Parental Attitudes About Sexually Transmitted Infection Vaccination for Their Adolescent Children

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Objectives: To evaluate parental attitudes about adolescent vaccination as a function of vaccine characteristics, including whether the vaccine prevented a sexually transmitted infection (STI), and to explore possible sociodemographic predictors of acceptability of STI vaccines.

Design: Participants were 278 parents who accompanied their children (69.1% female, aged 12-17 years) to appointments at medical clinics. By using computer-based questionnaires, parents rated 9 hypothetical vaccine scenarios, each of which was defined along 4 dimensions: mode of transmission (STI or non-STI), severity of infection (curable, chronic, or fatal), vaccine efficacy (50%, 70%, or 90%), and availability of behavioral methods for prevention (available or not available). Willingness by parents to vaccinate their adolescents under each vaccine scenario was assessed on a scale that ranged from 0 to 100. Conjoint analysis was used to determine the relative contribution of each dimension to the ratings.

Results: The mean vaccine scenario rating was 81.3. Sexually transmitted infection vaccines (mean, 81.3) were not rated differently than non-STI vaccines (mean, 80.0). Conjoint analysis indicated that severity of infection and vaccine efficacy had the strongest influence on ratings, followed by availability of behavioral prevention. Mode of transmission had a negligible effect on ratings. Child age (P=0.08) and sex (P=0.77), parent age (P=0.32) and education (P=0.34), insurance status (P=0.08), and data collection site (P=0.48) were not significantly associated with STI vaccine acceptability.

Conclusions: Parents were accepting of the idea of vaccinating their adolescent children against STIs. The most salient issues were severity of infection and vaccine efficacy, not sexual transmissibility. Parents also favored vaccines for infections that had no method of behavioral prevention available.


Several vaccines for the prevention of sexually transmitted infections (STIs) are in various stages of development. Included among these are preventive vaccines for Neisseria gonorrhoeae, Chlamydia trachomatis, herpes simplex virus type 2 (the principal cause of genital herpes), human papillomavirus (HPV), and human immunodeficiency virus. Based on cost-effectiveness analyses, the Institute of Medicine suggested that many STI vaccines are likely to result in substantial savings in health care costs. Ideally, an effective STI immunization program would target young adolescents and preadolescents, preferably before they become sexually active. Sexually transmitted infection immunization strategies targeted toward children and early adolescents will place much of the decision-making burden on parents. For instance, a study of hepatitis B vaccination of adolescents found that the best predictor of adolescent acceptance was the adolescent's belief that vaccination was regarded as important by the parent. This finding suggests that the success of these immunization programs will depend on a large extent on parental acceptance of STI immunization for adolescents and preadolescents. Furthermore, it has been suggested that pediatricians may be reluctant to recommend STI vaccination, an attitude that may be due, in part, to anticipation of negative parental reactions.

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Although several studies have examined determinants of acceptability of hypothetical STI vaccines, including individuals' health beliefs and attitudes about vaccine characteristics, relatively little has been published related to parental attitudes. One study examined attitudes of mothers in...
Mexico about the idea of HPV/cervical cancer vaccination for their adolescent daughters. The results indicated that more than 83% of the mothers would allow their daughters to have the vaccine.\textsuperscript{19} However, many of the participants may not have understood that HPV is an STI. A second qualitative study involved in-depth interviews performed with 34 parents from the United States.\textsuperscript{20} Content analysis indicated that most parents approved of the STI vaccines described (for gonorrhea, genital herpes, HPV, and human immunodeficiency virus). Parents opposed to vaccination with one or more of the vaccines generally perceived their children to be at less risk for infection. Another recently published study initially found somewhat lower endorsement by parents of an HPV vaccine (55%), but demonstrated an increase to 75% endorsement of vaccination after a brief educational intervention.\textsuperscript{21}

The primary objective of the present study was to evaluate how different characteristics associated with vaccination (eg, sexual transmissibility of the infection, severity of the infection, efficacy of the vaccine, and availability of behavioral methods of prevention) might influence parents' willingness to have their children vaccinated. An additional exploratory objective was to examine whether the age and sex of the child would influence parental acceptability of STI vaccination. It is possible that parents may be more willing to vaccinate younger children (because the potential onset of sexual activity is more distant and, therefore, less threatening) and girls (because girls and women typically experience greater adverse consequences due to an STI). Our primary research aim was to determine whether acceptability of STI vaccines would be influenced by the following characteristics: (1) the sexual transmissibility of the infection being prevented, (2) the severity of the infection, (3) the efficacy of the vaccine, and (4) whether behavioral methods are available for preventing infection.

### METHODS

#### SAMPLE AND STUDY DESIGN

Data were collected from parents or guardians who accompanied their children (aged 12-17 years) to medical appointments at urban primary care adolescent health clinics and community-based pediatric private practice settings. Parent participants were recruited from clinic waiting rooms by research assistants and oriented to the research project. Of the eligible potential participants approached (those able to understand English who had a child aged 12-17 years), 62.8% agreed to participate. Of the 37.2% who declined participation, 67.4% declined because of time constraints. Once the questionnaire was started, all participants adequately completed the instrument.

Data were collected via anonymous, audio, computer-assisted, self-administered interviews. Notebook computers with touch-sensitive screens were used, allowing respondents to answer questions by touching the screen with a plastic stylus. The study was approved by the university's Institutional Review Board, and written informed consent was obtained from all participants. Construction of the content of the audio, computer-assisted, self-administered interviews was based on prior STI vaccine research\textsuperscript{6,13,17,22} and preliminary semistructured interviews performed with parents.\textsuperscript{20} Before fielding the audio, computer-assisted, self-administered interviews, 20 pilot questionnaires were administered in paper-and-pencil format with debriefing interviews to ensure that questions were understood and that relevant issues were addressed.

#### MEASURES

**Background Information**

Background variables assessed included parent and child age and sex, clinic site (urban adolescent health clinic or private practice), insurance status, and parental education.

**Vaccine Acceptability**

To assess vaccine acceptability, participants responded to 9 items. The items were presented in random order by the computer to eliminate the possible influence of ordering effects. Each item described a hypothetical vaccine scenario uniquely defined along the following 4 dimensions: mode of transmission (STI or non-STI), severity of infection (curable with antibiotics, chronic and incurable, or usually fatal), vaccine efficacy (50%, 70%, or 90%), and availability of behavioral methods of prevention (yes or no).

For example, one scenario read as follows: “This vaccine keeps people from getting a disease that can be sexually transmitted. The disease can be cured with antibiotics. The vaccine works for 9 out of 10 people who get it. Using condoms will keep a person from getting the disease.” The table provides descriptions of the 9 vaccine scenarios. Parents were asked, “If this vaccine was available today and you had the time, would you let your child get vaccinated?” An 11-point response format was provided, ranging from 0 (“I would never let my child get this

### Table. Vaccine Scenarios Presented

<table>
<thead>
<tr>
<th>Sexually Transmitted Infection</th>
<th>Severity of Infection</th>
<th>Efficacy, %</th>
<th>Behavioral Prevention Available</th>
<th>Score, Mean (SD)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Chronic</td>
<td>50</td>
<td>Yes</td>
<td>74.9 (27.6)</td>
</tr>
<tr>
<td>Yes</td>
<td>Curable</td>
<td>50</td>
<td>No</td>
<td>75.7 (26.6)</td>
</tr>
<tr>
<td>No</td>
<td>Curable</td>
<td>70</td>
<td>Yes</td>
<td>76.4 (27.7)</td>
</tr>
<tr>
<td>Yes</td>
<td>Curable</td>
<td>90</td>
<td>Yes</td>
<td>80.9 (25.9)</td>
</tr>
<tr>
<td>Yes</td>
<td>Fatal</td>
<td>50</td>
<td>Yes</td>
<td>81.2 (26.0)</td>
</tr>
<tr>
<td>Yes</td>
<td>Chronic</td>
<td>70</td>
<td>No</td>
<td>82.0 (24.3)</td>
</tr>
<tr>
<td>Yes</td>
<td>Chronic</td>
<td>90</td>
<td>Yes</td>
<td>83.8 (22.8)</td>
</tr>
<tr>
<td>Yes</td>
<td>Fatal</td>
<td>70</td>
<td>Yes</td>
<td>84.4 (23.3)</td>
</tr>
<tr>
<td>No</td>
<td>Fatal</td>
<td>90</td>
<td>No</td>
<td>88.6 (20.2)</td>
</tr>
</tbody>
</table>

*Vaccine scenarios were rated on a scale of 0 to 100, in increments of 10, reflecting the probability of parental acceptance of vaccination for their child.
Sexually transmitted infection vaccine acceptability in general was evaluated by creating a scale score based on the mean value across 6 of the 9 items addressing vaccines preventing STIs (coefficient $= .92$). The acceptability of non-STI vaccines was assessed by creating a scale score based on the mean value across the 3 remaining items (coefficient $= .77$). The unequal number of STI vs non-STI vaccines was an unavoidable result of the fractional factorial design generated for the conjoint analysis method (see the “Data Analysis” subsection of this section for more information) and did not seem to bias the analysis.

**DATA ANALYSIS**

A paired $t$ test was used to compare the mean score for the 6 STI vaccine scenarios with the mean score for the 3 non-STI vaccine scenarios. The associations of continuous background variables (parent and child ages) to the 6-item STI vaccine acceptability measure were evaluated with Pearson product moment correlations. A 1-way analysis of variance was used to evaluate the association of each categorical variable (child sex, data collection location, insurance status, and parental education) to STI vaccine acceptability.

A full-profile ratings-based conjoint analysis was used to evaluate the effects of vaccine scenario dimensions on parental willingness to allow childhood vaccination. This regression-based analytic technique is frequently used in marketing research to evaluate how the characteristics of a product influence the product’s acceptability. During the past several years, conjoint analytic techniques have increasingly been applied to the study of health care preferences, including preferences related to hypothetical human immunodeficiency virus vaccines. As previously noted, in this study there were 4 dimensions evaluated (sexual transmissibility of infection, severity of infection, vaccine efficacy, and availability of behavioral prevention), each with either 2 or 3 attribute levels (eg, sexual transmissibility had 2 levels, whereas vaccine efficacy had 3 levels). Presenting every possible combination of characteristics (ie, a full factorial design) would have involved asking participants to rate 36 separate vaccine scenarios, a process that would be repetituous and time-consuming. Therefore, we chose to use a fractional factorial design with a representative subset of 9 scenarios, which was constructed using a procedure (Conjoint) from a commercially available software program (SPSS). The use of a fractional factorial design makes the rating task more feasible, but limits the analysis to the main effects of each dimension.

Conjoint analysis of the 9 vaccine items resulted in the development of a descriptive model, which provided information on each subject’s relative preferences with respect to attributes within each dimension (eg, preference for an STI vaccine vs a non-STI vaccine within the sexual transmissibility dimension). In conjoint analysis, these relative preferences are called part-worth utilities. The more that respondents preferentially distinguish among attributes, the wider the range in part-worth utilities. For example, if an STI vaccine was strongly preferred relative to a non-STI vaccine, the STI attribute would have a high positive part-worth utility value and the non-STI attribute would have an equally strong, but negative, part-worth utility value. For each dimension, the sum of the part-worth utilities is 0. The extent to which each dimension contributed to the vaccine ratings was measured by importance scores, which reflect the relative ranges of the part-worth utilities across the 4 dimensions. In this approach to conjoint analysis, the sum of importance scores across dimensions always equals 100.

The 278 parents who participated in this study were 92.8% female and ranged in age from 24 to 66 years (mean, 40.9 years; SD, 7.2 years). Their children were 69.1% female and ranged in age from 12 to 17 years (mean, 14.4 years; SD, 1.5 years). Of the children, 66.5% were recruited from urban adolescent medicine clinics and 33.5% from private practice settings. Of the parents, 56.1% described themselves as white, whereas 39.6% described themselves as African American. Less than 2% reported Hispanic ethnicity. In terms of parental education level, the participants were fairly evenly divided, with 26.3% reporting less than high school education, 25.2% reporting a high school degree, 30.6% indicating having received some college education, and 18.0% reporting a 4-year college degree. Of the parents, 65.7% reported that they either received Medicaid or were self-pay for medical care, whereas the remaining 34.3% reported having private insurance.

Across the 9 vaccine scenarios, overall willingness of parents to accept vaccination for their adolescent children ranged from 0 to 100 (mean, 81.3; SD, 21.1). The least acceptable vaccine scenario (“This vaccine keeps people from getting a disease that is not sexually transmitted. The disease cannot be cured, but people don’t die from it. The vaccine works for 5 of 10 people who get it. Washing hands several times a day will keep a person from getting the disease.”) received a mean score of 74.9 (SD, 27.6), whereas the most acceptable vaccine scenario (“This vaccine keeps people from getting a disease that is not sexually transmitted. People die from this disease in most cases. The vaccine works for 9 of 10 people who get it. Washing hands several times a day will not keep a person from getting the disease.”) received a mean score of 88.6 (SD, 20.2). The Table lists the mean scores and standard deviations for all 9 vaccine scenarios. A paired $t$ test indicated that the mean score for the 6 STI vaccine scenarios (score, 81.3) was higher, although not significantly so, compared with the mean score for the 3 non-STI vaccine scenarios (score, 80.0) ($t=1.9, P=.06$). Parent and child ages were not significantly correlated with STI vaccine acceptability ($r=.06 [P=.32]$ and $r=.11 [P=.08]$, respectively). Sexually transmitted infection vaccine acceptability also was not significantly associated with child sex ($F=0.09, P=.77, \eta^2<0.001$), data collection location ($F=0.49, P=.48, \eta^2=0.002$), insurance status ($F=3.2, P=.08, \eta^2=0.011$), or parent education ($F=1.13, P=.34, \eta^2=0.012$).

Eighty-one parents (29.1%) gave each of the 9 conjoint vaccine scenarios the same score. Of these 81 respondents, 2 gave ratings of 0 across all vaccines, indicating that they found none of the vaccines acceptable. Five parents gave ratings of 50 to all vaccines, indicating that they found all of the vaccines to be acceptable for their children. By using analysis of variance and logistic regression, we examined whether these high acceptors of vaccination ($n=74$) differed from the remaining participants ($n=204$) in terms of the sociodemographic measures previously de-
scribed. Parent age was not significantly different for high compared with low acceptors (F = 0.59, P = .44, \(\eta^2 = 0.002\)). The high acceptor group had children who were significantly, but marginally, older (mean age, 14.7 years) than the low acceptor group (mean age, 14.2 years) (F = 4.55, \(P = .03\), \(\eta^2 = 0.016\)). Child sex was not associated with acceptor group (odds ratio [OR], 1.08; 95% confidence interval [CI], 0.60-1.93). However, parents who were recruited from the urban clinics were more likely to be high acceptors than those who were recruited from the private practice settings (OR, 2.40; 95% CI, 1.30-9.20). Similarly, parents reporting self-pay for medical care or Medicaid insurance were more likely to be high acceptors than those with private insurance (OR, 2.51; 95% CI, 1.24-4.70). Finally, parents who had not graduated from high school (OR, 4.30; 95% CI, 1.62-11.43) and parents with a high school diploma (OR, 3.36; 95% CI, 1.25-9.06) were more likely to be high acceptors than those who had graduated from college.

Given that 81 participants demonstrated no variability in preferences across the vaccine scenarios, by necessity they were eliminated from the conjoint analysis, which is designed to identify determinants of preferences. The overall conjoint model, therefore, was based on the remaining 197 respondents.

The conjoint analysis resulted in the following findings. There was little difference in acceptability to parents of an STI compared with a non-STI vaccine. However, parents expressed a clear and strong preference for a vaccine that prevented a potentially fatal infection compared with vaccines that prevented a chronic or curable infection. In addition, there was a relatively strong preference for a 90% efficacious vaccine vs 70% and 50% efficacious vaccines. Finally, parents expressed a mild relative preference for a vaccine that prevented an infection for which there was no behavioral prevention available compared with one for which a behavioral prevention strategy existed. The Figure shows the part-worth utility values across the dimensions. As previously noted, conjoint analysis importance scores are derived from the range of part-worth utilities and reflect the extent to which each dimension contributed to parental ratings of vaccine scenarios. Vaccine efficacy was most influential in vaccine ratings (importance score, 44.5), followed by severity of infection (importance score, 31.4) and availability of behavioral prevention (importance score, 17.7). Sexual transmissibility of the infection had negligible influence on parental ratings (importance score, 6.4). The overall conjoint analysis model demonstrated an excellent fit with the data, reflected in a Pearson product moment \(r = 0.99\).

Although sexual transmissibility was not an important issue for the parents overall, it was an important factor in ratings for a subset of the participants. By using a part-worth utility cutoff of 7.0 or −7.0 (indicating moderately strong preferences in the context of this study), 31 parents (11.2% of the total sample) indicated a relatively strong preference for an STI vaccine (part-worth utilities, >7.0), whereas 16 parents (5.8% of the sample) indicated relatively strong opposition to an STI vaccine (part-worth utilities, <−7.0). For these 47 participants, sexual transmissibility as a dimension was quite influential in vaccine ratings, with importance scores ranging from 12.0 to 55.6 (mean, 29.2; SD, 10.4).

**COMMENT**

This study evaluates factors related to the willingness of parents to have their adolescent children vaccinated. We focused this particular study on the following characteristics of the vaccination situation: sexual transmissibility of the infection, severity of the infection, vaccine efficacy, and availability of behavioral prevention methods. We were also interested in examining possible demographic predictors of STI vaccine acceptability. A primary finding of this study was the willingness of most parents to consider STI vaccination for their adolescent children, regardless of parent age, child age, child sex, data collection location, insurance status, or parent education. More than one quarter of the sample indicated 100% willingness to vaccinate their children with any of the 9 vaccines described. These high acceptors were more likely to be recruited from urban clinics, were less likely to have private insurance, and were more likely to have a high school education or less. Our results are generally consistent with a recent study that involved a random digit–dialing survey of 315 parents of children younger than 18 years (Nicole Liddon, PhD, written communication, 1998). In this study, 69% of parents indicated that they would have their child vaccinated against human herpesvirus 2.

The lack of a significant correlation of STI vaccine acceptability with child age in the present study indicates that these parents did not differentiate the need for STI vaccination based on the age of their children. This finding, in turn, suggests that parents may not base decisions about vaccination on the relative temporal proximity of their children to the onset of sexual activity. However, given that the adolescents in this study were 12 to 17 years of age, it will be important in future research to extend the age range downward to fully explore this issue.

It has been suggested that pediatricians and other adolescent health care providers (eg, family practice physicians and nurses) may be reluctant to recommend STI vaccines to parents of adolescents, perhaps in part be-
cause of concerns about how parents might react to the recommendation. The high acceptability ratings reported by most parents in this study suggest that most parents would not react negatively to the suggestion that their children be immunized against STIs. As might be expected, vaccine efficacy and severity of infection substantially influenced parents’ ratings of vaccine scenarios. This result is consistent with prior STI and human immunodeficiency virus vaccination research studies with adolescents, college students, and other adults, which have found that efficacy of immunization and severity of infection are important determinants of acceptability. \(^{6,17,18,20,30}\) We also found that parents were more likely to endorse vaccines that prevented infections for which no behavioral method of prevention was available. A preliminary qualitative study also found that some parents talked about how their attitudes about STI vaccination were influenced to some extent by the degree to which a person could prevent infection through behavior (eg, abstinence or condom use). \(^{20}\) As new STI vaccines become available, it may be important to emphasize to parents that behavior prevention methods do not always work, that vaccination would not obviate the need for behavioral prevention of STIs, and that, therefore, vaccination against STIs would be a way of providing added protection against infection.

Our results did not support the notion that parents would be more reluctant to have their children vaccinated with an STI vaccine compared with a non-STI vaccine. This result is relatively consistent with preliminary research, which indicated that most parents are focused on protecting their children’s health and not so concerned about the source of infection. \(^{20}\) Clearly, the severity of disease and the efficacy of the vaccine were much more salient dimensions to these parents than was sexual transmissibility. There was, however, a small subset of parents (5.8%) who expressed a relatively strong antipathy toward an STI vaccine. In future studies, it will be important to focus more specifically on this group of parents to better understand the source of their reluctance to consider STI vaccination for their children.

This study has several limitations, suggesting that the results should be interpreted with some caution. First, the sample of parents was a nonrandom clinic-based convenience sample, indicating that the results cannot be generalized to all parents. Furthermore, given their presence at their adolescents’ health care visits, these parents may have represented a selected sample with a particularly positive view of immunization. However, the sample is a relevant one, in that STI vaccines will most likely be administered in clinical settings and will likely require parental permission for a period of time after their introduction. Nevertheless, in future research studies, it will be important to examine a more representative sample of parents to more fully understand determinants of support for and opposition to STI vaccination. A second limitation is that the parents’ responses to the hypothetical vaccine scenarios are not likely to be perfectly predictive of actual decision making. In addition, some of our findings (eg, that parents with less education, those with Medicaid insurance, and those attending an urban clinic were more likely to be high acceptors) are in contrast to reports in the literature that indicate that these same factors are associated with underimmunization of young children. \(^{31,32}\) This discrepancy may be a reflection of some of the limitations associated with having parents respond to hypothetical vaccines. However, the use of hypothetical scenarios is an unavoidable part of any research focused on intention to try products not yet available. Furthermore, marketing and health behavior research indicates that intention to perform a behavior is a reasonable, if imperfect, predictor of performing the behavior. \(^{33,34}\) Finally, this study focused on vaccine scenario characteristics and on sociodemographic factors. In future studies of STI vaccine acceptability, other issues will need to be examined, including but not limited to parental health beliefs, religious beliefs relevant to vaccination and STIs, behavioral risk factors, and relevant parental history and experiences (eg, history of STI in the parent).

In summary, severity of infection, vaccine efficacy, and, to a lesser extent, a lack of available behavioral prevention were associated with greater willingness of parents to accept vaccination for their adolescent children. Sexual transmissibility of the targeted infection was not an important issue for most parents, but was a concern for a small subset. In addition, child age was not significantly correlated with STI vaccine acceptability. These results suggest that there is not substantial opposition by parents to the idea of vaccinating their adolescent children against STIs. If these findings are replicated in other samples of parents, it will be important to inform pediatricians and other physicians and nurses that most parents will be likely to accept recommendations regarding STI vaccination.

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