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## HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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# HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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HPV vaccine, HPV vaccine awareness, HPV vaccine knowledge, HPV vaccine information sources, HPV vaccine uptake, youth

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3 **39 ABSTRACT:**  
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6 **40 Objectives:** We aimed to provide a detailed characterization of HPV vaccine awareness,  
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8 **41** knowledge, and information sources in the HPV vaccine decision-making process of youth, both  
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11 **42** male and female, in Switzerland.

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13 **43 Design:** With a mixed-methods study design, we conducted quantitative questionnaires and  
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15 **44** qualitative interviews, which lasted 20-45 minutes.

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18 **45 Setting and participants:** We recruited participants, 15-26 years of age, in physicians'  
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20 **46** offices, in a local sexual health clinic, and during military enlistment. We conducted quantitative  
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22 **47** questionnaires with 1001 youth participants (588 male, 413 female) and qualitative interviews  
23  
24 **48** with 31 youth (17 male, 14 female).

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27 **49 Primary and secondary outcome measures:** We assessed HPV vaccine awareness,  
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29 **50** knowledge, information sources and vaccination status.

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32 **51 Results:** In the study's quantitative component, 109 (20%) male and 262 (65%) female  
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34 **52** participants had received  $\geq 1$  dose of HPV vaccine. 697 (70%) participants were knowledgeable  
35  
36 **53** about the HPV vaccine. Females were more likely to be knowledgeable than males (342/412  
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38 **54** [83%] vs. 355/585 [61%];  $p < 0.01$ ). Younger participants in the sample compared to older  
39  
40 **55** participants were more likely to be aware about HPV vaccine (135/148 [91%] vs. 695/849 [82%];  
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42 **56**  $p < 0.01$ ). The three most mentioned information sources were school health programs (444  
43  
44 **57** [53%]), health care providers (191 [23%]), and participants' social networks (163 [20%]). Overall,  
45  
46 **58** 554/711 (78%) participants had a female-gendered perception of HPV vaccine, a finding which  
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48 **59** was further supported and explained by qualitative data.

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53 **60 Conclusions:** Despite a male HPV vaccine recommendation being made  $>4$  years prior to the  
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55 **61** data collection, HPV vaccine knowledge was higher among females than males, and a female-

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3 62 gendered perception of HPV vaccine remains prevalent. Internet and social media were minor  
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5 63 HPV vaccine information sources. Study findings demonstrate that HPV knowledge matters for  
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7 64 HPV vaccine uptake and suggest that we should improve HPV information quality and access for  
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10 65 youth, particularly by tailoring knowledge campaigns to young men.  
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3 67 **Strengths and limitations of this study:**  
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- 6 68 • One major strength of the study is that it uses a mixed methods approach, allowing for  
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8 69 the qualitative data to offer potential explanations to quantitative findings.  
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10 70 • The study included a large number of female and male youth, allowing us to gain  
11  
12 71 gendered differences regarding HPV vaccination information sources.  
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14 72 • One limitation of this study is that we might overestimate HPV vaccination knowledge  
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16 73 based on the way we classified answers for the quantitative component.  
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18 74 • Our sampling strategy led to a non-representative sample.  
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## 76 1. Introduction

77 Surprisingly little research has directly examined youth knowledge, awareness, and information  
78 sources as determinants of *human papillomavirus (HPV)* vaccine uptake. Furthermore, the  
79 research that has been done on youth perspectives has primarily focused on females [1-6],  
80 although the vaccine has been recommended for male youth for several years in many  
81 countries. Literature on the determinants of HPV vaccine attitudes and uptake among male  
82 youth remains limited [7-12]. Furthermore, the false perception that the HPV vaccination  
83 concerns only women continues to persist in popular discourse since it has been long known as  
84 the “cervical cancer vaccine” [3, 13].

85 In addition to issues related to access barriers [2, 14], previous reports in male and female youth  
86 suggest that low HPV vaccine uptake is also related to limited HPV vaccine awareness and  
87 knowledge [11, 15-17], and to the behavioral expectations youth perceive from their parents,  
88 family members, and peers [18, 19]. The most consistent predictor of HPV vaccination is having  
89 received a recommendation from a health care provider [12, 14, 20].

90 Previous research has focused on parents' attitudes and information sources towards HPV  
91 vaccine since the primary target group are 11-14-year-old adolescents [21-26]. A key component  
92 of the Swiss National Vaccination Strategy (NVS), in order to increase HPV vaccination rates,  
93 however, is to address insufficient levels of youth vaccination knowledge, e.g. by emphasizing  
94 the importance of school vaccination programs [27]. Also, the NVS aims to address insufficient  
95 vaccination access, e.g., by removing financial barriers, especially for young adults with limited  
96 financial resources. The effective implementation of each of these NVS approaches would  
97 benefit from additional research on HPV vaccine awareness, knowledge, and information  
98 sources in youth. We have recently documented the validity of measuring vaccine hesitancy  
99 (VH) in youth using the Youth Attitudes about Vaccines (YAV) questionnaire, which shows that



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2  
3 100 VH is an independent predictor of HPV non-immunization in Switzerland in female youth  
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5 101 **(Oleraweju V. et al, manuscript in preparation; Kiener L., Schwendener C., et al, manuscript in**  
6  
7 **102 preparation).**  
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9  
10 103 The aims of the present study were to provide a detailed characterization of HPV vaccine  
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12 104 awareness, knowledge, and information sources in the HPV vaccine decision-making process  
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14 105 among youth, both male and female, in Switzerland. We additionally aimed to gain a more  
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16 106 current understanding of gendered aspects youth may have around the HPV vaccine. Finally, we  
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18 107 examined how these factors contribute to HPV vaccine uptake in both sexes and in younger and  
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21 108 older adolescents.  
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## 110 **2. Methods**

### 111 *2.1 The Swiss Context*

112 The Swiss Federal Office of Public Health (FOPH) and the Federal Vaccination Commission have  
113 recommended HPV vaccine since 2007 for female youth [28], and since 2015 for male youth  
114 [29]. HPV vaccine uptake has increased in the last decade [30], but lies still below the 80%  
115 immunization target [31]. In 2017-2019, the most recent evaluation period, only 20% of 16-year  
116 old males and 64% of females, had received  $\geq 1$  dose of HPV vaccine on average throughout  
117 Switzerland [32]. Regional differences in uptake have been associated with specifics of  
118 vaccination policies of local health authorities, limited information access, and the availability  
119 and quality of school vaccination programs [33, 34].

### 121 *2.2 Study design*

122 We applied a convergent mixed-methods design [35], meaning we collected qualitative and  
123 quantitative data in parallel. We conducted the study in the context of our Swiss national  
124 research program (NRP74) on the determinants of VH in Switzerland regarding childhood and  
125 HPV vaccination. The local institutional review board (Ethikkommission Nordwest- und  
126 Zentralschweiz) approved the study. All participants provided written informed consent. Full  
127 details on our recruitment methods, power calculation, and the questionnaire have been  
128 previously published [36].

### 130 *2.3 Study population and recruitment*

131 Participants were 15-26 years of age, male and female. Of note, youth in Switzerland are legally  
132 able to make vaccine decisions starting at age 14 [37], which supports vaccination promotion  
133 efforts which focus on youth perspectives on HPV vaccination. Even though the primary target

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3 134 group is 11-14-year-olds, the vaccine is also recommended as a catch-up vaccine until 26 years  
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5 135 in many countries, including Switzerland. We recruited participating youth in the offices of  
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7 136 physicians providing biomedicine and sometimes additionally complementary and alternative  
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9 137 medicine (CAM), and in a local sexual health clinic. Recruitment was done in urban and rural  
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11 138 areas, and in 3 of 4 Swiss language regions, i.e., German, French, Italian. In order to gain more  
12  
13 139 male participants, we also recruited during military enlistment (military service is compulsory for  
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15 140 Swiss males, with enlistment being at age 18-24). Since July 1<sup>st</sup>, 2016 HPV vaccine has been  
16  
17 141 covered by mandatory health insurance for male adolescents 11-14 years of age and as a catch-  
18  
19 142 up vaccination until age 26 in Switzerland. We therefore divided male participants in an older  
20  
21 143 and a younger age group. We refer to male participants born before vs. on/after July 1<sup>st</sup>, 2002 as  
22  
23 144 the “older” and “younger” participants, respectively, meaning that younger male participants  
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25 145 were part of the HPV vaccine target age group when 11-14 years of age. For comparison  
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27 146 purposes, we applied the same age cut-offs to female participants.  
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#### 34 148 *2.4 Patient and public involvement*

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36  
37 149 We did not include patient or public involvement in designing the study, commenting the  
38  
39 150 outcomes, interpreting the results of this study or reviewing the manuscript.  
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#### 42 43 152 *2.5 Quantitative methods*

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46 153 As previously reported [36], we developed German, French, Italian, and English versions of the  
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48 154 questionnaire. We interviewed military participants on site (face-to-face), and the other  
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50 155 participants on the phone, after the physician/clinic visit. Quantitative interviews lasted 25-35  
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52 156 minutes and were conducted by medical students with previous training in participant  
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54 157 recruitment, informed consent procedures and interview techniques. Interviews were  
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3 158 conducted from January 2019 to April 2020. All data was entered to open data kit (ODK) using  
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5 159 tablets [36]. The questionnaire included socio-demographics including language, place of  
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7 160 residence, living situation (with parents, with roommates, with partner), age, nationality, and  
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9 161 school HPV vaccination program availability.

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12 162 HPV vaccination status (has received  $\geq 1$  dose of HPV vaccination) was assessed based on review  
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14 163 of the vaccination booklet of the participant, and, if unavailable, on personal report of being  
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16 164 vaccinated.

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19 165 In order to measure youth *awareness* about the HPV vaccine, we asked all participants if they  
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21 166 had heard of the HPV vaccine. To accommodate for a gendered perception, for those who said  
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23 167 “no” to the previous question, we asked if they had heard of the “cervical cancer vaccine.” To  
24  
25 168 measure youth *knowledge* about the HPV vaccine, we asked participants what the HPV vaccine  
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27 169 is intended for. Those who responded correctly were considered to be knowledgeable. We  
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29 170 considered an answer to be correct if they mentioned at least one correct aspect about the HPV  
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31 171 vaccine, i.e., it protects against “cancer”, “cervical cancer”, “papilloma virus”, or a “sexually  
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33 172 transmitted disease”. We sought to establish where youth obtained information about the HPV  
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35 173 vaccination by asking two questions, each with free text answer options in order to document  
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37 174 the most precise responses: (1) “Where have you heard about HPV vaccination?” and (2) “Who  
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39 175 did you consult with when deciding whether or not to get the HPV vaccine?”. Answers to the  
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41 176 second question included consulting people as well as traditional media, the internet, and other  
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43 177 forms of information supply.  
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## 49 179 2.6 Qualitative methods

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52 180 After completion of the quantitative interviews, participants were invited to participate in an  
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54 181 additional qualitative interview. We subsequently contacted interested youth who indicated  
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3 182 willingness in the German- and French-speaking regions of Switzerland. Additional participants  
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5 183 were recruited through researcher and participant social networks and by snowball sampling.  
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7 184 Our research team collaboratively developed a semi-structured interview guide, which we  
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10 185 piloted and revised iteratively for clarity and coherence. The interviews allowed us to gather  
11  
12 186 background information about the youth, their health status and lifestyle, the HPV vaccine  
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14 187 decision-making process, including knowledge, awareness, information sources, and the people  
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16 188 with whom they discussed the vaccination. Qualitative interviews were conducted face-to-face  
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18 189 or online (Skype or Zoom), lasted 20-45 minutes, and were audio-recorded and transcribed  
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20  
21 190 verbatim. Qualitative data were analyzed by social scientists Andrea Buhl and Michael J. Deml.  
22  
23 191 Analysis of the qualitative interviews was guided by the Framework Method [38] with support of  
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25 192 MAXQDA software. All quotes from interviews have been translated from German or French  
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28 193 into English and anonymized.  
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### 194 3. Results

195 For the study's quantitative component, we completed telephone interviews with 1010 youth.  
196 Of these, we excluded eight participants because they did not meet the age criteria, and one  
197 participant because of missing gender information. Quantitative analyses are therefore based  
198 on 1001 participants (588 male, 413 female). Their characteristics are shown in **Table 1**. For the  
199 study's qualitative component, we conducted 14 qualitative interviews with female youth and  
200 17 interviews with male youth. Qualitative participants ranged in age from 15 to 26 years in age  
201 (average ~21 years). Characteristics of the participants of the qualitative interview are shown in  
202 **Table 2**.

203 In the following sections, we present results regarding: (1) awareness and knowledge about the  
204 HPV vaccination, (2) youth HPV vaccination information sources and people with whom they  
205 had discussed the vaccination, and (3) youth's gendered perceptions of the HPV vaccine.

#### 207 3.1 Awareness about HPV Vaccination

208 For the purpose of this study, we defined *awareness* as having heard of the HPV or "cervical  
209 cancer" vaccine. For this analysis four additional quantitative interviews were excluded due to  
210 missing answers on HPV awareness and knowledge.

211 Significantly more female youth were aware of the HPV vaccine than male youth. Of the 997  
212 participants, 461 (46%) had heard of the HPV vaccine; 176/585 (30%) males and 285/412 (69%)  
213 females ( $p < 0.01$ ). Among the 536 participants who had not heard of HPV vaccine, 369 (69%) had  
214 heard of the "cervical cancer vaccine", 255/409 (62%) males and 114/127 (90%) females  
215 ( $p < 0.01$ ).

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217 Of the 997 participants, 830 (83%) had heard of the HPV or "cervical cancer vaccine", 431/585

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3 218 (74%) of males and 399/412 (97%) of females ( $p<0.01$ ). In both awareness of HPV vaccine and  
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5 219 awareness of “cervical cancer vaccine”, females had more awareness than males. 695/849 (82%)  
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7 220 of the older participants and 135/148 (91%) of the younger participants had heard of the HPV or  
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9 221 “cervical cancer vaccine” ( $p<0.01$ ). Details are shown in **Figure 1**.

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14 223 Of the 1001 participants, 371 (37%) had received  $\geq 1$  dose of HPV vaccine. As shown in **Figure 2**,  
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16 224 participants with greater awareness had also more often received  $\geq 1$  dose of HPV vaccine  
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18 225 compared to participants with limited awareness (362/830 [44%] vs. 8/110 [7%];  $p<0.01$ ). This  
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20 226 effect was manifest in males (102/431 [24%] of aware males vs. 6/106 [6%] of males with  
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22 227 limited awareness had received  $\geq 1$  HPV vaccine dose;  $p<0.01$ ), but not in females (260/399 of  
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24 228 aware females [65%] vs. 2/4 [50%] of females with limited awareness had received  $\geq 1$  HPV  
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26 229 vaccine dose;  $p=0.53$ ), however, only few (4/413) females were unaware of the vaccine.

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32 231 When we defined HPV vaccine uptake according to availability of a vaccination record, results  
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34 232 regarding the associations of awareness and uptake and of knowledge and uptake remained  
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36 233 essentially unchanged (**Supplementary Fig. 1 and 2**). Of note, other studies have also assessed  
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38 234 HPV vaccine uptake by using self-reported vaccination status [2, 8, 18].

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### 42 43 236 *3.2 Knowledge about HPV Vaccination and Implications for Uptake*

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45 237 We defined *knowledge* as being able to give a correct answer to what the HPV vaccine is for or  
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47 238 for the association of HPV with cervical cancer. For this analysis, four additional quantitative  
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49 239 interviews were excluded due to missing answers on HPV awareness and knowledge. 697/997  
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51 240 (70%) participants had knowledge of HPV vaccine or the “cervical cancer vaccine”, while  
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53 241 300/997 (30%) participants did not. Females were more knowledgeable than males (342/412

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3 242 [83%] vs. 355/585 [61%];  $p < 0.01$ ) which is also shown in **Figure 1**. We did not find a significant  
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5 243 difference regarding knowledge between younger and older participants (94/148 [64%] vs.  
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7 244 603/849 [71%];  $p = 0.07$ ).  
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12 246 As shown in **Figure 3**, more knowledgeable participants had received  $\geq 1$  dose of HPV vaccine  
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14 247 compared to participants with limited knowledge (298/697 [43%] vs. 72/243 [30%];  $p < 0.01$ ), and  
15  
16 248 there was no evidence that this difference was limited to either sex (77/355 [22%]  
17  
18 249 knowledgeable males vs. 31/182 [17%] males with limited knowledge had received  $\geq 1$  HPV  
19  
20 250 vaccine dose;  $p = 0.20$ ), and 221/342 knowledgeable females [65%] vs. 41/61 [67%] females with  
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22 251 limited knowledge had received  $\geq 1$  HPV vaccine dose;  $p = 0.70$ ).  
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28 253 For the study's qualitative component, although the youth had agreed to participate in  
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30 254 qualitative interviews explicitly about their HPV vaccination decisions, many participants were  
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32 255 not able to tell us what specifically the HPV vaccine was intended to protect against. When  
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34 256 asked about recommendations for improvements to HPV vaccination campaigns in Switzerland,  
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36 257 almost all youth mentioned desiring more and better information. The following dialogue  
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38 258 demonstrates how knowledge and awareness served as barriers for a 22-year-old male who had  
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40 259 not received the vaccine:

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43 260 Researcher: So, I see [from your vaccination certificate] that you didn't get the HPV  
44  
45 261 vaccine.

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48 262 Participant: No.

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50 263 Researcher: Was it a choice?

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52 264 Participant: No, it was an issue of information. I don't know what [HPV] is.  
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### 266 3.3 Youth Information Sources about HPV Vaccination

267 We assessed if and where adolescents had heard about HPV vaccination and who they may have  
268 turned to when deciding whether to get vaccinated against HPV. As shown in **Figure 4**, the three  
269 most commonly mentioned information sources by youth in the quantitative questionnaire  
270 were school health programs (53%), health care providers (23%), and participants' social  
271 networks (20%). The most mentioned information sources were similar for males and females.  
272 Internet and social media were mentioned infrequently as information sources (1% of all  
273 participants; 2% of males, 1% of females). Concerning the information sources used for deciding  
274 whether or not to vaccinate, most participants consulted their social networks (42%) and/or  
275 their healthcare provider (38%), as shown in **Figure 5**. Many participants (38%) did not talk to  
276 anyone about the HPV vaccine. We found this result predominantly with male participants (61%)  
277 and less with female participants (13%). Internet and social media were also infrequently  
278 mentioned for vaccine decision-making (3% of participants; 2% of males, 1% of females).

279  
280 Qualitative interviews with youth showed that very few had actively sought out information  
281 about the HPV vaccination during the initial recommended age for the first dose (11-14 years).  
282 Primary explanations for this from the youths' perspectives included that they were too young  
283 when the HPV vaccine was offered via school programs or by their pediatricians, and that their  
284 parents had made the decision without being involved in the decision-making process. The few  
285 youth who reported having had discussions about the HPV vaccination described having talked  
286 to family members, primarily mothers or older siblings, or doctors (pediatricians if the vaccine  
287 was offered during the initial recommended age, gynecologists for older female participants  
288 who had not been vaccinated, and sexual health doctors for young men who have sex with men  
289 (MSM)). Apart from the MSM in the qualitative study sample, young men reported not having

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3 290 discussed the HPV vaccine with anybody. Several of the young women we interviewed recalled  
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5 291 their parents' skepticism when the HPV vaccine was first introduced. A 26-year-old female who  
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7 292 had not received the HPV vaccine explained, "It was one of the first years when it came out.  
8  
9  
10 293 2009 or something like that. I was still a minor and still in high school. We needed our parents'  
11  
12 294 permission. My mother, who is a nurse, simply decided [against it because] it was a new vaccine,  
13  
14 295 and we didn't yet know the side effects."

16 296 When asked about where information about the HPV vaccine should come from, many youth  
17  
18 297 suggested better information campaigns via schools. This was particularly clear among youth  
19  
20 298 whose parents chose against the vaccine when they were in the initial recommended target age.  
21  
22 299 Despite not being vaccinated against HPV, an 18-year-old female described her views on the  
23  
24 300 added value of having HPV vaccination information campaigns and programs in schools,  
25  
26  
27 301 particularly once youth are able to make their own health decisions:

30 302 "I think it helped me a lot that that there was information at school and that the  
31  
32 303 vaccine was offered there. We were at an age when we started to make our  
33  
34 304 own decisions and that's why I liked the fact that we talked about it in school.  
35  
36 305 That helped me a lot. [...] because our parents had decided on everything  
37  
38 306 before. And this is, I think, the first time that we decide or shared decisions  
39  
40 307 about our health."

43 308 A 19-year-old female participant who had received the vaccine described the roles schools  
44  
45 309 played in explaining the rationale behind the HPV vaccine, "I think I find it very important that  
46  
47 310 there is an education and not just 'get vaccinated' and 'it's good for you or it helps you', but  
48  
49 311 rather also a 'why' and 'what is it about' and 'what would it look like if you weren't vaccinated',  
50  
51 312 what would be the consequence'? I think such a relatively educated attitude is also extremely  
52  
53 313 useful."

### 314 3.4 Youth's female-gendered perception of the HPV Vaccine

315 Given the HPV vaccination's association with cervical cancer in popular discourse, we analyzed if  
316 and to what extent participants had a gendered perception of HPV vaccine. From the  
317 quantitative sample, after excluding 290 of 1001 participants without knowledge of HPV or the  
318 "cervical cancer vaccine," 554 of 711 (78%) participants perceived the HPV vaccine as being only  
319 targeted towards women and not men (female-gendered answer) (**Supp. Table 1**). For example,  
320 many participants only mentioned cervical cancer when asked what the HPV vaccine is for and  
321 only few youth mentioned that the HPV vaccine protects also males from diseases. 290/361  
322 (80%) males and 264/350 (75%) females ( $p=0.12$ ) gave a female-gendered answer. While both  
323 older and younger participants had a female-gendered perception on the purpose of the HPV  
324 vaccination, significantly more older youth had female-gendered perceptions (496/611 (81%)  
325 older vs. 58/100 (58%) younger participants ( $p<0.01$ )). In addition, 277/331 (84%) older males  
326 vs. 13/30 (43%) younger males gave a female-gendered answer ( $p<0.01$ ); 219/278 (78%) older  
327 females vs. 45/70 (64%) younger females gave a female-gendered answer ( $p=0.02$ ).

328  
329 During qualitative interviews, we asked youth if they saw any differences for HPV vaccination  
330 between men and women. These questions elicited two types of responses: (1) youth noting the  
331 vaccination as being beneficial for females only, and (2) discourses about females bearing the  
332 brunt of responsibility for sexual health. For the first type of response, some youth were not  
333 aware that males could get vaccinated against HPV. A 20-year-old female who had received the  
334 vaccine discussed her memories of getting the vaccine in school, "If I remember correctly, boys  
335 didn't get vaccinated [when I was in school]." An 18-year-old male who had not received the  
336 vaccine, when asked who the HPV vaccine was for, responded, "Women. Could that be? To be  
337 honest, that's all I know right now." Others complained that they now realize how limited their

1  
2  
3 338 information about the vaccination and its benefits for young males was. A 19-year-old man

4  
5 339 explained:

6  
7 340 “Well, I really haven't heard about [the HPV vaccination for boys] from anyone until

8  
9  
10 341 now. And I don't think this is my personal fault that I don't know anything about it. Until

11  
12 342 now, it was only a topic for women, and now it's suddenly not anymore.”

13  
14 343 Other youth talked about female responsibility for sexual health. A 26-year-old female who had

15  
16 344 not been vaccinated against HPV explained how she saw the HPV vaccine for males as providing

17  
18 345 protection to the females with whom young men had sexual encounters, “Girls are going to take

19  
20 346 it more seriously. For boys, it doesn't concern them directly. It's protection for [girls].” A 20-

21  
22 347 year-old female who had not been vaccinated against HPV echoed this sentiment:

23  
24 348 “I mean, for [girls], we know that (...), if we're going to be in a relationship

25  
26 349 where we have sexual intercourse with somebody, we know that we have to

27  
28 350 protect ourselves. First of all, to not get pregnant. Second of all, we know that

29  
30 351 having any types of STDs and viruses would make our lives miserable. (...) But

31  
32 352 for boys, it's like, “Ok, I'll have to wear protection. But what's the worst that can

33  
34 353 happen?”

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#### 356 4. Discussion

357 Our study on HPV vaccine awareness, knowledge, information sources, and gendered  
358 perception among young males and females in Switzerland has four main findings. First, young  
359 females had more HPV vaccine awareness and knowledge than young males. This confirms  
360 previous reports, consistent with HPV vaccine having been introduced initially and worldwide as  
361 a vaccine designed only for females [15, 39, 40]. Even though awareness of HPV vaccine was  
362 higher in our study in females than in males, a recent Swiss national study found limited HPV  
363 awareness among 24–26-year-old women, suggesting opportunities for intervention also in  
364 women, including those that are older than the primary target age group [41].

365  
366 Second, increased knowledge was associated with higher HPV vaccine uptake, in both females  
367 and males, suggesting that knowledge matters. This confirms results from previous reports [11,  
368 15-17]. In our study we only saw a trend towards a small difference in HPV vaccine knowledge  
369 between the younger and older age groups. [15, 40]. Encouragingly, younger participants were  
370 more aware of HPV vaccine compared to older participants, in contrast to other studies [15, 42].

371  
372 Third, the internet and social media played a surprisingly minor role as HPV vaccine information  
373 sources for youth in our study. This stands in contrast to other studies that found social media  
374 to increasingly become a source of health information worldwide [43-46]. Another US study  
375 described the internet as being one of the most frequently mentioned sources of vaccine  
376 information among adolescents [47]. Currently, the potential of internet/ social media  
377 information for HPV prevention/ vaccination uptake seems not to be used in Switzerland.

378  
379 Fourth, despite the male HPV vaccine recommendation was introduced more than four years

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3 380 prior to our interviews, both female and male youth in our study associated HPV vaccine  
4  
5 381 predominantly with cervical cancer, consistent with the gendered views of HPV vaccine  
6  
7 382 documented in previous reports [3, 13]. That said, it is encouraging to see a slight shift in the  
8  
9 383 younger age group from a female gendered perspective to a gender-neutral perspective on HPV  
10  
11 384 vaccine.  
12  
13  
14 385

#### 16 386 **4.1 Strengths and limitations**

17  
18  
19 387 One of the major strengths of our study is that it is a mixed-methods study. Our qualitative work  
20  
21 388 adds some description and explanation to our quantitative findings. Furthermore, we have a  
22  
23 389 large number of male participants in our study. The Swiss context in particular lacks data on HPV  
24  
25 390 vaccine awareness, knowledge, and information sources from male youth. Our study addresses  
26  
27 391 this research gap. Previous studies have predominantly focused on parents and their knowledge  
28  
29 392 on HPV vaccine [21-26]. Our study included youth, and this allowed us to gain important insights  
30  
31 393 on who youth turn to when deciding on HPV vaccination. Since the vaccine is recommended as a  
32  
33 394 catch-up vaccine until 26 years in many countries, including Switzerland, we have to ensure that  
34  
35 395 youth are aware of the HPV vaccine and that they have the necessary knowledge to make an  
36  
37 396 informed HPV vaccination decision.  
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43  
44 398 One limitation of this study is that we might overestimate knowledge based on the way we  
45  
46 399 classified answers for the quantitative component. For example, if participants had heard of the  
47  
48 400 HPV vaccine, we simply asked them if they know what it is for but added no further questions. In  
49  
50 401 addition, for participants who have only heard of the “cervical cancer vaccine,” we did not ask  
51  
52 402 any follow-up questions on HPV knowledge. Other studies have assessed knowledge in more  
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54 403 depth, asking participants more knowledge specific questions [3, 18, 19]. Since our

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3 404 questionnaire already lasted 25-35 minutes with questions on VH (Jafflin K., manuscript in  
4  
5 405 preparation), CAM use (Jafflin K., manuscript in preparation, Kiener L., Schwendener C., et al,  
6  
7 406 manuscript in preparation) and moral foundations (Jafflin K., manuscript in preparation) we  
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9  
10 407 opted to not include more questions to further assess participants' knowledge. Another  
11  
12 408 limitation to this study was that our sampling strategy led to a non-representative sample.  
13  
14 409 Additionally, potential sources of bias arise from us not being able to get in contact with  
15  
16 410 participants who do not visit a physicians' office. Our sampling strategy however allowed us to  
17  
18 411 recruit a more diverse sample regarding biomedical and CAM providers.  
19  
20  
21 412

## 23 413 5. Conclusion

26 414 This study underlines the importance of HPV awareness and knowledge given the association  
27  
28 415 between HPV awareness and knowledge and HPV vaccine uptake. However, males still have  
29  
30 416 limited awareness and knowledge about HPV vaccine. Future strategies to increase HPV vaccine  
31  
32 417 uptake, especially among males, should focus on better and more information supply to youth  
33  
34 418 explaining them the benefit of the HPV vaccine. School vaccination programs have proven to be  
35  
36 419 effective and should be further expanded [30]. Parents play an important role in youth' decision  
37  
38 420 making process when it comes to HPV vaccine and they should be equally informed about the  
39  
40 421 benefits and importance of the HPV vaccine. Efforts should be made to underline the  
41  
42 422 effectiveness of the HPV vaccine for males and females to reach a gender-neutral perception of  
43  
44 423 the HPV vaccine. Targeted public health efforts should consider exploring internet and social  
45  
46 424 media as potential information distribution platforms. HPV vaccine uptake has improved over  
47  
48 425 the years, but there is substantial room for improvement, particularly in terms of increasing  
49  
50 426 knowledge and awareness among young men and women alike.  
51  
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55 427

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431

## 432 **Disclosure of Potential Conflict of Interest**

433 All authors: no conflicts.

434

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440

## 441 **Ethics approval**

442 The study was approved by the local ethics committee (Ethikkommission Nordwest- und  
443 Zentralschweiz, EKNZ; project ID number 2017-00725). The ethics approval covers all study  
444 participants, which includes adolescent and adult patients as well as biomedical and CAM  
445 providers. Informed consent was provided by all participants after the nature and possible  
446 consequences of the study had been fully explained.

447

## 448 **Data sharing statement**

449 Data is available upon reasonable request to the corresponding author.

450



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3 **451 Contributors' Statement Page**  
4

5 452 Ms. Kiener and Ms. Schwendener recruited participating youth, conducted interviews, carried  
6  
7 453 out the analysis, drafted the initial manuscript, and reviewed and revised the manuscript.  
8  
9

10 454 Dr. Jafflin conceptualized and designed the study, designed the data collection instruments,  
11  
12 455 coordinated and supervised data collection, carried out the analyses, and reviewed and revised  
13  
14 456 the manuscript.  
15

16 457 Ms. Rouached, Ms. Juillerat and Mr. Meier recruited participating youth, conducted interviews,  
17  
18 458 and reviewed and revised the manuscript.  
19

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24 461 Mr. Baumann and Ms. Debergh recruited participating youth, conducted interviews, and  
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28 463 Dr. Huber conceptualized and designed the study, recruited participating providers, and  
29  
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31

32 465 Dr. Merten conceptualized and designed the study, designed the data collection instruments,  
33  
34 466 coordinated and supervised data collection, and reviewed and revised the manuscript.  
35

36 467 Dr. Buhl designed the data collection instruments, recruited participating youth, conducted  
37  
38 468 interviews, analyzed qualitative data, and reviewed and revised the manuscript.  
39

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43  
44 471 qualitative data, and reviewed and revised the manuscript.  
45

46 472 Dr. Tarr conceptualized and designed the study, designed the data collection instruments,  
47  
48 473 recruited participating providers, coordinated and supervised data collection, carried out the  
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50 474 analyses, and reviewed and revised the manuscript.  
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3 475 All authors approved the final manuscript as submitted and agree to be accountable for all  
4 476 aspects of the work.  
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617 **Table 1. Participant Characteristics (quantitative questionnaire)**

	All Participants (n = 1001)	Male (n = 588)	Female (n = 413)
<b>Age</b>			
Age (years), median (IQR)	19 (18-21)	19 (19-20)	20 (17-23)
Born before July 1 <sup>st</sup> , 2002, n (%)	850 (85)	526 (89)	324 (78)
Born on/ after July 1 <sup>st</sup> , 2002, n (%)	151 (15)	62 (11)	89 (22)
<b>Nationality</b>			
Swiss, n (%)	916 (92)	549 (93)	367 (89)
<b>Language</b>			
German, n (%)	671 (67)	451 (77)	220 (53)
French, n (%)	168 (17)	47 (8)	121 (30)
Italian, n (%)	156 (16)	86 (15)	70 (17)
English, n (%)	6 (1)	4 (1)	2 (0.5)
<b>Recruitment setting</b>			
Biomedical provider, n (%)	405 (40)	146 (25)	259 (63)
Military service, n (%)	376 (38)	372 (63)	4 (1)
CAM provider, n (%)	151 (15)	57 (10)	94 (23)
Adolescent clinic, n (%)	69 (7)	13 (2)	56 (14)
<b>Living situation</b>			
With parents, n (%)	821 (82)	500 (85)	321 (78)
<b>School vaccination program</b>			
School program available, n (%)	449 (54)	269 (67)	180 (42)
<b>Vaccination status</b>			
	<i>n</i> = 941	<i>n</i> = 538	<i>n</i> = 403
Has received ≥1 does of HPV vaccine, n (%)	371 (39)	109 (20)	262 (65)

618 **Note.** All data shown are number (%) of participants, unless otherwise indicated. Due to rounding, total  
619 numbers may not add up to 100%.

620 **Abbreviations.** CAM, complementary and alternative medicine; IQR, interquartile range

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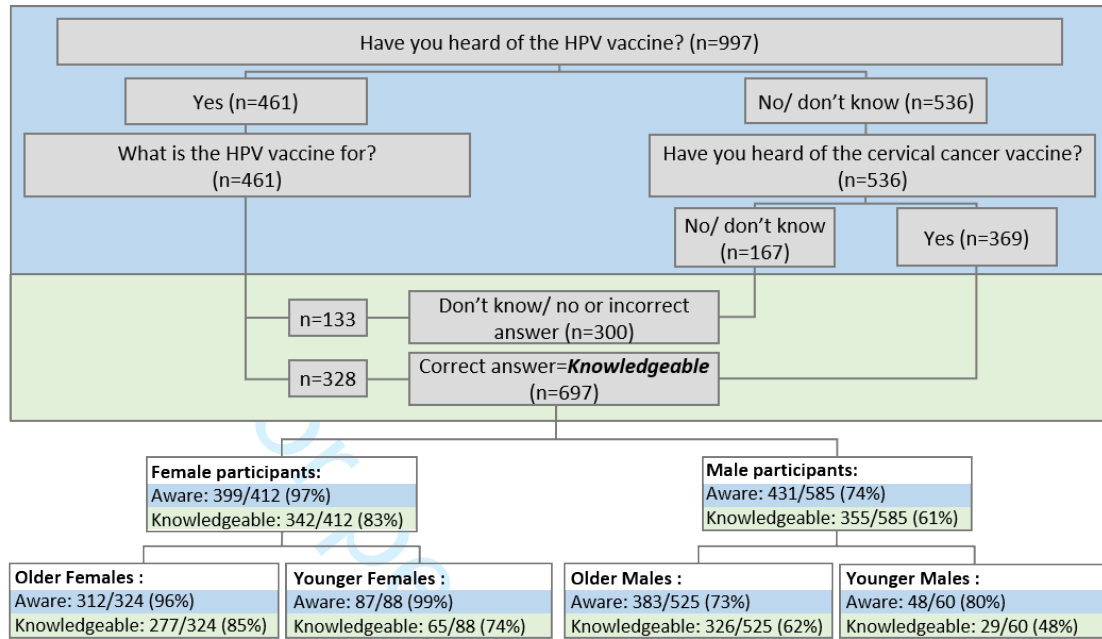
622 **Table 2. Participant Characteristics (qualitative interview)**

<b>French-Speaking Region</b>		
Female		N= 6
	Age	15-26 years, $\bar{x}$ =19.6 years
	Received at least 1 dose of HPV vaccination	N=4(66%)
	Informed through school vaccination program	N=6(100%)
Male		N=8
	Age	15-26 years, $\bar{x}$ =22.4 years
	Received at least 1 dose of HPV vaccination	N=4(50%)
	Informed through school vaccination program	N=1(13%)
<b>German-Speaking Region</b>		
Female		N=8
	Age	15-26 years, $\bar{x}$ =20.9 years
	Received at least 1 dose of HPV vaccination	N=4(50%)
	Informed through school vaccination program	N=7(88%)
Male		N=9
	Age	15-26 years, $\bar{x}$ = 20.6years
	Received at least 1 dose of HPV vaccination	N=1(11%)
	Informed through school vaccination program	N=1(11%)

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625 **Figure 1. Awareness and Knowledge of HPV Vaccine**



626 **Note.** All data in blue stands for awareness and all data in green for knowledge.  
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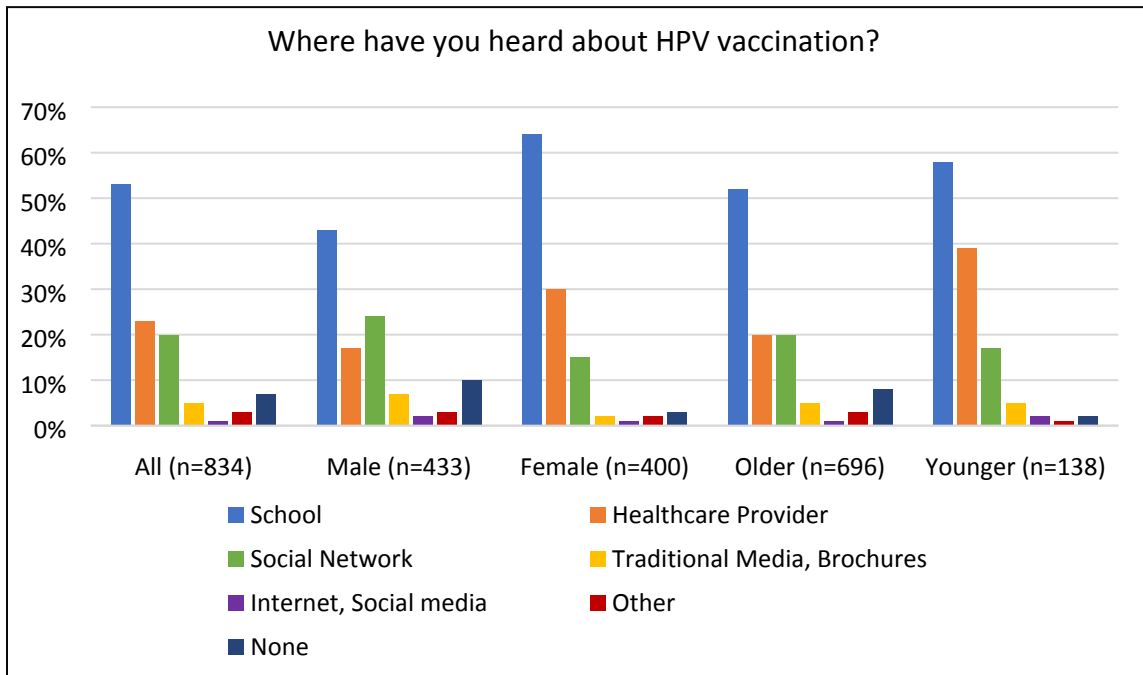
**Figure 2. Awareness and HPV Vaccine Uptake**

**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

**Figure 3. Knowledge and HPV Vaccine Uptake**

**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

638 **Figure 4. Information Sources**

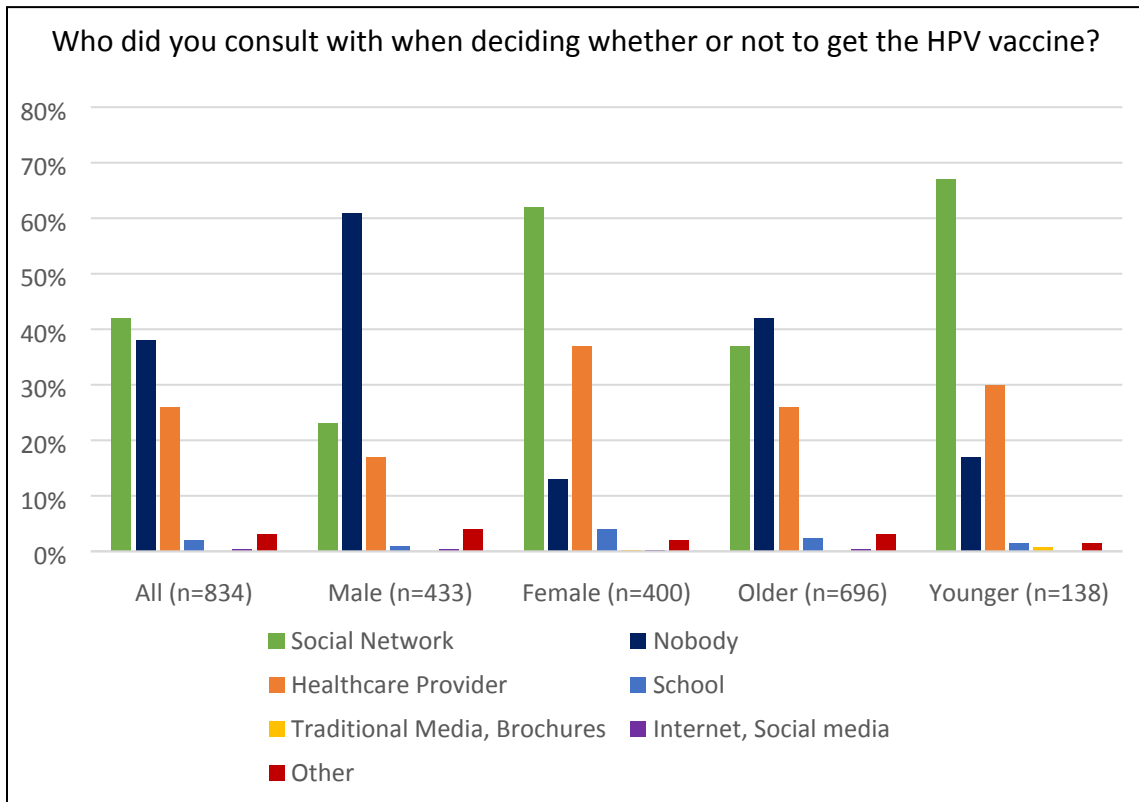


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640 **Note.** 167/1001 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were  
 641 possible.

642

643 **Figure 5. HPV Vaccine Consulting Behavior**

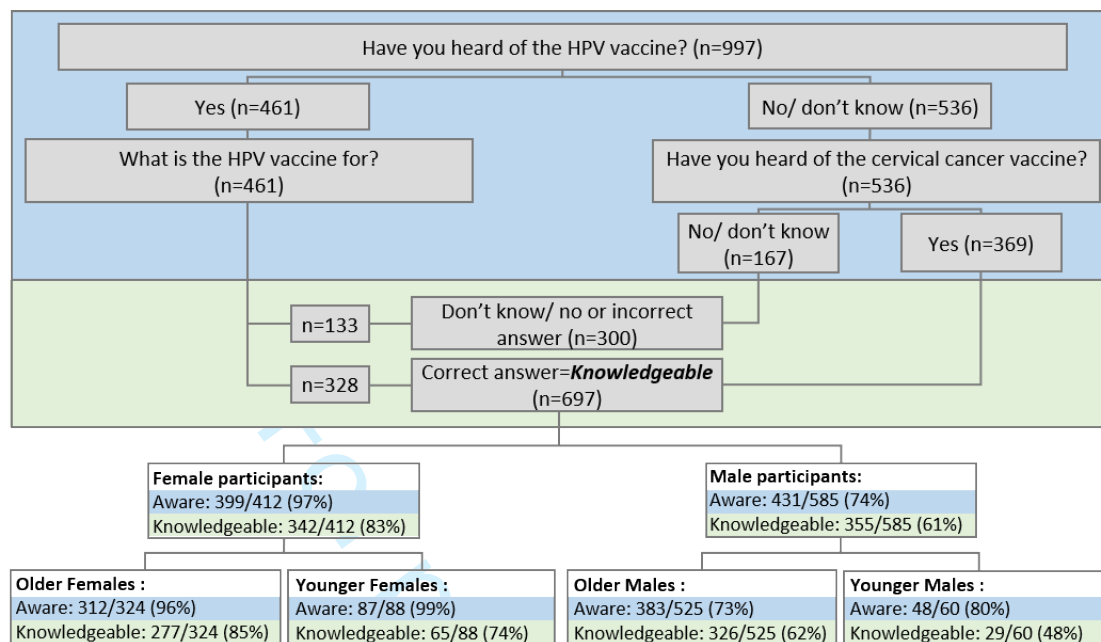


644

645 **Note.** 167/1001 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were  
 646 possible.

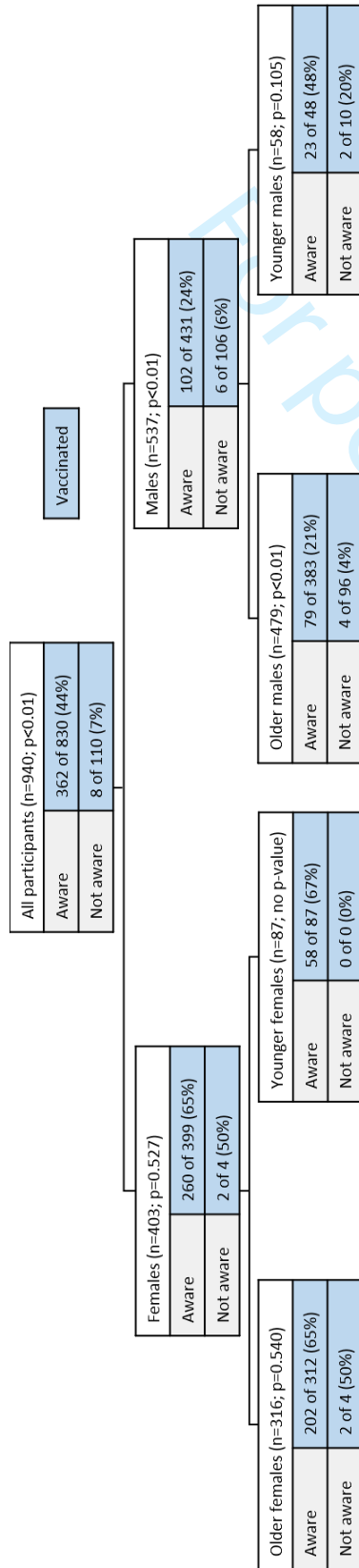
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**Figure 1. Awareness and Knowledge of HPV Vaccine**



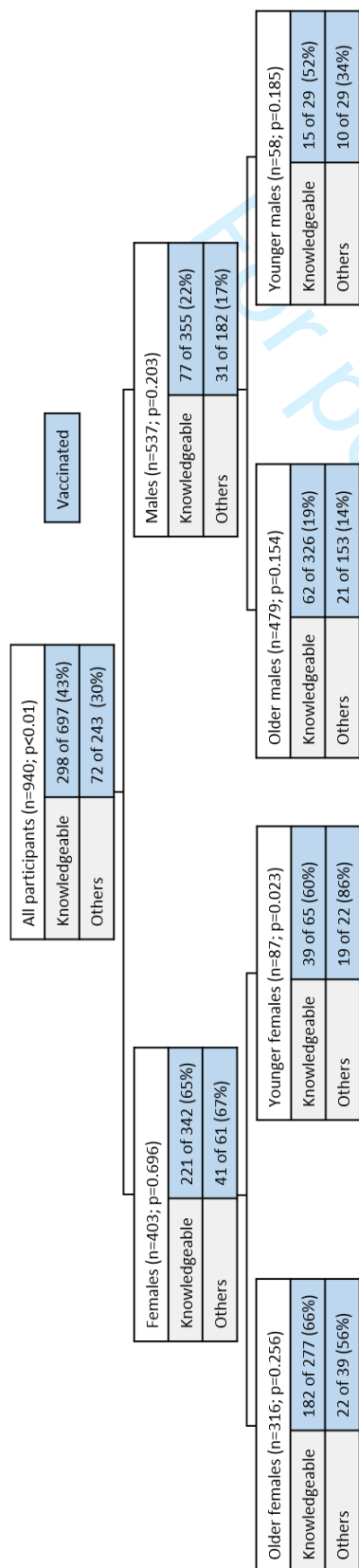
**Note.** All data in blue stands for awareness and all data in green for knowledge.

Figure 2. Awareness and HPV Vaccine Uptake



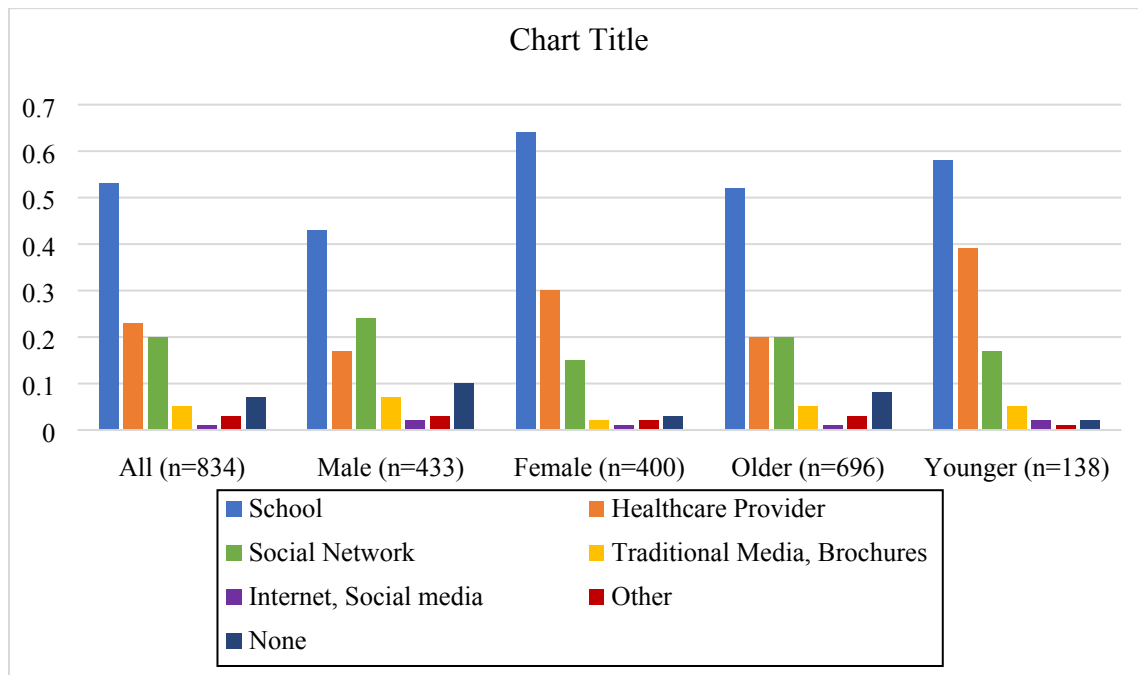
**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

**Figure 3. Knowledge and HPV Vaccine Uptake**



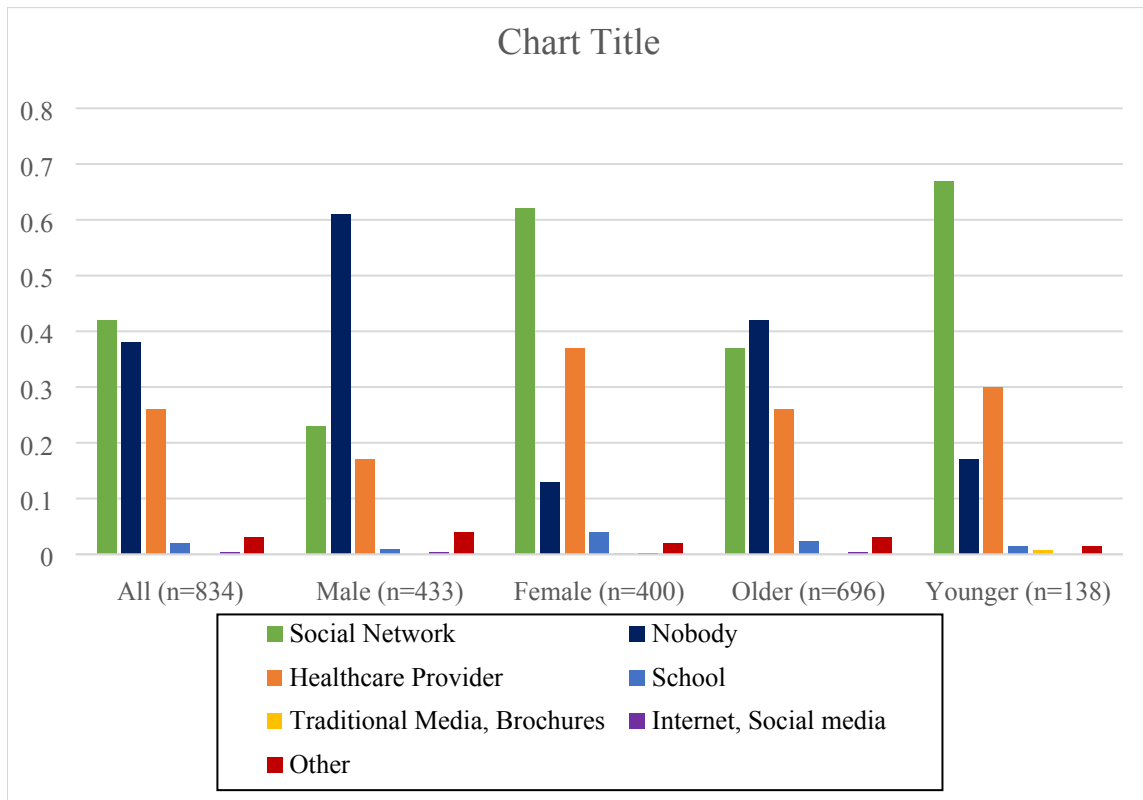
**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

**Figure 4. Information Sources**



**Note.** 167/1001 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were possible.

1 **Figure 5. HPV Vaccine Consulting Behavior**



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3 **Note.** 167/1001 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were  
 4 possible.



**Schwendener et al, HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study: Supplementary Material**

**Supplementary Table 1. Survey questions concerning gendered perceptions of HPV Vaccine**

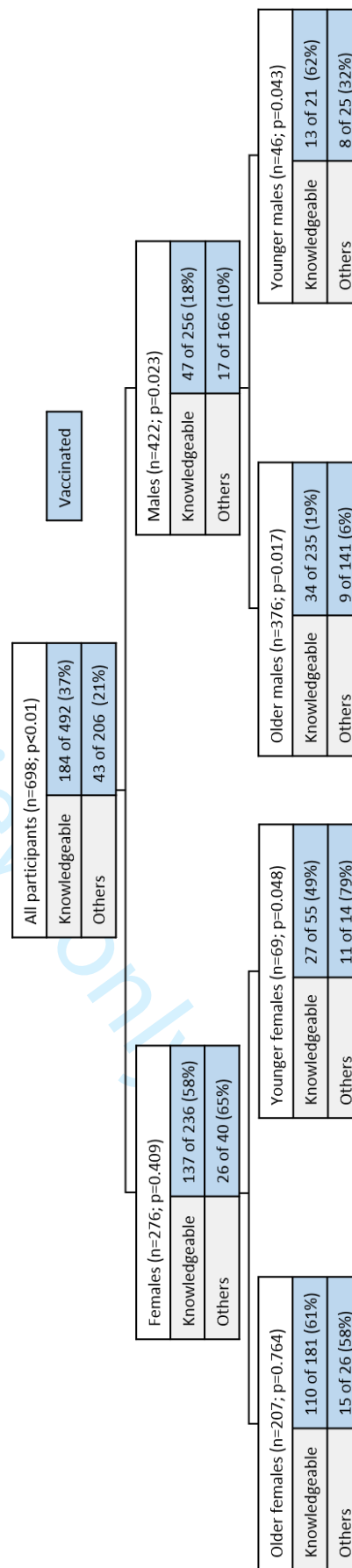
	All participants	By gender		By age groups	
		Male	Female	Born before 1.7.02	Born on/ after 1.7.02
<b>Have you heard of the HPV vaccine?</b>	<i>(n = 997)</i>	<i>(n = 585)</i>	<i>(n = 412)</i>	<i>(n = 849)</i>	<i>(n = 148)</i>
Yes, n (%)	461 (46)	176 (30)	285 (69)	359 (42)	102 (69)
No/ don't know, n (%)	536 (54)	409 (70)	127 (31)	490 (58)	46 (31)
<b>Have you heard of the cervical cancer vaccine?</b>	<i>(n = 535)</i>	<i>(n = 409)</i>	<i>(n = 126)</i>	<i>(n = 489)</i>	<i>(n = 46)</i>
Yes, n (%)	369 (69)	255 (62)	114 (90)	336 (69)	33 (72)
No/ don't know, n (%)	166 (31)	154 (38)	12 (10)	153 (31)	13 (28)
<b>What is the HPV vaccine for?</b>	<i>(n = 461)</i>	<i>(n = 176)</i>	<i>(n = 285)</i>	<i>(n = 359)</i>	<i>(n = 102)</i>
Only female, n (%)	185 (40)	35 (20)	150 (53)	160 (45)	25 (25)
All other answers, n (%)	276 (60)	141 (80)	135 (47)	199 (55)	77 (75)
<b>Combination of all questions</b>	<i>(n = 711)</i>	<i>(n = 361)</i>	<i>(n = 350)</i>	<i>(n = 611)</i>	<i>(n = 100)</i>
Only female, n (%)	554 (78)	290 (80)	264 (75)	496 (81)	58 (58)
All other answers, n (%)	157 (22)	71 (20)	86 (25)	115 (19)	42 (42)

**Supplementary Figure 1. Awareness and HPV**



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

**Supplementary Figure 2. Knowledge and HPV**



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Page Number
<b>Title and abstract</b>		
Title	<a href="#">#1a</a> Indicate the study's design with a commonly used term in the title or the abstract	1

1	Abstract	<a href="#">#1b</a>	Provide in the abstract an informative and balanced	2
2			summary of what was done and what was found	
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6	<b>Introduction</b>			
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9	Background /	<a href="#">#2</a>	Explain the scientific background and rationale for the	5
10	rationale		investigation being reported	
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14	Objectives	<a href="#">#3</a>	State specific objectives, including any prespecified	5,6
15			hypotheses	
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19	<b>Methods</b>			
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22				
23	Study design	<a href="#">#4</a>	Present key elements of study design early in the paper	7
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25				
26	Setting	<a href="#">#5</a>	Describe the setting, locations, and relevant dates, including	7,8
27			periods of recruitment, exposure, follow-up, and data	
28			collection	
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31	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of	7-10
32			selection of participants.	
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40		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential	n/a
41			confounders, and effect modifiers. Give diagnostic criteria, if	
42			applicable	
43				
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46				
47	Data sources /	<a href="#">#8</a>	For each variable of interest give sources of data and details	8-10
48	measurement		of methods of assessment (measurement). Describe	
49			comparability of assessment methods if there is more than	
50			one group. Give information separately for for exposed and	
51			unexposed groups if applicable.	
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1	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	n/a
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4	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	7-11
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6				
7	Quantitative	<a href="#">#11</a>	Explain how quantitative variables were handled in the	7-9
8	variables		analyses. If applicable, describe which groupings were	
9			chosen, and why	
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15	Statistical	<a href="#">#12a</a>	Describe all statistical methods, including those used to	8-10
16	methods		control for confounding	
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20	Statistical	<a href="#">#12b</a>	Describe any methods used to examine subgroups and	7-10
21	methods		interactions	
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26	Statistical	<a href="#">#12c</a>	Explain how missing data were addressed	n/a
27	methods			
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31	Statistical	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of	n/a
32	methods		sampling strategy	
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36	Statistical	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
37	methods			
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42	<b>Results</b>			
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45	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg	11
46			numbers potentially eligible, examined for eligibility,	
47			confirmed eligible, included in the study, completing follow-	
48			up, and analysed. Give information separately for for	
49			exposed and unexposed groups if applicable.	
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57	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	11
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
2				
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4	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	11,27,28
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14	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each variable of interest	11,12,16
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19	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	11-17
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27	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	n/a
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37	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were categorized	11-17
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42	Main results	<a href="#">#16c</a>	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
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48	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/a
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53	<b>Discussion</b>			
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56	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18,19
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1	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources	19,20
2			of potential bias or imprecision. Discuss both direction and	
3			magnitude of any potential bias.	
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9	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives,	18-20
10			limitations, multiplicity of analyses, results from similar	
11			studies, and other relevant evidence.	
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16	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study	18-20
17			results	
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22	<b>Other Information</b>			
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25	Funding	<a href="#">#22</a>	Give the source of funding and the role of the funders for the	21
26			present study and, if applicable, for the original study on	
27			which the present article is based	
28				
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 34 made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)

# BMJ Open

## HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Sexual health, Immunology (including allergy)
Keywords:	IMMUNOLOGY, Public health < INFECTIOUS DISEASES, PREVENTIVE MEDICINE, PUBLIC HEALTH, SEXUAL MEDICINE



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# HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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\*: equal contribution

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HPV vaccine, HPV vaccine awareness, HPV vaccine knowledge, HPV vaccine information sources, HPV vaccine uptake, youth

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3 **39 ABSTRACT:**  
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6 **40 Objectives:** We aimed to provide a detailed characterization of HPV vaccine awareness,  
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8 **41** knowledge, and information sources in the HPV vaccine decision-making process of youth, both  
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10 **42** male and female, in Switzerland.

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13 **43 Design:** With a mixed-methods study design, we conducted quantitative questionnaires and  
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15 **44** qualitative interviews, which lasted 20-45 minutes.

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18 **45 Setting and participants:** We recruited participants, 15-26 years of age, in physicians'  
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20 **46** offices, in a local sexual health clinic, and during military enlistment. We conducted quantitative  
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22 **47** questionnaires with 997 youth participants (585 male, 412 female) and qualitative interviews  
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24 **48** with 31 youth (17 male, 14 female).

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27 **49 Primary and secondary outcome measures:** We assessed HPV vaccine awareness,  
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29 **50** knowledge, information sources and vaccination status.

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32 **51 Results:** In the study's quantitative component, 108 (20%) male and 262 (65%) female  
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34 **52** participants had received  $\geq 1$  dose of HPV vaccine. 697 (70%) participants were knowledgeable  
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36 **53** about the HPV vaccine. Females were more likely to be knowledgeable than males (342/412  
37  
38 **54** [83%] vs. 355/585 [61%];  $p < 0.01$ ). Younger participants in the sample compared to older  
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40 **55** participants were more likely to be aware about HPV vaccine (135/148 [91%] vs. 695/849 [82%];  
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42 **56**  $p < 0.01$ ). The three most mentioned information sources were school health programs (442  
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44 **57** [53%]), health care providers (190 [23%]), and participants' social networks (163 [20%]). Overall,  
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46 **58** 554/710 (78%) participants had a female-gendered perception of HPV vaccine, a finding which  
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48 **59** was further supported and explained by qualitative data.

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52 **60 Conclusions:** Despite a male HPV vaccine recommendation being made  $>4$  years prior to the  
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54 **61** data collection, HPV vaccine knowledge was higher among females than males, and a female-

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62 gendered perception of HPV vaccine remains prevalent. Internet and social media were minor  
63 HPV vaccine information sources. Study findings demonstrate that HPV knowledge matters for  
64 HPV vaccine uptake and suggest that we should improve HPV information quality and access for  
65 youth, particularly by tailoring knowledge campaigns to young men.  
66

For peer review only

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3 67 **Strengths and limitations of this study:**  
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- 6 68 • One major strength of the study is that it uses a mixed methods approach, allowing for  
7  
8 69 the qualitative data to offer potential explanations to quantitative findings.  
9  
10 70 • The study included a large number of female and male youth, allowing us to gain  
11  
12 71 gendered differences regarding HPV vaccination information sources.  
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14 72 • One limitation of this study is that we might overestimate HPV vaccination knowledge  
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16 73 based on the way we classified answers for the quantitative component.  
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18 74 • Our sampling strategy led to a non-representative sample.  
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## 76 1. Introduction

77 Surprisingly little research has directly examined youth knowledge, awareness, and information  
78 sources as determinants of *human papillomavirus (HPV)* vaccine uptake. Furthermore, the  
79 research that has been done on youth perspectives has primarily focused on females [1-6],  
80 although the vaccine has been recommended for male youth for several years in many  
81 countries. Literature on the determinants of HPV vaccine attitudes and uptake among male  
82 youth remains limited [7-12]. Furthermore, the false perception that the HPV vaccination  
83 concerns only women continues to persist in popular discourse since it has been long known as  
84 the “cervical cancer vaccine” [3, 13].

85 In addition to issues related to access barriers [2, 14], previous reports in male and female youth  
86 suggest that low HPV vaccine uptake is also related to limited HPV vaccine awareness and  
87 knowledge [11, 15-17], and to the behavioral expectations youth perceive from their parents,  
88 family members, and peers [18, 19]. The most consistent predictor of HPV vaccination is having  
89 received a recommendation from a health care provider [12, 14, 20].

90 Previous research has focused on parents' attitudes and information sources towards HPV  
91 vaccine since the primary target group are 11-14-year-old adolescents [21-26]. A key component  
92 of the Swiss National Vaccination Strategy (NVS), in order to increase HPV vaccination rates,  
93 however, is to address insufficient levels of youth vaccination knowledge, e.g. by emphasizing  
94 the importance of school vaccination programs. Also, the NVS aims to address insufficient  
95 vaccination access, e.g., by removing financial barriers, especially for young adults with limited  
96 financial resources. Accordingly, HPV vaccine is now covered by the state when given until the  
97 age of 26 to men and women in the setting of a state vaccination program, thereby addressing  
98 such financial barriers to HPV vaccination in youth [27]. The effective implementation of each of  
99 these NVS approaches would benefit from additional research on HPV vaccine awareness,

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3 100 knowledge, and information sources in youth. We have recently documented the validity of  
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5 101 measuring vaccine hesitancy (VH) in youth using the Youth Attitudes about Vaccines (YAV)  
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7 102 questionnaire, which shows that VH is an independent predictor of HPV non-immunization in  
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9 103 Switzerland in female youth [28](**Kiener L., Schwendener C., et al, manuscript submitted**).  
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11  
12 104 The aims of the present study were to provide a detailed characterization of HPV vaccine  
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14 105 awareness, knowledge, and information sources in the HPV vaccine decision-making process  
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16 106 among youth, both male and female, in Switzerland. We additionally aimed to gain a more  
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18 107 current understanding of gendered aspects youth may have around the HPV vaccine. Finally, we  
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20 108 examined how these factors contribute to HPV vaccine uptake in both sexes and in younger and  
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22 109 older adolescents.  
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## 111 2. Methods

### 112 2.1 *The Swiss Context*

113 The Swiss Federal Office of Public Health (FOPH) and the Federal Vaccination Commission have  
114 recommended HPV vaccine since 2007 for female youth [29], and since 2015 for male youth  
115 [30]. HPV vaccine uptake has increased in the last decade [31], but lies still below the 80%  
116 immunization target [32]. In 2017-2019, the most recent evaluation period, only 20% of 16-year  
117 old males and 64% of females, had received  $\geq 1$  dose of HPV vaccine on average throughout  
118 Switzerland [33]. Regional differences in uptake have been associated with specifics of  
119 vaccination policies of local health authorities, limited information access, and the availability  
120 and quality of school vaccination programs [34, 35].

### 122 2.2 *Study design*

123 We applied a convergent mixed-methods design [36], meaning we collected qualitative and  
124 quantitative data in parallel. We conducted the study in the context of our Swiss national  
125 research program (NRP74) on the determinants of VH in Switzerland regarding childhood and  
126 HPV vaccination. The local institutional review board (Ethikkommission Nordwest- und  
127 Zentralschweiz) approved the study. All participants provided written informed consent. Full  
128 details on our recruitment methods, power calculation, and the questionnaire have been  
129 previously published [37].

### 131 2.3 *Study population and recruitment*

132 Participants were 15-26 years of age, male and female. Of note, youth in Switzerland are legally  
133 able to make vaccine decisions starting at age 14 [38], which supports vaccination promotion  
134 efforts which focus on youth perspectives on HPV vaccination. Even though the primary target

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3 135 group is 11-14-year-olds, the vaccine is also recommended as a catch-up vaccine until 26 years  
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5 136 in many countries, including Switzerland. We recruited participating youth in the offices of  
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7 137 physicians providing biomedicine and sometimes additionally complementary and alternative  
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9 138 medicine (CAM), and in a local sexual health clinic. Recruitment was done in urban and rural  
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11 139 areas, and in 3 of 4 Swiss language regions, i.e., German, French, Italian. In order to gain more  
12  
13 140 male participants, we also recruited during military enlistment (military service is compulsory for  
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15 141 Swiss males, with enlistment being at age 18-24). Since July 1<sup>st</sup>, 2016 the cost of HPV vaccine has  
16  
17 142 been covered by mandatory health insurance for male adolescents 11-14 years of age and as a  
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19 143 catch-up vaccination until age 26 in Switzerland. We therefore divided male participants in an  
20  
21 144 older and a younger age group. We refer to male participants born before vs. on/after July 1<sup>st</sup>,  
22  
23 145 2002 as the “older” and “younger” participants, respectively, meaning that younger male  
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25 146 participants were part of the HPV vaccine target age group when 11-14 years of age. For  
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27 147 comparison purposes, we applied the same age cut-offs to female participants.  
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#### 34 149 *2.4 Patient and public involvement*

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37 150 We did not include patient or public involvement in designing the study, commenting the  
38  
39 151 outcomes, interpreting the results of this study or reviewing the manuscript.  
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#### 42 153 *2.5 Quantitative methods*

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45 154 As previously reported [37], we developed German, French, Italian, and English versions of the  
46  
47 155 questionnaire. We interviewed military participants on site (face-to-face), and the other  
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49 156 participants on the phone, after the physician/clinic visit. Quantitative interviews lasted 25-35  
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51 157 minutes and were conducted by medical students with previous training in participant  
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53 158 recruitment, informed consent procedures and interview techniques. Interviews were  
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3 159 conducted from January 2019 to April 2020. All data was entered to open data kit (ODK) using  
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5 160 tablets [37]. The questionnaire included socio-demographics including language, place of  
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7 161 residence, living situation (with parents, with roommates, with partner), age, nationality, and  
8  
9 162 school HPV vaccination program availability.

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11  
12 163 HPV vaccination status (has received  $\geq 1$  dose of HPV vaccination) was assessed based on review  
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14 164 of the vaccination booklet of the participant, and, if unavailable, on personal report of being  
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16 165 vaccinated.

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19 166 In order to measure youth *awareness* about the HPV vaccine, we asked all participants if they  
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21 167 had heard of the HPV vaccine. To accommodate for a gendered perception, for those who said  
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23 168 “no” to the previous question, we asked if they had heard of the “cervical cancer vaccine.” To  
24  
25 169 measure youth *knowledge* about the HPV vaccine, we asked participants what the HPV vaccine  
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27 170 is intended for. Those who responded correctly were considered to be knowledgeable. We  
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29 171 considered an answer to be correct if they mentioned at least one correct aspect about the HPV  
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31 172 vaccine, i.e., it protects against “cancer”, “cervical cancer”, “papilloma virus”, or a “sexually  
32  
33 173 transmitted disease”. We sought to establish where youth obtained information about the HPV  
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35 174 vaccination by asking two questions, each with free text answer options in order to document  
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37 175 the most precise responses: (1) “Where have you heard about HPV vaccination?” and (2) “Who  
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39 176 did you consult with when deciding whether or not to get the HPV vaccine?”. Answers to the  
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41 177 second question included consulting people as well as traditional media, the internet, and other  
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43 178 forms of information supply.  
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## 50 180 2.6 Qualitative methods

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52 181 After completion of the quantitative interviews, participants were invited to participate in an  
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54 182 additional qualitative interview. We subsequently contacted interested youth who indicated  
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3 183 willingness in the German- and French-speaking regions of Switzerland. Additional participants  
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5 184 were recruited through researcher and participant social networks and by snowball sampling.  
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7 185 Our research team collaboratively developed a semi-structured interview guide, which we  
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9 186 piloted and revised iteratively for clarity and coherence. The interviews allowed us to gather  
10  
11 187 background information about the youth, their health status and lifestyle, the HPV vaccine  
12  
13 188 decision-making process, including knowledge, awareness, information sources, and the people  
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15 189 with whom they discussed the vaccination. Qualitative interviews were conducted (March 2019-  
16  
17 190 September 2020), either face-to-face or online (Skype or Zoom), they lasted 20-45 minutes, and  
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19 191 were audio-recorded and transcribed verbatim. Qualitative data were analyzed by social  
20  
21 192 scientists Andrea Buhl and Michael J. Deml. Analysis of the qualitative interviews was guided by  
22  
23 193 the Framework Method [39] with support of MAXQDA software. All quotes from interviews  
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25 194 have been translated from German or French into English and anonymized.  
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### 195 3. Results

196 For the study's quantitative component, we completed telephone (n=622) or face-to-face  
197 (n=375) interviews with 1010 youth. Of these, we excluded eight participants because they did  
198 not meet the age criteria, one participant because of missing gender information, and four  
199 additional interviews due to missing answers on awareness and knowledge. Quantitative  
200 analyses are therefore based on 997 participants (585 male, 412 female). Their characteristics  
201 are shown in **Table 1**. For the study's qualitative component, we conducted 14 qualitative  
202 interviews with female youth and 17 interviews with male youth. Qualitative participants ranged  
203 in age from 15 to 26 years in age (average ~21 years). Characteristics of the participants of the  
204 qualitative interview are shown in **Table 2**.

205 In the following sections, we present results regarding: (1) awareness and knowledge about the  
206 HPV vaccination, (2) youth HPV vaccination information sources and people with whom they  
207 had discussed the vaccination, and (3) youth's gendered perceptions of the HPV vaccine.

#### 209 3.1 Awareness about HPV Vaccination

210 For the purpose of this study, we defined *awareness* as having heard of the HPV or "cervical  
211 cancer" vaccine. Significantly more female youth were aware of the HPV vaccine than male  
212 youth. Of the 997 participants, 461 (46%) had heard of the HPV vaccine; 176/585 (30%) males  
213 and 285/412 (69%) females ( $p<0.01$ ). Among the 536 participants who had not heard of HPV  
214 vaccine, 369 (69%) had heard of the "cervical cancer vaccine", 255/409 (62%) males and  
215 114/127 (90%) females ( $p<0.01$ ).

216  
217 Of the 997 participants, 830 (83%) had heard of the HPV or "cervical cancer vaccine", 431/585  
218 (74%) of males and 399/412 (97%) of females ( $p<0.01$ ). In both awareness of HPV vaccine and

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3 219 awareness of “cervical cancer vaccine”, females had more awareness than males. 695/849 (82%)  
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5 220 of the older participants and 135/148 (91%) of the younger participants had heard of the HPV or  
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7 221 “cervical cancer vaccine” ( $p < 0.01$ ). Details are shown in **Figure 1**.  
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12 223 Of the 997 participants, 370 (39%) had received  $\geq 1$  dose of HPV vaccine. As shown in **Figure 2**,  
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14 224 participants with greater awareness had also more often received  $\geq 1$  dose of HPV vaccine  
15  
16 225 compared to participants with limited awareness (362/830 [44%] vs. 8/110 [7%];  $p < 0.01$ ). This  
17  
18 226 effect was manifest in males (102/431 [24%] of aware males vs. 6/106 [6%] of males with  
19  
20 227 limited awareness had received  $\geq 1$  HPV vaccine dose;  $p < 0.01$ ), but not in females (260/399 of  
21  
22 228 aware females [65%] vs. 2/4 [50%] of females with limited awareness had received  $\geq 1$  HPV  
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24 229 vaccine dose;  $p = 0.53$ ), however, only few (4/413) females were unaware of the vaccine.  
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30 231 When we defined HPV vaccine uptake according to availability of a vaccination record, results  
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32 232 regarding the associations of awareness and uptake and of knowledge and uptake remained  
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34 233 essentially unchanged (**Supplementary Fig. 1 and 2**).  
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### 38 235 3.2 Knowledge about HPV Vaccination and Implications for Uptake

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40 236 We defined *knowledge* as being able to give a correct answer to what the HPV vaccine is for or  
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42 237 for the association of HPV with cervical cancer. 697/997 (70%) participants had knowledge of  
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44 238 HPV vaccine or the “cervical cancer vaccine”, while 300/997 (30%) participants did not. Females  
45  
46 239 were more knowledgeable than males (342/412 [83%] vs. 355/585 [61%];  $p < 0.01$ ) which is also  
47  
48 240 shown in **Figure 1**. We did not find a significant difference regarding knowledge between  
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50 241 younger and older participants (94/148 [64%] vs. 603/849 [71%];  $p = 0.07$ ).  
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3 243 As shown in **Figure 3**, more knowledgeable participants had received  $\geq 1$  dose of HPV vaccine  
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5 244 compared to participants with limited knowledge (298/697 [43%] vs. 72/243 [30%];  $p < 0.01$ ), and  
6  
7 245 there was no evidence that this difference was limited to either sex (77/355 [22%]  
8  
9  
10 246 knowledgeable males vs. 31/182 [17%] males with limited knowledge had received  $\geq 1$  HPV  
11  
12 247 vaccine dose;  $p = 0.20$ ), and 221/342 knowledgeable females [65%] vs. 41/61 [67%] females with  
13  
14 248 limited knowledge had received  $\geq 1$  HPV vaccine dose;  $p = 0.70$ ).

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19 250 For the study's qualitative component, although the youth had agreed to participate in  
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21 251 qualitative interviews explicitly about their HPV vaccination decisions, many participants were  
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23 252 not able to tell us what specifically the HPV vaccine was intended to protect against. When  
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25 253 asked about recommendations for improvements to HPV vaccination campaigns in Switzerland,  
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27  
28 254 almost all youth mentioned desiring more and better information. The following dialogue  
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30 255 demonstrates how knowledge and awareness served as barriers for a 22-year-old male who had  
31  
32 256 not received the vaccine:

34 257 Researcher: So, I see [from your vaccination certificate] that you didn't get the HPV  
35  
36 258 vaccine.

38 259 Participant: No.

40 260 Researcher: Was it a choice?

42 261 Participant: No, it was an issue of information. I don't know what [HPV] is.

262

### 48 263 3.3 Youth Information Sources about HPV Vaccination

49  
50 264 We assessed if and where adolescents had heard about HPV vaccination and who they may have  
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52 265 turned to when deciding whether to get vaccinated against HPV. As shown in **Figure 4**, the three  
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54  
55 266 most commonly mentioned information sources by youth in the quantitative questionnaire

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3 267 were school health programs (53%), health care providers (23%), and participants' social  
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5 268 networks (20%). The most mentioned information sources were similar for males and females.  
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7 269 Internet and social media were mentioned infrequently as information sources (1% of all  
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9 270 participants; 2% of males, 1% of females). Concerning the information sources used for deciding  
10  
11 271 whether or not to vaccinate, most participants consulted their social networks (42%) and/or  
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13 272 their healthcare provider (27%), as shown in **Figure 5**. Many participants (38%) did not talk to  
14  
15 273 anyone about the HPV vaccine. We found this result predominantly with male participants (61%)  
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17 274 and less with female participants (12%). Internet and social media were also infrequently  
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19 275 mentioned for vaccine decision-making (0.4% of participants; 0.5% of males, 0.3% of females).  
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21 276  
22  
23 277 Qualitative interviews with youth showed that very few had actively sought out information  
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25 278 about the HPV vaccination during the initial recommended age for the first dose (11-14 years).  
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27 279 Primary explanations for this from the youths' perspectives included that they were too young  
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29 280 when the HPV vaccine was offered via school programs or by their pediatricians, and that their  
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31 281 parents had made the decision without being involved in the decision-making process. The few  
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33 282 youth who reported having had discussions about the HPV vaccination described having talked  
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35 283 to family members, primarily mothers or older siblings, or doctors (pediatricians if the vaccine  
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37 284 was offered during the initial recommended age, gynecologists for older female participants  
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39 285 who had not been vaccinated, and sexual health doctors for young men who have sex with men  
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41 286 (MSM)). Apart from the MSM in the qualitative study sample, young men reported not having  
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43 287 discussed the HPV vaccine with anybody. Several of the young women we interviewed recalled  
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45 288 their parents' skepticism when the HPV vaccine was first introduced. A 26-year-old female who  
46  
47 289 had not received the HPV vaccine explained, "It was one of the first years when it came out.  
48  
49 290 2009 or something like that. I was still a minor and still in high school. We needed our parents'



291 permission. My mother, who is a nurse, simply decided [against it because] it was a new vaccine,  
292 and we didn't yet know the side effects."

293 When asked about where information about the HPV vaccine should come from, many youth  
294 suggested better information campaigns via schools. This was particularly clear among youth  
295 whose parents chose against the vaccine when they were in the initial recommended target age.

296 Despite not being vaccinated against HPV, an 18-year-old female described her views on the  
297 added value of having HPV vaccination information campaigns and programs in schools,  
298 particularly once youth are able to make their own health decisions:

299 "I think it helped me a lot that that there was information at school and that the  
300 vaccine was offered there. We were at an age when we started to make our  
301 own decisions and that's why I liked the fact that we talked about it in school.  
302 That helped me a lot. [...] because our parents had decided on everything  
303 before. And this is, I think, the first time that we decide or shared decisions  
304 about our health."

305 A 19-year-old female participant who had received the vaccine described the roles schools  
306 played in explaining the rationale behind the HPV vaccine, "I think I find it very important that  
307 there is an education and not just 'get vaccinated' and 'it's good for you or it helps you', but  
308 rather also a 'why' and 'what is it about' and 'what would it look like if you weren't vaccinated',  
309 what would be the consequence'? I think such a relatively educated attitude is also extremely  
310 useful."

### 311 3.4 Youth's female-gendered perception of the HPV Vaccine

312 Given the HPV vaccination's association with cervical cancer in popular discourse, we analyzed if  
313 and to what extent participants had a gendered perception of HPV vaccine. From the  
314 quantitative sample, after excluding 287 of 997 participants without knowledge of HPV or the

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3 315 “cervical cancer vaccine,” 554 of 710 (78%) participants perceived the HPV vaccine as being only  
4  
5 316 targeted towards women and not men (female-gendered answer) (**Supp. Table 1**). For example,  
6  
7 317 many participants only mentioned cervical cancer when asked what the HPV vaccine is for and  
8  
9 318 only few youth mentioned that the HPV vaccine protects also males from diseases. 290/361  
10  
11 319 (80%) males and 264/349 (75%) females ( $p=0.13$ ) gave a female-gendered answer. While both  
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13 320 older and younger participants had a female-gendered perception on the purpose of the HPV  
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15 321 vaccination, significantly more older youth had female-gendered perceptions (496/611 (81%)  
16  
17 322 older vs. 58/99 (59%) younger participants ( $p<0.01$ )). In addition, 277/331 (84%) older males vs.  
18  
19 323 13/30 (43%) younger males gave a female-gendered answer ( $p<0.01$ ); 219/280 (78%) older  
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21 324 females vs. 45/69 (65%) younger females gave a female-gendered answer ( $p=0.02$ ).  
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28 326 During qualitative interviews, we asked youth if they saw any differences for HPV vaccination  
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30 327 between men and women. These questions elicited two types of responses: (1) youth noting the  
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32 328 vaccination as being beneficial for females only, and (2) discourses about females bearing the  
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34 329 brunt of responsibility for sexual health. For the first type of response, some youth were not  
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36 330 aware that males could get vaccinated against HPV. A 20-year-old female who had received the  
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38 331 vaccine discussed her memories of getting the vaccine in school, “If I remember correctly, boys  
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40 332 didn’t get vaccinated [when I was in school].” An 18-year-old male who had not received the  
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42 333 vaccine, when asked who the HPV vaccine was for, responded, “Women. Could that be? To be  
43  
44 334 honest, that’s all I know right now.” Others complained that they now realize how limited their  
45  
46 335 information about the vaccination and its benefits for young males was. A 19-year-old man  
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48 336 explained:  
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52 337 “Well, I really haven't heard about [the HPV vaccination for boys] from anyone until  
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54 338 now. And I don't think this is my personal fault that I don't know anything about it. Until  
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3 339 now, it was only a topic for women, and now it's suddenly not anymore.”  
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5 340 Other youth talked about female responsibility for sexual health. A 26-year-old female who had  
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7 341 not been vaccinated against HPV explained how she saw the HPV vaccine for males as providing  
8  
9 342 protection to the females with whom young men had sexual encounters, “Girls are going to take  
10  
11 343 it more seriously. For boys, it doesn't concern them directly. It's protection for [girls].” A 20-  
12  
13 344 year-old female who had not been vaccinated against HPV echoed this sentiment:  
14  
15 345 “I mean, for [girls], we know that (...), if we're going to be in a relationship  
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17 346 where we have sexual intercourse with somebody, we know that we have to  
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19 347 protect ourselves. First of all, to not get pregnant. Second of all, we know that  
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21 348 having any types of STDs and viruses would make our lives miserable. (...) But  
22  
23 349 for boys, it's like, “Ok, I'll have to wear protection. But what's the worst that can  
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27 350 happen?”  
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#### 353 4. Discussion

354 Our study on HPV vaccine awareness, knowledge, information sources, and gendered  
355 perception among young males and females in Switzerland has four main findings. First, young  
356 females had more HPV vaccine awareness and knowledge than young males. This confirms  
357 previous reports, consistent with HPV vaccine having been introduced initially and worldwide as  
358 a vaccine designed only for females [15, 40, 41]. Even though awareness of HPV vaccine was  
359 higher in our study in females than in males, a recent Swiss national study found limited HPV  
360 awareness among 24–26-year-old women, suggesting opportunities for intervention also in  
361 women, including those that are older than the primary target age group [42]. We might  
362 hypothesize that lower awareness of the older females in our sample is related to the amount of  
363 time that has passed since they received HPV vaccination during their early adolescence. In  
364 other words, lower awareness in the group of older females might be due to memory recall bias  
365 and perhaps less developed vaccination implementation programs at the time they would have  
366 been exposed to them.

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368 Second, increased knowledge was associated with higher HPV vaccine uptake, in both females  
369 and males, suggesting that knowledge matters. This confirms results from previous reports [11,  
370 15-17]. In our study we only saw a trend towards a small difference in HPV vaccine knowledge  
371 between the younger and older age groups. Other studies however, found a higher knowledge  
372 score in older compared to younger participants [15, 41]. Encouragingly, younger participants  
373 were more aware of HPV vaccine compared to older participants, in contrast to other studies  
374 [15, 43].

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376 Third, the internet and social media played a surprisingly minor role as HPV vaccine information

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3 377 sources for youth in our study. This stands in contrast to other studies that found social media  
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5 378 to increasingly become a source of health information worldwide [44-47]. Another US study  
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7 379 described the internet as being one of the most frequently mentioned sources of vaccine  
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10 380 information among adolescents [48]. Currently, the potential of internet/ social media  
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12 381 information for HPV prevention/ vaccination uptake seems not to be used in Switzerland.

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16 383 Fourth, despite the male HPV vaccine recommendation was introduced more than four years  
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18 384 prior to our interviews, both female and male youth in our study associated HPV vaccine  
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20 385 predominantly with cervical cancer, consistent with the gendered views of HPV vaccine  
21  
22 386 documented in previous reports [3, 13]. That said, it is encouraging to see a slight shift in the  
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24 387 younger age group from a female gendered perspective to a gender-neutral perspective on HPV  
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26 388 vaccine.

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#### 31 390 **4.1 Strengths and limitations**

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35 391 One of the major strengths of our study is that it is a mixed-methods study. Our qualitative work  
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37 392 adds some description and explanation to our quantitative findings. Furthermore, we have a  
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39 393 large number of male participants in our study. The Swiss context in particular lacks data on HPV  
40  
41 394 vaccine awareness, knowledge, and information sources from male youth. Our study addresses  
42  
43 395 this research gap. Previous studies have predominantly focused on parents and their knowledge  
44  
45 396 on HPV vaccine [21-26]. Our study included youth, and this allowed us to gain important insights  
46  
47 397 on who youth turn to when deciding on HPV vaccination. Since the vaccine is recommended as a  
48  
49 398 catch-up vaccine until 26 years in many countries, including Switzerland, we have to ensure that  
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51 399 youth are aware of the HPV vaccine and that they have the necessary knowledge to make an  
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53 400 informed HPV vaccination decision.

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3 401 One limitation of this study is that we might overestimate knowledge based on the way we  
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5 402 classified answers for the quantitative component. For example, if participants had heard of the  
6  
7 403 HPV vaccine, we simply asked them if they know what it is for but added no further questions. In  
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9 404 addition, for participants who have only heard of the “cervical cancer vaccine,” we did not ask  
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11 405 any follow-up questions on HPV knowledge. Other studies have assessed knowledge in more  
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13 406 depth, asking participants more knowledge specific questions [3, 18, 19]. Since our  
14  
15 407 questionnaire already lasted 25-35 minutes with questions on VH (Jafflin K., manuscript in  
16  
17 408 preparation), CAM use (Jafflin K., manuscript in preparation, Kiener L., Schwendener C., et al,  
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19 409 manuscript submitted) and moral foundations (Jafflin K., manuscript in preparation) we opted  
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21 410 to not include more questions to further assess participants’ knowledge. Another limitation to  
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23 411 this study was that our sampling strategy led to a non-representative sample. Additionally,  
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25 412 potential sources of bias arise from us not being able to get in contact with participants who do  
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27 413 not visit a physicians’ office. Our sampling strategy however allowed us to recruit a more diverse  
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29 414 sample regarding biomedical and CAM providers.  
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## 37 415 38 416 **5. Conclusion**

39 417 This study underlines the importance of HPV awareness and knowledge given the association  
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41 418 between HPV awareness and knowledge and HPV vaccine uptake. However, males still have  
42  
43 419 limited awareness and knowledge about HPV vaccine. Future strategies to increase HPV vaccine  
44  
45 420 uptake, especially among males, should focus on better and more information supply to youth  
46  
47 421 explaining them the benefit of the HPV vaccine. School vaccination programs have proven to be  
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49 422 effective and should be further expanded [31]. Parents play an important role in youth’ decision  
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51 423 making process when it comes to HPV vaccine and they should be equally informed about the  
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53 424 benefits and importance of the HPV vaccine. Efforts should be made to underline the  
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3 425 effectiveness of the HPV vaccine for males and females to reach a gender-neutral perception of  
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5 426 the HPV vaccine. Targeted public health efforts should consider exploring internet and social  
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7 427 media as potential information distribution platforms. HPV vaccine uptake has improved over  
8  
9 428 the years, but there is substantial room for improvement, particularly in terms of increasing  
10  
11 429 knowledge and awareness among young men and women alike.  
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14 430

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17  
18  
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### 25 435 **Disclosure of Potential Conflict of Interest**

26  
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28 436 All authors: no conflicts.  
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### 45 444 **Ethics approval**

46  
47  
48 445 The study was approved by the local ethics committee (Ethikkommission Nordwest- und  
49  
50 446 Zentralschweiz, EKNZ; project ID number 2017-00725). The ethics approval covers all study  
51  
52 447 participants, which includes adolescent and adult patients as well as biomedical and CAM  
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54 448 providers. Informed consent was provided by all participants after the nature and possible  
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3 449 consequences of the study had been fully explained.  
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8 451 **Data sharing statement**

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10 452 Data is available upon reasonable request to the corresponding author.  
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**Contributors' Statement Page**

Ms. Kiener and Ms. Schwendener recruited participating youth, conducted interviews, carried out the analysis, drafted the initial manuscript, and reviewed and revised the manuscript.

Dr. Jafflin conceptualized and designed the study, designed the data collection instruments, coordinated and supervised data collection, carried out the analyses, and reviewed and revised the manuscript.

Ms. Rouached, Ms. Juillerat and Mr. Meier recruited participating youth, conducted interviews, and reviewed and revised the manuscript.

Dr. Schärli, Dr. Muggli, Dr. Gültekin and Dr. Gruillot recruited participating youth, and reviewed and revised the manuscript.

Mr. Baumann and Ms. Debergh recruited participating youth, conducted interviews, and reviewed and revised the manuscript.

Dr. Huber conceptualized and designed the study, recruited participating providers, and reviewed and revised the manuscript.

Dr. Merten conceptualized and designed the study, designed the data collection instruments, coordinated and supervised data collection, and reviewed and revised the manuscript.

Dr. Buhl designed the data collection instruments, recruited participating youth, conducted interviews, analyzed qualitative data, and reviewed and revised the manuscript.

Dr. Deml conceptualized and designed the study, designed the data collection instruments, recruited participating providers and youth, conducted qualitative interviews, analyzed qualitative data, and reviewed and revised the manuscript.

Dr. Tarr conceptualized and designed the study, designed the data collection instruments, recruited participating providers, coordinated and supervised data collection, carried out the analyses, and reviewed and revised the manuscript.

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3 478 All authors approved the final manuscript as submitted and agree to be accountable for all  
4 479 aspects of the work.  
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3 **623 Figures:**  
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6 **624 1. Awareness and Knowledge of HPV Vaccine**  
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8 **625 2. Awareness and HPV Vaccine Uptake**  
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10 **626 3. Knowledge and HPV Vaccine Uptake**  
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13 **627 4. Information Sources**  
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15 **628 5. HPV Vaccine Consulting Behavior**  
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630 **Table 1. Participant Characteristics (quantitative questionnaire)**

	All Participants (n = 997)	Male (n = 585)	Female (n = 412)
<b>Age</b>			
Age (years), median (IQR)	19 (18-21)	19 (19-20)	20 (17-23)
Born before July 1 <sup>st</sup> , 2002, n (%)	849 (85)	525 (90)	324 (79)
Born on/ after July 1 <sup>st</sup> , 2002, n (%)	148 (15)	60 (10)	88 (21)
<b>Nationality</b>			
Swiss, n (%)	913 (92)	547 (94)	366 (89)
<b>Language</b>			
German, n (%)	667 (67)	448 (77)	229 (53)
French, n (%)	168 (17)	47 (8)	121 (29)
Italian, n (%)	156 (16)	86 (15)	70 (17)
English, n (%)	6 (1)	4 (1)	2 (0.5)
<b>Recruitment setting</b>			
Biomedical provider, n (%)	405 (41)	146 (25)	259 (63)
Military service, n (%)	375 (38)	371 (63)	4 (1)
CAM provider, n (%)	148 (15)	55 (9)	93 (23)
Adolescent clinic, n (%)	69 (7)	13 (2)	56 (14)
<b>Living situation</b>			
With parents, n (%)	817 (82)	497 (85)	320 (78)
<b>School vaccination program</b>			
School program available, n (%)	448 (45)	180 (31)	268 (65)
<b>Vaccination status</b>			
	<i>n = 940</i>	<i>n = 537</i>	<i>n = 403</i>
Has received $\geq 1$ does of HPV vaccine, n (%)	370 (39)	108 (20)	262 (65)

631 **Note.** All data shown are number (%) of participants, unless otherwise indicated. Due to rounding, total  
632 numbers may not add up to 100%.

633 **Abbreviations.** CAM, complementary and alternative medicine; IQR, interquartile range

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635 **Table 2. Participant Characteristics (qualitative interview)**

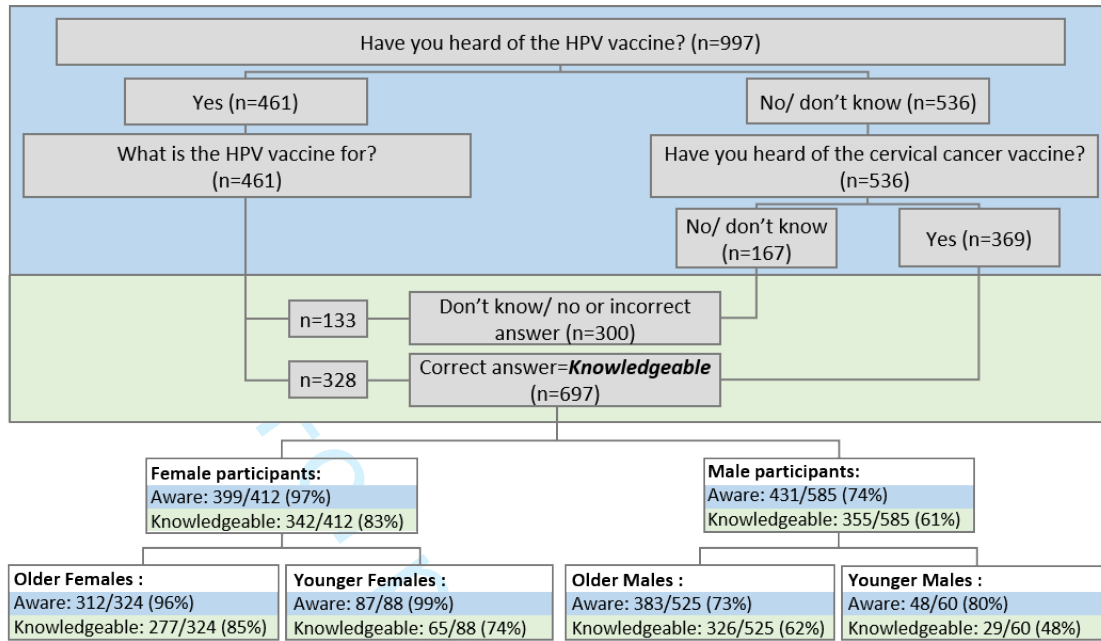
<b>French-Speaking Region</b>		
Female		N= 6
	Age	15-26 years, $\bar{x}$ =19.6 years
	Received at least 1 dose of HPV vaccination	N=4(66%)
	Informed through school vaccination program	N=6(100%)
Male		N=8
	Age	15-26 years, $\bar{x}$ =22.4 years
	Received at least 1 dose of HPV vaccination	N=4(50%)
	Informed through school vaccination program	N=1(13%)
<b>German-Speaking Region</b>		
Female		N=8
	Age	15-26 years, $\bar{x}$ =20.9 years
	Received at least 1 dose of HPV vaccination	N=4(50%)
	Informed through school vaccination program	N=7(88%)
Male		N=9
	Age	15-26 years, $\bar{x}$ = 20.6years
	Received at least 1 dose of HPV vaccination	N=1(11%)
	Informed through school vaccination program	N=1(11%)

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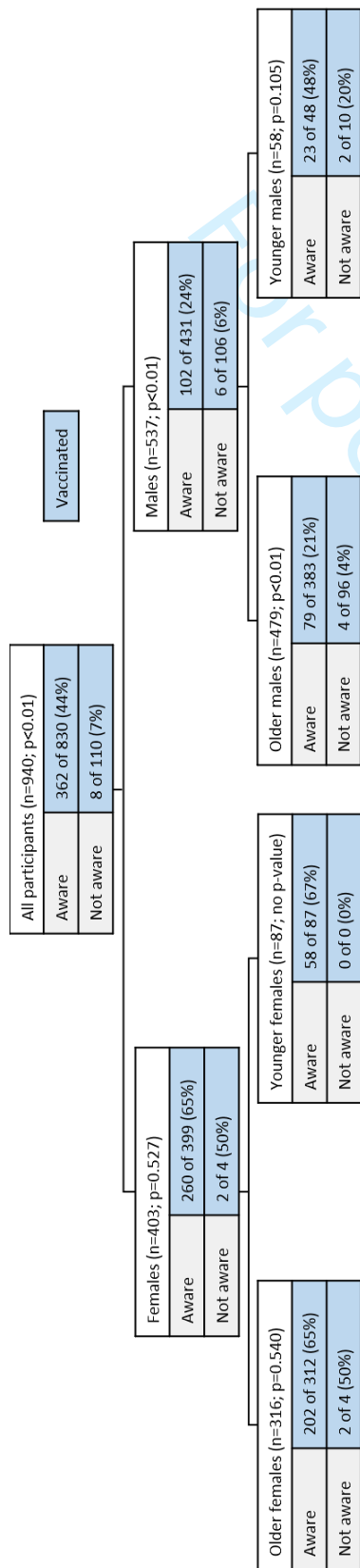


**Figure 1. Awareness and Knowledge of HPV Vaccine**



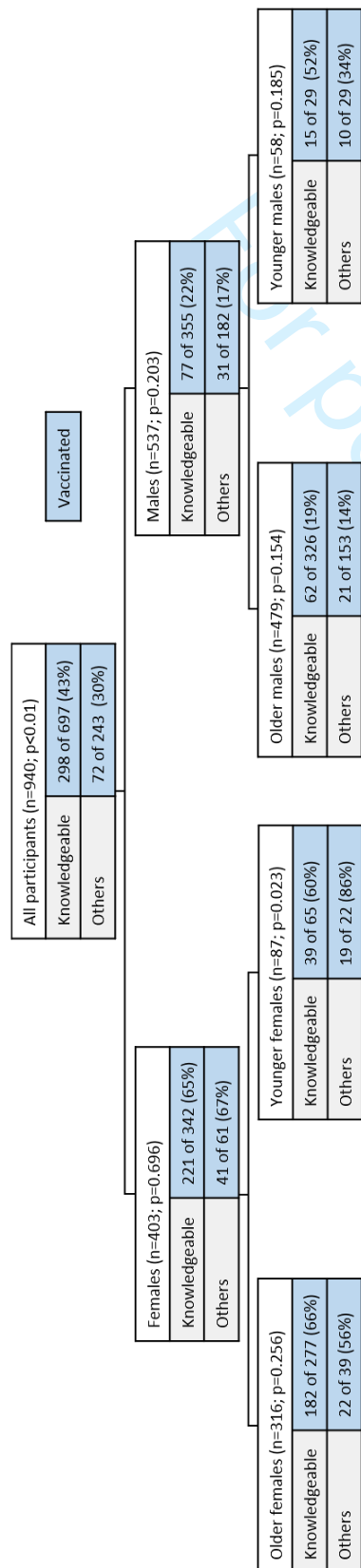
**Note.** All data in blue stands for awareness and all data in green for knowledge.

**Figure 2. Awareness and HPV Vaccine Uptake**



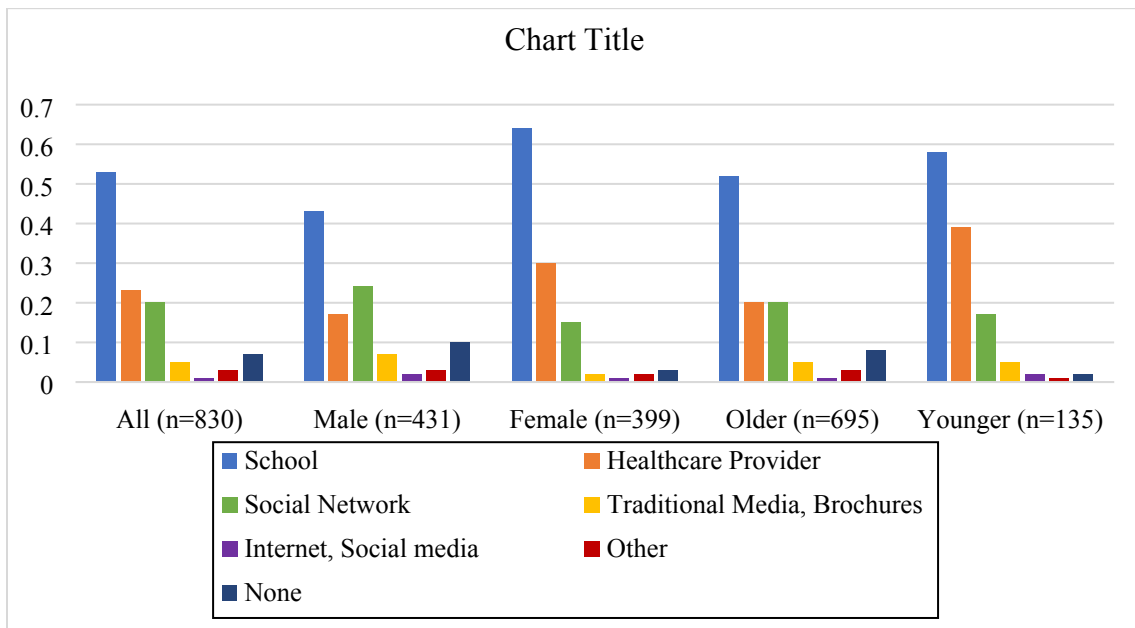
**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

**Figure 3. Knowledge and HPV Vaccine Uptake**



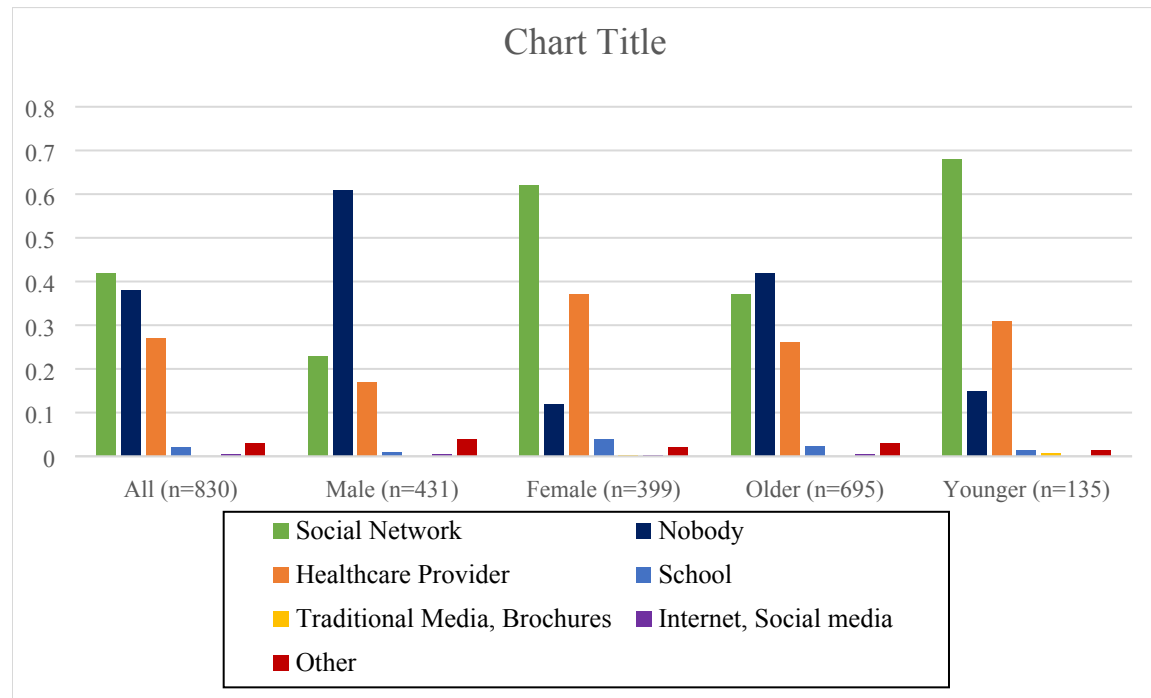
**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

Figure 4. Information Sources



**Note.** 167/997 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were possible.

1 **Figure 5. HPV Vaccine Consulting Behavior**



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3 **Note.** 167/997 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were

4 possible.

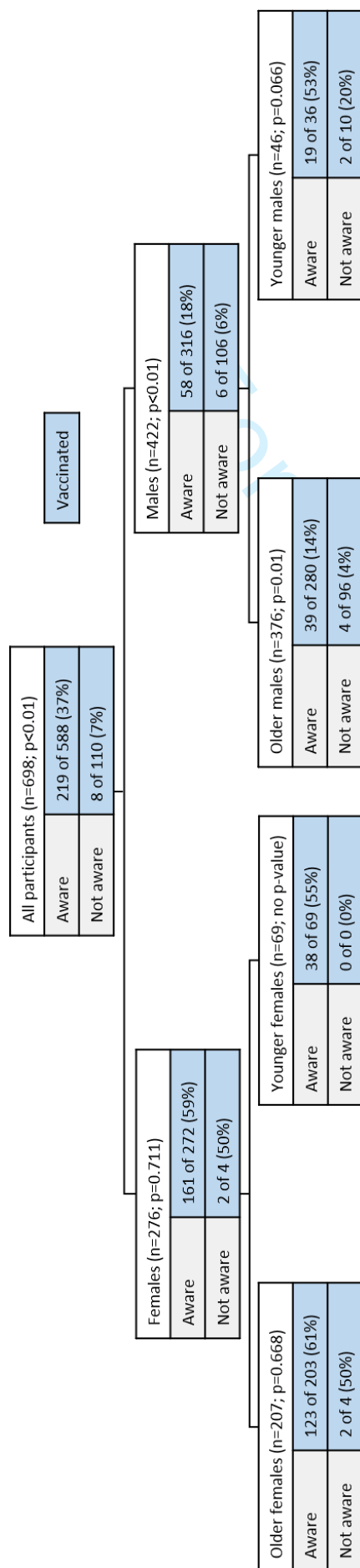
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## Supplement

Supplementary Table 1. Survey questions concerning gendered perceptions of HPV Vaccine

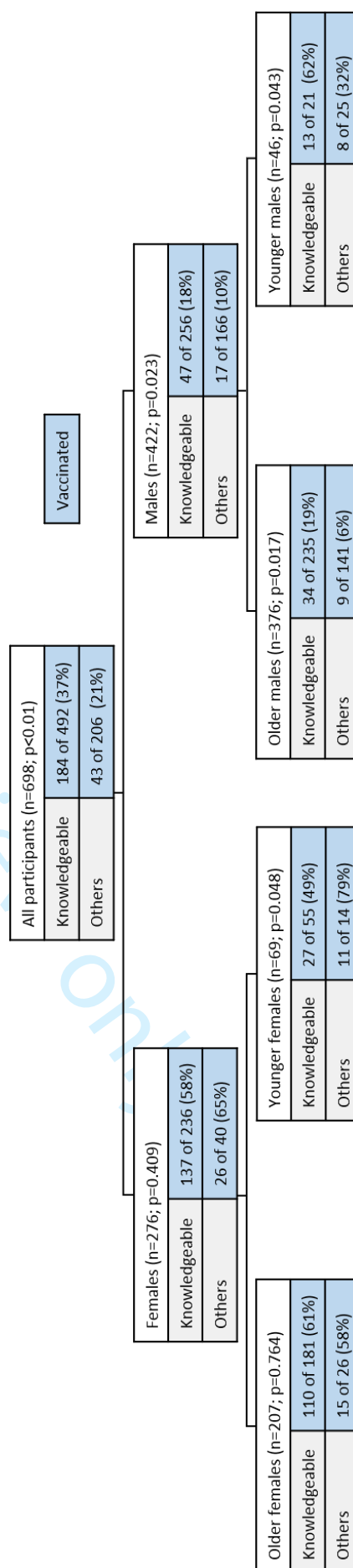
	All participants	By gender		By age groups	
		Male	Female	Born before 1.7.02	Born on/ after 1.7.02
<b>Have you heard of the HPV vaccine?</b>	<i>(n = 997)</i>	<i>(n = 585)</i>	<i>(n = 412)</i>	<i>(n = 849)</i>	<i>(n = 148)</i>
Yes, n (%)	461 (46)	176 (30)	285 (69)	359 (42)	102 (69)
No/ don't know, n (%)	536 (54)	409 (70)	127 (31)	490 (58)	46 (31)
<b>Have you heard of the cervical cancer vaccine?</b>	<i>(n = 535)</i>	<i>(n = 409)</i>	<i>(n = 126)</i>	<i>(n = 489)</i>	<i>(n = 46)</i>
Yes, n (%)	369 (69)	255 (62)	114 (90)	336 (69)	33 (72)
No/ don't know, n (%)	166 (31)	154 (38)	12 (10)	153 (31)	13 (28)
<b>What is the HPV vaccine for?</b>	<i>(n = 461)</i>	<i>(n = 176)</i>	<i>(n = 285)</i>	<i>(n = 359)</i>	<i>(n = 102)</i>
Only female, n (%)	185 (40)	35 (20)	150 (53)	160 (45)	25 (25)
All other answers, n (%)	276 (60)	141 (80)	135 (47)	199 (55)	77 (75)
<b>Combination of all questions</b>	<i>(n = 710)</i>	<i>(n = 361)</i>	<i>(n = 349)</i>	<i>(n = 611)</i>	<i>(n = 99)</i>
Only female, n (%)	554 (78)	290 (80)	264 (76)	496 (81)	58 (59)
All other answers, n (%)	156 (22)	71 (20)	85 (24)	115 (19)	41 (41)

Supplementary Figure 1. Awareness and HPV Vaccine



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

Supplementary Figure 2. Knowledge and HPV Vaccine



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Page
	Reporting Item	Number
<b>Title and abstract</b>		
Title	<a href="#">#1a</a> Indicate the study's design with a commonly used term in the title or the abstract	1



1	Abstract	<a href="#">#1b</a>	Provide in the abstract an informative and balanced	2
2			summary of what was done and what was found	
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6	<b>Introduction</b>			
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8				
9	Background /	<a href="#">#2</a>	Explain the scientific background and rationale for the	5
10	rationale		investigation being reported	
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14	Objectives	<a href="#">#3</a>	State specific objectives, including any prespecified	5,6
15			hypotheses	
16				
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20	<b>Methods</b>			
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22				
23	Study design	<a href="#">#4</a>	Present key elements of study design early in the paper	7
24				
25				
26	Setting	<a href="#">#5</a>	Describe the setting, locations, and relevant dates, including	7,8
27			periods of recruitment, exposure, follow-up, and data	
28			collection	
29				
30				
31	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of	7-10
32			selection of participants.	
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40		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential	n/a
41			confounders, and effect modifiers. Give diagnostic criteria, if	
42			applicable	
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46				
47	Data sources /	<a href="#">#8</a>	For each variable of interest give sources of data and details	8-10
48	measurement		of methods of assessment (measurement). Describe	
49			comparability of assessment methods if there is more than	
50			one group. Give information separately for for exposed and	
51			unexposed groups if applicable.	
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1	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	n/a
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4	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	7-11
5				
6				
7	Quantitative	<a href="#">#11</a>	Explain how quantitative variables were handled in the	7-9
8	variables		analyses. If applicable, describe which groupings were	
9			chosen, and why	
10				
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15	Statistical	<a href="#">#12a</a>	Describe all statistical methods, including those used to	8-10
16	methods		control for confounding	
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20	Statistical	<a href="#">#12b</a>	Describe any methods used to examine subgroups and	7-10
21	methods		interactions	
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26	Statistical	<a href="#">#12c</a>	Explain how missing data were addressed	n/a
27	methods			
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31	Statistical	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of	n/a
32	methods		sampling strategy	
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36	Statistical	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
37	methods			
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42	<b>Results</b>			
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44				
45	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg	11
46			numbers potentially eligible, examined for eligibility,	
47			confirmed eligible, included in the study, completing follow-	
48			up, and analysed. Give information separately for for	
49			exposed and unexposed groups if applicable.	
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57	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	11
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
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3				
4	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic,	11,27,28
5			clinical, social) and information on exposures and potential	
6			confounders. Give information separately for exposed and	
7			unexposed groups if applicable.	
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14	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each	11,12,16
15			variable of interest	
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19	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures.	11-17
20			Give information separately for exposed and unexposed	
21			groups if applicable.	
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27	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-	n/a
28			adjusted estimates and their precision (eg, 95% confidence	
29			interval). Make clear which confounders were adjusted for	
30			and why they were included	
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37	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were	11-17
38			categorized	
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42	Main results	<a href="#">#16c</a>	If relevant, consider translating estimates of relative risk into	n/a
43			absolute risk for a meaningful time period	
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48	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups	n/a
49			and interactions, and sensitivity analyses	
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53	<b>Discussion</b>			
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56	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18,19
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1	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources	19,20
2			of potential bias or imprecision. Discuss both direction and	
3			magnitude of any potential bias.	
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9	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives,	18-20
10			limitations, multiplicity of analyses, results from similar	
11			studies, and other relevant evidence.	
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16	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study	18-20
17			results	
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22	<b>Other Information</b>			
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25	Funding	<a href="#">#22</a>	Give the source of funding and the role of the funders for the	21
26			present study and, if applicable, for the original study on	
27			which the present article is based	
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# BMJ Open

## HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Sexual health, Immunology (including allergy)
Keywords:	IMMUNOLOGY, Public health < INFECTIOUS DISEASES, PREVENTIVE MEDICINE, PUBLIC HEALTH, SEXUAL MEDICINE

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# HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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## Key Words:

HPV vaccine, HPV vaccine awareness, HPV vaccine knowledge, HPV vaccine information sources, HPV vaccine uptake, youth



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3 **39 ABSTRACT:**  
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6 **40 Objectives:** We aimed to provide a detailed characterization of HPV vaccine awareness,  
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8 **41** knowledge, and information sources in the HPV vaccine decision-making process of youth, both  
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10 **42** male and female, in Switzerland.

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13 **43 Design:** With a mixed-methods study design, we conducted quantitative questionnaires and  
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15 **44** qualitative interviews, which lasted 20-45 minutes.

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18 **45 Setting and participants:** We recruited participants, 15-26 years of age, in physicians'  
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20 **46** offices, in a local sexual health clinic, and during military enlistment. We administered  
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22 **47** quantitative questionnaires to 997 youth participants (585 male, 412 female) and conducted  
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24 **48** qualitative interviews with 31 youth (17 male, 14 female).

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27 **49 Primary and secondary outcome measures:** We assessed HPV vaccine awareness,  
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29 **50** knowledge, information sources and vaccination status.

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32 **51 Results:** In the study's quantitative component, 108 (20%) male and 262 (65%) female  
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34 **52** participants had received  $\geq 1$  dose of HPV vaccine. 697 (70%) participants were knowledgeable  
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36 **53** about the HPV vaccine. Females were more likely to be knowledgeable than males (342/412  
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38 **54** [83%] vs. 355/585 [61%];  $p < 0.01$ ). Younger participants in the sample compared to older  
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40 **55** participants were more likely to be aware of HPV vaccine (135/148 [91%] vs. 695/849 [82%];  
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42 **56**  $p < 0.01$ ). The three most mentioned information sources were school health programs (442  
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44 **57** [53%]), health care providers (190 [23%]), and participants' social networks (163 [20%]). Overall,  
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46 **58** 554/710 (78%) participants had a female-gendered perception of HPV vaccine, a finding which  
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48 **59** was further supported and explained by qualitative data.

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52 **60 Conclusions:** Despite a male HPV vaccine recommendation being made  $>4$  years prior to the  
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54 **61** data collection, HPV vaccine knowledge was higher among females than males, and a female-

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62 gendered perception of HPV vaccine remains prevalent. Internet and social media were minor  
63 HPV vaccine information sources. Study findings demonstrate that HPV knowledge matters for  
64 HPV vaccine uptake and suggest that we should improve HPV information quality and access for  
65 youth, particularly by tailoring knowledge campaigns to young men.  
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For peer review only

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3 67 **Strengths and limitations of this study:**  
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- 6 68 • One major strength of the study is that it uses a mixed methods approach, allowing for  
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8 69 the qualitative data to offer potential explanations to quantitative findings.  
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10 70 • The study included a large number of female and male youth, allowing us to gain  
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12 71 gendered differences regarding HPV vaccination information sources.  
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14 72 • One limitation of this study is that we might overestimate HPV vaccination knowledge  
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16 73 based on the way we classified answers for the quantitative component.  
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18 74 • Our sampling strategy led to a non-representative sample.  
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## 76 1. Introduction

77 Surprisingly little research has directly examined youth knowledge, awareness, and information  
78 sources as determinants of *human papillomavirus (HPV)* vaccine uptake. Furthermore, the  
79 research that has been done on youth perspectives has primarily focused on females [1-6],  
80 although the vaccine has been recommended for male youth for several years in many  
81 countries. Literature on the determinants of HPV vaccine attitudes and uptake among male  
82 youth remains limited [7-12]. Furthermore, the false perception that the HPV vaccination  
83 concerns only women continues to persist in popular discourse since it has been long known as  
84 the “cervical cancer vaccine” [3, 13].

85 In addition to issues related to access barriers [2, 14], previous reports in male and female youth  
86 suggest that low HPV vaccine uptake is also related to limited HPV vaccine awareness and  
87 knowledge [11, 15-17], and to the behavioral expectations youth perceive from their parents,  
88 family members, and peers [18, 19]. The most consistent predictor of HPV vaccination is having  
89 received a recommendation from a health care provider [12, 14, 20].

90 Previous research has focused on parents' attitudes and information sources towards HPV  
91 vaccine since the primary target group are 11-14-year-old adolescents [21-26]. A key component  
92 of the Swiss National Vaccination Strategy (NVS), in order to increase HPV vaccination rates,  
93 however, is to address insufficient levels of youth vaccination knowledge, e.g. by emphasizing  
94 the importance of school vaccination programs. Also, the NVS aims to address insufficient  
95 vaccination access, e.g., by removing financial barriers, especially for young adults with limited  
96 financial resources. Accordingly, HPV vaccine is now covered by the state when given until the  
97 age of 26 to men and women in the setting of a state vaccination program, thereby addressing  
98 such financial barriers to HPV vaccination in youth [27]. The effective implementation of each of  
99 these NVS approaches would benefit from additional research on HPV vaccine awareness,

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3 100 knowledge, and information sources in youth. We have recently documented the validity of  
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5 101 measuring vaccine hesitancy (VH) in youth using the Youth Attitudes about Vaccines (YAV)  
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7 102 questionnaire, which shows that VH is an independent predictor of HPV non-immunization in  
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10 103 Switzerland in female youth [28](**Kiener L., Schwendener C., et al, manuscript submitted**).  
11  
12 104 The aims of the present study were to provide a detailed characterization of HPV vaccine  
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14 105 awareness, knowledge, and information sources in the HPV vaccine decision-making process  
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16 106 among youth, both male and female, in Switzerland. We additionally aimed to gain a more  
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18 107 current understanding of gendered aspects youth may have around the HPV vaccine. Finally, we  
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20 108 examined how these factors contribute to HPV vaccine uptake in both sexes and in younger and  
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22 109 older adolescents.  
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## 111 2. Methods

### 112 2.1 *The Swiss Context*

113 The Swiss Federal Office of Public Health (FOPH) and the Federal Vaccination Commission have  
114 recommended HPV vaccine since 2007 for female youth [29], and since 2015 for male youth  
115 [30]. HPV vaccine uptake has increased in the last decade [31], but lies still below the 80%  
116 immunization target [32]. In 2017-2019, the most recent evaluation period, only 20% of 16-year  
117 old males and 64% of females, had received  $\geq 1$  dose of HPV vaccine on average throughout  
118 Switzerland [33]. Regional differences in uptake have been associated with specifics of  
119 vaccination policies of local health authorities, limited information access, and the availability  
120 and quality of school vaccination programs [34, 35].

### 122 2.2 *Study design*

123 We applied a convergent mixed-methods design [36], meaning we collected qualitative and  
124 quantitative data in parallel. We conducted the study in the context of our Swiss national  
125 research program (NRP74) on the determinants of VH in Switzerland regarding childhood and  
126 HPV vaccination. The local institutional review board (Ethikkommission Nordwest- und  
127 Zentralschweiz) approved the study. All participants provided written informed consent. Full  
128 details on our recruitment methods, power calculation, and the questionnaire have been  
129 previously published [37].

### 131 2.3 *Study population and recruitment*

132 Participants were 15-26 years of age, male and female. Of note, youth in Switzerland are legally  
133 able to make vaccine decisions starting at age 14 [38], which supports vaccination promotion  
134 efforts which focus on youth perspectives on HPV vaccination. Even though the primary target

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3 135 group is 11-14-year-olds, the vaccine is also recommended as a catch-up vaccine until 26 years  
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5 136 in many countries, including Switzerland.  
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7 137 Since HPV vaccination programs in Switzerland are tailored for an age group (11-26 years) with  
8  
9 138 limited contact with the health system because young people who are otherwise healthy do not  
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11 139 tend to consult with physicians we used diverse recruitment strategies to increase study  
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13 140 participation. We recruited participating youth in the offices of physicians providing biomedicine  
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15 141 and sometimes additionally complementary and alternative medicine (CAM), and in a local  
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17 142 sexual health clinic. Recruitment was done in urban and rural areas, and in 3 of 4 Swiss language  
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19 143 regions, i.e., German, French, Italian. In order to gain more male participants, we also recruited  
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21 144 during military enlistment (military service is compulsory for Swiss males, with enlistment being  
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23 145 at age 18-24). Since July 1<sup>st</sup>, 2016 the cost of HPV vaccine has been covered by mandatory health  
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25 146 insurance for male adolescents 11-14 years of age and as a catch-up vaccination until age 26 in  
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27 147 Switzerland. We therefore divided male participants in an older and a younger age group. We  
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29 148 refer to male participants born before vs. on/after July 1<sup>st</sup>, 2002 as the “older” and “younger”  
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31 149 participants, respectively, meaning that younger male participants were part of the HPV vaccine  
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33 150 target age group when 11-14 years of age. For comparison purposes, we applied the same age  
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35 151 cut-offs to female participants.  
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#### 43 153 *2.4 Patient and public involvement*

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45 154 We did not include patient or public involvement in designing the study, commenting the  
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47 155 outcomes, interpreting the results of this study or reviewing the manuscript.  
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3 159 2.5 *Quantitative methods*  
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5 160 As previously reported [37], we developed German, French, Italian, and English versions of the  
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7 161 questionnaire. We interviewed military participants on site (face-to-face), and the other  
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9 162 participants on the phone, after the physician/clinic visit. Apart from age at time of interview  
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11 163 below 15 or above 26 there were no further exclusion criteria. Quantitative interviews lasted 25-  
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13 164 35 minutes and were conducted by medical students with previous training in participant  
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15 165 recruitment, informed consent procedures and interview techniques. Interviews were  
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17 166 conducted from January 2019 to April 2020. All data was entered to open data kit (ODK) using  
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19 167 tablets [37]. The questionnaire included socio-demographics including language, place of  
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21 168 residence, living situation (with parents, with roommates, with partner), age, nationality, and  
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23 169 school HPV vaccination program availability (**Supplementary Material 1**).

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27 170 HPV vaccination status (has received  $\geq 1$  dose of HPV vaccination) was assessed based on review  
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29 171 of the vaccination booklet of the participant, and, if unavailable, on personal report of being  
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31 172 vaccinated.

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34 173 In order to measure youth *awareness* about the HPV vaccine, we asked all participants if they  
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36 174 had heard of the HPV vaccine. To accommodate for a gendered perception, for those who said  
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38 175 “no” to the previous question, we asked if they had heard of the “cervical cancer vaccine.” To  
39  
40 176 measure youth *knowledge* about the HPV vaccine, we asked participants what the HPV vaccine  
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42 177 is intended for. Those who responded correctly were considered to be knowledgeable. We  
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44 178 considered an answer to be correct if they mentioned at least one correct aspect about the HPV  
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46 179 vaccine, i.e., it protects against “cancer”, “cervical cancer”, “papilloma virus”, or a “sexually  
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48 180 transmitted disease”. We sought to establish where youth obtained information about the HPV  
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50 181 vaccination by asking two questions, each with free text answer options in order to document  
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52 182 the most precise responses: (1) “Where have you heard about HPV vaccination?” and (2) “Who  
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3 183 did you consult with when deciding whether or not to get the HPV vaccine?”. Answers to the  
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5 184 second question included consulting people as well as traditional media, the internet, and other  
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7 185 forms of information supply.  
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## 11 187 *2.6 Qualitative methods*

12 188 After completion of the quantitative interviews, participants were invited to participate in an  
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14 189 additional qualitative interview. We subsequently contacted interested youth who indicated  
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16 190 willingness in the German- and French-speaking regions of Switzerland. Additional participants  
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18 191 were recruited through researcher and participant social networks and by snowball sampling.  
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20 192 Our research team collaboratively developed a semi-structured interview guide, which we  
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22 193 piloted and revised iteratively for clarity and coherence. The interviews allowed us to gather  
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24 194 background information about the youth, their health status and lifestyle, the HPV vaccine  
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26 195 decision-making process, including knowledge, awareness, information sources, and the people  
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28 196 with whom they discussed the vaccination. Qualitative interviews were conducted (March 2019-  
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30 197 September 2020), either face-to-face or online (Skype or Zoom), they lasted 20-45 minutes, and  
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32 198 were audio-recorded and transcribed verbatim. Qualitative data were analyzed by social  
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34 199 scientists Andrea Buhl and Michael J. Deml. Analysis of the qualitative interviews was guided by  
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36 200 the Framework Method [39] with support of MAXQDA software. All quotes from interviews  
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38 201 have been translated from German or French into English and anonymized.  
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### 202 3. Results

203 For the study's quantitative component, we completed telephone (n=622) or face-to-face  
204 (n=375) interviews with 1010 youth. Of these, we excluded eight participants because they did  
205 not meet the age criteria, one participant because of missing gender information, and four  
206 additional interviews due to missing answers on awareness and knowledge. Quantitative  
207 analyses are therefore based on 997 participants (585 male, 412 female). Their characteristics  
208 are shown in **Table 1**. For the study's qualitative component, we conducted 14 qualitative  
209 interviews with female youth and 17 interviews with male youth. Qualitative participants ranged  
210 in age from 15 to 26 years in age (average ~21 years). Characteristics of the participants of the  
211 qualitative interview are shown in **Table 2**.

212 In the following sections, we present results regarding: (1) awareness and knowledge about the  
213 HPV vaccination, (2) youth HPV vaccination information sources and people with whom they  
214 had discussed the vaccination, and (3) youth's gendered perceptions of the HPV vaccine.

#### 216 3.1 Awareness about HPV Vaccination

217 For the purpose of this study, we defined *awareness* as having heard of the HPV or "cervical  
218 cancer" vaccine. Significantly more female youth were aware of the HPV vaccine than male  
219 youth. Of the 997 participants, 461 (46%) had heard of the HPV vaccine; 176/585 (30%) males  
220 and 285/412 (69%) females ( $p<0.01$ ). Among the 536 participants who had not heard of HPV  
221 vaccine, 369 (69%) had heard of the "cervical cancer vaccine", 255/409 (62%) males and  
222 114/127 (90%) females ( $p<0.01$ ).

224 Of the 997 participants, 830 (83%) had heard of the HPV or "cervical cancer vaccine", 431/585  
225 (74%) of males and 399/412 (97%) of females ( $p<0.01$ ). In both awareness of HPV vaccine and

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2  
3 226 awareness of “cervical cancer vaccine”, females had more awareness than males. 695/849 (82%)  
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5 227 of the older participants and 135/148 (91%) of the younger participants had heard of the HPV or  
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7 228 “cervical cancer vaccine” ( $p<0.01$ ). Details are shown in **Figure 1**. Subgroup analysis showed a  
8  
9 229 significant difference in awareness between participants who were recruited in the military and  
10  
11 230 all other participants (biomedical vs. military  $p<0.01$ ; CAM vs. military  $p<0.01$ ; adolescent clinic  
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13 231 vs. military  $p<0.01$ ). However, this effect was not due to the different subgroups but is rather  
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15 232 derived from the unequal distribution of gender (more males) within the military subgroup  
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17 233 **(Supplementary Table 1-3)**.  
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23 235 Of the 997 participants, 370 (39%) had received  $\geq 1$  dose of HPV vaccine. As shown in **Figure 2**,  
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25 236 participants with greater awareness had also more often received  $\geq 1$  dose of HPV vaccine  
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27 237 compared to participants with limited awareness (362/830 [44%] vs. 8/110 [7%];  $p<0.01$ ). This  
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29 238 effect was manifest in males (102/431 [24%] of aware males vs. 6/106 [6%] of males with  
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31 239 limited awareness had received  $\geq 1$  HPV vaccine dose;  $p<0.01$ ), but not in females (260/399 of  
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33 240 aware females [65%] vs. 2/4 [50%] of females with limited awareness had received  $\geq 1$  HPV  
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35 241 vaccine dose;  $p=0.53$ ), however, only few (4/413) females were unaware of the vaccine.  
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41 243 When we defined HPV vaccine uptake according to availability of a vaccination record, results  
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43 244 regarding the associations of awareness and uptake and of knowledge and uptake remained  
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45 245 essentially unchanged (**Supplementary Fig. 1 and 2**).  
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### 50 247 3.2 Knowledge about HPV Vaccination and Implications for Uptake

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52 248 We defined *knowledge* as being able to give a correct answer to what the HPV vaccine is for or  
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54 249 for the association of HPV with cervical cancer. 697/997 (70%) participants had knowledge of  
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3 250 HPV vaccine or the “cervical cancer vaccine”, while 300/997 (30%) participants did not. Females  
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5 251 were more knowledgeable than males (342/412 [83%] vs. 355/585 [61%];  $p < 0.01$ ) which is also  
6  
7 252 shown in **Figure 1**. We did not find a significant difference regarding knowledge between  
8  
9  
10 253 younger and older participants (94/148 [64%] vs. 603/849 [71%];  $p = 0.07$ ). Subgroup analysis  
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12 254 showed a significant difference in knowledge between participants who were recruited in the  
13  
14 255 military and all other participants (biomedical vs. military  $p < 0.01$ ; CAM vs. military  $p < 0.01$ ;  
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16 256 adolescent clinic vs. military  $p < 0.01$ ). However, this effect was not due to the different  
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18 257 subgroups but is rather derived from the unequal distribution of gender (more males) within the  
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20  
21 258 military subgroup (**Supplementary Table 1-3**).

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23 259  
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25 260 As shown in **Figure 3**, more knowledgeable participants had received  $\geq 1$  dose of HPV vaccine  
26  
27 261 compared to participants with limited knowledge (298/697 [43%] vs. 72/243 [30%];  $p < 0.01$ ), and  
28  
29 262 there was no evidence that this difference was limited to either sex (77/355 [22%]  
30  
31 263 knowledgeable males vs. 31/182 [17%] males with limited knowledge had received  $\geq 1$  HPV  
32  
33 264 vaccine dose;  $p = 0.20$ ), and 221/342 knowledgeable females [65%] vs. 41/61 [67%] females with  
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35 265 limited knowledge had received  $\geq 1$  HPV vaccine dose;  $p = 0.70$ ).

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37 266  
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39 267 For the study’s qualitative component, although the youth had agreed to participate in  
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41 268 qualitative interviews explicitly about their HPV vaccination decisions, many participants were  
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43 269 not able to tell us what specifically the HPV vaccine was intended to protect against. When  
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45 270 asked about recommendations for improvements to HPV vaccination campaigns in Switzerland,  
46  
47 271 almost all youth mentioned desiring more and better information. The following dialogue  
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49 272 demonstrates how knowledge and awareness served as barriers for a 22-year-old male who had  
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51 273 not received the vaccine:

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3 274 Researcher: So, I see [from your vaccination certificate] that you didn't get the HPV

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5 275 vaccine.

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7 276 Participant: No.

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9 277 Researcher: Was it a choice?

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11 278 Participant: No, it was an issue of information. I don't know what [HPV] is.

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### 14 15 16 280 3.3 *Youth Information Sources about HPV Vaccination*

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19 281 We assessed if and where adolescents had heard about HPV vaccination and who they may have

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21 282 turned to when deciding whether to get vaccinated against HPV. As shown in **Figure 4**, the three

22  
23 283 most commonly mentioned information sources by youth in the quantitative questionnaire

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25 284 were school health programs (53%), health care providers (23%), and participants' social

26  
27 285 networks (20%). The most mentioned information sources were similar for males and females.

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29 286 Internet and social media were mentioned infrequently as information sources (1% of all

30  
31 287 participants; 2% of males, 1% of females). Concerning the information sources used for deciding

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33 288 whether or not to vaccinate, most participants consulted their social networks (42%) and/or

34  
35 289 their healthcare provider (27%), as shown in **Figure 5**. Many participants (38%) did not talk to

36  
37 290 anyone about the HPV vaccine. We found this result predominantly with male participants (61%)

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39 291 and less with female participants (12%). Internet and social media were also infrequently

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41 292 mentioned for vaccine decision-making (0.4% of participants; 0.5% of males, 0.3% of females).

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44  
45 294 Qualitative interviews with youth showed that very few had actively sought out information

46  
47 295 about the HPV vaccination during the initial recommended age for the first dose (11-14 years).

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49 296 Primary explanations for this from the youths' perspectives included that they were too young

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51 297 when the HPV vaccine was offered via school programs or by their pediatricians, and that their

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3 298 parents had made the decision without being involved in the decision-making process. The few  
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5 299 youth who reported having had discussions about the HPV vaccination described having talked  
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7 300 to family members, primarily mothers or older siblings, or doctors (pediatricians if the vaccine  
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9 301 was offered during the initial recommended age, gynecologists for older female participants  
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11 302 who had not been vaccinated, and sexual health doctors for young men who have sex with men  
12  
13 303 (MSM)). Apart from the MSM in the qualitative study sample, young men reported not having  
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15 304 discussed the HPV vaccine with anybody. Several of the young women we interviewed recalled  
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17 305 their parents' skepticism when the HPV vaccine was first introduced. A 26-year-old female who  
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19 306 had not received the HPV vaccine explained, "It was one of the first years when it came out.  
20  
21 307 2009 or something like that. I was still a minor and still in high school. We needed our parents'  
22  
23 308 permission. My mother, who is a nurse, simply decided [against it because] it was a new vaccine,  
24  
25 309 and we didn't yet know the side effects."  
26  
27 310 When asked about where information about the HPV vaccine should come from, many youth  
28  
29 311 suggested better information campaigns via schools. This was particularly clear among youth  
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31 312 whose parents chose against the vaccine when they were in the initial recommended target age.  
32  
33 313 Despite not being vaccinated against HPV, an 18-year-old female described her views on the  
34  
35 314 added value of having HPV vaccination information campaigns and programs in schools,  
36  
37 315 particularly once youth are able to make their own health decisions:

38  
39 316 "I think it helped me a lot that that there was information at school and that the  
40  
41 317 vaccine was offered there. We were at an age when we started to make our  
42  
43 318 own decisions and that's why I liked the fact that we talked about it in school.  
44  
45 319 That helped me a lot. [...] because our parents had decided on everything  
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47 320 before. And this is, I think, the first time that we decide or shared decisions  
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49 321 about our health."  
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3 322 A 19-year-old female participant who had received the vaccine described the roles schools  
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5 323 played in explaining the rationale behind the HPV vaccine, “I think I find it very important that  
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7 324 there is an education and not just ‘get vaccinated’ and ‘it's good for you or it helps you’, but  
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10 325 rather also a ‘why’ and ‘what is it about’ and ‘what would it look like if you weren't vaccinated’,  
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12 326 what would be the consequence’? I think such a relatively educated attitude is also extremely  
13  
14 327 useful.”  
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### 18 19 329 *3.4 Youth's female-gendered perception of the HPV Vaccine*

20  
21 330 Given the HPV vaccination's association with cervical cancer in popular discourse, we analyzed if  
22  
23 331 and to what extent participants had a gendered perception of HPV vaccine. From the  
24  
25 332 quantitative sample, after excluding 287 of 997 participants without knowledge of HPV or the  
26  
27 333 “cervical cancer vaccine,” 554 of 710 (78%) participants perceived the HPV vaccine as being only  
28  
29 334 targeted towards women and not men (female-gendered answer) (**Supplementary Table 4**). For  
30  
31 335 example, many participants only mentioned cervical cancer when asked what the HPV vaccine is  
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33 336 for and only few youth mentioned that the HPV vaccine protects also males from diseases.  
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35 337 290/361 (80%) males and 264/349 (75%) females ( $p=0.13$ ) gave a female-gendered answer.  
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39 338 While both older and younger participants had a female-gendered perception on the purpose of  
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41 339 the HPV vaccination, significantly more older youth had female-gendered perceptions (496/611  
42  
43 340 (81%) older vs. 58/99 (59%) younger participants ( $p<0.01$ )). In addition, 277/331 (84%) older  
44  
45 341 males vs. 13/30 (43%) younger males gave a female-gendered answer ( $p<0.01$ ); 219/280 (78%)  
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47 342 older females vs. 45/69 (65%) younger females gave a female-gendered answer ( $p=0.02$ ).  
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53 344 During qualitative interviews, we asked youth if they saw any differences for HPV vaccination  
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55 345 between men and women. These questions elicited two types of responses: (1) youth noting the  
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3 346 vaccination as being beneficial for females only, and (2) discourses about females bearing the  
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5 347 brunt of responsibility for sexual health. For the first type of response, some youth were not  
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7 348 aware that males could get vaccinated against HPV. A 20-year-old female who had received the  
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9 349 vaccine discussed her memories of getting the vaccine in school, "If I remember correctly, boys  
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11 350 didn't get vaccinated [when I was in school]." An 18-year-old male who had not received the  
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13 351 vaccine, when asked who the HPV vaccine was for, responded, "Women. Could that be? To be  
14  
15 352 honest, that's all I know right now." Others complained that they now realize how limited their  
16  
17 353 information about the vaccination and its benefits for young males was. A 19-year-old man  
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19 354 explained:

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22  
23 355 "Well, I really haven't heard about [the HPV vaccination for boys] from anyone until  
24  
25 356 now. And I don't think this is my personal fault that I don't know anything about it. Until  
26  
27 357 now, it was only a topic for women, and now it's suddenly not anymore."

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30 358 Other youth talked about female responsibility for sexual health. A 26-year-old female who had  
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32 359 not been vaccinated against HPV explained how she saw the HPV vaccine for males as providing  
33  
34 360 protection to the females with whom young men had sexual encounters, "Girls are going to take  
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36 361 it more seriously. For boys, it doesn't concern them directly. It's protection for [girls]." A 20-  
37  
38 362 year-old female who had not been vaccinated against HPV echoed this sentiment:

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41 363 "I mean, for [girls], we know that (...), if we're going to be in a relationship  
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43 364 where we have sexual intercourse with somebody, we know that we have to  
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45 365 protect ourselves. First of all, to not get pregnant. Second of all, we know that  
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47 366 having any types of STDs and viruses would make our lives miserable. (...) But  
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49 367 for boys, it's like, "Ok, I'll have to wear protection. But what's the worst that can  
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51 368 happen?"

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#### 370 4. Discussion

371 Our study on HPV vaccine awareness, knowledge, information sources, and gendered  
372 perception among young males and females in Switzerland has four main findings. First, young  
373 females had more HPV vaccine awareness and knowledge than young males. This confirms  
374 previous reports, consistent with HPV vaccine having been introduced initially and worldwide as  
375 a vaccine designed only for females [15, 40, 41]. Even though awareness of HPV vaccine was  
376 higher in our study in females than in males, a recent Swiss national study found limited HPV  
377 awareness among 24–26-year-old women, suggesting opportunities for intervention also in  
378 women, including those that are older than the primary target age group [42]. We might  
379 hypothesize that lower awareness of the older females in our sample is related to the amount of  
380 time that has passed since they received HPV vaccination during their early adolescence. In  
381 other words, lower awareness in the group of older females might be due to memory recall bias  
382 and perhaps less developed vaccination implementation programs at the time they would have  
383 been exposed to them.

384  
385 Second, increased knowledge was associated with higher HPV vaccine uptake, in both females  
386 and males, suggesting that knowledge matters. This confirms results from previous reports [11,  
387 15-17]. In our study we only saw a trend towards a small difference in HPV vaccine knowledge  
388 between the younger and older age groups. Other studies however, found a higher knowledge  
389 score in older compared to younger participants [15, 41]. Encouragingly, younger participants  
390 were more aware of HPV vaccine compared to older participants, in contrast to other studies  
391 [15, 43].

392  
393 Third, the internet and social media played a surprisingly minor role as HPV vaccine information

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3 394 sources for youth in our study. This stands in contrast to other studies that found social media  
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5 395 to increasingly become a source of health information worldwide [44-47]. Another US study  
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7 396 described the internet as being one of the most frequently mentioned sources of vaccine  
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10 397 information among adolescents [48]. Currently, the potential of internet/ social media  
11  
12 398 information for HPV prevention/ vaccination uptake seems not to be used in Switzerland.  
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16 400 Fourth, despite the male HPV vaccine recommendation was introduced more than four years  
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18 401 prior to our interviews, both female and male youth in our study associated HPV vaccine  
19  
20 402 predominantly with cervical cancer, consistent with the gendered views of HPV vaccine  
21  
22 403 documented in previous reports [3, 13]. That said, it is encouraging to see a slight shift in the  
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24 404 younger age group from a female gendered perspective to a gender-neutral perspective on HPV  
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26 405 vaccine.  
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#### 31 32 407 **4.1 Strengths and limitations** 33

34  
35 408 One of the major strengths of our study is that it is a mixed-methods study. Our qualitative work  
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37 409 adds some description and explanation to our quantitative findings. Furthermore, we have a  
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39 410 large number of male participants in our study. The Swiss context in particular lacks data on HPV  
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41 411 vaccine awareness, knowledge, and information sources from male youth. Our study addresses  
42  
43 412 this research gap. Previous studies have predominantly focused on parents and their knowledge  
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45 413 on HPV vaccine [21-26]. Our study included youth, and this allowed us to gain important insights  
46  
47 414 on who youth turn to when deciding on HPV vaccination. Since the vaccine is recommended as a  
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49 415 catch-up vaccine until 26 years in many countries, including Switzerland, we have to ensure that  
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51 416 youth are aware of the HPV vaccine and that they have the necessary knowledge to make an  
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53 417 informed HPV vaccination decision.  
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3 418 One limitation of this study is that we might overestimate knowledge based on the way we  
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5 419 classified answers for the quantitative component. For example, if participants had heard of the  
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7 420 HPV vaccine, we simply asked them if they know what it is for but added no further questions. In  
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9 421 addition, for participants who have only heard of the “cervical cancer vaccine,” we did not ask  
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11 422 any follow-up questions on HPV knowledge. Other studies have assessed knowledge in more  
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13 423 depth, asking participants more knowledge specific questions [3, 18, 19]. Since our  
14  
15 424 questionnaire already lasted 25-35 minutes with questions on VH (**Jafflin K., manuscript in**  
16  
17 425 **preparation**), CAM use (**Jafflin K., manuscript in preparation, Kiener L., Schwendener C., et al,**  
18  
19 426 **manuscript submitted**) and moral foundations (**Jafflin K., manuscript in preparation**) we opted  
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21 427 to not include more questions to further assess participants’ knowledge. Another limitation to  
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23 428 this study was that our sampling strategy led to a non-representative sample. Additionally,  
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25 429 potential sources of bias arise from us not being able to get in contact with participants who do  
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27 430 not visit a physicians’ office. Our sampling strategy however allowed us to recruit a more diverse  
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29 431 sample regarding biomedical and CAM providers.  
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## 37 433 **5. Conclusion**

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39 434 This study underlines the importance of HPV awareness and knowledge given the association  
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41 435 between HPV awareness and knowledge and HPV vaccine uptake. However, males still have  
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43 436 limited awareness and knowledge about HPV vaccine. Future strategies to increase HPV vaccine  
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45 437 uptake, especially among males, should focus on better and more information supply to youth  
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47 438 explaining them the benefit of the HPV vaccine. School vaccination programs have proven to be  
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49 439 effective and should be further expanded [31]. Parents play an important role in youth’ decision  
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51 440 making process when it comes to HPV vaccine and they should be equally informed about the  
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53 441 benefits and importance of the HPV vaccine. Efforts should be made to underline the  
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3 442 effectiveness of the HPV vaccine for males and females to reach a gender-neutral perception of  
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5 443 the HPV vaccine. Targeted public health efforts should consider exploring internet and social  
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7 444 media as potential information distribution platforms. HPV vaccine uptake has improved over  
8  
9 445 the years, but there is substantial room for improvement, particularly in terms of increasing  
10  
11 446 knowledge and awareness among young men and women alike.  
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14 447

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18  
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20  
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22

23 451

### 25 452 **Disclosure of Potential Conflict of Interest**

26  
27  
28 453 All authors: no conflicts.  
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30 454

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### 46 461 **Ethics approval**

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48  
49 462 The study was approved by the local ethics committee (Ethikkommission Nordwest- und  
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51 463 Zentralschweiz, EKNZ; project ID number 2017-00725). The ethics approval covers all study  
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53 464 participants, which includes adolescent and adult patients as well as biomedical and CAM  
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55 465 providers. Informed consent was provided by all participants after the nature and possible  
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3 466 consequences of the study had been fully explained.  
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8 468 **Data sharing statement**

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10 469 Data is available upon reasonable request to the corresponding author.  
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3 **471 Contributors' Statement Page**  
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5 472 Ms. Kiener and Ms. Schwendener recruited participating youth, conducted interviews, carried  
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7 473 out the analysis, drafted the initial manuscript, and reviewed and revised the manuscript.  
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10 474 Dr. Jafflin conceptualized and designed the study, designed the data collection instruments,  
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12 475 coordinated and supervised data collection, carried out the analyses, and reviewed and revised  
13  
14 476 the manuscript.  
15

16 477 Ms. Rouached, Ms. Juillerat and Mr. Meier recruited participating youth, conducted interviews,  
17  
18 478 and reviewed and revised the manuscript.  
19

20 479 Dr. Schärli, Dr. Muggli, Dr. Gültekin and Dr. Gruillot recruited participating youth, and reviewed  
21  
22 480 and revised the manuscript.  
23

24 481 Mr. Baumann and Ms. Debergh recruited participating youth, conducted interviews, and  
25  
26 482 reviewed and revised the manuscript.  
27

28 483 Dr. Huber conceptualized and designed the study, recruited participating providers, and  
29  
30 484 reviewed and revised the manuscript.  
31

32 485 Dr. Merten conceptualized and designed the study, designed the data collection instruments,  
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34 486 coordinated and supervised data collection, and reviewed and revised the manuscript.  
35

36 487 Dr. Buhl designed the data collection instruments, recruited participating youth, conducted  
37  
38 488 interviews, analyzed qualitative data, and reviewed and revised the manuscript.  
39

40 489 Dr. Deml conceptualized and designed the study, designed the data collection instruments,  
41  
42 490 recruited participating providers and youth, conducted qualitative interviews, analyzed  
43  
44 491 qualitative data, and reviewed and revised the manuscript.  
45

46 492 Dr. Tarr conceptualized and designed the study, designed the data collection instruments,  
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48 493 recruited participating providers, coordinated and supervised data collection, carried out the  
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50 494 analyses, and reviewed and revised the manuscript.  
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3 495 All authors approved the final manuscript as submitted and agree to be accountable for all  
4 496 aspects of the work.  
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3 640 **Figures:**  
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647 **Table 1. Participant Characteristics (quantitative questionnaire)**

	All Participants (n = 997)	Male (n = 585)	Female (n = 412)
<b>Age</b>			
Age (years), median (IQR)	19 (18-21)	19 (19-20)	20 (17-23)
Born before July 1 <sup>st</sup> , 2002, n (%)	849 (85)	525 (90)	324 (79)
Born on/ after July 1 <sup>st</sup> , 2002, n (%)	148 (15)	60 (10)	88 (21)
<b>Nationality</b>			
Swiss, n (%)	913 (92)	547 (94)	366 (89)
<b>Language</b>			
German, n (%)	667 (67)	448 (77)	229 (53)
French, n (%)	168 (17)	47 (8)	121 (29)
Italian, n (%)	156 (16)	86 (15)	70 (17)
English, n (%)	6 (1)	4 (1)	2 (0.5)
<b>Recruitment setting</b>			
Biomedical provider, n (%)	405 (41)	146 (25)	259 (63)
Military service, n (%)	375 (38)	371 (63)	4 (1)
CAM provider, n (%)	148 (15)	55 (9)	93 (23)
Adolescent clinic, n (%)	69 (7)	13 (2)	56 (14)
<b>Living situation</b>			
With parents, n (%)	817 (82)	497 (85)	320 (78)
<b>School vaccination program</b>			
School program available, n (%)	448 (45)	180 (31)	268 (65)
<b>Vaccination status</b>			
	<i>n = 940</i>	<i>n = 537</i>	<i>n = 403</i>
Has received $\geq 1$ does of HPV vaccine, n (%)	370 (39)	108 (20)	262 (65)

648 **Note.** All data shown are number (%) of participants, unless otherwise indicated. Due to rounding, total  
649 numbers may not add up to 100%.

650 **Abbreviations.** CAM, complementary and alternative medicine; IQR, interquartile range

651

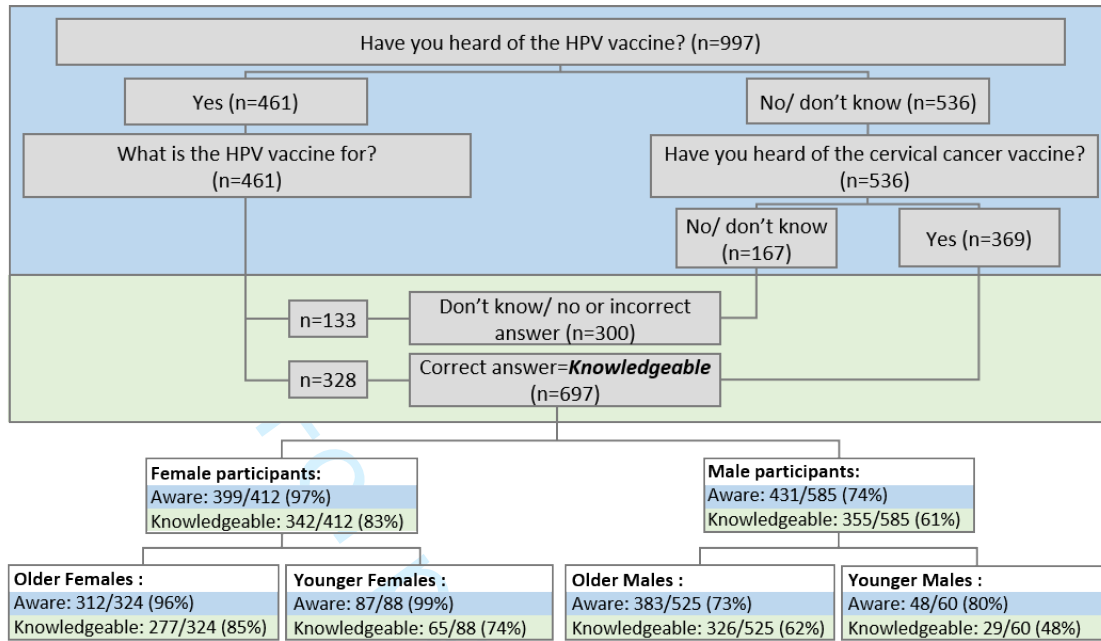
652 **Table 2. Participant Characteristics (qualitative interview)**

<b>French-Speaking Region</b>		
Female		N= 6
	Age	15-26 years, $\bar{x}$ =19.6 years
	Received at least 1 dose of HPV vaccination	N=4 (66%)
	Informed through school vaccination program	N=6 (100%)
Male		N=8
	Age	15-26 years, $\bar{x}$ =22.4 years
	Received at least 1 dose of HPV vaccination	N=4 (50%)
	Informed through school vaccination program	N=1 (13%)
<b>German-Speaking Region</b>		
Female		N=8
	Age	15-26 years, $\bar{x}$ =20.9 years
	Received at least 1 dose of HPV vaccination	N=4 (50%)
	Informed through school vaccination program	N=7 (88%)
Male		N=9
	Age	15-26 years, $\bar{x}$ = 20.6years
	Received at least 1 dose of HPV vaccination	N=1 (11%)
	Informed through school vaccination program	N=1 (11%)

653

654

**Figure 1. Awareness and Knowledge of HPV Vaccine**



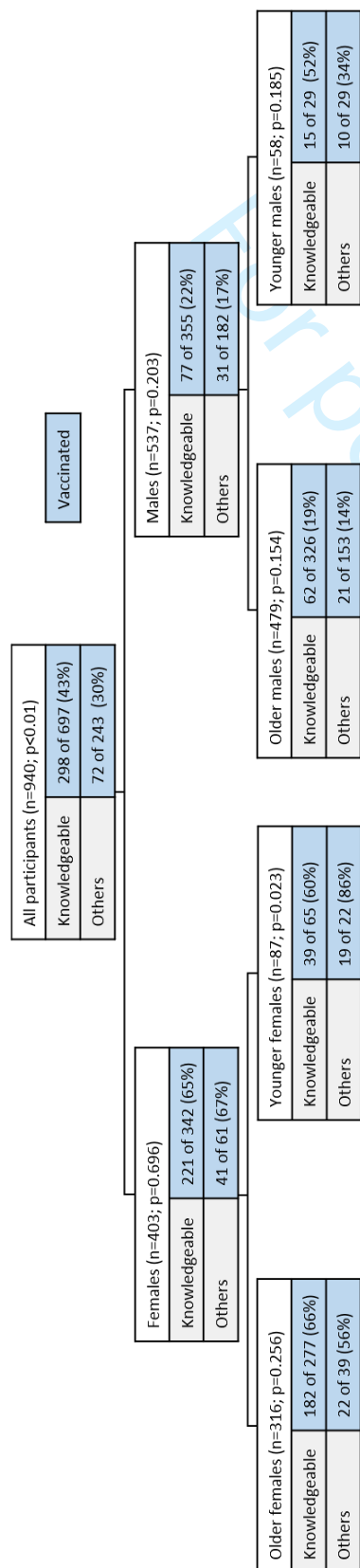
**Note.** All data in blue stands for awareness and all data in green for knowledge.

**Figure 2. Awareness and HPV Vaccine Uptake**



**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

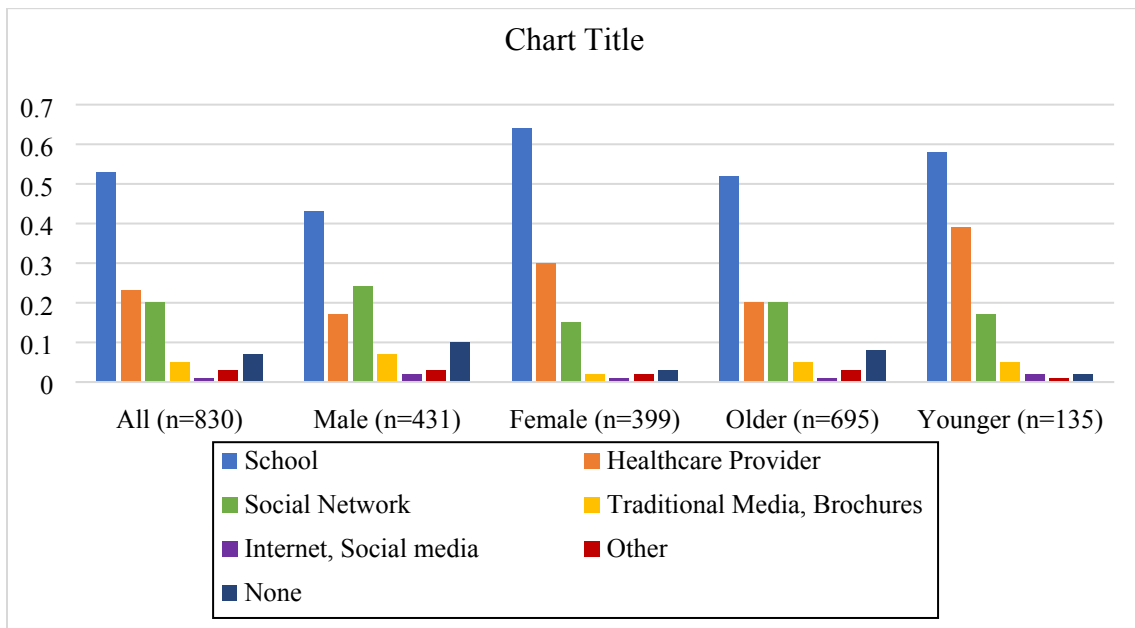
**Figure 3. Knowledge and HPV Vaccine Uptake**



**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

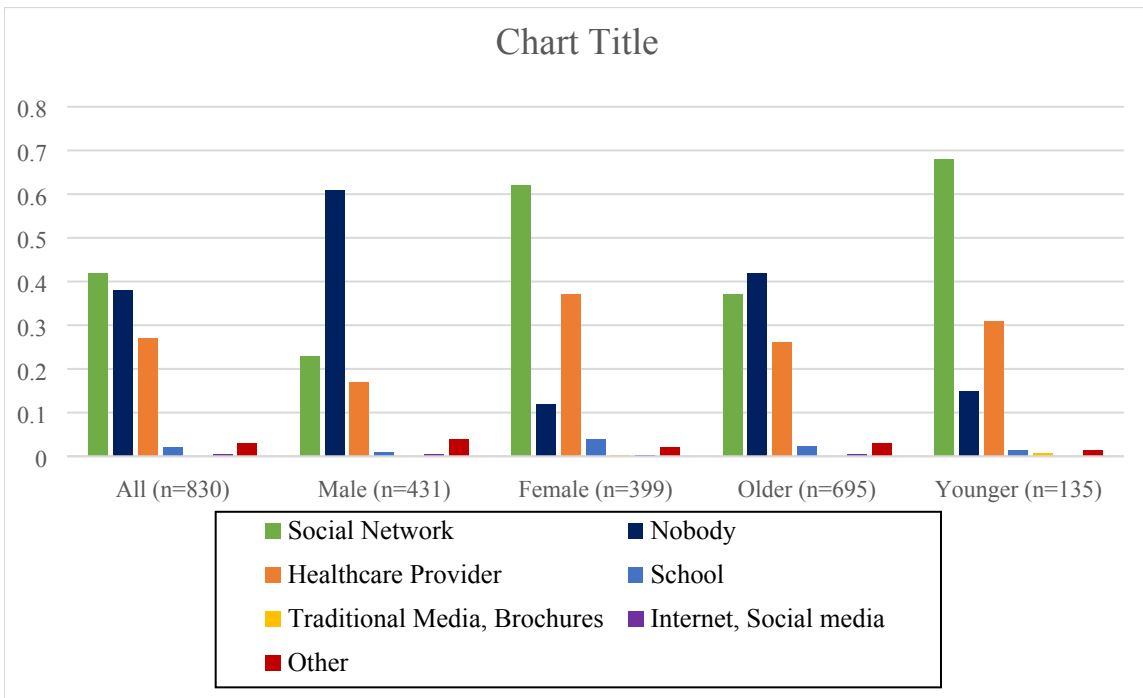


Figure 4. Information Sources



**Note.** 167/997 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were possible.

1 **Figure 5. HPV Vaccine Consulting Behavior**



2

3 **Note.** 167/997 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were possible.

4

5

Review only

1  
2  
3 **Schwendener et al, HPV Vaccine Awareness, Knowledge, and Information Sources**  
4 **among Youth in Switzerland: A Mixed Methods Study: Supplementary Material 1 –**  
5 **HPV Vaccination Questionnaire**  
6  
7

8 Hello, this is [interviewer name]. Could I speak with [participant name], please? As planned, I  
9 am calling to interview you as part of our study about vaccination decision-making.  
10

11 I would first like to verify some details.  
12

- 13 1. Could you please tell me your birth date?
- 14 2. What is the sex of [participant name]?
- 15     a. Boy
- 16     b. Girl
- 17     c. Intersex
- 18     d. Doesn't want to disclose
- 19
- 20 3. Is Dr. [provider name] your doctor?
- 21 4. Do you live with your parents, or somewhere else?
- 22     a. Lives with parent(s)
- 23     b. Doesn't live with parents
- 24     c. Doesn't want to disclose
- 25     d. Missing
- 26     ➔ If a continue with question 5.
- 27     ➔ If b continue with question 12.
- 28     ➔ If c,d continue with question 13.
- 29
- 30 5. To start off, I would like to know how many people normally live in your parents'  
31 household, yourself included. Please include your family, but also any tenants, au  
32 pairs, students, or other people who live in your home at least 4 days a week.
- 33 6. Could you please tell me about the people who live in your home, yourself included?
- 34 7. First yourself [person 1], what is your age?
- 35 8. Sex of person 1
- 36     a. Male
- 37     b. Female
- 38     c. Other/ not disclosed
- 39     d. Missing
- 40
- 41 9. Person 2, age
- 42 10. Person 2, sex
- 43     a. Male
- 44     b. Female
- 45     c. Other/ not disclosed
- 46     d. Missing
- 47
- 48 11. How is [second person] related to you?
- 49     If male:
- 50     a. Father
- 51     b. Stepfather
- 52     c. Father/mother's partner
- 53     d. Stepbrother
- 54
- 55
- 56
- 57
- 58
- 59
- 60

- e. Grandfather
- f. Uncle, cousin
- g. Other relative
- h. Not a relative
- i. Doesn't want to disclose
- j. Doesn't know
- k. Missing

If female:

- a. Mother
- b. Stepmother
- c. Mother/ father's partner
- d. Sister or half-sister
- e. Grandmother
- f. Aunt, cousin
- g. Other relative
- h. Not a relative
- i. Doesn't want to disclose
- j. Doesn't know
- k. Missing

12. How many persons lived in your parent's household at the time before you moved out (yourself included)?

Now I would like to ask some questions about your thoughts and experiences with vaccination.

13. Have you ever delayed getting a vaccine for reasons other than illness or allergy?

- a. Yes
- b. No
- c. Doesn't want to disclose
- d. Doesn't know
- e. Missing

14. Have you ever skipped a vaccine for reasons other than illness or allergy?

- a. Yes
- b. No
- c. Doesn't want to disclose
- d. Doesn't know
- e. Missing

15. On a scale from 0 to 10, with 0 being not sure at all and 10 being completely sure, How sure are you that following the recommended vaccine schedule is a good idea for you?

➔ If question 15 is unclear, continue with question 16. Otherwise continue with question 17.

16. I will rephrase the question: On a scale from 0 to 10, with 0 being not sure at all and 10 being completely sure, how sure are you that it is a good idea to vaccinate you with the vaccines recommended by the Federal Office of Public Health?

1  
2  
3 Do you agree or disagree with the following statements:  
4

5 17. We get more vaccines than are good for us.

- 6 a. Strongly agree  
7 b. Agree  
8 c. Not sure  
9 d. Disagree  
10 e. Strongly disagree  
11 f. Doesn't want to disclose  
12 g. Missing

13 18. I believe that many of the illnesses that vaccines prevent are severe.

- 14 a. Strongly agree  
15 b. Agree  
16 c. Not sure  
17 d. Disagree  
18 e. Strongly disagree  
19 f. Doesn't want to disclose  
20 g. Missing

21 19. It is better to develop immunity by getting sick than to get a vaccine.

- 22 a. Strongly agree  
23 b. Agree  
24 c. Not sure  
25 d. Disagree  
26 e. Strongly disagree  
27 f. Doesn't want to disclose  
28 g. Missing

29 20. It's better to get fewer vaccines at the same time.

- 30 a. Strongly agree  
31 b. Agree  
32 c. Not sure  
33 d. Disagree  
34 e. Strongly disagree  
35 f. Doesn't want to disclose  
36 g. Missing

37 21. How concerned are you that you might have a serious side effect from a vaccine?

- 38 a. Not at all concerned  
39 b. Not too concerned  
40 c. Not sure  
41 d. Somewhat concerned  
42 e. Very concerned  
43 f. Doesn't want to disclose  
44 g. Missing

45 22. How concerned are you that one of the vaccines might not be safe?

- 46 a. Not at all concerned  
47 b. Not too concerned  
48  
49  
50  
51  
52  
53  
54  
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56  
57  
58  
59  
60

- c. Not sure
- d. Somewhat concerned
- e. Very concerned
- f. Doesn't want to disclose
- g. Missing

23. How concerned are you that a vaccine might not prevent disease?

- a. Not at all concerned
- b. Not too concerned
- c. Not sure
- d. Somewhat concerned
- e. Very concerned
- f. Doesn't want to disclose
- g. Missing

24. Overall, how hesitant about vaccines would you consider yourself to be?

- a. Not at all hesitant
- b. Not too hesitant
- c. Not sure
- d. Somewhat hesitant
- e. Very hesitant
- f. Doesn't want to disclose
- g. Missing

Do you agree or disagree with the following statements:

25. I trust the information I receive about vaccines.

- a. Strongly agree
- b. Agree
- c. Not sure
- d. Disagree
- e. Strongly disagree
- f. Doesn't want to disclose
- g. Missing

26. I am able to openly discuss my concerns about vaccines with my doctor.

- a. Strongly agree
- b. Agree
- c. Not sure
- d. Disagree
- e. Strongly disagree
- f. Doesn't want to disclose
- g. Missing

27. All things considered, how much do you trust your doctor, on a scale from 0 to 10, with 0 being not at all and 10 being completely?

Now I want to ask you some questions about the HPV vaccine.

28. Have you heard of the HPV vaccine?

- 1  
2  
3 a. Yes  
4 b. No  
5 c. Doesn't want to disclose  
6 d. Doesn't know  
7 e. Missing  
8  
9  
10 → If a: continue with question 29.  
11 → If b-e: continue with question 30.  
12  
13 29. What is it for?  
14 30. Have you heard of the cervical cancer vaccine?  
15 a. Yes  
16 b. No  
17 c. Doesn't want to disclose  
18 d. Doesn't know  
19 e. Missing  
20  
21 → If a: continue with question 31.  
22 → If b-e: continue with question 37.  
23  
24 31. Have you received HPV vaccine?  
25 a. Yes  
26 b. No  
27 c. Doesn't want to disclose  
28 d. Doesn't know  
29 e. Missing  
30  
31 → If a: continue with question 31.  
32 → If b-e: continue with question 33.  
33  
34 32. Where did you receive HPV vaccine?  
35 a. At school  
36 b. At a doctor recommended by school  
37 c. At the family doctor's  
38 d. At the pediatrician's  
39 e. At the gynecologist's  
40 f. At a vaccination center  
41 g. Other  
42 h. Doesn't want to disclose  
43 i. Doesn't know  
44 j. Missing  
45  
46 33. Where have you heard about HPV vaccination?  
47  
48 34. Was the HPV vaccine recommended by your school?  
49 a. Yes  
50 b. No  
51 c. Doesn't want to disclose  
52 d. Doesn't know  
53 e. Missing  
54  
55 35. How do you feel about offering the HPV vaccine at school?  
56 a. Very supportive  
57  
58  
59  
60

- 1  
2  
3 b. Somewhat supportive  
4 c. Not sure  
5 d. Somewhat unsupportive  
6 e. Very unsupportive  
7 f. Doesn't want to disclose  
8 g. Doesn't know  
9 h. Missing  
10  
11  
12 36. Who did you consult with when deciding whether or not to get the HPV vaccine?  
13  
14 37. What are your most trusted information sources on vaccination?  
15 a. No information/ no source  
16 b. Family  
17 c. My doctor  
18 d. Other doctor  
19 e. Friends and acquaintances  
20 f. Public health authorities  
21 g. TV  
22 h. Internet  
23 i. Social media (such as Facebook, Instagram and Twitter)  
24 j. Print media (such as books, magazines and newspapers)  
25 k. Other: \_\_\_\_  
26 l. Doesn't want to disclose  
27 m. Doesn't know  
28 n. Missing  
29 → If g: add question 38.  
30 → If h: add question 39.  
31 → If i: add question 40.  
32 → If j: add question 41.  
33 → If k: add question 42.  
34 → Otherwise continue with question 43.  
35  
36  
37  
38  
39  
40  
41 38. Which TV programs?  
42 39. Which websites?  
43 40. What social media?  
44 41. What print media?  
45 42. What other sources?  
46  
47 43. Did you apply the information you received when making decisions about  
48 vaccination?  
49 a. Yes  
50 b. No  
51 c. Doesn't want to disclose  
52 d. Doesn't know  
53 e. Missing  
54  
55 44. How is your health in general? Is it...  
56 a. Very good  
57 b. Good  
58  
59  
60



- 1
- 2
- 3 c. OK
- 4 d. Bad
- 5 e. Very bad
- 6 f. Doesn't want to disclose
- 7 g. Doesn't know
- 8 h. Missing
- 9
- 10

11 45. How important is health for you? Here are three options, please tell us which one is  
12 closest to your own opinion.

- 13 a. I live without worrying too much about consequences for my health.
- 14 b. My lifestyle is influenced by considerations about maintaining my health.
- 15 c. Considerations about my health have a large impact on how I live.
- 16 d. Doesn't want to disclose
- 17 e. Doesn't know
- 18 f. Missing
- 19
- 20
- 21

22 46. In the last 12 months, that is since [month, year], which of the following treatments  
23 have you used for your own health? Please indicate yes or no for each.

- 24 a. Acupressure
- 25 b. Acupuncture
- 26 c. Anthroposophical medicine
- 27 d. Chinese medicine
- 28 e. Chiropractics
- 29 f. Herbal treatment
- 30 g. Homeopathy
- 31 h. Hypnotherapy
- 32 i. Massage therapy
- 33 j. Osteopathy
- 34 k. Physiotherapy
- 35 l. Reflexology
- 36 m. Spiritual Healing
- 37 n. Other: \_\_\_\_
- 38 o. None of these
- 39 p. don't know
- 40
- 41
- 42
- 43
- 44
- 45

46 Now I would like to ask you some questions about other topics to get a sense of your core  
47 worldview and political and religious sentiments.

48  
49 47. Do you consider yourself as belonging to any particular religion or denomination?

- 50 a. Yes
- 51 b. No
- 52 c. Doesn't want to disclose
- 53 d. Doesn't know
- 54 e. Missing
- 55
- 56

57 → If a: continue with question 48.

58 → If b-e: continue with question 50.

59 48. Which one?  
60

- 1  
2  
3 a. Christian  
4 b. Jewish  
5 c. Islamic  
6 d. Eastern religions  
7 e. Other non-Christian religions  
8 f. Doesn't want to disclose  
9 g. Doesn't know  
10 h. Missing  
11  
12  
13  
14 → If a-e: continue with question 49.  
15 → If f-h: continue with question 50.  
16  
17 49. Please specify which exactly.  
18 50. Apart from special occasions such as weddings and funerals, about how often do you  
19 attend religious services nowadays?  
20 a. Every day  
21 b. More than once a week  
22 c. Once a week  
23 d. At least once a month  
24 e. Only on special holy days  
25 f. Less often  
26 g. Never  
27 h. Doesn't want to disclose  
28 i. Doesn't know  
29 j. Missing  
30  
31 51. Regardless of whether you belong to a particular religion, how religious would you  
32 say you are?  
33 a. Not at all religious  
34 b. Somewhat religious  
35 c. Religious  
36 d. Very religious  
37 e. Doesn't want to disclose  
38 f. Doesn't know  
39 g. Missing  
40  
41 52. How important do you consider spiritual experiences to be in your everyday life?  
42 a. Very important  
43 b. Somewhat important  
44 c. Not very important  
45 d. Not important at all  
46 e. Not sure  
47 f. Doesn't want to disclose  
48 g. Doesn't know  
49 h. Missing  
50  
51 53. How interested would you say you are in politics? Are you...  
52 a. Very interested  
53 b. Quite interested  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3 c. Hardly interested  
4 d. Or, not at all interested?  
5 e. Doesn't want to disclose  
6 f. Doesn't know  
7 g. Missing  
8  
9  
10 54. Is there a particular political party that you feel closer to than all the other political  
11 parties?  
12 a. Yes  
13 b. No  
14 c. Doesn't want to disclose  
15 d. Doesn't know  
16 e. Missing  
17  
18 → If a: continue with question 55.  
19 → If b-e: continue with question 56.  
20  
21 55. Which one?  
22  
23 56. In politics, people sometimes talk of "left" and "right". Where would you place  
24 yourself? Would you consider yourself...  
25 a. Left  
26 b. Center left  
27 c. Center  
28 d. Center right  
29 e. Right  
30 f. Doesn't want to disclose  
31 g. Doesn't know  
32 h. Missing  
33  
34 57. How often do you participate in activities with a society, a club, a political party, a  
35 cultural association, or other groups, including religious groups?  
36 a. Almost every day  
37 b. About once a week  
38 c. About 1-3 times a month  
39 d. A few times a year  
40 e. More rarely  
41 f. Never  
42 g. Doesn't want to disclose  
43 h. Doesn't know  
44 i. Missing  
45  
46  
47  
48  
49  
50

51 We would now like to pose some questions regarding the values that generally guide people  
52 in their everyday life. The questions don't directly relate to vaccinations.

53  
54 When you decide whether something is right or wrong, to what extent are the following  
55 considerations relevant to your thinking?  
56

- 57 58. Whether or not someone suffered emotionally. Is it not at all relevant, not very  
58 relevant, slightly relevant, somewhat relevant, very relevant or extremely relevant?  
59 a. Not at all relevant  
60

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- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

59. Whether or not someone was treated differently than others.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

60. Whether or not someone's actions showed love for his or her country.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

61. Whether or not someone's actions showed lack of respect for authority.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

62. Whether or not someone violated standards of purity and decency.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant

- 1  
2  
3 f. Extremely relevant  
4 g. Doesn't want to disclose  
5 h. Doesn't know  
6 i. Missing  
7  
8 63. Whether or not someone was good at math.  
9  
10 a. Not at all relevant  
11 b. Not very relevant  
12 c. Slightly relevant  
13 d. Somewhat relevant  
14 e. Very relevant  
15 f. Extremely relevant  
16 g. Doesn't want to disclose  
17 h. Doesn't know  
18 i. Missing  
19  
20 64. Whether or not someone cared for someone weak and vulnerable.  
21  
22 a. Not at all relevant  
23 b. Not very relevant  
24 c. Slightly relevant  
25 d. Somewhat relevant  
26 e. Very relevant  
27 f. Extremely relevant  
28 g. Doesn't want to disclose  
29 h. Doesn't know  
30 i. Missing  
31  
32 65. Whether or not someone acted unfairly.  
33  
34 a. Not at all relevant  
35 b. Not very relevant  
36 c. Slightly relevant  
37 d. Somewhat relevant  
38 e. Very relevant  
39 f. Extremely relevant  
40 g. Doesn't want to disclose  
41 h. Doesn't know  
42 i. Missing  
43  
44 66. Whether or not someone did something to betray his or her group.  
45  
46 a. Not at all relevant  
47 b. Not very relevant  
48 c. Slightly relevant  
49 d. Somewhat relevant  
50 e. Very relevant  
51 f. Extremely relevant  
52 g. Doesn't want to disclose  
53 h. Doesn't know  
54 i. Missing  
55  
56  
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1  
2  
3 67. Whether or not someone conformed to the traditions of society.

- 4 a. Not at all relevant  
5 b. Not very relevant  
6 c. Slightly relevant  
7 d. Somewhat relevant  
8 e. Very relevant  
9 f. Extremely relevant  
10 g. Doesn't want to disclose  
11 h. Doesn't know  
12 i. Missing

13  
14  
15  
16 68. Whether or not someone did something disgusting.

- 17 a. Not at all relevant  
18 b. Not very relevant  
19 c. Slightly relevant  
20 d. Somewhat relevant  
21 e. Very relevant  
22 f. Extremely relevant  
23 g. Doesn't want to disclose  
24 h. Doesn't know  
25 i. Missing

26  
27  
28  
29  
30 Please listen to the following statements and indicate whether you strongly disagree,  
31 moderately disagree, slightly disagree, slightly agree, moderately agree or strongly agree.

32  
33 69. Compassion for those who are suffering is the most crucial virtue.

- 34 a. Strongly disagree  
35 b. Moderately disagree  
36 c. Slightly disagree  
37 d. Moderately agree  
38 e. Strongly agree  
39 f. Doesn't want to disclose  
40 g. Doesn't know  
41 h. Missing

42  
43  
44  
45 70. When the government makes laws, the number one principle should be ensuring that  
46 everyone is treated fairly.

- 47 a. Strongly disagree  
48 b. Moderately disagree  
49 c. Slightly disagree  
50 d. Moderately agree  
51 e. Strongly agree  
52 f. Doesn't want to disclose  
53 g. Doesn't know  
54 h. Missing

55  
56  
57  
58 71. I am proud of my country's history.

- 59 a. Strongly disagree  
60

- 1  
2  
3 b. Moderately disagree  
4 c. Slightly disagree  
5 d. Moderately agree  
6 e. Strongly agree  
7 f. Doesn't want to disclose  
8 g. Doesn't know  
9 h. Missing  
10  
11  
12 72. Respect for authority is something all children need to learn.  
13 a. Strongly disagree  
14 b. Moderately disagree  
15 c. Slightly disagree  
16 d. Moderately agree  
17 e. Strongly agree  
18 f. Doesn't want to disclose  
19 g. Doesn't know  
20 h. Missing  
21  
22 73. People should not do things that are disgusting even if no one is harmed.  
23 a. Strongly disagree  
24 b. Moderately disagree  
25 c. Slightly disagree  
26 d. Moderately agree  
27 e. Strongly agree  
28 f. Doesn't want to disclose  
29 g. Doesn't know  
30 h. Missing  
31  
32 74. It is better to do good than to do bad.  
33 a. Strongly disagree  
34 b. Moderately disagree  
35 c. Slightly disagree  
36 d. Moderately agree  
37 e. Strongly agree  
38 f. Doesn't want to disclose  
39 g. Doesn't know  
40 h. Missing  
41  
42 75. One of the worst things a person could do is hurt a defenseless animal.  
43 a. Strongly disagree  
44 b. Moderately disagree  
45 c. Slightly disagree  
46 d. Moderately agree  
47 e. Strongly agree  
48 f. Doesn't want to disclose  
49 g. Doesn't know  
50 h. Missing  
51  
52 76. Justice is the most important requirement for a society.  
53  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3 a. Strongly disagree  
4 b. Moderately disagree  
5 c. Slightly disagree  
6 d. Moderately agree  
7 e. Strongly agree  
8 f. Doesn't want to disclose  
9 g. Doesn't know  
10 h. Missing  
11  
12

13  
14 77. People should be loyal to their family members even when they have done  
15 something wrong.

- 16 a. Strongly disagree  
17 b. Moderately disagree  
18 c. Slightly disagree  
19 d. Moderately agree  
20 e. Strongly agree  
21 f. Doesn't want to disclose  
22 g. Doesn't know  
23 h. Missing  
24  
25  
26

27 78. Men and women should each have different roles to play in society.

- 28 a. Strongly disagree  
29 b. Moderately disagree  
30 c. Slightly disagree  
31 d. Moderately agree  
32 e. Strongly agree  
33 f. Doesn't want to disclose  
34 g. Doesn't know  
35 h. Missing  
36  
37  
38

39 79. I would call some acts wrong on the grounds that they are unnatural.

- 40 a. Strongly disagree  
41 b. Moderately disagree  
42 c. Slightly disagree  
43 d. Moderately agree  
44 e. Strongly agree  
45 f. Doesn't want to disclose  
46 g. Doesn't know  
47 h. Missing  
48  
49  
50

51 I just have a few more questions to finish up.

52  
53 80. Which of these descriptions applies to what you have been doing for the last seven  
54 days?

- 55 a. In paid work or away temporarily  
56 b. In education (even if on vacation)  
57 c. Unemployed and actively looking for a job  
58 d. Unemployed, wished to work but didn't actively look for a job  
59  
60



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3 e. Permanently sick or disabled  
4 f. Retired  
5 g. In community or military service  
6 h. Doing housework, looking after children or other persons  
7 i. Other  
8 j. Doesn't want to disclose  
9 k. Doesn't know  
10 l. Missing  
11  
12 → If a: continue with question 81.  
13 → If b-l: continue with question 82.  
14  
15 81. Regardless of your basic or contracted hours, how many hours per week do you  
16 normally work, including any paid or unpaid overtime?  
17  
18 82. And what about your father? Which describes his situation in the last seven days?  
19 a. In paid work or away temporarily  
20 b. In education (even if on vacation)  
21 c. Unemployed and actively looking for a job  
22 d. Unemployed, wished to work but didn't actively look for a job  
23 e. Permanently sick or disabled  
24 f. Retired  
25 g. In community or military service  
26 h. Doing housework, looking after children or other persons  
27 i. Other  
28 j. Doesn't want to disclose  
29 k. Doesn't know  
30 l. Missing  
31  
32 → If a: continue with question 83.  
33 → If b-l: continue with question 85.  
34  
35 83. How many hours does he normally work, including any paid or unpaid overtime?  
36  
37 84. What is his current occupation?  
38  
39 85. And what about your mother? Which describes her situation in the last seven days?  
40 a. In paid work or away temporarily  
41 b. In education (even if on vacation)  
42 c. Unemployed and actively looking for a job  
43 d. Unemployed, wished to work but didn't actively look for a job  
44 e. Permanently sick or disabled  
45 f. Retired  
46 g. In community or military service  
47 h. Doing housework, looking after children or other persons  
48 i. Other  
49 j. Doesn't want to disclose  
50 k. Doesn't know  
51 l. Missing  
52  
53 86. How many hours does she normally work, including any paid or unpaid overtime?  
54  
55 87. What is her current occupation?  
56  
57  
58  
59  
60

- 1  
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3 → If a: continue with question 86.  
4 → If b-l: continue with question 88.

5  
6 88. Are you a citizen of Switzerland?

- 7 a. Yes  
8 b. No  
9 c. Doesn't want to disclose  
10 d. Doesn't know  
11 e. Missing

- 12  
13 → If a: continue with question 90.  
14 → If b: continue with question 89.  
15 → If c-e: continue with question 93.

16  
17 89. What citizenship do you hold?

18  
19 90. Were you born in Switzerland?

- 20 a. Yes  
21 b. No  
22 c. Doesn't want to disclose  
23 d. Doesn't know  
24 e. Missing

- 25  
26 → If a, c-e: continue with question 93.  
27 → If b: continue with question 91.

28  
29 91. In which country were you born?

30  
31 92. What year did you first come to Switzerland?

32  
33 93. What is your postcode?

34 We have finished the interview. Thank you very much for your time.

35  
36 94. Do you have comments you would like to make?

37  
38 95. Thank you very much for your participation in this telephone interview. In order to  
39 better understand what young people think about HPV vaccinations we plan to also  
40 speak to some young people in person. We are able to travel to a place that is  
41 convenient and comfortable for our interview partners at a date and time that suit  
42 them. Please let me know if:

- 43  
44 a. you would be interested to take part in a face-to-face interview  
45 b. are not sure yet but we may contact you again  
46 c. you would not like to be contacted again

- 47  
48 → If a,b: continue with question 96.  
49 → If c: end of interview.

50  
51 96. Would you prefer to be interviewed alone, or would you rather have one or even  
52 both of your parents being present?

- 53 a. Alone  
54 b. With one or both parents  
55 c. Missing

56  
57 97. How can we contact you?

- 58 a. SMS  
59 b. Telephone  
60

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- c. Email:\_\_\_
- d. Missing

For peer review only

## Schwendener et al, HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study: Supplementary Material 2

**Supplementary Table 1. Awareness and knowledge of subgroups**

	All Participants (n = 997)	Biomedical provider (n = 405)	Military Service (n = 375)	CAM provider (n = 148)	Adolescent clinic (n = 69)
<b>Awareness</b>					
Aware, n (%)	830 (83)	357 (88)	271 (72)	136 (92)	66 (96)
<b>Knowledge</b>					
Knowledgeable, n (%)	697 (70)	293 (72)	229 (61)	119 (80)	56 (81)

**Note.** All data shown are number (%) of participants, unless otherwise indicated.

**Abbreviations.** CAM, complementary and alternative medicine

**Supplementary Table 2. Awareness and knowledge of subgroups – male participants**

	All Participants (n = 585)	Biomedical provider (n = 146)	Military Service (n = 371)	CAM provider (n = 55)	Adolescent clinic (n = 13)
<b>Awareness</b>					
Aware, n (%)	431 (74)	108 (74)	268 (72)	43 (78)	12 (92)
<b>Knowledge</b>					
Knowledgeable, n (%)	355 (61)	77 (53)	227 (61)	41 (75)	10 (77)

**Note.** All data shown are number (%) of participants, unless otherwise indicated.

**Abbreviations.** CAM, complementary and alternative medicine

**Supplementary Table 3. Awareness and knowledge of subgroups – female participants**

	All Participants (n = 412)	Biomedical provider (n = 259)	Military Service (n = 4)	CAM provider (n = 93)	Adolescent clinic (n = 56)
<b>Awareness</b>					
Aware, n (%)	399 (97)	249 (96)	3 (75)	93 (100)	54 (96)
<b>Knowledge</b>					
Knowledgeable, n (%)	342 (83)	216 (83)	2 (50)	78 (84)	46 (82)

**Note.** All data shown are number (%) of participants, unless otherwise indicated.

**Abbreviations.** CAM, complementary and alternative medicine

**Supplementary Table 4. Survey questions concerning gendered perceptions of HPV Vaccine**

	All participants	By gender		By age groups	
		Male	Female	Born before 1.7.02	Born on/ after 1.7.02
<b>Have you heard of the HPV vaccine?</b>	<i>(n = 997)</i>	<i>(n = 585)</i>	<i>(n = 412)</i>	<i>(n = 849)</i>	<i>(n = 148)</i>
Yes, n (%)	461 (46)	176 (30)	285 (69)	359 (42)	102 (69)
No/ don't know, n (%)	536 (54)	409 (70)	127 (31)	490 (58)	46 (31)
<b>Have you heard of the cervical cancer vaccine?</b>	<i>(n = 535)</i>	<i>(n = 409)</i>	<i>(n = 126)</i>	<i>(n = 489)</i>	<i>(n = 46)</i>
Yes, n (%)	369 (69)	255 (62)	114 (90)	336 (69)	33 (72)
No/ don't know, n (%)	166 (31)	154 (38)	12 (10)	153 (31)	13 (28)
<b>What is the HPV vaccine for?</b>	<i>(n = 461)</i>	<i>(n = 176)</i>	<i>(n = 285)</i>	<i>(n = 359)</i>	<i>(n = 102)</i>
Only female, n (%)	185 (40)	35 (20)	150 (53)	160 (45)	25 (25)
All other answers, n (%)	276 (60)	141 (80)	135 (47)	199 (55)	77 (75)
<b>Combination of all questions</b>	<i>(n = 711)</i>	<i>(n = 361)</i>	<i>(n = 350)</i>	<i>(n = 611)</i>	<i>(n = 100)</i>
Only female, n (%)	554 (78)	290 (80)	264 (75)	496 (81)	58 (58)
All other answers, n (%)	157 (22)	71 (20)	86 (25)	115 (19)	42 (42)

Supplementary Figure 1. Awareness and HPV



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

Supplementary Figure 2. Knowledge and HPV



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

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In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Page
	Reporting Item	Number
<b>Title and abstract</b>		
Title	<a href="#">#1a</a> Indicate the study's design with a commonly used term in the title or the abstract	1

1	Abstract	<a href="#">#1b</a>	Provide in the abstract an informative and balanced	2
2			summary of what was done and what was found	
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4				
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6	<b>Introduction</b>			
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8				
9	Background /	<a href="#">#2</a>	Explain the scientific background and rationale for the	5
10	rationale		investigation being reported	
11				
12				
13				
14	Objectives	<a href="#">#3</a>	State specific objectives, including any prespecified	5,6
15			hypotheses	
16				
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18				
19				
20	<b>Methods</b>			
21				
22				
23	Study design	<a href="#">#4</a>	Present key elements of study design early in the paper	7
24				
25				
26	Setting	<a href="#">#5</a>	Describe the setting, locations, and relevant dates, including	7,8
27			periods of recruitment, exposure, follow-up, and data	
28			collection	
29				
30				
31	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of	7-10
32			selection of participants.	
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40		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential	n/a
41			confounders, and effect modifiers. Give diagnostic criteria, if	
42			applicable	
43				
44				
45				
46				
47	Data sources /	<a href="#">#8</a>	For each variable of interest give sources of data and details	8-10
48	measurement		of methods of assessment (measurement). Describe	
49			comparability of assessment methods if there is more than	
50			one group. Give information separately for for exposed and	
51			unexposed groups if applicable.	
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1	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	n/a
2				
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4	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	7-11
5				
6				
7	Quantitative	<a href="#">#11</a>	Explain how quantitative variables were handled in the	7-9
8	variables		analyses. If applicable, describe which groupings were	
9			chosen, and why	
10				
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15	Statistical	<a href="#">#12a</a>	Describe all statistical methods, including those used to	8-10
16	methods		control for confounding	
17				
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19				
20	Statistical	<a href="#">#12b</a>	Describe any methods used to examine subgroups and	7-10
21	methods		interactions	
22				
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25				
26	Statistical	<a href="#">#12c</a>	Explain how missing data were addressed	n/a
27	methods			
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31	Statistical	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of	n/a
32	methods		sampling strategy	
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36	Statistical	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
37	methods			
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42	<b>Results</b>			
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44				
45	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg	11
46			numbers potentially eligible, examined for eligibility,	
47			confirmed eligible, included in the study, completing follow-	
48			up, and analysed. Give information separately for for	
49			exposed and unexposed groups if applicable.	
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57	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	11
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
2				
3				
4	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic,	11,27,28
5			clinical, social) and information on exposures and potential	
6			confounders. Give information separately for exposed and	
7			unexposed groups if applicable.	
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14	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each	11,12,16
15			variable of interest	
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19	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures.	11-17
20			Give information separately for exposed and unexposed	
21			groups if applicable.	
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27	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-	n/a
28			adjusted estimates and their precision (eg, 95% confidence	
29			interval). Make clear which confounders were adjusted for	
30			and why they were included	
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37	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were	11-17
38			categorized	
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42	Main results	<a href="#">#16c</a>	If relevant, consider translating estimates of relative risk into	n/a
43			absolute risk for a meaningful time period	
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48	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups	n/a
49			and interactions, and sensitivity analyses	
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52				
53	<b>Discussion</b>			
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55				
56	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18,19
57				
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1	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources	19,20
2			of potential bias or imprecision. Discuss both direction and	
3			magnitude of any potential bias.	
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9	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives,	18-20
10			limitations, multiplicity of analyses, results from similar	
11			studies, and other relevant evidence.	
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16	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study	18-20
17			results	
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22	<b>Other Information</b>			
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25	Funding	<a href="#">#22</a>	Give the source of funding and the role of the funders for the	21
26			present study and, if applicable, for the original study on	
27			which the present article is based	
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# BMJ Open

## HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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Secondary Subject Heading:	Sexual health, Immunology (including allergy)
Keywords:	IMMUNOLOGY, Public health < INFECTIOUS DISEASES, PREVENTIVE MEDICINE, PUBLIC HEALTH, SEXUAL MEDICINE

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# HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study

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HPV vaccine, HPV vaccine awareness, HPV vaccine knowledge, HPV vaccine information sources, HPV vaccine uptake, youth

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2  
3 **39 ABSTRACT:**  
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6 **40 Objectives:** We aimed to provide a detailed characterization of HPV vaccine awareness,  
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8 **41** knowledge, and information sources in the HPV vaccine decision-making process of youth, both  
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11 **42** male and female, in Switzerland.

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13 **43 Design:** With a mixed-methods study design, we conducted quantitative questionnaires and  
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15 **44** qualitative interviews, which lasted 20-45 minutes.

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18 **45 Setting and participants:** We recruited participants, 15-26 years of age, in physicians'  
19  
20 **46** offices, in a local sexual health clinic, and during military enlistment. We administered  
21  
22 **47** quantitative questionnaires to 997 youth participants (585 male, 412 female) and conducted  
23  
24 **48** qualitative interviews with 31 youth (17 male, 14 female).

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27 **49 Primary and secondary outcome measures:** We assessed HPV vaccine awareness,  
28  
29 **50** knowledge, information sources and vaccination status.

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32 **51 Results:** In the study's quantitative component, 108 (20%) male and 262 (65%) female  
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34 **52** participants had received  $\geq 1$  dose of HPV vaccine. 697 (70%) participants were knowledgeable  
35  
36 **53** about the HPV vaccine. Females were more likely to be knowledgeable than males (342/412  
37  
38 **54** [83%] vs. 355/585 [61%];  $p < 0.01$ ). Younger participants in the sample compared to older  
39  
40 **55** participants were more likely to be aware of HPV vaccine (135/148 [91%] vs. 695/849 [82%];  
41  
42 **56**  $p < 0.01$ ). The three most mentioned information sources were school health programs (442  
43  
44 **57** [53%]), health care providers (190 [23%]), and participants' social networks (163 [20%]). Overall,  
45  
46 **58** 554/710 (78%) participants had a female-gendered perception of HPV vaccine, a finding which  
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48 **59** was further supported and explained by qualitative data.

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52 **60 Conclusions:** Despite a male HPV vaccine recommendation being made  $>4$  years prior to the  
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54 **61** data collection, HPV vaccine knowledge was higher among females than males, and a female-



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62 gendered perception of HPV vaccine remains prevalent. Internet and social media were minor  
63 HPV vaccine information sources. Study findings demonstrate that HPV knowledge matters for  
64 HPV vaccine uptake and suggest that we should improve HPV information quality and access for  
65 youth, particularly by tailoring knowledge campaigns to young men.  
66

For peer review only

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3 67 **Strengths and limitations of this study:**  
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- 6 68 • One major strength of the study is that it uses a mixed methods approach, allowing for  
7  
8 69 the qualitative data to offer potential explanations to quantitative findings.  
9  
10 70 • The study included a large number of female and male youth, allowing us to gain  
11  
12 71 gendered differences regarding HPV vaccination information sources.  
13  
14 72 • One limitation of this study is that we might overestimate HPV vaccination knowledge  
15  
16 73 based on the way we classified answers for the quantitative component.  
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18 74 • Our sampling strategy led to a non-representative sample.  
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## 76 1. Introduction

77 Surprisingly little research has directly examined youth knowledge, awareness, and information  
78 sources as determinants of *human papillomavirus (HPV)* vaccine uptake. Furthermore, the  
79 research that has been done on youth perspectives has primarily focused on females [1-6],  
80 although the vaccine has been recommended for male youth for several years in many  
81 countries. Literature on the determinants of HPV vaccine attitudes and uptake among male  
82 youth remains limited [7-12]. Furthermore, the false perception that the HPV vaccination  
83 concerns only women continues to persist in popular discourse since it has been long known as  
84 the “cervical cancer vaccine” [3, 13].

85 In addition to issues related to access barriers [2, 14], previous reports in male and female youth  
86 suggest that low HPV vaccine uptake is also related to limited HPV vaccine awareness and  
87 knowledge [11, 15-17], and to the behavioral expectations youth perceive from their parents,  
88 family members, and peers [18, 19]. The most consistent predictor of HPV vaccination is having  
89 received a recommendation from a health care provider [12, 14, 20].

90 Previous research has focused on parents' attitudes and information sources towards HPV  
91 vaccine since the primary target group are 11-14-year-old adolescents [21-26]. A key component  
92 of the Swiss National Vaccination Strategy (NVS), in order to increase HPV vaccination rates,  
93 however, is to address insufficient levels of youth vaccination knowledge, e.g. by emphasizing  
94 the importance of school vaccination programs. Also, the NVS aims to address insufficient  
95 vaccination access, e.g., by removing financial barriers, especially for young adults with limited  
96 financial resources. Accordingly, HPV vaccine is now covered by the state when given until the  
97 age of 26 to men and women in the setting of a state vaccination program, thereby addressing  
98 such financial barriers to HPV vaccination in youth [27]. The effective implementation of each of  
99 these NVS approaches would benefit from additional research on HPV vaccine awareness,

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3 100 knowledge, and information sources in youth. We have recently documented the validity of  
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5 101 measuring vaccine hesitancy (VH) in youth using the Youth Attitudes about Vaccines (YAV)  
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7 102 questionnaire, which shows that VH is an independent predictor of HPV non-immunization in  
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10 103 Switzerland in female youth [28](**Kiener L., Schwendener C., et al, manuscript submitted**).  
11  
12 104 The aims of the present study were to provide a detailed characterization of HPV vaccine  
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14 105 awareness, knowledge, and information sources in the HPV vaccine decision-making process  
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16 106 among youth, both male and female, in Switzerland. We additionally aimed to gain a more  
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18 107 current understanding of gendered aspects youth may have around the HPV vaccine. Finally, we  
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20 108 examined how these factors contribute to HPV vaccine uptake in both sexes and in younger and  
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22 109 older adolescents.  
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## 111 2. Methods

### 112 2.1 *The Swiss Context*

113 The Swiss Federal Office of Public Health (FOPH) and the Federal Vaccination Commission have  
114 recommended HPV vaccine since 2007 for female youth [29], and since 2015 for male youth  
115 [30]. HPV vaccine uptake has increased in the last decade [31], but lies still below the 80%  
116 immunization target [32]. In 2017-2019, the most recent evaluation period, only 20% of 16-year  
117 old males and 64% of females, had received  $\geq 1$  dose of HPV vaccine on average throughout  
118 Switzerland [33]. Regional differences in uptake have been associated with specifics of  
119 vaccination policies of local health authorities, limited information access, and the availability  
120 and quality of school vaccination programs [34, 35].

### 122 2.2 *Study design*

123 We applied a convergent mixed-methods design [36], meaning we collected qualitative and  
124 quantitative data in parallel. We conducted the study in the context of our Swiss national  
125 research program (NRP74) on the determinants of VH in Switzerland regarding childhood and  
126 HPV vaccination. The local institutional review board (Ethikkommission Nordwest- und  
127 Zentralschweiz) approved the study. All participants provided written informed consent. Full  
128 details on our recruitment methods, power calculation, and the questionnaire have been  
129 previously published [37].

### 131 2.3 *Study population and recruitment*

132 Participants were 15-26 years of age, male and female. Of note, youth in Switzerland are legally  
133 able to make vaccine decisions starting at age 14 [38], which supports vaccination promotion  
134 efforts which focus on youth perspectives on HPV vaccination. Even though the primary target

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3 135 group is 11-14-year-olds, the vaccine is also recommended as a catch-up vaccine until 26 years  
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5 136 in many countries, including Switzerland.  
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7 137 Since HPV vaccination programs in Switzerland are tailored for an age group (11-26 years) with  
8  
9 138 limited contact with the health system because young people who are otherwise healthy do not  
10  
11 139 tend to consult with physicians we used diverse recruitment strategies to increase study  
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13 140 participation. We recruited participating youth in the offices of physicians providing biomedicine  
14  
15 141 and sometimes additionally complementary and alternative medicine (CAM), and in a local  
16  
17 142 sexual health clinic. Recruitment was done in urban and rural areas, and in 3 of 4 Swiss language  
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19 143 regions, i.e., German, French, Italian. In order to gain more male participants, we also recruited  
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21 144 during military enlistment (military service is compulsory for Swiss males, with enlistment being  
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23 145 at age 18-24). Since July 1<sup>st</sup>, 2016 the cost of HPV vaccine has been covered by mandatory health  
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25 146 insurance for male adolescents 11-14 years of age and as a catch-up vaccination until age 26 in  
26  
27 147 Switzerland. We therefore divided male participants in an older and a younger age group. We  
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29 148 refer to male participants born before vs. on/after July 1<sup>st</sup>, 2002 as the “older” and “younger”  
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31 149 participants, respectively, meaning that younger male participants were part of the HPV vaccine  
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33 150 target age group when 11-14 years of age. For comparison purposes, we applied the same age  
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35 151 cut-offs to female participants.  
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#### 43 153 *2.4 Patient and public involvement*

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45 154 We did not include patient or public involvement in designing the study, commenting the  
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47 155 outcomes, interpreting the results of this study or reviewing the manuscript.  
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3 159 2.5 *Quantitative methods*  
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5 160 As previously reported [37], we developed German, French, Italian, and English versions of the  
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7 161 questionnaire. We interviewed military participants on site (face-to-face), and the other  
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9 162 participants on the phone, after the physician/clinic visit. Apart from age at time of interview  
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11 163 below 15 or above 26 there were no further exclusion criteria. Quantitative interviews lasted 25-  
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13 164 35 minutes and were conducted by medical students with previous training in participant  
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15 165 recruitment, informed consent procedures and interview techniques. Interviews were  
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17 166 conducted from January 2019 to April 2020. All data was entered to open data kit (ODK) using  
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19 167 tablets [37]. The questionnaire included socio-demographics including language, place of  
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21 168 residence, living situation (with parents, with roommates, with partner), age, nationality, and  
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23 169 school HPV vaccination program availability (**Supplementary Material 1**). We did not collect  
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25 170 information on participants' underlying health conditions, diagnoses, and/or reasons for clinic  
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27 171 visits - this was not part of our national research program that focused on vaccine hesitancy, and  
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29 172 we did not request ethics commission approval for collection of such information. In addition,  
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31 173 detailed analysis of participant's medical conditions would have been time consuming and could  
32  
33 174 have undermined participant's willingness to participate in our study.  
34  
35 175 HPV vaccination status (has received  $\geq 1$  dose of HPV vaccination) was assessed based on review  
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37 176 of the vaccination booklet of the participant, and, if unavailable, on personal report of being  
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39 177 vaccinated.

40  
41 178 In order to measure youth *awareness* about the HPV vaccine, we asked all participants if they  
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43 179 had heard of the HPV vaccine. To accommodate for a gendered perception, for those who said  
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45 180 "no" to the previous question, we asked if they had heard of the "cervical cancer vaccine." To  
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47 181 measure youth *knowledge* about the HPV vaccine, we asked participants what the HPV vaccine  
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49 182 is intended for. Those who responded correctly were considered to be knowledgeable. We  
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3 183 considered an answer to be correct if they mentioned at least one correct aspect about the HPV  
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5 184 vaccine, i.e., it protects against “cancer”, “cervical cancer”, “papilloma virus”, or a “sexually  
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7 185 transmitted disease”. We sought to establish where youth obtained information about the HPV  
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9 186 vaccination by asking two questions, each with free text answer options in order to document  
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11 187 the most precise responses: (1) “Where have you heard about HPV vaccination?” and (2) “Who  
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13 188 did you consult with when deciding whether or not to get the HPV vaccine?”. Answers to the  
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15 189 second question included consulting people as well as traditional media, the internet, and other  
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17 190 forms of information supply.  
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## 23 192 *2.6 Qualitative methods*

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25 193 After completion of the quantitative interviews, participants were invited to participate in an  
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27 194 additional qualitative interview. We subsequently contacted interested youth who indicated  
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29 195 willingness in the German- and French-speaking regions of Switzerland. Additional participants  
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31 196 were recruited through researcher and participant social networks and by snowball sampling.  
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33 197 Our research team collaboratively developed a semi-structured interview guide, which we  
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35 198 piloted and revised iteratively for clarity and coherence. The interviews allowed us to gather  
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37 199 background information about the youth, their health status and lifestyle, the HPV vaccine  
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39 200 decision-making process, including knowledge, awareness, information sources, and the people  
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41 201 with whom they discussed the vaccination. Qualitative interviews were conducted (March 2019-  
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43 202 September 2020), either face-to-face or online (Skype or Zoom), they lasted 20-45 minutes, and  
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45 203 were audio-recorded and transcribed verbatim. Qualitative data were analyzed by social  
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47 204 scientists Andrea Buhl and Michael J. Deml. Analysis of the qualitative interviews was guided by  
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49 205 the Framework Method [39] with support of MAXQDA software. All quotes from interviews  
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51 206 have been translated from German or French into English and anonymized.  
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### 207 3. Results

208 For the study's quantitative component, we completed telephone (n=622) or face-to-face  
209 (n=375) interviews with 1010 youth. Of these, we excluded eight participants because they did  
210 not meet the age criteria, one participant because of missing gender information, and four  
211 additional interviews due to missing answers on awareness and knowledge. Quantitative  
212 analyses are therefore based on 997 participants (585 male, 412 female). Their characteristics  
213 are shown in **Table 1**. For the study's qualitative component, we conducted 14 qualitative  
214 interviews with female youth and 17 interviews with male youth. Qualitative participants ranged  
215 in age from 15 to 26 years in age (average ~21 years). Characteristics of the participants of the  
216 qualitative interview are shown in **Table 2**.

217 In the following sections, we present results regarding: (1) awareness and knowledge about the  
218 HPV vaccination, (2) youth HPV vaccination information sources and people with whom they  
219 had discussed the vaccination, and (3) youth's gendered perceptions of the HPV vaccine.

#### 221 3.1 Awareness about HPV Vaccination

222 For the purpose of this study, we defined *awareness* as having heard of the HPV or "cervical  
223 cancer" vaccine. Significantly more female youth were aware of the HPV vaccine than male  
224 youth. Of the 997 participants, 461 (46%) had heard of the HPV vaccine; 176/585 (30%) males  
225 and 285/412 (69%) females ( $p<0.01$ ). Among the 536 participants who had not heard of HPV  
226 vaccine, 369 (69%) had heard of the "cervical cancer vaccine", 255/409 (62%) males and  
227 114/127 (90%) females ( $p<0.01$ ).

229 Of the 997 participants, 830 (83%) had heard of the HPV or "cervical cancer vaccine", 431/585  
230 (74%) of males and 399/412 (97%) of females ( $p<0.01$ ). In both awareness of HPV vaccine and

231 awareness of “cervical cancer vaccine”, females had more awareness than males. 695/849 (82%)  
232 of the older participants and 135/148 (91%) of the younger participants had heard of the HPV or  
233 “cervical cancer vaccine” ( $p < 0.01$ ). Details are shown in **Figure 1**. Subgroup analysis showed a  
234 significant difference in awareness between participants who were recruited in the military and  
235 all other participants (biomedical vs. military  $p < 0.01$ ; CAM vs. military  $p < 0.01$ ; adolescent clinic  
236 vs. military  $p < 0.01$ ). However, this effect was not due to the different subgroups but is rather  
237 derived from the unequal distribution of gender (more males) within the military subgroup  
238 **(Supplementary Table 1-3)**.

240 Of the 997 participants, 370 (39%) had received  $\geq 1$  dose of HPV vaccine. As shown in **Figure 2**,  
241 participants with greater awareness had also more often received  $\geq 1$  dose of HPV vaccine  
242 compared to participants with limited awareness (362/830 [44%] vs. 8/110 [7%];  $p < 0.01$ ). This  
243 effect was manifest in males (102/431 [24%] of aware males vs. 6/106 [6%] of males with  
244 limited awareness had received  $\geq 1$  HPV vaccine dose;  $p < 0.01$ ), but not in females (260/399 of  
245 aware females [65%] vs. 2/4 [50%] of females with limited awareness had received  $\geq 1$  HPV  
246 vaccine dose;  $p = 0.53$ ), however, only few (4/413) females were unaware of the vaccine.

248 When we defined HPV vaccine uptake according to availability of a vaccination record, results  
249 regarding the associations of awareness and uptake and of knowledge and uptake remained  
250 essentially unchanged (**Supplementary Fig. 1 and 2**).

### 252 3.2 Knowledge about HPV Vaccination and Implications for Uptake

253 We defined *knowledge* as being able to give a correct answer to what the HPV vaccine is for or  
254 for the association of HPV with cervical cancer. 697/997 (70%) participants had knowledge of

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3 255 HPV vaccine or the “cervical cancer vaccine”, while 300/997 (30%) participants did not. Females  
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5 256 were more knowledgeable than males (342/412 [83%] vs. 355/585 [61%];  $p<0.01$ ) which is also  
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7 257 shown in **Figure 1**. We did not find a significant difference regarding knowledge between  
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10 258 younger and older participants (94/148 [64%] vs. 603/849 [71%];  $p=0.07$ ). Subgroup analysis  
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12 259 showed a significant difference in knowledge between participants who were recruited in the  
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14 260 military and all other participants (biomedical vs. military  $p<0.01$ ; CAM vs. military  $p<0.01$ ;  
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16 261 adolescent clinic vs. military  $p<0.01$ ). However, this effect was not due to the different  
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18 262 subgroups but is rather derived from the unequal distribution of gender (more males) within the  
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20 263 military subgroup (**Supplementary Table 1-3**).  
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26 265 As shown in **Figure 3**, more knowledgeable participants had received  $\geq 1$  dose of HPV vaccine  
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28 266 compared to participants with limited knowledge (298/697 [43%] vs. 72/243 [30%];  $p<0.01$ ), and  
29  
30 267 there was no evidence that this difference was limited to either sex (77/355 [22%]  
31  
32 268 knowledgeable males vs. 31/182 [17%] males with limited knowledge had received  $\geq 1$  HPV  
33  
34 269 vaccine dose;  $p=0.20$ ), and 221/342 knowledgeable females [65%] vs. 41/61 [67%] females with  
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36 270 limited knowledge had received  $\geq 1$  HPV vaccine dose;  $p=0.70$ ).  
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41 272 For the study’s qualitative component, although the youth had agreed to participate in  
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43 273 qualitative interviews explicitly about their HPV vaccination decisions, many participants were  
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45 274 not able to tell us what specifically the HPV vaccine was intended to protect against. When  
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47 275 asked about recommendations for improvements to HPV vaccination campaigns in Switzerland,  
48  
49 276 almost all youth mentioned desiring more and better information. The following dialogue  
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51 277 demonstrates how knowledge and awareness served as barriers for a 22-year-old male who had  
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53 278 not received the vaccine:  
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3 279 Researcher: So, I see [from your vaccination certificate] that you didn't get the HPV

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5 280 vaccine.

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7 281 Participant: No.

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9 282 Researcher: Was it a choice?

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11 283 Participant: No, it was an issue of information. I don't know what [HPV] is.

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### 14 15 16 285 3.3 *Youth Information Sources about HPV Vaccination*

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19 286 We assessed if and where adolescents had heard about HPV vaccination and who they may have

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21 287 turned to when deciding whether to get vaccinated against HPV. As shown in **Figure 4**, the three

22  
23 288 most commonly mentioned information sources by youth in the quantitative questionnaire

24  
25 289 were school health programs (53%), health care providers (23%), and participants' social

26  
27 290 networks (20%). The most mentioned information sources were similar for males and females.

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29 291 Internet and social media were mentioned infrequently as information sources (1% of all

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31 292 participants; 2% of males, 1% of females). Concerning the information sources used for deciding

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33 293 whether or not to vaccinate, most participants consulted their social networks (42%) and/or

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35 294 their healthcare provider (27%), as shown in **Figure 5**. Many participants (38%) did not talk to

36  
37 295 anyone about the HPV vaccine. We found this result predominantly with male participants (61%)

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39 296 and less with female participants (12%). Internet and social media were also infrequently

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41 297 mentioned for vaccine decision-making (0.4% of participants; 0.5% of males, 0.3% of females).

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44  
45 299 Qualitative interviews with youth showed that very few had actively sought out information

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47 300 about the HPV vaccination during the initial recommended age for the first dose (11-14 years).

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49 301 Primary explanations for this from the youths' perspectives included that they were too young

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51 302 when the HPV vaccine was offered via school programs or by their pediatricians, and that their

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3 303 parents had made the decision without being involved in the decision-making process. The few  
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5 304 youth who reported having had discussions about the HPV vaccination described having talked  
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7 305 to family members, primarily mothers or older siblings, or doctors (pediatricians if the vaccine  
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9 306 was offered during the initial recommended age, gynecologists for older female participants  
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11 307 who had not been vaccinated, and sexual health doctors for young men who have sex with men  
12  
13 308 (MSM)). Apart from the MSM in the qualitative study sample, young men reported not having  
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15 309 discussed the HPV vaccine with anybody. Several of the young women we interviewed recalled  
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17 310 their parents' skepticism when the HPV vaccine was first introduced. A 26-year-old female who  
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19 311 had not received the HPV vaccine explained, "It was one of the first years when it came out.  
20  
21 312 2009 or something like that. I was still a minor and still in high school. We needed our parents'  
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23 313 permission. My mother, who is a nurse, simply decided [against it because] it was a new vaccine,  
24  
25 314 and we didn't yet know the side effects."  
26  
27 315 When asked about where information about the HPV vaccine should come from, many youth  
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29 316 suggested better information campaigns via schools. This was particularly clear among youth  
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31 317 whose parents chose against the vaccine when they were in the initial recommended target age.  
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33 318 Despite not being vaccinated against HPV, an 18-year-old female described her views on the  
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35 319 added value of having HPV vaccination information campaigns and programs in schools,  
36  
37 320 particularly once youth are able to make their own health decisions:

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39 321 "I think it helped me a lot that that there was information at school and that the  
40  
41 322 vaccine was offered there. We were at an age when we started to make our  
42  
43 323 own decisions and that's why I liked the fact that we talked about it in school.  
44  
45 324 That helped me a lot. [...] because our parents had decided on everything  
46  
47 325 before. And this is, I think, the first time that we decide or shared decisions  
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49 326 about our health."  
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3 327 A 19-year-old female participant who had received the vaccine described the roles schools  
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5 328 played in explaining the rationale behind the HPV vaccine, "I think I find it very important that  
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7 329 there is an education and not just 'get vaccinated' and 'it's good for you or it helps you', but  
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10 330 rather also a 'why' and 'what is it about' and 'what would it look like if you weren't vaccinated',  
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12 331 what would be the consequence'? I think such a relatively educated attitude is also extremely  
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14 332 useful."  
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### 18 19 334 *3.4 Youth's female-gendered perception of the HPV Vaccine*

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21 335 Given the HPV vaccination's association with cervical cancer in popular discourse, we analyzed if  
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23 336 and to what extent participants had a gendered perception of HPV vaccine. From the  
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26 337 quantitative sample, after excluding 287 of 997 participants without knowledge of HPV or the  
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28 338 "cervical cancer vaccine," 554 of 710 (78%) participants perceived the HPV vaccine as being only  
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30 339 targeted towards women and not men (female-gendered answer) (**Supplementary Table 4**). For  
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32 340 example, many participants only mentioned cervical cancer when asked what the HPV vaccine is  
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34 341 for and only few youth mentioned that the HPV vaccine protects also males from diseases.  
35  
36  
37 342 290/361 (80%) males and 264/349 (75%) females ( $p=0.13$ ) gave a female-gendered answer.  
38

39 343 While both older and younger participants had a female-gendered perception on the purpose of  
40  
41 344 the HPV vaccination, significantly more older youth had female-gendered perceptions (496/611  
42  
43 345 (81%) older vs. 58/99 (59%) younger participants ( $p<0.01$ )). In addition, 277/331 (84%) older  
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45  
46 346 males vs. 13/30 (43%) younger males gave a female-gendered answer ( $p<0.01$ ); 219/280 (78%)  
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48 347 older females vs. 45/69 (65%) younger females gave a female-gendered answer ( $p=0.02$ ).  
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52 349 During qualitative interviews, we asked youth if they saw any differences for HPV vaccination  
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55 350 between men and women. These questions elicited two types of responses: (1) youth noting the  
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3 351 vaccination as being beneficial for females only, and (2) discourses about females bearing the  
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5 352 brunt of responsibility for sexual health. For the first type of response, some youth were not  
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7 353 aware that males could get vaccinated against HPV. A 20-year-old female who had received the  
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9 354 vaccine discussed her memories of getting the vaccine in school, "If I remember correctly, boys  
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11 355 didn't get vaccinated [when I was in school]." An 18-year-old male who had not received the  
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13 356 vaccine, when asked who the HPV vaccine was for, responded, "Women. Could that be? To be  
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15 357 honest, that's all I know right now." Others complained that they now realize how limited their  
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17 358 information about the vaccination and its benefits for young males was. A 19-year-old man  
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19 359 explained:

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23 360 "Well, I really haven't heard about [the HPV vaccination for boys] from anyone until  
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25 361 now. And I don't think this is my personal fault that I don't know anything about it. Until  
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27 362 now, it was only a topic for women, and now it's suddenly not anymore."

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30 363 Other youth talked about female responsibility for sexual health. A 26-year-old female who had  
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32 364 not been vaccinated against HPV explained how she saw the HPV vaccine for males as providing  
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34 365 protection to the females with whom young men had sexual encounters, "Girls are going to take  
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36 366 it more seriously. For boys, it doesn't concern them directly. It's protection for [girls]." A 20-  
37  
38 367 year-old female who had not been vaccinated against HPV echoed this sentiment:

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41 368 "I mean, for [girls], we know that (...), if we're going to be in a relationship  
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43 369 where we have sexual intercourse with somebody, we know that we have to  
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45 370 protect ourselves. First of all, to not get pregnant. Second of all, we know that  
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47 371 having any types of STDs and viruses would make our lives miserable. (...) But  
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49 372 for boys, it's like, "Ok, I'll have to wear protection. But what's the worst that can  
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51 373 happen?"

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#### 375 4. Discussion

376 Our study on HPV vaccine awareness, knowledge, information sources, and gendered  
377 perception among young males and females in Switzerland has four main findings. First, young  
378 females had more HPV vaccine awareness and knowledge than young males. This confirms  
379 previous reports, consistent with HPV vaccine having been introduced initially and worldwide as  
380 a vaccine designed only for females [15, 40, 41]. Even though awareness of HPV vaccine was  
381 higher in our study in females than in males, a recent Swiss national study found limited HPV  
382 awareness among 24–26-year-old women, suggesting opportunities for intervention also in  
383 women, including those that are older than the primary target age group [42]. We might  
384 hypothesize that lower awareness of the older females in our sample is related to the amount of  
385 time that has passed since they received HPV vaccination during their early adolescence. In  
386 other words, lower awareness in the group of older females might be due to memory recall bias  
387 and perhaps less developed vaccination implementation programs at the time they would have  
388 been exposed to them.

389  
390 Second, increased knowledge was associated with higher HPV vaccine uptake, in both females  
391 and males, suggesting that knowledge matters. This confirms results from previous reports [11,  
392 15-17]. In our study we only saw a trend towards a small difference in HPV vaccine knowledge  
393 between the younger and older age groups. Other studies however, found a higher knowledge  
394 score in older compared to younger participants [15, 41]. Encouragingly, younger participants  
395 were more aware of HPV vaccine compared to older participants, in contrast to other studies  
396 [15, 43].

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398 Third, the internet and social media played a surprisingly minor role as HPV vaccine information



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3 399 sources for youth in our study. This stands in contrast to other studies that found social media  
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5 400 to increasingly become a source of health information worldwide [44-47]. Another US study  
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7 401 described the internet as being one of the most frequently mentioned sources of vaccine  
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10 402 information among adolescents [48]. Currently, the potential of internet/ social media  
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12 403 information for HPV prevention/ vaccination uptake seems not to be used in Switzerland.

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16 405 Fourth, despite the male HPV vaccine recommendation was introduced more than four years  
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18 406 prior to our interviews, both female and male youth in our study associated HPV vaccine  
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20 407 predominantly with cervical cancer, consistent with the gendered views of HPV vaccine  
21  
22 408 documented in previous reports [3, 13]. That said, it is encouraging to see a slight shift in the  
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24 409 younger age group from a female gendered perspective to a gender-neutral perspective on HPV  
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26 410 vaccine.

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#### 31 32 412 **4.1 Strengths and limitations**

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35 413 One of the major strengths of our study is that it is a mixed-methods study. Our qualitative work  
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37 414 adds some description and explanation to our quantitative findings. Furthermore, we have a  
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39 415 large number of male participants in our study. The Swiss context in particular lacks data on HPV  
40  
41 416 vaccine awareness, knowledge, and information sources from male youth. Our study addresses  
42  
43 417 this research gap. Previous studies have predominantly focused on parents and their knowledge  
44  
45 418 on HPV vaccine [21-26]. Our study included youth, and this allowed us to gain important insights  
46  
47 419 on who youth turn to when deciding on HPV vaccination. Since the vaccine is recommended as a  
48  
49 420 catch-up vaccine until 26 years in many countries, including Switzerland, we have to ensure that  
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51 421 youth are aware of the HPV vaccine and that they have the necessary knowledge to make an  
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53 422 informed HPV vaccination decision.  
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3 423 One limitation of this study is that we might overestimate knowledge based on the way we  
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5 424 classified answers for the quantitative component. For example, if participants had heard of the  
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7 425 HPV vaccine, we simply asked them if they know what it is for but added no further questions. In  
8  
9 426 addition, for participants who have only heard of the “cervical cancer vaccine,” we did not ask  
10  
11 427 any follow-up questions on HPV knowledge. Other studies have assessed knowledge in more  
12  
13 428 depth, asking participants more knowledge specific questions [3, 18, 19]. Since our  
14  
15 429 questionnaire already lasted 25-35 minutes with questions on VH (**Jafflin K., manuscript in**  
16  
17 430 **preparation**), CAM use (**Jafflin K., manuscript in preparation, Kiener L., Schwendener C., et al,**  
18  
19 431 **manuscript submitted**) and moral foundations (**Jafflin K., manuscript in preparation**) we opted  
20  
21 432 to not include more questions to further assess participants’ knowledge. Another limitation to  
22  
23 433 this study was that our sampling strategy led to a non-representative sample. Additionally,  
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25 434 potential sources of bias arise from us not being able to get in contact with participants who do  
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27 435 not visit a physicians’ office. Our sampling strategy however allowed us to recruit a more diverse  
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29 436 sample regarding biomedical and CAM providers.  
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## 37 438 **5. Conclusion**

38  
39 439 This study underlines the importance of HPV awareness and knowledge given the association  
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41 440 between HPV awareness and knowledge and HPV vaccine uptake. However, males still have  
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43 441 limited awareness and knowledge about HPV vaccine. Future strategies to increase HPV vaccine  
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45 442 uptake, especially among males, should focus on better and more information supply to youth  
46  
47 443 explaining them the benefit of the HPV vaccine. School vaccination programs have proven to be  
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49 444 effective and should be further expanded [31]. Parents play an important role in youth’ decision  
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51 445 making process when it comes to HPV vaccine and they should be equally informed about the  
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53 446 benefits and importance of the HPV vaccine. Efforts should be made to underline the  
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3 447 effectiveness of the HPV vaccine for males and females to reach a gender-neutral perception of  
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5 448 the HPV vaccine. Targeted public health efforts should consider exploring internet and social  
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7 449 media as potential information distribution platforms. HPV vaccine uptake has improved over  
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9 450 the years, but there is substantial room for improvement, particularly in terms of increasing  
10  
11 451 knowledge and awareness among young men and women alike.  
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14 452

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18  
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### 25 457 **Disclosure of Potential Conflict of Interest**

26  
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28 458 All authors: no conflicts.  
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### 45 466 **Ethics approval**

46  
47  
48 467 The study was approved by the local ethics committee (Ethikkommission Nordwest- und  
49  
50 468 Zentralschweiz, EKNZ; project ID number 2017-00725). The ethics approval covers all study  
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52 469 participants, which includes adolescent and adult patients as well as biomedical and CAM  
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54 470 providers. Informed consent was provided by all participants after the nature and possible  
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3 471 consequences of the study had been fully explained.  
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7 473 **Data sharing statement**  
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10 474 Data is available upon reasonable request to the corresponding author.  
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**Contributors' Statement Page**

Ms. Kiener and Ms. Schwendener recruited participating youth, conducted interviews, carried out the analysis, drafted the initial manuscript, and reviewed and revised the manuscript.

Dr. Jafflin conceptualized and designed the study, designed the data collection instruments, coordinated and supervised data collection, carried out the analyses, and reviewed and revised the manuscript.

Ms. Rouached, Ms. Juillerat and Mr. Meier recruited participating youth, conducted interviews, and reviewed and revised the manuscript.

Dr. Schärli, Dr. Muggli, Dr. Gültekin and Dr. Gruillot recruited participating youth, and reviewed and revised the manuscript.

Mr. Baumann and Ms. Debergh recruited participating youth, conducted interviews, and reviewed and revised the manuscript.

Dr. Huber conceptualized and designed the study, recruited participating providers, and reviewed and revised the manuscript.

Dr. Merten conceptualized and designed the study, designed the data collection instruments, coordinated and supervised data collection, and reviewed and revised the manuscript.

Dr. Buhl designed the data collection instruments, recruited participating youth, conducted interviews, analyzed qualitative data, and reviewed and revised the manuscript.

Dr. Deml conceptualized and designed the study, designed the data collection instruments, recruited participating providers and youth, conducted qualitative interviews, analyzed qualitative data, and reviewed and revised the manuscript.

Dr. Tarr conceptualized and designed the study, designed the data collection instruments, recruited participating providers, coordinated and supervised data collection, carried out the analyses, and reviewed and revised the manuscript.

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3 500 All authors approved the final manuscript as submitted and agree to be accountable for all  
4 501 aspects of the work.  
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3 645 **Figures:**  
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6 646 1. Awareness and Knowledge of HPV Vaccine  
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8 647 2. Awareness and HPV Vaccine Uptake  
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652 **Table 1. Participant Characteristics (quantitative questionnaire)**

	All Participants (n = 997)	Male (n = 585)	Female (n = 412)
<b>Age</b>			
Age (years), median (IQR)	19 (18-21)	19 (19-20)	20 (17-23)
Born before July 1 <sup>st</sup> , 2002, n (%)	849 (85)	525 (90)	324 (79)
Born on/ after July 1 <sup>st</sup> , 2002, n (%)	148 (15)	60 (10)	88 (21)
<b>Nationality</b>			
Swiss, n (%)	913 (92)	547 (94)	366 (89)
<b>Language</b>			
German, n (%)	667 (67)	448 (77)	229 (53)
French, n (%)	168 (17)	47 (8)	121 (29)
Italian, n (%)	156 (16)	86 (15)	70 (17)
English, n (%)	6 (1)	4 (1)	2 (0.5)
<b>Recruitment setting</b>			
Biomedical provider, n (%)	405 (41)	146 (25)	259 (63)
Military service, n (%)	375 (38)	371 (63)	4 (1)
CAM provider, n (%)	148 (15)	55 (9)	93 (23)
Adolescent clinic, n (%)	69 (7)	13 (2)	56 (14)
<b>Living situation</b>			
With parents, n (%)	817 (82)	497 (85)	320 (78)
<b>School vaccination program</b>			
School program available, n (%)	448 (45)	180 (31)	268 (65)
<b>Vaccination status</b>			
	<i>n = 940</i>	<i>n = 537</i>	<i>n = 403</i>
Has received ≥1 does of HPV vaccine, n (%)	370 (39)	108 (20)	262 (65)

653 **Note.** All data shown are number (%) of participants, unless otherwise indicated. Due to rounding, total  
654 numbers may not add up to 100%.

655 **Abbreviations.** CAM, complementary and alternative medicine; IQR, interquartile range

656

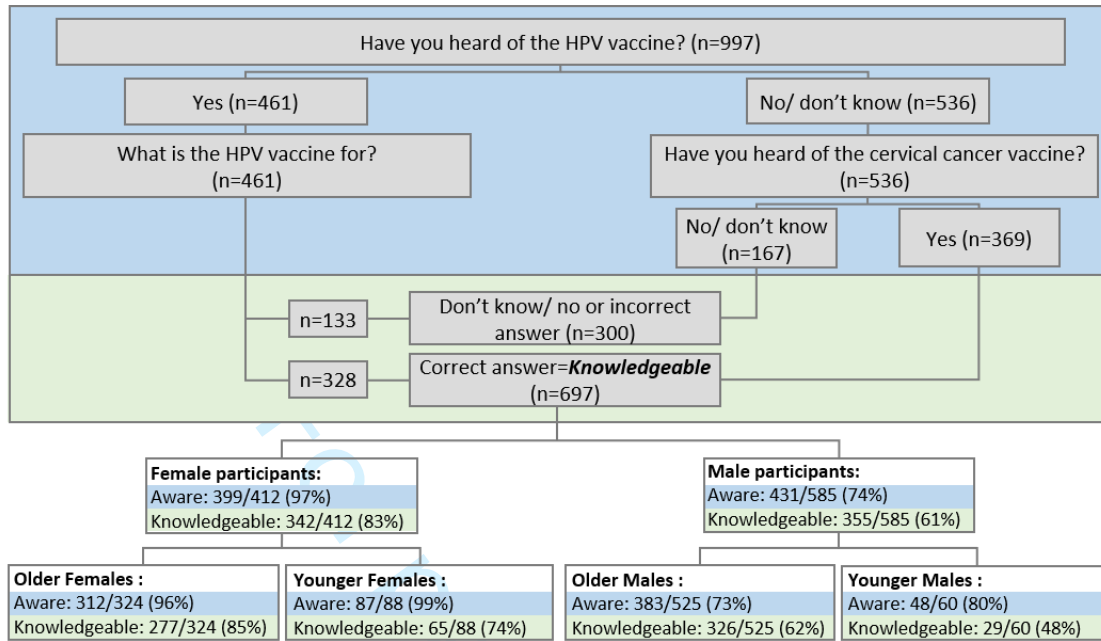
657 **Table 2. Participant Characteristics (qualitative interview)**

<b>French-Speaking Region</b>		
Female		N= 6
	Age	15-26 years, $\bar{x}$ =19.6 years
	Received at least 1 dose of HPV vaccination	N=4 (66%)
	Informed through school vaccination program	N=6 (100%)
Male		N=8
	Age	15-26 years, $\bar{x}$ =22.4 years
	Received at least 1 dose of HPV vaccination	N=4 (50%)
	Informed through school vaccination program	N=1 (13%)
<b>German-Speaking Region</b>		
Female		N=8
	Age	15-26 years, $\bar{x}$ =20.9 years
	Received at least 1 dose of HPV vaccination	N=4 (50%)
	Informed through school vaccination program	N=7 (88%)
Male		N=9
	Age	15-26 years, $\bar{x}$ = 20.6years
	Received at least 1 dose of HPV vaccination	N=1 (11%)
	Informed through school vaccination program	N=1 (11%)

658

659

**Figure 1. Awareness and Knowledge of HPV Vaccine**



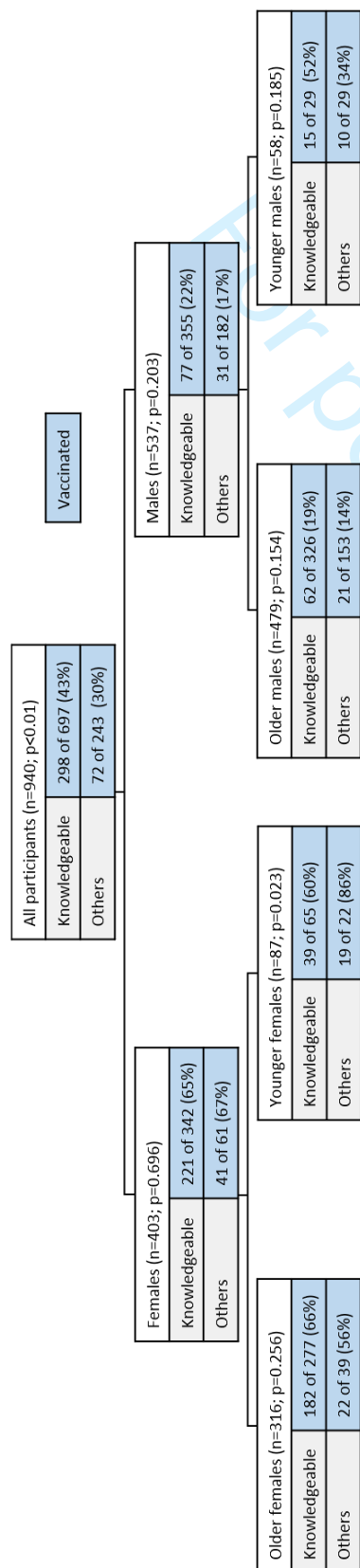
**Note.** All data in blue stands for awareness and all data in green for knowledge.

**Figure 2. Awareness and HPV Vaccine Uptake**



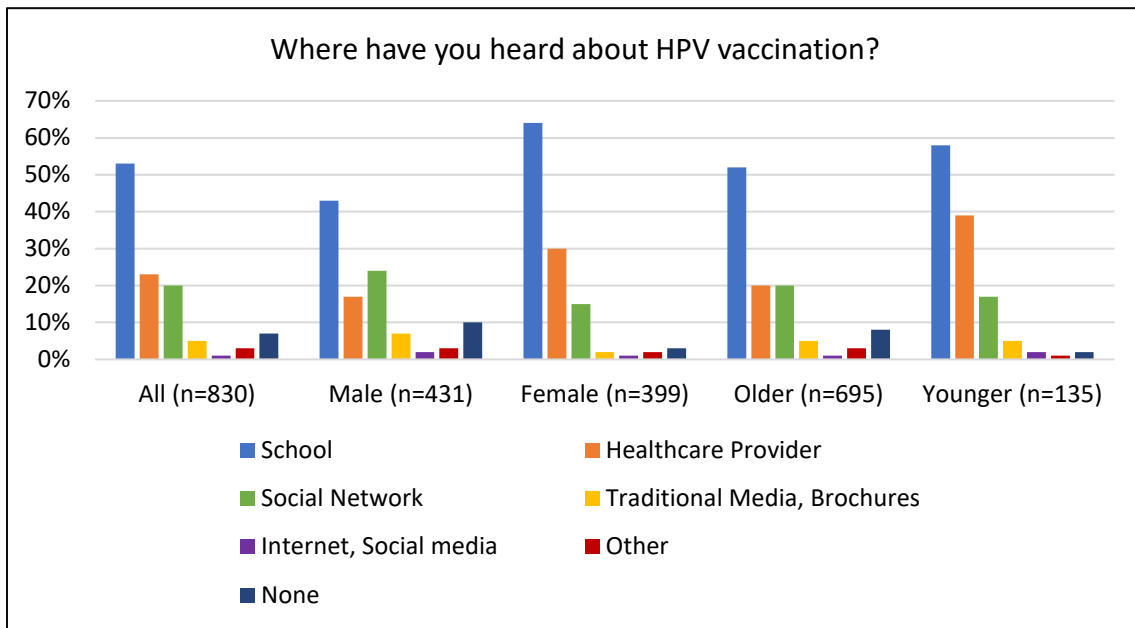
**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

**Figure 3. Knowledge and HPV Vaccine Uptake**



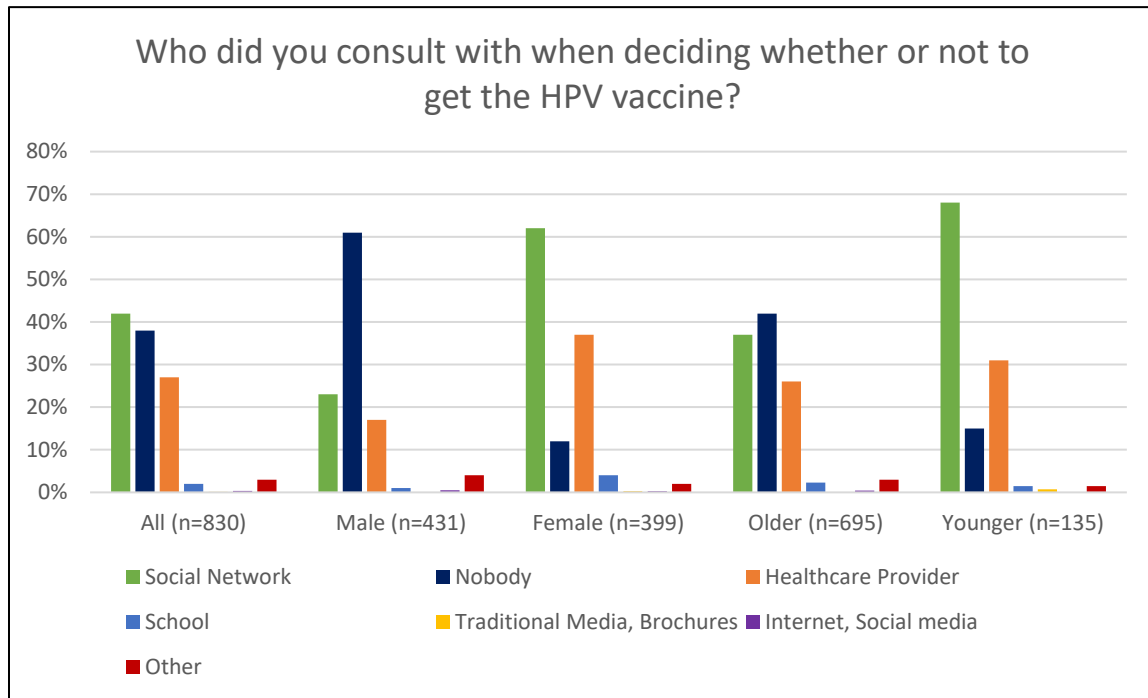
**Note.** 53/997 participants were excluded due to missing information on HPV immunization status and 4/997 due to missing answers.

Figure 4. Information Sources



**Note.** 167/997 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were possible.



**Figure 5. HPV Vaccine Consulting Behavior**

**Note.** 167/997 participants were excluded due to lack of HPV vaccine knowledge. Multiple answers were possible.

1  
2  
3 **Schwendener et al, HPV Vaccine Awareness, Knowledge, and Information Sources**  
4 **among Youth in Switzerland: A Mixed Methods Study: Supplementary Material 1 –**  
5 **HPV Vaccination Questionnaire**  
6  
7

8 Hello, this is [interviewer name]. Could I speak with [participant name], please? As planned, I  
9 am calling to interview you as part of our study about vaccination decision-making.  
10

11 I would first like to verify some details.  
12

- 13 1. Could you please tell me your birth date?
- 14 2. What is the sex of [participant name]?
- 15     a. Boy
- 16     b. Girl
- 17     c. Intersex
- 18     d. Doesn't want to disclose
- 19
- 20 3. Is Dr. [provider name] your doctor?
- 21 4. Do you live with your parents, or somewhere else?
- 22     a. Lives with parent(s)
- 23     b. Doesn't live with parents
- 24     c. Doesn't want to disclose
- 25     d. Missing
- 26     ➔ If a continue with question 5.
- 27     ➔ If b continue with question 12.
- 28     ➔ If c,d continue with question 13.
- 29
- 30 5. To start off, I would like to know how many people normally live in your parents'  
31 household, yourself included. Please include your family, but also any tenants, au  
32 pairs, students, or other people who live in your home at least 4 days a week.
- 33 6. Could you please tell me about the people who live in your home, yourself included?
- 34 7. First yourself [person 1], what is your age?
- 35 8. Sex of person 1
- 36     a. Male
- 37     b. Female
- 38     c. Other/ not disclosed
- 39     d. Missing
- 40
- 41 9. Person 2, age
- 42 10. Person 2, sex
- 43     a. Male
- 44     b. Female
- 45     c. Other/ not disclosed
- 46     d. Missing
- 47
- 48 11. How is [second person] related to you?
- 49     If male:
- 50     a. Father
- 51     b. Stepfather
- 52     c. Father/mother's partner
- 53     d. Stepbrother
- 54
- 55
- 56
- 57
- 58
- 59
- 60

- e. Grandfather
- f. Uncle, cousin
- g. Other relative
- h. Not a relative
- i. Doesn't want to disclose
- j. Doesn't know
- k. Missing

If female:

- a. Mother
- b. Stepmother
- c. Mother/ father's partner
- d. Sister or half-sister
- e. Grandmother
- f. Aunt, cousin
- g. Other relative
- h. Not a relative
- i. Doesn't want to disclose
- j. Doesn't know
- k. Missing

12. How many persons lived in your parent's household at the time before you moved out (yourself included)?

Now I would like to ask some questions about your thoughts and experiences with vaccination.

13. Have you ever delayed getting a vaccine for reasons other than illness or allergy?

- a. Yes
- b. No
- c. Doesn't want to disclose
- d. Doesn't know
- e. Missing

14. Have you ever skipped a vaccine for reasons other than illness or allergy?

- a. Yes
- b. No
- c. Doesn't want to disclose
- d. Doesn't know
- e. Missing

15. On a scale from 0 to 10, with 0 being not sure at all and 10 being completely sure, How sure are you that following the recommended vaccine schedule is a good idea for you?

➔ If question 15 is unclear, continue with question 16. Otherwise continue with question 17.

16. I will rephrase the question: On a scale from 0 to 10, with 0 being not sure at all and 10 being completely sure, how sure are you that it is a good idea to vaccinate you with the vaccines recommended by the Federal Office of Public Health?

1  
2  
3 Do you agree or disagree with the following statements:  
4

5 17. We get more vaccines than are good for us.

- 6 a. Strongly agree  
7 b. Agree  
8 c. Not sure  
9 d. Disagree  
10 e. Strongly disagree  
11 f. Doesn't want to disclose  
12 g. Missing

13 18. I believe that many of the illnesses that vaccines prevent are severe.

- 14 a. Strongly agree  
15 b. Agree  
16 c. Not sure  
17 d. Disagree  
18 e. Strongly disagree  
19 f. Doesn't want to disclose  
20 g. Missing

21 19. It is better to develop immunity by getting sick than to get a vaccine.

- 22 a. Strongly agree  
23 b. Agree  
24 c. Not sure  
25 d. Disagree  
26 e. Strongly disagree  
27 f. Doesn't want to disclose  
28 g. Missing

29 20. It's better to get fewer vaccines at the same time.

- 30 a. Strongly agree  
31 b. Agree  
32 c. Not sure  
33 d. Disagree  
34 e. Strongly disagree  
35 f. Doesn't want to disclose  
36 g. Missing

37 21. How concerned are you that you might have a serious side effect from a vaccine?

- 38 a. Not at all concerned  
39 b. Not too concerned  
40 c. Not sure  
41 d. Somewhat concerned  
42 e. Very concerned  
43 f. Doesn't want to disclose  
44 g. Missing

45 22. How concerned are you that one of the vaccines might not be safe?

- 46 a. Not at all concerned  
47 b. Not too concerned  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

- c. Not sure
- d. Somewhat concerned
- e. Very concerned
- f. Doesn't want to disclose
- g. Missing

23. How concerned are you that a vaccine might not prevent disease?

- a. Not at all concerned
- b. Not too concerned
- c. Not sure
- d. Somewhat concerned
- e. Very concerned
- f. Doesn't want to disclose
- g. Missing

24. Overall, how hesitant about vaccines would you consider yourself to be?

- a. Not at all hesitant
- b. Not too hesitant
- c. Not sure
- d. Somewhat hesitant
- e. Very hesitant
- f. Doesn't want to disclose
- g. Missing

Do you agree or disagree with the following statements:

25. I trust the information I receive about vaccines.

- a. Strongly agree
- b. Agree
- c. Not sure
- d. Disagree
- e. Strongly disagree
- f. Doesn't want to disclose
- g. Missing

26. I am able to openly discuss my concerns about vaccines with my doctor.

- a. Strongly agree
- b. Agree
- c. Not sure
- d. Disagree
- e. Strongly disagree
- f. Doesn't want to disclose
- g. Missing

27. All things considered, how much do you trust your doctor, on a scale from 0 to 10, with 0 being not at all and 10 being completely?

Now I want to ask you some questions about the HPV vaccine.

28. Have you heard of the HPV vaccine?

- 1  
2  
3 a. Yes  
4 b. No  
5 c. Doesn't want to disclose  
6 d. Doesn't know  
7 e. Missing  
8  
9  
10 → If a: continue with question 29.  
11 → If b-e: continue with question 30.  
12  
13 29. What is it for?  
14 30. Have you heard of the cervical cancer vaccine?  
15 a. Yes  
16 b. No  
17 c. Doesn't want to disclose  
18 d. Doesn't know  
19 e. Missing  
20  
21 → If a: continue with question 31.  
22 → If b-e: continue with question 37.  
23  
24 31. Have you received HPV vaccine?  
25 a. Yes  
26 b. No  
27 c. Doesn't want to disclose  
28 d. Doesn't know  
29 e. Missing  
30  
31 → If a: continue with question 31.  
32 → If b-e: continue with question 33.  
33  
34 32. Where did you receive HPV vaccine?  
35 a. At school  
36 b. At a doctor recommended by school  
37 c. At the family doctor's  
38 d. At the pediatrician's  
39 e. At the gynecologist's  
40 f. At a vaccination center  
41 g. Other  
42 h. Doesn't want to disclose  
43 i. Doesn't know  
44 j. Missing  
45  
46 33. Where have you heard about HPV vaccination?  
47  
48 34. Was the HPV vaccine recommended by your school?  
49 a. Yes  
50 b. No  
51 c. Doesn't want to disclose  
52 d. Doesn't know  
53 e. Missing  
54  
55 35. How do you feel about offering the HPV vaccine at school?  
56 a. Very supportive  
57  
58  
59  
60

- 1  
2  
3 b. Somewhat supportive  
4 c. Not sure  
5 d. Somewhat unsupportive  
6 e. Very unsupportive  
7 f. Doesn't want to disclose  
8 g. Doesn't know  
9 h. Missing  
10  
11  
12 36. Who did you consult with when deciding whether or not to get the HPV vaccine?  
13  
14 37. What are your most trusted information sources on vaccination?  
15 a. No information/ no source  
16 b. Family  
17 c. My doctor  
18 d. Other doctor  
19 e. Friends and acquaintances  
20 f. Public health authorities  
21 g. TV  
22 h. Internet  
23 i. Social media (such as Facebook, Instagram and Twitter)  
24 j. Print media (such as books, magazines and newspapers)  
25 k. Other: \_\_\_\_  
26 l. Doesn't want to disclose  
27 m. Doesn't know  
28 n. Missing  
29 → If g: add question 38.  
30 → If h: add question 39.  
31 → If i: add question 40.  
32 → If j: add question 41.  
33 → If k: add question 42.  
34 → Otherwise continue with question 43.  
35  
36  
37  
38  
39  
40  
41 38. Which TV programs?  
42  
43 39. Which websites?  
44  
45 40. What social media?  
46  
47 41. What print media?  
48  
49 42. What other sources?  
50  
51 43. Did you apply the information you received when making decisions about  
52 vaccination?  
53 a. Yes  
54 b. No  
55 c. Doesn't want to disclose  
56 d. Doesn't know  
57 e. Missing  
58  
59 44. How is your health in general? Is it...  
60 a. Very good  
b. Good

- 1
- 2
- 3 c. OK
- 4 d. Bad
- 5 e. Very bad
- 6 f. Doesn't want to disclose
- 7 g. Doesn't know
- 8 h. Missing
- 9
- 10

11 45. How important is health for you? Here are three options, please tell us which one is  
12 closest to your own opinion.

- 13 a. I live without worrying too much about consequences for my health.
- 14 b. My lifestyle is influenced by considerations about maintaining my health.
- 15 c. Considerations about my health have a large impact on how I live.
- 16 d. Doesn't want to disclose
- 17 e. Doesn't know
- 18 f. Missing
- 19
- 20
- 21

22 46. In the last 12 months, that is since [month, year], which of the following treatments  
23 have you used for your own health? Please indicate yes or no for each.

- 24 a. Acupressure
- 25 b. Acupuncture
- 26 c. Anthroposophical medicine
- 27 d. Chinese medicine
- 28 e. Chiropractics
- 29 f. Herbal treatment
- 30 g. Homeopathy
- 31 h. Hypnotherapy
- 32 i. Massage therapy
- 33 j. Osteopathy
- 34 k. Physiotherapy
- 35 l. Reflexology
- 36 m. Spiritual Healing
- 37 n. Other: \_\_\_\_
- 38 o. None of these
- 39 p. don't know
- 40
- 41
- 42
- 43
- 44
- 45

46 Now I would like to ask you some questions about other topics to get a sense of your core  
47 worldview and political and religious sentiments.

48  
49 47. Do you consider yourself as belonging to any particular religion or denomination?

- 50 a. Yes
- 51 b. No
- 52 c. Doesn't want to disclose
- 53 d. Doesn't know
- 54 e. Missing
- 55
- 56

57 → If a: continue with question 48.

58 → If b-e: continue with question 50.

59 48. Which one?  
60



- 1  
2  
3 a. Christian  
4 b. Jewish  
5 c. Islamic  
6 d. Eastern religions  
7 e. Other non-Christian religions  
8 f. Doesn't want to disclose  
9 g. Doesn't know  
10 h. Missing  
11  
12  
13  
14 → If a-e: continue with question 49.  
15 → If f-h: continue with question 50.  
16  
17 49. Please specify which exactly.  
18 50. Apart from special occasions such as weddings and funerals, about how often do you  
19 attend religious services nowadays?  
20 a. Every day  
21 b. More than once a week  
22 c. Once a week  
23 d. At least once a month  
24 e. Only on special holy days  
25 f. Less often  
26 g. Never  
27 h. Doesn't want to disclose  
28 i. Doesn't know  
29 j. Missing  
30  
31 51. Regardless of whether you belong to a particular religion, how religious would you  
32 say you are?  
33 a. Not at all religious  
34 b. Somewhat religious  
35 c. Religious  
36 d. Very religious  
37 e. Doesn't want to disclose  
38 f. Doesn't know  
39 g. Missing  
40  
41 52. How important do you consider spiritual experiences to be in your everyday life?  
42 a. Very important  
43 b. Somewhat important  
44 c. Not very important  
45 d. Not important at all  
46 e. Not sure  
47 f. Doesn't want to disclose  
48 g. Doesn't know  
49 h. Missing  
50  
51 53. How interested would you say you are in politics? Are you...  
52 a. Very interested  
53 b. Quite interested  
54  
55  
56  
57  
58  
59  
60

- 1  
2  
3 c. Hardly interested  
4 d. Or, not at all interested?  
5 e. Doesn't want to disclose  
6 f. Doesn't know  
7 g. Missing  
8  
9  
10 54. Is there a particular political party that you feel closer to than all the other political  
11 parties?  
12 a. Yes  
13 b. No  
14 c. Doesn't want to disclose  
15 d. Doesn't know  
16 e. Missing  
17  
18 → If a: continue with question 55.  
19 → If b-e: continue with question 56.  
20  
21 55. Which one?  
22  
23 56. In politics, people sometimes talk of "left" and "right". Where would you place  
24 yourself? Would you consider yourself...  
25 a. Left  
26 b. Center left  
27 c. Center  
28 d. Center right  
29 e. Right  
30 f. Doesn't want to disclose  
31 g. Doesn't know  
32 h. Missing  
33  
34 57. How often do you participate in activities with a society, a club, a political party, a  
35 cultural association, or other groups, including religious groups?  
36 a. Almost every day  
37 b. About once a week  
38 c. About 1-3 times a month  
39 d. A few times a year  
40 e. More rarely  
41 f. Never  
42 g. Doesn't want to disclose  
43 h. Doesn't know  
44 i. Missing  
45  
46  
47  
48  
49  
50

51 We would now like to pose some questions regarding the values that generally guide people  
52 in their everyday life. The questions don't directly relate to vaccinations.

53  
54 When you decide whether something is right or wrong, to what extent are the following  
55 considerations relevant to your thinking?  
56

- 57 58. Whether or not someone suffered emotionally. Is it not at all relevant, not very  
58 relevant, slightly relevant, somewhat relevant, very relevant or extremely relevant?  
59 a. Not at all relevant  
60

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- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

59. Whether or not someone was treated differently than others.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

60. Whether or not someone's actions showed love for his or her country.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

61. Whether or not someone's actions showed lack of respect for authority.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant
- f. Extremely relevant
- g. Doesn't want to disclose
- h. Doesn't know
- i. Missing

62. Whether or not someone violated standards of purity and decency.

- a. Not at all relevant
- b. Not very relevant
- c. Slightly relevant
- d. Somewhat relevant
- e. Very relevant

- 1  
2  
3 f. Extremely relevant  
4 g. Doesn't want to disclose  
5 h. Doesn't know  
6 i. Missing  
7  
8 63. Whether or not someone was good at math.  
9  
10 a. Not at all relevant  
11 b. Not very relevant  
12 c. Slightly relevant  
13 d. Somewhat relevant  
14 e. Very relevant  
15 f. Extremely relevant  
16 g. Doesn't want to disclose  
17 h. Doesn't know  
18 i. Missing  
19  
20 64. Whether or not someone cared for someone weak and vulnerable.  
21  
22 a. Not at all relevant  
23 b. Not very relevant  
24 c. Slightly relevant  
25 d. Somewhat relevant  
26 e. Very relevant  
27 f. Extremely relevant  
28 g. Doesn't want to disclose  
29 h. Doesn't know  
30 i. Missing  
31  
32 65. Whether or not someone acted unfairly.  
33  
34 a. Not at all relevant  
35 b. Not very relevant  
36 c. Slightly relevant  
37 d. Somewhat relevant  
38 e. Very relevant  
39 f. Extremely relevant  
40 g. Doesn't want to disclose  
41 h. Doesn't know  
42 i. Missing  
43  
44 66. Whether or not someone did something to betray his or her group.  
45  
46 a. Not at all relevant  
47 b. Not very relevant  
48 c. Slightly relevant  
49 d. Somewhat relevant  
50 e. Very relevant  
51 f. Extremely relevant  
52 g. Doesn't want to disclose  
53 h. Doesn't know  
54 i. Missing  
55  
56  
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58  
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1  
2  
3 67. Whether or not someone conformed to the traditions of society.

- 4 a. Not at all relevant  
5 b. Not very relevant  
6 c. Slightly relevant  
7 d. Somewhat relevant  
8 e. Very relevant  
9 f. Extremely relevant  
10 g. Doesn't want to disclose  
11 h. Doesn't know  
12 i. Missing

13  
14  
15  
16 68. Whether or not someone did something disgusting.

- 17 a. Not at all relevant  
18 b. Not very relevant  
19 c. Slightly relevant  
20 d. Somewhat relevant  
21 e. Very relevant  
22 f. Extremely relevant  
23 g. Doesn't want to disclose  
24 h. Doesn't know  
25 i. Missing

26  
27  
28  
29  
30 Please listen to the following statements and indicate whether you strongly disagree,  
31 moderately disagree, slightly disagree, slightly agree, moderately agree or strongly agree.

32  
33 69. Compassion for those who are suffering is the most crucial virtue.

- 34 a. Strongly disagree  
35 b. Moderately disagree  
36 c. Slightly disagree  
37 d. Moderately agree  
38 e. Strongly agree  
39 f. Doesn't want to disclose  
40 g. Doesn't know  
41 h. Missing

42  
43  
44  
45 70. When the government makes laws, the number one principle should be ensuring that  
46 everyone is treated fairly.

- 47 a. Strongly disagree  
48 b. Moderately disagree  
49 c. Slightly disagree  
50 d. Moderately agree  
51 e. Strongly agree  
52 f. Doesn't want to disclose  
53 g. Doesn't know  
54 h. Missing

55  
56  
57  
58 71. I am proud of my country's history.

- 59 a. Strongly disagree  
60

- 1  
2  
3 b. Moderately disagree  
4 c. Slightly disagree  
5 d. Moderately agree  
6 e. Strongly agree  
7 f. Doesn't want to disclose  
8 g. Doesn't know  
9 h. Missing  
10  
11  
12 72. Respect for authority is something all children need to learn.  
13 a. Strongly disagree  
14 b. Moderately disagree  
15 c. Slightly disagree  
16 d. Moderately agree  
17 e. Strongly agree  
18 f. Doesn't want to disclose  
19 g. Doesn't know  
20 h. Missing  
21  
22 73. People should not do things that are disgusting even if no one is harmed.  
23 a. Strongly disagree  
24 b. Moderately disagree  
25 c. Slightly disagree  
26 d. Moderately agree  
27 e. Strongly agree  
28 f. Doesn't want to disclose  
29 g. Doesn't know  
30 h. Missing  
31  
32 74. It is better to do good than to do bad.  
33 a. Strongly disagree  
34 b. Moderately disagree  
35 c. Slightly disagree  
36 d. Moderately agree  
37 e. Strongly agree  
38 f. Doesn't want to disclose  
39 g. Doesn't know  
40 h. Missing  
41  
42 75. One of the worst things a person could do is hurt a defenseless animal.  
43 a. Strongly disagree  
44 b. Moderately disagree  
45 c. Slightly disagree  
46 d. Moderately agree  
47 e. Strongly agree  
48 f. Doesn't want to disclose  
49 g. Doesn't know  
50 h. Missing  
51  
52 76. Justice is the most important requirement for a society.  
53  
54  
55  
56  
57  
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- 1  
2  
3 a. Strongly disagree  
4 b. Moderately disagree  
5 c. Slightly disagree  
6 d. Moderately agree  
7 e. Strongly agree  
8 f. Doesn't want to disclose  
9 g. Doesn't know  
10 h. Missing  
11  
12

13  
14 77. People should be loyal to their family members even when they have done  
15 something wrong.

- 16 a. Strongly disagree  
17 b. Moderately disagree  
18 c. Slightly disagree  
19 d. Moderately agree  
20 e. Strongly agree  
21 f. Doesn't want to disclose  
22 g. Doesn't know  
23 h. Missing  
24  
25  
26

27 78. Men and women should each have different roles to play in society.

- 28 a. Strongly disagree  
29 b. Moderately disagree  
30 c. Slightly disagree  
31 d. Moderately agree  
32 e. Strongly agree  
33 f. Doesn't want to disclose  
34 g. Doesn't know  
35 h. Missing  
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39 79. I would call some acts wrong on the grounds that they are unnatural.

- 40 a. Strongly disagree  
41 b. Moderately disagree  
42 c. Slightly disagree  
43 d. Moderately agree  
44 e. Strongly agree  
45 f. Doesn't want to disclose  
46 g. Doesn't know  
47 h. Missing  
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51 I just have a few more questions to finish up.

52  
53 80. Which of these descriptions applies to what you have been doing for the last seven  
54 days?

- 55 a. In paid work or away temporarily  
56 b. In education (even if on vacation)  
57 c. Unemployed and actively looking for a job  
58 d. Unemployed, wished to work but didn't actively look for a job  
59  
60

- 1  
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3 e. Permanently sick or disabled  
4 f. Retired  
5 g. In community or military service  
6 h. Doing housework, looking after children or other persons  
7 i. Other  
8 j. Doesn't want to disclose  
9 k. Doesn't know  
10 l. Missing  
11  
12 → If a: continue with question 81.  
13 → If b-l: continue with question 82.  
14  
15 81. Regardless of your basic or contracted hours, how many hours per week do you  
16 normally work, including any paid or unpaid overtime?  
17  
18 82. And what about your father? Which describes his situation in the last seven days?  
19 a. In paid work or away temporarily  
20 b. In education (even if on vacation)  
21 c. Unemployed and actively looking for a job  
22 d. Unemployed, wished to work but didn't actively look for a job  
23 e. Permanently sick or disabled  
24 f. Retired  
25 g. In community or military service  
26 h. Doing housework, looking after children or other persons  
27 i. Other  
28 j. Doesn't want to disclose  
29 k. Doesn't know  
30 l. Missing  
31  
32 → If a: continue with question 83.  
33 → If b-l: continue with question 85.  
34  
35 83. How many hours does he normally work, including any paid or unpaid overtime?  
36  
37 84. What is his current occupation?  
38  
39 85. And what about your mother? Which describes her situation in the last seven days?  
40 a. In paid work or away temporarily  
41 b. In education (even if on vacation)  
42 c. Unemployed and actively looking for a job  
43 d. Unemployed, wished to work but didn't actively look for a job  
44 e. Permanently sick or disabled  
45 f. Retired  
46 g. In community or military service  
47 h. Doing housework, looking after children or other persons  
48 i. Other  
49 j. Doesn't want to disclose  
50 k. Doesn't know  
51 l. Missing  
52  
53 86. How many hours does she normally work, including any paid or unpaid overtime?  
54  
55 87. What is her current occupation?  
56  
57  
58  
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3 → If a: continue with question 86.  
4 → If b-l: continue with question 88.

5  
6 88. Are you a citizen of Switzerland?

- 7 a. Yes  
8 b. No  
9 c. Doesn't want to disclose  
10 d. Doesn't know  
11 e. Missing

- 12  
13 → If a: continue with question 90.  
14 → If b: continue with question 89.  
15 → If c-e: continue with question 93.

16  
17 89. What citizenship do you hold?

18  
19 90. Were you born in Switzerland?

- 20 a. Yes  
21 b. No  
22 c. Doesn't want to disclose  
23 d. Doesn't know  
24 e. Missing

- 25  
26 → If a, c-e: continue with question 93.  
27 → If b: continue with question 91.

28  
29 91. In which country were you born?

30 92. What year did you first come to Switzerland?

31 93. What is your postcode?

32  
33  
34 We have finished the interview. Thank you very much for your time.

35  
36 94. Do you have comments you would like to make?

37  
38 95. Thank you very much for your participation in this telephone interview. In order to  
39 better understand what young people think about HPV vaccinations we plan to also  
40 speak to some young people in person. We are able to travel to a place that is  
41 convenient and comfortable for our interview partners at a date and time that suit  
42 them. Please let me know if:

- 43  
44 a. you would be interested to take part in a face-to-face interview  
45 b. are not sure yet but we may contact you again  
46 c. you would not like to be contacted again

- 47  
48 → If a,b: continue with question 96.  
49 → If c: end of interview.

50  
51 96. Would you prefer to be interviewed alone, or would you rather have one or even  
52 both of your parents being present?

- 53 a. Alone  
54 b. With one or both parents  
55 c. Missing

56  
57 97. How can we contact you?

- 58 a. SMS  
59 b. Telephone  
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- c. Email:\_\_\_
- d. Missing

For peer review only

## Schwendener et al, HPV Vaccine Awareness, Knowledge, and Information Sources among Youth in Switzerland: A Mixed Methods Study: Supplementary Material 2

**Supplementary Table 1. Awareness and knowledge of subgroups**

	All Participants (n = 997)	Biomedical provider (n = 405)	Military Service (n = 375)	CAM provider (n = 148)	Adolescent clinic (n = 69)
<b>Awareness</b>					
Aware, n (%)	830 (83)	357 (88)	271 (72)	136 (92)	66 (96)
<b>Knowledge</b>					
Knowledgeable, n (%)	697 (70)	293 (72)	229 (61)	119 (80)	56 (81)

**Note.** All data shown are number (%) of participants, unless otherwise indicated.

**Abbreviations.** CAM, complementary and alternative medicine

**Supplementary Table 2. Awareness and knowledge of subgroups – male participants**

	All Participants (n = 585)	Biomedical provider (n = 146)	Military Service (n = 371)	CAM provider (n = 55)	Adolescent clinic (n = 13)
<b>Awareness</b>					
Aware, n (%)	431 (74)	108 (74)	268 (72)	43 (78)	12 (92)
<b>Knowledge</b>					
Knowledgeable, n (%)	355 (61)	77 (53)	227 (61)	41 (75)	10 (77)

**Note.** All data shown are number (%) of participants, unless otherwise indicated.

**Abbreviations.** CAM, complementary and alternative medicine

**Supplementary Table 3. Awareness and knowledge of subgroups – female participants**

	All Participants (n = 412)	Biomedical provider (n = 259)	Military Service (n = 4)	CAM provider (n = 93)	Adolescent clinic (n = 56)
<b>Awareness</b>					
Aware, n (%)	399 (97)	249 (96)	3 (75)	93 (100)	54 (96)
<b>Knowledge</b>					
Knowledgeable, n (%)	342 (83)	216 (83)	2 (50)	78 (84)	46 (82)

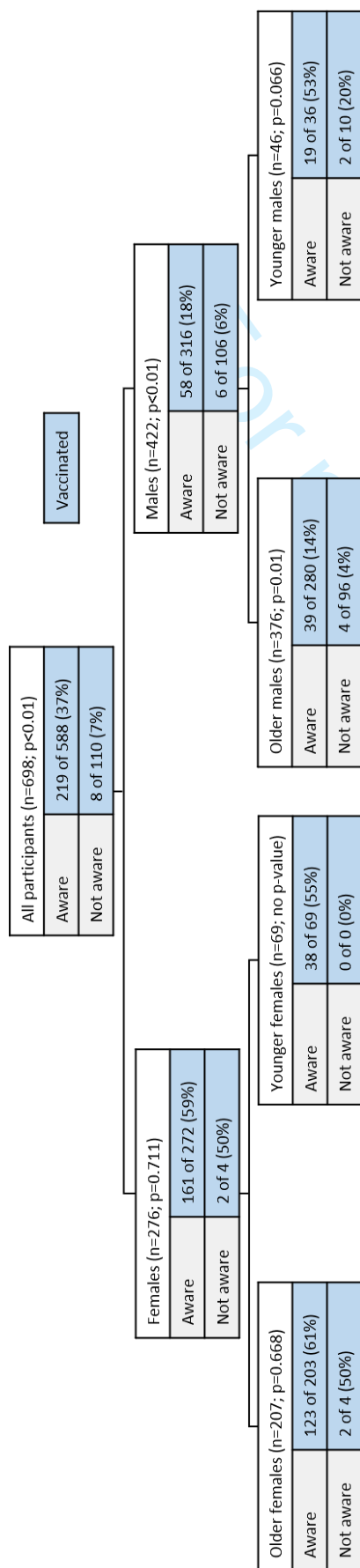
**Note.** All data shown are number (%) of participants, unless otherwise indicated.

**Abbreviations.** CAM, complementary and alternative medicine

**Supplementary Table 4. Survey questions concerning gendered perceptions of HPV Vaccine**

	All participants	By gender		By age groups	
		Male	Female	Born before 1.7.02	Born on/ after 1.7.02
<b>Have you heard of the HPV vaccine?</b>	<i>(n = 997)</i>	<i>(n = 585)</i>	<i>(n = 412)</i>	<i>(n = 849)</i>	<i>(n = 148)</i>
Yes, n (%)	461 (46)	176 (30)	285 (69)	359 (42)	102 (69)
No/ don't know, n (%)	536 (54)	409 (70)	127 (31)	490 (58)	46 (31)
<b>Have you heard of the cervical cancer vaccine?</b>	<i>(n = 535)</i>	<i>(n = 409)</i>	<i>(n = 126)</i>	<i>(n = 489)</i>	<i>(n = 46)</i>
Yes, n (%)	369 (69)	255 (62)	114 (90)	336 (69)	33 (72)
No/ don't know, n (%)	166 (31)	154 (38)	12 (10)	153 (31)	13 (28)
<b>What is the HPV vaccine for?</b>	<i>(n = 461)</i>	<i>(n = 176)</i>	<i>(n = 285)</i>	<i>(n = 359)</i>	<i>(n = 102)</i>
Only female, n (%)	185 (40)	35 (20)	150 (53)	160 (45)	25 (25)
All other answers, n (%)	276 (60)	141 (80)	135 (47)	199 (55)	77 (75)
<b>Combination of all questions</b>	<i>(n = 711)</i>	<i>(n = 361)</i>	<i>(n = 350)</i>	<i>(n = 611)</i>	<i>(n = 100)</i>
Only female, n (%)	554 (78)	290 (80)	264 (75)	496 (81)	58 (58)
All other answers, n (%)	157 (22)	71 (20)	86 (25)	115 (19)	42 (42)

Supplementary Figure 1. Awareness and HPV



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

Supplementary Figure 2. Knowledge and HPV



**Note.** 302/1001 participants were excluded due to no vaccination booklet and 1/1001 due to missing answers.

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies.

		Page
	Reporting Item	Number
<b>Title and abstract</b>		
Title	<a href="#">#1a</a> Indicate the study's design with a commonly used term in the title or the abstract	1

1	Abstract	<a href="#">#1b</a>	Provide in the abstract an informative and balanced	2
2			summary of what was done and what was found	
3				
4				
5				
6	<b>Introduction</b>			
7				
8				
9	Background /	<a href="#">#2</a>	Explain the scientific background and rationale for the	5
10	rationale		investigation being reported	
11				
12				
13				
14	Objectives	<a href="#">#3</a>	State specific objectives, including any prespecified	5,6
15			hypotheses	
16				
17				
18				
19				
20	<b>Methods</b>			
21				
22				
23	Study design	<a href="#">#4</a>	Present key elements of study design early in the paper	7
24				
25				
26	Setting	<a href="#">#5</a>	Describe the setting, locations, and relevant dates, including	7,8
27			periods of recruitment, exposure, follow-up, and data	
28			collection	
29				
30				
31	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of	7-10
32			selection of participants.	
33				
34				
35				
36				
37				
38				
39				
40		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential	n/a
41			confounders, and effect modifiers. Give diagnostic criteria, if	
42			applicable	
43				
44				
45				
46				
47	Data sources /	<a href="#">#8</a>	For each variable of interest give sources of data and details	8-10
48	measurement		of methods of assessment (measurement). Describe	
49			comparability of assessment methods if there is more than	
50			one group. Give information separately for for exposed and	
51			unexposed groups if applicable.	
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1	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	n/a
2				
3				
4	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	7-11
5				
6				
7	Quantitative	<a href="#">#11</a>	Explain how quantitative variables were handled in the	7-9
8	variables		analyses. If applicable, describe which groupings were	
9			chosen, and why	
10				
11				
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14				
15	Statistical	<a href="#">#12a</a>	Describe all statistical methods, including those used to	8-10
16	methods		control for confounding	
17				
18				
19				
20	Statistical	<a href="#">#12b</a>	Describe any methods used to examine subgroups and	7-10
21	methods		interactions	
22				
23				
24				
25				
26	Statistical	<a href="#">#12c</a>	Explain how missing data were addressed	n/a
27	methods			
28				
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30				
31	Statistical	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of	n/a
32	methods		sampling strategy	
33				
34				
35				
36	Statistical	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
37	methods			
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41				
42	<b>Results</b>			
43				
44				
45	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg	11
46			numbers potentially eligible, examined for eligibility,	
47			confirmed eligible, included in the study, completing follow-	
48			up, and analysed. Give information separately for for	
49			exposed and unexposed groups if applicable.	
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57	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	11
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
2				
3				
4	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic,	11,27,28
5			clinical, social) and information on exposures and potential	
6			confounders. Give information separately for exposed and	
7			unexposed groups if applicable.	
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14	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each	11,12,16
15			variable of interest	
16				
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19	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures.	11-17
20			Give information separately for exposed and unexposed	
21			groups if applicable.	
22				
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27	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-	n/a
28			adjusted estimates and their precision (eg, 95% confidence	
29			interval). Make clear which confounders were adjusted for	
30			and why they were included	
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37	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were	11-17
38			categorized	
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42	Main results	<a href="#">#16c</a>	If relevant, consider translating estimates of relative risk into	n/a
43			absolute risk for a meaningful time period	
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48	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups	n/a
49			and interactions, and sensitivity analyses	
50				
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52				
53	<b>Discussion</b>			
54				
55				
56	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18,19
57				
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1	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources	19,20
2			of potential bias or imprecision. Discuss both direction and	
3			magnitude of any potential bias.	
4				
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9	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives,	18-20
10			limitations, multiplicity of analyses, results from similar	
11			studies, and other relevant evidence.	
12				
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15				
16	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study	18-20
17			results	
18				
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20				
21				
22	<b>Other Information</b>			
23				
24				
25	Funding	<a href="#">#22</a>	Give the source of funding and the role of the funders for the	21
26			present study and, if applicable, for the original study on	
27			which the present article is based	
28				
29				
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31				

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 34 made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)