Development and Production of a Theory-Based, Audience Centered HPV Vaccine Promotion Comic Book for East African Adolescents

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Abstract

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HPV vaccine uptake is suboptimal among East African adolescents. We describe the development and production of a theory-based, audience centered HPV vaccine comic book for East African adolescents. We held three focus groups with East African immigrant mothers in King County, Washington (n=30) to identify themes and suggestions to inform comic book production. We conducted message mapping to bridge focus group themes, theoretical constructs, message objective, and message appeal. Finally, we embedded the theory-based messages into the story script and gathered input from community members on cultural appropriateness. The comic book incorporated emerging themes from the focus groups including mothers' preference that comic book characters resemble members of their community; resonance with the social connections between the adolescent main character and her social network including adolescent-teacher, adolescent-peers, adolescent-mother, and adolescent-

grandmother; integration of emotion through humor; and information needs. The story highlighted information about HPV infection and transmission, vaccine benefits, and risks. The story consisted of three scenes: 1) adolescent HPV vaccine education by a health professional at school; 2) discussion of HPV vaccine beliefs and experiences among a group of adolescent peers; and 3) communication with their mothers about HPV vaccine and intent for vaccination. Through this formative research process we identified suggestions linked to larger established themes regarding HPV vaccine and used them to produce a comic book for East African adolescents. Ongoing testing will assess acceptability and impact of the comic book on HPV vaccine knowledge, vaccination intention, and vaccine uptake.

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Introduction

Health communication using comic books has shown success at improving adolescent vaccine-related knowledge, promoting positive attitudes toward vaccines, and improving vaccine uptake (Gillies, Stork, & Bretman, 1990; Katz et al., 2014; Kreuter et al., 2007; Mendelson et al., 2017; Simmons et al., 2017). Unlike text-based messages, comic books portray visceral visual messages that enhance understanding of content compared to text alone (Green & Myers, 2010). The combination of engaging text and explanatory images enhances understanding by activating different parts of the brain involved with information processing (Green & Myers, 2010; Kreuter et al., 2007). This combination of viewing and reading facilitates the formation of connections between new information and present knowledge, which improves recall of health information (Green & Myers, 2010). Understanding the wide appeal of comic books for children and adolescents, researchers have used them to promote nutrition and physical activity among diverse racial and ethnic groups including Hispanics and African Americans (Ko et al., 2018; Leung, Tripicchio, Agaronov, & Hou, 2014). A key study conducted by Katz and colleagues (2014) testing the impact of the Human Papillomavirus (HPV) vaccine promotion comic book showed that both parents and adolescents found the comic book acceptable, improved knowledge, and promoted positive attitudes toward the HPV vaccine among parents (Katz et al., 2014).

HPV is responsible for almost all cervical cancers worldwide (Walboomers et al., 1999) and a large portion of oropharyngeal, anal, vaginal, vulvar, and penile cancers (IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2007). The U.S. Advisory Committee on Immunization Practices (ACIP) has recommended routine HPV vaccination for adolescents 11–12 years old since 2006 for girls, and since 2011 for boys, with catch-up

vaccination up to age 26 for females and age 21 for males (Markowitz et al., 2014). Despite the vaccine's availability, nearly every state in the U.S. falls short of the Healthy People 2020 goal of 80% HPV vaccine coverage in 13–17-year-olds according to the National Immunization Survey-Teen (NIS-Teen; CDC, 2017). In 2016, NIS-Teen showed 65.1% of girls and 56% of boys ages 13–17 years had initiated the HPV vaccine. In the same timeframe, just 50%of girls and 38% of boys in this age group had completed all recommended doses of the HPV vaccine (CDC, 2017).

Research shows that rates of HPV vaccine initiation and completion are disproportionate across racial and ethnic groups (Burger et al., 2016). According to the 2016 NIS-Teen, the percentage of adolescents who had initiated and completed the HPV vaccine series was 55% and 40% for Non-Hispanic Whites, 63% and 47% for Non-Hispanic Asians, 66% and 46% for Non-Hispanic Blacks, 70% and 50% for Hispanics, and 61% and 42% for those who identified as Non-Hispanic multiracial, respectively (CDC, 2017). These data show that Non-Hispanic Blacks may be less likely to complete the HPV vaccine series compared to other racial/ethnic groups despite higher rates of HPV vaccine initiation. In their review of NIS-Teen and National Health Interview Survey (NHIS) data, Jeudin and colleagues (2013) examined initiation and completion rates of the HPV vaccine series among Non-Hispanic White, Non-Hispanic Black, Non-Hispanic Asian, and Hispanic adolescents. Their study found that Non-Hispanic Black and Hispanic adolescents were less likely to complete all three doses of HPV vaccine compared to Non-Hispanic White and Non-Hispanic Asian adolescents (Jeudin, Liveright, Carmen, & Perkins, 2013). Even these rates may be misleading, however, because most studies and data sources, including the U.S. census, lump together Non-Hispanic Black subgroups. This limits our ability to identify communities that have particularly low vaccine uptake and understand their barriers

to vaccine uptake. In a seminal paper on HPV vaccine uptake among East African community, Greenfield and colleagues (2015) examined vaccine-related knowledge and attitudes of Somali, Ethiopian/Eritrean, and Hispanic parents in King County, Washington through in-person surveys and focus group discussions (Greenfield et al., 2015). The study found that, despite Somali and Ethiopian/Eritrean parents reporting acceptance of vaccines in general, they had little-to-no knowledge of HPV vaccine, thus few parents reported having had their children vaccinated against HPV (Greenfield et al., 2015).

Decisions to initiate and complete the HPV vaccine series involve multiple stakeholders including providers, parents, and children. Providers and parents of East African children report that children's concerns and their preference for getting the vaccine are weighted as heavily as those of parents and health care providers (Dailey & Krieger, 2017; Gowda, Schaffer, Dombkowski, & Dempsey, 2012; Greenfield et al., 2015; Simmons et al., 2017). Many interventions aimed at improving adolescent HPV vaccine uptake target parent knowledge and attitudes because parental perceptions are important predictors of adolescent HPV vaccination (Zimet et al., 2005) and parental consent is often required (Farrell & Rome, 2007). However, as adolescences are the recipients of the vaccine, teens may be more involved in decision making around HPV vaccination compared to routine childhood vaccinations initiated in infancy (Farrell & Rome, 2007). Greater adolescent involvement may take place in states moving towards a "mature minor rule" where adolescents are considered mature enough to consent to treatment, especially around sexual health (Boonstra & Nash, 2000).

The appeal of educational comic books to adolescents (Spiegel, McQuillan, Halpin, Matuk, & Diamond, 2013) and their potential for health promotion (Dobbins, 2016; McNicol, 2017) position them as a potential channel for effectively communicating HPV vaccine

information. Past research has focused on the evaluation of comic books, with less attention given to the development of the material (Nyhan, Reifler, Richey, & Freed, 2014; Sabogal, Otero-Sabogal, Pasick, Jenkins, & Pérez-Stable, 1996). The purpose of this paper is to address this gap by presenting the process for developing a theory-based, audience-centered comic book for HPV vaccine promotion among East African adolescents in King County, WA.

Methods

Focus groups

Focus groups were conducted with East African mothers to inform development of a multilevel communication intervention for HPV vaccine promotion among East African adolescents targeted to mothers, adolescents, and health care providers. Here we discuss findings which pertain to the adolescent comic book part of the intervention.

Recruitment. We convened three focus groups of 9-11 women each (n=30). Women were able to take part if they were fluent in Somali, Amharic, or Tigrinya and had at least one child 11-17 years old. Bilingual research team members recruited participants by telephone, or face-to-face at venues that served members of the target community, such as places of worship. Community partners also provided the research team with contact information of potential participants. A bilingual research team member called up to 3 times to determine interest. With both recruitment strategies, a bilingual research team member explained the study and collected information on languages spoken and information on their children, including age, gender, and HPV vaccination status. Women considered eligible and interested in participating were asked additional demographic questions on ethnicity, country of birth, education, religion, employment, household income, and marital status.

One week before the focus group, the research team member called participants to remind them of the date, time, and location of the focus group. Before beginning, the focus group moderator administered written informed consent to the participants in their native language.

Story mock-ups. The research team drafted a short version of the comic book's story line to present to focus group participants. The literature on vaccine-related barriers and facilitators and information from our community partners and bilingual/bicultural research team informed the story line. Bilingual research team members translated the story line into in Somali, Amharic, and Tigrinya. **Table 1** presents the story line for each scene. We created story mock-ups by superimposing the story line onto photos of adolescents representing the target communities obtained from health promotion materials and inventories of publicly available stock photos. Moderators presented the story mock-ups to focus group participants to elicit suggestions on story content, graphic image, and cultural acceptability of the material.

Focus group guide. The focus group moderator guide covered topics based on the literature exploring key factors affecting HPV vaccine uptake. Focus group guides included specific questions about the comic book based on the mock-ups including comic book characters, story line, and design. Bilingual and bicultural research staff members translated the guide from English to Somali, Amharic, and Tigrinya, and reviewed the questions for clarity and cultural appropriateness.

Data collection. Focus group sessions lasted 1-1.5 hours and were conducted in Somali, Amharic, or Tigrinya. A bilingual research team moderated each focus group. After soliciting information on key factors affecting HPV vaccine uptake, the moderator gathered suggestions on the comic book story script and images. Focus groups were audio recorded and translated from

Somali, Amharic, and Tigrinya into English. The research team reviewed the translated versions and referred to them during the post focus group debriefing sessions.

Data analysis. The research team conducted the focus group analysis using an interactive process involving three steps. First, researchers met after each focus group, developed notes on key themes, and provided feedback to the moderator for the next focus group to clarify emerging themes. Second, two research team members independently reviewed each transcript to identify main ideas and meanings. Researchers generated tentative labels to capture the essence of each idea and compared and contrasted notes. Third, two research team members reviewed the data and clustered similar ideas together into themes and codes representative of each theme. The coding scheme was refined throughout data analysis.

Theory-Based Message Mapping

We mapped focus group findings to theoretical constructs of the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) to inform the final storyline. The HBM is a health behavior model that helps explain why an individual decides to engage in health promoting behaviors through the lens of perceptions (Champion & Skinner, 2002).These perceptions are perceived susceptibility (i.e. an individuals' subjective assessment of risk for developing the health problem), perceived severity (i.e. an individual's evaluation of the medical and social consequences of a condition), perceived benefits (i.e. an individual's belief about whether the intended action will be beneficial in reducing risk of the condition or not), perceived barriers (i.e. an individual's perception of the negative consequences of performing the action), cues to action (i.e. environmental or bodily affects that instigate the desired action), and self-efficacy (i.e. an individual's confidence in their ability to carry out the desired behavior;) (Champion & Skinner, 2002). The TPB is another health behavior model that helps understand

behavior change from the perspective of intention (Ajzen, 1991; Montaño & Kasprzyk, 2002). Intention, which is deemed most proximal to behavior change, is shaped by attitudes toward the behavior (i.e. an individual's appraisal of the outcome of engaging in the behavior, whether positive or negative), the subjective norm around the behavior (i.e. an individual's perception of who will approve or disapprove of the behavior, and whether they want to comply), and perceived behavioral control (i.e. an individual's perception of the behavior's facilitators and barriers and their perceived power over carrying out the behavior; Montaño & Kasprzyk, 2002). Constructs of both theories have been shown to be correlated with HPV vaccine uptake in adolescents (Bastani et al., 2011; Brawner et al., 2013) and young adults (Gerend & Shepherd, 2012).

Results

Demographics of Focus Group Participants

Table 2 reports focus group participant demographics. Participants' mean (standard deviation) age was 41.0 (5.6) years, and they had 9.5 (4.5) years of formal education. Most were married (80.0%), and had 1-2 children between the ages of 11-17 years.

Message Pretesting

Comic Book Characters. Mothers across the focus groups agreed that the comic book should incorporate a diverse set of characters including girls and boys from different races and ethnicities, feature the main character to be from the community, and show families. Mothers indicated that the main characters should look like they are "from the community." Somali mothers had specific input on how the main character should look, saying girls should be "wearing hijab and dressed modestly." There was a consensus across the focus groups about the importance of featuring families. However, conversations diverged when discussing which

family members to highlight. Somali mothers suggested grandmothers and fathers; however, Ethiopian mothers differed on including fathers. Discussing the story line, an Ethiopian mother indicated her satisfaction with the characters shown in the mock-up, which did not include a father, and emphasized the central role mothers play in the family.

> *Here there is Senait [the main character], Helen [character's friend], doctor and mother and students. Mother means and represents the whole family, the doctor is here to tell what the vaccine is…Senait is there to tell the information to her mother what she heard from her friend and other students. So, I don't think it is important to include additional people in the story.*

Perception of the Story. While mothers wanted more information about HPV infection, transmission, benefits, and risks in the comic book, they also shared their thoughts about the draft story line finding it relatable, persuasive, and with resonance, particularly regarding information sharing among peers. Pointing at the story line, an Ethiopian mother shared how she deemed the exchange of information between boys and girls effective:

> *Boys discuss with girls about the importance of the vaccination and girls share the information [pointing to the group picture] this is effective in showing that boys sharing the information to girls and girls sharing the information to boys thus they prevent themselves from the disease.*

Mothers also discussed the persuasiveness of the story to move people from "not knowing" about the HPV vaccine to "knowing" the benefits of the vaccine and the severity of the disease to ultimately impacting a person's decision to get vaccinated. A Somali woman shared:

> *I think the message here is that when you explain something to someone then they'll understand it. The person [referring to the main character] was unsure before and thought it was a bad thing, and then afterward when the benefits of the shot and the dangers of the disease were explained the person understood and was able to act on it and get the vaccine.*

While Somali mothers also identified with the message about the deep connection between "the girl and her mother" and their affective interaction, the Ethiopian mothers identified with the humorous twist about the pain message, with mothers bursting out laughing

when the focus group moderator read this section of the script. A woman explained how "most of the time children talk about the pain" and not about "side effects." Another Ethiopian mother shared her view toward the story, and how she anticipated her child to respond to the message.

> *I am very happy and excited to see this [the story]. For me the story is very good, particularly talking about the pain. My child understands a message better when communicated this way than I tell him.*

Diffusion of Information. Across all focus groups, mothers agreed that "schools play an important role" in teaching children about the HPV vaccine. Some mothers commented positively on the way the story represented HPV information diffusing from school to home, how the main character learned about the vaccine in school and used this information to engage her mother and grandmother. An Ethiopian mother said, "Like in the story our kids communicate what they hear from school." An Eritrean mother shared similar sentiments about the realities of learning in schools, since this is where children spend most of their day.

Information Needs. Women expressed lack of information on HPV and the HPV vaccine including cause, symptoms, diagnosis, treatment, and prevention of HPV. Some women mentioned the importance of understanding the "risks and benefits" of the vaccine. Although concerns arose about sexual activity once mothers learned the mode of transmission, they also emphasized their need to have more information before making a decision for their children.

Production of the Comic Book

The research team used key findings from focus group discussions, theory-based message mapping, and input from community partners to transform the draft story line into a narrative with dialogue. Specifically, the work focused on expanding the messages that resonated with the focus group participants and embedding new text to address concerns raised during the discussions. **Table 3** shows key messages mapped to the constructs of these two theories.

Script. The final story had three scenes. Scene 1 describes the main character as an adolescent female. The main character's health teacher invites a local doctor to talk to her class about HPV and the HPV vaccine. The doctor explains to the students that HPV is very common, and that it will infect almost everyone at some point. She urges students to get vaccinated for HPV. Scene 2 shows the main character walking home with her school friends. One of her friends says she got the HPV vaccine a few weeks ago to prevent cancer. She also mentions several other friends, both boys and girls, she knows got vaccinated. The main character tells her friend that she always disliked vaccines because of the pain. Her friend reminds her that it's a relatively easy pain compared to fighting cancer or even studying for their next math test. In scene 3, the main character arrives home and asks her mother to talk to her doctor about the HPV vaccine at their next visit. After her mother learns about the benefit of the vaccine to prevent cancer, she agrees to talk to the doctor about the vaccination. She is proud of her daughter's proactive approach to her health and her future. The story script went through multiple iterations and children from similar age groups and/or from the target population, community members from the target community, and the bilingual research staff members each reviewed the script.

Storyboard and Characters. After finalizing the script for each scene, an artist (Isabelle Celentano) developed the storyboard using graphic frames and dialogs laying out conversation breaks and flow for each image. **Table 4** shows the storyboarding table used for the first spread of Scene 1 (pages 2 and 3). After laying out each comic book spread, IC sketched a draft of the main characters, beginning with the Somali version of the comic book. Following discussions with the research team and community partners, several styles and versions of the characters were developed and reviewed. **Figures 1 and 2** compare the "Meet the Characters" page for the Ethiopian and Somali versions of the comic book. The artist purposefully created main and

supporting characters that could be reused across the Somali, Eritrean, and Ethiopian versions of the comic book, including those in hijab and those not in hijab. This saved a significant amount of time by allowing the artist to create a final Somali version of the comic book, and then swap characters for cultural relevance to the Eritrean and Ethiopian communities, without duplicating work.

All three versions of the comic book (Ethiopian, Eritrean, and Somali) had identical dialogue, while the character names were changed relevant to each community. IC finalized the Somali version of the comic book first, followed by the Amharic and Tigrinya versions. IC created character sketches in Adobe Photoshop and finalized the comic book layout and features in Adobe Illustrator. Finally, the research team printed high-resolution versions of the final comic book for the adolescents, whose components are outlined in **Table 5**. **Figures 3-5** show spreads from each of the three scenes of the Somali version of the comic book.

Discussion

This paper presents the process for developing and producing a theory-based, audience-centered HPV comic book for East African adolescents using an iterative process of integrating focus group findings, results of message pre-testing, key constructs from health behavior theory, information from prior formative research studies, and input from community partners and the bilingual/bicultural research team. Our message-mapping method helped identify "what" to communicate to adolescents to promote behavior change and "how" to communicate in a way that will capture their attention.

Researchers have successfully developed and tested comic books to improve nutrition and physical activity among Hispanic and African American adolescents alone (Leung et al., 2014) and as part of a multi-level intervention (Ko et al., 2018) and to promote HPV vaccine

uptake (Katz et al., 2014). Research shows comic books are a promising tool to communicate with children by improving information processing and recall (Green & Myers, 2010; Kreuter et al., 2007) while remaining highly entertaining (Singhal & Rogers, 2001). While Katz and colleagues (2014) used a similar theory-based approach, our methods are unique in regard to the audience-centered nature of the comic book. Unlike their study, we incorporated focus group findings from mothers of the target communities into development of the comic book message, storyline, script, and characters. Our focus group participants outlined several innovative and salient factors of this type of health education material that are consistent with and build upon the literature.

East African mothers emphasized that the main characters and families should be representative of the community as they were in the story mock-ups. When creating narratives that are culture-centric in health promotion, using characters similar to the target audience allows them to form a personal connection to the message (Larkey & Hecht, 2010; Singhal & Rogers, 2002). An important advantage of using characters that represent the target audience in comic books is the ability to facilitate observational learning through the depiction of role models (Leung et al., 2014). Creating characters dressed modestly and in hijab enhances cultural resonance and allows observational learning to emerge naturally (Larkey & Hecht, 2010; Leung et al., 2014). Modeling behaviors can increase personal relevance increasing the appeal of the messages and ultimately promoting behavior change (Kreuter & McClure, 2004; Turner, 2012).

Mothers who participated in the focus groups highlighted three aspects of the comic book story that resonated with them. First, they noted the accuracy of information sharing between peers as depicted in the story. Both boy and girl characters shared information and experiences around the HPV vaccine in the story. Adolescent behaviors are more susceptible to peer

influence than the behavior of adults and children for several physical and psychological reasons associated with puberty (Albert, Chein, & Steinberg, 2013). Peers can easily influence health behaviors over which teens have complete control, such as physical activity (Chung, Ersig, & McCarthy, 2017). A health behavior like HPV vaccination is different because parental consent is required, thus calling for a multifaceted approach (Farrell & Rome, 2007). Since peer influence can have long-lasting implications for adolescent health (Crosnoe & McNeely, 2008), peer-based messaging is one key area of focus for changing adolescent health behavior (Albert et al., 2013; Crosnoe & McNeely, 2008).

Second, mothers found the humor appeal around vaccine pain messaging in the story particularly salient. In the story, a friend of the main character compares the pain of getting the HPV vaccine to the "pain" of studying for their next math test. Humor appeals are used in health communication messaging; however they are not appropriate for every situation. Turner (2012) explains that humor appeals in health messages are suitable for portraying positive behaviors that do not occur naturally, such as getting the HPV vaccine. Humor appeals are useful for highlighting positive feelings around benefits of the recommended health behavior (Turner, 2012) and for reducing reactance associated with vaccine hesitancy (Moyer-Gusé, Robinson, & Mcknight, 2018). In our case, we use humor to communicate about the short-term pain associated with HPV vaccination, a key concern among adolescents, by comparing it to "pains" of everyday adolescent life and avoided fear or threat-based appeals.

Third, mothers found the reciprocal nature of the mother-daughter relationship in the story realistic. Researchers often assume that adolescents adopt the majority of their parents' attitudes, beliefs, and expectations (Mosavel, Simon, & van Stade, 2006), and research often conceptualizes health information as delivered "top-down" from parents to children and

adolescents in a unidirectional manner (Evans, Clark, Levison, Levin, & Mellins, 2001; Mosavel et al., 2006). This does not recognize the influential role adolescents can have on their family's health education and behavior, particularly among low-income and immigrant families where children often have more access to education and a better understanding of available resources than their parents (Mosavel et al., 2006). In their study of a low-income, ethnically diverse community in South Africa, Mosavel et al. (2006) found that a strong mother-daughter relationship facilitated a bidirectional exchange of health information. Ninety-three percent of mothers in the study who agreed their daughters could give them health advice also concluded that they would listen to that advice.

Mothers across the three focus groups also identified with the way the story depicted diffusion of health information from school to home. The main character in the story first learns about HPV and the HPV vaccine when a health professional visits her class to discuss the benefits of getting vaccinated. After receiving confirmatory information from her peer group, she presents what she learned to her mother and grandmother. Focus group participants agreed that their children often did the same. While few studies have assessed how school-based health education interventions for children and adolescents impact parental behavior, one study by Evans and colleagues (2001) showed positive results. Their study examined a school-based asthma self-management intervention for children and its effect on their primary caregivers (Evans et al., 2001). They found that children who participated in the program as well as their caregivers demonstrated significant improvements in their asthma management skills (Evans et al., 2001). Findings from our three focus groups as well as evidence presented by Evans and colleagues (2001) demonstrate the important role school-based health education programs play in health promotion for adolescents and their parents.

Strengths and Limitations

A key strength of this study is its rigorous approach. Through integrating findings from formative work and focus groups, mapping these findings to constructs of health behavior theory, and utilizing health communication strategies, we created a theory-based audience centered comic book to address HPV knowledge and beliefs among adolescents. This study adds to the limited body of research on the use of message mapping and is the first to implement this method in diverse populations. Few other studies have examined the comic book medium for delivering health-related messages, particularly to East African adolescents. However, this study relied solely on the perspectives of East African mothers and excluded adolescents from the message pretesting phase. This phase only included one focus group in each of the three communities. Another limitation is the lack of generalizability of our findings. This study is very specific to the Seattle metropolitan area and perceptions that arise from that context, and do not apply to all of the East African immigrant populations in the U.S.

Conclusion

To improve disproportionate vaccine uptake among different racial and ethnic groups, it is necessary to create audience-centered educational material that is rooted in health behavior theory. Data are being collected and analyzed to determine whether this method can produce material acceptable to East African adolescents as a means for learning about HPV and HPV vaccine, what factors affect the acceptability of this material, and its impact on East African adolescents' HPV-related knowledge and beliefs. Future studies could improve generalizability of this method by testing it in other sub-populations, or in East African communities in other geographic locations. A future research direction around comic books for health promotion might consider the environment in which this type of material is disseminated. Mothers in our

study agreed their children often brought home information they learned in school. Researchers might further test this theory by evaluating the impact of health-related comic books disseminated in school-based health education programs.

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Table 1. Scenes and story line

Scene	Storyline
Scene 1	The comic book follows an adolescent female main character (MC). Her health teacher invites a local doctor to talk about HPV and HPV vaccine to her class. The doctor tells the class that HPV is so common that almost everyone will be infected at some point – the scary part is they may never know, and it can cause cancer. The doctor urges students to get vaccinated for HPV.
Scene 2	After school ends, the MC walks home with her friend who says that she got vaccinated a few weeks ago to prevent cancer. She mentions several other friends, both boys and girls, who got vaccinated. The MC always disliked vaccination because she finds it painful. Her friend reminds her that it's a relatively easy pain compared to fighting cancer or even studying for their next math test.
Scene 3	When the MC arrives home, she asks her mother to talk to her doctor about the HPV vaccine at their next visit because she wants to get vaccinated. After her mother and grandmother learn about the benefit of the vaccine to prevent cancer, she agrees that it's a very good idea to get vaccinated and is very proud of her daughter's decision.

Table 2. Characteristics of Somali, Ethiopian, and Eritrean Mothers *(n=30)*

	Somali *n=11*	Amharic *n=10*	Tigrinya *n=9*
Parents' Age, mean (SD)	42.9 (6.0)	35.9 (10.1)	44.4 (14.4)
Ethnicity, n (%)			
Somali	11 (100.0)	0	0
Amhara	0	6 (60.0)	0
Hadere	0	1 (10.0)	0
Tigre	0	2 (20.0)	9 (100.0)
Oromo	0	1 (10.0)	0
Country of Birth			
Somalia	10 (90.9)	0	0
Ethiopia	0	9 (90.0)	2 (22.2)
Eritrea	0	1 (10.0)	7 (77.8)
Kenya	1 (9.1)		
Years in the US, mean (SD)	12 (7.9)	11(6.1)	23.4 (2.5)
Years of Education, mean (SD)	6.6 (5.5)	11.5 (1.3)	10.7 (4.2)
Religion, n (%)			
Islam	11 (100.0)	3 (30.0)	0
Christian	0	7 (70.0)	9 (100)
Work Outside of Home, n (%)			
Yes	7 (63.6)	5 (50.0)	7 (77.8)
No	4 (36.4)	5 (50.0)	1 (11.1)
Marital Status, n (%)			
Married	10 (90.9)	7 (70.0)	7 (77.8)
Unmarried	1 (9.1)	3 (30.0)	2 (22.2)
Income, n (%)			
<25	6 (54.5)	3 (30.0)	2 (22.2)
25-50	1 (9.1)	6 (60.0)	1 (11.1)
>50	3 (27.3)	0	6 (66.7)
Don't Know	1 (9.1)	1 (10.0)	0
Children's Age, mean (SD)	14.8 (1.9)	12.7 (4.2)	15 (5.2)
Children's Gender, n (%)			
Male	7 (63.6)	4 (40.0)	3 (33.3)
Female	4 (36.4)	6 (60.0)	6 (66.7)
HPV Vaccination Status, n (%)			
Yes	2 (18.2)	1 (10.0)	3 (33.3)
No	4 (36.4)	7 (70.0)	4 (44.4)
Don't Know	5 (45.5)	2 (20.0)	2 (22.2)

Table 3. Theory-based message mapping

Theory construct	Purpose[1]	Message
Perceived susceptibility	Define populations at risk; personalize risk based on features or behavior; heighten perceived susceptibility	"HPV is so common that almost everyone will be infected at some point." "Most people infected will never know."
Perceived severity	Specify consequences of the risk and condition	"…cause disease and trouble like cancer."
Perceived benefits	Define action to take; how, where, when; clarify the expected positive effects	"The vaccine will protect you from cancer in the future." "…so we will not get sick in the future from something we could have prevented." "It's an easy step that you can take now to prevent cancer in the future."
Perceived barriers	Identify and reduce barriers through reassurance, incentives, assistance	"I've always hated shots because they hurt."
Cues to action	Provide how-to information; promote awareness; give reminders	"Talk to your parents, nurses, and doctors about the HPV vaccine."
Self-efficacy	Provide training and guidance in performing action	"…I am sure I can ask my parents to talk to my doctor about the HPV vaccine." "…I am sure I can get the HPV vaccine."

[1] Adapted from Glanz, K., Lewis, M., & Rimer, B. K. (1997). *Theory at a Glance: A Guide for Health Promotion Practice.* National Institute of Health.

Table 3. Theory-based message mapping

Theory construct	Purpose[1]	Message
Intention	Demonstrate intention to perform the behavior in question	"…and we plan to get the HPV vaccine now." "I plan to talk to my parents about the HPV vaccine."
Subjective norm	Identify perceived social pressure to perform or not to perform the behavior	"You even told me that many of your friends have had the HPV vaccine shots."

Table 4. Example storyboard for Scene 1, pages 2 and 3

Frame	Other text	Image	Dialogue
1	"In health class…" *Murmurs*	A medium shot of the main character and her friend sitting next to each other in health class. Other students are visible in the background. Iman leans toward her friend.	**Other student:** "I'm so excited to meet the doctor. I mean…this just doesn't happen often, right?" **Main Character:** "I know! I want to be a doctor or a nurse someday so, maybe I can ask them some questions."
2	None	A wide shot of the health teacher standing beside the doctor at the front of the classroom. The shot is taken at the rear of the classroom with the back of students' heads visible.	**Health Teacher:** "Quiet everyone. This is Dr. Gomez from the public health clinic. She will be talking today about a very important vaccine today." **Doctor:** "Hi guys!" **Students:** "Hi."
3	None	A close-up shot of the doctor at the front of the room speaking.	**Doctor:** "How many of you have heard about HPV? Ok, you there. What have you heard?"
4	None	A wide shot of doctor at the front of the classroom. A few students have their hands raised.	**Student 1:** "That it's deadly and attacks your immune system." **Doctor:** "Okay, um, I think you may be thinking about HIV. HIV attacks the immune system and yes, it can be deadly…"
5	*Squeaking marker*	A close-up shot of the doctor at the front of the classroom writing "HPV" on the board.	**Doctor:** "But, today, I am here to talk to you about HPV, the one with a P. Anyone heard of the HPV vaccine, or heard of the human papillomavirus?"

Table 5. Comic book development based on focus group participants' comments

Categories		Participant comment	Inclusion in final product
Comic book preferences	*Characters*	Characters should look like the target population, and should be in appropriate, modest dress	Characters change dress, style, and names for Somali, Eritrean, and Ethiopian versions of the comic book
		Include girls and boys as characters	Added two boy characters to Scene 2
		Include a grandmother	Included a grandmother in Scene 3
		Mother represents the whole family	Included mother and grandmother in Scene 3, left out father for simplicity
Information Needs	*HPV information*	Do you have to be sexually active to get HPV?	Added specific references to spread through sexual contact
		What are the symptoms? How would someone know if they have HPV?	Emphasized that most won't know they're infected because there are no symptoms
		What's the difference between HPV and HIV? Does HPV stay in your system forever, like HIV? Is HPV like Hepatitis B or C, or like gonorrhea?	Student mistakes HPV for HIV when asked in class, and doctor emphasizes the 'P' in HPV when written on the board
	HPV vaccine information	Why did HPV not affect [the mothers' generation]? Is the cancer caused by HPV new? Is the HPV vaccine new?	Mentioned the types of cancer caused by HPV; grandma indicates there were no such vaccines to prevent these types of cancer when she was young

Table 5. Comic book development based on focus group participants' comments

Categories		Participant comment	Inclusion in final product
		If children won't be sexually active until marriage, why do they need the vaccine now? If the child asks for the vaccine, does that mean they are sexually active or want to become sexually active?	Emphasized the need to get the vaccine now in order to prevent cancer later on by comparing the HPV vaccine to putting on a seatbelt before driving
		What are the short- and long-term side effects of the HPV vaccine? Will the HPV vaccine cause cancer?	Health professional specifically mentions the side effects of the vaccine including fainting and dizziness, but emphasizes vaccine has been shown to be safe from serious or long-term side effects
Decision-making factors among adolescents	*Social Influence*	Friends play an important role in adolescents' decisions and actions	Scene 2 shows the main character discussing the vaccine with her friends who have already been vaccinated and encourage each other to discuss the vaccine with their parents.
		Adolescents should get information from multiple sources, not just from parents	HPV and HPV vaccine info is disseminated by a member of the health department (Scene 1), adolescents' peers (Scene 2), and family (Scene 3)
	Acculturation	Adolescents make their own decisions, especially those who have adopted western culture	Main character convinces her mother to discuss the vaccine with her doctor