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► To cite this version:

Dragos-Paul Hagi, Marion Saquet, Henri Partouche, Serge Gilberg, Amandine Gagneux-Brunon, et al.. Impact of a shared medical decision-making aid on patient decisional conflict regarding human papillomavirus vaccination: a mixed-methods study. *Family Practice*, 2025, 42 (6), pp.cmaf077. <10.1093/fampra/cmaf077>. <hal-05353800>

HAL Id: hal-05353800

<https://hal.science/hal-05353800v1>

Submitted on 18 Nov 2025

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Impact of a Shared Medical Decision-Making Aid on Patient Decisional Conflict Regarding HPV Vaccination: A Mixed-Methods Study

Short title: Impact of a French HPV Vaccination Patient Decision Aid

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Key messages

- A digital decision aid (DA) was tested to support HPV vaccination decisions
- The tool significantly reduced users' decisional conflict
- Participants reported higher HPV vaccination intention after using the DA
- The DA fostered empowerment and improved communication
- Further research is needed to assess the impact on vaccine uptake

Abstract

Introduction

Human papillomaviruses (HPV) cause several vaccine-preventable cancers, including cervical cancer. In France, HPV vaccination coverage remains low. Decision aids (DAs) can help individuals make informed health choices. This study assessed the impact of an online DA (SOSHPV) on decisional conflict and vaccination intention, and explored user perceptions in real-life contexts.

Methods

A convergent mixed-methods design was used (November 2023–June 2024). The quantitative component included a pre-post questionnaire assessing knowledge, vaccination intention, and decisional conflict. The qualitative component involved semi-structured interviews with a subsample of users, analyzed using grounded theory.

Results

Among 943 website visitors, 187 participants (54 males, 12 adolescents) completed the pre-survey, and 44 (12 males, 6 adolescents) completed both assessments. Over half (54%) were young parents using the tool to support HPV vaccination decisions for their child. Post-intervention, knowledge improved ($p < 0.001$), and decisional conflict decreased ($p < 0.001$). Vaccination intention shifted: 55% to 75% in favor, 32% to 18% undecided ($p < 0.001$). Qualitative analysis ($n = 12$) revealed three themes: social ambivalence around vaccination, the DA as a support for informed choices, and its role in enhancing communication with healthcare providers.

Discussion

This study showed a reduction in decisional conflict and increased vaccination intention. These findings suggest that DAs may play an important role in addressing vaccine hesitancy and supporting value-aligned choices in real-world settings.

Conclusion

This study highlights the potential of an online DA to improve vaccine acceptance by reducing decisional conflict and enhancing dialogue. Further research is needed to assess its large-scale impact on vaccine uptake.

Keywords : Papillomavirus Vaccines ; Decision Support Techniques; Vaccination; Adolescent Health Services ; Health Communication; Primary Health Care

Introduction

Cervical cancer is the fourth most common cancer among women worldwide¹. In France, it ranks as the 12th most common cancer in women, with an estimated 3,159 new cases and 1,100 deaths in 2023². Over 99% of these cancers are caused by persistent infection with human papillomavirus (HPV), a sexually transmitted virus against which condoms offer only partial protection^{2,3}. The WHO recommends combining vaccination with cervical screening to eliminate cervical cancer⁴.

Moreover, HPV is linked not only to cervical cancer but also to oropharyngeal and genital cancers affecting both sexes—25% of HPV-related cancers occur in men^{2,3}.

Despite early implementation and reimbursement for girls aged 11 and up, and the more recent inclusion of boys in 2021⁵, France's vaccination rates remain low—under 50% for girls and 20% for boys in 2023—among the lowest in Europe⁶. HPV vaccination is seen as one of the most difficult to promote, particularly among socially disadvantaged groups^{7,8}. Barriers include lack of information, fear of side effects, and absence of physician recommendation. These challenges are further compounded by persistent vaccine hesitancy^{7,8}, recognized by the WHO as a major global health threat, with France ranking among the most vaccine-hesitant countries⁹.

In adolescents, the decision to vaccinate often falls to the parents, who must weigh perceived benefits against concerns about side effects or inadequate information⁷. This uncertainty can lead to decisional conflict, defined as hesitation between options involving risk or conflicting with personal values¹⁰. This conflict is exacerbated by unclear information, social pressure, low self-efficacy, and lack of medical guidance^{11,12}.

Decision aid (DA) tools have been developed to support individuals facing complex health decisions by facilitating informed choices, those that are both knowledge-based and aligned with personal values. DA achieves this by presenting clear, evidence-based information about available options and outcomes, while also helping individuals clarify what matters most to them in the decision-making process. By supporting both understanding and value alignment, DA helps reduce decisional conflict, improve patient–provider communication, and increase the proportion of decisions that are informed and personally meaningful^{10,13}.

A North-American study found that a clear recommendation by a healthcare provider is key to vaccine acceptance¹⁴. However many parents reported little follow-up after initially declining the HPV vaccine, despite wanting more information and dialogue¹⁵. To address these communication gaps, DA are increasingly used as complementary tools, either during consultations or beforehand, to enhance patient education and support shared decision-making^{13,16,17}. Although research on DAs is expanding^{10,13,14,18-21}, evaluations of their use in real-world, user-initiated contexts are still scarce^{13,18}.

In this context, the SOSHPV online DA²¹ was developed in 2021 by our team as part of the French national PrevHPV project²², in collaboration with adolescents, parents, and general practitioners (GPs). However, its real-world use and impact among end users - particularly in a French-speaking population, had not yet been evaluated.

This study aimed to assess the DA impact on decisional conflict and HPV vaccination knowledge and to explore individuals' perceptions in real-world conditions. Changes in vaccination intention were also examined.

Methods

Study Design

This study used a convergent mixed method²³ to assess the impact of an online DA on HPV decisional conflict, knowledge, perceptions and vaccination intention.

The SOSHPV decision aid was developed in line with IPDAS criteria, as detailed elsewhere²¹. The process involved defining objectives, assembling a multidisciplinary steering group, and co-designing the tool through a narrative literature review, two initial focus groups, and alpha testing with three additional groups and 11 interviews involving adolescents, parents, and GPs. Designed with adolescents in mind, the DA was intended to support shared decision-making more broadly. It includes evidence-based content, a self-reflection section, and a decisional conflict questionnaire.

A mixed-methods approach was chosen to provide a more comprehensive understanding of both the measurable changes in knowledge and attitudes (quantitative component) and the underlying reasoning, emotional responses, and real-life experiences influencing these outcomes (qualitative component), particularly relevant for shared decision-making in HPV vaccination. Quantitative and qualitative data were collected and analysed separately, then integrated during interpretation through collaborative discussions between the authors. The study is reported in accordance with the GRAMMS (Good Reporting of a Mixed Methods Study) for mixed-methods research²⁴, and the qualitative component follows the COREQ (Consolidated Criteria for Reporting Qualitative Research) checklist²⁵.

Sample and Recruitment

The sample consisted of internet users who visited the DA website²¹ between November 2023 and June 2024. The DA was made freely accessible online as part of the national PrevHPV project and was promoted by the French Institute for Public Health Research (IReSP), as well as on websites targeting health professionals, such as regional health agencies and local medical networks²⁶⁻²⁸. Participants were invited to participate in the study via a pop-up invitation when accessing the site. Those who agreed, completed a pre-intervention

questionnaire before interacting with the tool. A flashing button then allowed them to complete the same questionnaire post-intervention.

Participants gave informed consent before answering any questionnaires. At the end of the post-intervention survey, they were invited to participate in a qualitative semi-structured interview. No specific inclusion criteria were applied regarding profession or background, in order to capture a range of user experiences.

Questionnaire responses were matched using a unique identifier for each participant. For the purpose of this study, we considered all adolescents aged 10 to 19 years²⁹.

Quantitative Data Collection

The questionnaire included three parts: (i) HPV vaccination knowledge, (ii) decisional conflict, including vaccination intention, and (iii) sociodemographic data.

HPV vaccination knowledge was assessed using a 5-item questionnaire developed by the authors, based on a narrative review of the literature and aligned with recent French public health policy changes, such as the extension of the vaccination and its coverage to boys⁵. Items addressed recommendations for girls and boys, condom effectiveness, HPV-related cancer prevention, the recommended vaccination age (starting at 11), and the continued need for screening post-vaccination. Scores ranged from 0 to 5, with higher scores indicating greater knowledge.

Decisional conflict was assessed using the validated Decisional Conflict Scale (DCS), which measures uncertainty across five domains: feeling informed, values clarity, support, uncertainty, and decision effectiveness. Scores range from 0 to 100; values <25 indicate readiness, while >37.5 suggest indecision. The DCS is validated in French³¹ and has been used in HPV vaccination studies, including a parental DA study in China²⁰.

In this study, the decision focused on initiating HPV vaccination, referred to as vaccination intention. Vaccination intention was recorded pre- and post-exposure to the DA and tailored by age and parental status. Adolescents (11–19) were asked about their own intention to vaccinate. Adults were first asked about their children's vaccination status; if they had unvaccinated children, intention referred to vaccinating them. Otherwise, the question concerned their own vaccination intention.

To evaluate changes in intention, we tracked shifts in participants' responses and reported the net difference, along with the number of participants who moved toward or away from vaccination. To visualize how vaccination intentions changed following use of the DA, the evolution is presented as a pre-post bar chart.

The sociodemographic data collected included age, gender, education level, occupational category, awareness of HPV vaccination, and sources of information regarding HPV vaccination.

Qualitative Data Collection

Qualitative data were collected through semi-structured interviews, conducted in French via secure videoconferencing or in person when applicable. Individuals aged 11 and older were eligible, including minors. Two medical doctors trained in qualitative research (DPH and MS) conducted the interviews, which were transcribed verbatim, anonymized, and key excerpts translated into English. Transcripts were double-coded, with discrepancies resolved through discussion. Thematic analysis followed a grounded theory approach, and data collection continued until theoretical saturation was reached (when no new themes or insights emerged from the data).

Statistical Analysis

Descriptive and analytical methods were used to evaluate the impact of the DA tool on HPV vaccination knowledge, decisional conflict, and vaccination intention. An additional analysis compared participants who completed both the pre- and post-questionnaires (“completers”) to those who only completed the pre-questionnaire (“non-completers”), to assess potential attrition bias.

Descriptive Analysis

Sociodemographic characteristics, sources of information, and vaccination intention were described using frequencies and percentages for categorical variables and means (with standard deviations) for continuous variables.

Pre-post Comparisons

Pre- and post-intervention changes in HPV vaccination knowledge scores and decisional conflict scores were analysed. Normality of data distribution was assessed with the Shapiro–Wilk test. Depending on the distribution, Wilcoxon signed-rank tests (non-normal) or paired t-tests (normal) were applied.

Changes in HPV vaccination intention were analysed using Cochran’s Q test, suitable for comparing repeated binary responses across related conditions. Participants’ responses were categorized into three groups (“In favour of vaccination,” “Undecided,” or “Against”) and recorded into binary variables for analysis. A subgroup analysis for adolescent participants was planned.

Given the observational nature of the study, no a priori sample size calculation was performed. However, a post hoc power analysis was conducted to assess whether the final sample provided sufficient power to detect meaningful pre–post differences.

Attrition Analysis

To assess the potential impact of participant attrition, we conducted a comparative analysis between participants who completed both the pre- and post-intervention questionnaires (“completers”) and those who only completed the pre-intervention questionnaire (“non-completers”). For categorical variables (e.g., education level, source of information, vaccination intention) Chi-square test. For continuous variables (e.g., age, knowledge score, decisional conflict score): Student’s t-test or Mann-Whitney U test depending on normality.

Software and Significance Thresholds

All analyses were performed using Jamovi. Post hoc power calculations were performed using G*Power (Version 3.1.9.6). A p-value < 0.05 was considered statistically significant.

Results

I- Quantitative results:

During the study period (November 2023 to June 2024), the DA website was visited by 943 individuals, among whom 245 responded to the pop-up invitation to participate in the study. Of these, 187 completed the initial questionnaire, and 44 participants ultimately provided matched pre- and post-intervention responses. Figure 1 displays the participant flow diagram.

Figure 1.

Baseline characteristics of the study population, presented in Table 1, show a predominance of participants with a high level of education. 55.3% of completers and 46.0% of non-completers—reported receiving information about HPV vaccination primarily from the family doctor, followed by input from family circle. Information from the school environment was less frequent, ranking third among all sources in both groups. Overall, 54% (101/187) were deciding for their child, suggesting most users were young parents rather than adolescents (38.6% of completers vs. 58.7% of non-completers). Among parent users, 31 had at least one vaccinated child (30.7%), while 70 (69.3%) had not yet vaccinated any.

A comparison between participants who completed both questionnaires (“completers”) and those who did not, revealed that completers were younger (mean age: 31.3 vs. 37.1 years; $p = 0.02$) and reported higher initial decisional conflict (scores 36.2 vs 20.3 $p < 0.001$). Among

non-completers, 64.3% favored vaccination, 25.2% were undecided, and 10.5% were against, similar to completers (54.6%, 31.8%, and 13.6%, respectively), with no significant differences.

Table 1. Baseline Characteristics of 187 Online Users Accessing a French HPV Decision Aid Tool by Study Completion Status (France, 2023–2024)

Pre-post comparisons of DCS scores and subscores, HPV knowledge score, and vaccination intention are shown in Table 2. Results demonstrated a significant improvement in both knowledge scores (+0.56, $p < 0.001$) and decisional conflict scores (-22.5 , $p < 0.001$) across all subgroups.

Post hoc power analyses indicated that the sample of 44 participants was sufficient to detect meaningful changes in both outcomes. For decisional conflict, the observed effect size ($r = 0.79$) corresponded to a power $> 99\%$, while for HPV knowledge, an effect size of $r = 0.54$ yielded a power of 93.8%.

Table 2. Pre-/Post-Intervention : Comparison of HPV vaccination knowledge, decision self-efficacy, decisional conflict scores, and vaccination decisions before and after using the DA (mean) among 44 french online users of an HPV decision aid tool (2023-2024)

Change in Vaccination Intention

Participants' vaccination opinions were significantly different before and after using the DA ($p < 0.001$).

A pre-post bar chart (Figure 2) shows vaccination intention before and after using the decision aid. The proportion in favor increased from 55% (24/44) to 75% (33/44), with 9 participants shifting from “undecided” and 2 from “against.” Of the 24 initially in favor, 22 remained, one became undecided, and one moved to “against.”

The undecided group decreased from 14 to 6, 9 shifted to “in favor,” 2 to “against,” and 3 remained undecided. The number “against” changed slightly (6 to 5): 2 remained opposed, 3 shifted away (2 to undecided, 1 to in favor), and 2 new participants moved into the “against” category.

Figure 2

Subgroup Analysis: Adolescents

A subgroup analysis focusing on adolescents (n=6) revealed a reduction in decisional conflict, but no changes in knowledge, self-efficacy, or vaccination intention.

II-Qualitative results:

The sample consisted of 12 participants aged between 11 and 69 years.. The average duration of the interviews was 25.5 minutes. Theoretical data saturation was reached by the 11th interview and confirmed by an additional interview.

Most interviews were conducted online via secure videoconferencing platforms with two interviews being held in-person. One participant (P4) identified as a nurse, which may have influenced their views on shared decision-making and patient engagement. Among the twelve interviews conducted, one (P11) involved a joint discussion between an 11-year-old girl and her mother.

The qualitative analysis revealed three central and interrelated meta-themes: (1) Before the DA - vaccination as a reflection of current social ambivalence and information overload, (2) The DA as a Tool for Supporting Autonomy and Informed Choices, and (3) The DA as a communication bridge between patients and healthcare providers.

- 1) Before the DA - vaccination as a reflection of current social ambivalence and information overload

An Imposed Course of Action and the Lack of Collective Protection Awareness

Participants expressed a loss of personal autonomy, feeling that vaccination was imposed on them: *"I was never really presented with the advantages or risks; it was always just 'you get vaccinated, and that's it'" (P2).*

This perception was compounded by a lack of initiative in seeking information: *"I rarely look up information about a vaccine" (P6).*

Additionally, participants appeared to lose sight of the concept of collective protection, framing the decision in individual terms: *"I don't get the flu shot because I don't want an extra vaccine... I never caught the flu anyway" (P6).*

The absence of a mandate also played a role in shaping vaccine decisions as illustrated by one participant, a nurse, who recounted: *"She didn't want to inject something into her child since it wasn't mandatory" (P4).* However, this was not universal—some participants still acknowledged social responsibility: *"It was also about protecting my loved ones" (P8).*

Irrational Fears and the “Too Much Information” Issue

This sense of imposed vaccination and loss of personal autonomy was linked to an overwhelming number of information sources. Participants mentioned irrational fears and suspicions of political or financial influence:

"A lot of people say that vaccination is just a scheme by pharmaceutical lobbies, and that doctors get commission payments" (P6).

Structural Barriers to Information - Perceived Reliability and Accessibility of Sources.

Communication methods did not align with current public expectations and habits. Participants noted the disappearance of traditional and “secure” sources of information and the lack of widespread media campaigns:

"Doctors used to visit schools... just like family planning used to be done in the past, but that doesn't exist anymore" (P7).

The issue of unequal access to vaccination information was frequently raised, particularly regarding family communication and women's health:
"These topics can be taboo in some families, so sometimes the only place to talk about them is at school or with a doctor" (P6).

2) The DA as a Tool for Supporting Autonomy and Informed Choices

The tool helped simplify scientific information, making it accessible to those who might otherwise feel excluded: *"With this kind of tool, you can inform a lot of people about things that aren't well known in certain places" (P9).*

The tool also appeared to restore a sense of responsibility in health choices: *"It would make people more aware, take better care of themselves, and improve overall health" (P5).* However, some participants found this autonomy unsettling: *"I've never been asked for my opinion, so if suddenly they do, it makes me think there's a bigger risk" (P1).*

Summarizing Reliable Sources

The tool effectively consolidated various sources of information: *"It's a good summary of scientific studies, so you don't have to dig through all the medical societies' reports... and it comes from credible sources"* (P4).

Speaking the Same Language and Structuring Communication

The tool was perceived as a way for doctors and participants to better understand each other: *"It helps guide discussions because sometimes the way I explain my issues doesn't help the doctor get on the right track"* (P1).

The tool provided reassurance that both parties had understood each other and conveyed the right message: *"It's a more relaxed approach in the long term, even for the doctor, because it's easier to talk to someone who really understands their situation"* (P1).

Additionally, it helped structure medical consultations and ensure thoroughness: *"Doctors can forget to mention some important details"* (P3). *"When you go to the doctor, sometimes you get lost in the conversation, and when you leave, you feel like you've made progress—but not really"* (P5).

Aligning with One's Decision and Promoting Treatment Adherence

Using this tool as part of shared medical decision-making helped participants feel aligned with their final choice, reducing fear and regret while ensuring decisions matched their values: *"Making the right decision for oneself and in line with one's values"* (P6). *"Ensuring both parties agree on the course of action"* (P9).

One participant drew a comparison with chronic illness management, highlighting that autonomy enhances commitment:

"Take a diabetic, for example—if you just tell them, 'this is how it is, take this and that's that,' they'll probably never really follow the treatment. But if you explain the treatments, the consequences, the different options they have, they'll get more involved than if everything is imposed from the start" (P4).

Another emphasized how shared decision-making could define what "good care" means: *"In the end, we talk a lot about what constitutes good care—but maybe this is what matters most: if you agree with your doctor and feel like the decision was made with you, not imposed on you, then you're more likely to follow through with treatment."* (P9).

3) The DA as a communication bridge between patients and healthcare providers

A Bridge Between Doctor and Patient, and the Need for Decision-Making Time

Participants felt that the DA would help sustain dialogue, acting as a bridge between the doctor and patient. It allowed them to reflect on the information at home and return to the doctor with further questions: *"It maintains the connection—the doctor provides the material, and it follows you home, allowing you to continue thinking about it"* (P5).

Participants also highlighted the need for more time—both during consultations and for personal reflection: *"In a consultation, the person won't absorb everything or take the time to process it"* (P9). *"It makes follow-up discussions easier because you already have some information... it's a lasting resource"* (P5).

The Human Discussion Supporting the DA (and Vice Versa)

Participants emphasized that neither the DA nor human interaction alone was sufficient; rather, they complemented each other in restoring trust and patient engagement: *"The tool could back up what the doctor says, even if I don't fully trust the doctor"* (P4). *"I prefer when it's presented by a doctor because people can ask questions directly"* (P8).

However, for trust to develop, shared decision-making needed to become routine: *"It would be good if this approach were more widespread because if a patient isn't used to it, they might feel unsettled"* (P1).

The Final Decision—Not Always What Was Expected

Finally, some acknowledged that shared decision-making might lead to unexpected choices. Patients might not always make the decision preferred by the doctor, or they might choose an option that ultimately isn't ideal for them. Yet, they emphasized that respect for patient autonomy fosters better engagement with treatment.:

" Sometimes, from my perspective, the patient might not make the best decision. But it's still their decision—and if you go against it, the treatment's effectiveness and therapeutic value will be lower" (P4).

III-Convergence of Quantitative and Qualitative results:

The integration of quantitative and qualitative findings informed a conceptual model (Figure 3) highlighting the DA as a central mediator in HPV vaccination decision-making. Developed using a grounded theory approach, the model draws on both measurable outcomes (e.g., reduced decisional conflict, increased intention) and participants' experiences.

The model reflects key emergent themes—such as ambivalence prior to using the DA, improved autonomy, and enhanced patient-healthcare professional communication—and illustrates how these qualitative insights align with measurable outcomes

The DA appears as a central element mediating these changes, supporting informed, value-congruent decisions. As one participant put it: “It’s the exchange... and the satisfaction at the end” (P5).

Figure 3.

Discussion

This convergent mixed-methods study evaluated the impact of an online DA on HPV vaccination knowledge, decisional conflict, and intention. Quantitatively, the DA significantly improved HPV-related knowledge and reduced decisional conflict across all subdomains, especially among initially undecided users. Vaccination intention increased, though some shifts away from vaccination were also observed. Qualitative findings enriched these results, highlighting that the DA supported informed, value-based decisions rather than persuasion.

Prior HPV-specific DA studies in China²⁰, the Netherlands³³, Canada³⁴ and Israel³⁵ have shown similar improvements in knowledge and reductions in decisional conflict, though impact on uptake varied depending on baseline coverage and context. In the U.S., a multifaceted intervention including a DA increased vaccination¹⁹. These findings, like ours, reinforces that the primary function of DAs is not to increase uptake per se, but to support informed, value-congruent decisions.

This study extends existing HPV DA research by evaluating how such tools function when accessed independently, outside of clinical or research settings. While previous studies have demonstrated similar effects under guided conditions, our results show that individuals can meaningfully engage with DAs on their own. This contributes to the implementation literature by providing real-world evidence on the feasibility of standalone DAs in routine health decision-making. Furthermore, our qualitative results offer additional depth, illustrating how users experience autonomy, navigate uncertainty, and use DAs to structure communication.

In our qualitative interviews, participants consistently described the DA as a helpful resource for clarifying their views, even when their final decision diverged from health authority recommendations. Similar findings emerged from a French COVID-19 DA study³⁷, where users appreciated the tool but noted it didn’t necessarily change their decision.

As one participant, a nurse, reflected: *“Sometimes the patient might not make the best decision. But it’s still their decision—and if you go against it, the treatment’s effectiveness and therapeutic value will be lower” (P4)*. This highlights how supporting informed autonomy, even when decisions differ from clinical expectations, can foster trust and engagement.

Strengths and Limitations

A strength of this study is its real-world, user-initiated design, which reflects how digital DAs may be used in routine, unsupervised contexts. The mixed-methods approach enabled both quantitative outcome assessment and qualitative insight into user experiences and decision-making processes.

However, several limitations warrant discussion. First, a possible selection bias: participants who completed both surveys were more often undecided, suggesting the tool reached its target audience but may not reflect the broader population. Second, the short time between assessments may have inflated outcomes via short-term recall effects.

Interview data may have been influenced by social desirability bias, as interviews were conducted by healthcare-trained researchers. The small sample size, particularly among adolescents, limits generalizability and must be interpreted with caution. Only six adolescents participated in the quantitative phase and two in the interviews.

Additionally, participants’ own HPV vaccination status was not systematically collected, limiting interpretation of shifts in vaccination intention. Nonetheless, this exploratory study identified relevant trends and user experiences, laying the groundwork for future large-scale evaluation.

Our findings also raise questions about the DA’s target audience. While designed for adolescents, most users were young parents deciding for their children. This suggests future tools may need to differentiate content and format for both adolescents and parents.

School-based HPV campaigns in France present an opportunity to integrate DAs earlier in the decision process. Used by school nurses or public health teams, these tools could support informed communication. This aligns with recent calls³⁷ to embed interventional research into real-world strategies to maximize both equity and impact. While our findings are promising, large-scale validation is needed to confirm effectiveness.

Conclusion

This study offers preliminary evidence that a digital DA can reduce decisional conflict and increase HPV vaccination intention, particularly among undecided users. Qualitative findings suggest the DA helped participants shift from passive recipients to active decision-makers by fostering confidence, reflection, and dialogue.

While limited by selection bias and underrepresentation of adolescents, the study underscores the potential of DAs to support informed, value-based vaccination choices. Future research should assess real-world effectiveness over time and adapt content to meet the needs of both adolescents and their parents.

Declarations

Ethical Considerations

Informed consent was obtained from all participants before their involvement in the study. Anonymization of participant data was ensured through unique identifiers for quantitative data and the removal of identifiable information from qualitative transcripts. The study received ethics committee approval on 8 November 2023, IRBN1322023/CHUSTE.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Data availability

The data that support the findings of this study are available from the corresponding author upon request.

Funding

The PrevPHV study is conducted with the support of IReSP and Inserm, and with financial support from ITMO Cancer AVIESAN (Alliance Nationale pour les Sciences de la Vie et de la Santé/ National Alliance for Life Sciences & Health) within the framework of the Cancer Plan. The funder have not been involved in the conceptualization, design, data collection, analysis, decision to publish, nor preparation of the manuscript.

Acknowledgments

The authors would like to thank the representants of the following institutions who participate to the steering committee of the research programme: Inserm, IReSP, ITMO Cancer AVIESAN, ITMO Public Health AVIESAN, INCa (the French National Cancer Institute), the French Public Health Agency (Santé publique France), Ministry of Health, Ministry of National Education.

The authors would also like to thank Prof. Xavier Gocko and Dr. Elodie Charuel for their valuable input.

Collaborators

The PrevHPV Study group includes the authors of the present manuscript and: For the team 1: Aurélie Bocquier, Stéphanie Bonnay, Maïa Simon; for the team 2: Marie Ecollan, Juliette Pinot, Louise Rossignol, Arthur Tron, Minghui Zuo; for the team 3: Gaëlle Vareilles, Julie Bros, Catherine Juneau; for the team 4: Marion Branchereau; for the team 5: Elisabeth Botelho-Nevers, Géraldine Jambon, Florian Jeanleboeuf, Julie Kalecinski, Christine Lasset, Laetitia Marie Dit Asse; for the team 7: Jonathan Sicsic, Jocelyn Raude, Sandra Chyderiotis, Damien Oudin-Doglioni, Anne-Sophie Barret, Isabelle Bonmarin, Daniel Levy-Bruhl; Clémence Castagnet (Inserm), and Mélanie Simony (IReSP).

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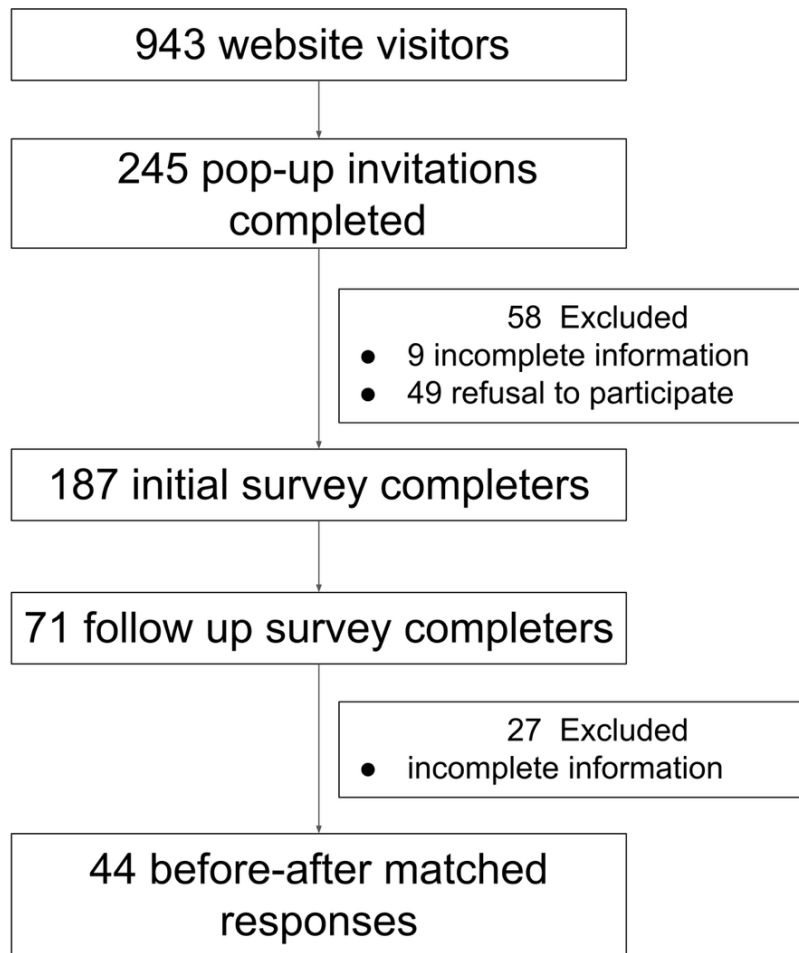
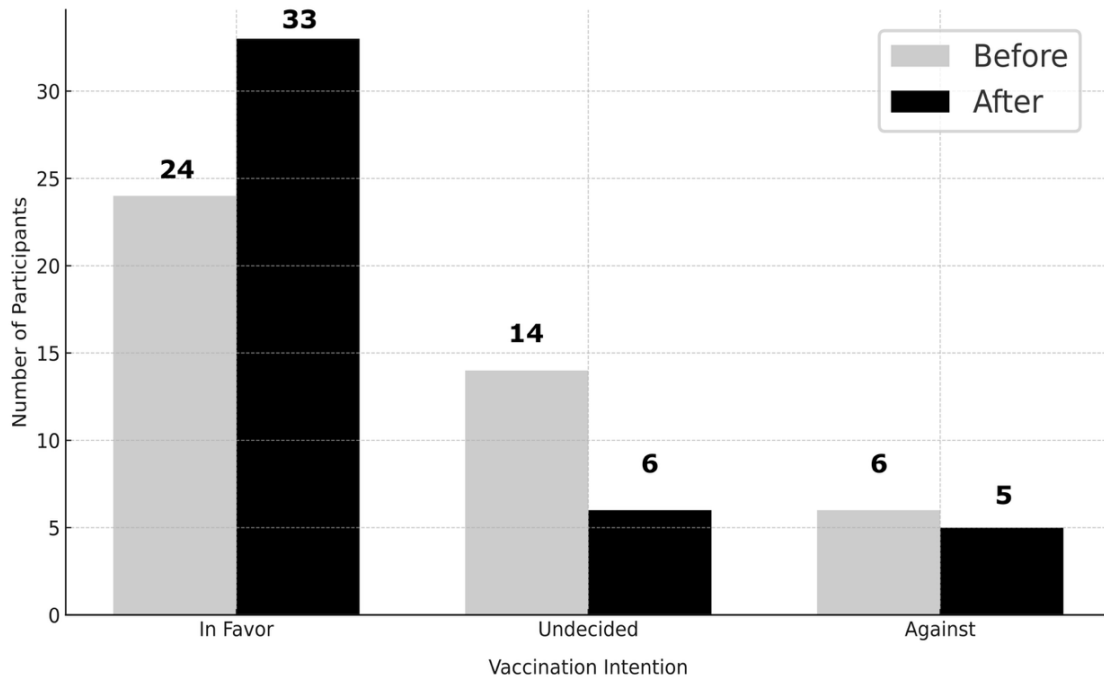


Figure 1. Study flowchart of online users participating in the evaluation of an HPV decision aid tool (France, 2023–2024).

Change in HPV Vaccination Intention Before and After Using DA (n=44)



Note: The matched pre-post bar chart shows overall distribution, detailed participant-level shifts are described in the text.

Figure 2. Pre-post bar chart illustrating the evolution of HPV vaccination decisions before and after exposure to the decision aid, among online users (France, 2023–2024).

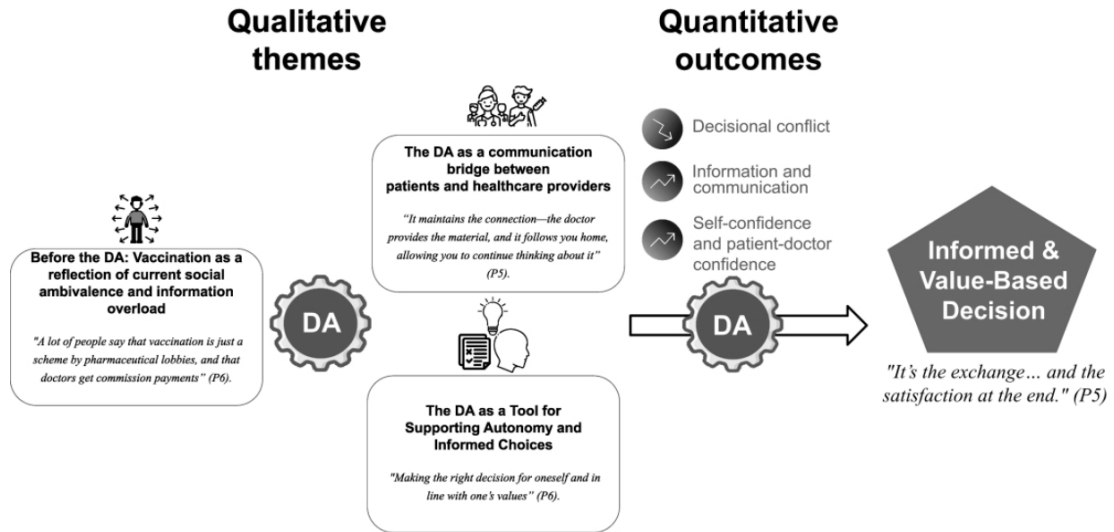


Figure 3. Conceptual model illustrating how the decision aid acted as an activating mechanism in HPV vaccination decision-making, based on participant interviews (France, 2023–2024).

Table 1. Baseline Characteristics of 187 Online Users Accessing a French HPV Decision Aid Tool by Study Completion Status (France, 2023–2024)

	Completers		Non-completers		P
	N=44	%	N=143	%	
Age	31.3 ± 10.8	SD	37.1 ± 11.4	SD	p=0.02
Women	32	72.7	101	70.6	p=0.87
Adolescents	6	13.6	6	4.2	p=0.025
Knowledge Score, mean ± SD	4.3 ± 1.0		4.3 ± 1.0		p=0.88
Decision for child (parent)	17	38.6	84	58.7	p=0.019
• ≥1 child already vaccinated	5	29.4	26	31.0	p=0.9
DCS Score, mean ± SD	36.2 ± 21.4		20.3 ± 21.18		p<0.001
Vaccination Intention					p=0.50
• In favor	24	54.6	92	64.3	
• Undecided	14	31.8	36	25.2	
• Against	6	13.6	15	10.5	
Awareness of HPV Vaccination	38	86.4	137	95.80	p=0.19
Sources of Information					p=0.49
Family Doctor	21	55.3	63	46.0	
Family circle	8	21.1	26	19.0	
School	3	7.8	17	12.4	
Internet	4	10.5	11	8.0	
Other	2	5.3	20	14.6	
Education Level					p=0.69
Higher education	34	80.9	131	91.6	
High school or equivalent	5	11.9	6	4.3	
Middle school or equivalent	3	7.1	2	1.4	
Occupational category					p=0.37
Medical profession	13	29.6	51	36.2	
Employee	15	34.1	37	26.2	
Student	6	13.6	8	5.7	
Freelancers / Executives I	8	18.2	38	26.9	

Unemployed / Retired	2	4.5	6	4.3
Skilled / Manual Workers	0		1	0.7

* Elements in bold are statistically significant ($p < 0.05$). *p-values derived from Chi-square tests for categorical variables and Mann-Whitney U test for continuous variables*

Table 2. Pre-/Post-Intervention : Comparison of HPV vaccination knowledge, decision self-efficacy, decisional conflict scores, and vaccination decisions before and after using the DA (mean) among 44 french online users of an HPV decision aid tool (2023-2024)

	Before	After	Evolution	P
Vaccination Intention N (%)				p<0.001
• In Favor	24 (55%)	33 (75%)	+9 (+11/-2)	
• Undecided	14 (32%)	6 (14%)	-8 (+3/-11)	
• Against	6 (14%)	5 (11%)	-1 (+3/-4)	
Knowledge Score Mean (SD)	4.3 (1.0)	4.9 (0.4)	+0.5	p<0.001
DCS Score Mean (SD)	36.2 (+/-21.4)	13.7 (+/-14.68)	-22.5	p<0.001
DCS Subscores				
Informed decision	48.1 (30.2)	11.4 (15.2)	-36.8	p<0.001
Values clarity	42.4 (26.4)	13.8 (16.0)	-28.6	p<0.001
Support	27.5 (19.9)	15.2 (18.4)	-12.1	p<0.001
Uncertainty	35 (25.8)	13.5 (17.7)	-21.6	p<0.001
Effective decision	30.1 (21.6)	14.6 (18.6)	-15.5	p<0.001

* Elements in bold are statistically significant ($p < 0.05$). *p-values derived from Cochran's Q test for categorical variables and Wilcoxon Signed Rank test for paired continuous variables*