A study of women and mothers’- of- minor- age- daughters knowledge of HPV as well as the attitudes toward the HPV vaccine
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Abstract
Background— The Human papillomavirus (HPV) is a common sexually transmitted infection that generally goes unnoticed due to a lack of symptoms; however, HPV can lead to anogenital warts and, in chronic cases, cervical cancer. The Merck pharmaceutical company developed a commercial version of a quadrivalent recombinant non-infectious vaccine that was tested in preclinical research. This vaccine targets serotypes HPV16 and HPV18, which cause an estimated 70% of all cervical cancers, as well as serotypes HPV6 and HPV11, which cause 90% of external genital warts. In June 2006 the FDA approved Gardasil®, an HPV immunization for use in females aged 9 to 26 years. Aim—This project aims to examine the current understanding and beliefs of the women surveyed and provide a base which healthcare professionals can use to aid in expanding women’s general knowledge about this virus and its prevention. Methods— A cross-sectional survey was conducted among women across Texas aged 17 years and above. Approximately 200 women from two different groups were approached at random and asked to participate in a survey examining their knowledge, attitudes, and beliefs about HPV and the new HPV vaccine known as Gardasil®. These were termed Group 1 (women ages 17-26 years) and Group 2 (mothers of girls ages 9-16). After collection, the data was interpreted using the Statistical Package for the Social Sciences (SPSS) and the results were presented as frequencies (%) or means and standard deviations, as appropriate. Results—The majority of both groups knew that HPV was a sexually transmitted infection that could cause cervical cancer, but far fewer recognized other long-term effects. Television was the most commonly cited information source in both groups, and most knew that Gardasil® was a preventive step, not a treatment. Concern over side effects and cost were the most influential factors in choosing whether to get Gardasil®, not religious beliefs or value systems. Most women thought the vaccine worth the high price but worried about whether they could afford it even so. Conclusion—While awareness and knowledge is increasing, much education is still needed about risk factor awareness and potential vaccine side effects. By making Gardasil® more affordable to the public the use of the vaccine would likely increase. Statewide acceptance is likely to be fostered by the absence of major side effects and the release of a generic form.

INTRODUCTION
The Human papillomavirus (HPV) is a DNA virus that is known to be the most common sexually transmitted infection in the United States. It is estimated that this virus affects about 75% of sexually active adults in America. Generally, most HPV infections go unnoticed due to a lack of HPV related symptoms; however, HPV can lead to anogenital warts and in chronic cases it can lead to cervical cancer. Although the HPV virus has over 100 different serotypes, not all are known to cause cancer. In particular, a group of approximately 30 different serotypes are passed through sexual contact. Of those 30, serotypes 6 and 11 have been recognized as causing genital warts. Furthermore, 13 of the serotypes are known as “high risk” due to their ability to cause cervical dysplasia, which in time can lead to cancer. These 13 types differ from the ones that are known to cause the genital warts alone. A recent report stated that 93% of invasive cervical cancers worldwide contain Human papillomavirus (HPV). According to a 2002 study that evaluated various infection induced cancers, cervical cancers had approximately 500,000 incidences. HPV was the causative factor in each of those 500,000 incidences.

In response to this potentially life threatening virus and its persistence, Merck developed a commercial version of a...
quadrivalent recombinant non-infectious vaccine that was tested in preclinical research. This vaccine targets serotypes HPV16 and HPV18, which have been confirmed to cause an estimated 70% of all cervical cancers. This quadrivalent vaccine also covers serotypes HPV6 and HPV11, which have been confirmed to cause 90% of external genital warts. Recently the FDA approved Gardasil®, an HPV immunization for the use in girls and women ages 9 to 26 years of age. The FDA’s approval of Gardasil® presents to Americans two controversial dilemmas: whether the women should get immunized and whether mothers of minors should immunize their young girls. Many variables affect the American woman’s awareness of HPV and its potential harmful effects. These variables include education, access to healthcare, age, and religion.

As America’s healthcare system expected, educating the American public on HPV and its demonstrated link to cervical cancer will be one of the biggest challenges affecting Gardasil®’s effectiveness. For example, in a study of 321 college students, only 33% had ever heard of HPV and only 17% knew that HPV was sexually transmitted. An alarmingly low 2% identified HPV as being a cause of cervical cancer. Generally speaking, college educated individuals are more well informed about what is going on in the world around them than is the general public; therefore, if only 17% of the 321 college women surveyed knew that HPV was a sexually transmitted disease, the general female population’s awareness is likely much less than that. These statistics highlight just how dire the need is to inform the general public about infections and potentially terminal diseases they can contract through everyday adult activities.

The survey design was partially derived from Michelle Giles and Suzanne Garland’s survey that was published in the Australian and New Zealand Journal of Obstetrics and Gynecology. Giles and Garland designed a survey to assess the knowledge of 90 women, ages 18-30. These 90 women were categorized into three different groups: women who attended a dysplasia clinic, women who attended a local university’s health service clinic, and women who were participants in a phase 3 HPV vaccine trial. Giles and Garland tested the survey participants’ knowledge of HPV infection, cervical cancer, Pap test and HPV vaccines. Giles and Garland’s three-part survey revealed data that aided in the designing of the proposed study.

The first part of Giles and Garland’s study found that 94% of the 90 participants correctly understood the following: the scraping that occurred during a Pap was designed to detect abnormal cells, the appropriate time frame to receive a pap smear, and what doctors meant when telling patients that their test results were “abnormal.”

The second part of the survey revealed what knowledge the participants had of HPV. The vast majority of Giles and Garland’s survey participants had heard of HPV and knew that HPV is a sexually transmitted disease; however, many survey participants could not identify the risk factors associated with HPV. Conversely, Giles and Garland’s survey participants were able to regularly identify one HPV risk factor, the “failure to use a condom.”

The third section of the survey revealed that only 33% of the women surveyed were aware that a HPV vaccine existed. Furthermore, 25 of the 30 women who had heard of the vaccine belonged to the group of survey participants that was enrolled in the phase 3 follow-up trial of an HPV vaccine. This leads one to believe that the 33% of women who had heard of the vaccine was an abnormally high number because those particular women were receiving a HPV vaccine at the time of the survey. Giles and Garland’s research confirmed the common medical belief that many young women do not fully understand the risk factors for HPV infection and the effects it can have on their bodies. Giles and Garland’s survey has served as a solid foundation for the proposed research, however, Giles and Garland’s survey was limited in its findings.

One limitation of Giles and Garland’s survey was the size of the sample from the population. With the small sample size used by Giles and Garland, the statistics obtained are not as reliable as statistics gathered from a large sample population. The survey used in this study encompassed a much larger sample population and a wider demographic range.

Another limitation of Giles and Garland’s survey was the characteristics of the women who were surveyed. Giles and Garland only surveyed women who were in some way involved in the medical community. Because of their involvement in the medical community, the surveyed women’s knowledge is not indicative of the general population’s knowledge of HPV. The surveyed women’s is likely much higher than that of a woman who is not involved in the medical community.

The limitations of Giles and Garland’s survey indicate that further investigation is needed. The general, non-medical
The hypothesis was that the women that are over age 17 will favor Gardasil® at a higher proportion than mothers of adolescent girls (ages 9-16). It is also was hypothesized that the higher the education, the more exposure to the media regarding this vaccine and a greater general knowledge base of HPV alone will augment the acceptance of the vaccine. The information obtained from the survey helps determine what the individuals in Gardasil’s® target demographic feel, believe, and know about HPV.

The HPV vaccine has garnered significant press coverage at the local, state, and federal level. Many factors pertaining to HPV vaccines and adolescent immunization in general will challenge HPV vaccine implementation. The factors challenging HPV vaccination implementation include the following: a low perception of risk, the media, religious beliefs and financing the vaccine.

RISK PERCEPTION

The American public’s perception of risk association with HPV will challenge HPV vaccination implementation for a number of reasons. Generally, the American public has a low perception of risk association with attaining HPV infection. As mentioned earlier, in a previous study only 17% of the 321 college students surveyed were aware that HPV was sexually transmitted. Norman Constantine, PhD and Petra Jerman, PhD, MPH studied acceptance of the HPV vaccine among Californian parents in 2006. Their survey analysis revealed that the three most recognized influences on parental acceptance are “perceived dangers of the vaccine, perceived dangers of the disease, and perceived susceptibility to the disease.” One reason parents chose not to vaccinate their daughters is that they deny a need for vaccination. Another study performed by Slomovitz et al at M.D. Anderson Cancer Center in 2005 found that mothers who did not accept the vaccine for their 8-14 year old children “cited the risk of unknown adverse effects and their belief that their children are not sexually active.” A low perception of risk challenges HPV vaccination implementation because if only a small percentage of the American population is aware of risks associated with HPV, demand for the vaccine will be impaired. Davies et al. researched whether additional education would affect parental acceptance of the vaccine. This study found that 20% of parents who originally rejected the vaccine reversed their decision after learning more about the subject. This suggests that increased health education about the vaccine may lead to higher acceptance rates.

MEDIA

The media (including news articles, television, and the Internet) will challenge HPV vaccination implementation. When the media discusses HPV, it tends to highlight the fact that HPV is transmitted through sexual contact. Many parents of adolescent girls do not want to promote the HPV vaccine because they are afraid that acceptance of the vaccine will promote adolescent sexual activity. Vaccination implementation may also force parents to explain to their children the reasoning behind the vaccination. One parent responds in a survey conducted by Olshen, et al., “I can’t imagine how I would explain to this kid what this vaccination is…and why you have to get it three times if you were ten years old.” Another respondent echoes, “It’s scary telling a child that they are protected by [sic] certain sexually transmitted diseases.” Many parents are uncomfortable with this idea. Furthermore, misinformation about the vaccine and its putative rejection by the general population has already been published. The overall consensus among scientific studies is that while not every parent endorses the vaccine, the majority are accepting of it. Yet Davies et. al discovered “anti-vaccination activists” on the Internet, a finding confirmed by our team’s own search. The website www.thinktwice.com/ploys.htm, the first result under the Google search “are vaccines safe”, displays the headline “Immunization Ploys: Are Parents Being Manipulated? 30 Tactics Used by the Medical Profession to Hoodwink the Public.” Also, the media generally gives a lot of attention to any adverse reactions to immunizations without discussing the benefits. This attention negatively impacts parents’ feelings toward immunizations in general, much less a controversial vaccine such as Gardasil®. Gregory D. Zimet, PhD advises healthcare providers to be aware that patients often obtain information from media reporting and to be ready to guide their self-education efforts toward reliable sources. The general principle that the media is beneficial ally to decision-making when accurate and
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objective, and a destructive enemy when it is not, certainly applies to the current issue of HPV vaccination.

BELIEF SYSTEMS

Religious, moral, and social beliefs towards sexual contact and vaccine administration could be strong arguments against the HPV vaccine. Since it is a vaccine against a sexually transmitted infection it has the possibility to be looked down upon and refused by many religions or belief systems. A study performed by Dempsey, et al. and published by the American Academy of Pediatrics compared parental acceptance of the vaccine between groups that did and did not receive a detailed HPV information sheet (sample size 840 individuals). A startling conclusion is drawn about the link between education and vaccine acceptance. In contrast to the Davis study, no significant relationship was found between increased education and parental acceptance. This suggests that parents may draw more on their own beliefs, social attitudes, and preferences in making decisions than on scientific fact. This finding, however, should not rule out efforts to increase public education. The Dempsey study acknowledges that its conflict with the Davis conclusion may be because of geographic and sociocultural differences across the nation. Further limitations include that those who completed the survey did so without the benefit of consulting a healthcare provider and did not test the influence of all factors. As with any controversial topic, individual studies must simply add to the larger picture.

FINANCIAL COSTS

Finally, financing the vaccine is a challenge to HPV vaccination implementation. The quadrivalent recombinant non-infectious vaccine is a three-dose vaccine that costs $120 per dose which totals to $360 per series. At this time not all insurance companies fully cover this vaccination, and even more so, those who are uninsured will find it hard to finance such an expense. American women are debating whether to forego a vaccine that has the potential to eradicate their risk of cervical cancer or to find a possible way to finance it. In parallel, there are mothers who will have a hard time affording their daughter’s immunization, and in some cases their own as well. The cost of the vaccine must also be viewed at a broader level. When the governor of Texas signed an executive order mandating the HPV vaccine for all sixth grade girls (an order which was later overturned), a provision for partially/uninsured girls was included. The issue that was overlooked was the cost. In an editorial published by the Journal of the American Medical Association, the authors point out that no matter who pays for the vaccines, someone will suffer. Health disparities between economic groups would be exacerbated if consumers/insurers pay for the vaccine, and the state would have to find alternate ways to distribute the public health budget if the vaccine were to be covered by the government. So whether the vaccine is available on a voluntary or a mandatory basis, financing the vaccine is a major factor in whether Americans will get Gardasil®.

With this survey, the knowledge, attitudes, and beliefs of women aged 17-26 and mothers of girls between the ages of 9 and 16 concerning the HPV vaccine, HPV, and cervical cancer was investigated. The hope of this research was to find a better way both of these age groups to become knowledgeable on the subject of this vaccine. The data obtained can be used as an educational tool to explain to women not only about HPV but other sexually transmitted diseases. With a baseline of the public’s general knowledge on the subject of HPV and this vaccine, health care providers will now have a better understanding of the level to which they must educate their patients. With better education on HPV, vaccination, cervical cancer and sexually transmitted diseases in general the health care system could increase the overall quality of women’s health.

METHODS

This cross-sectional survey was conducted among women across Texas ages 17 years and above. Approximately 200 women from two different groups were approached and asked to participate in a survey examining their knowledge, attitudes and beliefs about HPV and the new HPV vaccination known as Gardasil®. These two groups are made up of women ages 17 to 26, and women who are mothers of girls ages 9 to 16. The survey was partially based on earlier work published by the Australian and New Zealand Journal of Obstetrics and Gynaecology. It was presented in paper form to the participants to be self-completed. Although the survey was designed to be self-administered, interviewers will also be available for anyone who needs assistance.

Since the survey was handed out at random without the use of standard sampling methods, it is possible that a substantial proportion of potential subjects could have been missed or overlooked. However, in order to broaden the participant pool and make it more representative of the general Texas population, a Spanish-language questionnaire
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was developed specifically for this project. Back-translation was used to confirm the accuracy of the initial translations into Spanish.

After collection, the data from the surveys was interpreted using Statistical Package for the Social Sciences (SPSS) and the results were presented as frequencies (%) or means and standard deviations, as appropriate.

The project was approved the Institutional Review Board of the University of Texas Medical Branch.

The surveys used are listed in the appendix section.

RESULTS

Approximately 200 women from two different groups participated in this survey examining their knowledge, attitudes and beliefs about HPV and the new HPV vaccination known as Gardasil®. These two groups are made up of women ages 17 to 26, and women who are mothers of girls ages 9 to 16. For the purpose of analysis, the women ages 17 to 26 will be labeled as Group 1 and the women who are mothers of girls ages 9 to 16 are labeled Group 2. The average age of those surveyed in Group 1 was 22.36 years old (N=128, SD= 2.477). For Group 2 the age was measured in ranges. The majority of the women fell between 30-49 years old (81.5%). Furthermore, of Group 1, 55.5% of survey participants had completed a high school level education. Also in this group, 43.7% participants had completed an associates, bachelors, or graduate education. Of Group 2, 41.4% had completed a high school level education and 55.7% had completed an associates, bachelors, or graduate education.

RISK PERCEPTION

As part of the survey it was important to find if knowledge of HPV correlated with knowledge of the vaccine. In order to assess this, those surveyed were asked questions about signs and symptoms of HPV and various risk factors. It was found that the awareness of the Gardasil® vaccine was much higher than the knowledge of the Human papillomavirus. Part of the survey examined the knowledge of HPV prior to taking this survey. What was found was that 95.3% of participants had heard of the HPV prior to taking this survey. Of the people surveyed only 3.1% had never heard of HPV.

Additionally, the survey asked women how often HPV infection can cause problems. Of the women surveyed, 90.6% in Group 1 and 82.8% in Group 2 believed that HPV always or sometimes causes health problems. (Figure 1)

Figure 1
Figure 1: Results of the question that evaluates women’s beliefs of how often HPV infection causes problems

The survey went on to analyze if these women were aware of the specific medical complications brought on by HPV infection. Over 40% of the participants were able to identify at least one of the problems brought on by the initial infection with HPV, which includes development of genital warts, vaginal/vulval irritation, vaginal discharge, and painful sexual intercourse. (Figure 2) A surprising 90.6% of those surveyed in Group 1 and 85.7% in Group 2 knew that HPV could lead to cervical cancer. The participants were much less aware of the other long-term effects of HPV, including abnormal Pap smears and infertility. Only 7% of Group 1 and 12.9% of Group 2 reported not knowing of the long-term effects of HPV at all. (Figure 3)

Figure 2
Figure 2: Women’s belief of what kind of problems HPV infection might cause
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Figure 3
Figure 3: Women’s belief of long-term effects of HPV infection

Only 36.7% of those surveyed in Group 1 and 41.4% in Group 2 knew that both men and women could be affected by HPV, whereas 56.2% in Group 1 and 48.6% in Group 2 believed that the virus affects only women.

Another fact that needs to be addressed within the general public is the average age group with the highest risk of acquiring HPV. When asked this question 74.2% of those surveyed in Group 1 and 77.1% in Group 2 chose the correct age group in which HPV has the highest risk (15-24). Only 28.1% in Group 1 and 24.3% in Group 2 either chose the incorrect age groups for those at highest risk for acquiring HPV, marked greater than one answer, or marked “Don’t know” in the survey. Additionally, as stated in the introduction, previous studies have shown that only 17% of college-aged women were aware that HPV is a sexually transmitted disease. This study found that women’s knowledge of sexual transmission has increased to 97% within the same age group. Of the mothers surveyed within Group 2, 91.4% were aware that HPV is transmitted via sexual contact.

As previously mentioned, past studies have shown that the general population has a low perception of the risks associated with acquiring HPV. This survey looked to determine if the emergence of the Gardasil® vaccine has made people more aware of the risk factors linked to acquiring HPV. The results showed that most survey participants were able to pick out at least one risk factor associated with acquiring HPV; however, over 20% in both groups were unable to identify any risk factors at all. The most commonly recognized individual risk factor for Group 1 was failure to use condoms during sexual activity at 63%.

For Group 2, 67.1% of the women surveyed answered that more than two sexual partners was the greatest risk factor. (Figure 4)

Figure 4
Figure 4: Knowledge of surveyed women of the known HPV risk factors

MEDIA

It is clear that the media has played a large role in contributing to public knowledge about HPV and the new vaccine, Gardasil®. In the surveys there was a correlation between what the participants knew about HPV and the specific information provided within media advertisements for Gardasil®. These included Internet, commercials and magazine ads. Out of both groups surveyed, television advertisement was the leading source of information. As seen in figure five, the least common media source was the Internet. (Figure 5)
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**Figure 5**

Figure 5: Media sources used by women surveyed

In addition, it was important to determine if those surveyed found the information that they received from the media about HPV and Gardasil® informative and effective. Of those surveyed, 82% of Group 1 and 80% of Group 2 stated that the methods of advertisement were adequate. One participant stated, “the ads allow you to consider treatment and prevention, and bring the subject to mind!” Conversely, another participant stated, “These commercials definitely make people remember the drug and its use, but fail to go into further detail about the side effects…it’s [sic] not convincing for such a new vaccine.” When specific knowledge about the vaccine’s effectiveness was surveyed, a substantial 83.6% of Group 1 and 85.7% of Group 2 were correct in choosing that the vaccine is most effective when received prior to the first sexual intercourse. On the other hand, 3.9% of Group 1 and 1.4% of Group 2 thought that the vaccine was never effective. When asked if those surveyed were aware that Gardasil® was a preventative measure and not a treatment, 84% of Group 1 and 90% of Group 2 knew that it was a preventative measure.

**BELIEF SYSTEMS**

Along with knowledge and media, one’s beliefs on sexuality, religion, and parenting play a large role in the choice of whether or not to get the vaccine for one’s self or her daughters. A large part of our survey was focused on assessing the knowledge of HPV and the vaccine itself. As part of evaluating this, Group 2 was asked if they would explain the reason for this vaccine to their daughters and what it protects her from. We hypothesized that most parents will not explain to their daughters the purpose of this vaccine and what it protects her from. Of those surveyed 88.6% stated that they would explain to their daughter the reason for this vaccine.

A fear amongst mothers is that if they were to vaccinate their daughter that it would encourage early sexual activity and promiscuity. To assess this fear, the question was posed to Group 1 whether or not they would be more likely to have unprotected sex once vaccinated. Of the group surveyed, only 8 of the 128 women stated that they would be more likely to have unprotected sex after being vaccinated.

Religious views were hypothesized to play a large role in the decision as to whether or not women would get the vaccine for themselves or their daughters. From our data, only 2 people out of all of the women surveyed from each group stated that religious views would play a part in their decision. Instead, the data showed that fear of side effects were a strong reason for women to choose against the vaccine. Of Group 1, 23.4% stated that they would not get the vaccine due to this reason alone. The same trend was seen in Group 2 with 34.3% of the women choosing against the vaccine due to the fear of side effects. Furthermore, women felt that a fear of the vaccine weakening the immune system would play a role in choosing against receiving the vaccine for themselves or their daughters (Group 1 = 10.2% and Group 2= 15.7%).

In order to determine how significant of a role these beliefs play in decision making, the women were asked to rate how likely they were to get vaccinated or to vaccinate their daughter. Over 70% of those surveyed in Group 1 and 67% of those in Group 2 said they would be more likely to get the vaccine for themselves or their daughters. The likelihood of each participant getting the vaccine for herself was determined based on a scale of 1-10, with 1 being “absolutely not getting the vaccine for myself”, and 10 being “absolutely I will get the vaccine for myself”. Those who marked answers 1-5 are less likely to get the vaccine than those who marked 6-10. However it is important to note that although 70% and 67% of those in Group 1 and Group 2...
respectively said that they would get the vaccine for themselves, only 20% in each group had actually received the vaccine to date.

Lastly, in our assessment regarding the influence of one’s beliefs about Gardasil® it was concluded that even if parents do approve of the vaccine, they would disapprove of mandating it. Of those surveyed, 57.1% of mothers thought it was an infringement of their own parental rights.

**FINANCIAL COSTS**

Due to the high cost of the vaccine, it was hypothesized that the surveyed women’s socioeconomic status, which was based on annual income, would play a role in their acceptance of the vaccine for their daughters and/or for themselves. For the purpose of this survey, lower socioeconomic status was defined by an annual income of $0 to $39,999, and higher socioeconomic status was defined by an annual income of $40,000 or greater. We believed that women of higher socioeconomic status would be more likely to accept the cost of the vaccine. The results of the survey showed that 84.4% of Group 1 and 74.3% of Group 2 thought that the vaccine was worth the cost. The hypothesis was proven in Group 2’s data but disproved from the data of Group 1 since 78.9% of those in Group 1 were considered to be of lower socioeconomic status. It should be noted that a large portion of Group 1 participants were in college or high school. Thus, many were not employed and did not yet have an annual income. Therefore they fell into the lower socioeconomic subgroup.

In consideration of the knowledge of people surveyed, our hypothesis was proven in the fact that the majority of women were not aware of the vaccine’s cost. In fact, over 60% in each group were not aware of the cost prior to taking this survey.

**DISCUSSION**

This study was a cross-sectional survey distributed in both English and Spanish to two groups of women and designed to provide quantitative data on the knowledge, beliefs, and attitudes of Texas women regarding the human papillomavirus (HPV) vaccine, Gardasil®. Generally, when a new vaccine is created, one expects some hesitation toward the new, unfamiliar procedure and wariness of side effects. Not only may a potential vaccine recipient perceive risk to a different degree than her neighbor does (or a member of the healthcare profession, for that matter), but she may have other factors which influence her decision such as media opinion, religious beliefs, and financial cost. With these factors in mind, this study constructed questions to investigate whether our hypotheses, based on results of previous studies, medical literature, and personal experience within the population of our state, were correct.

**RISK PERCEPTION**

When investigating the perception of risk involved in Gardasil® use, the near entirety of women (95.3%) in both groups had at least heard about HPV. This is a positive development since previous studies focusing on the same age groups have reported much lower rates of familiarity with the disease. Furthermore, the overwhelming majority (over 85%) in both groups realize that HPV infection can lead to cervical cancer, and to a somewhat lesser degree, genital warts. It appears that Texas women are for the most part aware of the virus and its two most immediate effects, although the results did demonstrate some ignorance regarding other adverse effects of HPV infection, such as abnormal Pap smears and infertility.

Regarding the risk of viral transmission, over 90% of women in both groups correctly identified sexual activity as the way the virus is spread. Yet when asked to identify a particular sexual risk factor, many faltered. When one was selected, the two groups differed dramatically: Group 1 most often chose “failure to use a condom” and Group 2 chose “greater than two sexual partners”. This may suggest that younger women see condom use as the most important way to protect themselves from disease; older women may think that a reduced number of partners is most effective.

Both young women and mothers tended to see HPV infection more as a woman’s problem; just over half in both groups thought that HPV affects only women. Women are indeed more greatly affected once they have acquired the disease, and have more serious health consequences, but it is important that the public is further educated about the role of males in the transmission of the HPV virus. Males can contract HPV and genital warts too, and more importantly, can spread it without any knowledge of having the disease themselves. The tendency to think of any health issue as a “man’s problem” or “woman’s problem” may impede awareness in the population at large and stifle attempts to combat it. A war waged on two fronts, in this case against disease, is usually more effective. Since the release of Gardasil®, it appears that the battle to improve the public’s perception of risk is making advances.
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MEDIA
Survey participants obtained their knowledge of HPV mostly from Gardasil® television commercials, and when being solicited to take the survey, several recognized Gardasil’s® two-word slogan “One Less”. The next most popular source for all women was a doctor, and here is an important difference between the groups: a higher percentage of mothers (32%) got information from a doctor compared to young women 17-26 years old (26%). Is this because mothers take children to the pediatrician more often than post-adolescent women seek care? Do mothers put more faith in doctors than in media advertisements, as compared to young women? These questions bear further investigation.

What is clear is that media also plays a role in raising questions about the safety of Gardasil®. While being asked to take the survey, several women mentioned that they had recently seen television news stories announcing adverse side effects; although few could recall a particular effect, they felt less sure of requesting the vaccine. Many women surveyed wanted to wait until the vaccine has been tested more, and until adverse side effects are ruled out.

BELIEF SYSTEMS
In trying to determine how beliefs affect vaccine acceptance, Group 2 was asked whether they would explain to their daughters the reason for the injection. Our hypothesis that mothers would not give their daughters an explanation was overwhelmingly refuted. This shows that mothers are more willing to discuss sexually transmitted diseases and prevention with their daughters than was previously thought. One potential argument against administering Gardasil® to young girls is that doing so may condone or encourage sexual activity. Yet only 8 out of 128 young women in Group 1 said that receiving the vaccine would lead them to increase the number of their sexual partners. For some parents, this may still be too many to dispel doubts about Gardasil®, but it does refute the idea that a large percentage of those vaccinated will become more promiscuous.

Disproving our hypothesis that religious beliefs would play a large part in the acceptance of Gardasil®, only 2 out of 128 women surveyed cited religion as an influence in their decision.

Far more participants, proportionally more mothers than young women, were concerned about vaccine side effects. Although these concerns did not necessarily cause them to reject the vaccine, they did want more reassurance that the vaccine was safe. This general acceptance coupled with desire for more information crossed educational boundaries. Our hypothesis that educated women would be more accepting of Gardasil® was incorrect; around 70% of women in both groups, regardless of education, said they were likely to get the vaccine for themselves or their daughters. This suggests that health education, not necessarily general education, is more important in promoting vaccine acceptance.

Despite the large number of mothers indicating that they are likely to have their daughters vaccinated with Gardasil®, 51% of mothers think mandating the vaccine is an infringement of parental rights. As Governor Rick Perry of Texas discovered when trying to mandate the vaccine to schoolgirls, there is not yet a parental consensus regarding the vaccine, and pressing the issue is likely to offend as many as it pleases.

FINANCIAL COSTS
Our hypothesis that women of higher socioeconomic status (SES) would be more likely to accept the cost of the vaccine was proven among mothers but disproven among young women. Just as many women of lower SES were accepting of the cost of the vaccine, but were worried about how to afford it. Still, over 70% of both groups thought that the vaccine was worth the cost. A recurring theme in the comments section and in response to “Is the vaccine worth the cost?”, was “yes, if you can afford it” and “does insurance pay for it?” As in many issues, the deciding factor in vaccination may come down to budget. One participant noted that “whoever makes a cheaper form of Gardasil will make some money”.

CONCLUSION
In summary, this study has accomplished a more up-to-date, and in some ways deeper, investigation of the knowledge, beliefs, and attitudes of Texas women to HPV and the vaccine Gardasil®. It demonstrates that while awareness and knowledge is increasing, much education is still needed about lowering risk factors and explaining side effects. Also, making the vaccine more financially available to the public would increase its use. In the future, it is possible that absence of major side effects and the release of a generic vaccine will lead to statewide acceptance, perhaps even mandating. Limitations of this study include the geographical area and the random nature of distributing the surveys which may have overlooked segments of the
population. Reducing genital warts and cervical cancer has the potential to relieve a great amount of suffering for both men and women, and to ease financial costs on the healthcare system. Persuading Americans that a vaccine can do that will take time and effort, but this study concludes that we as a state, and perhaps as a nation, are indeed on that path.

APPENDIX I

The survey questions for mothers of girls 9-16 years of age are as follows:

1. How many daughters do you have?_____ What are their ages?___________
   Comments: _______________________________________

2. What is your age?
   [20-29] [30-39] [40-49] [50-59] [60 and up]

3. What is your highest level of education completed? High school/GED___ Associates____ Bachelor____
   Graduate____ Post Graduate____
   Comments: _______________________________________

4. What is your race? Caucasian____ Hispanic_____ African American___ Indian____ Asian_____ Other______

5. What is your yearly family income?
   ____$0-$19,999
   ____$20,000-$39,999
   ____$40,000-$59,999
   ____$60,000-$79,999
   ____$80,000-$99,999
   ____$100,000 and above
   Comments: _______________________________________

6. Have you heard of HPV (Human papilloma Virus)? Y or N
   Comments: _______________________________________

7. What age group do you think is at the highest risk of acquiring HPV?
   [0-14] [15-24] [25-35] [36 and up]
   Comments: _______________________________________

8. Which of the following increases a woman’s risk of getting HPV? (Check all that apply)
   ____More than two sexual partners
   ____If your partner has had more than two sexual partners
   ____If your first sexual activity was at 16 or younger
   ____Failure to use condoms
   ____Don’t know

9. Do you think HPV
   ____Always causes problems
   ____Sometimes causes problems
   ____Never causes problems
   ____Don’t know

10. What kind of problems might HPV infection cause? (check all that apply)
    ____Genital warts
    ____Vulval/vaginal irritation
    ____Vaginal discharge
    ____Painful sexual intercourse

11. Is HPV an infection which affects (check all that apply)
    ____Only or mainly men
    ____Only or mainly women
    ____Both men and women
    ____Don’t know

12. What are the long-term effects of HPV? (check all that apply)
    ____Disappears and there are no long-term effects
    ____Abnormal Pap test
    ____Cervical cancer
    ____Infertility
    ____Don’t know

13. How do you believe that HPV is transmitted? (check all that apply)
    a. Shaking hands ______
    b. Coughing on someone ______
    c. By blood ______
    d. Congenital (while you are pregnant) ______
    e. Intimate (sexual) contact ______
    f. It in the air ______
    g. From animals ______
    Comments: _______________________________________

14. How do you believe that HPV is transmitted? (check all that apply)
    a. Shaking hands ______
    b. Coughing on someone ______
    c. By blood ______
    d. Congenital (while you are pregnant) ______
    e. Intimate (sexual) contact ______
    f. It in the air ______
    g. From animals ______
    Comments: _______________________________________
A study of women and mothers'- of- minor- age- daughters knowledge of HPV as well as the attitudes toward the HPV vaccine

14. Do you get your annual check up which includes a Papsmear? Y or N
   Comments: ________________________________

15. Has your daughter received the HPV vaccine, Gardasil®? Y or N
   Comments: ________________________________

16. The Gardasil® vaccine involves a series of 3 shots that are $120 each to total $360 for total administration. Were you aware of the cost of this vaccine prior to this survey? Y or N
   Comments: ________________________________

17. Do you think that the vaccine is worth the cost? Y or N
   Comments: ________________________________

18. Do any of the following affect your opinion on administration of Gardasil®? (circle if so)
   a. Religion
   b. Fear of vaccination side effects
   c. Fear of vaccine weakening the immune system
   Comments: ________________________________

19. Before giving her the vaccine would you explain the reason for this vaccine to your daughter, for example, what it protects her from? Y or N
   Comments: ________________________________

20. Do you believe that Gardasil® encourages early sexual activity or promiscuity? Y or N
   Comments: ________________________________

21. Were you aware of Gardasil® prior to this survey? Y or N
   Comments: ________________________________

22. If so where did you get your information from?
   Magazine___ Television_____ Doctor_____ Internet______ other_____
   Comments: ________________________________

23. Are these methods of advertisement for Gardasil® effective? Y or N
   Comments: ________________________________

24. Are you aware that Gardasil® is a preventative measure and not a treatment for HPV? Y or N
   Comments: ________________________________

25. When is Gardasil® most effective?
   ___Before a girl becomes sexually active
   ___After a girl’s first sexual experience
   ___Once a girl sees signs and symptoms of HPV
   ___Gardasil® is NEVER effective

26. Do you believe that making the vaccine mandatory for girls of school age is an infringement of parental rights? Y or N
   Comments: ________________________________

27. Do you have a family history of cervical cancer? Y or N
   Comments: ________________________________

28. How likely are you to get the Gardasil® vaccine for your daughter?
   1___ 2___ 3___ 4___ 5___ 6___ 7___ 8___ 9___ 10
   ABSOLUTELY getting the vaccine

The survey questions for women ages 17-26 include:

1. What is your age?_____
   Comments: ________________________________

2. What is your highest level of education completed? High school/GED___ Associates____ Bachelor_____ Graduate_____ Post Graduate_____
   Comments: ________________________________

3. What is your race? Caucasian____ Hispanic_____ African American___ Indian____ Asian_____ Other_____

4. What is your yearly income?
   ___$0-$19,999
   ___$20,000-$39,999
A study of women and mothers'- of- minor- age- daughters knowledge of HPV as well as the attitudes toward the HPV vaccine

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5. Have you heard of HPV? Y or N
Comments: ________________________________

6. What age group do you think is at the highest risk of acquiring HPV?
[0-14] [15-24] [25-35] [36 and up]
Comments: ________________________________

7. Which of the following increases your risk of getting HPV?
___ More than two sexual partners
___ If your partner has had more than two sexual partners
___ If your first sexual activity was at 16 or younger
___ Failure to use condoms
___ Don’t know

8. Do you think HPV
___ Always causes problems
___ Sometimes causes problems
___ Never causes problems
___ Don’t know

9. What kind of problems might HPV infection cause? (check all that apply)
___ Genital warts
___ Vulval/vaginal irritation
___ Vaginal discharge
___ Painful sexual intercourse

10. Is HPV an infection which affects (check all that apply)
___ Only or mainly men
___ Only or mainly women
___ Both men and women
___ Don’t know

11. What are the long-term effects of HPV? (check all that apply)
___ Disappears and there are no long-term effects
___ Abnormal Pap test
___ Cervical cancer
___ Infertility
___ Don’t know

12. How do you believe that HPV is transmitted? (check all that apply)
   a. Shaking hands ______
   b. Coughing on someone ______
   c. By blood ______
   d. Congenital ______
   e. Intimate (sexual) contact ______
   f. It in the air ______
   g. From animals ______
Comments: ________________________________

13. Do you get your annual check up which includes a Pap smear? Y or N
Comments: ________________________________

14. Have you received the HPV vaccine, Gardasil®? Y or N
Comments: ________________________________

15. The Gardasil® vaccine involves a series of 3 shots that are $120 each to total $360 for total administration. Were you aware of the cost of this vaccine prior to this survey? Y or N
Comments: ________________________________

16. Do you think that the vaccine is worth the cost? Y or N
Comments: ________________________________

17. Do any of the following affect your opinion on administration of Gardasil®? (circle if so)
   a. Religion
   b. Fear of vaccination side effects
   c. Fear of vaccine weakening the immune system
Comments: ________________________________

18. Were you aware of Gardasil® prior to this survey? Y or N
Comments: ________________________________
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19. If so where did you get your information from?
Magazine___ Television_____ Doctor_____ Internet_____
other_____
Comments: _______________________________________

20. Are these methods of advertisement for Gardasil® effective? Y or N
Comments: _______________________________________

21. When is Gardasil® most effective?
___Before a girl becomes sexually active
___After a girl’s first sexual experience
___Once a girl sees signs and symptoms of HPV
___Gardasil® is NEVER effective

22. Were you aware that Gardasil® is a preventative measure and not a treatment for HPV? Y or N
Comments: _______________________________________

23. If you were to get vaccinated with Gardasil® would you be more likely to have unprotected sex? Y or N
Comments: _______________________________________

24. Do you have a family history of cervical cancer? Y or N
Comments: _______________________________________

How likely are you to get the Gardasil® vaccine for yourself?

1___2___3___4___5___6___7___8___9___10
ABSOLUTELY getting the vaccine

References

15. Tanne JH. Texas governor is criticized for decision to vaccinate all girls against HPV. BMJ 2007;334(7589):332-3.
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