

Dr Google

What about the human papillomavirus vaccine?

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Objectives: To assess and analyze the information and recommendations provided by Google Web Search™ (Google) in relation to web searches on the HPV vaccine, indications for females and males and possible adverse effects.

Results: In the comprehensive analysis of results, 72.2% of websites offer information favorable to HPV vaccination, with varying degrees of content detail, vs. 27.8% with highly dissuasive content in relation to HPV vaccination. The most frequent type of site is the blog or forum. The information found is frequently incomplete, poorly structured, and often lacking in updates, bibliography and adequate citations, as well as sound credibility criteria (scientific association accreditation and/or trust mark system).

Materials and Methods: Descriptive cross-sectional study of the results of 14 web searches. Comprehensive analysis of results based on general recommendation given (favorable/dissuasive), as well as compliance with pre-established criteria, namely design, content and credibility. Sub-analysis of results according to site category: general information, blog/forum and press.

Conclusions: Google, as a tool which users employ to locate medical information and advice, is not specialized in providing information that is necessarily rigorous or valid from a scientific perspective. Search results and ranking based on Google's generalized algorithms can lead users to poorly grounded opinions and statements, which may impact HPV vaccination perception and subsequent decision making.

Introduction

The Internet currently stands out as an emerging information provider for the general public, in all subject areas including health. It continues to expand at a rapid rate, both in registered data volume and in web users.¹ Increased Internet accessibility as well as the autonomy granted to the user in targeted searches have facilitated the use of the Internet tool and have opened up a new dimension in the chain of information transfer and medical advice.^{2,3}

Traditional sources of medical advice and health education, largely linked to the figure of the specialized physician, may be displaced and even challenged by this new communication agent, the boundaries of which are not set or controlled by the medical experts themselves. A survey conducted in seven European countries showed that the Internet follows doctors very closely as the second most important source of information for women in those countries, on topics related to the human papillomavirus (HPV) and its vaccine.⁴

HPV vaccination has positive indications that have been widely demonstrated in target groups and supported by high quality tests, contained in each vaccine's specification sheet.⁵⁻¹⁰ Most European countries actively recommend vaccination and include these vaccines in their systematic vaccination programs.^{11,12} In Spain the

cohort for systematic vaccination includes girls between 9 and 14 y of age, and is strongly recommended for women under 26 y of age. The growing evidence of the benefits of vaccinating boys aged 9 to 26 y indicates an individualized assessment for this group.¹³

However, there is a mismatch between vaccination objectives and true vaccination coverage: according to the conclusions of *Eurosurveillance* 2010 study, only 2 out of 18 European participating countries that implemented the standard vaccination program had achieved a vaccination coverage of over 60%.¹⁴ The reasons for this disparity have been widely debated and they include issues linked to both the information and the education about the disease and its vaccine, the influence of anti-vaccine movements and, particularly, the need for greater coordination among health authorities, scientific associations, social agents and the media, in order to ultimately achieve a greater HPV vaccination coverage.^{13,15-19} Deterrent factors influencing personal decision-making in relation to HPV vaccination have been identified and analyzed and have highlighted, in particular, concerns surrounding vaccine effectiveness and an over-perception of the risk of side effects.²⁰⁻²²

In the analysis of current opposition trends to systematic vaccination, arguments pertaining to the subjective and/or emotional realms allowing for a greater possibility of manipulation, rather than those of scientific evidence, were found.²³

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Table 1. Search list

[vacuna virus papiloma]
(papillomavirus vaccine)
[vacuna cancer cuello utero]
(cervical cancer vaccine)
[vacuna virus papiloma humano]
(hpv vaccine)
[beneficios vacuna virus papiloma humano]
(benefits hpv shot)
[efectos adversos vacuna virus papiloma humano]
(side effects hpv shot)
[vacuna virus papiloma humano hombres]
(hpv vaccine men)
[es segura la vacuna cancer cuello de utero?]
(is cervical cancer vaccine safe?)
[es segura la vacuna virus papiloma humano?]
(is hpv vaccine safe?)
[debo vacunar a mi hija del virus papiloma humano?]
(should I vaccinate my daughter against hpv?)
[debo vacunar a mi hijo del virus papiloma humano?]
(should I vaccinate my son against hpv?)
[tiene riesgos la vacuna del virus papiloma humano?]
(does hpv vaccine have any risks?)
[es eficaz la vacuna del virus papiloma humano?]
(is hpv vaccine effective?)
[funciona la vacuna del virus papiloma humano?]
(does hpv vaccine work?)
[vacuna virus papiloma humana previene cáncer cuello uterino?]
(does hpv vaccine prevent cervical cancer?)

Searches performed on www.google.es (Google Spanish domain). Keywords were introduced in Spanish.

The aim of this study is to assess the immediate information provided by the most frequently used Internet search engine: Google Web Search™ (from now on Google), on the HPV vaccine, including benefits, universal suitability, potential side effects and indication for males.

The initial hypothesis is that “Dr Google” may not be a physician working on scientific evidence, rather it offers indiscriminate information on the HPV vaccine.

Results

From the total 140 search results, 54 different websites were found in total and subsequently analyzed. Fifteen additional websites had previously been excluded from this total: 13 containing direct access to videos and 2 editorial websites with links to scientific articles with restricted access which did not meet the accessibility requirement.

Out of the total of 54 websites, 53.7% appeared only once, 27.8% appeared through 2 different searches and 18.6% appeared

3 times or more. The most repeated websites, which appeared 3 times or more in the various web searches, are shown in Table 3. The websites from the top 10 ranked and top 3 ranked search results were analyzed. A sub-analysis of the features of each website category was also performed.

In the overall analysis of results, the following data may be highlighted: 72.7% of websites offered general descriptive and favorable information, in varying degrees of detail, about the HPV vaccine, vs. 27.8% which contained clearly dissuasive arguments.

However, in most websites, it was common to find incomplete, non-comprehensive information and poorly structured information, alongside a lack of relevant bibliographical sources and references, updates and reliable credibility criteria (see Table 4).

Most websites (88.9%) were targeted at the general public. A minority (9.3%) was specifically aimed at women, as specified on the webpage itself. A small percentage (1.9%) was targeted specifically at health professionals, according to the website's stated purpose. As to the country or origin, most websites (68.5%) were Spanish, 22.2% were from Central and South America and 9.3% were from the US.

With regard to the website category, 40.7% sites were blogs/forums (out of which only two sites focused exclusively on health-related matters), 29.7% were informative sites (out of which seven sites were linked to scientific associations, four were non-scientific in nature and five were linked to government institutions) and 29.5% fell into the press category (newspapers and online magazines).

The 54 websites were evaluated to ascertain compliance with the established analysis criteria. Table 4 reflects the percentages of site compliance.

A discrepancy between the key search words and results obtained was observed in searches about the HPV vaccine prescription for males: search results were generically targeted at women. This could potentially be due to some limitation in Google's gender distinction tool or to the added effect of a string of non-prioritized keywords.

In terms of accreditation, only three websites showed a medical and health related certification label or trust mark: Spanish Pediatrics Association,²⁷ American Cancer Society and a private medical center that specialized in various fields. The marks found were HONcode (Health On the Net Foundation), WIS (*Web de Interés Sanitario*) and WMA (*Web Médica Acreditada*).

It was also observed that when information searches were done through questions rather than statements, results tended to be blogs/forums or videos. This was possibly due to a match between questions and a more informal use of language and the presence of dialog in blog/forums and videos.

Considering that the first search results tend to be the most visited by web users, a specific top-3 result-per-search analysis was conducted in order to spot significant differences with regards to the overall 10-results search study. Results were found to be consistent with regards to general recommendation (33.3% contain clearly dissuasive information on HPV vaccination), target audience (86.7% are aimed at the general public) and national ownership (73.7% of websites would be Spanish). As far as website

Table 2. Analysis criteria

Form and design criteria
• Clear structure and organization of content (yes/no)
• Ease of navigation, “user-friendliness” (yes/no)
Content criteria
• Information relevance and coherence: congruence between key word search and output (yes/no)
• Scientific rigor: adequate citations. In non-scientific sites, explicit mention of the fact that the site’s content does not replace the advice of a health professional (yes/no)
• Covers a wide scope on the subject and presents an accurate and comprehensive message (yes/no)
• Message clarity and comprehensibility. Use of understandable language (yes/no)
• Updated information, maintenance of site, mention of last content review date (yes/no)
• Presence of advertising and sponsor links on the site: clarity and transparency of such links, properly distinguished from the rest of the content (yes/no)
Credibility criteria
• Mention of the author/s and their qualifications. Includes author/institution contact details and address (yes/no)
• Scientific Association accreditations (yes/no)
• Accreditation certificate or trust mark (HON, WMA, WIS, PWMC or others) (yes/no)
• Clear statement of bibliographical sources. Reliable references for specialists cited (yes/no)

Site assessment based on rating of established criteria, namely form and design, content and credibility.

category is concerned, there was a clear predominance of blogs/forums (53.4%), followed by an increased presence of information sites (40.1%) and a minority of press related websites (6.7%).

Due to the high variability in criteria compliance depending on website category, a sub-analysis was conducted grouping all sites into three clear-cut category types (detailed under *Materials and Methods*): information sites, press sites and blogs/forums.

In light of the results obtained, the question was raised as to whether there could be an association between website category and the website’s for or against recommendation in relation to HPV vaccination.

The association between these qualitative variables (recommendation vs. website category) was assessed using Pearson’s chi-square test (see **Table 5**).

The obtained result of the chi-square statistic test was 9.976, a statistically significant figure ($p = 0.007$) which demonstrated that, in this sample, an association between website category and type of recommendation offered was found. This association suggests that within the set Web Search conditions of this study, a general information site is likely to recommend or provide information on the HPV vaccine, as opposed to both press sites and blogs/forums, which in a 1:4 probability ratio may present dissuasive information. Consequently, we are not able to conclude that press sites are anti-vaccine and we should mention that many HPV-related press articles found in the course of this study focused on discussing specific controversial news about presumed adverse effects in two Spanish adolescent girls, following the HPV vaccine’s inclusion in Spain’s systematic vaccination programs.

A Chi-square test was also used to assess the association between website category and the established analysis criteria. Each site was assessed on each criterion individually, as well as on overall design, content and credibility standards. In the overall assessment, sites that complied with all the criteria, or all except one, were rated favorably. Results may be seen in **Table 6**.

A statistically significant association between website category and the following criteria standards was found: the design standards of “clear structure and organization of content,” “ease of navigation,” the content standards of “scientific rigor: adequate citations,” “wide scope and accurate and comprehensive message,” “updated information, maintenance of site” and the credibility standards of “scientific association accreditations” and “clear statement of bibliographical sources and reliable references.”

Evaluating the relationship between the most frequent website category found (blog/forum sites, representing 40.7% of all general results, and 53.4% of all top-3 searches) and relevant results of the criteria-based analysis (scientific rigor, comprehensive message, updated information, scientific association accreditation, bibliographical sources and reliable references, as detailed in **Table 6**), it may be concluded that web users accessing blog/forum sites to find information about HPV vaccine, run a considerable risk of obtaining non-rigorous information.

Discussion

The information obtained from the Google search performed in the present study presents a favorable overall recommendation toward HPV vaccination. Nevertheless, the in-depth analysis shows that this virtual assistant operates in no way like a doctor working on scientific evidence. Google, as a tool users employ to find medical information and advice, functions as an inconsistent, inaccurate and lax reporting agent in relation to HPV vaccination and likewise, probably, to other health-related inquiries. It offers non-homogeneous recommendations and often ill-founded arguments and facts that are altogether poorly contrasted and not scientifically justified. Search results and ranking based on Google’s generalized algorithms can lead users to poorly grounded opinions and statements, which may impact HPV vaccination perception and subsequent decision making.

Table 3. List of the most popular websites, appearing in three or more instances

No. of instances	Website	URL (home page)	Website type	Overall recommendation
11	Geosalud	www.geosalud.com	Information site references to FDA, NHI.	Informs/recommends
11	National Health Institute	www.cancer.gov	Information site linked to government structures (USA) and scientific associations	Informs/recommends
8	Josep Pamies	www.joseppamies.wordpress.com	Personal blog with forum	Dissuasive information
8	Miguel Jara	www.migueljara.com	Personal blog with forum	Dissuasive information
6	Wikipedia	www.es.wikipedia.org	Information non-scientific site	Informs/recommends
5	El País	www.elpais.com	Press site	News article focusing on side effects, containing dissuasive information
5	Medline Plus	www.nlm.nih.gov	Governmental information site (USA)	Informs/recommends
3	En Femenino	www.foro.enfemenino.org	Blog/forum targeted at a female audience	Opinion forum containing dissuasive comments
3	CDC	www.cdc.gov	Information site linked to government structures (USA) and scientific associations	Informs/recommends
3	Cancer.org	www.cancer.org	Information site	Informs/recommends

18.6% of the websites appeared three times or more in the search results.

Table 4. Top 10 and Top 3 ranking results, based on established analysis criteria

Overall results	Top 3 results	Design (1–2), content (3–8) and credibility (9–12) criteria
42.6%	55.3%	1. Clear structure and organization of content.
77.8%	93.3%	2. Easy navigation, “user-friendliness.”
87%	93.3%	3. Information relevance and coherence: congruence between key word search and output.
35.2%	40%	4. Scientific rigor: adequate citations. In non-scientific sites, explicit mention of the fact that the site’s content does not replace the advice of a health professional.
40.7%	40%	5. Covers a wide scope on the subject and presents an accurate and comprehensive message.
96.3%	100%	6. Message clarity and comprehensibility. Use of understandable language.
35.2%	33.3%	7. Updated information, maintenance of site, mention of last content review date.
79.6%	93.3%	8. Presence of advertising and sponsor links on the site: clarity and transparency of such links, properly distinguished from the rest of the content.
55.6%	46.7%	9. Mention of the author/s and their qualifications. Includes author/institution contact details and address.
25.9%	26.7%	10. Scientific Association accreditations.
5.6%	13.3%	11. Accreditation certificate or trust mark (HON, WMA, WIS, PWMC or others).
42.6%	66.7%	12. Clear statement of bibliographical sources. Reliable references for specialists cited.

Google currently stands out as the most popular search engine worldwide, and it is an expanding and rapidly evolving tool for providing and exchanging information. Understanding the background of the codified searches, page priority rank and the “democratic philosophy” functioning pillars, offers the key to maximizing this sophisticated tool and being able to lead individualized and more accurate searches (see **Appendix:** Background on Google’s Search).

On the other side, from the perspective of the average Google user, personalization tools carry potential for confusion: web surfers may believe that they are directing their own objective information search, and they could well be unaware of the search engine’s bias (based on elements related to hierarchy criteria, as well as the user’s “stored backstage” that Google makes use of in order to render the individualized set of best results).

In the specific area of health care, as well as in other specialized subject areas, Google provides a huge amount of data, sorted without any consideration of strict scientific regulations, content or discrimination upon the basis of “truth.” The general web user may be prone to becoming overwhelmed with an excessive and non-prioritized amount of data if a serious, effective and systematic screening of Google’s search results is not performed.²⁸

The interactive and dynamic nature of the World Wide Web promotes the popularity of popular scientific websites, containing comment and debate forums, moderated by authors who are not necessarily specialized. When it comes to potentially controversial health-related issues, these forums can easily generate distinct waves of public opinion and promote speculation. Their capacity to influence public opinion, like other media, should not be underestimated.

The information about vaccination contained in nonspecialized or nonaccredited websites may have the potential to modify or alter the internet user's perception of a vaccine's real level of effectiveness and its potential side effects, two major concerns for anyone considering getting the vaccine for oneself or a family member.²⁹ A Google web search aimed at targeting these doubts may easily generate contradictory data and increase controversy, especially among audiences who frequently rely on virtual communities and social networks to share concerns with their peers. Universal vaccination opposition movements also rely on this media tool to group like-minded thought waves.^{23,30}

In short, Google may not provide users with the information that they should have or that they need, but rather with the information that they would like to find. It could be argued that depending on how you put across a certain idea or question in the search box, "Dr Google" "always tries to prove you are right," with the risk this could entail should a web user start his or her search misinformed or biased in one direction or another, or should he or she take Google for an encyclopedia and therefore be unaware of how the search engine operates (i.e., if a user searches for "HPV vaccine cons," he or she will be considerably more likely to come across sites that focus on the vaccine's negative side effects rather than sites offering more comprehensive information).

Inter-observer variability in the assessment of the websites would be one mentionable limitation of the present study; this aspect will be targeted accordingly in a supplementary concordance analysis. The limited inclusion criteria established (language and specific geographical location) also open up the possibility of conducting additional expanded studies, carrying out searches in other languages and from varying geographical locations, in order to assess possible variations.

The numerous and multifarious advantages of the virtual era are known to all. Within this context, it is however essential to highlight the role of the general practitioner or specialist physician as a provider of individualized, adequate and timely advice to a patient or an individual. The fundamental communication role of the pediatrician with young people is also central—anticipation being a key factor—as well as the gynecologist's role as health care provider for young women.^{31,32} The importance of being pro-active in this field should be highlighted: ideally the patient should be informed without having to request information, since reluctance to ask questions may occasionally be an issue.

Technological advances are leading toward the virtualization of numerous spaces for dialog, and it is essential to accept this in order to adjust to change and offer alternatives. There is a need to create and promote scientific medical sites that act as popular communication channels, and offer reliable medical recommendations.³ In blogs and forums aimed at sharing experiences and concerns related to the HPV, health care professional should be present as moderators. It is also essential to highlight the importance of providing accessible language (a criterion that all selected sites in this study complied with), adapting the message to the average user, and differentially, to the teenage profile user. In this respect, it ought to be mentioned that none of the sites analyzed in this study were targeted exclusively and specifically

Table 5. Sub-group analysis based on website category

	Blog/forum website	Information website	Press website
Website (n = 54)	22	16	16
Informs/recommends	54.5% (12)	100% (16)	75% (12)
Dissuasive information	45.5% (10)	0% (0)	25% (4)

Overall recommendation. The association between the qualitative variables (recommendation vs. website category) was assessed with Pearson's chi-square test. The obtained value of the chi-square statistic was 9.976, a statistically significant figure ($p = 0.007$).

at a teenage audience. The perceived barriers preventing adolescents from accessing health services could ultimately motivate this population group—occasionally reluctant to consult doctors or adults for information or advice—to resort to using health-related Internet chatrooms and forums, which allow them both the intimacy in discussing sensitive issues and the desire to retain their anonymity.³³ Further research would be needed however to evaluate more differences within the youth cohort related to internet health use.

On the other hand, greater web user awareness is possibly needed in relation to trust labels and certifications, which could serve as indicators of compliance with most of the content and credibility criteria established in this study.^{24,28}

Since Google's web search is not specialized in providing medical information, a health-care specific search engine or similar tool could be created. Such a tool could categorize and structure medically verified information, and could become the reference point for this type of information for general Internet users and concerned individuals seeking impartial medical advice on the Internet.

Additionally, a trust network or certification scheme could be applied to help promote confidence among users, with supporting tools—such as discussion forums, moderated by medical professionals and free from advertising—to foster a community of information sharing and clarification. This service could establish itself as an accurate, rigorous and trustworthy "Dr Google," whose viewpoint users could seek freely and confidently.

Materials and Methods

A cross-sectional study was performed using Google Search Web (Spanish domain) www.google.es.

Fourteen searches were conducted on September 20, 2012, using specific keywords in both statement and question form, related to HPV vaccination (including safety, side effects and indication for males).

The 14 information searches performed may be seen in **Table 1**. Keywords were introduced in Spanish. The terms chosen were those that ordinary lay people would typically use in a standard search.

The first 10 search results for each search were studied individually. Sites were described and analyzed.

For the general description of websites, the following parameters were considered: target audience (general public, women,

Table 6. Sub-group analysis based on website category and analysis criteria (design criteria: 1–2; content criteria: 3–8; credibility criteria: 9–12)

Criteria-based analysis	Blog/ forum	Information website	Press website	Chi-square value	"p" value
1. Clear structure and organization of content.	27.3%	81.3%	25%	13.916	0.001*
2. Easy navigation, "user-friendliness."	72.7%	100%	62.5%	7.057	0.029*
Design criteria – overall assessment	22.7%	81.3%	18.8%		
3. Information relevance and coherence: congruence between key word search and output.	77.3%	93.8%	93.8%	3.137	0.208
4. Scientific rigor: adequate citations. In non-scientific sites, explicit mention of the fact that the site's content does not replace the advice of a health professional.	22.7%	68.8%	18.8%	11.296	0.004*
5. Covers a wide scope on the subject and presents an accurate and comprehensive message.	18.2%	87.5%	25%	20.769	0.000*
6. Message clarity and comprehensibility. Use of understandable language	95.5%	100%	93.8%	0.950	0.622
7. Updated information, maintenance of site, mention of last content review date.	9.1%	62.5%	43.8%	12.318	0.002*
8. Presence of advertising and sponsor links on the site: clarity and transparency of such links, properly distinguished from the rest of the content.	77.3%	93.8%	68.8%	3.210	0.201
Content criteria – overall assessment	4.5%	56.3%	0%		
9. Mention of the author/s and their qualifications. Includes author/institution contact details and address.	45.5%	75%	50%	3.559	0.169
10. Scientific Association accreditations	13.6%	56.3%	12.5%	10.893	0.004*
11. Accreditation certificate or trust mark (HON, WMA, WIS, PWMC or others).	4.5%	12.5%	0%	2.455	0.293
12. Clear statement of bibliographical sources. Reliable references for specialists cited.	27.3%	75%	31.3%	9.826	0.007*
Credibility criteria: overall assessment	9.1%	31.3%	6.3%		

Association between these qualitative variables (website category and analysis criteria) was assessed with Pearson's chi-square test (*Statistically significant association).

teenagers, healthcare professionals), geographical location and website type.

Four types of website types were defined: "scientific site," "nonscientific site," "press site" and "blog/forum."

A "scientific site" was one either created or supported by an official scientific organization. A "non-scientific site" contained general information unrelated to a formal scientific organization. "Press sites" included online newspapers and magazines as well as isolated press releases, regardless of whether they allowed readers to leave comments on articles. The "blog/forum" category encompassed discussion or informational sites (owned by a single individual or a small group) consisting of discrete entries ("posts"), typically displayed in reverse chronological order, providing information or opinion on a particular subject, and allowing readers to leave comments and generate debate. It is this interactive format that distinguished them from other static websites. Sites created as "virtual communities" with discussion boards or forums were also included in this category.

Press sites with reader comments were not considered blogs/forums because of their distinct format and as a result of the fact that there was no recognizable interactive debate between the readers and author of the article.

For statistical analysis purposes, websites were then classified into three main categories, according to profile: general information pages (including both scientific and non-scientific sites), press sites and blogs/forums, each with distinct structural and content characteristics as explained above. Two major differentiating factors were: authorship type (organization or association, media or independent author-s or group) and information flow

(one-way, typical of information and press sites, and two-way, for blogs/forums).

Sites were then assessed according to established criteria, in relation to form and design, content and credibility (Table 2). The criteria were established by the author. They were inspired from published criteria for health-related website evaluation and from principles established by Medical Health Accreditation institutions.²⁴⁻²⁶

One of the criteria included was the presence or absence of medical health "trust marks" on the websites. A trust mark is an ethical standard which aims at offering proof of quality health information. A trust mark shows the intent of a website to publish transparent and truthful information.

Evaluation of compliance with criteria was either "yes" or "no." For each criterion, positive assessment was only given if all the parameters described were consistently and strictly met.

Additionally, an overall assessment was performed for each site in order to ascertain whether it provided information either neutrally or positively in favor of the HPV vaccine or whether, on the contrary, the site generated doubt or put forward dissuasive arguments. Only sites that explicitly contained dissuasive arguments were considered anti HPV-vaccine sites.

The association between website category and the overall recommendation (favorable or dissuasive) was assessed. The association between website category and compliance with the established analysis criteria was also evaluated. This study was conducted with the results obtained both in the top 10 and top 3 search results.

In order to minimize bias in web searches due to inter-user variability, certain specific search conditions were established, namely the exclusive use of Google as a search engine, the pre-search elimination of registered user navigation history as well as ensuring to sign off Gmail® or any other websites with which Google could potentially establish data exchange. Basic set-up data were also defined (typically set up by default based on user location identification): language (Spanish) and geographical location within Spain (Santiago de Compostela). The fieldwork was performed by two data extractors who co-evaluated the resulting websites and a consensus about the rating to be assigned was reached, following the strict guidelines outlined.

The following site exclusion criteria were established: sites that were only accessible through sponsored links, advertising sites, restricted-access websites, direct links to videos or other sites and languages other than the one defined in the search.

Statistical analysis. A descriptive analysis was performed resulting in percentages reflecting level of compliance with the pre-established criteria as well the site's overall stance toward HPV vaccination.

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In the following sub-analysis based on website category classification (blog-forum/general information/press), a contingency table was developed with the respective percentages for several qualitative variables (positive or negative recommendation as well as the various analysis criteria) vs. website category. Pearson's Chi-Square test was applied in order to detect possible association among these variables. Values of $p < 0.05$ were considered statistically significant.

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Appendix: Background on Google's search

Google, the world's most popular search engine, offers a practical tool to "organize the world's information and make it universally accessible and useful" according to its creators. Through searches codified by means of keywords, Google offers results in the form of lists of websites organized hierarchically and majorly based on a priority rank called PageRank. PageRank is a patented link analysis algorithm, named after Larry Page, one of Google's founders, "that assigns a numerical weighting to each element of a hyperlinked set of documents, such as the Internet, with the purpose of measuring its relative importance within the set." The presence of hyperlinks within a site would help to increase their position, the theory behind it being that "web pages linked from many important pages are themselves likely to be important" (the notion of important or non-important being purely human and

subjective, this being ultimately the heart of Google's so-called "democratic philosophy": we can all have a say).³⁴ The PageRank of a given website depends on the number and PageRank metric of all pages that link to it. A page that is linked to by many other pages with high PageRank receives a high rank itself. If there are no links to a web page, then there is less support for that page. In addition to PageRank, Google applies numerous other disclosed and non-disclosed criteria to determine the ranking of pages on result lists. Currently, the search engine's ongoing challenge is to enhance its ranking methodologies in such a way that each user may find the most personalized result for his or her online search as well as the most personalized ads, both based on all the personal information about each individual user that Google has progressively stored (based on previous searches, navigation patterns, personal information provided by users through Gmail and registration into other partner programs, etc.).³⁵