

**Comparative Effectiveness of Two Educational Health Mass Media Messages
Different in Format**

By

Heba Adel Tawfiek Aref

A thesis submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Master of Science

Auburn, Alabama
May 8, 2018

Keywords: Mass media, Educational health messages, Meningitis B, vaccination

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Approved by:

Thesis Committee

Kimberly B. Garza, Chair, Assistant Professor of Health Outcomes Research and Policy

Salisa C. Westrick, Professor of Health Outcomes Research and Policy

C. Edward Chou, Associate Professor of Health Outcomes Research and Policy

Fred Kam, Medical Director of AUMC

Debra Worthington, Professor of Communication

Abstract

Background: Meningitis B (MenB) is a rare but serious disease. Vaccination is an effective means to prevent MenB. It is recommended by the CDC that universities should consider all media delivery methods when aiming at immunizing a university population.

Objective: To compare the effect of multi-modal (audiovisual with text) with single mode (text-only) health messages on knowledge, perceptions, and intention to obtain the MenB vaccine using the Health Belief Model.

Methods: We recruited 121 first-year college students for a two-group randomized prospective study. Participants received either online audiovisual with text or online text only educational material. Participants' knowledge, perceptions, and intention were assessed before and after exposure to the interventions.

Results: No significant difference was found in mean score improvement of knowledge, perceptions, and intention for multi-modal compared to single mode educational material ($p>0.05$).

Implications: Both audiovisual-with-text vehicle and text-only vehicle are effective educational tools for promoting vaccination among college students.

Acknowledgements

First and foremost, I am so grateful to God, Allah, for endowing me with all the blessings that allowed me to get this thesis out. Among these blessings is my very dear advisor Dr. Kimberly Garza. I would have never been able to complete this master's thesis without her support, genuine devotion, and patience. She was not only my advisor, but also my dear friend and sister.

I am so grateful to each and everyone of my committee members, Dr. Westrick, Dr. Chou, Dr. Worthington, and Dr. Kam, for always providing me with constructive feedback and useful insights as this project evolved from an idea into a complete study. Each committee member provided all the knowledge and expertise needed in his/her respective fields. Because of these amazing people, this was an enjoyable rewarding experience.

In addition, I am so thankful to the Fulbright Program, sponsored by the U.S. Department of State, for providing me with funding required to complete my degree in the US. This educational and cultural experience provided me with a lifelong positive impact on the personal, academic, and professional levels.

I would like to thank all my dear professors and peers in the Health Outcomes Research and Policy (HORP) department. I believe I got a high-quality education in that department that will help me pursue further graduate studies soon.

Words can never express my deep gratitude to my beloved parents for making me the person who I am today. I highly appreciate all my husband's efforts with me during the past two years. His endless patience, love, and support have always empowered me. Finally, I am thankful to the most precious three angels of my life: Yahia, Youssef, and little Hagar. It is their true, unconditional, tremendous love that gave me the motivation to study and complete this degree.

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Chapter 1: Introduction

Meningitis B infection and vaccine

Meningitis B (MenB) disease has a rapidly progressing clinical presentation. It is a challenging disease because the earliest symptoms are nonspecific and “flu like” (1,2). Severe manifestations include inflammation of the meninges (meningitis), bacteremia, pneumonia, permanent neurological sequelae, and limb amputations (1–3). Even with quick comprehensive diagnosis and treatment, progression, complications, and even death may occur (2,4,5).

Usually the highest incidence of serogroup B disease is among infants (<1 year of age), but adolescents (teens or young adults) also show another peak for the incidence of MenB disease (1,6) as evidenced by several recent university outbreaks. Vaccination is the most effective strategy to reduce the morbidity and mortality from MenB (7).

Mass media messages

Mass media campaigns are used to spread information at a low cost to a large number of individuals. Therefore, they are a vital component in improving a population’s health behaviors (8). It is recommended by both the CDC and the American College Health Association (ACHA) that universities consider all media delivery methods when implementing a plan to immunize numerous members of the university population (9). This is essential to overcome the possible barriers to vaccination (10). Some factors such as each individual’s perception of risk behavior, perception of susceptibility and severity, health concerns, and self-motivation may determine each person’s reaction towards a certain media

message (11) . Therefore, the Health Belief Model (HBM) was used as the theoretical framework for this study.

The Health Belief Model as the theoretical framework

The HBM is widely used to study people's reactions towards prevention programs, illnesses, and adherence to prescribed medical regimens(12,13). This model contains several primary concepts (14) (Figure 1.1) that predict why people will act to prevent, screen for, or have control over a certain illness. These concepts include:

- **Perceived Susceptibility:** beliefs about the likelihood of getting a disease
- **Perceived Severity:** beliefs about the seriousness of consequences of contracting a disease
- **Perceived Benefits:** beliefs about the perceived *benefits* of the actions to reduce the risk of negative outcomes from the disease
- **Perceived Barriers:** beliefs about the potential negative aspects of a health behavior
- **Cues to Action:** factors that triggers protective action, such as media publicity.
- **Self-Efficacy:** beliefs that one can successfully execute the behavior required to produce the desired outcomes (15).

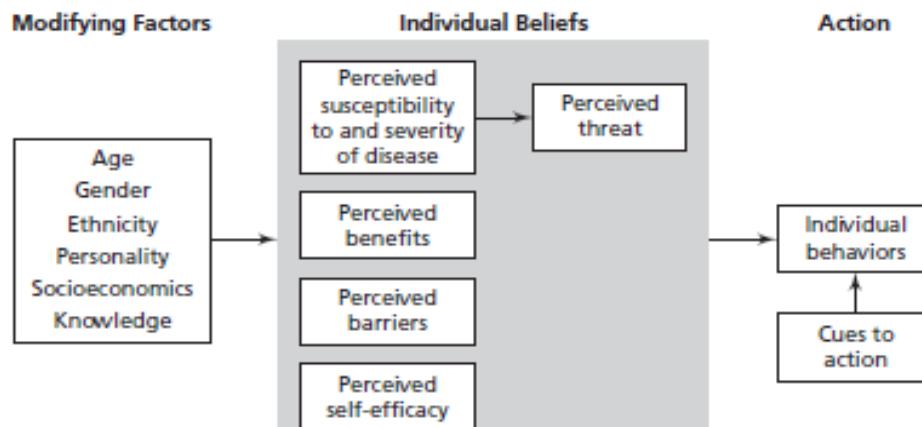


Figure 1.1: Health Belief Model components and linkages

Even though numerous vaccination campaigns have been conducted nationally and at the state level, research investigating mass media campaign tools focusing on MenB vaccination is quite limited.

Overview of the study design and specific aims

This was a 3 months prospective study that recruited college students, who were randomly assigned to one of two groups. Group (1) was presented with an online textual educational mass media message, while Group (2) was presented with an online video educational mass media message. Both messages addressed MenB and the MenB vaccine. They had the same content but differed in format (text versus video). Participants completed a pre-intervention questionnaire, then were exposed to the intervention (text or video), and subsequently completed a post-intervention questionnaire. A follow-up survey was administered three months later to capture the actual vaccination rate of MenB vaccine. Pre- and post-intervention questionnaires included items related to knowledge about MenB and the MenB vaccine, the HBM constructs listed above, and intention to receive the vaccine in the future. The follow-up questionnaire contained items related to actual receipt of the vaccine, perceived barriers and facilitators, and knowledge about MenB and the MenB vaccine.

Specific aim one:

To compare the pre-versus post-intervention impact and the change from pre- to post-intervention between two different formats (text or video) of the same educational mass media message on knowledge, perceptions, and intention related to the MenB disease and vaccination among college students.

Specific aim two:

To compare vaccine uptake and knowledge retention among the two groups three months after the study.

Study significance and Implications

This study has a potential significance contributing to the area of health communication. First, this study examined the impact of a MenB educational message (both text and video) on the knowledge, perceptions, and intention of participants. Second, this study also addressed the difference in effect between the two modes (either text or video) of message delivery. Finally, a description of the vaccination rate, facilitators, and barriers for vaccinations was provided. These findings add to the body of knowledge regarding factors that influence vaccine uptake and how to effectively deliver educational messages to promote vaccination.

Since the participants recruited were mainly Auburn University college students, findings of our study can be used by the Auburn University Medical Clinic (AUMC) to decide upon the most cost-effective educational mass media message to be used to promote a health behavior among college students. These results may guide development of the optimum educational mass media campaign for college students to help increase the vaccination rate to meet the Healthy People 2020 goals of disease prevention.

Chapter 2. Literature Review

Among the many Healthy People 2020 objectives is to “improve the healthy development, health, safety, and well-being of adolescents and young adults” (16). According to the U.S. Census Bureau, adolescents (ages 10 to 19) and young adults (ages 20 to 24) make up around 21 percent of the whole population of the United States (17). In the years from 2009-2015, seven Meningitis B (MenB) outbreaks took place on college campuses (18). Although the number of deaths and cases may be viewed as low, the seriousness of the disease and its severe complications clearly counteract the Healthy People 2020 objective.

Part 1: Meningitis B infection and vaccine

1.1 Invasive meningococcal disease (Meningitis)

Invasive meningococcal disease (IMD) is a rare but serious disease (18) caused by *N. meningitides*, which is a Gram-negative aerobic diplococcus, hosted by humans. It is an opportunistic pathogen, usually living as a commensal in the nasopharynx, colonizing the upper respiratory tract, without causing damage to the host (19,20). Adolescents and young adults are reported to have the highest rates of nasopharyngeal carriage of *N. meningitides*. The asymptomatic carriage prevalence increases from 4.5% in childhood, with a peak of 23.7% in 19-year-old individuals, and then decreases to 7 to 8% in adulthood (21).

The different *N. meningitidis* strains are divided in 12 serogroups (A, B, C, 29E, H, I, K, L, W, X, Y, and Z serogroup) on the basis of the capsular

polysaccharides immunohistochemical characteristics. Serogroups A, B, C, W, and Y are responsible for most IMD cases worldwide. Further classification into serotypes/sub-serotypes or immunotypes is established on major outer membrane class 1 (PorA) and class 2 or 3 (Por B) proteins or on lipopolysaccharides (LPS), respectively (22).

Direct contact with Flügge's droplets from people with IMD or, more frequently, from asymptomatic carriers is the main route of transmission. Usually, the standard humoral response is sufficient to inhibit the spreading of the microorganism and avoid IMD. However, when the antibody immune response is not optimal, through mechanisms still incompletely understood, bacteremia takes place (23). This causes endothelial damage, increasing vascular permeability, and initiating a prothrombotic state (24).

Meningococcal disease is considered a rare complication of bacterial colonization and usually manifests itself with meningitis (in greater than 50% of cases), bacteremia, and sometimes septicemia (25). The disease may occur in two forms: endemic form (with sporadic cases) or epidemic form (with outbreaks of varying extent and duration). The main risk groups are: newborns and children <1 year (in which natural immunity is particularly low), adolescents (since their usual behaviors at this stage inevitably involves close interpersonal contact and naturally have higher carriage rates), travelers in highly endemic zones (sub-Saharan Africa), patients with immunosuppression, and elderly subjects (26,27).

The clinical presentation of IMD includes a quick clinical progression and the presence of skin rash, often starting from lower limbs (28). In contrast to other most common infectious meningitis, IMD manifests itself less frequently with seizures or focal neurological signs (29), and the most common sequelae include deafness, spasticity, seizures, limb amputations, and disabilities of learning and attention (24).

1.2 Epidemiology and the global burden of Meningitis

N.meningitidis serogroup B (MenB) causes 500,000 cases of septicemia and meningitis every year across the whole world. Despite the low incidence of the invasive form, it is matter of great concern for health professionals due to the quick onset and course of the disease, the difficulty of early diagnosis, the major post-infection sequelae (brain damage, deafness, kidney failure, and lower limb amputation), and high fatality rates (5 to 15%) (28,30). The overall incidence of the meningococcal disease varies around the globe. In North America, Europe and Australia the rate is 0.3–3 cases per 100,000 (27), while it can reach 10–1000/100,000 in Africa, during an epidemic (31) .

Serogroups have different geographical distribution. Events caused by the group A are more common in Africa and Asia, while groups B and C have a greater dissemination in North America and Europe. In the United States, the incidence of MenB disease is historically low (0.05 per 100,000). In Canada, from 1991 to 2011, the MenB disease incidence ranged from 0.1 to 0.9/100,000 per year. In Australia (2011), the incidence rate was 0.8/100,000 and in New Zealand (2012) was 1.2/100,000 (32). In 2009, 29 European countries reported a

meningococcal disease incidence of 0.92 cases per 100,000, with the Republic of Ireland (3.4/100,000) and the UK (2.0/100,000) having the highest rates(31).

1.3 Meningitis B as a health care issue among college students

Despite the fact that serogroup B meningococcal disease incidence among adolescents and young adults aged 11-23 years has remained low (approximately 50-60 cases and 5-10 deaths reported annually), an increasing proportion of meningococcal disease cases in this age group have been attributed to serogroup B (18,33,34). These cases have happened following the widespread use of Men ACWY vaccine in adolescents and young adults (34).

According to the National Meningitis Association (NMA) (35) and the CDC (36), from 2013 to 2016 around six college campuses experienced outbreaks of serogroup B meningococcal disease (37–39) :

1. *Princeton University*: Nine cases of serogroup B meningococcal disease occurred at or were associated with an outbreak at Princeton University from March 2013 through March 2014. One Drexel University student who was in contact with Princeton students died. Some students suffered neurological effects such as memory loss, difficulty retaining information and difficulty concentrating.
2. *University of California, Santa Barbara*: Four cases of serogroup B meningococcal disease occurred in one month at the University of California, Santa Barbara in late 2013. These cases were connected to one that occurred on campus seven months earlier.
3. *Providence College*: Two cases of serogroup B meningococcal disease occurred within a week at Providence College in early February 2015.

4. *University of Oregon*: Seven cases of serogroup B meningococcal disease occurred at the University of Oregon from January to June 2015. One student died.
5. College in Rhode Island: Two cases of serogroup B meningococcal disease occurred in undergraduate students in 2015.
6. *Santa Clara University*: Three cases of serogroup B meningococcal disease occurred at Santa Clara University from January to February 2016.

1.4 Vaccination

MenB vaccines were not licensed in the United States before the late 2014 (40). The first large-scale use of four-component meningococcal serogroup B vaccine (4CMenB) started in the USA in 2013, during two meningitis outbreaks that occurred at two universities and were caused by different MenB clones (ST409 in Princeton and ST32 in Santa Barbara). The first episode occurred at Princeton University. As soon as there was an epidemic cluster declaration, the Department of Health of New Jersey (NJDOH) initiated a wide educational campaign to inform all students about the mode of pathogen transmission and, then, prescribed an antibiotic prophylaxis for all close contacts of cases. Upon the identification of the fifth case, the Centers for Disease Control and Prevention (CDC), the NJDOH and Princeton University considered the production of a vaccination campaign, taking into consideration the need to require the Food and Drug Administration (FDA) authorization for the use of 4CMenB, not yet licensed in the USA at that time. The permission for the experimental vaccine use was issued just before the identification of the eighth case, and the first vaccinations

were administered in early December. Their strategy included the administration of two doses and the overall vaccination rate reached over 90% (41).

The second epidemic outbreak occurred at Santa Barbara University (California) in November 2013. As in Princeton's outbreak, the Department of Health of Santa Barbara (SBPHD) organized the activities of prevention, first with antibiotic prophylaxis, then administering two doses of the vaccine with a plan similar to that adopted in Princeton (42,43).

Following these events, in June 2014, the FDA announced the authorization for extensive use of the vaccine in the US for adolescents and young adults between 10 and 25 years of age (44). Until April 2015, the CDC kept recommending that all university students, graduates, and all members of the university community in Princeton receive a free immunization against MenB (45).

In summary, in the period of 2013-2016 around six serogroup B outbreaks have occurred on college campuses. These resulted in 41 cases and 3 deaths (18). The four outbreaks that occurred between March 2013 and May 2015 indicated a 200- to 1,400-fold increase in risk for meningococcal disease among students at these colleges during the outbreak period compared with the equivalent age group in the general population (34).

Currently, in the USA, two MenB vaccines are licensed for use in persons aged 10–25 years: MenB-FHbp (Trumenba) and MenB-4C (Bexsero). Either MenB vaccine can be used when indicated. The Advisory Committee on Immunization Practices (ACIP), part of the CDC, does not state a product

preference. The two MenB vaccines are not interchangeable, so the same vaccine product must be used for all doses in a series. It is recommended that the minimum interval between any 2 doses of MenB vaccine is 4 weeks. On the basis of available data and expert opinion, MenB-FHbp or MenB-4C may be administered concomitantly with other vaccines indicated for this age, but at a different anatomic site, if feasible (46).

The ACIP currently recommends routine use of MenB vaccines among persons identified to be at increased risk because of a serogroup B meningococcal disease outbreak like college outbreak (46). In June 2015, ACIP recommended that “adolescents and young adults aged 16–23 years may also be vaccinated with MenB vaccines to provide short-term protection against most strains of serogroup B meningococcal disease” (Category B recommendation: made for individual clinical decision making). The ACIP recommended either a 3-dose series of MenB-FHbp (Trumenba) or a 2-dose series of MenB-4C (Bexsero), that was consistent with the original Food and Drug Administration (FDA) licensure for the MenB vaccines (46).

In April 2016, changes to the dosage and administration of MenB-FHbp (Trumenba) were approved by FDA to allow for two options; option (1) 2-dose series (administered at 0 and 6 months) and option (2) 3-dose series (administered at 0, 1–2, and 6 months) (47,48). In addition, the package insert of Trumenba now states that the choice of dosing schedule depends on the patient’s risk for exposure and susceptibility to serogroup B meningococcal

disease. Recommendations for the usage of MenB-4C (Bexsero) remained unchanged (18,34).

The ACIP recommendations for adolescents and young adults aged 16–23 years (Category B recommendation: *made for individual clinical decision making*) state that when the vaccine is given to healthy adolescents who are not at increased risk for meningococcal disease, two doses of MenB-FHbp (Trumenba) should be administered at 0 and 6 months (46).

Although MenB vaccines are now licensed and available in the United States, it is not an easy goal to promote the benefits and barriers associated with receiving MenB vaccines to university students. In a study by Breakwell et al., 2016, researchers informed undergraduate students about a MenB outbreak that was occurring on campus, through an extensive university campaign. By the end of the vaccination campaign, coverage among undergraduates was 51% for at least one dose of MenB-4C and 40% for the recommended two doses (40). Thus, only half of all eligible undergraduates were vaccinated. Among the unvaccinated respondents, the two most common barriers that contributed to their decision to not receive vaccine were the perception of low disease risk and concerns about the vaccine safety (40). These two reasons were consistent with those reported by university students as reasons to not get flu or human papillomavirus vaccines and by parents to not get their children vaccinated with the Men ACWY vaccine (49–52).

Generally, adolescents and young adults think they are invulnerable to serious diseases (49,53–55). Lack of awareness and knowledge among

adolescents (56) and their parents (57) has been shown to be related to the low vaccination rates. Therefore, the CDC and the American College of Health Association (ACHA) recommend that universities should consider all media delivery channels when implementing a mass media campaign to immunize members of the university population (9,10).

Part 2: Mass media messages

2.1 Media messages and its association with health behaviors

Mass media campaigns are used to spread information at a low cost to a large sector of a specific population. Therefore, mass media messages are considered as a vital component to improve a population's health behaviors and consequently health status (8). McQuail defined mass media as; " a type of communication that operates on a large scale, reaching and involving virtually everyone in a society to a greater or lesser degree." (58). Mass media use is reported to have a significant impact on the knowledge and awareness of health issues and the utilization rate of health services (59,60).

For example, in a study assessing the impact of a celebrity promotional colorectal cancer awareness campaign, promoting the usage of colon cancer screening, there was an increase in the colonoscopy rate by 38 percent during the 9 months following the show (61). Other researchers reported an earlier and increased rate of flu vaccination among elderly people associated with media reports in both television and newspaper (62).

2.2 Media messages and its association with vaccinations among college students

Developing a successful productive vaccination plan requires searching for the motivators for people to do the action of vaccination. If we take the flu

vaccine as an example, adults were more likely to get the vaccine if they believed that: (1) flu is a serious illness; (2) flu vaccine is effective; and (3) side effects that can be caused by the vaccine are minor (63,64). However, not as much data are available regarding factors associated with vaccine uptake in college students specifically.

Reported barriers to obtaining the flu vaccine include: concerns about side effects and vaccine safety, perceptions of low effectiveness of the vaccine preventing illness, and perceptions of lesser degrees of severity of the disease (63). However, unlike the adult or the elderly population, vaccinating college students is a difficult task because most young adults feel they are not vulnerable to diseases at this stage of their lives (49).

To counter those barriers to vaccination, the CDC and the American College Health Association (ACHA) recommend that universities consider all media forms (TV, radio, social media, online media, etc.) when developing a plan to immunize a large sector of the university population (10,65).

Among college students, social media and the Internet had been shown to greatly impact the student reception and perception of health information (66–68). Peddecord and colleagues (69) evaluated movie preview slide advertisements promoting the flu vaccine and found that 24% of the sample recalled the flu advertisement, especially after longer and more repetitive viewing (8,69). Another study performed by Wilson and Huttlinger assessing the sources of health information related to flu and flu vaccination among college students. They found that the top four sources of health information, in order of

significance, were: family, online information from different websites, friends, and television (67). The least likely sources of health information were university flyers, the student health center, and their professors.

In addition, health educational interventions, considered an integral part of health mass media messages, have been shown to enhance knowledge and vaccination intentions among college students for other vaccines such as the human papilloma virus (HPV) vaccine (70,71). Still the question remains as to whether different educational intervention formats or delivery methods may lead to different outcomes. Most studies that looked at the impact of educational interventions on HPV knowledge and vaccination intentions have used text formats (70–72). Fewer published studies have evaluated video formats (73,74).

It is important to note that some studies have shown that a health care professional's (HCP's) recommendation is one of the strongest predictors of vaccine uptake (75,76) with a strong physician recommendation resulting in a 4-fold greater probability to receive vaccines, such as the HPV vaccine (77). Despite the abundance of the Internet and other communication channels, many individuals still cite HCPs as their most trusted source of health information (78,79). This may lead us to think that HCPs can strongly influence vaccination intentions among the population of young adults on college campuses.

2.3: Online text versus online video messages

Online messaging as an effective platform for college students

The internet has been widely used in promoting physical and mental health wellness. This is mainly due to its feasibility and proven efficacy. Examples of such use of the internet include smoking cessation and chronic pain

management (80). This is essential for our population as online messaging is appreciated among the college population. Many studies have concluded that Internet-based interventions targeting eating disorders and preventing weight gain are feasible and effective among college students (81–83).

Which channel is more effective; text or video?

In various health-related fields such as dermatology (sun screen usage), immunization (poliovirus vaccine), and cancer (melanoma), video interventions were shown to be more effective than text materials in increasing health-related knowledge and behavior (84–86).

Generally, words alone are less efficient in targeting positive attitude when compared to using pictures or pictures with text (87,88). Research has indicated that multimodal (more than one delivery system, i.e.: audio and video) usage yields better communication results (89,90) than single mode (only one delivery system, i.e: text) usage. Despite these findings, some researchers argue that audiovisual communication may be a distractor to the recipient's' response (91), while others suggest audiovisual messaging is an effective method of triggering attention and stimulating recipients' emotional responses to delivered messages(92).

Promoting health behavior, such as vaccination uptake, can be looked at from an advertising campaign lens. The product here is the health behavior to be promoted. Studies have found that the advertising efficacy is generally increased by the use of audiovisual channels (74–76). Raney et al. (2003), showed that, compared to a text-based website, embedding a video on a website has

increased site evaluation and produced greater intent to return to the site and make a purchase (93).

Some researchers describe videos as a “vivid” channel of information and therefore it is a common technique used to influence recipient’s perceptions in the advertising industry (94–96). Heo and Sundar (2000), indicated that using video is a superior storytelling media, as videos in general connect emotionally with recipients more quickly and immediately than text (97).

Using the dual coding theory (89,90), the efficacy of audio-video messages with text over text only messages in promoting health behavior is reviewed. The proposed framework will help in examining and explaining the benefits for multi-modal (i.e. verbal and non-verbal) communication, used to present online health education messages, versus single mode (text only) communication. These benefits are operationalized by measuring change in knowledge, perceptions, and intentions to uptake the MenB vaccine.

Theoretical framework

The dual coding theory (89,90) suggests an explanation for the reason and the pathways through which the multi-modal messages are better than messages with one modality. Thus, this theory provides an explanation for why messages that have both text and video are more effective than text-only messages.

The assumption of the dual coding theory is that there are two information processing systems (verbal and non-verbal) that are independent. When a message recipient is presented with both types of information processing systems, the recipient should then organize the information with both verbal and

non-verbal entities. There are “logogens”, defined as verbal entities (e.g. words in text) organized in terms of associations and hierarchies (89,90). And, there are “imagens”, defined as non-verbal entities organized via its part to the whole which includes any non-verbal processing. From the perspective of the dual coding, the multimodal communication has an advantage because of the information processing operation that triggers the recipient to store the information presented as both logogens and imagens, thus preserved in the short-term memory.

Conceptual model

The conceptual model (Figure 2.1) is derived from the dual coding theory (89), in that the subject who receives the verbal and non-verbal stimuli condition (video and text) goes through dual sensory systems (representing logogens and imagens) to process the information. This can help explain why the multi-modal condition could lead to more knowledge, higher perceptions levels, and higher intention levels.

With the dual coding theory in mind, this study is based on work by Krawczyk et al. (98) to explore if there is any efficacy of multi-modal messages (i.e. audio-video and text) and, if so, explain why it seems to work better than text with pictures only content from a multi-modal information processing angle. Thus, the focus in the conceptual model is to show the expected outcomes that are thought to emerge from receiving the online message with the audio-video content with text.

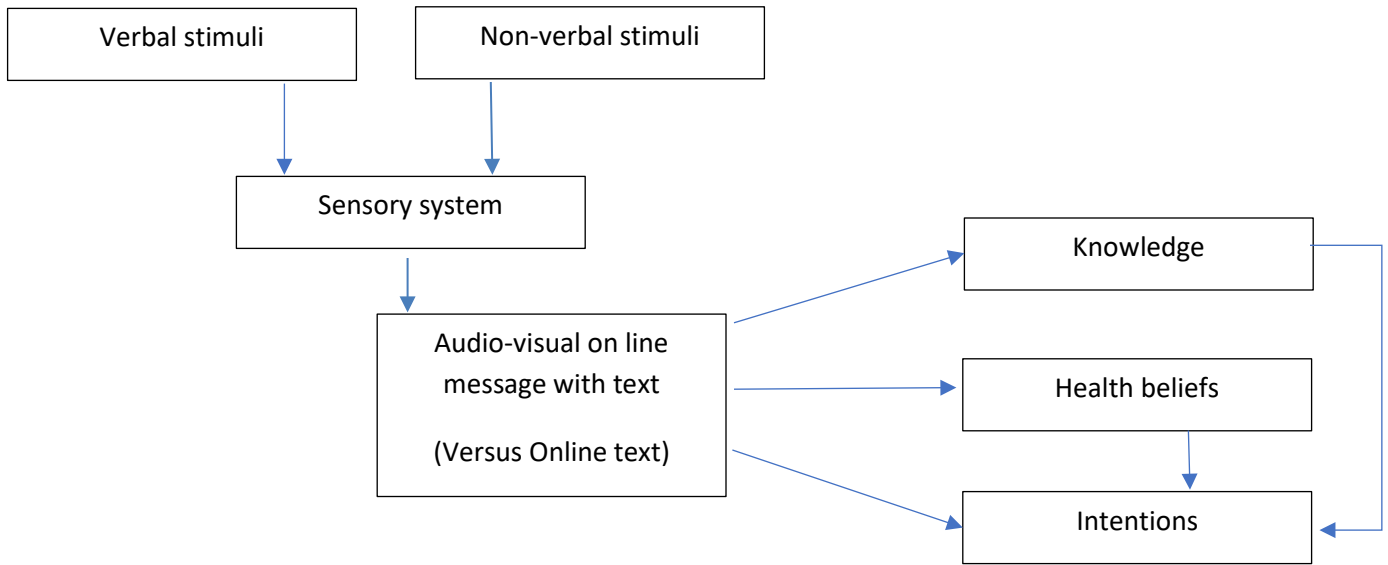


Figure 2.1: The conceptual framework

Part 3: The Health Belief Model as the theoretical framework for behavior

3.1 History of the Model

The Health Belief Model (HBM) was developed in the 1950's by social psychologists Hochbaum, Rosenstock and others, who were working in the United States Public Health Service to analyze the public's failure to participate in programs to detect and prevent illness, such as tuberculosis screening. Thus, originally, the HBM was designed to describe the model for disease prevention (13). Later, the HBM was used to assess the people's behavioral responses to health-related conditions.

Currently, there is an enormous empirical evidence supporting the utilization of the HBM in a broad range of health behaviors (99) such as different kinds of cancer screening (100–102), osteoporosis screening (103), smoking (104), adherence (105), and AIDS prevention behaviors (106,107). In addition,

numerous studies proved that the HBM showed a great success in the prediction of dietary and nutritional habits (108–110).

3.2 Model Constructs

The HBM suggests that changes in behavior are achieved through changes in knowledge and beliefs (111). This model reveals the relationship between beliefs and behaviors and at the same time confirms that preventive behavior is based on personal beliefs (112). The HBM model holds that people will follow health recommendations when they have enough motivators and when they believe that they are susceptible to the disease. The individual should feel that that the negative behavior may seriously affect his/her life; that following the health recommendations may decrease their level of vulnerability; and that the benefits outweigh the harms (14).

The HBM contains several constructs that are proposed to predict why people engage in prevention, screening, and/or controlling health conditions. These constructs are:

1. ***Perceived Susceptibility***: belief about personal risk of getting a disease or condition
2. ***Perceived Severity***: belief about the seriousness of the condition or consequences of leaving it untreated
3. ***Perceived Benefits***: belief about the potential positive aspects of a health action
4. ***Perceived Barriers***: belief about the potential negative aspects of a health action
5. ***Cues to Action***: factors which trigger the performance of an action

6. **Self-Efficacy:** belief that one can achieve the behavior required to execute the outcome; self-confidence to do a certain positive behavior or not do a certain negative behavior

Research has indicated that health beliefs involves the individual's perception of susceptibility to, and severity of, diseases or disorders as well as the perception of benefits of, and barriers to, taking an action to prevent diseases or illness (13) together with one's self-confidence to undertake the health behavior (15). Personal characteristics, such as age, gender, ethnicity, education, personality and knowledge modify these individual perceptions (perceived susceptibility, perceived severity, perceived benefits, perceived barriers,), self-efficacy, and cues to action) (113). Also, these perceptions may be modified by the physical, social, and cultural environment (99).

Perceived susceptibility and severity of a health condition together, have been labeled by researchers as "perceived threat" (113). If the perceived benefits of taking preventive action to avoid a disease are high and the perceived threat of the disease is also high, the individual is likely to modify or engage in health behavior. However, if the perceived barriers to taking preventive action are more negatively viewed than the harm from the resulting disease or condition, the individual is unlikely to modify or engage in healthy behavior. Therefore, the perceived benefits of healthy behaviors minus the perceived barriers to the healthy behavior can determine the probability that an individual will be taking preventative action (114).

The Cues to Action in the environment trigger the health behavior, and act on individual perceptions, such as perceived benefits, and perceived susceptibility (113). Self-Efficacy is the belief that one can engage in the behavior required to execute the outcome (113).

It is of interest to note that self-efficacy was not clearly incorporated into early formulations of the HBM. The original model was developed in the context of preventive health actions (accepting a screening test or an immunization) that were not perceived to involve complex behaviors (102). However, in 1988, the influence of what was called then the Social cognitive Theory, lead to the addition of the self-efficacy component (the person's confidence in his/her ability to take the action) (115). It can be concluded that self-efficacy play a significant role in the initiation and maintenance of behavioral change (15).

For behavior change to be successful and productive, people must, as the original HBM states, feel threatened by their current behavioral patterns (perceived susceptibility and severity) and believe that the positive change will lead to a valued outcome at an acceptable cost (perceived benefit vs. perceived barriers). In addition, the individual must feel himself/herself competent (self-efficacious) to overcome perceived barriers to take the required action to perform the positive change (102).

As noted previously, immunization was not originally believed to be considered a complex behavior requiring self-efficacy. However, more recent studies have identified HPV-related knowledge, health beliefs, and self-efficacy

as predictors of vaccine uptake (116,117). Hence, these factors are included for examination in this current study.

Part 4: Proposed study objectives

To the best of our knowledge, there are no published studies comparing the efficacy of text and video interventions specific to MenB. Therefore, the current study evaluates the impact of two MenB educational interventions (text and video) to change MenB disease and vaccine knowledge and perceptions and to increase vaccination intentions among college students. Also, the MenB vaccination rate will be described 3 months after exposure to the educational intervention (113).

Specifically, our study will explore the efficacy of health information delivered in a video format compared to the same health information delivered in a text format. It is hypothesized that (1) both intervention groups (text and video) will change the knowledge and perceptions of MenB disease and the vaccine compared to the baseline knowledge (2) both intervention groups will increase the vaccination intentions compared to the baseline intention, and (3) the video intervention will be more effective in improving knowledge, perceptions and vaccination intentions compared to the text intervention. Therefore, we aim at exploring any effect differences of multi-modal (audiovisual with text i.e: video) online health messages and single mode (text only) online health messages on health behavior related outcomes among college students.

Chapter 3: Research Design and Methods

This chapter focuses on the research methods that were used for this study. A description of the research design, study population, data collection method, and data analysis are provided in this chapter.

Considering the literature review and the theory of dual coding, our main research question is whether the video intervention could be superior to the text intervention or not. However, we chose to follow the more conservative path in hypothesis formulation and data analysis. Therefore, the bidirectional type of hypothesis was utilized in our aims.

This study has two main specific aims:

Specific aim one:

To compare the effectiveness of two different formats of educational media (video or text) on knowledge of MenB disease and MenB vaccine, perceived severity and seriousness of MenB, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among college students.

Specific aim 1 (a)

To compare the overall (pre- versus post-intervention) impact of educational media on knowledge of MenB disease and MenB vaccine, perceived severity and seriousness of Meningitis B, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among college students.

The hypothesis is as follows:

H₀: There is no difference in knowledge, perceived severity, seriousness, benefits, barriers, self-efficacy, cues to action, and intention pre- and post-intervention.

H_A: There is a difference in knowledge, perceived severity, seriousness, benefits, barriers, self-efficacy, cues to action, and intention pre- and post-intervention.

Specific aim 1 (b)

To compare the change from pre- to post-intervention of two different formats of educational media (video or text) on knowledge of MenB disease and MenB vaccine, perceived severity and seriousness of Meningitis B, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among college freshmen.

The hypothesis is as follows:

H₀: There is no difference in the change in knowledge of MenB disease and MenB vaccine, perceived severity and seriousness of Meningitis B, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among treatment groups.

H_A: There is a difference in the change in knowledge of MenB disease and MenB vaccine, perceived severity and seriousness of Meningitis B, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among treatment groups (text vs. video).

Specific aim two:

To compare vaccine uptake and knowledge retention among the two treatment groups 3-months post-intervention.

Specific aim 2 (a)

To compare the rate of MenB vaccination uptake three months after exposure to the study intervention among treatment groups (video or textual MenB educational material).

The hypothesis is as follows:

H₀: There is no difference in the MenB vaccination uptake between the two groups exposed to the two formats of educational media.

H_A: There is a difference in the MenB vaccination uptake between the two groups exposed to the two formats of educational media.

Specific aim 2 (b)

To compare knowledge retained three months after exposure to the study intervention among treatment groups (video or textual MenB educational material).

The hypothesis is as follows:

H₀: There is no difference in MenB knowledge between the two groups exposed to the two formats of educational media.

H_A: There is a difference in MenB knowledge between the two groups exposed to the two formats of educational media.

Specific aim 2 (c):

To describe self-reported facilitators and barriers among participants exposed to educational material.

Study Design

The study was a 3 months prospective study that recruited college students. The intervention was an educational mass media message to improve knowledge, perceptions, and intentions regarding MenB vaccine. Participants were randomly assigned to one of two groups. Group (1) was presented with an online **text** educational mass media message, while Group (2) was presented with an online **video** educational mass media message. Pre-post intervention surveys and a 3-month follow-up survey were used for intervention delivery and data collection. Surveys were administered online using Qualtrics.

Data were collected from July 19, 2017 to November 30, 2017. The procedure was carried out via online survey engine (Qualtrics.com). Study interventions (text or video) were randomly assigned to each participant via Qualtrics. A follow-up survey was sent for each participant 3 months after his/her completion of the pre-post-survey. Follow-up survey administration started on October 28,2017 and followed sequentially.

Participants

In the summer of 2017, a convenience sample of incoming Freshmen (approximately 2500 students), admitted for the upcoming Fall semester at Auburn University were invited to participate in the study through electronic mail sent by the office of the Director of the First Year Experience as part of Auburn University's orientation program, known as Camp War Eagle (CWE). Subsequently, another invitation was sent by the same office via the orientation program for transfer students and freshmen who cannot attend Camp War Eagle, known as Successfully Orienting Students (SOS). To increase sample size, a

third wave of study invitations was sent out in October of 2017 by the Office of Institutional Research to all currently enrolled Freshman students 18 years of age and older. Lastly, a reminder email invitation was sent to SOS participants in late October. Exclusion criteria were: age less than 18 years and previous receipt of MenB vaccine.

Procedure

Phase I: participants clicked on a link to the survey or entered the link into a web browser to access the survey. They were first presented with the online information letter. Then, the pre- and post-intervention questionnaires were administered online through Qualtrics Survey Software (Appendix B).

Participants completed the survey from a computer of their choice. After agreeing to participate, participants completed the online pre-intervention questionnaire battery, and were then randomly assigned, via Qualtrics, to one of two conditions: text or video messages. The text message intervention group read an educational MenB and vaccine pamphlet on screen, and the video message intervention group watched an educational MenB and vaccine video that has the same content. Participants in the two groups took less than five minutes to read their pamphlet or watch their video. Finally, participants completed the online post-intervention questionnaire battery. The entire survey took approximately 15-20 minutes.

At the end of the survey, participants who wished to participate in the drawing for a chance to win a one of four \$50 cash prizes, was instructed to click on a link to a second survey where his/her contact information (name, daytime and evening telephone numbers, mailing address and e-mail address) could be

entered. Thus, survey responses were downloaded into one Qualtrics database, while contact information was downloaded into a second, separate Qualtrics database. In this way, no identifying information could be linked to survey responses.

In the final item of the post-intervention questionnaire, participants were given the opportunity to participate in a follow-up survey 3 months post-intervention (Phase II) by providing their email address.

Phase II: for those who agreed to participate in the follow-up survey, a link to the survey was sent to the email address they provided, approximately 3 months after the initial survey. The same procedure was used for obtaining consent and for providing contact information for the second drawing. In this questionnaire, participants were asked again the same knowledge questions that were asked in the pre- and post-intervention questionnaire to determine their knowledge retention. Also, they were asked to indicate whether they got the MenB vaccine or not, facilitators if they got it, and barriers if they did not get it.

Consent

All forms of recruitment and consent material indicated that the study is investigating factors that affect students'-decision making regarding their health. There was no mention of Meningitis B or the Meningitis B vaccine, so that we can avoid priming the participants and/or avoid selection bias that could result if participants choose not to take the survey because of the topic. Participants were presented with an electronic information letter and were told that continuing with the survey indicates that they have provided their consent (Appendix B). All participants were informed that they are allowed to withdraw from the study at

any time. If they proceeded, they were asked to confirm that they are at least 18 years of age and that they have not previously received the Meningococcal B vaccine.

Incentive

Individuals who completed the pre-and post-intervention survey and provided their contact information had their names entered in a drawing for a chance to win one of four \$50 cash prizes. Cash prizes were awarded through the Auburn University Payment and Procurement office. Each respondent was given a similar second opportunity to win one of four additional \$50 cash prizes if he/she completed the follow-up survey.

IRB approval

The study protocol was reviewed and approved by the Auburn University Institutional Review Board (IRB). Any modification in recruitment method or study survey questionnaire was submitted to the IRB via an IRB modification request and was approved.

Intervention development

The development of both the text and the video interventions was guided by the Health Belief Model (HBM) as shown in Table 3.1. The HBM is a theoretical framework commonly applied to health-behavior research (118,119). Key factors of the HBM, as they apply to intentions to receive the MenB vaccine, are: perceived susceptibility to and severity of MenB; perceived benefits (e.g., the prevention of MenB); perceived barriers (e.g., side effects of the MenB vaccine); cues to action (e.g., a Health Care Provider recommending the HPV vaccine);

and self-efficacy (i.e., confidence to complete the two-dose or three-dose MenB vaccine series).

Table 3.1: Expressions reflecting the HBM constructs in the educational interventions

HBM construct	Expression in the educational intervention (text or video)
1. Perceived susceptibility	<p>“Adolescents and young adults ,16 through 23 years old, are among groups that are at increased risk”</p> <p>“Meningococcal disease often occurs without warning — even among people who are otherwise healthy.”</p> <p>“Anyone can get meningococcal disease, but certain people are at increased risk, among those are, adolescents and young adults, like you!”</p> <p>“Meningococcal disease can spread from person to person through: Close lengthy contact, coughing, sneezing, kissing.”</p>
2. Perceived severity	<p>“This bacterium is called <i>Neisseria meningitidis</i> and it causes a serious illness referred to as Meningococcal disease.”</p> <p>“It can lead to meningitis, which is infection of the lining of the brain and spinal cord, and infections of the blood.”</p> <p>“Even when it is treated, meningococcal disease kills 10 to 15 infected people out of 100. And of those who survive, about 10 to 20 out of every 100 will suffer disabilities such as hearing loss, brain damage, kidney damage, and amputations”</p> <p>“Even if you’re lucky enough to not experience these adverse effects, you still face missing many days from classes and you and your family may face expensive medical costs.”</p>
3. Perceived barriers	<p>“It is available NOW at Auburn University Medical Clinic or at your physician’s clinic”</p> <p>“If you took your first dose at your home, you can take subsequent dose(s) here at AUMC or at your private physician’s clinic.”</p> <p>“Side effects are usually mild and go away on their own within a few days, but serious reactions are also possible”</p> <p>“The vaccine is usually covered by your insurance plan.”</p>
4. Perceived benefits	<p>“But, there is GOOD NEWS! MenB vaccine can help PREVENT the disease!”</p> <p>“MenB vaccine could be given to anyone 16 through 23 years old to provide short term protection against most strains of serogroup B meningococcal disease; 16 through 18 years are the preferred ages for vaccination” (CDC,2016).</p> <p>“So, why get vaccinated? to protect yourself and your family and friends from getting this serious disease, to shield yourself and your family from the financial and emotional costs of the disease, to avoid an extended hospital stay and missing significant class time, and to avoid severe life-threatening complications that can impact your quality of life forever”</p>
5. Self-efficacy	<p>“Dr. Fred Kam, M.D., Medical director of the Auburn University Medical Clinic (AUMC), will tell you why you need to be concerned about a certain microorganism, Meningitis B (MenB) bacteria, and how you can protect yourself against it”</p> <p>““It is available NOW at Auburn University Medical Clinic or at your physician’s clinic”</p>

	<p><i>“How do you protect yourself? For best protection, two or three doses of a serogroup B meningococcal vaccine are needed. The same vaccine must be used for all doses. Ask your physician or visit us at Auburn University Medical clinic to know if you are a good candidate for the vaccine”/ “The vaccine is usually covered by your insurance plan”.</i></p>
6. Cues to action	<p><i>“Are you at risk for the potentially deadly Meningitis B (MenB) disease?”</i></p> <p><i>“Dr. Fred Kam, M.D., Medical director of the Auburn University Medical Clinic (AUMC), will tell you why you need to be concerned about a certain microorganism, Meningitis B (MenB) bacteria, and how you can protect yourself against it”</i></p> <p><i>“Recently many MenB outbreaks took place on campuses, such as Princeton University in 2013 and University of Oregon in 2015, several students died as a result.”</i></p> <p><i>“The Center for Disease Control and Prevention (CDC) recommends that college students get vaccinated.”</i></p> <p><i>“Get the MenB vaccine ..Protect yourself...protect your family ...protect your friends and others. What are you waiting for?”</i></p> <p><i>“It is available NOW at Auburn University Medical Clinic or at your physician’s clinic”</i></p>

The text and video interventions (Appendix E and F) contain information about the incidence, transmission, consequences of MenB, and the efficacy and safety of the vaccine. This information was obtained from the Vaccine Information Statement (VIS) developed by the Center for Disease Control (CDC) and framed to address the HBM constructs.

Since college students’ often believe they are not susceptible to diseases in this stage of their life (49), both of the educational mass media messages were developed as gain-framed messages. Because, gain frame messages are believed to be more effective for those who perceive low susceptibility to a health problem, but loss-framed messages should be more effective for those who perceive high susceptibility” (120).

The researcher (Heba Aref) developed the interventions for the purpose of this study using experiences of members of the thesis committee in the field of vaccination (Dr. Kam and Dr. Westrick) and mass media development (Dr.

Worthington). In order to control for the effect of content, the video and text interventions contained identical information but differed in the format (text vs video) in which the information was delivered. Both interventions were delivered electronically (inserted in the Qualtrics survey), with text in the format of an on-line page (hosted by Adobe Spark) and the video as an MP4 animated PowerPoint video (hosted by YouTube). The video and the text portrayed a health care provider, (Dr. Fred Kam, director of the Auburn University Medical Clinic (AUMC)), delivering the information. To ensure the credibility of the interventions, participants were asked “How credible did you find the informational pamphlet/ video that you read/watched?” Participants answered on a 5-point scale (1 = *Not at all credible* to 5 = *Very credible*).

Questionnaire development

In the current study, participants were asked to respond to a pre-post-questionnaire and a follow-up questionnaire. The pre-post-questionnaires focused on; knowledge (7 items), HBM constructs (33 items), and the intention (2 items) to obtain MenB vaccine.

The pre-post-questionnaire development began with a literature review to identify if any valid and reliable survey tools were available and could be adapted for use in the current study. Thus, the knowledge items were based upon the study conducted by Waller et al.,2013 (121). For the HBM items, Champion’s Health Belief Model Constructs Instrument was identified (Champion, 1999), and permission to use the instrument was obtained. Champion’s original scale was used to study breast self-examination behavior and measured five constructs related to the HBM, including susceptibility, severity, benefits, barriers, and

health motivation (122). Thus, the study survey questions are adapted from Champion's original HBM Constructs Instrument (1999). As Champion did not include the self-efficacy items, these items were developed based on items published by Myers and Goodwin (123). And finally, the intention items were derived from other similar research published in 2008 (124). Survey face and content validity was determined by an expert panel review.

The pre- and post-intervention questionnaires (41 items) were identical, except that the post-intervention questionnaire contained the credibility question ("How credible did you find the informational pamphlet/ video that you read/watched?") and the demographic items at the end (6 items), including gender, age, annual family household income, race, ethnicity, and education level.

Measures

Reliability and descriptive statistics for the measures appear in Table 3.2.

Full survey instruments are presented in Appendix C.

1) Pre-post-survey

Knowledge:

Knowledge was measured using mixture of "True" and "False" items that were incorporated into the questionnaire so that the risk of response bias could be minimized. Example of these questions are: "Meningitis is a common disease. True or False?" and "Meningitis is a rare disease. True or False?"

HBM constructs:

The HBM items in the survey were measured using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Examples of items for each construct:

1. Perceived susceptibility: *“There is a good possibility I will get Meningitis B in the next 4 years”*
2. Perceived severity: *“I am afraid to think about Meningitis B complications”*
3. Perceived benefits: *“If I complete Meningitis B vaccination, I will decrease my chance of dying from Meningitis B”*
4. Perceived barriers: *“I have worries about the cost of Meningitis B vaccine”*
5. Self-efficacy: *“I am confident I can get the Meningitis B vaccine easily”*
6. Cues to action: *“I will take the Meningitis B vaccination if my doctor says it is important”*

Intention:

Intention to receive the MenB vaccine was measured using 2 questions. One of them was, “How likely are you to receive the Meningitis B vaccine in the future?”.

Then the participant indicated the degree to which he/she does or does not intend to receive the vaccine on a 5-point scale (1 = *extremely likely* to 5 = *extremely unlikely*). The other question was “Do you intend to receive the Meningitis B vaccine?”. Then the participant answered by choosing Yes or No.

2) Follow-up survey

This survey consisted of 13 items which included the following; (1) knowledge retention items (7 items), (2) whether the participant received the

vaccine or not, (3) location of vaccination, (4) barriers to receiving the vaccine, (5) facilitators to receiving the vaccine, (6) sources of information about the vaccine, and (6) degree of influence of the source of information. Items in the follow-up survey were based upon those mentioned by Shropshire, Brent-Hotchkiss, and Andrews, 2013 (125). See Appendix H for surveys items.

Survey scales were scored by obtaining a mean score for each HBM construct and each construct item was equally weighted. Items were reverse coded when necessary, so that high scores represent higher degrees of the construct. Internal consistency of each construct scale was measured (Cronbach's α). The KR-20 was used to determine the internal consistency of the knowledge questions. The HBM constructs and other related survey questions are shown in Appendix C.

Table 3.2: Description of the components of the pre-post intervention instrument

Component	Number of items	Range of possible score (Scale)	Internal consistency reliability* (pre-intervention)	Internal consistency reliability* (post-intervention)
1. Knowledge	7	0-100%	0.17	0.37
2. Perceived susceptibility	5	5-25	0.90	0.92
3. Perceived severity	7	7-35	0.86	0.92
4. Perceived benefits	6	6-30	0.93	0.96
5. Perceived barriers	7	7-35	0.84	0.83
6. Self-efficacy	4	4-20	0.88	0.93
7. Cues to action	4	4-20	0.87	0.90
8. Intention **	1	1-5	N/A	N/A

**Cronbach's alpha coefficients, except for knowledge of MenB, which was assessed using Kuder-Richardson formula 20. **Intention was tested only with one item*

Statistical analysis

Data analysis was conducted using the Statistical Package for the Social Sciences 16.0 (SPSS, Chicago, Illinois). Descriptive statistics were conducted on demographics and baseline characteristics. Independent samples t-test was used to compare the baseline characteristics of both groups. The paired sample t-test was used to compare between the mean pre-test score and post-test score of knowledge, perceptions, and intentions in both text and video groups. The difference in difference analysis was used to compare the change in scores pre to post between both text and video groups. In addition, linear regression analysis was used to determine predictors of intention. Finally, descriptive statistics were used to report the three months-follow-up survey results.

Chapter 4: Results

Demographics of the sample

Of the initial 299 participants who took the survey, only 133 (44.4%) were randomized to either read an online text educational material or watch an online video-educational material. The study was completed by 121 (40.4 %) participants. According to the Qualtrics report, 61 (20.4%) participants did not complete the survey. A total of 117 (39.1%) participants were excluded. The most common reason for exclusion was due to previous MenB vaccine uptake, which 112 (37.4%) participants self-reported. Also, 5 (1.6%) participants reported that they were not Auburn University undergraduate students and therefore were excluded.

One hundred and fifty-three participants (51.1%) stated that they do not remember if they received the MenB vaccine, while 29 participants (9.6%) stated that they did not receive the vaccine. Both of these groups were included. One hundred participants (33.4%) agreed to participate in the three months-follow-up survey. However, only 38 participants responded.

Among the 121 participants who completed the study, 60 participants were randomly assigned to the online text group, and 61 participants were randomly assigned to the online video group as shown in Figure 4.1. The mean age of the participants was 19.53 ± 2.28 years (range, 18–32 years). Regarding credibility of the educational intervention: participants reported the educational interventions are very credible (65.3%), somewhat credible (28.9%), neutral (2.5%), somewhat not credible (1.7%), and not at all credible (1.7%).

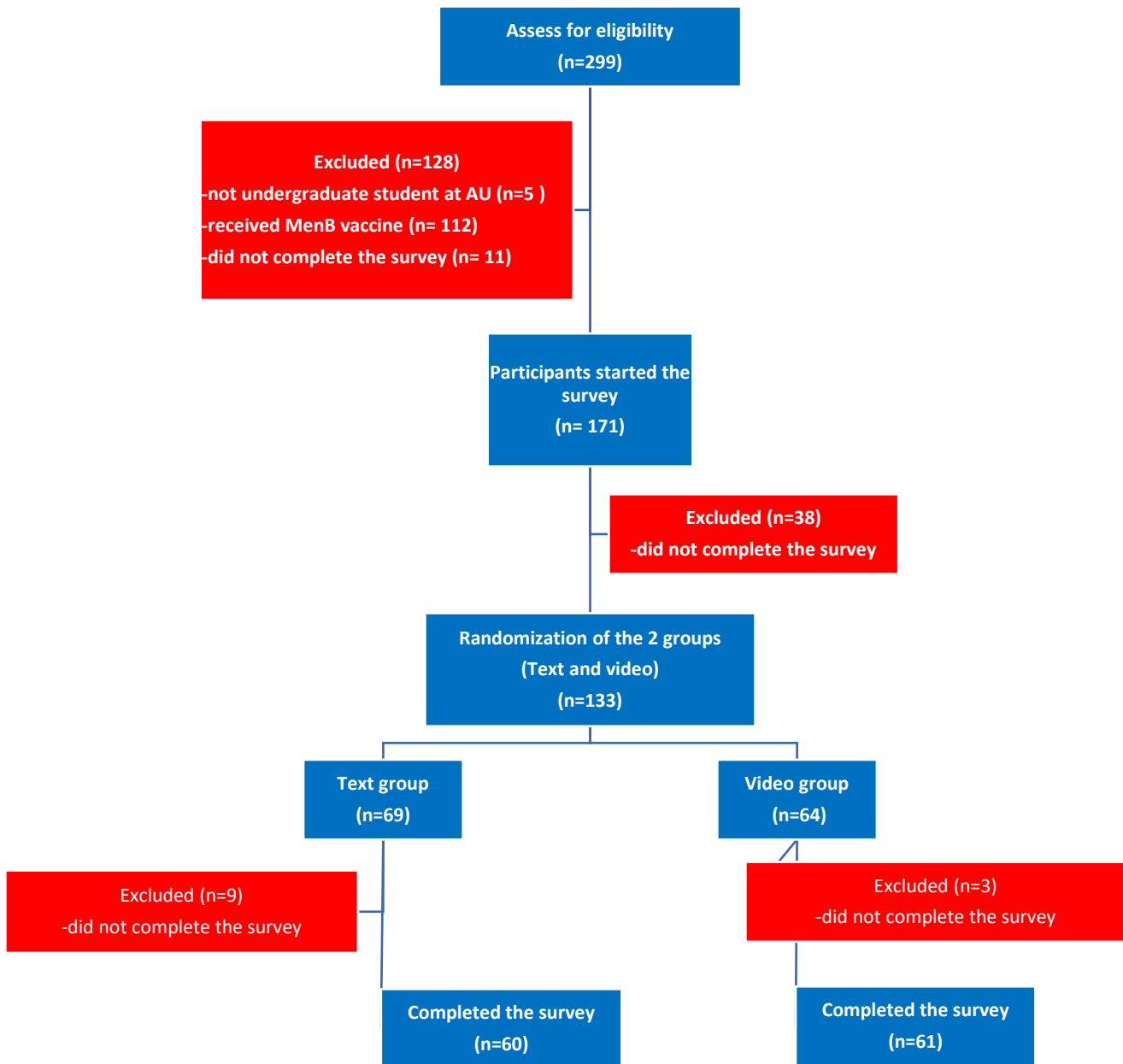


Figure 4.1: Randomization schema and participants' flow diagram

The majority of the participants were white (93.9%), held a high school diploma (91.7%), freshman students (83.5%), and were females (70.2%). The mean age of the sample was (19.6±2.7) with the range of (18.2-32.8) years. The most frequently reported socioeconomic status (SES) of this sample was upper middle (42.5% indicated an annual family income of \$70,000 to \$139,999). Detailed demographic data revealed no significant differences among the two treatment groups ($p>0.05$) with the exception of income ($p=.01$) and age ($p=.03$) as represented in Table 4.1.

Baseline characteristics

No differences existed at baseline in mean knowledge, HBM constructs, or intention to receive the vaccine between the two treatment groups ($p>0.05$) as shown in Table 4.1.

Table 4.1: Comparison of the baseline characteristics between the text and video groups

Demographic factor	Text (n=60) n (%)	Video (n=61) n (%)	Overall (n=121) n (%)	p value
Gender†				
Male	17 (28.3)	19 (31.1)	36 (29.8)	0.73
Female	43 (71.7)	42 (68.9)	85 (70.2)	
Age‡				
Mean±SD	19.09±1.25	19.96±2.92	19.53±2.28	0.03*
Marital status §				
Single (never married)	57 (95)	59 (96.7)	116 (95.9)	0.49
Currently married	2 (3.3)	2 (3.3)	4 (3.3)	
Separated, divorces, or widowed	1 (1.7)	0(0.0)	1 (0.8)	
Status at AU§				
Freshman	53 (88.3)	48 (78.7)	101 (83.5)	0.17
Sophomore	4 (6.7)	6 (9.8)	10 (8.3)	
Junior	3 (5.0)	4 (6.0)	7 (5.8)	
Senior	0 (0.0)	3 (4.9)	3 (2.5)	
Education §				
High school diploma	55 (91.7)	56 (91.8)	111 (91.7)	0.49
Two-year undergraduate degree	2 (3.3)	4 (6.6)	6 (5.0)	
Bachelor's degree	2 (3.3)	1 (1.6)	3 (2.5)	
Other	1 (1.7)	0 (0.0)	1 (0.8)	
Income# §				
Less than 20,000 per year	4 (6.7)	5 (8.3)	9 (7.5)	0.01
20,000-69,999	18 (30)	15 (25)	33 (27)	
70,000-139,999	18 (30)	33 (55)	51 (42.5)	
140,000 or more per year	20 (33.3)	7 (11.7)	27 (22.5)	
Hispanic 				
Hispanic origin	1 (1.7)	3 (4.9)	4 (3.3)	0.61
Non-Hispanic origin	59 (98.3)	58 (95.1)	117 (96.7)	
Race§				
White/Caucasian	31 (93.9)	23 (92.0)	54 (93.1)	0.96
Black/ African America	1 (3.0)	1 (4.0)	2 (3.4)	
Other	1 (3.0)	1 (4.0)	2 (3.4)	
Willingness to participate in the follow-up survey †				
Willing	54 (90.0)	46 (75.4)	100 (82.6)	0.03*
Non-willing	6 (10)	15 (24.6)	21 (17.4)	
Baseline perceptions	Mean ± SD	Mean ± SD	Mean ± SD	
Knowledge**	80.47±15.77	78.22±16.41	79.33 ± 16.07	0.44
Perceived susceptibility	8.65 ± 2.86	8.65 ± 3.1	8.65 ± 2.99	0.99
Perceived Severity	21.85 ± 5.23	22.63 ± 5.52	22.24 ± 5.37	0.42
Perceived benefits	22.00 ± 4.21	22.24 ± 5.01	22.12 ± 4.61	0.77
Perceived barriers	19.25 ± 4.62	18.9 ± 6.41	19.07 ± 5.57	0.73
Self-efficacy	13.55 ± 3.26	13.55 ± 3.81	13.55 ± 3.54	0.99
Cues to action	20.18 ± 4.58	18.57 ± 5.60	19.37 ± 5.16	0.08
Intention	3.22 ± 0.94	3.20 ± 0.99	3.21 ± 0.96	0.91

*: p value is significant if $p < 0.05$, †Chi-square test, ‡ Independent sample t-test, § likelihood ratio, ||: Fisher's exact test, ** knowledge is calculated as percentage, #Immediate family's total annual household income, AU: Auburn University, SD: standard deviation.

Phase I:

The overall effect of both interventions

For the overall sample, the mean post-intervention knowledge, perceived susceptibility, perceived severity, perceived benefits, self-efficacy, cues to action, and intention scores were significantly higher than the mean pre-intervention scores. It was also indicated that the mean post-intervention perceived barriers scores were significantly lower than pre-intervention scores, Table 4.2. In addition, there was an increase in the percentage of participants who answered “yes” to the additional intention question “Do you intend to receive the Meningitis B vaccine?” from 50.9% pre-intervention to 65.6% post-intervention.

Table 4.2: Comparison between the overall mean pre-intervention scores and post-intervention scores regardless of intervention type‡

	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	<i>p</i>
Knowledge**	5.56 ± 1.10	5.90 ± 1.00	0.002
Perceived susceptibility	8.62 ± 2.99	11.86 ± 4.36	<0.001
Perceived severity	22.22 ± 5.35	24.28 ± 6.22	<0.001
Perceived benefits	22.12 ± 4.61	23.09 ± 4.73	<0.001
Perceived barriers	19.07 ± 5.57	17.41 ± 5.17	<0.001
Self-efficacy	19.37 ± 3.54	20.14 ± 3.26	<0.001
Cues to action	13.55 ± 5.16	15.62 ± 5.76	0.016
Intention	3.20 ± 0.96	3.65 ± 0.91	<0.001

‡Paired sample t-test is used, *Significant at the 0.05 level (two-tailed), ** knowledge is calculated as percentage correct

*: *p* value is significant if *p*<0.05, †Chi-square test, ‡ Independent sample t-test, § likelihood ratio, ||: Fisher’s exact test, ** knowledge is calculated as percentage, #Immediate family’s total annual household income, AU: Auburn University, SD: standard deviation.

Pre- versus post-interventions scores in each of the text and video groups

Both video and text groups showed significant post-test mean score improvement in perceived susceptibility, severity, benefits, barriers, self-efficacy and intention to obtain MenB vaccine ($p < 0.05$). The video group also showed a significant post-test mean score improvement in knowledge and perceived cues to action ($p < 0.05$) as shown in Table 4.3.

Changes in scores pre- to post- intervention in both text and video groups

No significant differences were found in mean score improvement of knowledge, perceptions, and intention for video compared to text educational material ($p > 0.05$). This is indicated in Table 4.4.

Table 4.3: Comparison between the mean pre-intervention score and post-intervention test scores of knowledge, perceptions, and intentions in each of the text and video groups separately‡

Construct	Text (n=60)				Video (n=61)			
	Mean	SD	Difference between the two means†	p*	Mean	SD	Difference between the two means†	p*
Knowledge**								
Pre-exposure	80.47	15.77	4.53	0.07	78.22	16.41	6.55	0.00*
Post-exposure	85.00	14.97			84.77	12.74		
Perceived susceptibility								
Pre-exposure	8.65	2.86	2.85	0.00*	8.65	3.12	3.50	0.00*
Post-exposure	11.50	4.37			12.16	4.37		
Perceived severity								
Pre-exposure	21.85	5.23	1.71	0.01*	22.63	5.52	2.40	0.00*
Post-exposure	23.56	6.15			25.04	6.29		
Perceived benefits								
Pre-exposure	22.00	4.21	0.93	0.03*	22.24	5.01	1.00	0.00*
Post-exposure	22.90	4.56			23.24	4.91		
Perceived barriers								
Pre-exposure	19.25	4.62	-1.88	0.00*	18.90	6.41	-1.44	0.00*
Post-exposure	17.36	5.19			17.45	5.18		
Self-efficacy								
Pre-exposure	13.50	3.26	1.95	0.00*	13.55	3.81	2.19	0.00*
Post-exposure	15.50	3.08			15.75	3.46		
Cues to action								
Pre-exposure	20.18	4.58	0.56	0.20	18.57	5.60	0.98	0.03*
Post-exposure	20.75	5.59			19.55	5.91		
Intention								
Pre-exposure	3.22	0.94	0.55	0.00*	3.20	0.99	0.34	0.00*
Post-exposure	3.77	0.85			3.54	0.97		

‡ Paired sample t-test is used, *Significant at the 0.05 level (two-tailed), † Post-exposure minus pre-exposure (i.e. subtracting pre-exposure mean from the post exposure mean), ** knowledge is calculated as percentage correct

Table 4.4: Difference in difference analysis. Comparing the change in scores pre to post between both text and video groups‡

Construct	Mode type (n)	Mean change in scores†	SD	<i>p</i>*
Knowledge**	Text (65)	3.29	19.52	0.29
	Video (61)	6.55	14.88	
Perceived susceptibility	Text (61)	2.96	3.76	0.37
	Video (61)	3.50	3.51	
Perceived severity	Text (61)	1.72	5.17	0.41
	Video (61)	2.40	4.51	
Perceived benefits	Text (60)	0.93	3.32	0.88
	Video (61)	1.00	2.78	
Perceived barriers	Text (60)	1.88	5.19	0.62
	Video (61)	1.44	4.07	
Self-efficacy	Text (60)	1.95	2.45	0.56
	Video (61)	2.19	2.90	
Cues to action	Text (60)	0.56	3.42	0.50
	Video (61)	0.98	3.59	
Intention	Text (60)	0.55	0.76	0.13
	Video (61)	0.34	0.68	

‡ Independent sample t-test is used, SD: standard deviation, ** Knowledge is calculated as percentage

Factors associated with intention to uptake the MenB vaccine

A Hierarchical regression was carried out using vaccination intention as a dependent variable. In step (1): we assessed unadjusted comparison of intention in the text vs video groups. No significant effect was found. In step (2): the HBM components were added as control variable and a significant difference in intention among the two treatment groups was shown with the text group demonstrating greater intention to obtain the vaccine. In step (3): age and income were added (because originally at baseline there was a significant difference between the 2 groups in age and one of the four the income levels (more than 140,000\$)). By looking at the final step, this model could explain 31.7% of the change in intention. We have to note here that this model does not control for the pre-intervention scores.

Table 4.5: Hierarchical regression-intention for MenB vaccination uptake as dependent variable

Predictor	Step 1		Step 2		Step 3	
	Standardized Beta (B)	p	Standardized Beta (B)	p	Standardized Beta (B)	p
Intervention type dummy (video=1, text=0)	-.123	0.178	-.168*	.033	-.155	.062
Perceived susceptibility sum scores after the intervention			.280**	.005	.279**	.005
Perceived severity sum scores after the intervention			.118	.297	.182	.119
Perceived benefits sum scores after the intervention			.305**	.005	.287**	.009
Perceived barriers sum scores after the intervention			-.325***	.000	-.317***	.000
Self-efficacy sum scores after the intervention			.011	.887	.005	.950
Cues to action sum scores after the intervention			-.011	.901	-.006	.945
Knowledge sum scores after the intervention			-.049	.568	-.052	.548
Age					.115	.158
Income# 20,000 to 69,999\$ per year dummy‡					.226	.108
Income# 70,000 to 139,999 per year dummy‡					.187	.214
Income# more than 140,000 per year dummy‡					.277*	.044

*p<0.05, **p<0.01, ***p<0.001, # Immediate family's total annual household income, ‡ income less than 20,000\$ was used as a reference,

Model Fit Statistics:

Step 1: R²= .015, Adj R²= .007, F (1,119) = 1.836, R²change= 0.015

Step 2: R²= .352, Adj R²= .306, F (7,112) = 7.603***, R²change= .337

Step 3: R²= .386, Adj R²= .317, F (4,108) = 5.650***, R²change= .034

Phase II (3 Months follow-up):

Important findings 3 months later after phase I

First: knowledge retention:

As seen in Table 4.6, there is no significant difference ($p=1.00$) between the mean percentage of knowledge sum scores immediately after intervention (88.34 ± 13.22) when compared to the scores taken three months after the survey (88.34 ± 10.94). In addition, there was no significant difference in the mean knowledge scores three months after exposure between text group (87.86 ± 12.501) and the video group (88.89 ± 9.239), ($p=0.77$).

Table 4.6: Mean Knowledge scores in different stages of the study (n=38)

Pre-intervention mean knowledge score	Immediate post-intervention mean knowledge scores	Three months post-intervention mean knowledge scores
82.70 ± 14.1	88.34 ± 13.2	88.34±10.9
$p = 0.02^*$		$p = 1.00$

* p is significant if $p < 0.05$)

Second: vaccine uptake:

It was shown that only three participants, out of the 38 who completed the three-months follow-up survey, obtained the MenB vaccine. These three participants reported that they took the vaccine at their family doctor clinic and two of them reported that this study influenced them to get the vaccine. However, several barriers were reported from the remaining 35 participants. These included: cost, fear of illness from the vaccine, fear of needles, lack of convenience, and lack of time, Table 4.7.

Table 4.7: Descriptive statistics for the responses related to MenB vaccine uptake

Item	n	%
<u>A) Participants who received the vaccine</u>	3	7.9
Location of vaccine uptake		
Family doctor	3	7.9
Sources of information about the vaccine		
• TV ad	1	2.63
• This study, 3 months ago	2	5.26
Facilitators:		
• Parent's encouragement	1	2.63
• Knowing that this vaccine will prevent a serious disease, parent's encouragement, and cost covered by health insurance	1	2.63
• Doctor's recommendation, knowing that this vaccine will prevent a serious disease, and parent's encouragement	1	2.63
<u>B) Participants who did not receive the vaccine</u>	35	92.1
<u>Barriers</u>		
Cost	9	23
Fear of illness	3	7.6
Fear of needles	1	2.5
Lack of access	1	2.5
Convenience/lack of time	16	41
Never heard of it	6	15.3
Other (such as "I don't care to", "Haven't thought to", "Nothing, just didn't feel like it.", "Not a big enough concern to me", "I forgot about it", "Never recommended to me", "I might already have had the vaccine? I'm not sure", "Haven't been to a doctor")	9	23

Chapter 5: Discussion and conclusion

Our study examined two different formats for delivering the same content of an educational mass media message. The effect of single mode (text only) and multimodal (audio-visual with text) vehicles on knowledge, perceptions, and intention of MenB vaccination were assessed. While both formats were found to be effective in improving overall intention to obtain MenB vaccine, no difference in intention was found between the two intervention groups. The follow-up survey in a small subsample of participants revealed knowledge retention after three months, but no significant impact on actual uptake of the vaccine.

The overall impact of both interventions– specific aim 1(a)

The first objective was to investigate whether both educational interventions are effective means of communicating information about a certain health behavior. This was accomplished by comparing the overall (pre- versus post-intervention) impact of educational media on knowledge of MenB and MenB vaccine, perceived severity and susceptibility of MenB, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among college students. All participants reported having some knowledge, operationalized as mean percent correct on a knowledge test, of MenB and the vaccine at baseline. Nevertheless this knowledge, was relatively low, which is consistent with the literature(126,127). These low levels of MenB knowledge pre-intervention confirms the need for more educational messages targeted towards young adults.

Both the video and text interventions significantly improved all the Health Belief Model constructs examined. For the overall sample, the mean post-intervention scores of knowledge ($p=0.002$), perceived susceptibility ($p<0.001$), perceived severity ($p<0.001$), perceived benefits ($p<0.001$), self-efficacy ($p<0.001$), cues to action ($p=0.016$), and intention ($p<0.001$) were significantly higher than the pre-intervention scores. Similarly, the mean post-intervention perceived barriers score was significantly lower than pre-intervention score ($p<0.001$). This is consistent with research that showed that educational interventions, in general, lead to improved knowledge (70,73,98,128), perceived severity, susceptibility, and benefits (128). Research has shown that increased perceived severity of meningitis disease, perceived benefits of vaccination, and knowledge about the vaccine were strongly associated with willingness to receive MenB vaccine (129).

Considering effectiveness of both educational interventions in improving intentions, this study findings indicated that intentions to obtain the MenB vaccine increased from pre- to post-intervention in both intervention groups. This finding is in agreement with the existing literature (98,130,131). Since MenB is rare but serious disease, and vaccination rates among young adults are still low (132), it is a significant finding that both interventions were effective in improving vaccination intent. Literature consistently supports intention as the strongest predictor of actual behavior (133).

Comparative effectiveness of the two interventions – specific aim 1(b)

The second objective was to test whether the multimodal intervention (audio-video) could be more efficacious than the single mode (text only) intervention. This was done by comparing the change from pre- to post-intervention of the two different formats of educational media on knowledge of MenB disease and MenB vaccine, perceived severity and susceptibility of MenB, perceived benefits and barriers to getting the vaccine, self-efficacy in getting the vaccine, cues to action, and intention to get the vaccine among college freshmen. This was accomplished using two approaches.

First: Comparing the pre-and post- interventions mean scores separately for each intervention.

The pre- and post- mean scores were compared separately for each intervention (Table 4.3). This comparison indicated that both video and text groups showed significant post-test mean score improvement in perceived susceptibility, severity, benefits, barriers, self-efficacy and intention to obtain MenB vaccine. Interestingly, the video group also showed a significant post-test mean score improvement in knowledge and perceived cues to action. Thus, the video format of the educational material showed a significant improvement in all tested constructs of the HBM. This is consistent with other studies (84–86) that found video to be more effective than the text format at improving knowledge, awareness, and health behaviour. Also, other researchers have found that video is an effective tool specifically to improve knowledge (73,134–137), perceptions (128,138,139), and intention (140,141).

Second: Comparing the change in scores from pre-to post-intervention between both interventions

The change in scores from pre- to post-intervention were compared using a difference in difference analysis (Table 4.4). This comparison showed that no significant differences were found in mean score improvement of knowledge, perceptions, or intention for video compared to text educational material. Likewise, after controlling for the HBM main constructs, knowledge, age, and income, the intervention type (text versus video) was not found to be a significant predictor of post-intervention intention.

Therefore, the video intervention utilized in this study was not superior to the text intervention. This finding is inconsistent with the dual coding theory assumptions, which lead us to expect that the video will be better than the text. While some researchers have indicated that video is better than text format for delivering educational health messages (84–86,142,142), other studies suggest these results, finding no significant differences between video and text formats for delivering health related mass media messages (98,143,144,144).

Some explanations for this finding might include that: (1) both interventions had the same content but only differed in format, and (2) young adults in our study (mostly Generation Z) may not be engaged by this relatively long duration (4:35 minutes) non-interactive video presented in this study. The video intervention could be improved in future studies by:

- 1) Making it shorter in duration as research has shown that drop-off in engagement is significant after 2 minutes of a video content (28).

2) Adding the interactivity component (digital promotion) to both educational formats. This added interactivity feature could lead to better performance for the video format. For example, when the participant enters her/his name, age, current year of enrollment, then the video will respond by saying “Hello, (name).” “Did you know that the MenB incidence in (year of enrollment) has been shown to be....?”. Also, by imbedding the video into social media (Facebook, Twitter, Instagram, Pinterest, Snapchat...etc.) where adolescents and young adults have a strong on-line presence (145), there will be a space for more interactivity where the participant would be able to comment, share, and like or dislike the video and that would create a 2-way channel (dialogue) (146) rather than a 1 way channel (monologue).

3) Adding live testimonials from parents of MenB related deceased young adults and MenB survivors with complications. Research indicates that viewers were more likely to be influenced if the website contained video testimonials than they were when the site contained no testimonials (94). Testimonials could stimulate stronger emotional reactions that might lead to a different result. Another aspect that could be added to the video educational material in future studies is to use digital technologies to make it personalized provision of information.

All these might have a favorable impact on the video as a format for health mass media messages and might lead to the results expected by the dual coding theory. However, seeing no difference between the text and video in terms of effectiveness, yet finding an overall improvement in knowledge, perceptions, and

intention, may be a valuable finding. This finding would suggest that a relatively low-cost (147–149) text educational tool could be as beneficial as the video in health behavior targeted mass media campaigns.

Effect of the intervention on vaccination uptake – specific aim 2 (a)

Our second set of objectives included 3 sub-objectives. The first sub-objective was comparing the rate of MenB vaccination uptake three months after exposure to the study intervention among treatment groups (video or text). We were disappointed to find out that only three participants out of the 38 (7.9%) received the vaccine.

There could be more than one explanation for this finding.

- (1) The inappropriate timing of sending the follow-up survey may have contributed to a low response rate. The follow-up survey link was sent in November where the students were likely busy with their exams. This might have contributed to the small size sample (n=38) obtained in the follow-up survey. Thus, some participants might have taken the vaccine but did not participate in the follow-up survey.
- (2) Seven participants out of the main sample of 121(5.7%) were above the recommended age (16-23 years old) for MenB vaccinations, so they may not have been interested to participate in the follow-up survey. In addition, one participant out of the follow-up sample of 38 (2.6%) was above the recommended age , therefore he/she did not get the MenB vaccine because they were not supposed to.

(3) Both the knowledge-behavior gap (150–152) and the intention-behavior gap (153) could explain why we found this low vaccination uptake. Despite the positive finding of increased knowledge and intention after exposure to both interventions and that other researchers stated knowledge (14,154) and intention as a strong predictors of behavior (133), it was also demonstrated that knowledge and intention explains only a part of the variance in behavior (153,155,156).

For knowledge, the Health Belief Model (14) and the Social Cognitive Theory (154) suggests that knowledge about the behavior and how to perform the behavior would lead to taking action and engaging in the behavior. Therefore, some researchers indicated that knowledge is a critical factor that can lead to the actual behavior (157). However, within many health domains, knowledge has not shown to be even associated with the required health behavior. These include condom use in AIDS (158), colorectal cancer screening (159), breast-self-examination (160), diabetes control (161), and exercising to decrease the osteoporosis risk (162). Researchers such as Silver Wallace (163) went further to state that “knowledge has been consistently shown to be noninfluential in predicting behavior”(p. 170). Other researches indicated that motivation together with knowledge are essential factors to perform the required behavior (164,165). This motivation could be internal such as those brought about through motivational interviewing techniques (166) or external such as financial or social incentives .

For intention, it was shown by the Theory of Planned Behavior (TPB) that intention may predict the actual performance of the behavior (167) and researchers reported it to be the most predictive construct for behavioral change especially in patients with diabetes (168). However, the intention-behavior gap was also reported by other researchers (169), where intention does not always lead to performing the behavior (170). For example, approximately half of those who intend to do aerobic exercise, actually meet their exercise requirement (171). Other examples of the intention-behavior gap include other domains such as: food parenting(173) which is the “diet related’ parenting practices according to Larsen et al.(172)”, hand washing (174), alcohol use (175), and participation in HIV vaccine trials (176).

Lastly, many other factors may have hindered the actual vaccination uptake, despite good intentions to do so (168,177,178). In our population, these factors may include: social norms, short follow-up period (only 3 months), perceived cost, perceived inconvenience, and other barriers that will be discussed later stressing on how to overcome them to move young adults’ population from intention to the actual vaccination uptake behavior.

Knowledge retention three months post-intervention – specific aim 2 (b)

The second sub-objective was to describe and compare the knowledge retention in both interventions groups 3-months post-intervention. Participants who agreed to participate in the follow-up survey were contacted 3 months after the intervention to determine knowledge retention via the same knowledge test used in the initial survey.

Immediately after watching the educational program, participants demonstrated improved knowledge of MenB disease and vaccine, with an increase of knowledge test scores from 83% to 88%. There was no difference between the mean knowledge scores immediately after exposure and mean knowledge scores three months later (88%) . Thus, we may say that knowledge was successfully retained three months after the intervention. This is consistent with literature (179–181), demonstrating that educational tools improve knowledge and are helpful in retaining it. This is a positive finding, indicating that a brief, low-cost intervention can improve knowledge and awareness, and this effect is sustained over time. However, we cannot be certain that this is due to our interventions, as there might have been some external factors that contributed to this knowledge retention. Further research is needed using a lengthier follow-up period in order to determine long-term knowledge retention.

Barriers and facilitators to vaccination uptake– specific aim 2 (c)

In addition, in our third sub-objective, we wanted to describe self-reported barriers and facilitators to vaccination among participants exposed to both formats of educational material. The most commonly stated barriers for vaccination were lack of time and cost. This is consistent with other studies that indicated that finding the time is a barrier to get the vaccine (182). The self-reported “perceived” cost, “perceived” lack of time, and inconvenience barriers reflected that essential information in both interventions might have been overlooked and needed to be addressed for this population. The majority of our population were college students, therefore the cost of the vaccine was a concern for them. Despite the fact that it was mentioned in both interventions that

most health insurance companies cover the vaccine, students still perceived cost as one of the barriers. Therefore, in future similar studies, it is recommended that insurance coverage details would be mentioned and a link to a website or a clinic telephone number to be provided, so that the student could use either one to determine whether his/her insurance cover the MenB vaccine. Also, for future studies, to address the “perceived” inconvenience, it would be of great importance to stress on the accessibility of the Auburn University Medical Clinic, mentioning the public transit route, the working hours of the clinic, and the fact that the whole procedure for obtaining the MenB vaccine takes 7-10 minutes.

It would also be beneficial as a part of a vaccination campaign to provide the “walk-in” clinic or the “pop-up” clinic in student busy intersection points like the dorms, the dining area, and the major gathering points for the students. Provision of the vaccine in such areas might help the students to receive the vaccine anytime between their classes or study times, thus reducing the perception of lack of time and inconvenience as barriers. These suggestions might facilitate the vaccine uptake.

Among the facilitators mentioned for up taking the MenB vaccine were: parents’ encouragement, cost covered by health insurance, knowing that the vaccine will prevent a serious disease, and doctor’s recommendation. Other research has indicated that, in addition to targeting the student population, university vaccination campaigns could also target the student’s parents and local health care providers. This can lead to a better uptake of MenB vaccines

(40). So, this broad spectrum targeting strategy could be applied in future vaccine campaigns.

Only 2 of the 3 who got the vaccine mentioned that they heard about the vaccine from this study and it is the reason why they obtained the vaccine. However, this relatively small impact of the educational intervention on actual vaccination uptake is a valuable finding if we could claim that two additional lives were saved as a result.

Factors associated with intention to obtain the vaccine

As hypothesized, higher perceived susceptibility of MenB was associated with increased vaccination intention. And, as presented by the linear regression model (Table 4.5), higher perceived benefits and lower perceived barriers were significant predictors of intention to obtain the vaccine. These findings emphasize the importance of improved access to MenB vaccine so that barriers could be minimized. Perceived benefits are also reported to be essential in health promotion models to explain adoption of health behavior (183–187), which is consistent with our findings.

About one-third (31.7%) of the variance in intention to obtain the vaccine after the educational intervention was explained (or predicted) by the model. This might indicate that other factors such as subjective norm (i.e: The individual's estimate of the social pressure to perform or not perform a behavior) may also play a role. Unfortunately, specific information relevant to testing the influence of the subjective norm was not collected. However, peer pressure especially among this age category could greatly influence their intention to uptake the vaccine. Incorporating subjective norms in future studies could positively contribute to

more clarification of all the factors that could influence preventive behavior such as vaccine uptake (188).

Implications of findings

1) Public health implications

Our findings have implications for public health efforts to increase vaccination rates:

- 1) Both educational tools (text and video) are effective means to improve knowledge, perceptions, and intentions for vaccination uptake. Other studies support these findings (85,98,144,189). Therefore, an implementation of either of these formats for increasing knowledge and awareness could have a positive impact and might consequently lead to more vaccination as suggested by previous research (190). Knowing that there is no significant difference between the interventions implies that using the more cost-effective text format of the educational material may be equally impactful. Text format of an educational material involves less effort, time, skills, and consequently lower cost (147–149).
- 2) Also, significant differences in knowledge, perceptions, and intentions pre- and post-intervention for both groups for this age category of young adults who think they are invulnerable to serious disease (49,53–55) is a significant finding. This suggests that young adults can be influenced by educational interventions even when presented in text format. This could be directly applied to other important health issues affecting young adults/college students such as safe sex, alcohol consumption, HPV vaccination, and HIV pre-exposure prophylaxis (PrEP).

3) The findings emphasize the feasibility of using the Internet in future vaccination interventions, given that both interventions were delivered online and found to be effective. Over half of American Internet users searched for health care information online (191–193). This, coupled with the strong presence of young adults online (194,195), suggests that the online platform can be used effectively in delivering other health information via different formats like text, video, games, emails, and social networks. On the other hand, people often start their search with a general search engine which sorts and ranks websites independently from its quality. Since anti-vaccination advocates are vocal on the Web, this can lead to more anti vaccination web resources appearing to information seekers (196). Therefore, biased information exposure in this context can cause an impaired judgment and unfavorable decision making decreasing vaccination uptake. Using the internet as a platform to create educational interventions can be more beneficial, cost-effective(197,198), and more reachable (199) than traditional communication tools. Thus, a strong online presence of pro-vaccination information is essential.

2) Theoretical implication:

Based on these findings, the Health Belief Model appears to be a valid theoretical framework for designing interventions to improve vaccination rates. Since beliefs about severity, susceptibility, benefits, barriers, self-efficacy, and cues to action may play a role in shaping people's responses to health messages that promote an illness prevention behavior such as vaccination, the HBM could be more widely applied in vaccination media messages.

3) Research implications:

A systematic review of interventions to increase seasonal influenza vaccination among pregnant women suggested a need for increased clarity and details in reporting the content of interventions to increase vaccination uptake (200). We believe that our detailed methodology provided here could help to improve the comparability and generalizability of published studies for systematic reviews purposes related to vaccination in general or MenB vaccination in specific.

Limitations:

Although this study had many strengths, our findings must be interpreted with caution in light of several limitations. These include design limitations, potential for certain biases, low sample size, and limited generalizability.

1) Design limitations

A large number of participants dropped out before completing the whole survey and this might have led to a bias in response. Also, since we had multiple modes of recruitment, that might have led to participants taking the survey more than once. Although it is unlikely to happen, we cannot overlook this possibility. Since our survey was carried out via an online platform (Qualtrics) and not a study specific computer lab or a certain area where investigators control for cross contamination, there is a probability that participants might have been exposed to or talked about their peers' interventions. Some of those who might have obtained the vaccine might be among those who refused to participate in the follow-up survey, which could have lead to lower reported vaccination uptake. In addition, the evaluation of knowledge retention three months later might be

another limitation. We assessed retention of knowledge at 3 months after the educational intervention but could not verify longer-term retention of this knowledge. A longer time period for measuring the knowledge retention might have been more valuable in determining the sustainability of knowledge retention.

2) Potential biases

We could not verify that each participant actually read or watched the assigned intervention. As with any self-report measure, respondents may not have been truthful in self-reporting their perceptions, intentions, and actual vaccination uptake. Recall bias and social desirability are issues with self-reported research. Interestingly, the baseline knowledge among the follow-up subsample was higher (82.7%) compared to the entire sample (78.6%). This may indicate a selection bias where those who completed the follow-up survey were somehow different from those who did not.

3) Small sample size

The adequate sample size required was not reached in both the main survey and the follow-up survey. This might have happened due to the inappropriate timing of recruitment where the majority of the sessions of Camp War Eagle were missed and the SOS camp supported more recruitment later by the end of August, then the office of institutional research helped in more recruitment in September. By the time, the follow-up survey launched, it was the finals exam study time. These circumstances might have lead to the small sample size in the main and follow-up survey. It is important to note that the lack

of significant differences in effectiveness of the two interventions could be due to lack of adequate power to detect an effect.

4) Limited generalizability:

Results may not be generalizable to a wider population of young adults who are not college students living in the Southeast. Self-selection to participate in the study might be an issue since the sample may be representative of only individuals who are interested in health. This also may lead to limited generalizability.

Future studies

- 1) Although the generalizability of these results may be limited, our findings provide implications for future research and aid the design and implementation of a vaccine administration mass media campaign using web-based text and video format.
- 2) More studies are needed at various colleges in different geographic areas and with nonstudents of the same age.
- 3) In future studies there could be a stress on the inclusion of motivating factors (cues to action) within the educational mass media message. These motivating factors could be in the form of financial or social incentive to increase the vaccination uptake. This is an approach supported by other research that proved the importance of incentives in increasing the HPV vaccination rate among adolescents (201).
- 4) Other cues to action that could be added to the interventions might include: online educational card games and educational music videos played by health care workers (202).

- 5) In addition, providing a live face to face communication link within the educational intervention could be another way to address any concern (barrier), which might lead to better vaccination uptake results.
- 6) Future research might be targeted towards testing both educational interventions (text and video) on digital marketing platforms such as online social networks, e-mails, and online games.
- 7) Also, we might address other diseases affecting young adults such as Human papilloma virus (HPV) and sexually transmitted diseases (STD).
- 8) In addition, investigating the context where participants are exposed to these educational interventions (where the educational intervention is located, for example the university clinic website, the course registration page, social networks, etc.) could be another idea for future research.
- 9) Examining the effect of message framing on different HBM perceptions and actual vaccination could be another valuable addition to this type of research.
- 10) Social norms influence on college students might be an additional construct to explore. Investigating peer influences and peer support that exists besides an educational intervention designed for young college students could be of value in designing mass media campaigns, especially for the young adults' population.

Conclusion

As evidence of the efficacy of vaccines in preventing MenB infection is already established (127,203–205), it is critical that college students be informed about MenB risks and benefits of vaccine. To the best of our knowledge, this

study is the first pre-post- design study comparing the efficacy of online text and video MenB educational interventions guided by a theoretical framework. Both the text and video interventions improved knowledge, perceptions, and vaccination intentions. The text and video formats were equally successful in the present study, suggesting a cost-effective text format may a good channel to change knowledge, perceptions, and intentions to receive the MenB vaccine. Continuous efforts should target educational interventions that aim to promote vaccination, potentially reducing disease-related morbidity and mortality.

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Appendices

Appendix A

Electronic Advertisement

The following statement will be included in an email sent by the Office of the First Year Experience in their usual correspondence to Camp War Eagle attendees approximately one week prior to the date of their assigned session.

“Participate in a Health Education Study

Incoming freshmen are invited to participate in a study focused on effective delivery of health information. Students who complete a short online survey will be eligible to win cash prizes in the amount of \$50. For more information, visit the Camp War Eagle website at <http://fye.auburn.edu/orientation/camp-war-eagle/cwe-details/> or email Heba Aref at hza0031@auburn.edu.”

The website contains the following information:

Invitation to Participate in a Study Assessing the Relative Efficacy of Two Educational Interventions

PURPOSE: The goal of this research is to compare the efficacy of textual and video educational interventions among college students. This information will shed light on how the delivery method of healthcare information may affect students’ perceptions and intentions. This study is being conducted by Heba Aref, a graduate student in the Department of Health Outcomes Research and Policy, Harrison School of Pharmacy, under the advisement of Dr. Kimberly B. Garza, Assistant Professor of Health Outcomes Research and Policy.

WHAT DO YOU DO? If you decide to participate, you will complete an online survey consisting of items related to your knowledge, perceptions, and intentions related to health. You can access the survey using the web address below. Any student 18 years of age or older is eligible to participate.

WHY PARTICIPATE? Participants who complete the online survey and provide their contact information will have a chance to win one of four \$50 cash prizes. The survey will take approximately 15-20 minutes to complete, and can be taken at any time, wherever you have access to the internet. In addition, participants will be invited to complete a very brief follow-up survey with an additional chance to win one of four \$50 cash prizes.

For more information, please contact: Heba Aref at hza0031@auburn.edu or (334)-498-6580

To connect to the survey directly, go to
*** link to survey***

The Auburn University Institutional Review Board has approved this document for use from 05/31/2017 to 05/30/2018. Protocol # 17-220EP 1705

Appendix B

Information letter - Consent to Participate (for the pre-post-intervention survey)

You are invited to participate in a research study to test the best way to inform college students about healthy behaviors. This study is being conducted by Heba Aref under the supervision of Dr. Kimberly Garza, Assistant Professor of Health Outcomes Research and Policy. The purpose of the study is to shed light on effective communication techniques that can be used when informing college students about healthy behaviors.

We would appreciate your help in this study by answering questions related to knowledge, perceptions, and intentions in regard to infection risk and vaccination. Completing the questionnaire will take approximately 15-20 minutes. The survey must be completed in one sitting; you cannot exit and return to the survey once you've begun. There are no known risks or direct benefits from participating in this study. Although there are no sensitive questions or questions that are likely to cause discomfort, you may elect to quit at any time without penalty.

Participation in this study is voluntary and in no way will affect your class standing, grades, or status on an athletic team if you are a student at Auburn University. To compensate you for your time, if you complete all the questions in the survey and provide your contact information, you will be entered in a drawing for a chance to win one of four \$50 cash prizes. Chances of winning are approximately one in 600. Contact information will be collected in a separate database and will not be linked to your responses to the survey. If you also agree to participate in a follow-up survey in approximately three months and provide your email address, you can have the opportunity to enter in another drawing to win an additional cash prize. In this case, your survey data will be linked to your email address. Information obtained from this study

may be published in a professional journal, and/or presented at a professional meeting.

If so, only group data will be presented.

If you have any questions about this study, please contact:

Heba Aref, B.Sc, M.Sc at 334-498-6580 or

Kimberly B. Garza, PharmD, MBA, PhD at 334-844-8360.

For more information regarding your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone at (334) 844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH PROJECT. YOUR COMPLETION OF THE ON-LINE SURVEY INDICATES YOUR WILLINGNESS TO PARTICIPATE.

"The Auburn University Institutional Review Board has approved this document for use from May 31, 2017 to May 30, 2018. Protocol #17-220 EP 1705".

By choosing "I accept" you acknowledge that you have read and understand the information given above and agree to proceed with the questionnaire.

- I accept
- I do not wish to continue

Eligibility

Are you 18 years of age or older?

- Yes
- No

If no, then the participant will not be able to continue the survey.

Did you obtain the Meningitis B vaccination when you were 16 years of age or older?

- Yes
- No

If yes, then the participant will not be able to continue the survey.

Appendix C

Pre-post-intervention survey

1) Pre-intervention Survey
The knowledge construct:

Construct/Item	True	False
1) Knowledge *		
1. Meningitis B is a common disease		
2. Meningitis B is a serious disease		
3. Meningitis B may cause limbs amputations		
4. Meningitis B can cause death		
5. College students cannot get Meningitis B		
6. Meningitis B can be passed on by coughing and /or kissing		
7. Meningitis B vaccine cannot prevent Meningitis B disease		

The Health Belief Model (HBM) constructs:

Construct/Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2) Perceived susceptibility**					
8. It is extremely likely I will get Meningitis B in the future					
9. I feel I will get Meningitis B in the future					
10. There is a good possibility I will get Meningitis B in the next 4 years					

Construct/Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
11. My chances of getting Meningitis B are high					
12. I am more likely than the average student to get Meningitis B					
3) Perceived severity**					
13. The thought of Meningitis B scares me					
14. When I think of Meningitis B complications, my heart beats faster					
15. I am afraid to think about Meningitis B complications					
16. Problems I would experience with Meningitis B would last for a long time					
17. Meningitis B would threaten a relationship with people whom I care about					
18. If I have Meningitis B complications, my whole life would change					
19. If I develop Meningitis B complications, I may die					
4) Perceived benefits**					
20. When I get the Meningitis B vaccination, I will feel good about myself					

Construct/Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
21. When I complete the 2 or 3 doses of Meningitis B vaccination, I will not worry as much about Meningitis B infection					
22. Completing the Meningitis B vaccination will make me protected against Meningitis B infection					
23. If I complete Meningitis B vaccination, I will decrease my chance of dying from Meningitis B.					
24. If I complete Meningitis B vaccination, I will decrease my chance of having limb amputations because of Meningitis B infection					
25. If I complete Meningitis B vaccination, I will decrease my chance of getting any complications because of Meningitis B infection.					
5) Perceived barriers**					
26. I am afraid of needles of the Meningitis B vaccine					
27. I have worries about the cost of					

Construct/Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Meningitis B vaccine					
28. Obtaining the vaccine will expose me to unwanted side effects					
29. I do not think I can commit to 2 or 3 doses of Meningitis B vaccine					
30. Meningitis B vaccine may cause Meningitis B infection					
31. I do not know where to get the Meningitis B vaccine					
32. Obtaining the MenB vaccine will take time					
6) Cues to action**					
33. I will take the Meningitis B vaccination if my doctor said it is important					
34. I will take the Meningitis B vaccination if my parents said it is important					
35. I will take the Meningitis B vaccine if a friend said it is important					
36. I will take the Meningitis B vaccine if I see a TV ad that said it is important					
37. I will take the Meningitis B					

Construct/Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
vaccine if I see a Facebook post or a tweet on Tweeter that says it is important					
38. I will take the Meningitis B vaccine if I listen to a radio ad that says it is important					
39. I will take the Meningitis B vaccine if I see a banner that says it is important					
7) Self-efficacy †					
40. I know how to get the Meningitis B vaccine					
41. I am confident I can get the Meningitis B vaccine easily					
42. I am able to find places where I can get the Meningitis B vaccine					
43. I am confident that I can easily take 2 or 3 doses of the Meningitis B vaccine					
8) Intention ††	1 Extremely likely	2 Somewhat Likely	3 Neutral	4 Somewhat Unlikely	5 Extremely unlikely
44. How likely are you to receive the Meningitis B vaccine in the future?					

**Questions of construct no. (1) are based upon the questionnaire developed and validated by (121)*

***Questions of constructs no. (2)-(6) are based upon the questionnaire developed and validated by (185)*

†Questions of construct no.(7) are based upon the questionnaire developed and validated by (123)

††Questions of construct no.(8) are based upon the questionnaire developed and validated by (124)

Educational Materials

The following pages contained the educational materials (online text or video). Participants were randomly assigned to view one or the other within the Qualtrics survey, then proceeded to the post-intervention questionnaire.

2) Post-intervention Survey

The post-intervention survey will have all the above items plus the credibility construct and the demographic items below.

Credibility:

How credible did you find the information provided about Meningitis B?

Not at all credible	Somewhat not credible	Neutral	Somewhat credible	Very credible
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Demographic items:

1. What is your gender?

- Male
- Female

2. What is your date of birth? (Please use MM/DD/YYYY format.)

3. What is the total annual household income at your home?

- Less than 20,000 per year
- \$20,000 to \$69,999 per year
- \$70,000 to \$139,999 per year
- \$140,000 or more per year

4. Did you have any education after the High School?

- Yes
- No
- If yes, can you specify
it.....

5. Are you of Hispanic, Latino, or Spanish origin?

- Yes
- No

6. What is your race, check all that apply?

- White/Caucasian
- Black / African American
- Asian

- Pacific
- Other (please specify)

.....
.....

7. Would you be willing to participate in a follow-up survey in approximately 3 months from now and have another chance to win one of four \$50 cash prizes? If so, please provide your email address below. A link to the follow-up survey will be sent to this address.

- Yes, I wish to participate and here is my e-mail.....
.....
- No, thanks

Congratulations! You have now completed the survey. When you click the "Click here to continue" button below, you will be redirected to another page where you may enter your contact information. If you provide your contact information, your name will be entered in a drawing for a chance to win one of four \$50 cash prizes. If you do not wish to provide your contact information, simply leave those items blank and click the button to complete the survey.

Contact Information Survey

This will be collected in a separate database and cannot be linked to the primary survey – see

Appendix D

Contact Information for the pre-post-intervention cash withdraw

If you provide your contact information below, your name will be entered in a drawing for a chance to win one of four \$50 cash prizes. If your name is drawn, you will be contacted and given instructions for how to claim your prize.

1. What is your first and last name?

First Name

Last Name

2. What is the best telephone number to reach you during the daytime?

3. What is the best telephone number to reach you in the evening (after 5 pm)?

4. Please provide an e-mail address. We will only use this address to notify you in the event that you are a winner.

5. What is your mailing address?

Street Address

City

State

ZIP code

Appendix E

Text intervention

<https://spark.adobe.com/page/QatcuCh3Nm98I/>



ARE YOU AT RISK FOR THE POTENTIALLY DEADLY MENINGITIS B (MEN B) DISEASE?

Dr. Fred Kam, M.D., Medical director of the Auburn University Medical Clinic (AUMC), will tell you why you need to be concerned about a certain microorganism, Meningitis B (Men B) bacteria, and how you can protect yourself against it.



Dr. Fred Kam, Medical Director, AUMC

This bacteria is called **Neisseria meningitidis** and it causes a serious illness referred to as **Meningococcal disease**.

It can lead to **meningitis**, which is infection of the lining of the brain and spinal cord, and infections of the blood.

Meningococcal disease often occurs without warning — even among people who are otherwise healthy.

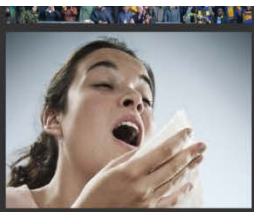
Anyone can get meningococcal disease but certain people are at increased risk, among those are, adolescents and young adults, like you!





Meningococcal disease can spread from person to person through:

- 1. Close lengthy contact
- 2. Coughing
- 3. Sneezing
- 4. Kissing
- 5. Participating in sports teams or music groups
- 6. Living in the same household such as in dorms.



Recently many Men B outbreaks took place on campuses, such as Princeton

5:58 AM



Recently many Men B outbreaks took place on campuses, such as Princeton University in 2013 and University of Oregon in 2015.

Several students died as a result.

In fact, even when it is treated, meningococcal disease kills 10 to 15 infected people out of 100.

And of those who survive, about 10 to 20 out of every 100 will suffer disabilities such as:

1. Hearing loss
2. Brain damage
3. Kidney damage
4. Amputations
5. Nervous system problems such as memory loss and difficulty in concentration.

Even if you're lucky enough to not experience these adverse effects, you still face missing many days from classes and you and your family may face expensive

And of those who survive, about 10 to 20 out of every 100 will suffer disabilities such as:

1. Hearing loss
2. Brain damage
3. Kidney damage
4. Amputations
5. Nervous system problems such as memory loss and difficulty in concentration.

Even if you're lucky enough to not experience these adverse effects, you still face missing many days from classes and you and your family may face expensive medical costs.

But, there is GOOD NEWS !

Meningitis B vaccine or Men B vaccine can help PREVENT the disease!

The Center for Disease Control and Prevention (CDC) recommends that college students get vaccinated.



*Men B vaccine could be given to anyone 16 through 23 years old to provide short term protection against most strains of serogroup B meningococcal disease; 16 through 18 years are the preferred ages for vaccination" (CDC,2016).

How do you protect yourself?

For best protection, two or three doses of a serogroup B meningococcal vaccine are needed. The same vaccine must be used for all doses. Ask your physician or visit us at Auburn University Medical clinic to know if you are a good candidate for the vaccine.

If you took your first dose at your home, you can take subsequent dose(s) here at

If you took your first dose at your home, you can take subsequent dose(s) here at AUMC or at your private physician's clinic.

The vaccine is usually covered by your insurance plan.

As with any medication, there is a chance of reactions.

These are usually mild and go away on their own within a few days, but, like any vaccination, serious reactions are also possible. People who get serogroup B meningococcal vaccine may experience:

1. Soreness, redness, or swelling where the shot was given
2. Tiredness or fatigue
3. Headache
4. Muscle or joint pain
5. Fever or chills
6. Nausea or diarrhea

These reactions can last up to 3 - 7 days

So, why get vaccinated?

1. To protect yourself and your family and friends from getting this serious disease
2. To shield yourself and your family from the financial and emotional costs of the disease
3. To avoid an extended hospital stay and missing significant class time
4. To avoid severe life threatening complications that can impact your quality of life forever

Get the Men B vaccine

Protect yourself...

Protect your family...

Protect your friends and others...



What are you waiting for?

For more information, please check the CDC website of Meningitis B



**CENTERS FOR DISEASE
CONTROL AND PREVENTION**

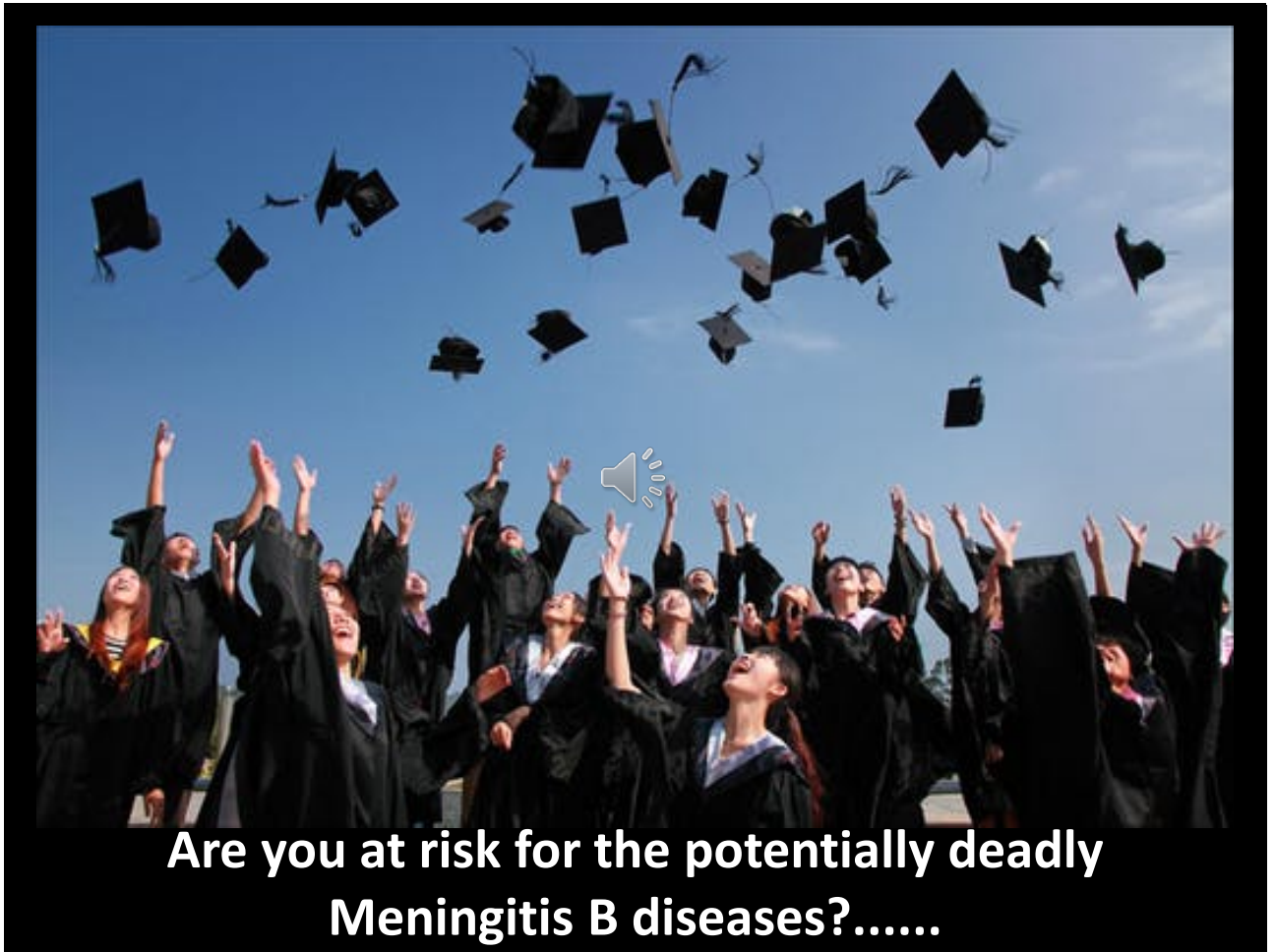
<https://www.cdc.gov/vaccines/hcp/vis/vis-statements/mening-serogroup.html>

Appendix F

Slide 1

Video intervention (slides)


<https://youtu.be/pkq3ns0vGL4>



Slide 2



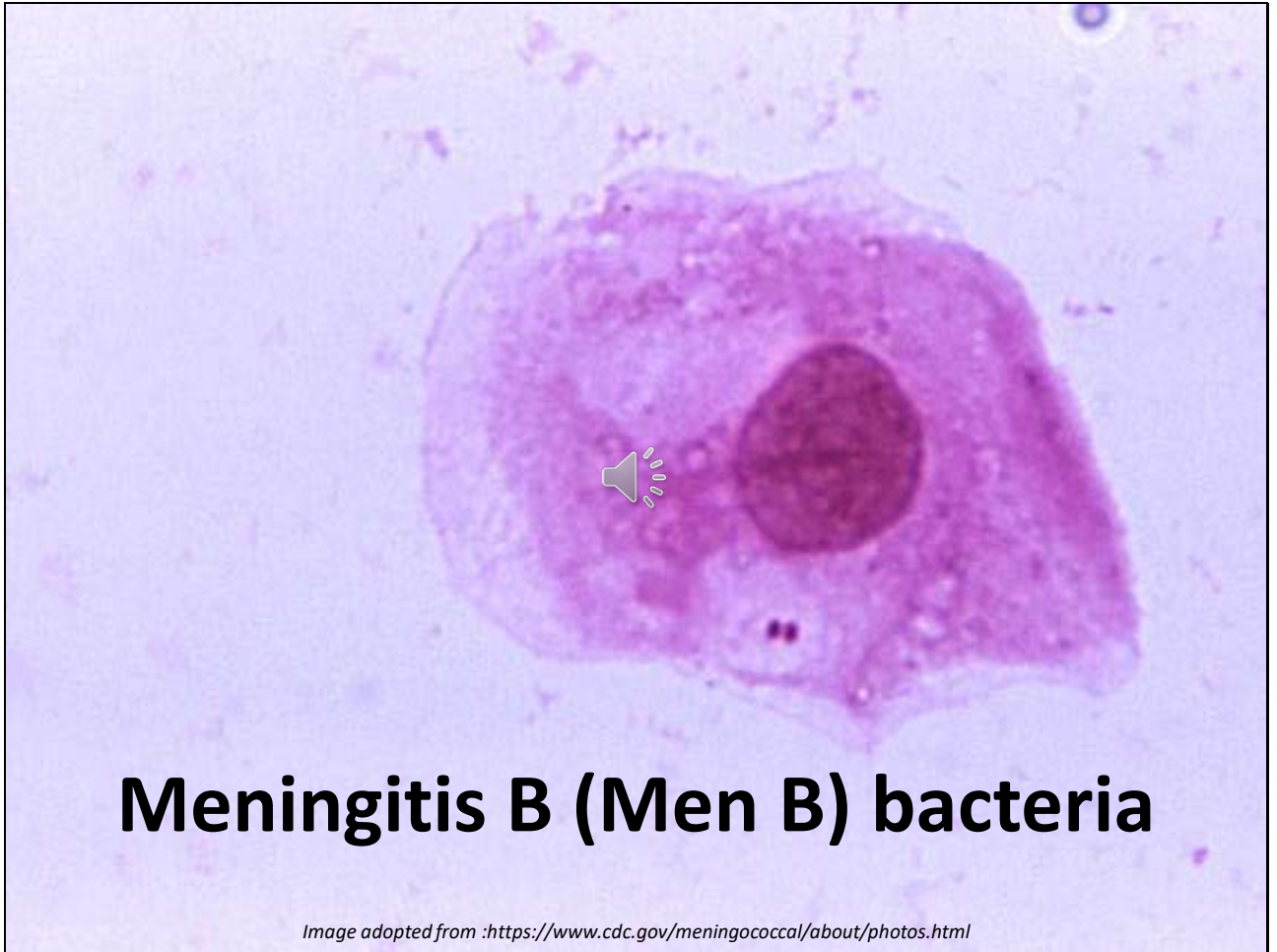
AUBURN UNIVERSITY
MEDICAL CLINIC



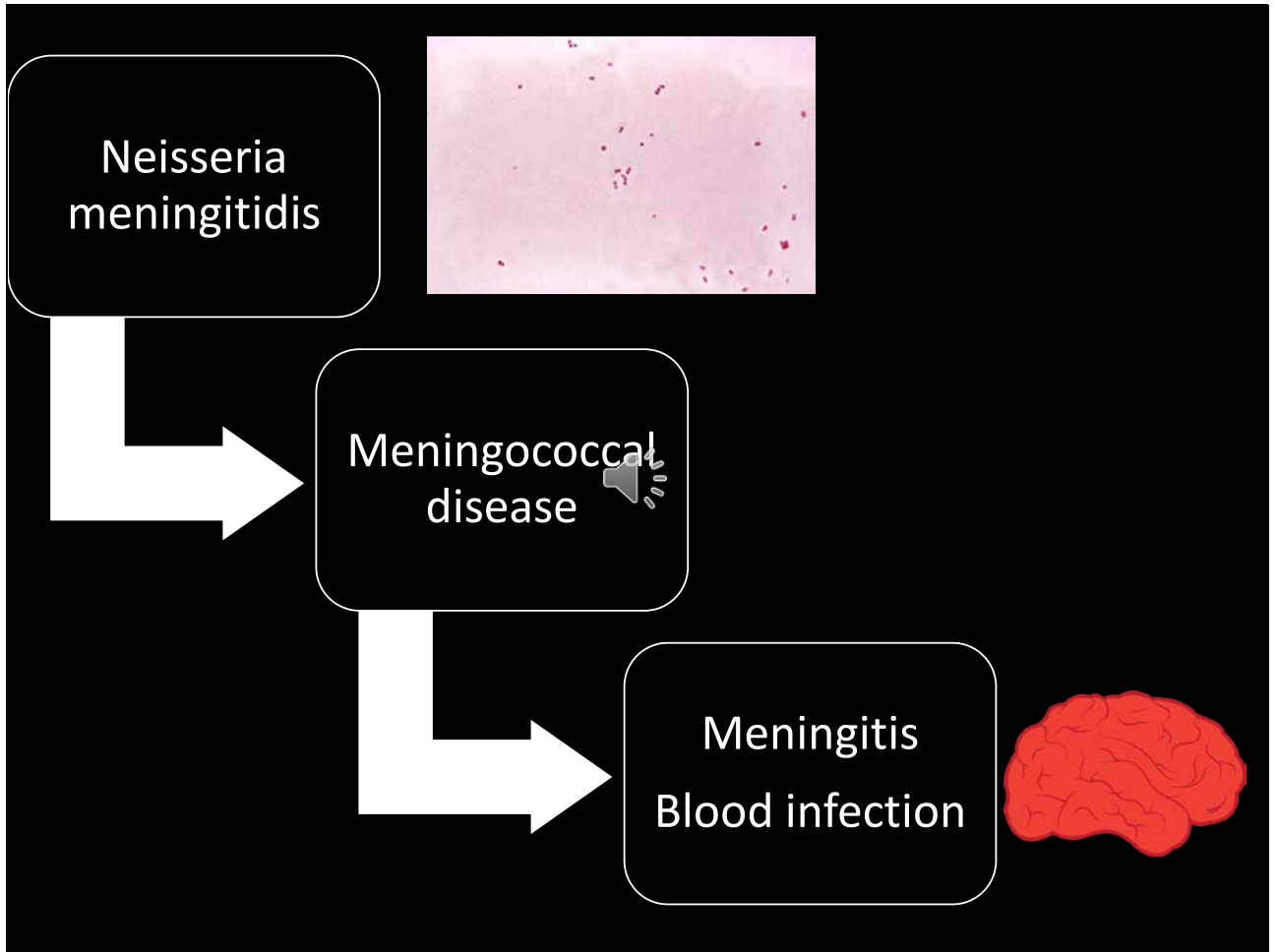
A portrait of Dr. Fred Kam, M.D., Medical Director at AUMC. He is a middle-aged man with short, graying hair, wearing glasses, a white lab coat, a blue shirt, and a red and blue striped bow tie. The lab coat has the Auburn University Medical Clinic logo on the left chest. The background is a solid blue color. A small speaker icon is visible on the left side of the portrait.

**Dr. Fred Kam, M.D.,
Medical Director at AUMC**

Slide 3



Slide 4



Slide 5



Slide 6



Men B outbreaks on campuses



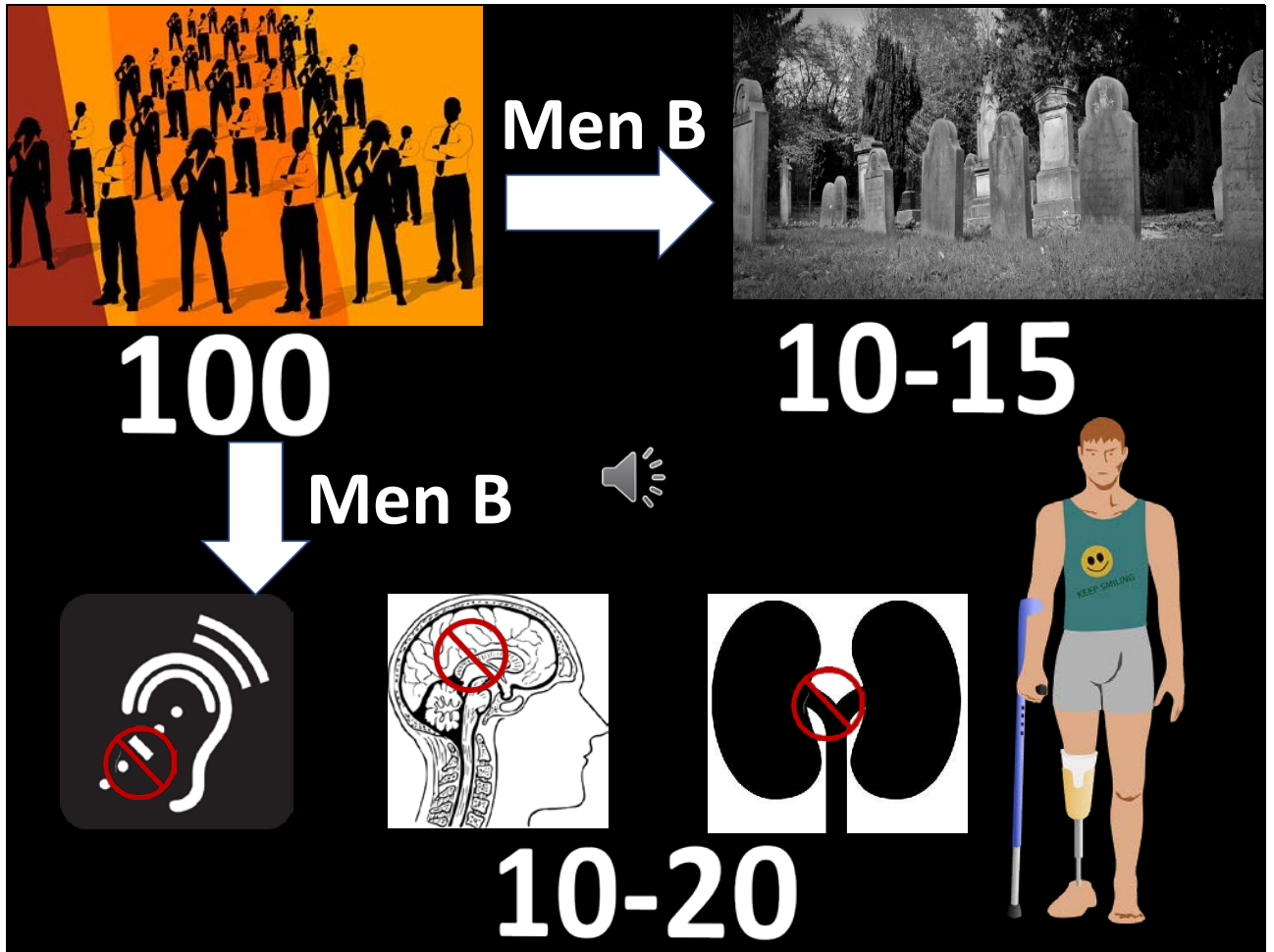
 **PRINCETON
UNIVERSITY**

2013



2015

Slide 8



Even if you are lucky enough to not experience these effects.....



HOSPITAL CHARGES

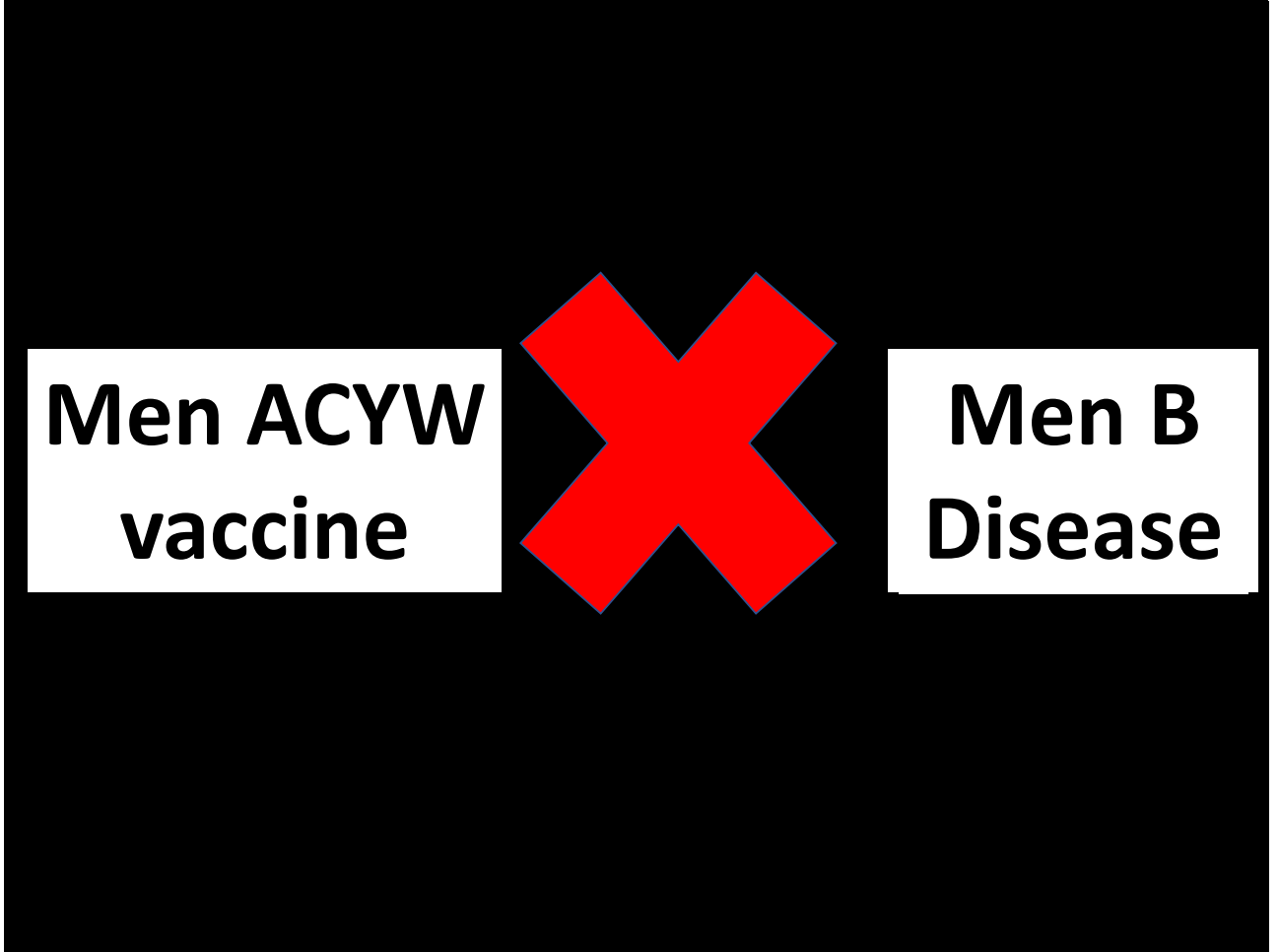
Good News! Men B Vaccine can PREVENT the disease !

AUBURN UNIVERSITY
MEDICAL CLINIC





“Men B vaccine could be given to anyone 16 through 23 years old to provide short term protection against most strains of serogroup B meningococcal disease; 16 through 18 years are the preferred ages for vaccination.”



How do you protect yourself?

2 or 3 doses of Men B vaccine

Same vaccine must be used for all doses

Ask to know if you are a good candidate for the vaccine

**If you took your first dose at home,
subsequent dose(s) can be taken here at
AUMC or at your private physician's office**



AUMC nursing staff



Your physician's office



Possible reactions

- Mild** **Severe**
1. Soreness, redness, swelling at the shot was given
 2. Tiredness or fatigue
 3. Headache
 4. Muscle or joint pain
 5. Fever or chills
 6. Nausea or diarrhea



3-7 days

Why get vaccinated?...



Get the Men B vaccine

Protect yourself...

Protect your family...

**Protect your friends
and others...**

**What are
you waiting
for ?**



Slide 19



For more information, please check the CDC website of Meningitis B

<https://www.cdc.gov/vaccines/hcp/vis/vis-statements/mening-serogroup.html>

Appendix F (cont.)

MenB Study Video script

- Hello, this is Dr. Fred Kam, I am a physician and the medical director of Auburn University Medical Clinic (AUMC).
- Today, I would like to tell you why you need to be concerned about a certain microorganism, Meningitis B bacteria, and how you may protect yourself against it.
- The bacteria is called *Neisseria meningitidis* and it causes a serious illness referred to as Meningococcal disease.
- It can lead to meningitis, which is infection of the lining of the brain and spinal cord, and infections of the blood.
- Meningococcal disease often occurs without warning — even among people who are otherwise healthy.
- Anyone can get meningococcal disease, but certain people are at increased risk, among those are, adolescents and young adults, like you.
- Meningococcal disease can spread from person to person through:
 1. Close lengthy contact
 2. Coughing
 3. Sneezing
 4. Kissing
 5. Participating in sports teams or music groups
 6. Living in the same household such as in dorms.
- Recently many MenB outbreaks took place on campuses, such as Princeton University in 2013 and University of Oregon in 2015. Several students died as a result.
- In fact, even when it is treated, meningococcal disease kills 10 to 15 infected people out of 100. And of those who survive, about 10 to 20 out of every 100 will suffer disabilities such as hearing loss, brain damage, kidney damage, amputations, nervous system problems such as memory loss and difficulty in concentration.

- Even if you're lucky enough to not experience these adverse effects, you still face missing many days from classes and you and your family may face expensive medical costs.
- But, there is good news! Meningitis B vaccine or MenB vaccine can help PREVENT the disease!
- It is available NOW at Auburn University Medical Clinic or at your physician's clinic.
- It's important to understand that MenB vaccine differs from other meningococcal vaccine like Men ACWY that you may have received previously. These other vaccines don't protect against this strain of Meningococcal disease.
- The Center for Disease Control and Prevention (CDC) recommends that college students get vaccinated.

How do you protect yourself?

- For best protection, two or three doses of a serogroup B meningococcal vaccine are needed. The same vaccine must be used for all doses. Ask your physician or visit us at Auburn University Medical clinic to know if you are a good candidate for the vaccine.
- If you took your first dose at your home, you can take subsequent dose(s) here at AUMC or at your private physician's clinic.
- This vaccine is usually covered by your insurance plan.
- As with any medication, there is a chance of reactions. These are usually mild and go away on their own within a few days, but, like any vaccination, serious reactions are also possible. People who get serogroup B meningococcal vaccine may experience:
 1. Soreness, redness, or swelling where the shot was given
 2. Tiredness or fatigue
 3. Headache
 4. Muscle or joint pain
 5. Fever or chills
 6. Nausea or diarrhea

These reactions can last up to 3 to 7 days

So, why get vaccinated?

1. To protect yourself and your family and friends from getting this serious disease.
2. To shield yourself and your family from the financial and emotional costs of the disease.
3. To avoid an extended hospital, stay and missing significant class time.
4. To avoid severe life-threatening complications that can impact you quality of life forever

Get the MenB vaccine.

Protect yourself. Protect your family. Protect your friends and others.

What are you waiting for?!.....

References:

All the previous information is adopted from the CDC MenB VIS.

Appendix G

Information letter - Consent to Participate (for the follow-up survey)

You are invited to participate in a follow-up survey related to the study you participated in earlier this summer. This study is being conducted by Heba Aref under the supervision of Dr. Kimberly Garza, Assistant Professor of Health Outcomes Research and Policy. The purpose of this portion of the study is to shed light on the relative effectiveness of communication techniques that can be used when informing college students about healthy behaviors.

We would appreciate your help in this study by answering these 13 questions related to the educational material about Meningitis B vaccine previously presented to you. Completing the questionnaire will take approximately five minutes. The survey must be completed in one sitting; you cannot exit and return to the survey once you've begun. There are no known risks or direct benefits from participating in this study. Although there are no sensitive questions or questions that are likely to cause discomfort, you may elect to quit at any time without penalty.

Participation in this study is voluntary and in no way, will affect your class standing, grades, or status on an athletic team if you are a student at Auburn University. To compensate you for your time, if you complete all the questions in the survey and provide your contact information, you will be entered in a drawing for a chance to win one of four \$50 cash prizes. Chances of winning are approximately one in 100. Contact information will be collected in a separate database and will not be linked to your responses to the survey. Information obtained from this study may be published in a professional journal, and/or presented at a professional meeting. If so, only group data will be presented.

If you have any questions about this study, please contact:

Heba Aref, B.Sc, M.Sc at 334-498-6580 or

Kimberly B. Garza, PharmD, MBA, PhD at 334-844-8360.

For more information regarding your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone at (334) 844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH PROJECT. YOUR COMPLETION OF THE ON-LINE SURVEY INDICATES YOUR WILLINGNESS TO PARTICIPATE.

The Auburn University Institutional Review Board has approved this document for use from October 18, 2017 to May 30, 2018. Protocol #17-220 EP 1705.

By choosing "I accept" you acknowledge that you have read and understand the information given above, and agree to proceed with the questionnaire.

- I accept
- I do not wish to continue

Appendix H

Follow-up survey

1. Have you received the Meningitis B vaccine within the 3 past months?

- Yes
- No → **(Skip to question 3)**

2. If yes, where did you get your vaccines?

- Auburn University Medical Clinic (AUMC)
 - Health Department
 - Family Doctor
 - Pharmacy
 - Other (please specify)
-

3. If no, what prevented you from getting the vaccine? (Check all that apply)

- Cost
 - Fear of Illness
 - Fear of needles
 - Lack of access
 - Convenience/Lack of time
 - Other (please specify)
-

4. Where did you hear about the Meningitis B vaccine?

- This study, 3 months ago
- Facebook
- Television Ad
- Web site
- Friend
- Another on-Campus event (please specify)
- Other

5. How much did this source of information (#4) influence your decision to get vaccinated?

1. Not at all. I would have gotten the vaccine anyways.
2. Minor influence.
3. Encouraged me to get vaccination.
4. Strongly influenced my decision to get vaccinated.
5. Is the reason I got vaccinated. I wouldn't have come otherwise

Congratulations! You have now completed the survey. When you click the "Click here to continue" button below, you will be redirected to another page where you may enter your contact information. If you provide your contact information, your name will be entered in a drawing for a chance to win one of four \$50 cash prizes. If you do not wish to provide your contact information, simply leave those items blank and click the button to complete the survey.

Contact Information Survey

This will be collected in a separate database and cannot be linked to the primary survey – see Appendix I.

Appendix I

Contact Information for the follow-up cash withdraw

If you provide your contact information below, your name will be entered in a drawing for a chance to win one of four \$50 cash prizes. If your name is drawn, you will be contacted and given instructions for how to claim your prize.

6. What is your first and last name?

First Name

Last Name

7. What is the best telephone number to reach you during the daytime?

8. What is the best telephone number to reach you in the evening (after 5 pm)?

9. Please provide an e-mail address. We will only use this address to notify you in the event that you are a winner.

10. What is your mailing address?

Street Address

City

State

ZIP code

End of thesis