent really is the one to make that decision. Over 37% of students in this study perceived that they had the authority to make the decision of whether or not to be vaccinated. This survey reported perceptions, which are often not equal to truths, so it was uncertain if perceived authority was actual authority. However, Douglas County school administration officials shared that the students in the school district had varying levels of parent involvement. The study revealed that, other than the 28.7% of students who were uncertain about their decision making authority, students had an opinion on whether or not to be vaccinated. The ability to make vaccine decisions is an important component in the Health Belief Model with regards to barriers and self-efficacy. Anecdotally, during the MCV study, students showed that despite having parental approval to receive MCV4, the student made the final decision when the time came to be vaccinated as part of the study.

Education

This study showed that students who received education from a doctor through the MCV study were more likely to understand disease risks, severity, and vaccine effectiveness, which may lead to greater vaccination rates. These components fit into the Health Belief Model as perceived susceptibility, severity, benefits, and self-efficacy and are theorized to lead to an increase in the preventive health behavior of vaccination. Healthcare visits for some students were infrequent; therefore it is critical that physicians are armed with a plan to provide education and vaccination counseling to an adolescent anytime there is a contact.

Knowledge of Entry Laws

The aforementioned solutions may not result in vaccination for every adolescent. For these adolescents, the answer is a vaccination mandate before school entry. In this population, knowledge of school entry laws was associated with individual adolescent acceptance of vaccination. Groups that had less agreement for knowledge of entry laws included males, minority, and poorer students. This could be a result of less healthcare contact and fewer opportunities for information sharing. Surprisingly, knowledge of college entry laws was not significantly different between college bound students and technical/career track students. In the case of meningococcal disease, the vaccination (or at least education stating that the meningococcal vaccination should be received) is necessary to enter college, so it seems that knowing about the recommendation is a less important educational endpoint. However, early knowledge of this requirement would enable VFC participants to receive vaccine for free or reduced cost before they age out of the program.

According to research results, some students did not agree that either they were at risk for disease or needed vaccination. For these students and those who have negative feelings about vaccines (11.5% of students had some level of agreement that their parents thought vaccines were dangerous), school entry law could be the only reason vaccination occurs. In fact, school entry laws make being able to attend school perceived benefit of vaccination. It is the policy of the Board of Regents of the University System of Georgia that schools have the option to make any vaccine recommended by ACIP required for school [33].

Limitations

The limitations of this study were similar to survey research in general. While all students from the Douglas County school district that were included in the analysis had an equal opportunity to complete the survey, less than a third of students actually completed it. This should be considered a convenience sample and was subject to selection bias. Characteristics of a student that was likely to fill out a survey may be different than those who did not. Because of this, it was uncertain if the survey respondents represented all Douglas County students. The survey was given a few weeks before the end of the school year. If a student was going to drop out, he or she would have done so earlier in the year before the survey was administered. This survey could not have included drop out students. Additionally, the end of year overall student population was statistically different at the 0.05 level than the survey population based on the school administrative variables, sex, race/ethnicity, degree track, and lunch payment status (data not shown). This survey was self reported and was subject to biases in responses. However, even though the survey responses may only approximate the truth, one important goal of this research was to identify what students think and how these perceptions might affect behavior.

Douglas County administrative records combined race and ethnicity into one category. This research divided this information into separate race and ethnicity variables.

Therefore students could only have been classified by race or ethnicity, not both. This could have lead to misclassification bias as people conventionally can be both a member of a race and an ethnicity. Many of these students watched a presentation and video about meningococcal disease and vaccination when they were being recruited for the MCV study. This education and potential participation in the MCV study reduced generalizability of this study outside of this population. While stratifying by presentation (Tables 21 and 22) showed the importance and effect of the study's education, the education and recruitment efforts (posters, announcements) was likely to render students in the Douglas County school system different than the average student. The comparisons in this study were associations, thus causality cannot be assumed.

Health Belief Model

In this study, survey questions correspond to Health Belief Model components. In addition to students understanding their susceptibility, they also understood that meningococcal disease was serious. This study identified student groups where this was not so, for whom risk information needs to be specialized. Most importantly, most students were aware that the benefit from receiving the meningococcal vaccine was reduction in disease risk. Vaccine efficacy information must be shared with others. Mistrust of medicine and fear of vaccination side effects can be classified as a barrier to vaccination. Those with mistrust need reassurances from a trusted resource to replace misinformation. If providers advocate vaccination at every contact, recent healthcare can be considered a cue to action. Self efficacy could only be mildly approximated through the question: "How effective is the meningococcal vaccine," that by receiving the vaccine the student identified with a range of effectiveness. See Table 23 for Health Belief Model constructs.

Table 23. Health Belief Model component and vaccination counterpart

Health Belief Model component	Vaccination counterpart
Perceived susceptibility	Knowledge that I am at risk for meningococcal disease
Perceived severity	Knowledge that meningococcal disease is a serious illness
Perceived benefits	Knowing that vaccination reduces my risk of disease
Perceived barriers	Fear of vaccine side effects
Cues to action	Recent healthcare visit
Self-efficacy	Knowledge that the vaccine is effective

Recommendations

Healthcare

It is critical that adolescents have a healthcare contact. The responses of this survey population showed that for four out of five students (80.4%), had a healthcare visit within the last two years, as recommended by AAP and SAM. However, in order to encourage the other 20% of students to make contact with a healthcare professional during these vital adolescent years, improvements must occur in the publicizing of the need for an adolescent healthcare visit. Healthcare providers serving pre-adolescents are in a perfect position to inform parents of the need for a future adolescent visit.

In this survey population, 55.1% strongly agreed or agreed that their doctor thinks they should be vaccinated. This percentage seems low when compared to the 80.4% of children who reported a healthcare visit within the past two years. When this information is considered along with the survey data that indicate that 37.7% of students strongly agreed or agreed that they have vaccine decision making authority, it becomes clear that in order to solidify the adolescent's perception that vaccines are beneficial, practitioners must recommend vaccination to every adolescent at every healthcare visit as a solution to reduce disease risk.

In the survey population, 11.6% of adolescents showed some level of disagreement that they think they should be vaccinated while 10.1% of adolescents showed some level of disagreement that their parents think they should be vaccinated. Healthcare practitioners may not be able to recognize the one student in 10 whose individual or parental beliefs are not conducive to vaccination. Because of this, healthcare providers serving adolescents must discuss the topic of vaccination with every adolescent. In cases where the client has vaccine misconceptions, communication is necessary. According to the survey population, non-White and poorer students, when compared to others, had higher vaccine related worries about mild and serious vaccine side effects and believed that vaccines were more dangerous. Practitioners that serve these population groups should be prepared to discuss vaccine related side effects and misconceptions to correct perceptions that pose a barrier to vaccination.

School

This study has identified a number of adolescents who, according to the Health Belief Model, present with barriers to vaccination. In the survey population, 19.6% had not visited a healthcare provider within the last two years, 11.6% did not believe that they should be vaccinated, 39.7% strongly agreed or agreed that they were concerned about mild vaccine side effects, and 42.3% strongly agreed or agreed that they were concerned about a serious vaccine side effect. According to the Health Belief Model, the students described above lack the perceptions and beliefs that contribute to the decision to be vaccinated. For these students, a non-behavioral intervention, such as school entry laws, may be a solution. To protect students who are unlikely to be vaccinated for behavioral reasons, school entry laws should continue. Another way to strengthen school entry laws regarding vaccines is to institute policies that require students be up-to-date with vaccination before they are allowed to compete in sports. Though strengthening school entry laws will likely improve vaccination for students with access to healthcare providers, meeting these entry requirements is difficult for students who have limited or no access to healthcare practitioners. Hence, in areas without access to healthcare, school based clinics could be instituted. Additionally, in this study, the school-based education had a large effect on the knowledge and beliefs of adolescents, therefore schools should be used to deliver vaccination related messages to students.

Increasing Adolescent Demand for Vaccine

According to data from this survey, 37.7% of adolescents agreed that their parents or guardians allowed the student themselves to make the decision regarding whether or not to be vaccinated. Because of this, the perceptions of adolescents regarding vaccines should be considered when designing pro-vaccine interventions. In order to strengthen the effectiveness of such campaigns, special consideration should be given to targeting those adolescents and their families who do not currently believe in the importance of vaccination or who are fearful of vaccination.

Results of this study found differences in perceived vaccine safety among various groups of students. When comparisons were made between income and race groups, survey responses indicated that poorer students and students who were non-White strongly agreed or agreed more than other students that their parents believed vaccines were dangerous and they worried about a mild or serious side effect. Clinics that serve these populations need to be aware of these perceptions and their impact on the individual’s decision to be vaccinated. In order to overcome these perceptions, healthcare providers need to be prepared to effectively communicate vaccination safety issues with materials designed for poor and non-White populations.

In summary, based on the information from this study, public health practitioners should:

1. Healthcare practitioners should inform parents of the need for adolescent visits.
2. Recommend vaccination for adolescents to every adolescent and their parents
3. Discuss vaccination for adolescents with every adolescent and their parents at every healthcare visit to improve perceived prevention benefits of vaccination.
4. Be prepared to discuss possible vaccine side effects and misconceptions effectively with non-White and poor populations.
5. Consider schools as an environment to deliver vaccination related messages to students.
6. Consider the perceptions of adolescents, in addition to their parents, when designing pro-vaccine interventions.
7. Specifically target adolescents and their families who do not currently believe in the importance of vaccination or who are fearful of vaccination.

Future Studies

This study uses the context of the Health Belief Model to describe vaccine related knowledge, attitudes, and beliefs of adolescents. Using this framework, this study identified behavioral endpoints to estimate the likelihood of adolescent vaccination. Associating the behavioral endpoints with actual vaccination records and rates of disease could increase our understanding between knowledge, attitudes, and beliefs toward vaccination and actual vaccination and reduction of disease. A study integrating these components could identify behavioral constructs to focus on.

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Appendices

Appendix A. Survey administered to students

Vaccination Survey

Instructions: **Please choose the answer that is closest to what you think.** Even if you are not entirely certain, your best guess is important for each statement. Mark your answers completely on the blue answer sheet using a #2 pencil. After you are done, please turn your answer sheet in to your teacher or school's main office. **Your information will only be used in this project and will be kept private and confidential to the extent allowed by law.**

First, on the answer sheet, please fill in your:
A. Last and First Name B. Sex C. Grade D. Birthdate

The following questions are about meningococcal disease and the meningococcal vaccine.

		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
1. Meningococcal disease is a serious illness	1	A	B	C	D	E
2. Teenagers and young adults are at risk to catch meningococcal disease	2	A	B	C	D	E
3. The meningococcal vaccine is **recommended** for students who plan to go to college	3	A	B	C	D	E
4. The meningococcal vaccine is **required** for students who plan to go to college	4	A	B	C	D	E
5. I worry about mild vaccine side effects (sore arm, fever, muscle aches) from the meningococcal vaccine	5	A	B	C	D	E
6. I worry about a very serious side effect from the meningococcal vaccine	6	A	B	C	D	E
7. **If I get** the meningococcal vaccine, I am still at risk to catch meningococcal disease	7	A	B	C	D	E
8. **Without** the meningococcal vaccine, I am at risk to catch meningococcal disease	8	A	B	C	D	E

		Very High	High	Uncertain	Low	Very Low
9. **If I get** the meningococcal vaccine, my risk to catch meningococcal disease is:_______	9	A	B	C	D	E
10. **Without** the meningococcal vaccine, my risk to catch meningococcal disease is:_______	10	A	B	C	D	E

		Very Effective	Effective	Uncertain	Ineffective	Very Ineffective
11. How effective is the meningococcal vaccine in preventing disease?	11	A	B	C	D	E

		Yes	No	Don't Know
12. I saw the video and presentation about meningococcal disease at my school	12	A	B	C

The following questions are about vaccinations in general.

		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
13. My parents / guardians want me to receive all recommended vaccines	13	A	B	C	D	E
14. There are some vaccines that my parents / guardians do not want me to receive	14	A	B	C	D	E
15. My parents / guardians think vaccines are dangerous	15	A	B	C	D	E
16. My parents / guardians let me decide if I should be vaccinated	16	A	B	C	D	E
17. My doctor / healthcare provider thinks I should be vaccinated	17	A	B	C	D	E
18. *If you belong to a religious group:* My religious group thinks I should be vaccinated	18	A	B	C	D	E
19. *If you identify with a racial or ethnic community:* My community thinks I should be vaccinated	19	A	B	C	D	E
20. Regardless of what others say, I think I should be vaccinated	20	A	B	C	D	E
21. I avoid shots whenever possible because I dislike needles	21	A	B	C	D	E
22. When I am vaccinated, it protects people around me	22	A	B	C	D	E
23. Recommended vaccines are available for teens through age 18, free or at low cost	23	A	B	C	D	E

		1 or Less	2	3	4	5 or More
24. How many years has it been since you went to a healthcare provider (outside school) for a checkup?	24	A	B	C	D	E

ND! Thank you for your help. Did you fill in your name, sex, grade, and birthdate?

Appendix B. ACIP recommended immunization schedules for persons aged 7–18 years — United States, 2007

Vaccine ▼ / Age ▶	7–10 years	11–12 YEARS	13–14 years	15 years	16–18 years
Tetanus, Diphtheria, Pertussis[1]	*See footnote 1*	Tdap	Tdap		
Human Papillomavirus[2]	*See footnote 2*	HPV (3 doses)	HPV Series		
Meningococcal[3]	MPSV4	MCV4		MCV4[3]	
			MCV4		
Pneumococcal[4]	PPV				
Influenza[5]	Influenza (Yearly)				
Hepatitis A[6]	HepA Series				
Hepatitis B[7]	HepB Series				
Inactivated Poliovirus[8]	IPV Series				
Measles, Mumps, Rubella[9]	MMR Series				
Varicella[10]	Varicella Series				

Range of recommended ages

Catch-up immunization

Certain high-risk groups

This schedule indicates the recommended ages for routine administration of currently licensed childhood vaccines, as of December 1, 2006, for children aged 7–18 years. Additional information is available at http://www.cdc.gov/nip/recs/child-schedule.htm. Any dose not administered at the recommended age should be administered at any subsequent visit, when indicated and feasible. Additional vaccines may be licensed and recommended during the year. Licensed combination vaccines may be used whenever any components of the combination are indicated and other components of the vaccine are not contraindicated and if approved by the Food and Drug Administration for that dose of the series. Providers should consult the respective Advisory Committee on Immunization Practices statement for detailed recommendations. Clinically significant adverse events that follow immunization should be reported to the Vaccine Adverse Event Reporting System (VAERS). Guidance about how to obtain and complete a VAERS form is available at http://www.vaers.hhs.gov or by telephone, 800-822-7967.

1. **Tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap).** *(Minimum age: 10 years for BOOSTRIX® and 11 years for ADACEL™)*
   - Administer at age 11–12 years for those who have completed the recommended childhood DTP/DTaP vaccination series and have not received a tetanus and diphtheria toxoids vaccine (Td) booster dose.
   - Adolescents aged 13–18 years who missed the 11–12 year Td/Tdap booster dose should also receive a single dose of Tdap if they have completed the recommended childhood DTP/DTaP vaccination series.
2. **Human papillomavirus vaccine (HPV).** *(Minimum age: 9 years)*
   - Administer the first dose of the HPV vaccine series to females at age 11–12 years.
   - Administer the second dose 2 months after the first dose and the third dose 6 months after the first dose.
   - Administer the HPV vaccine series to females at age 13–18 years if not previously vaccinated.
3. **Meningococcal vaccine.** *(Minimum age: 11 years for meningococcal conjugate vaccine [MCV4]; 2 years for meningococcal polysaccharide vaccine [MPSV4])*
   - Administer MCV4 at age 11–12 years and to previously unvaccinated adolescents at high school entry (at approximately age 15 years).
   - Administer MCV4 to previously unvaccinated college freshmen living in dormitories; MPSV4 is an acceptable alternative.
   - Vaccination against invasive meningococcal disease is recommended for children and adolescents aged ≥2 years with terminal complement deficiencies or anatomic or functional asplenia and certain other high-risk groups. See *MMWR* 2005;54(No. RR-7):1–21. Use MPSV4 for children aged 2–10 years and MCV4 or MPSV4 for older children.
4. **Pneumococcal polysaccharide vaccine (PPV).** *(Minimum age: 2 years)*
   - Administer for certain high-risk groups. See *MMWR* 1997;46(No. RR-8):1–24, and *MMWR* 2000;49(No. RR-9):1–35.
5. **Influenza vaccine.** *(Minimum age: 6 months for trivalent inactivated influenza vaccine [TIV]; 5 years for live, attenuated influenza vaccine [LAIV])*
   - Influenza vaccine is recommended annually for persons with certain risk factors, health-care workers, and other persons (including household members) in close contact with persons in groups at high risk. See *MMWR* 2006;55 (No. RR-10):1–41.
   - For healthy persons aged 5–49 years, LAIV may be used as an alternative to TIV.
   - Children aged <9 years who are receiving influenza vaccine for the first time should receive 2 doses (separated by ≥4 weeks for TIV and ≥6 weeks for LAIV).
6. **Hepatitis A vaccine (HepA).** *(Minimum age: 12 months)*
   - The 2 doses in the series should be administered at least 6 months apart.
   - HepA is recommended for certain other groups of children, including in areas where vaccination programs target older children. See *MMWR* 2006;55 (No. RR-7):1–23.
7. **Hepatitis B vaccine (HepB).** *(Minimum age: birth)*
   - Administer the 3-dose series to those who were not previously vaccinated.
   - A 2-dose series of Recombivax HB® is licensed for children aged 11–15 years.
8. **Inactivated poliovirus vaccine (IPV).** *(Minimum age: 6 weeks)*
   - For children who received an all-IPV or all-oral poliovirus (OPV) series, a fourth dose is not necessary if the third dose was administered at age ≥4 years.
   - If both OPV and IPV were administered as part of a series, a total of 4 doses should be administered, regardless of the child's current age.
9. **Measles, mumps, and rubella vaccine (MMR).** *(Minimum age: 12 months)*
   - If not previously vaccinated, administer 2 doses of MMR during any visit, with ≥4 weeks between the doses.
10. **Varicella vaccine.** *(Minimum age: 12 months)*
    - Administer 2 doses of varicella vaccine to persons without evidence of immunity.
    - Administer 2 doses of varicella vaccine to persons aged ≤13 years at least 3 months apart. Do not repeat the second dose, if administered ≥28 days after the first dose.
    - Administer 2 doses of varicella vaccine to persons aged ≥13 years at least 4 weeks apart.

Appendix C. Consent form

Vaccination Survey

Georgia State University Institute of Public Health

Dear Student and Parents,

We invite you to fill out a survey to help in a research project to see what high school students think about vaccines. A short survey that asks how you feel about vaccines is with this letter. Please look over the survey and, if you choose to do so, fill it out and give it back to your teacher or school's main office. A random group of students in the Douglas County high school system will be asked to help with this survey. It should take you a few minutes to finish.

With your help, we hope to understand ideas about vaccines. We hope to find reasons why some teens do not get vaccines. We do not know of any risks to you if you fill out this survey. There may not be any direct benefit to you either. Your grade or how you are treated at school will not be affected if you decide to, or not to participate. We will keep your survey private to the extent allowed by law. After the study is over, all records will be destroyed. Dr. Karen Gieseker and Brendan Noggle promise not to share any information that could identify you with anyone else.

We hope you will take the time to fill out this entire survey and return it, but you do not have to. You may skip questions or stop at any time. Whether or not you choose to help, let us know if you would like a report of our results. Please take this page home to your parents or guardians.

If you have questions or would like a report, please contact Brendan Noggle at (404)519-6961 or rnoggle1@student.gsu.edu or Karen Gieseker, PhD at (404)463-4734 or kgieseker@gsu.edu. If you have questions or concerns about your rights as a participant in this study, you may contact Susan Vogtner in the Office of Research Integrity at (404)463-0674 or svogtner1@gsu.edu.

Thank you for your participation!

Sincerely,

(her signature here) (date)
Karen Gieseker, PhD

(my signature here) (date)
Brendan Noggle

If you wish to help with the survey, please sign and date here

______________________________ __/__/__
Participant signature **date**

Page 1 of 1 Version date 3/7/2007

APPROVED *Consent Form Approved by Georgia State University IRB April 26, 2007 - April 25, 2008*