**Apostolos Efkarpidis[1] / George Koulierakis[2] / Polichronis Efkarpidis[3]**

# Socio-cognitive factors influencing Greek lyceum female students' intention to receive a Pap smear and a vaccine against HPV

[1] "Vardakeio & Proio" Syros General Hospital, Ermoupolis, Syros, Greece
[2] Department of Sociology, National School of Public Health, 196 Alexandras Avenue, 112 51 Athens, Greece, Phone: 00302132010169, E-mail: gkoulierakis@esdy.edu.gr
[3] First Special Primary School of Thessaloniki, Perea, Thessaloniki, Greece

**Abstract:**
**Background:** The human papillomavirus (HPV) is responsible for 99.7% of cervix cancers worldwide. As this is a preventable and treatable cancer, if diagnosed early, it is important to explore not only young women's related knowledge, but also their intentions for prevention activities, through a theoretical perspective.
**Objective:** To investigate the role of the Health Belief Model (HBM) and the Health Locus of Control theory (HLC) (social cognitive models) to act as potentially influencing factors for the prevention intentions among lyceum female students.
**Methods:** This cross-sectional study took place from January to May 2014, among 1129 female students, who attended lyceums in six islands of the Cyclades Region, Greece. Students filled-in a self-complementary questionnaire, after the necessary approval was provided by the relevant authorities.
**Results:** Intention to take the Pap smear was determined by student's level of knowledge ($p < 0.001$) about Pap smears, their age ($p = 0.004$), HPV susceptibility ($p < 0.001$), subjective obstacles of taking the Pap smear ($p < 0.001$) and subjective benefits of the Pap smear ($p < 0.001$). The vaccination intention against HPV was influenced by the subjective benefit from vaccination ($p < 0.001$) and the level of knowledge of the vaccine ($p < 0.001$).
**Conclusions:** Knowledge, age and HBM variables were significantly associated with students' intention for vaccination and screening on HPV. The study demonstrates the importance of raising awareness through specific education programmes in schools and theory-based tailored health programmes on HPV aspects (transmission, prevention, treatment) to increase the intention for prevention.

**Keywords:** HPV, HPV vaccine, intentions, Pap smear, social cognitive models
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## Introduction

Human papillomavirus (HPV) is considered the most common sexually transmitted infection among men and women; it is mostly transmitted through intimate skin to skin contact [1], while it is considered responsible for almost 70% of cervical cancers worldwide [2], [3], [4]. Worldwide, the majority of new HPV cases are sexually active men and women 15–25 years old [5].

Adolescents tend to feel invulnerable and thus adopt risky sexual behaviour, believing that the chances of contracting sexually transmitted infections are minimal. This is particularly true in cases where adolescents consider their sexual partner "safe" [6].

In Greece, cervical cancer is rated as the 11th most frequent cancer type among diagnosed women and the second most frequent type among young women aged 15–44 years. Additionally, 53.2% of invasive cancer cases in Greece are attributed to HPV types 16 and 18. At the same time, it seems that only 39.2% of Greek women aged 18–69 years are involved in cervical smear screening every 3 years [7], [8].

Worldwide, HPV vaccination is recommended for routine vaccination of boys and girls. In Greece, the vaccine is highly recommended for girls between the ages of 12 and 15 years and for women through to the age of 26 who have not been vaccinated previously. For boys it is still not advocated.

**George Koulierakis** is the corresponding author.

Nevertheless, the effectiveness of each HPV vaccination programme depends on the ability of young people and their parents to assess their personal risk of developing cancer of the cervix. This assessment is largely linked to the level of HPV-related knowledge (ways of transmission, risk factors, consequences) and specific beliefs associated with HPV [9], [10].

A range of social cognition models have been developed and widely applied to account for socio-demographic variations in health behaviour [11] and to represent how evaluations of anticipated action outcomes, perceived social approval and perceptions of control can shape individual cognition and behaviour [12]. Among these models, the Health Belief Model (HBM) and the Health Locus of Control theory (HLC) are two of the most widely used, well-tested and highly recommended models for explaining and predicting a variety of health-related behaviours, health-related decisions and health outcomes, ranging from immunisation and adherence to medical treatment, to HIV prevention, smoking, alcohol consumption and weight control [13], [14], [15], [16].

The HBM was spelled out in terms of six constructs representing the perceived threat and net benefits: perceived susceptibility, perceived severity, perceived benefits and perceived barriers. These concepts were proposed as accounting for people's "readiness to act." An added concept, cues to action, would activate that readiness and stimulate overt behaviour. A recent addition to the HBM is the concept of self-efficacy, or one's confidence in the ability to successfully perform an action [17].

The HBM is based on the understanding that an individual will take a health-related action (i.e. HPV vaccination) if he/she: (a) feels that a negative health condition (i.e. cervical cancer) can be avoided, (b) has a positive expectation that by taking a recommended action, he/she will avoid a negative health condition (i.e. taking the HPV vaccine will be effective at preventing cervical cancer) and (c) believes that he/she can successfully take a recommended health action (i.e. comfortably and with confidence) [18].

The principles of the HLC theory are rooted in Rotter's theory of social learning [19] . The attribution of the health control center to internal or external factors is a psychological measure of an individual's belief about the causal relationship that attaches between his/her behaviour and the results it has. Individuals maintain beliefs about whether the results of a condition are due to their own efforts or are the result of chance or fate, or the intervention of powerful others.

People with an internal locus of control source believe that their own actions determine the rewards they receive and are more likely to engage in prevention activities, while those with an external control source believe that their own behaviour does not affect the rewards in their lives, they believe that they are generally outside their own control and thus are rarely involved in prevention behaviours [18].

Worldwide, despite the increased number of studies on youth's HPV-related beliefs and attitudes, few have used social cognition models as a theoretical framework [20], [21], [22], [23], [24]. In Greece, the few studies on HPV knowledge and attitudes were conducted among adults (university students and the general population) [25], [26], [27]. To date, no theory-based study has been conducted among high school students. The current study attempts to fill this gap in the Greek literature, aiming: (a) to investigate students' precise ("correct") knowledge about HPV, the Pap smear and the vaccine against HPV; (b) to explore the correlations between knowledge, students' age, the components of the HBM and the variables of the HLC theory; (c) to identify the independent theory-based predictors of students' intentions to take a Pap smear and/or receive a vaccine against HPV.

## Materials and methods

This cross-sectional study was conducted from January to May 2014 among all senior high school female students of the islands of Syros, Naxos, Paros, Santorini, Tinos and Milos, located in the Cyclades Region, after the necessary approval of the research protocol given by the document No 143892/Γ7 16/11/2012 entitled "Approval of scientific research" by the Directorate of Counseling and Vocational Guidance and Educational Activities of the Unified Administrative Division of Primary and Secondary Education of the Ministry of Education and Religious Affairs, Culture and Sports of Greece. There was no stratification in rural or urban schools as they are built on the island's urban fabric.

### Participants

The entire population of female students in all three senior high schools' classes, during the academic year 2013–2014 (n = 1147), was invited to participate. One thousand one hundred and twenty-nine students accepted to participate and filled-in the questionnaire (response rate: 98.4%).

## Procedure

Data was gathered during one class-hour (45 min). The basic researcher (AE) entered each classroom of all high school classes and provided students with basic clarifications regarding the purpose of the study and questionnaire completion, lasting about 15 min. The average time for completing the questionnaire was 19 min. Completion of the questionnaires was followed by a 5-min presentation, providing basic information on HPV and the means of protection. During the last 5 min and the 10 min break, a discussion between the researcher and students took place for resolving queries.

## Measures

Data was gathered by means of a self-completed questionnaire on demographics, Pap smear knowledge, HPV knowledge, HPV vaccine knowledge and HBM and HLC theory beliefs. The questionnaire was constructed for the purposes of the current study, based on a similar measures used in previous research [28].

### HPV-related knowledge

The knowledge scale consisted of 52 items, each with a choice of three responses – "Correct", "Incorrect", or "Don't know'. The 52 items were combined into three sub-scales, each of which tapped students' knowledge of: (a) Pap smear (12 items) ("Pap smear is a check for a sexually transmitted disease"); (b) HPV transmission and consequences (25 items) ("HPV affects only/mostly women"); and (c) HPV vaccination (15 items) ("A benefit of HPV vaccination is that cures cervical cancer"). The knowledge questionnaire showed a high reliability coefficient (Cronbach's α: total = 0.95; HPV = 0.92; Pap smear = 0.85; HPV vaccination = 0.88).

In order to obtain a unified measure of knowledge among students for each of the mentioned sections, an index of "correct knowledge" was calculated, by adding the number of correct answers and then dividing this number with the total number of questions in each section.

When encoding, the "Don't know" responses were grouped together with the wrong replies and considered as indicators of a lack of knowledge.

### HMB-related beliefs

This section contained 17 statements in which students declared their agreement. Each item was rated on a five-point Likert scale, from "strongly agree" to "strongly disagree", in such a way that higher scores represented stronger beliefs of susceptibility and severity (re HPV infection), as well as stronger beliefs on benefits and costs (re HPV preventive behaviours: vaccination and Pap smear) (Cronbach's α = 0.61).

### HLC theory-related beliefs

This section contained 15 statements in which students declared their agreement. Each item was rated on a five-point Likert scale, from "strongly agree" to "strongly disagree", in such a way that higher scores represented stronger beliefs of HLC theory, to herself, to chance or to powerful others (Cronbach's α = 0.69).

Intentions. Students' intention to take HPV precautions was measured by using the reported intention questions "Do you intent to take the Pap smear in the immediate future?" and "Do you intent to take the HPV vaccine in the immediate future?" (0 = "No" and "Not yet thought of it", 1 = "Yes").

## Statistical analysis

Descriptive statistics (frequencies) were used to describe students' demographic characteristics. To explore the associations between student's knowledge, age, the components of the HBM and the variables of the HLC theory, Pearson's correlation coefficient was used. For this analysis, the specific variables were selected on the grounds that they represent the basic determinants of HPV precautionary actions. Finally, in order to identify potential independent predictors of students' intention to take the Pap smear and take the HPV vaccine in the immediate future, two logistic regression models were applied. The two intentions' questions were used as the dependent variables and regressed on demographic and knowledge variables, as well as theory-based

variables, namely age; indexes of "correct knowledge" on HPV, Pap smear and HPV vaccine, respectively; HMB-related beliefs (susceptibility and severity re HPV infection, benefits and barriers) and HLC beliefs (internal, chance, powerful others). Variables were entered into a forward stepwise logistic regression analysis if p values < 0.05. The logistic regression-derived odd ratios and the 95% CI are shown in Table 3 and Table 4. All p-values reported in statistical procedure are two-tailed.

The analyses were conduct using the SPSS statistical package (version 20.0, SPSS Inc., Chicago, IL, USA).

## Results

Participants' mean age was 16.97 years [standard deviation (SD) = 3.23]. The rest of the demographic characteristics of the sample are presented in Table 1. As far as the educational classes, high school in Greece involves 3 years of study. The first year is the A' lyceum class and the next 2 years are the B' and C' lyceum classes, respectively.

**Table 1:** Basic demographic characteristics of the sample of 1129 female senior high school students.

| | n | % |
|---|---|---|
| **Educational class** | | |
| A'class | 382 | 33.8 |
| B' class | 428 | 37.9 |
| C' class | 337 | 29.8 |
| **Island where they are living** | | |
| Syros | 259 | 22.9 |
| Naxos | 272 | 24.1 |
| Santorini | 250 | 22.1 |
| Paros | 205 | 18.2 |
| Tinos | 115 | 10.2 |
| Milos | 46 | 4.1 |
| **Age** | | |
| 15 | 164 | 14.5 |
| 16 | 393 | 34.8 |
| 17 | 380 | 33.7 |
| 18 | 161 | 14.3 |
| >18 | 48 | 4.3 |
| **Nationality** | | |
| Greek | 1072 | 95 |
| Albanian | 55 | 4.9 |
| Ukrainian | 6 | 0.5 |
| Dutch | 1 | 0.1 |
| Italian | 2 | 0.2 |
| Danish | 2 | 0.2 |
| Bulgarian | 4 | 0.4 |
| Polish | 5 | 0.4 |

| | Father | | Mother | |
|---|---|---|---|---|
| | n | % | n | % |
| **Parents' education level** | | | | |
| Graduate of elementary school | 208 | 18.4 | 148 | 13.1 |
| Graduate of high school | 670 | 59.3 | 715 | 63.3 |
| University/technical institution graduate | 227 | 20.1 | 254 | 22.5 |
| Master's degree | 21 | 1.9 | 21 | 1.9 |
| Ph.D. degree | 10 | 0.9 | 6 | 0.5 |
| **Parents' occupation** | | | | |
| Civil servant | 222 | 19.7 | 176 | 15.6 |
| Private clerk | 197 | 17.4 | 194 | 17.2 |
| Self-employed worker | 550 | 48.7 | 195 | 17.3 |
| Housewife | | | 454 | 40.2 |
| Retired | 84 | 7.4 | 42 | 3.7 |
| Unemployed | 67 | 5.9 | 77 | 6.8 |
| **Family's financial status** | | | | |

| | | |
|---|---|---|
| Very low | 52 | 4.6 |
| Low | 193 | 17.1 |
| Average | 770 | 68.2 |
| High | 91 | 8.1 |
| Very high | 9 | 0.8 |
| Don't know | 27 | 2.4 |

As can be seen in Table 1, the vast majority of students (n = 1072; 95%) were Greek, relatively equally (≈30%) distributed in the educational classes. A significant majority of both parents were graduates of a high school (n = 670; 59.3% and n = 715; 63.3%, respectively). Most students' fathers were self-employed workers (n = 550; 48.7%) while mothers were housewives (n = 454; 40.2%). Almost seven out of 10 of the students (n = 770; 68.2%) defined their families' financial status as average.

## Age, knowledge and beliefs correlation

Table 2 shows the means and the Pearson correlations between age, knowledge on HPV issues (expressed with the correct knowledge index), HBM and HLC-based beliefs on HPV issues. Students showed low correct knowledge levels (Pap smear: mean = 0.28; SD = 0.22; HPV: mean = 0.31; SD = 0.23; HPV vaccination: mean = 0.22; SD = 0.22). On the other hand, they held strong beliefs for HPV severity (mean = 3.30; SD = 0.70), benefits from adopting HPV preventive actions (mean = 4.20; SD = 0.62) and relatively strong internal HLC beliefs (mean = 3.56; SD = 0.74).

**Table 2:** Means, standard deviations and inter-item Pearson's correlations for female students' age, knowledge and beliefs (n = 1129).

| | | Age | Knowledge | | | Health belief model-based beliefs | | | | Health Locus of Control-based beliefs | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 1 | Age | 1 | 0.148[a] | 0.143[a] | 0.138[a] | 0.058 | −0.048 | −0.089[a] | 0.108[a] | 0.044 | 0.010 | −0.016 |
| 2 | "Correct knowledge" of Pap smear | | 1 | 0.440[a] | 0.431[a] | 0.015 | 0.014 | −0.194[a] | 0.218[a] | −0.019 | −0.069[b] | −0.151[a] |
| 3 | "Correct knowledge" of HPV | | | 1 | 0.587[a] | 0.133[a] | 0.014 | −0.166[a] | 0.185[a] | 0.011 | −0.060[b] | −0.179[a] |
| 4 | "Correct knowledge" of HPV vaccination | | | | 1 | 0.051 | 0.036 | −0.187[a] | 0.203[a] | 0.001 | −0.022 | −0.162[a] |
| 5 | HPV severity | | | | | 1 | 0.200[a] | 0.147[a] | 0.269[a] | 0.089[a] | 0.147[a] | 0.073[b] |
| 6 | HPV susceptibility | | | | | | 1 | 0.123[a] | 0.169[a] | 0.066[b] | 0.107[a] | 0.095[a] |
| 7 | Perceived costs from adopting HPV preventive actions | | | | | | | 1 | −0.145[a] | −0.013 | −0.026 | 0.299[a] |
| 8 | Perceived benefits from adopting HPV preventive actions | | | | | | | | 1 | 0.100[a] | 0.253[a] | −0.113[a] |
| 9 | HLC – internal | | | | | | | | | 1 | 0.203[a] | 0.022 |
| 10 | HLC – powerful others | | | | | | | | | | 1 | 0.057 |
| 11 | HLC – chance | | | | | | | | | | | 1 |
| | Mean | 16.97 | 0.28 | 0.31 | 0.22 | 3.30 | 2.98 | 2.40 | 4.20 | 3.56 | 3.38 | 2.61 |
| | SD | 2.91 | 0.22 | 0.23 | 0.22 | 0.70 | 0.82 | 0.88 | 0.62 | 0.74 | 0.74 | 0.81 |

[a]Correlation is significant at the 0.01 level (2-tailed). [b]Correlation is significant at the 0.05 level (two-tailed). HBM, health belief model; HLC, health locus of control.

As Table 2 additionally shows, age was strongly associated with correct knowledge of the Pap smear (r = 0.148; p < 0.01), HPV (r = 0.143; p < 0.01) and HPV vaccination (r = 0.138; p < 0.01) and subjective feeling of the benefits of preventive actions (r = 0.108; p < 0.01), while it was negatively correlated with the subjective sense of the barriers for prevention activities (r = −0.089; p < 0.01).

Intercorrelation coefficients for the three knowledge domains were high (r = 0.44 and r = 0.431), indicating that knowledge domains are strongly associated with each other.

Correct knowledge about the Pap smear, HPV and the vaccine against the virus was negatively correlated with the subjective feeling of costs and positively correlated with the subjective sense of the benefits of prevention actions (coefficients ranged from r = 0.166 to r = 0.213, yet statistically significant). Furthermore, increasing knowledge about HPV and the Pap test, was strongly correlated with the decrease of attribution to the powerful others (r = −0.069; p < 0.05 and r = −0.060; p < 0.05) and to chance (r = −0.151; p < 0.01 and r = −0.179; p < 0.01).

Finally, all four components of the HBM were significantly correlated with each other. Three out of the four HBM components (not the subjective sense of barriers) were significantly (though not strongly) correlated with the three parameters of the HLC theory, with coefficients ranging from 0.066 to 0.299.

As can be seen in Table 3, only age, knowledge of the Pap smear and the susceptibility, benefits and costs components of the HBM were the most significant predictors of females' intention to take the Pap smear. More particularly, older girls, have 118% possibility of taking the Pap smear [odds ratio (OR) = 1.18; 95% confidence interval (CI): 1.06–1.32]. Additionally, for every increasing unit in Pap smear-related correct knowledge, the possibility of taking the test increases by more than 6 times (OR = 6.59; 95% CI: 3.08–14.09). Females who thought themselves as susceptible to the HPV virus were 0.5 times more prone to take the Pap smear (OR = 1.43; 95% CI: 1.16–1.78), while those who thought of the benefits from taking preventive measures for HPV were 1.5 times more likely to take the Pap smear (OR = 2.42; 95% CI: 1.72–3.41). Finally, the possibility of taking the Pap smear decreased by 35% for girls who thought of the costs from taking preventive measures for HPV (OR = 0.65; 95% CI: 0.52–0.82).

**Table 3:** Stepwise logistic regression-derived odd ratios and 95% CI for reported intention to take a Pap smear (n = 1129).

| Variables | Odds ratio | 95% CI | p-Value |
|---|---|---|---|
| Step 1 | | | |
| Age | 1.24 | 1.11–1.40 | 0.001 |
| Step 2 | | | |
| Index "Correct knowledge" of Pap smear | 9.72 | 4.74–19.93 | <0.001 |
| Index "Correct knowledge" of HPV | 0.79 | 0.40–1.55 | ns |
| Age | 1.19 | 1.07–1.34 | 0.002 |
| Step3 | | | |
| HBM – severity | 0.81 | 0.60–1.10 | ns |
| HBM – susceptibility | 1.44 | 1.17–1.79 | 0.001 |
| HBM – costs | 0.65 | 0.52–0.81 | <0.000 |
| HBM – benefits | 2.54 | 1.82–3.54 | <0.000 |
| Index "Correct knowledge" of Pap smear | 6.29 | 2.95–13.37 | <0.000 |
| Index "Correct knowledge" of HPV | 0.50 | 0.24–1.04 | ns |
| Age | 1.18 | 1.06–1.32 | 0.004 |
| Step 4 | | | |
| HLC – internal | 1.06 | 0.81–1.37 | ns |
| HLC – powerful others | 1.16 | 0.89–1.51 | ns |
| HLC – chance | 1.01 | 0.78–1.30 | ns |
| HBM – severity | 0.80 | 0.59–1.08 | ns |
| HBM – susceptibility | 1.43 | 1.16–1.78 | 0.001 |
| HBM – costs | 0.65 | 0.52–0.82 | <0.001 |
| HBM – benefits | 2.42 | 1.72–3.41 | <0.001 |
| Index "Correct knowledge" of Pap smear | 6.59 | 3.08–14.09 | <0.001 |
| Index "Correct knowledge" of HPV | 0.52 | 0.25–1.08 | ns |
| Age | 1.18 | 1.06–1.32 | 0.004 |

HBM, health belief model; HLC, health locus of control.

As can be seen in Table 4, only knowledge of HPV vaccination and the benefits component of the HBM were the most significant predictors of females' intention to take the vaccination. More specifically, for every increasing unit in HPV vaccination-related correct knowledge, the possibility of taking the vaccine increases by about 4.5 times (OR = 5.49; 95% CI: 2.79–10.78). Females who thought of the benefits from taking preventive measures for HPV were more than 1.5 times more likely to take the Pap smear (OR = 2.56; 95% CI: 1.87–3.51).

**Table 4:** Stepwise logistic regression-derived odd ratios and 95% CI for reported intention to take the HPV vaccine (n = 1129).

| Variables | Odds ratio | 95% CI | p-Value |
|---|---|---|---|
| Step 1 | | | |
| Index "Correct knowledge" of HPV vaccination | 7.08 | 3.69–13.58 | <0.001 |
| Index "Correct knowledge" of HPV | 1.30 | 0.65–2.60 | ns |
| Step 2 | | | |
| Index "Correct knowledge" of HPV vaccination | 5.33 | 2.71–10.46 | <0.001 |
| Index "Correct knowledge" of HPV | 0.97 | 0.47–2.00 | ns |
| HBM – severity | 0.99 | 0.76–1.31 | ns |
| HBM – susceptibility | 1.22 | 1.00–1.48 | 0.049 |
| HBM – costs | 0.96 | 0.78–1.18 | ns |
| HBM – benefits | 2.62 | 1.93–3.55 | <0.001 |
| Step 3 | | | |
| HLC – internal | 1.00 | 0.79–1.28 | ns |
| HLC – powerful others | 1.13 | 0.88–1.43 | ns |
| HLC – chance | 1.10 | 0.87–1.40 | ns |
| HBM – severity | 0.98 | 0.74–1.29 | ns |
| HBM – susceptibility | 1.20 | 0.99–1.46 | ns |
| HBM – costs | 0.94 | 0.76–1.17 | ns |
| HBM – benefits | 2.56 | 1.87–3.51 | <0.001 |
| Index "Correct knowledge" of HPV vaccination | 5.49 | 2.79–10.78 | <0.001 |
| Index "Correct knowledge" of HPV | 1.03 | 0.50–2.13 | ns |

HBM, health belief model; HLC, health locus of control.

## Discussion

The current study investigated in detail the knowledge and beliefs regarding HPV transmission and prevention, in the light of two social-cognition models – the HBM and the HLC theory – among Greek senior high school female students attending school in the five larger (Syros, Naxos, Paros, Tinos, Santorini) and one smaller (Milos) populated islands of the Cyclades Region in Greece. Findings showed that knowledge levels – as expressed with the "correct knowledge" index – was low, similar to previous research worldwide [25], [29], [30], [31], [32].

There were aspects regarding the appropriate age that HPV vaccination should be taken or the casual relationship between HPV and cervical cancer where girls declared their ignorance. These findings confirm previous research [20], [31], [32], [33] and could be considered as expected, at least regarding Greece. This is because, in Greece, some years ago – when the HPV vaccine was included in the National Vaccination Programme only for girls, there was a strong public debate on its effectiveness and the potential side effects.

In any case, as the HPV vaccine is recommended for young girls in puberty, parents are primarily responsible for making decisions about vaccination. Knowledge on HPV-related aspects (risk factors for cervical cancer, Pap smear, HPV vaccination) among females as well as other factors greatly affect their awareness, which in turn prevents women from taking precautions, thus enhancing the risk for sexually transmitted diseases (STDs) and cervical cancer [34], [35]. Research on adult women had shown moderate levels of vaccination acceptability, indicating fear of side effects, lack of information and scepticism over the aetiology of cancer as the main causes of denial [26]. Additionally, a number of quantitative studies have identified a number of influential factors for parental willingness to vaccinate their daughters: these include worry about HPV or sexually transmitted infections and beliefs that the vaccine is effective) [36], [37]; approval of significant others [38], [39]; poverty, low income, social isolation, immigration, lack of insurance coverage, etc. [40]; family's prevention culture and mother's habits [41].

As far as the Pap smear uptake, psychological (i.e. fear of examination and results, likelihood of humiliation, lack of privacy, etc.) and socio-cultural (i.e. shame for gynaecological examination, low income and poverty, low educational attainment, race and gender, religious beliefs) barriers have a negative effect for taking the test [42], [43], [44].

Participants in the current study perceived HPV as a serious infectious disease, thought themselves as being vulnerable to be infected and overall perceived more benefits than costs from adopting HPV preventive

measures. Nevertheless, findings from the regression analyses indicated that age, precautions-related knowledge (Pap smear and HPV vaccination) and the susceptibility, benefits and costs components of the HBM (not severity) were the most significant predictors of females' intention to take the Pap smear and the HPV vaccine, respectively.

These findings are partially in line with previous research [22], [24], mostly regarding the influential role of perceived susceptibility on intentions for HPV-related precautions. However, in contrast with previous research, our findings revealed all other components of the HBM – except severity – to be significant predictors of students'intentions.

A possible explanation for this inconsistency could be the differences in sample characteristics and their familiarity with the Pap smear. In Greece, contrary to other health systems the first invitation for a Pap smear is done at 20 or 21 years. Until then, there is a general principle recommended also by experts that a girl must take the Pap smear within the first year after the onset of her sexual activity. Thus, being younger (compared to college students in previous research) and more familiar with the principle for taking the Pap smear practice our female students may be more prone to take a rational assessment of costs and benefits of their actions and underpin these cognitions with their level of knowledge. Indeed, the mentioned beliefs were associated in the expected direction with students' levels of correct knowledge (the more knowledgeable being the students, the strongest the beliefs on severity, susceptibility and benefits – the weakest the beliefs on costs – they held).

This is an encouraging result; firstly, because it confirmed the established relationship between HPV-related knowledge and perceptions [20], [45]. Then, because according to the HBM, behaviour change is more likely when one's perceived susceptibility is high, when perceived severity is greater, and when the expected benefits are more than the expected costs [17]. It has been shown that low perceivable susceptibility – that is, the perception of self as less or not vulnerable to cervical cancer in conjunction with wrong perceptions on Pap smear procedures and low levels of HPV knowledge, can affect a woman's decision to take the test [34], [43].

Results of the current study have implications and provide triggers for future research. From a theoretical perspective, although the effectiveness of the HBM in predicting behaviour has been questioned [15], the current study confirmed its capability to function as a reliable theory for framing youth's beliefs and attitudes about HPV and the relevant precautions like vaccination [23]. Nevertheless, as decision making about such a complex behaviour like sexually-related precautions is determined by multiple factors, future studies could benefit from a combinational application of a more detailed model – such as the theory of planned behaviour [46]. From the perspective of application, the above are important for designing theory-based campaigns for promoting HPV vaccination, as these campaigns could target specific aspects of students' cognitions (i.e. eliminating the strength of costs' beliefs), thus being more effective.

Focussing on the community, HPV interventions could enhance people's awareness in all levels (high school, university, family) [47]. Nevertheless, awareness should be accompanied with prevention services and policies like the availability of the HPV vaccine and Pap smear facilitation [48]. Based on the mentioned and our results, it is suggested that the implementation of a national systematic health promotion and additional educational programmes at schools about HPV and the potential harmful effects, together with the National Screening Programme for cervical cancer should be of top priority.

Finally, it is important to implement policies and initiatives for encouraging parents to vaccinate their daughters with the approved HPV vaccine and stop the prevailing fragmentation and simplicity of HPV-related information.

## References

[1] Centers for Disease Control and Prevention (CDC). Human papillomavirus (HPV). What is HPV? Available at: http://www.cdc.gov/hpv/parents/whatishpv.html. Accessed on 2 February 2015.
[2] Baseman JG, Koutsky LA. The epidemiology of human papillomavirus infections. J Clin Virol. 2005;32(Suppl):S16–24.
[3] Bosch F, De Sanjose S. The epidemiology of human papillomavirus infection and cervical cancer. Dis Markers. 2007;23:213–27.
[4] Stamataki P, Papazafiropoulou A, Elefsiniotis I, Giannakopoulou M, Brokalaki H, Apostolopoulou E, et al. Prevalence of HPV infection among Greek women attending a gynecological outpatient clinic. BMC Infect Dis. 2010;10:27.
[5] Centers for Disease and Prevention (CDC). Quadrivalent human papillomavirus vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP). 2007. Available at: https://www.cdc.gov/mmwr/preview/mmwrhtml/rr56e312a1.htm. Accessed on 22 April 2015.
[6] Tinsley BJ, Lees B, Sumartojo E. Child and adolescent HIV risk: familiar and cultural perspectives. J Fam Psychol. 2004;18:208–24.
[7] Institut Català d' Oncologia (ICO). Information centre on HPV and cancer: human papillomavirus and related cancers. Barcelona: Fact Sheet – Greece; 2014.
[8] Institut Català d' Oncologia (ICO). Information centre on HPV and cancer (HPV Information Centre). 2015 human papillomavirus and related diseases in Greece. Barcelona: Summary Report 03–20.

[9] Walker C. Attitudes, Practices, and beliefs about human papillomavirus vaccine among young adult African-American women: implications for effective implementation. DEd., University of North Carolina; 2009.
[10] Hunter T, Weinstein M. Beliefs and knowledge about the human papillomavirus vaccine among undergraduate men. Health Educ J. 2016;75(2):249–56.
[11] Armitage J, Conner M. Social cognition models and health behavior: a structured review. Psychol Health. 2000;15:173–89.
[12] Abraham C, Sheeran P, Henderson M. Extending social cognition models of health behaviour. Health Educ Res. 2011;26(1):624–37.
[13] Painter J, Borba C, Hynes M, Mays D, Glanz K. The use of theory in health behavior research from 2000 to 2005: a systematic review. Ann Behav Med. 2008;35:358–62.
[14] Reiter P, Brewer N, Gottlieb S, McRee AL, Smith JS. Parent's health beliefs and HPV vaccination of their adolescent daughters. Soc Sci Med. 2009;69(3):475–80.
[15] Carpenter CJ. A meta-analysis of the effectiveness of health belief model variables in predicting behavior. Health Commun. 2010;25(8):661–9.
[16] Janowski K, Kurpas D, Kusz J, Mroczek B, Jedynak T. Health-related behavior, profile of Health Locus of Control and acceptance of illness in patients suffering from chronic somatic diseases. PLoS One. 2013;8(5):e63920.
[17] Janz K, Becker H. The health belief model: a decade later. Health Educ Behav. 1984;11:1–47.
[18] Koulierakis G. Socio-psychological models of behavior in relation to health and disease. In: Agrafiotis D, editor. Sociological and Psychological Approach of Hospitals/Health Services – Health Behaviors: Standards and Changes. Patras: Open University; 2000. p. 15–96.
[19] Rotter JB. Social learning and clinical psychology. NJ, US: Prentice-Hall, Inc.: Englewood Cliffs; 1954.
[20] Garces DM. Applying the health belief model to cervical cancer screening. Rev CES Med. 2006;20:55–63.
[21] Ndikom C, Ofi B. Awareness, perception and factors affecting utilization of cervical cancer screening services among women in Ibadan, Nigeria: a qualitative study. Reprod Health. 2012;9:11.
[22] Gerend MA, Shepherd JE. Predicting human papillomavirus vaccine uptake in young adult women: comparing the health belief model and theory of planned behavior. Ann Behav Med. 2012;44(2):171–80.
[23] Guvenc G, Seven M, Akyuz A. Health belief model scale for human papilloma virus and its vaccination: adaptation and psychometric testing. J Pediatr Adolesc Gynecol. 2016;29:252–8.
[24] Jozkowskiab KN, Geshnizjanic A. Using a reasoned action approach to examine US college women's intention to get the HPV vaccine. Health Educ J. 2016;75(1):14–26.
[25] Notara V, Soultatou P, Tselika A. Exploration of health service users' knowledge of HPV and immunization against the virus. Interscientific Health Care. 2010;2:184–9.
[26] Gesouli-Voltyraki E, Tsetsekou E, Marneras C. HPV vaccination acceptance among women in Greek provincial areas. Arch Hell Med. 2010;27:522–8.
[27] Tsipra E, Nazou E, Karkalousos P. Knowledge and attitudes of university students and their mothers regarding the human papilloma virus. Rostrum of Asclepius. 2015;14:103–20.
[28] Koulierakis G. HIV risk behaviours amongst Greek inmates: a theoretical perspective. DEd, University of Stirling; 2002.
[29] Sandfort J, Pleasant A. Knowledge, attitudes, and informational behaviours of college students in regard to the human papillomavirus. J Am Coll Health. 2009;58:141–9.
[30] Elit L, Trim K, Mohan R. The knowledge and attitudes of university students concerning HPV vaccine and cervical screening. Clin Med Insights Reprod Health. 2009;3:1–8.
[31] William K, Forster A, Marlow L, Woller J. Attitudes towards human papillomavirus vaccination: a qualitative study of vaccinated and unvaccinated girls aged 17–18 years. J Fam Plann Reprod Health Care. 2011;37:22–25.
[32] Bebiş H, Güleşen A, Ortabağ T. Knowledge and attitudes of Turkish young adult men regarding HPV and HPV related diseases. J Behav Health. 2013;2:52–8.
[33] Haesebaert J, Lutringer-Magnin D, Kalecinski J, Barone G, Jacquard AC, Régnier V, et al. French women's knowledge of and attitudes towards cervical cancer prevention and the acceptability of HPV vaccination among those with 14–18 year old daughters: a quantitative-qualitative study. BMC Public Health. 2012;12:1034.
[34] Pirzadeh A, Mazaheri MA. The effect of education on women's practice based on the Health Belief Model about Pap smear test. Int J Prev Med. 2012;3(8):585–90.
[35] Donati S, Giambi C, Declich S, Salmaso S, Filia A, Ciofi degli Atti ML. Knowledge, attitude and practice in primary and secondary cervical cancer prevention among young adult Italian women. Vaccine. 2012;30(12):2075–82.
[36] Dempsey AF, Zimet GD, Davis RL, Koutsky L. Factors that are associated with parental acceptance of human papillomavirus vaccines: a randomized intervention study of written information about HPV. Pediatrics. 2006;117(5):1486–93.
[37] Sauvageau C, Duval B, Gilca V, Lavoie F, Ouakki M. Human papilloma virus vaccine and cervical cancer screening acceptability among adults in Quebec, Canada. BMC Public Health. 2007;7:304.
[38] Zimet GD. Improving adolescent health: focus on HPV vaccine acceptance. J Adolesc Health. 2005;37:S17–23.
[39] Ogilvie GS, Remple VP, Marra F, McNeil SA, Naus M, Pielak KL, et al. Parental intention to have daughters receive the human papillomavirus vaccine. Can Med Assoc J. 2007;177(12):1506–12.
[40] Kahn JA, Ding L, Huang B, Zimet GD, Rosenthal SL, Frazier AL. Mothers' intention for their daughters and themselves to receive the human papillomavirus vaccine: a national study of nurses. Pediatrics. 2009;123(6):1439–45.
[41] Steens A, Wielders CH, Bogaards JA, Boshuizen HC, de Greeff SC, de Melke HE. Association between human papillomavirus vaccine uptake and cervical cancer screening in the Netherlands: implications for future impact on prevention. Int J Cancer. 2013;132:932–943.
[42] Oscarsson MG, Benzein EG, Wijma BE. Reasons for non-attendance at cervical screening as reported by non-attendees in Sweden. J Psychosom Obstet Gynaecol. 2008;29:23–31.
[43] Esin NM, SerapBulduk S, Ardic A. Beliefs about cervical cancer screening among Turkish married women. J Cancer Educ. 2011;26:510–5.
[44] Demirhindi H, Nazlican E, Akbaba M. Cervical cancer screening in Turkey: a community-based experience after 60 years of Pap smear usage. Asian Pac J Cancer Prev. 2012;13:6497–500.

[45] Gerend M, Magloire Z. Awareness, knowledge, and beliefs about human papillomavirus in a racially diverse sample of young adults. J Adolesc Health. 2008;42:237–42.
[46] Ajzen I. The theory of planned behaviour. Organ Behav Hum Decis Process. 1991;50:179–211.
[47] Scorcia-Wilson T. The relationship between knowledge and beliefs about human papillomavirus, acceptance of the human papillomavirus vaccine, and intentions to practice safer sex behaviors among female college students [dissertation]. University of South Florida; 2010.
[48] Ferrara M, Langiano E, De Vito E. A school based community randomized trial of the effect of peer health education on primary prevention knowledge, attitude and behaviors towards HPV among adolescents. Ital J Public Health. 2012;9:20–32.