

Understanding Human Papillomavirus: An Internet Survey of Knowledge, Risk, and Experience among Female and Male College Students in Hawaii

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ABSTRACT

Background: Persistent Human Papillomavirus (HPV) is an etiologic agent in the development of cervical cancer. Despite the increasingly high prevalence of HPV, people at risk of exposure lack knowledge about the virus, its relationship to cervical cancer, and a realistic perspective regarding HPV consequences. **Purpose:** To describe knowledge about HPV with particular emphasis on behavioral risk and experience with HPV and an abnormal Pap smear. **Methods:** A 36-item Internet survey was developed which included a 14-item knowledge composite (HPVAPK), a behavioral risk composite, and an experience composite. The independent variables examined were gender, HPV-risk behavior, and experience. The dependent variable (HPVAPK) was a knowledge-composite that addressed HPV and abnormal Pap smears. **Results:** Among the students (n=492) who completed the Internet survey, females with higher risk behavior and those with a history of an abnormal Pap were more knowledgeable than males, those with lower risk behavior, and those with indirect experience, or no experience with the topic. However, even those with the highest knowledge scores exhibited a low level of knowledge regarding particular HPV issues. **Discussion:** Not only did this study reveal a low level of knowledge about HPV and abnormal Pap smears, it revealed particular topics that are misunderstood about HPV and the diagnosis of an abnormal Pap smear—even among women who have experience with an abnormal Pap smear. **Translation to Health Education Practice:** The issues highlighted should be included when discussing HPV and abnormal Pap smears with both males and females within small educational forums such as health education classes, and student health visits.

BACKGROUND

Among women who avail themselves of Papanicolaou (Pap) smear screening, the abnormal Pap smear is the first sign that a problem exists during an otherwise asymptomatic process of HPV infection, viral persistence, and cervical neoplasia. HPV testing has been approved by the U.S. Food and Drug Administration (FDA) primarily for clinical decision-making in conjunction with an abnormal Pap smear and for determining the appropriate interval for Pap smear screening in low risk women who are age 30 or greater.¹ In the U.S., the

prevalence of HPV among women aged 14-59 is 26.8% (95% confidence intervals) and as high as 44.8% (95% CI) among women aged 20-24.^{2,3} Approximately six million new infections occur per year in the U.S.^{4,5} The persistence of particular HPV subtypes (e.g., HPV16, HPV18) is required for the emergence of pre-cancerous cervical lesions detected by Pap smear screening. Among the 50 million Pap smears obtained annually in the United States, approximately 3.5 million (7%) reveal cytological abnormalities requiring follow-up.⁶ Although there is great expense and psychological distress

associated with both genital wart associated HPV, and cervical pre-cancer associated

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HPV, a majority of HPV infections and low grade cervical lesions resolve spontaneously among young women.^{1,7,8}

Studies of knowledge of HPV among students and adolescents have shown a low level of awareness of the existence of HPV⁹⁻¹⁴ including poor knowledge about HPV symptoms and mode of transmission.^{9,14} One such study evaluated knowledge, attitudes, and behaviors of university students regarding HPV and other sexually transmitted infections¹⁴ utilizing a random sample of 500 university students in Tampa, Florida, who were mailed a self-administered survey. Among the 289 respondents, only 37% had ever heard of HPV. The median score on a 13-item knowledge scale was only 3. The lowest knowledge scores were among males who engaged in higher-risk sexual behaviors such as involvement with multiple partners and absence of condom use.

Additional studies have corroborated a lower level of HPV knowledge among males.^{9,10,12,14} Holcomb¹² surveyed adults who attended three family practice offices in Michigan (N=289) and revealed that females, higher age, higher education, and those who were married had higher knowledge scores than males, lower age, lower education, and those who were unmarried, although in general knowledge scores were low.

Gerhardt¹¹ examined knowledge of HPV and cervical dysplasia among a university cervical dysplasia clinic population in Ohio (N=50) which included a sample of 88% African American and 12% Caucasian women. Interviews utilizing a questionnaire were done 2.5 years after the diagnosis of HPV or cervical dysplasia. Although 86% responded correctly to basic knowledge questions addressing the relationship between HPV and cervical dysplasia, the study revealed low levels of knowledge about HPV-related issues: 52% did not know that smoking increased cervical cancer risk, 42% believed that HPV was always symptomatic, 22% did not know that condoms could decrease HPV transmission.

Despite the increasingly high prevalence of HPV, many people at risk of exposure lack knowledge about the existence of

HPV, its relationship to cervical cancer, as well as a realistic perspective regarding HPV consequences. Women with abnormal Pap smears typically experience uncertainty and psychological distress in response to their diagnosis. This is in part due to a lack of pre-existing knowledge, stigmatization, or misinformation about abnormal Pap smears and HPV.¹⁵⁻¹⁹ Thus, a dearth of public knowledge about HPV contributes to this situation.

In 2006, the FDA approved a vaccine (Gardasil®-Merck) for the prevention of four HPV subtypes (HPV 6, 11, 16, and 18) for young women without prior exposure to HPV. The media hype surrounding the development and distribution of this vaccine brought general information about HPV infection to the forefront of the public's eye through aggressive vaccine marketing strategies. At present, Gardasil® has been approved for use only among young women, not men, and is an effective prevention strategy only among those without prior exposure to HPV. Therefore, the pre-sexual adolescent female population has been targeted for vaccination.²⁰ Although the public at risk is beginning to become aware of the existence of HPV, several issues should be addressed in order to provide both women and men with a reasonable perspective of the consequences of HPV. The following study differs from existing studies of knowledge and beliefs about HPV and abnormal Pap smears in two ways: one, that it uses the Internet as both an anonymous, private survey-delivery tool and an educational resource and two, that it addresses not only basic knowledge about HPV, but also particular misconceptions and uncertainties about HPV and abnormal Pap smears among both females and males.

PURPOSE

The purpose of this study was to describe knowledge about Human Papillomavirus and abnormal Pap smears among a multi-ethnic student population by utilizing an Internet-delivered survey. Data was collected in March of 2004, prior to commercial marketing in preparation for FDA approval and distribution of Gardasil®.

Specifically, the study focus was to mea-

sure knowledge about:

- the difference between wart-associated HPV and cervical cancer associated HPV
- issues involving male partners of women with abnormal Pap smears due to HPV
- the consequences of exposure to HPV and having abnormal Pap smears.

Those with experience due to a history of an abnormal Pap smear, or exposure to the topic from friends or classes were compared to those with less experience. Those at higher risk of HPV infection were compared to those with lower risk of exposure.

METHODS

This was a cross-sectional, descriptive study utilizing an Internet-delivered survey. The sampling frame consisted of female and male University of Hawaii undergraduate students with access to a university e-mail account (N=8,668). Permission was obtained from the University of Hawaii Committee on Human Subjects to conduct this study. Additional permission was obtained from the University of Hawaii Office of the Registrar to access the university student listserv for study recruitment via an e-mail invitation.

The sampling procedure involved sending batches of 1,000 to 2,000 e-mails five times within a two-week period to the listserv, inviting participation in the Internet survey. Each student initially received one invitation. This was repeated two weeks later in order to enhance response rate. Students were instructed to respond only once to the survey. Those students who responded to the e-mail invitation accessed a hyperlink to the website. The website was designed utilizing Dreamweaver (Macromedia) software and included an "about us page" that provided an introduction and the credentials of the researcher, a consent form, and a separate link to the 36-item survey. Participants were able to access the survey only after completion of the consent form. The students' e-mail addresses were blinded from the survey response page thereby establishing anonymity and confidentiality. The completed anonymous surveys were retrieved from



a secure university e-mail account (n=492). Each response was data-entered into SPSS (Statistical Product and Service Solutions, Version 10.0, SPSS, Inc.), a data management program for statistical analysis.

After completion of the survey, participants were able to access a hyperlink to an answer page as well as further educational and support websites such as the American Social Health Association (ASHA), a nationally recognized organization that provides health education regarding sexually transmitted diseases. An additional hyperlink connected participants to the Cancer Information Service (CIS) in Hawaii, an agency that provides health education about various cancers, including cervical cancer. Participants were also invited to telephone the CIS information line with any questions about cervical cancer.

The Survey

The 36-item survey included fourteen items that addressed knowledge about HPV and abnormal Pap smears (HPVAPK). The questions for the 14-item HPVAPK composite were derived from common questions and misconceptions among women attending one women's health clinic due to an abnormal Pap smear. Existing surveys from the published literature were consulted^{11,12,14,21} which included basic statements regarding awareness of the existence of HPV, the differences between genital-wart causing HPV, and cervical-cancer-causing HPV, transmission of HPV, and symptoms of HPV. The resulting survey addressed these issues as well as risk factors for cervical cancer, implications for male partners, and language used to describe abnormal Pap smears.

Face validity was refined by consultation from five University of Hawaii professors from the departments of Nursing, Sociology, and Cancer Epidemiology; from a critique by a class of twelve survey-development students; and during a test of ten health-care students. Content validity was established by obtaining expert commentary from three Obstetrics and Gynecology physicians and one nurse practitioner and by comparison with published health-education materials

from credible sources such as the ASHA and the American Society for Colposcopy and Cervical Pathology (ASCCP).

Internal-consistency reliability determines the homogeneity of an instrument. The internal consistency of the knowledge composite was adequate (Cronbach's alpha 0.85). Individual item reliability was assessed by sequentially deleting individual items and obtaining resultant alphas, each of which were lower than the composite alpha. Thus, each of the fourteen items maintained internal consistency reliability.

Response options to the HPVAPK were either true, false, or "don't know." The uncertain response ("don't know") was considered an admission of lack of knowledge or uncertainty. By having the option of a "don't know" response among otherwise dichotomous variables, the likelihood of a random guess in response to the item is somewhat decreased. Correct responses were scored as a 1, and incorrect or "don't know" responses were coded as 0, resulting in an HPVAPK composite score range of 0-14.

The additional items on the survey included four items that categorized behavioral risk; seven items that addressed direct or indirect experience with the topic; one item that addressed self-perceived knowledge about HPV; four items that addressed particular beliefs about HPV or abnormal Pap smears; and six demographic items. The demographic, risk, and experience items utilized a multiple choice format. Six of the 36 items, including the *belief items*, are not relevant to this report and therefore will not be discussed.

Behavioral risk for exposure to HPV was represented as a risk composite based on responses to four risk items: rarely or sometimes using condoms; prior history of sexually transmitted infection; sexual relationship characterized as involving multiple partners or frequent short-term relationships; or self-perceived risk of HPV exposure. Risk was categorized as *high risk*, *at risk*, or *low risk*. High risk was defined by a positive response to 3-4 risk items; at risk was defined by a positive response to 1-2 risk items; low risk was defined by a negative

response to all four of the risk items.

Experience items were categorized as direct experience, indirect experience, and no experience. Direct experience was measured exclusively by a personal history of having an abnormal Pap smear. Indirect experience was measured by a positive response to any of six experience items: information obtained through a university course; an Internet search on the topic of HPV or abnormal Pap smears; participation in a local clinical research project that recruited students; talking with a health-care provider; or through knowing someone, such as a sexual partner, friend, or relative that had direct experience with HPV or abnormal Pap smears. No experience was defined by a negative response to all seven experience items.

Data Analysis

Descriptive statistics, including percentages for all nominal and ordinal data and means and standard deviations for all interval and ratio data, was used. ANOVA was used for group comparisons. Analysis for females with the exclusion of males, and for males with the exclusion of females was obtained to assess gender differences. All statistical calculations were based on 95% confidence levels. Power calculations established that the sample achieved adequate power with a confidence interval of 4.3%.

RESULTS

Sample Demographics

This was a self selected sample of 5.6% among a population of University of Hawaii students (N=8,668), each of whom was issued an e-mail address for the purpose of university related communications. The sample (n=492) consisted of more female (75.8%) than male (24.1%) students. Participants were typically in their early twenties as would be expected in a college sample and had an average of three years of college. Seventy-nine percent (n=389) of the participants were under age 24. Almost half of participants identified their ethnicity as Asian. There were 31 (6.3%) foreign students in the sample. A demographic comparison of the sample and the sampling

**Table 1. Sample (n=492) and Population Demographics**

University of Hawaii Undergraduates	Population percent	Sample percent
E-mail accounts N=8,668	100.0	5.6
Females	56.0	75.8
Males	44.0	24.2
Ethnicity		
Asian	47.0	48.8
Caucasian	19.6	18.9
Filipino	7.5	12.2
Hawaiian	8.6	11.4
Hispanic	1.8	3.7
Major Field of Study		
Arts and Sciences	33.5	4.5
Social Sciences	12.4	26.4
Business	6.7	14.6
Nursing/Dental Hygiene	2.7	5.5
Education	2.8	5.1
Natural Sciences	12.2	10.0
Arts and Humanities	7.8	6.5
Computer/ICS	4.4	5.5
Tropical Agriculture/Family Resources	3.7	4.7
Travel	2.6	1.8
Language Arts	3.8	3.5
Engineering	5.4	5.5
Hawaiian/Asian Studies	1.0	1.0
	Mean	Mean
Age	22.4	22.7**
Years of education	*	15**
* Data unavailable		
** Sample Standard deviation for age 4.5 Sample Standard deviation for education 2.1		

population including ethnicity, gender, age, and major fields of study are described in Table 1. Twenty-five percent of women in the sample had a prior history of an abnormal Pap smear.

Knowledge Scores

The mean HPVAPK (knowledge composite) score was 4.8 (SD 3.2) with a range of 0-13; none of the participants answered all 14 questions correctly (Table 2). Roughly half (55.7%) of the sample answered five items or fewer correctly. One item, self-perceived knowledge of HPV, which was independent of the 14-item knowledge composite revealed that 41% of the sample did

not know that HPV was related to abnormal Pap smears (*Prior to reading this survey, I did not know that a virus was in any way related to abnormal Pap smears*).

Behavioral Risk and Knowledge

In terms of behavioral risk, 13.8% of the sample (n=68) reported a prior history of a sexually transmitted disease. Twenty-eight percent (n=104) of females in the sample admitted to a self-perceived risk of exposure to HPV, whereas 24.9% (n=93) of females reported a history of an abnormal Pap smear. Forty-four percent of females and 24% of males reported lack of condom use. Nine percent of the sample indicated

higher risk relationship status characterized by multiple sexual partners or frequent short term relationships. Ninety percent of the sample described their relationship as either monogamous or no sexual activity. A small percentage of the sample (8.5%; n=42) were classified as *high-risk* behavior, as indicated by positive responses to three or four items of the risk composite created for this analysis. The *at-risk* category, defined by a positive response to one or two of the risk items, represented the largest percentage of the sample (46.3%, n=228). Forty five percent (n=222) had all negative responses to the four risk items and therefore were categorized as *low-risk*.

Two-way ANOVA was utilized to examine differences between the three risk categories in terms of the dependent variable (HPVAPK score), including gender as a covariate (Figure 1). There were significant differences in HPVAPK scores between the three risk groups ($p=0.0001$, $F=35.501$); the highest HPVAPK score was found among those at highest risk. The magnitude of the difference between groups was moderate ($\text{Eta}^2=0.127$). There was an interaction with the gender and risk variables, but the magnitude of the difference was small ($p=0.002$, $F=9.24$, $\text{Eta}^2=0.019$, adjusted $r^2=0.138$).

In order to better understand gender differences in reported behavioral risk, multiple regression of the four risk items (relationship, condom use, history of STD, and self-perceived risk) determined which of the risk variables explained HPVAPK score differences among females. The results indicated that a history of sexually transmitted infection had the greatest positive influence on knowledge (HPVAPK scores), ($B=2.2$, $p<0.05$). Self-perceived risk was also predictive of knowledge ($B=1.18$, $p<0.05$). Relationship status and condom use were not significantly associated with knowledge.

Experience and Knowledge

The experience composite categorized experience with the topic of HPV and abnormal Pap smears. Among the 373 female participants, 93 (24.9%) had a history of an abnormal Pap smear and 80 (21.4%) indi-

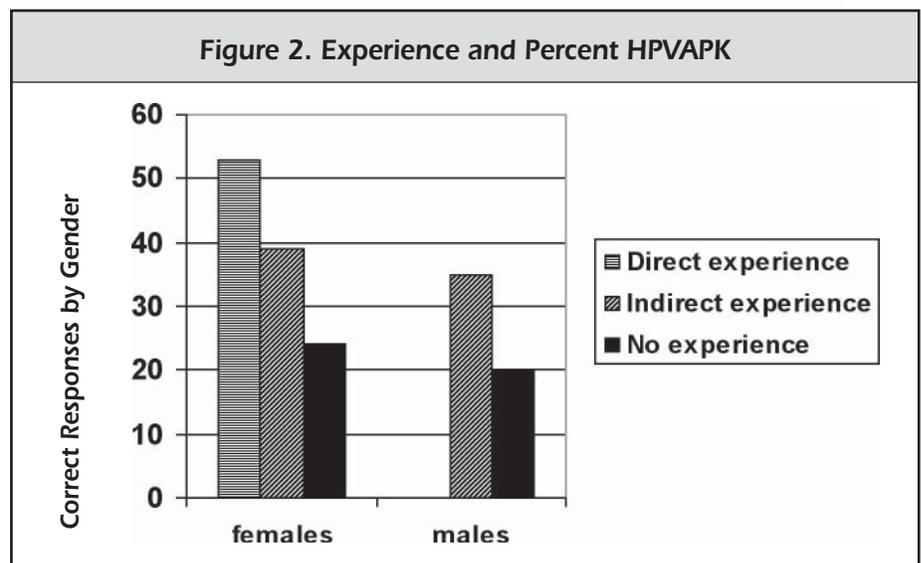
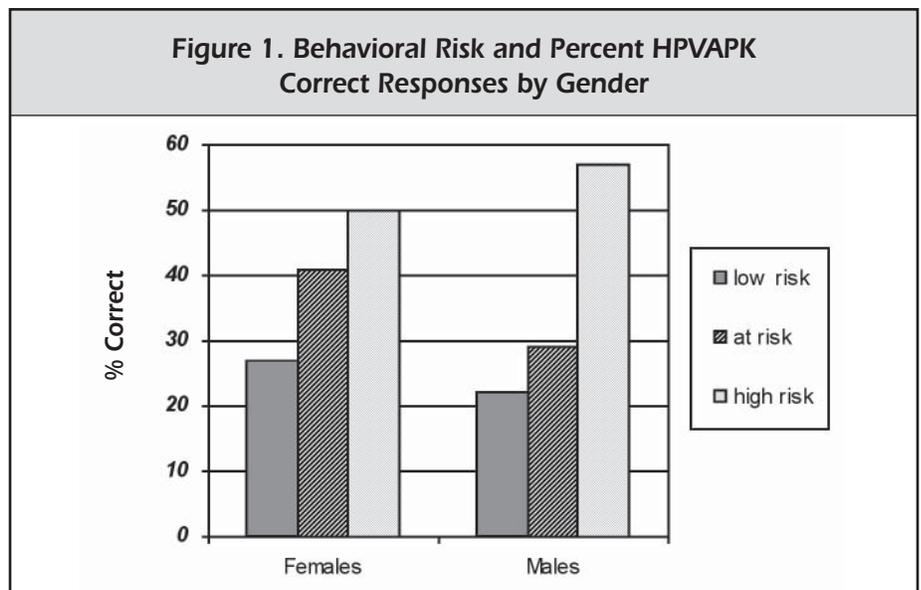


cated never having had a Pap smear done. Three mutually exclusive categories—no experience, indirect experience, and direct experience among both females and males—were analyzed for group differences in the HPVAPK scores by a two-way ANOVA. The analysis showed that the HPVAPK scores among the three groups differed significantly ($p=0.0001$, $F=72.862$) and that the magnitude of the difference was large ($\text{Eta}^2=0.23$). Those with direct experience had the highest knowledge scores, followed by those with indirect experience. Gender, which was examined as a covariate, had a minor interaction with experience but did not alter the significance of the findings ($p=0.015$, $F=6$, adjusted $r^2=0.234$). The knowledge scores among the three experience categories by gender are shown in Figure 2. In males, among the six items that represented indirect experience, the most common response was having discussed HPV or abnormal Pap smears in a class (Table 3).

DISCUSSION

This study showed that the sample population of university students had a low level of knowledge about HPV and abnormal Pap smears. Experience appears to have been the best teacher: females with a history of an abnormal Pap smear, and females at highest behavioral risk of acquiring HPV knew more than males, those without HPV-related experience, or those with low-risk behaviors. Greater knowledge among a higher-risk group may also be a function of experience.

Perhaps the most notable aspect of this study is not only that it reveals a low level of knowledge about HPV and abnormal Pap smears, as has been shown by other studies^{11,12,14,22} but that it reveals particular topics that are misunderstood about HPV and the diagnosis of an abnormal Pap smear even among women who have experience with an abnormal Pap smear. These topics are discussed below within the following categories: HPV Basics; HPV, warts, and cancer; HPV in males; risk and prevention; and Pap smear terminology. Gender, experience, and risk behavior are also discussed.



LEGENDS TO FIGURES

Figure 1. Behavioral Risk and Correct Responses to HPVAPK by Gender

There were three risk categories: high risk, at risk, and low risk. Among females, 10% were high risk, 51% were at risk, and 39% were low risk. Among males, 3% were high risk, 32% were at risk, and 65% were low risk. High risk females and high risk males had a higher number of correct answers than at risk or low risk females or males.

Figure 2. Experience and Percent Correct Responses to HPVAPK by Gender

There were three experience categories: direct experience, indirect experience, and no experience. Only females with an abnormal Pap smear were categorized as direct experience. A positive response to any of six questions characterized indirect experience. Females with direct experience had the highest number of correct responses. Females and males with indirect experience had a higher number correct than those without experience.

**Table 2. Correct Responses to HPVAPK Items, by Gender**

HPVAPK item (correct answer)	Correct Responses		
	% of females	% of males	% of total
Risk factors for cervical cancer include persistent positive HPV results (True)	67.6	52.1	63.8
Risk factors for cervical cancer include history of multiple sexual partners (True)	57.6	43.7	54.3
HPV is not a very common virus (False)	57.1	43.7	53.9
Most women with an abnormal Pap smear are able to have a completely normal pregnancy in the future (True)	52.5	30.3	47.2
You can tell if someone has been exposed to HPV by looking for warts (False)	49.9	37.8	47.0
HPV can cause genital warts (True)	41.8	26.9	38.2
Risk factors for cervical cancer include smoking cigarettes (True)	38.9	32.8	37.4
Routine medical screening for STD usually includes an HPV test (False)	29.5	17.6	26.6
Condoms will help prevent women from having abnormal Pap smears (True)	26.8	21.8	25.6
High-grade abnormal Pap smears are treated by removing a small part of the cervix to prevent cervical cancer (True)	27.1	17.6	24.8
Low-grade abnormal Pap smears are usually not harmful and often go away completely without treatment (True)	25.2	10.1	21.5
There is a screening test that is commonly used to test males for HPV (False)	18.5	12.6	17.1
Genital warts can cause cervical cancer (False)	18.8	10.1	16.7
If a heterosexual woman has HPV, her sexual partner should be seen by his health-care provider to be treated for it even if he has no sign of warts (False)	2.9	4.2	3.3

Note: Total N=492; Females n=373; Males n=119

HPV Basics

Roughly half of this sample of educated students did not know that HPV is a common virus. Indeed, half of the sample indicated that they had no experience at all with the topic of HPV. Several studies do show a public awareness of sexually transmitted diseases in general, particularly HIV, and that high-school health-education classes are a major source of STD education.^{9,10} However, one must conclude that adequate information about STDs and particularly HPV is lacking within high-school health educational forums.

Other public resources for health education include the Internet, health-care providers, family, friends, popular magazines, and television. Waller¹⁸ noted that the usual public media resources do not appear to

be addressing HPV issues adequately. This was corroborated by Anhang et al.²³ in a content analysis between 1995–2002, of 111 news stories about HPV from ten highly circulated newspapers and three major television networks. They found coverage of this topic was limited, and content failed to include vital information about the nature of HPV and its consequences. This is very recently changing with the advent of a vaccine (Gardasil®-Merck) approved in 2006 for the prevention of HPV for young women without prior HPV exposure. Media campaigns to promote the vaccine are just beginning to broaden the public's awareness of HPV. However, commercial marketing messages are unlikely to adequately address the complexity of issues surrounding the consequences of HPV and abnormal Pap smears,

and may, in fact, exaggerate the actual risk of cervical cancer among young women who are not eligible for the vaccine.

HPV, Warts, and Cancer

While roughly half of the present sample knew that HPV was associated with abnormal Pap smears, and one-third also knew that HPV was identified with genital warts, the distinction between the HPV types that cause warts and the HPV types that cause cervical cancer was known by very few. Indeed, only 16% of the sample knew that external genital warts do not cause cervical cancer. This distinction is also one that causes significant fear and concern among women with external genital warts, who may believe that cervical cancer is impending. Maissi²⁴ measured anxiety, concern, and distress among women with abnormal Pap



Table 3. Experience among Females and Males

Experience items	Females		Males	
	% yes	% no	% yes	% no
Have you ever taken a college course that included the topic of sexually transmitted infections?	26.8	73.2	27.7	72.3
Have you ever known a friend or relative that was worried about having an abnormal Pap smear or HPV?	25.2	74.8	15.1	84.9
Have you ever talked with a doctor or health care provider about HPV?	24.4	75.6	0.8	99.2
Have you ever known anyone with HPV?	19.0	60.6	7.6	63.9
Have you ever done an Internet search on the topic of HPV or abnormal Pap smears?	9.9	82.3	5.0	80.7
Have you ever been a participant in the HPV study conducted by the Cancer Research Center of Hawaii?	7.0	93.0	0	100
Have you ever been told that you had an abnormal Pap smear?*	24.9	75.1	n/a	n/a

* Direct experience among females only

smears with positive HPV testing (n=536) and found that younger age, a higher perceived risk of cervical cancer, and a lack of understanding about the meaning of test results were associated with the highest levels of anxiety.

Pap Smear Terminology

Not surprisingly, females with a history of an abnormal Pap smear scored higher on the two questions that addressed the consequences of a low-grade cervical lesion or a high-grade cervical lesion. However, even among these experienced females, one-third indicated they did not know the answer to these questions. The distinctions between a low-grade lesion and a high-grade lesion and the distinction between low-risk HPV and high-risk HPV involve fairly complex knowledge that may need reinforcement over time, even for women with abnormal Pap smears. Additionally, it may not be clear to female patients with abnormal Pap smears that low-grade lesions frequently resolve spontaneously without treatment. It has been suggested that low-grade lesions should not be categorized as truly precancerous.²⁵ It is reasonable, therefore, to provide reassuring statistics to patients with low-grade lesions

that they are not likely to develop cervical cancer—with the caveats that careful monitoring for change to higher-grade lesions will remain important to their health and that treatment may become necessary if the low-grade abnormality persists. High-grade pre-cancerous lesions, confirmed by colposcopy and biopsy as cervical intraepithelial neoplasia (CIN II, III), have a greater chance of progression to cervical cancer and therefore do require treatment intervention usually by an excision procedure such as LEEP, or cold-conization, or by an ablative procedure such as cryotherapy or laser ablation.²⁶

Understanding of the terms *low-grade lesions* and *high-grade lesions* may be important during and after disclosure of an abnormal Pap smear, but the concepts may be too complex or too detailed to expect from a population inexperienced with this problem. However, it is important for the general public to understand the difference between having an abnormal Pap smear and having cervical cancer, a distinction that is frequently misunderstood.

HPV in Males

Men may be very much affected by their partner's experiences in dealing with an

abnormal Pap smear but frequently remain uninformed about the underlying issues, or even marginalized as vectors of a sexually transmitted disease. As in other studies^{9,10,12,14} males had lower knowledge scores (26% correct) than females (37% correct) in this sample. A very high percentage of the sample (73%) believed that even asymptomatic male partners of HPV-affected women should see a health-care provider. Actually, there is no current standard of care to screen males for HPV aside from genital inspection for visible exophytic warts. In a study of HPV in males, Rosenblatt et al.²⁷ concluded that most HPV infections in males resolved spontaneously and that methods to detect HPV in males—such as HPV DNA testing, penoscopy, or penile biopsy—among male partners of women with abnormal Pap smears is not warranted in the absence of visible lesions. Although penile epithelial lesions (PIN) do occur, high-grade PIN and penile cancer is extremely rare, despite an increase in HPV prevalence.²⁷ Ongoing studies will determine the safety, efficacy, and advisability of vaccinating young males against HPV.²⁰

Perhaps the belief that male partners should see a health-care provider reflects more of a need or desire among males and



female partners of males for males to have equal access to health care. Even if HPV is very prevalent among both genders and the majority of HPV infections resolve spontaneously, both males and females may feel an ethical responsibility to know their HPV status, or a desire for males to at least obtain information directly from a health-care provider about their own risks.

Risk and Prevention

The issue of prevention can provide a means for people at risk of infection to feel some sense of control over the possibility of future HPV infection or impending cervical cancer. Condoms are associated with the concept of safe sex. Although condoms do not protect against external genital warts due to lack of an external barrier, they are likely to protect against cervical infection.^{13,25} A large percentage of the sample population (71%) in this study did not recognize the potentially protective role of condoms in the prevention of cervical disease. Smoking has been identified as a modifiable risk factor for cervical cancer.^{28,29} Yet, only 37% of the sample was aware of this.

Gender Differences

This study agrees with previous reports that females are more knowledgeable than males about HPV and abnormal Pap smears.^{9,10,12,14} Although only females have direct experience by having an abnormal Pap smear, this difference in knowledge may also be partially explained by the fact that females have better access to health-care screening tests and simultaneous health education than males. Partners of women with abnormal Pap smears may have a similar but indirect learning opportunity during or after disclosure of a woman's abnormal Pap smear. This may depend upon how involved the partner is, or how involved the woman wants the partner to be in understanding her condition. In this sample there were 93 (24.9%) women that reported a history of an abnormal Pap smear. There were only 18 males in this study (15% of males) who reported knowing a friend who had an abnormal Pap smear or HPV. There were 43 males (36%) that reported some form

of indirect experience. One study that addressed disclosure between partners of HPV diagnosis showed that 50% of female patients said they planned to inform future partners of their HPV exposure, but only 30% actually did inform new partners prior to sexual relations.³⁰ The experience of male partners is partly dependent on the decisions and attitudes of women with abnormal Pap smears regarding communication with partners.

Behavioral Risk

Multiple sexual partners, lack of condom use, self-perceived risk, and prior history of a sexually transmitted infection characterize risk for HPV exposure in this study. Surprisingly few people in this sample were in the high-risk behavior category, which consisted of more females than males. This is in contrast to other studies that have suggested that college student of this age group have higher-risk behaviors.^{9,31} However, measurements of behavioral risk vary among studies. The National College Health Risk Behavior Survey (n=5,000) evaluated risk behavior by number of sexual partners, and condom use; 25.7% of 18–24-year-olds reported 6 or more lifetime sexual partners; 37.7% used condoms; 12–25% reported history of a sexually transmitted disease.³¹ DiIorio, Dudley, Lehr, and Soet reported condom use among a random sample of 6 colleges (n=1,349, mean age 20.6, 50.5% Caucasian) and found that 28% used condoms almost with every intercourse, over 50% used condoms frequently, and only 9.6% never used a condom.³² In the present study, 38.6% did not use condoms and only 9.3% reported relationship risk characterized by multiple sexual partners or frequent short term relationships.

Those who did meet criteria for the high-risk category may have been more knowledgeable due to experience, but if so, there did not appear to be a change in behavior or reduction of risk-taking behavior as a result of knowledge, since the highest-risk and most knowledgeable group had three to four of the possible risk factors.

Experience Teaches

This study confirmed, as expected, that

people with direct experience in having an abnormal Pap smear were more knowledgeable about HPV than those without such experience. However, even women with experience were not well informed about particular issues such as: risks for cervical cancer; partner screening or partner management; the protective usefulness of condoms; or the distinction between external warts and cervical cancer risk. These issues should be included in efforts to educate the public and during the patient-education process for women who have abnormal Pap smears.

Limitations of This Study

Although this sample was diverse and large enough for a meaningful descriptive analysis, evidence suggests that this was a highly self-selected sample and conclusions cannot be generalized to all University of Hawaii students. In this sample, 25% of females had a personal history of an abnormal Pap smear, whereas the national average is about 7%,⁶ indicating a basis for this self-selection. People are motivated to participate in survey research due to interest in the topic addressed. Motivation may be due to personal history, or a perceived need to learn more about a topic. This is a common sampling flaw not only among Internet surveys, but also among those conducted in person, by telephone, or by mail.³³ An additional limitation in this study may have been the use of technical terms in some of the items on the knowledge scale affecting the readability.

TRANSLATION TO HEALTH EDUCATION PRACTICE

In 2006, the FDA approved a preventive vaccine for women aged 9–26 who have no known prior exposure to HPV.³⁴ Only recently have public media campaigns begun to address the public's informational needs regarding HPV. Although only females are at risk for cervical disease detected as an abnormal Pap smear due to HPV, health education efforts regarding HPV should address both males and females and should include the following issues: the difference



between genital wart associated (low risk) HPV and cervical cancer associated (high risk) HPV; risk factors for cervical cancer; a realistic perspective of the incidence of cervical cancer among women exposed to HPV; HPV prevalence; HPV in males; infectivity; reassuring statistics regarding potential effects on fertility; the appropriate use and limitations of HPV testing; and prevention including condom use, smoking avoidance particularly among women with a history of HPV, and appropriate use of the HPV vaccine. These complex HPV-related issues may be best addressed in smaller educational forums such as college health services, interactive educational websites, or during individual health care encounters. Further HPV research and the development of lucid informational messages will ultimately assist health educators, health care providers, patients, and the public at risk for HPV infection to reduce the knowledge gap evidenced in this study.

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