

# Men's Behavior Change Following Infection With a Sexually Transmitted Disease

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*An analysis of data on 20–39-year-old men participating in the 1991 National Survey of Men finds that of 466 respondents who had ever had a sexually transmitted disease (STD), 25% had sex while infected. However, 85% of these men informed their partner of their infection before having intercourse. Black men were significantly less likely than whites to have had sex while infected. Overall, 29% of men with an STD did not modify their sexual behavior or condom use. Blacks, married men and men who were affiliated with a religious group were less likely than whites, single men and those with no religious affiliation to maintain the same behavior subsequent to the diagnosis of an STD infection as before. Black men were more likely than whites to start using condoms; blacks, religious men, less-educated men and those who were older when they had their first sexual experience were the most likely to stop having sex with casual partners once they learned that they were infected with an STD.*

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**S**exually transmitted diseases (STDs) are a major public health problem in the United States. Nearly 12 million Americans are infected with an STD annually; approximately 43 million have viral STDs, which cannot be cured and thus infect the individual for life.<sup>1</sup> For virtually all STDs, the number of documented cases has increased in the last 10 years.<sup>2</sup> The number of Americans infected with the human immunodeficiency virus (HIV), for example, has increased steadily since the 1980s, and in 1993, more than 40,000 U.S. residents died from AIDS-related illnesses.<sup>3</sup> Further, STDs cost society more than \$3.5 billion each year.<sup>4</sup>

During the last century, extraordinary medical advances in the ability to diagnose STDs have not led to tremendous success in controlling them. For example,

even though penicillin has been an important and effective part of the public health campaign against syphilis and gonorrhea for more than 40 years, these STDs continue to be significant health problems. In fact, in some subgroups of the population, the incidence rates of these infections have risen dramatically.<sup>5</sup>

STDs persist in the U.S. population largely because of the complex ways in which pathogens and their hosts interact with social and environmental factors that determine the mechanism of acquisition and the pattern of transmission of these diseases.<sup>6</sup> For example, social changes, such as modified patterns of nonmarital sexual behavior, overwhelm the effects of medical treatments. The control and prevention of STDs thus calls for more than technological improvements or medical innovations: It requires an understanding of the social and behavioral linkages involved in the acquisition and transmission of infection.

Some studies have explored the social, demographic and behavioral characteristics associated with the acquisition of STDs.<sup>7</sup> An equally important issue is how individuals behave once they are infected. In this article, we use a population-based data set to examine the effects of in-

dividual characteristics on the likelihood that an adult male will engage in a particular type of behavior and, secondly, that he will modify his risk-related behavior once he has learned that he has an STD.

## Conceptual Framework

We assume that individual characteristics that affect sexual and health care behavior in general—age, race or ethnicity, marital status, affiliation with an organized religion, socioeconomic status, and age and contraceptive use at first intercourse—also affect behavior subsequent to an STD infection.

Younger people engage in riskier sexual behavior than do those who are older; they accumulate partners more rapidly, and they tend to choose riskier partners.<sup>8</sup> Consequently, they are more likely to be exposed to the risk of acquiring an STD. We expect that infected young men are more likely than their older counterparts to continue to engage in behavior that exposes their partners and themselves to infection. In addition, since young men are less inclined than older men to seek health care services in general,<sup>9</sup> we expect that when differential infection rates are accounted for, those who are younger when they become infected are also probably less likely to use STD-related medical services.

Race and ethnicity are also related to sexual and health care behavior.<sup>10</sup> Blacks and Hispanics have higher rates of STDs than whites, and the gap seems to be widening.<sup>11</sup> Therefore, understanding the behavior of these populations subsequent to infection is crucial to understanding the behavioral component of STD transmission.

The disproportionate representation of STDs among certain racial and ethnic groups may be due to a high likelihood of risky behavior among these groups, a biological predisposition to infection upon exposure, or differential access to and use of health care services.<sup>12</sup> The argument for biological predisposition notwithstanding

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ing, ample evidence supports the remaining two explanations. For example, blacks initiate sexual activity at an earlier age and have a greater number of sex partners than those of other races.<sup>13</sup>

There is little reason to expect that blacks will modify their sexual behavior any more than members of other racial groups do after receiving an STD diagnosis. However, minority populations are characterized by poor health education, poor health care-seeking behavior, and poor access to diagnostic and therapeutic health services; for example, the use of organized medical and STD clinic services is lower among blacks and Hispanics than among whites.<sup>14</sup> Consequently, we expect racial and ethnic minorities to be less likely than whites to comply with medical recommendations following an STD infection.

Marital status is a reliable predictor of both sexual and health care behavior. Single people engage in riskier sexual behavior than those who are married,<sup>15</sup> perhaps because norms regarding sexual exclusivity are stronger for marriage than for other types of relationships. We expect this relationship to hold also after diagnosis of an STD. On the other hand, because perceived risk is generally lower in monogamous relationships, married people are less likely than their single counterparts to use condoms.<sup>16</sup> This may or may not be the case following an STD infection; married men may be more likely to realize that condoms decrease the likelihood of infection and may use condoms at a higher rate to avoid infecting their spouse. Married people are also more likely to seek medical care than unmarried people; therefore, we expect them to have better health care practices following an STD infection, as well.

Men who are affiliated with an organized religion generally have a more conservative sexual ideology than those with no religious affiliation.<sup>17</sup> Thus, they tend to have fewer sex partners and to engage in a narrower range of sexual practices with those partners.<sup>18</sup> We have no reason to believe that this would be different following an STD infection. On the other hand, a more conservative sexual ideology might stigmatize STDs and consequently suppress both the use of condoms and the use of STD-related clinical services following infection. However, among those who do seek treatment, we might expect religious affiliation to lead to better compliance with medical advice and to increased preventive behavior; such an influence may mitigate the overall effect of religious behavior on preventive behavior.

In general, as socioeconomic status increases, so does the likelihood of having multiple partners and engaging in a variety of sexual behavior with those partners.<sup>19</sup> However, increasing socioeconomic status is also associated with higher levels of condom use.<sup>20</sup> The effect of socioeconomic status may change once an individual has become infected. Higher socioeconomic status is generally associated with a greater sense of self-efficacy, and an STD infection may help an individual to realize the costs and consequences of risky sexual practices, resulting in greater behavior modification. In addition, higher socioeconomic status, insofar as it is marked by higher income and an increased likelihood of having health care insurance coverage, facilitates access to health care services. We hypothesize that these factors will promote the use both of condoms and of STD-related medical services after an infection.

Two additional variables are included in our analysis, as indicators of a propensity for risk-taking: age at initiation of sexual activity, which is related to subsequent sexual behavior and contraceptive use;<sup>21</sup> and contraceptive use at first vaginal intercourse, a strong predictor of later use.<sup>22</sup> We expect that men who were younger when they first engaged in sexual activity are more likely than those who were older at first intercourse to engage in risky behavior while infected with an STD. Similarly, we expect that those who used a birth control method at first vaginal intercourse will engage in more responsible behavior following an STD diagnosis.

## Data and Methods

### *Study Population and Sample*

The data used in this study were collected in 1991 from a nationally representative household sample of men aged 20–39. The National Survey of Men was based on a stratified, clustered, area probability sample design. Of the 17,650 housing units in the original sample frame, 93% were successfully screened for eligibility. In-person interviews were completed with 3,321 respondents (70% of eligible men): 1,238 blacks and 2,083 whites (including a small number of men of other races). Blacks were oversampled to allow sufficient representation in the database. Other populations known to have an elevated risk of contracting an STD were not oversampled, but are represented at a rate proportionate to their size in the population. The weighted sample accounts for the effects of stratification, clustering, the oversampling of black men and differential

nonresponse. The results presented here are based on weighted data and permit generalizations to the U.S. population represented by the sample.<sup>23</sup>

Overall, 494 men in the sample (15%) reported ever having had an STD.\* These men were asked a series of questions regarding their behavior and behavior changes following the diagnosis. In cases of multiple infections, the questions were repeated for each disease; to minimize potential recall problems, only data regarding the most recent infection were used.<sup>†</sup> We excluded from the analysis men for whom data were missing, reducing the sample size to 466.

In a general population sample, the incidence and prevalence of STDs are usually so low that it is difficult to conduct separate analyses by disease. Thus, we initially lumped all STDs together. Subsequently, in an effort to account for differences among the reported STDs in infectivity rates, symptoms, treatments and the likelihood of cure, we conducted a separate analysis focusing on the 298 men who had had gonorrhea—the most commonly reported STD in the United States.

### **Measures**

• *Outcome variables.* We examined 10 outcomes that capture behavior and behavior change following the diagnosis of an STD. The first two pertain to men's sexual behavior while infected: whether they had had sex (vaginal, oral or anal intercourse) and, if so, whether they had told their partners about the infection beforehand. Since the number of respondents who reported having had sex while infected was small, we were not able to assess the second outcome among the subsample of men who had had gonorrhea.

The third outcome relates to whether the men returned to their doctor or clinic to be retested after treatment had been completed.<sup>‡</sup> This measure is used as an indicator of compliance with medical advice regarding the treatment of STDs.

The next six outcomes were derived from a multicategory question using a card listing various behavior changes that

\*The diseases reported in the study were HIV or AIDS, gonorrhea, syphilis, chlamydia, genital herpes and genital warts.

<sup>†</sup>In all, 63 men said they had had more than one STD during their lifetime. For the seven of these men who had had more than one disease diagnosed in the same month, gonorrhea was selected whenever it was an option; otherwise, the first disease mentioned was used.

<sup>‡</sup>Because HIV, AIDS and genital herpes are incurable and thus do not require a retest, men who reported these diseases were not asked this question.

**Table 1. Percentage distribution or means (and standard deviations) of characteristics of men aged 20–39, by men's STD infection status, 1991 National Survey of Men**

Characteristic	Any STD (N=466)	Gonorrhea (N=298)	No STD (N=2,893)
% DISTRIBUTIONS			
<b>Type of infection</b>			
Viral	31	na	na
Bacterial	69	na	na
<b>Race</b>			
Black	33	49	10
White	67	51	90
<b>Marital status at diagnosis</b>			
Single	89	95	49
Married	11	5	51
<b>Religion</b>			
Any	80	81	89
None	20	19	11
<b>Education</b>			
≤high school	53	64	54
>high school	47	36	46
<b>Used contraceptive at first vaginal sex</b>			
No	74	77	61
Yes	26	23	39
Total	100	100	100
<b>MEANS</b>			
Mos. between diagnosis and interview	9.00 (6.07)	10.93 (5.68)	na
Age at diagnosis	23.16 (5.11)	21.51 (4.35)	na
Age at first sex	14.86 (3.03)	14.91 (3.22)	16.21 (3.66)

Notes: In this and subsequent tables, the category "any STD" includes HIV/AIDS, gonorrhea, syphilis, chlamydia, genital herpes and genital warts; na=not applicable.

one might adopt following an STD diagnosis: "stopped having vaginal, oral, or anal sex altogether," "don't have sex as often," "stopped having sex with more than one partner," "stopped having sex with partners I don't know well," "started to use condoms" and "used condoms more often." The last response category was "no behavioral change."

The wording for the questions about behavior change do not permit us to determine whether an individual also engaged

age distributions or means and standard deviations. Five social and demographic variables were included: age at diagnosis, race (black vs. white), marital status at diagnosis (single vs. currently married\*), religious affiliation (any vs. none†) and, as an indicator of socioeconomic status, education (high school or less vs. more than high school†).

Age at first intercourse and contraceptive use at first intercourse were included as measures of previous risk-taking behavior. The former is a discrete variable obtained from data on date of birth and date of first intercourse; the latter is a dichotomous measure.

Two control variables were included. The first is the number of months between diagnosis of the disease and the interview. This is the period during which the respondent would potentially have modified his behavior. (If this period was short, there may not

\*The "single" category includes never-married, divorced, widowed and separated men. We conducted preliminary analyses using three categories (never-married, currently married and formerly married) and four categories (never-married, currently married, divorced or widowed, and separated); we ultimately combined all unmarried categories because the number of men in the formerly married categories was small and the effects were the same.

†Preliminary analyses were conducted with four categories (Catholic, conservative Protestant, other Protestant, and Jewish and other). The consistent finding was that those who belong to some religion behave differently than those who belong to no religion, with little difference among religions.

‡In preliminary analyses, we measured this variable as a four-category discrete measure and on an interval scale. The largest differences were between those with more than a high school education and those who had not gone beyond high school.

in a specific type of behavior before he acquired the disease. Thus, if a respondent replied that he had not changed a risky behavior after becoming infected, it could mean either that he continued to engage in that behavior or that he had never engaged in it. Despite this ambiguity, the analysis of this set of questions remains useful for making policy recommendations. Importantly, the outcome "no behavioral change" is much less ambiguous, because the men in this sample are likely to have engaged in some type of risky behavior before they were infected.

Since all of these variables are dichotomous, the analyses were conducted using logistic regression techniques.<sup>24</sup>

•**Independent variables.** Table 1 lists the predictor and control variables used in the analyses, along with their percent-

have been an opportunity to modify a specific type of behavior.) In addition, for the first three outcomes investigated, this variable serves as a control for any changes in public health policy or recommendations regarding behavior while infected. For example, prior to about 1988, retesting following treatment was required for chlamydia and gonorrhea infections; thus, we would expect the number of months between infection and interview to have a positive relationship with retesting.

Second, in the analyses of men who had had any STD, we included a control variable to indicate whether the disease was a bacterial or a viral infection. This is important because viral infections require permanent changes in behavior, whereas bacterial infections, which can be treated in a relatively short period of time, require only temporary behavior change to avoid spreading the disease. (Of course, regardless of the type of infection, long-lasting changes in sexual behavior are necessary to avoid repeat infections.)

## Results

### Behavior While Infected

Among men who had had any STD, 25% had had sex while they were infected; by contrast, among those who had had gonorrhea, the proportion was 13% (Table 2). This difference is largely because the "any STD" measure includes men who had a viral infection. Among those who had sex while they were infected, 85% reported that they had told their partners in advance that they had an STD. Some 70% of men who had had any infection and 76% of those who had had gonorrhea had returned to their doctor or clinic to be retested for the disease.

Men who had a viral STD were significantly more likely than those who had

**Table 2. Percentage of men who engaged in specific behavior and in behavior change after STD diagnosis, by type of STD**

Behavior and behavior change	Any STD	Gonorrhea
<b>Behavior</b>		
Had sex while infected	25	13
Told partners about infection†	85	86
Returned to doctor for retest	70	76
<b>Behavior change</b>		
None	29	22
Stopped having sex	10	8
Reduced frequency of sex	20	22
Stopped having sex with more than one partner	20	21
Stopped having sex with partners not known well	33	44
Started using condoms	23	24
Used condoms more often	19	20

†Percentages based on those who had sex while infected.

had a bacterial infection to have had sex while infected (Table 3); the analysis offers some evidence ( $p \leq .10$ ) that they were less likely to have a retest. Overall, there is a positive relationship between age and having sex while infected, but this relationship is not significant among men who reported only a gonorrhea infection. Younger respondents infected with gonorrhea were more likely than those who had been older at diagnosis to return to their doctor or clinic for rescreening.

Race is also related to behavior after an STD diagnosis. Black men were less likely than whites to have had intercourse while infected with any STD or with gonorrhea. However, black men who had had sex while infected were significantly less likely than white men to have informed their partners that they had an STD.

Single men who had had any STD were less likely than their married counterparts to have told their partners about their infection. Other results by marital status also suggest that married men may engage in better health care practices than unmarried men.

The likelihood that men infected with any STD had had intercourse varied significantly according to whether or not they reported a religious affiliation. Furthermore, those with a religious affiliation were more likely to have informed their sexual partners about their infection and to have returned for the recommended follow-up.

In both samples, the regression coefficients suggest that men with more than a high school education were less likely than those with a lower level of education to have had sex while infected, but the result for the overall sample is only marginally significant. However, among men who had had any STD, the better-educated were significantly more likely than those with less schooling to have told their partners that they were infected.

Interestingly, respondents who had more than a high school education were less likely to have returned for a follow-up screening than were those with less education. (The coefficient for the subsample who had had gonorrhea is significant at  $p \leq .10$ .) This surprising result may reflect that individuals of relatively high socio-economic status are likely to go to private physicians, who may not require a follow-up visit after STD treatment, whereas those of lower socioeconomic status probably seek treatment from public health facilities, which commonly require such visits.

Previous risk-taking behavior had no significant effect on sexual behavior while infected among men who had had any

STD. Surprisingly, among men who had had a gonorrhreal infection, those who had used a contraceptive method at first sex were significantly less likely than those who had not to have obtained a follow-up screening. This might in part be a result of the change in rescreening requirements for gonorrhea (and chlamydia) after 1988.

#### **Infection-Related Behavior Change**

The most common behavior change was to avoid having sex with partners who were not known well, reported by 33% of men overall and 44% of those in the gonorrhea subsample (Table 2). More important, however, 29% and 22%, respectively, had not changed their behavior in any way after learning that they were infected.

The type of disease (i.e., viral vs. bacterial) does not appear to have been an important determinant of the likelihood of behavior change subsequent to the diagnosis of an STD (Table 4, page 156). However, the kinds of behavior changes men made in response to an STD varied with the type of infection. Men with a viral infection were less likely than those with a bacterial infection to have reduced the frequency with which they had sex and to have avoided sex with partners whom they did not know well. However, those with a viral STD were more likely to have begun using condoms.

The variable reflecting the time elapsed between the STD diagnosis and the interview captures some of the period effects. For both the overall sample and those who had had gonorrhea, the longer ago the diagnosis, the more likely it was that men would report having made no behavior change. This finding may reflect the widespread public health efforts in recent years to curb the spread of HIV infection. As for

the specific changes made in sexual behavior following an infection, those who had had an STD diagnosed more recently were more likely than those whose disease had been identified longer ago to have stopped engaging in sex with multiple partners and to have increased their condom use. They were, however, less likely to have refrained from having sex altogether. The relationship between length of time since diagnosis and increased condom use remained significant

among men who had had gonorrhea.

Individual characteristics had a strong influence on whether or not infected individuals changed their sexual behavior, but not always in the expected direction. The older the men had been at diagnosis, the more likely they were not to have changed their behavior. This somewhat counterintuitive and unexpected result could indicate that older men are less worried about future infections because they have better access to health care and are less embarrassed about obtaining services. Another possible explanation is that older men are less likely to have engaged in risky practices before becoming infected, so have less room for behavior changes.

The results for the effects of age at diagnosis on specific behavior changes suggest ( $p \leq .10$ ) that within the sample overall, being older at diagnosis may be related to a subsequent reduction in the frequency of intercourse, while being younger may lead to an increase in condom use. Among men who had had gonorrhea, age at diagnosis was related to abstention from sex ( $p = .07$ ), suggesting that younger men may be more likely to adopt this change after becoming infected.

In both groups, black men were significantly less likely than white men to have maintained the same behavior after learning that they had an STD. While black men were less likely than whites to have avoided any type of sexual contact while infected, they were more likely than whites to have stopped having sex with partners they did not know well and to have begun using condoms. Among men who had had gonorrhea, black men also were more likely than white men to have increased the frequency with which they used con-

**Table 3. Logistic regression coefficients showing the likelihood that men engaged in various types of sexual and health care behavior while infected with an STD, by type of STD and background characteristics of the men**

Characteristic	Any STD			Gonorrhea	
	Had sex	Told partner	Had retest	Had sex	Had retest
Viral STD	1.76**	-0.60	-0.50*	na	na
Mos. between diagnosis and interview	-0.02	0.27**	0.04*	-0.09**	0.03
Age at diagnosis	0.08**	-0.19	-0.05	-0.00	-0.13**
Black	-0.88**	-4.09**	-0.03	-1.30**	-0.47
Single at diagnosis	0.68	-4.74**	-0.93*	-1.37*	-1.55*
Any religion	0.63**	1.84**	1.09**	0.95*	1.68**
>high school education	-0.46*	2.32**	-1.01**	-1.29**	-0.56*
Age at first sex	0.04	-0.21	0.05	-0.10	0.07
Used contraceptive at first sex	-0.22	1.29	-0.08	-0.30	-1.19**
Intercept	-4.71**	11.01*	1.53	1.97	3.50*
-2 log likelihood	399.79	61.01	448.49	195.18	274.43
df	9/436	9/61	9/402	8/277	8/275

\* $p \leq .10$ . \*\* $p \leq .05$ . Note: Reference categories are not shown.

**Table 4. Logistic regression coefficients showing the likelihood that men engaged in various behavior changes after diagnosis of an STD, by type of STD, background characteristics and previous risk-taking behavior**

Type of STD, characteristic and previous behavior	No change	Stopped having sex:				Started using condoms	Used condoms more often
		Altogether	As often	With >1 partner	With partners not known well		
<b>Any STD</b>							
Viral STD	0.39	0.62	-0.97**	-0.46	-1.18**	0.79**	0.03
Mos. between diagnosis and interview	0.08**	0.07**	-0.04	-0.08**	-0.04*	-0.00	-0.07**
Age at diagnosis	0.10**	0.04	0.06*	-0.05	-0.04	-0.03	-0.06*
Black	-0.89**	-1.07**	-0.10	-0.10	0.50**	1.61**	0.30
Single at diagnosis	1.12**	0.41	-0.43	-0.78*	0.81*	-0.68*	0.12
Any religion	-1.00**	0.98*	0.31	0.57*	0.67**	0.54	0.67*
>high school education	0.73**	-0.27	0.92**	-1.07**	-0.71**	0.33	0.36
Age at first sex	-0.13**	0.12*	-0.09**	0.03	0.12**	0.09**	-0.02
Used contraceptive at first sex	0.26	-1.09**	-0.72**	0.27	0.08	0.66**	-0.80**
Intercept	-2.54**	-6.45**	-1.08	0.59	-2.20*	-2.92**	0.04
-2 log likelihood	481.77	261.11	413.24	417.18	504.38	443.66	432.14
df	9/436	9/435	9/436	9/436	9/435	9/436	9/436
<b>Gonorrhea</b>							
Mos. between diagnosis and interview	0.10**	-0.09	-0.05*	-0.05*	0.01	-0.00	-0.07**
Age at diagnosis	0.05	-0.18*	0.05	0.03	0.02	-0.03	-0.07
Black	-0.93**	-1.78**	-0.35	0.16	0.78**	1.63**	0.68**
Single at diagnosis	2.57	-2.80**	0.11	0.08	0.37	-0.83	-0.360
Any religion	-0.84**	-1.08	0.05	0.02	0.12	0.34	0.72
>high school education	0.35	2.57**	1.26**	-1.12**	-0.55**	0.71**	0.36
Age at first sex	-0.12**	0.01	-0.10*	0.00	0.20**	0.09*	0.03
Used contraceptive at first sex	0.03	-2.91**	-0.45	0.40	0.02	0.99**	-1.18**
Intercept	-3.25	4.99	-.76	-1.50	-4.41**	-2.87	-0.24
-2 log likelihood	278.33	112.10	275.75	284.06	371.58	275.59	271.97
df	8/277	8/276	8/277	8/277	8/276	8/277	8/277

\*p≤.10. \*\*p≤.05.

doms; this finding is consistent with an overall increase in condom use among blacks in recent years.<sup>25</sup>

Overall, men who had been married at the time they received an STD diagnosis were more likely than single men to have changed their behavior. Among those who had had gonorrhea, married men were significantly more likely than single men to have abstained from sex while infected. Since gonorrhea can be treated relatively easily and rapidly, forgoing sex for a short period of time may not pose as much of an inconvenience for married men as it may for single men, who may have less consistent access to a partner and therefore may be more reluctant to pass up an opportunity for a sexual encounter.

Men who were affiliated with an organized religion were significantly more likely than those with no religious affiliation to have changed their behavior after learning that they had an STD. In the overall sample, those who were affiliated with a religion were more likely than those with no religious affiliation to have stopped having sex with partners whom they did not know well.

The effects of education were mixed and somewhat unexpected. Contrary to

our hypothesis of a positive effect of socioeconomic status on behavior change, among men who had had any STD, those with more than a high school education were less likely than those with less schooling to have changed their sexual behavior after learning of their infection. More highly educated men may look for options other than behavior change to avoid future infection; they also (like older men) may have better access to health care and may be less embarrassed about using services. Higher education was associated with a reduction in the frequency of intercourse, while lower education was associated with avoiding sex with multiple or casual partners. Surprisingly, education had no significant effect on condom use.

Education's effect on specific types of sexual behavior was more pronounced among men who had had gonorrhea (although level of schooling did not significantly influence the likelihood of any behavior change in this group). Men who had more than a high school education were more likely than less-educated respondents to have stopped or reduced sexual activity following the diagnosis of gonorrhea, and they were more likely to have started using condoms. Those who

had a high school education or less were more likely to have changed their partner selection behavior, confining sexual activity to monogamous relationships with partners they knew well.

Previous risk-taking behavior also had mixed effects. The older the men had been at first intercourse, the more likely they were to have changed their behavior after acquiring an STD. Among men who had had any STD, older age at first intercourse was associated with avoiding sex with casual partners and with starting to use condoms; the results also suggest an effect on abstinence from sexual activity ( $p=.07$ ). However, men who were older when they had first had sex were less likely to have reduced their frequency of intercourse while infected, possibly because they had not been having sex as frequently before infection.

Contraceptive use at first intercourse had no impact on the overall likelihood of behavior change, but was significantly associated with several types of behavior. Men who had used a method the first time they had had sex were significantly less likely to have abstained from sex or to have reduced the frequency with which they had intercourse while infected. This may indicate that they realize that these

changes are not the only way to prevent further infection but that responsible behavior while engaging in sexual activity also can be effective. They were also more likely to have started using condoms subsequent to an STD diagnosis, but were less likely to increase their condom use. In the group who had had gonorrhea, these associations were generally in the same direction, but weaker.

## Discussion

Our examination of 20–39-year-old men's sexual and health care behavior and behavior changes following the diagnosis of an STD confirm the role of behavioral factors in the persistence of STDs in the United States. To begin with, sizable proportions of the men in our sample continued to have sex while they were infected, did not tell their sex partners that they were infected, did not return to their doctor to be rescreened following therapy and did not change their sexual behavior or condom use in any way.

Further, among those who reported behavior change, each type of behavioral modification was reported only by a small group, ranging from 10% who abstained from sex to 33% who stopped having sex with partners they did not know well. Only about one-fifth of the men reported a change in their practice of having multiple partners or in their condom use. Clearly, a substantial proportion of men who are infected with an STD are unable, are unwilling or do not know how to make effective changes in their behavior to avoid being infected again and to avoid infecting others.

The behavioral patterns we identified varied considerably across social and demographic subgroups. Certain groups were consistently at increased risk of spreading their infection because of their sexual behavior while they were infected. This variability has important implications because STD transmission rates are characterized by great heterogeneity within and between populations, which in turn is directly related to differences in sexual behavior.<sup>26</sup> Identifying the groups at risk of infection and the interrelationships between such groups is a useful starting point for the development of an understanding of STD transmission dynamics,

and for the design and implementation of prevention programs.

Our results suggest that the populations that are normally targeted through public health clinics are improving their behavior (at least after infection), while groups that are less likely to receive intervention (specifically, those who are more likely to see a private physician) are consequently less likely to make changes in their behavior after learning that they have an STD. Therefore, it is important for private providers to start screening for STDs and discussing these infections with their patients. We need to recognize that groups that have traditionally been ignored are also at risk of acquiring STDs and may be at greater risk of spreading infections to others.

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