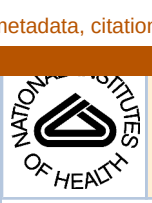

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Vaginal Microbicide Preferences Among Midwestern Urban Adolescent Women

Amanda E. Tanner, PhD, MPH[1], **Jennifer M. Katzenstein, MS**[2], **Gregory D. Zimet, PhD**[1], **Dena S. Cox, PhD**[3], **Anthony D. Cox, PhD**[3], and **J. Dennis Fortenberry, MD, MS**[1]

1*Indiana University School of Medicine, Section of Adolescent Medicine, Indianapolis, IN*

2*Indiana University Purdue University Indianapolis, Department of Psychology, Indianapolis, IN*

3*Indiana University Purdue University Indianapolis, Kelley School of Business, Indianapolis, IN*

Abstract

Purpose—The purpose of this study was to assess adolescent women's preferences for specific microbicide characteristics including: pregnancy prevention, timing of application, potential for side effects, and whether it targeted Human Immunodeficiency Virus (HIV) or other sexually transmitted infections (STI). Potential differences in microbicide preferences by adolescent age group and behavioral patterns, including engaging in sexual intercourse and use of hormonal contraception, were examined, as it was hypothesized that as adolescents progress into adulthood and gain sexual experience their preferences in microbicide characteristics may shift.

Method—Adolescent and young women (N = 405, 56.0% African American; 24.0% Euro-American) between the ages of 14 and 20 (M = 17.0, SD = 1.8) were recruited from urban community-based clinics. Video-Audio Computer-Assisted Self-Interviews (VACASI) were conducted with the young women during which they were asked about their preferences regarding the characteristics of hypothetical vaginal microbicides. Conjoint analysis was utilized to determine adolescent women's relative preferences for each microbicide characteristic and intent-to-purchase microbicides based upon a combination of the selected properties.

Results—Overall, the results suggest adolescent and young women had an ordered preference for a microbicide with (1) no side effects, (2) pregnancy prevention, (3) post-coital application, and (4) protection against HIV. Age and behavioral group conjoint analyses resulted in the same pattern of preferences as those reported for the entire group. However, women having sex and not using hormonal contraception had a stronger preference for post-coital application.

Conclusion—The findings suggest that young women's ratings of microbicides were sensitive to characteristics such as side effects, pregnancy prevention, and timing of application. The conjoint

Corresponding Author, Amanda E. Tanner, PhD, MPH, Section of Adolescent Medicine, Indiana University School of Medicine, 410 W. 10th Street, Room 1001, Indianapolis IN 46202, Phone: 317 274-8812, Fax: 317 274-0133, Email: aetanner@indiana.edu.

Author contribution

Amanda E. Tanner—data collection, data analysis, manuscript preparation
Jennifer M. Katzenstein—data analysis, manuscript preparation
Gregory D. Zimet—study conceptualization, funding, data analysis, manuscript preparation
Dena S. Cox—study conceptualization, data analysis
Anthony D. Cox—study conceptualization, data analysis
J. Dennis Fortenberry—study conceptualization, funding, manuscript preparation

analysis approach is useful in understanding microbicide preferences and should be utilized with other populations to assess preferences for specific microbicide characteristics.

Keywords

Microbicides; Adolescent women; Sexuality; Conjoint analysis

Introduction

The search for a woman-initiated prevention method has led to focus on topical microbicides for STI/HIV prevention. Microbicides are substances that may substantially reduce transmission of STI when applied in the vagina or rectum [1]. Some microbicides may also prevent pregnancy, although not all microbicides will be contraceptive [2]. Microbicides are currently not commercially available; products are in various phases of clinical trials [1]. Most microbicides under development are coitus-dependent, requiring women to recognize and prepare for sexual situations and be willing to use a product that requires some comfort with touching their genitals [3]. The process of inserting a microbicide into the vagina may be challenging as the dialogue around young women's sexuality and their bodies is often lacking [4]. Acceptability research, therefore, remains crucial in order to anticipate and prospectively address the kinds of obstacles previously associated with other female-initiated products, such as the female condom [5,6]. For instance, while women enjoyed having more control in using the female condom, they often did not like the size and discomfort associated with use or the inability to use it covertly [6].

Extant microbicide acceptability research with young women has indicated that contraceptive and disease prevention properties, timing of use, and associated side effects are important characteristics [7]. The findings suggest that young women generally prefer both pregnancy and disease prevention in a single product and insertion with an applicator up to eight hours in advance [8]. In addition, there is a preference for lubricating products [9,10] with low amounts of messiness [9] and leakage [8]. Previous research also indicates that relevant potential side effects may impact microbicide use, including yeast infections, vaginal itching, and allergic reactions [7,11]. Furthermore, access was an important gauge of acceptability in a group of adolescent women. Women indicated that microbicides should be promoted through "adolescent-specific and girl-specific venues," including women's magazines [7]. There was also a reported desire for microbicides that would be small enough to carry in their pocket, bra, or within cell phone or palm pilot cases, and should be distributed through schools and sexuality education classes [7]. Most young women preferred over-the-counter availability of microbicides, yet stated they would be embarrassed if purchasing the product in the presence of others [7,8].

Thus far, microbicide acceptability research with adolescents has been conducted primarily with older adolescents, using individual interview and focus group methodologies [7,9,11–16]. These qualitative methodologies allow for an in-depth assessment of individual as well as relational and age-related issues that may influence microbicide use [13,17]. However, social desirability is often a concern when studying stigmatized or socially sensitive issues associated with sexuality [18,19]. Past research has shown that using a Video-Audio Computer-Assisted Self-Interview (VACASI) format (participants privately responding to questions on a computer) for presenting survey questions alleviates the tendency for individuals to present themselves positively and answer questions in a socially desirable fashion [20]. In addition, women and adolescents report sensitive behaviors more frequently when questions are asked using computer interviewing techniques than when participating in a face-to-face interview [20–22]. Existing microbicide acceptability research with adolescents also often lacks detailed attention to the multiple dimensions that must be considered simultaneously in a decision to

try a product such as a microbicide. The addition of quantitative biopsychosocial studies addressing these issues thus complements the existing qualitative microbicide acceptability research [8,23–24].

The purpose of this study was to quantitatively assess, using full profile ratings based conjoint analysis, preferences for specific microbicide characteristics among a young, urban population of women. Building on existing literature we chose to assess young women's preferences for pregnancy and STI (including HIV) prevention as well as timing of application and side effect potential. It was hypothesized that as women progress through the adolescent years, their relative preferences for specific microbicide characteristics may change as a function of their age and sexual experience.

Methods

Study participants

Participants were 405 adolescent and young women between the ages of 14 and 20 (M = 17, SD = 1.8) recruited from community-based urban health clinics in the Midwestern United States in an area with relatively low rates of HIV [25]. Informed consent was received from all participants. For women 18 years old and over consent was received directly and for those younger than 18 years of age parental permission as well as adolescent consent were received. Before obtaining consent, the research assistant explained to the young woman (and her parent) the details, procedure, and duration of the study. See Table 1 for participant demographics.

Development of Study Methodology

VACASI was used in the study to increase the validity of the information received from the adolescent women. The VACASI content for this study was developed from a pilot study designed to elicit a range of issues relevant to the examination of adolescents' acceptability of, and preference, for microbicides. Focus groups, individual interviews, and dyad interviews were conducted, transcribed verbatim, and the results analyzed to determine the characteristics of microbicides most often mentioned and about which adolescents expressed the greatest concern. Individual interviews and a card sort methodology were used to additionally develop ranked preferences for microbicide target (HIV versus other STI), timing of application (before or after sex), contraceptive properties, and types of side effects [26]. Based on these pilot data, a VACASI script was developed, further pilot tested, and finalized for use in the current study.

Study procedure

After informed consent was received, the young women were given a computer and headphones in a private exam room to begin the questionnaire. The VACASI began with participants being asked to choose one of four possible "guides" whose face and voice were used throughout the VACASI. Guides were young women (approximately 18 – 20 years old) who were professional actors of varied ethnic appearance and voice. The guides were used to increase young women's level of comfort with the interview [27]. Following the choice of a guide, more information was given about the microbicide and a product sample was shown. The participant was then asked multiple demographic and sexual behaviors questions and presented with microbicide vignettes that asked her to rate the likelihood of buying each microbicide. The self-interviews were completed in English and lasted 25 – 45 minutes. Participants received $20 compensation for the time and effort involved in completing the questionnaire. The protocols for the entire project were approved by the University's Institutional Review Board.

Study measures

Background—Demographic information was collected from each participant including: age, race, ethnicity, and education. Participants also answered questions regarding their sexual behaviors (e.g., Has a partner ever put his penis in your vagina?) and contraceptive use (e.g., What kinds of birth control have you used in the past month?).

Microbicide preferences—Eight microbicide formulas were uniquely described along four specific dimensions, with multiple attributes within each dimension, to assess participants' relative preference for each individual property. Table 2 summarizes the microbicide formulas. The first dimension, *contraception*, contained two attributes—whether the microbicide would prevent pregnancy or not. The second dimension, *timing*, was related to the timing of microbicide application in relation to coitus (attributes—1 hour pre-coital, 15 minutes pre-coital, or 10 minutes post-coital application). The third dimension, *target*, was defined in terms of what infections were prevented by the microbicide (attributes—HIV only or other STI but not HIV). The final dimension, *side effects*, varied with respect to side effects (attributes—burning and itching in 10% of women or no side effects at all). The product profiles were presented in random sequence across participants and women were asked to rate their intent to purchase each microbicide formula.

Intent to purchase microbicides—Intent to purchase microbicides was measured by asking participants to rate each of eight microbicides using a 7-point likelihood scale, ranging from "extremely unlikely to buy" to "extremely likely to buy." As we were uncertain what the cost of microbicides would be, we asked respondents to assume that the cost of microbicides would be approximately the same as condoms. Recent estimates, however, suggest that microbicides will cost approximately $1 per application [28].

Data Analysis

Data management and analysis were performed using SPSS 15.0 [29]. Descriptive statistics were conducted to assess the demographic variables. The quantitative marketing research technique, conjoint analysis, was employed in order to assess preference for specific microbicide characteristics and formulas among young women. Conjoint analytic techniques are commonly used to evaluate how product characteristics influence the product acceptability, often while the product is still in development [30]. Conjoint analysis allows for the assessment of the relative preference women have for microbicide characteristics (e.g., contraceptive properties, timing of application).

The full profile ratings based conjoint analysis technique used in this study incorporates a fractional factorial design and is a regression based analytic approach to examine how different product dimensions influence intent to purchase [31]. Conjoint analysis allows for multiple product characteristics to be simultaneously assessed with a relatively small number of items that minimizes the burden to the respondent (i.e., a fractional factorial design) [8,32]. The conjoint analysis technique has been applied in several health care preference studies [33–37] and one other microbicide acceptability study, with considerable differences in terms of sample demographics and product characteristics [8].

Using the aforementioned dimensions (*contraception*, *timing*, *target*, and *side effects*), 24 microbicide formulas would have to be rated to assess every combination of attributes. However, a fractional factorial design allows for the examination of representative sub-sample of eight microbicide formulas, thus reducing respondent burden (see Table 2 for microbicide formulations). By having the respondents evaluate each of the eight product constructions, we were able to estimate the effect of each product characteristic on purchase intentions. A

limitation of the fractional factorial design is that only the main effects of each dimension can be assessed, as only a relatively small subset of all possible combinations are presented.

Full profile rating based conjoint analysis results in part-worth utilities and importance scores [8,32]. Part-worth utilities reflect the relative value placed on the specific attributes within each dimension, for example contraceptive compared to non-contraceptive. A negatively rated part-worth utility indicates a *relative* antipathy for a particular attribute whereas a positively rated part-worth utility indicates a *relative* preference for an attribute. This approach to conjoint analysis also provides importance scores, which summed across all dimensions equal 100. The higher the importance score for a given dimension, the greater the influence on microbicide ratings. Part-worth utilities summed within a given dimension equal zero with a greater range in utilities translating into a higher importance score for a given dimension.

Results

Descriptive statistics: Overall sample

The women (N = 405) were between the ages of 14 and 20 years, with a mean age of 17 (SD = 1.8). Of these women, 56.0% (n = 227) were African American, 24.0% (n = 97) were Euro-American, 5.4% (n = 22) were Latina, and the remainder identified as other or mixed ethnic and racial backgrounds. On average, women had completed 10.3 years of education (SD = 1.6), with 23.5% (n = 94) having completed high school and 6.8% (n = 27) having completed some college. Of the women, 67.7% (n = 275) had engaged in sexual intercourse, and 52.8% (n = 214) were currently using a hormonal contraceptive. Participant characteristics for the entire sample and the groups divided by age category are summarized in Table 1.

Descriptive statistics: Age & behavioral group

As we were interested in developmental changes, women were divided by age and sexual and contraceptive experiences into groups. This allowed between group comparisons with respect to the microbicide preference profiles provided by the conjoint analyses. The three age categories were defined as: 14 and 15 year olds (n = 100, 24.9%), 16 and 17 year olds (n = 124, 30.6%), and women age 18 to 20 (n = 181, 44.7%). Conceptually, these age groups (i.e., 14 & 15 year olds; 16 & 17 year olds; and those 18 and older) represent middle adolescence, late adolescence, and emerging adulthood. The women 18 years of age and older, as legal adults, differ in sexual rights from the rest of the sample. Differences existed among age groups in terms of sexual behaviors and contraceptive experience. Among 14–15 year olds, less than half had engaged in sexual intercourse (43.9%, n = 43) or using hormonal contraception (34.1%, n = 31). The majority of the age 18 and older women had engaged in sexual intercourse (86.3%, n = 151) and were using hormonal contraception (71.2%, n = 126). In contrast, less than half of 16–17 year olds were using hormonal contraception (47.9%, n = 57) although most reported ever having sexual intercourse (65.9%, n = 81). Therefore, the behavioral groups consisted of women who had never had intercourse (n = 121, 29.9%), were engaging in intercourse and not using hormonal contraception (n = 89, 22.0%), and were engaging in intercourse and using hormonal contraception (n = 181, 44.7%). Group characteristics are summarized in Table 1.

Microbicide intent-to-purchase

On the 7-point response scale (ranging from 1 = extremely unlikely to by to 7 = extremely likely to buy), the mean intent-to-purchase ratings ranged from 3.38 (SD = 2.04) to 5.35 (SD = 1.76) across the eight different microbicide formulas. The microbicide with the highest intention rating had these properties: contraceptive, application 10 minutes post-coitus, protecting against HIV only, and not having side effects. The microbicide with the lowest

intention to purchase had the following characteristics: non-contraceptive, application 1hour pre-coitus, protecting against HIV only, and having side effects.

Microbicide preference: Entire sample

Relative attribute preferences as determined by conjoint analysis could only be calculated from subject data in which there was variability across the eight microbicides. Twenty-two women (5.4% of the total sample) rated all microbicides at the same level and were therefore not included in the conjoint analysis results. The part-worth utility (PWU) results (Figure 1) for the remaining 94.6% of the sample indicated strong relative preferences for contraceptive properties (PWU, 0.37) and for no side effects (PWU, 0.55). In addition, there was a moderate preference for 10-minute post-coital application (PWU, 0.14), and a slight preference for a microbicide that targets other STI, but not HIV (PWU, 0.04). In contrast, the following microbicide attributes were viewed as relatively less preferable: no contraceptive action (PWU, −0.37), side effects (PWU, −0.55), applied one hour before coitus (PWU, −0.14), and targeted HIV only (PWU, −0.04).

Reflecting the PWU results, the majority of women indicated a relative preference for contraception (n = 249; PWU = .13 to 2.38). However, a reasonably large minority of respondents expressed a relative preference for non-contraception (n = 74; PWU = 0.13 to 2.25), with the remaining women not distinguishing between contraception and non-contraception. Also, although most women expressed a relatively negative response to side-effects (n = 292; PWU = −0.13 to −.2.50), for 43 women, side effects were viewed as relatively unimportant as reflected in low, positive PWU (ranging from 0.13 to 0.88). With respect to timing, 161 indicated a preference for post-coital application (PWU = 0.08 to 3.50), 92 preferred 15 minutes pre-coitus (PWU = 0.25 – 2.83), and 89 expressed a preference for one hour pre-coitus (PWU = 0.17 – 2.67). Respondents were relatively equally divided in preference for either HIV prevention (n = 152; PWU = 0.13 to 2.50) or prevention of other STDs (n = 168; PWU = 0.13 to 2.25).

Side effects most strongly influenced ratings with an importance score of 50.1 followed by contraceptive properties with an importance score of 33.6 and timing with an importance score of 13.0. The microbicide target did not substantially influence ratings (importance score, 3.4). Importance scores, in total, add up to 100, therefore, side effects and contraceptive effect were the strongest influences on young women's microbicide preferences.

Microbicide preference: Age and behavioral groups

We calculated conjoint analysis results separately on the basis of both age group and sexual and contraceptive behavior experiences. Results indicated that all of the age and behavioral groups had the same pattern of preferences for the combination of microbicide characteristics as the overall group (i.e., not having side effects followed by having contraceptive properties). In order to evaluate differences that may exist within the behavioral groups we conducted a series of analysis of variance (ANOVA) tests with sexual and contraceptive behavior group as the independent variable and the PWU associated with different microbicide attributes (i.e., no side effects) as the dependent variables. After the application of the Dunnet's post hoc test, results indicated one significant ANOVA [$F(2,342) = 3.6$, $p < .05$] suggesting that women having sex and using condoms had a stronger preference for post-coital application compared to those women currently having sex and using hormonal contraception.

Discussion

This study examined adolescent and young women's preference for specific microbicide characteristics utilizing full profile ratings based conjoint analysis. Similar to existing research

[7,11], young women's preferences were sensitive to side effects, contraceptive properties, and timing of application. Specifically, adolescent women reported an ordered preference for a microbicide with no side effects, having contraceptive properties, applied 10 minutes post-coitally, and protecting against STI rather than HIV.

Young women's preferences were most influenced by side effects and contraceptive properties. Lack of side effects was the most preferential microbicide characteristic for the overall sample. It is interesting that young women would be primarily concerned with side effects given that the option was that there would either be no side effects or side effects in 10% of women. This may reflect young women's experiences with negative side effects of existing hormonal contraceptive methods [10] or be a result of young women's assumption that they would be the ones to have side effects. The concern related to side effects for these women suggests it will be essential for health care providers to discuss the likelihood of side effects with young women so they are not surprised and will continue to use microbicides for protection. Contraceptive properties were the second most favored characteristic for the young women, including for women who were currently using hormonal contraception. These results may reflect the saliency of pregnancy in this population of young women and will be an important characteristic to discuss with women as early generation microbicides may not be contraceptive [2].

In contrast to other research that suggests adolescent women have a preference for microbicide application up to 8 hours in advance [8], young women in the current study preferred a microbicide that was applied 10 minutes post-coitus, or 15 minutes pre-coitus, compared to one applied 1 hour before intercourse. Women's relative preference for the 10 minutes post-coital application could be explained by their desire to separate microbicide use from intercourse. This result may also be reflective of the appeal of the possibility of using microbicides surreptitiously due to the difficulties often associated with sexual communication for young women and the ability to avoid direct discussions related to microbicide application that is after coitus [9,15]. Similarly, the antipathy toward the 1 hour pre-coital application is likely explained by the often unplanned nature of sexual interactions among adolescents [10]. In addition, while the lubricating effects of a pre-coital microbicide may be attractive to some young women, post-coital application was viewed in a more positive light, this result may be due to lack of knowledge related to the potential of lubrication to enhance sexual comfort. The lubricating potential of microbicides may be an attractive characteristic, especially for combining use with condoms to increase comfort for individuals who choose to use condoms.

As a group, adolescent and young women were slightly more accepting of a vaginal microbicide that prevented STI other than HIV as compared to a vaginal microbicide that protected against HIV only. This preference is interesting, as HIV has far fewer treatments than those available to treat and cure other STI [38]. However, the relative disinterest in HIV prevention may reflect the very low prevalence of HIV and the saliency of other STI for the study population [35, 39]. HIV prevalence will likely have implications for microbicide marketing based on geography, where highlighting potential for HIV protection may be more useful in higher prevalence areas while highlighting other characteristics may be more beneficial in other areas.

Our findings suggest that young women's ratings of microbicides were responsive to characteristics such as side effects, pregnancy prevention, and timing of application. They were most likely to indicate an intent to purchase a microbicide that was contraceptive, applied 10 minutes post-coitally, protected against STI, and did not have side effects. However, it is important to note that a substantial number of the women preferred characteristics other than those identified as preferred by the group as a whole. These findings suggest that in the future a variety of microbicide formulations will be useful as not all women (and their partners) will have preferences for the same characteristics. In addition, while we did not find a significant

difference in preferences by age group or behavioral factors age, sexual experiences, and use of hormonal contraceptives may play an important and complex role in microbicide preferences and utilization based on specific microbicide characteristics. Thus, more mixed methodological work will be helpful in examining the individual variation in sexual and contraceptive experience. Shifts in attitudes across varying levels of sexual experiences may reflect developmental changes in reproductive health behaviors and priorities and may be important considerations for the promotion and social marketing of microbicides. The availability of microbicides with differing characteristics will allow microbicide formulas to be targeted to the specific needs of women and may increase the likelihood of use. That said, we recognize the ongoing difficulties associated with creating one effective microbicide and realize that this variety will not be available for some time.

Full profile ratings based conjoint analysis, a marketing research tool, was used in the study to examine adolescent women's relative preference for microbicide characteristics. This approach to data analysis is a unique way of examining the complicated microbicide preferences of adolescent women and how these preferences might differ based upon individual factors. While conjoint analysis has been used effectively in marketing research and suggests a level of interest it does not indicate the likelihood of continued use [8,36–37,32]. However, intention has been shown to be predictive of actual behavior [40] and without an actual product available the starting point needs to be intent as intent is a key antecedent to behavior. In addition, the dimensions chosen for the study may not be reflective of an actual product, as we have limited knowledge regarding the characteristics of early generation microbicides [1,28]. Using the VACASI technique to collect data in the present study allowed for more privacy in data collection, helping prevent much of the response bias and socially desirable answering often associated with collecting sexuality-related data. Therefore, it is probable that the intent to purchase results reported here are more valid than results collected during a face-to-face interview.

Due to the nature of the clinics in which these women were recruited, incidence of sexual intercourse as well as experiences with STI might be greater than in the general population and their preferences may not be reflective of the larger population. In addition, as women were asked about hypothetical microbicide products, we were not able to evaluate what their experience would be with actual microbicide use. The inability to assess young women's use of a product disregards their bodily experience (either positive or negative) or how a microbicide would be introduced into and negotiated within a sexual relationship should be examined in future research. In addition, we were not able to capture relationship specific information (e.g., quality, length) that may impact women's desire and ability to use a future microbicide [10].

This study expands on existing adolescent microbicide acceptability research and future research in this area may benefit from utilizing conjoint analysis. Additionally, the combination of conjoint analysis techniques with qualitative methodologies could be useful in assessing microbicide preferences and reasoning at an individual level. This combined approach would allow for a more in-depth examination of some of the issues related to young women's sexual experiences, the relationship with their bodies, and their sexual interest and pleasure. For instance, recent work has suggested that the lubricating properties of microbicides may be a highlight of use and may be of higher value to some women compared to others [9,10]. The implications of introducing a product with lubricating qualities into a sexual interaction and the potential impact on relationship and sexual satisfaction should be assessed as they may be important determinants of continued use and should be considered in future research. In addition, relationship and communication quality and the effects these factors have on overall microbicide acceptability and use as well as the possibility of surreptitious use should be examined. Specifically these factors should be examined to determine acceptance of covert

microbicide use as well as what the potential consequences of not telling the partner may be for the young woman. Vaginal microbicides are a promising prevention strategy and promotion strategies should address the variable microbicide preferences specific to the target population.

In conclusion, as microbicide development continues attention will need to focus on the impact of preferred characteristics for adolescent women and how preferences may change as a function of developmental stage and sexual and contraceptive experience. Young women are clearly an important target for microbicide promotion and the results of this study suggest that they have interest in microbicide use. Their preferences will likely influence the focus of targeted social marketing and education programs for microbicide use. Focusing on young women will be essential to encourage utilization in this population, which remains at higher risk for the potential negative effects of sexual initiation and to promote overall healthy sexual development.

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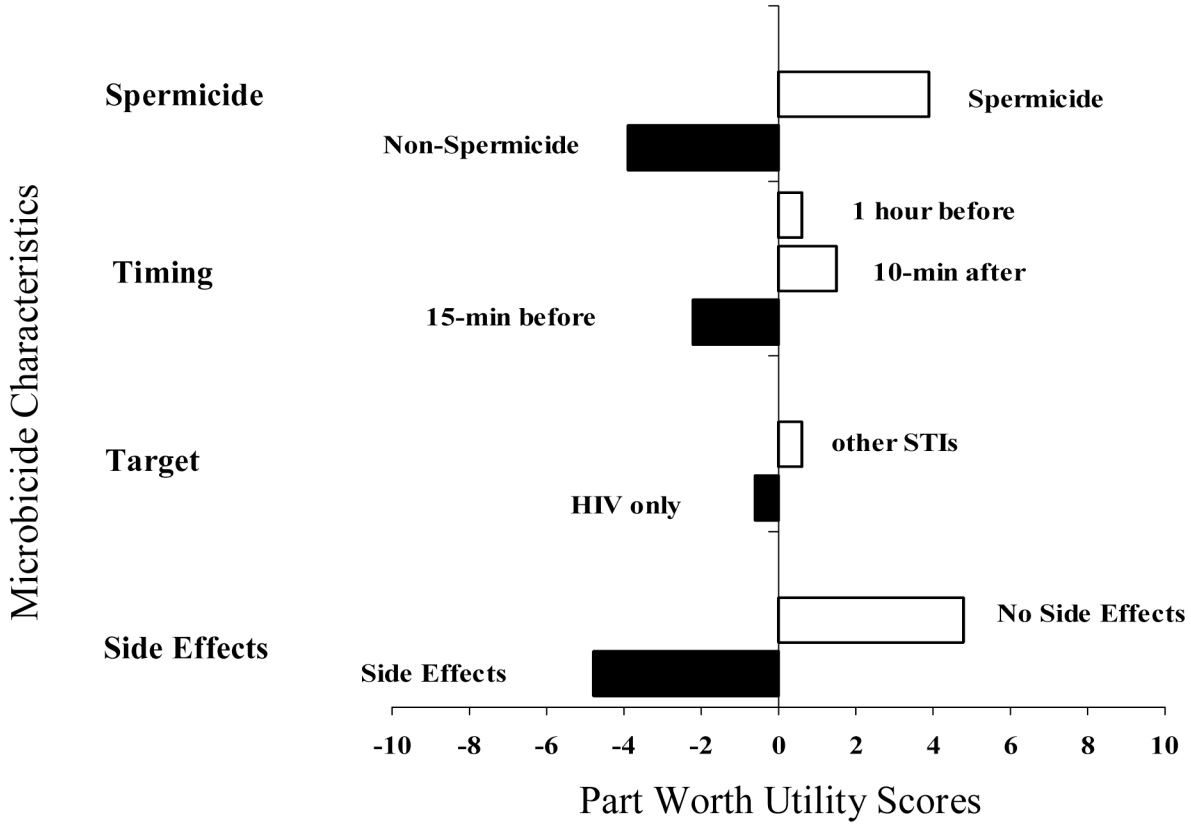

Figure 1.
Part Worth Utilities for the preference for each characteristic, among the entire sample of adolescents.

Table 1

Participant characteristics

	Total Sample N=405		**Ages 14–15 N=100**		**Ages 16–17 N=124**		**Ages 18–20 N=181**	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age	17	1.8	14.6	0.5	16.5	0.5	18.9	0.8
Grade Level Completed	10.38	1.66	8.5	0.9	10.2	1.1	11.4	1.2
	N	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Race								
African American	227	56.0	55	55.0	59	55.6	103	56.9
Euro-American	97	24.0	19	19.0	37	29.8	41	22.7
Other/Mixed	49	12.1	17	17.0	12	9.7	20	11.0
Ethnicity								
Non-Hispanic	380	93.8	93	93.0	120	96.8	170	93.9
Hispanic	22	5.4	7	7.0	4	3.2	11	6.1
Sexual Intercourse								
Yes	275	69.4	43	43.9	81	65.9	151	86.3
No	121	30.6	55	56.1	42	34.1	24	24.0
Hormonal Contraceptive Use								
Yes	214	55.3	31	34.1	57	47.9	126	71.2
Condom	32	8.3	4	4.4	14	11.8	14	7.9
No	141	36.4	56	61.5	48	40.3	37	20.9

Table 2

Characteristics of hypothetical microbicides.

Formula	Contraception	Side effects	Timing	Target
1	yes	yes	15 min before	STI
2	yes	no	10 min after	HIV
3	yes	yes	1 hour before	HIV
4	no	no	15 min before	HIV
5	no	no	1 hour before	STI
6	no	yes	10 min after	STI
7	no	yes	1 hour before	HIV
8	yes	no	1 hour before	STI