

Running Head: YOUNG MEN'S STD RISK

Differentiating Sexual Risk Behaviors as Young Men Transition to Adulthood

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Abstract

Context: Understanding how sexual risk behaviors intersect and change across men's transition into young adulthood is important for the design and evaluation of effective strategies to reduce human immunodeficiency virus (HIV) and other sexually transmitted disease (STD) transmission.

Methods: Using cluster analysis on three waves of data from 1,880 men participating in the National Survey of Adolescent Males (NSAM), we assess how men group together based on sexual risk behaviors.

Results: Two dimensions of sexual risk-taking define the clusters: partner characteristics and condom use. Over 50% of men remain in low-risk groups across time. In the first two waves, 24-32% of men report high-risk behaviors that are associated with higher STD histories. Nearly 40% of men who enter a high-risk group transition to a lower risk group by the third wave. Nine percent of men either maintain steady high-risk or show increasing risk behaviors; higher STD reports characterize both trajectories. Low condom use combined with multiple concurrent partners during adolescence are associated with STDs in young adulthood. Yet, high condom use coupled with risky partners do not lead to STDs in young adults.

Conclusions: The prominence of low-risk behaviors across time suggests that most young men avoid high-risk sexual risk-taking. Young men who report many partners, many concurrent partners, and some condom use have the highest STD risk and report the highest past and current STD status of all young men. Effective strategies to reduce HIV and STD risk in young men must simultaneously address multiple dimensions of sexual behavior.

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Introduction

Understanding how sexual risk behaviors change as men become adults is important to reduce transmission of sexually transmitted diseases (STDs) including HIV. Sexual intercourse with strangers, one-time partners, sex with prostitutes or drug users, sex with same-sex partners, concurrent sexual relationships with two or more partners, and infrequent condom use can all contribute to increased STD risk in young men. While each individual behavior constitutes an independent source of increased risk, young men engage in various combinations of these behaviors that result in further differentiation of the risks of STD transmission. In this manuscript we describe (1) risk groups that emerge as the result of how the sexual risk behaviors “cluster” together; (2) young men's membership in these risk groups; and (3) how membership in particular risk groups relates to young men's STD status.

Background

Surveillance data indicate that a disproportionate burden of STD occurs among young adults, and HIV, one of the most serious STDs, is higher among young men than young women (1). In 2000, nearly 55 percent of the 2.8 million new cases of Chlamydia were presented by youth ages 15 to 24. Given the asymptomatic nature of Chlamydia, these reports most likely are underestimates of incidence rates among men (2). High STD rates among teenagers and young adults result, in part, from higher incidence of sexual behaviors that put them at risk for the transmission of infection (3). Choices regarding initiation of sex, partner selection, and use of contraception—including condoms—are important determinants of the probability of STD infection (4; 5). Engaging in multiple sexual risk elements most likely increases (perhaps nonlinearly, e.g., exponentially) the odds of a person becoming infected. Yet research on adolescent risk behaviors typically treats specific behaviors independently. For example, reports of levels of sexual experience among teenagers declining and condom use increasing have been reported separately rather than empirically linking the two in the same study (6, 7) and those studies that examine how these behaviors vary together have been cross-sectional rather than longitudinal patterns (8, 9, 10).

A number of cross-sectional research studies indicate that many HIV-related risk behaviors, including sexual and drug use behaviors, begin in the adolescent years and peak in the young adult years

(11; 12; 13; 14; 15). Cross-sectional data suggest that as young men age into adulthood, the prevalence of risk behaviors and the acquisition of new partners declines; people develop more stable relationships and more stable patterns in their lives (13; 16). Condom use, although frequent among youth, declines as men age and often changes as a function of relationships (17; 18; 19; 20). These findings are consistent with a hypothesis that as sexual relationships become longer, stable, and committed individual men's risk profiles change. Cross-sectional data, however, adjudicate between this developmental hypothesis, and an alternative, that younger cohorts have different behavior than their older counterparts. The current study, which uses longitudinal data is well situated to address (a) the population at greatest risk for contracting STDs – men between 15 and 26 years of age; (b) one of the three most commonly contracted STDs – Chlamydia, and (c) sexual behavioral and STD outcome patterns across time.

Method

Data

We use data from all three waves of the National Survey of Adolescent Males (NSAM) in our analyses. The NSAM began in 1988 with a nationally representative sample of 1,880 never-married men ages 15 to 19 who were living in households in the conterminous United States. The second wave of the survey occurred in 1990/1991 when the respondents were ages 17 to 22. Respondents were interviewed again in 1995 at ages 21 to 26. There are 1,290 men who were interviewed in all three waves. Across the waves, there was a 75 percent follow-up rate (not including the 38 who died between Waves 1 and 3). Longitudinal weights were developed to adjust for non-response. After weighting, we could not identify any significant biases in age or behavioral characteristics (21).

Sample

Our analysis proceeds in two phases: an exploratory phase using cluster analysis and a validation phase using univariate and bivariate statistical tests. For the cluster analysis we used all available data from the 1,880 young men who began the study in 1988. Each man contributed an observation – the unit of analysis – for each survey year of participation*. Thus, men who were interviewed three times

(n=1,290) contributed three observations, men who were interviewed twice (n=473) contributed two observations, and men who were only interviewed in 1988 (n=117) contributed one observation. Analyses are adjusted for the non-independence of the observations (we ran models using IIS and estimating robust standard errors using STATA 9.1).

For the validation phase of the analyses, men served as the unit of analysis, the n's vary depending upon the outcome considered. We used appropriate cross-sectional weights for sampling effects and longitudinal weights are used to adjust for non-response through the most recent wave (22).

Measures

Predictor variables. The measures available in NSAM that we believe best represent the dimensions of HIV and STD risk described in the literature are—partner quantity, partner quality, partner concurrency, and use of condoms. We constructed these measures to address behavior within the year prior to the survey and standardized them to z-scores (details on variable construction are available upon request). All of the measures are continuous. The five measures we use in our cluster analysis are:

1. *The number of female sexual partners in the last year.*
2. *The number of female sexual partners in the last year whom the respondent knew for less than a day prior to first intercourse (hereafter “stranger partners”).*
3. *The number of risky sexual partners in the last year (“risky partners”).*
4. *The number of months in the last year with more than two sexual partners in the same month (“concurrent partners”).*
5. *The percentage of sexual acts without a male condom in the last year (“unprotected sex”).*

Outcome variables. In all three waves respondents self-reported whether or not a doctor ever told them that they had Syphilis, Gonorrhea, and Herpes. In 1988 and 1991 respondents were also asked about genital warts and in 1995 they were also asked about Chlamydia. For each wave of the survey, we constructed a measure of ‘ever diagnosed with an STD’ based on the respondent’s report at that wave or previous waves. Two additional STD measures were collected in 1995 – self-reports of STD diagnoses

within the last year and a biomarker for Chlamydia via urine samples (23).

In 1995, respondents were asked to provide a urine sample to be utilized for STD testing. Specimens were tested for the presence of *C. trachomatis* (CT) using commercial polymerase chain reaction (Amplicor, Roche Diagnostic Systems, Branchburg, NJ). There are no CT test results for 382 (28%) of the 1,377 respondents in 1995. In half of the cases with missing test results, respondents were unwilling to take the test. The other half were missing because interviews were done over the phone or because test results were lost, damaged, of insufficient quantity, or mislabeled. Analytical testing using multiple imputation determined that non-response bias had a negligible effect on the prevalence estimates. Although the Chlamydia test was completed by a portion of the sample, the higher validity of this measure counter balances the reduced sample size for these analyses.

Analytic Strategy - Cluster Analysis

Our first research question is: “to what extent can young men be classified into meaningful groupings based on how they select partners and use condoms?” To answer it we used cluster analysis. Cluster analysis techniques provide multivariate statistical procedures that organize a set of observations into relatively homogeneous groups with respect to a set of characteristics in a given time period. There are a variety of clustering methods; we used k-means, a non-hierarchical method that allowed us to specify the number of clusters in the analysis.*** We were concerned that the clusters have similar meaning across time. To this end, we used all available *observations* from sexually experienced respondents across the three waves to generate the clusters and each respondent was assigned cluster membership for each observation he contributed.**** We then computed Z-scores across all time points for each risk variable. Hence, a respondent's risk behavior score is relative to that of all risk behaviors across time. Then, based on his risk behaviors across the five variables, each respondent was classified into a cluster for each wave.

Data from men who reported no heterosexual experience were excluded from the cluster analysis for the waves in which the experience had not yet occurred because these men theoretically have a value of zero on all of the variables used in the analysis. The percent of cases by wave used in the cluster

analysis increases across waves (Table 1). In total, 4,031 observations were used in the cluster analysis.

Our second research question is: “what patterns emerge with respect to men’s adoption of safer sexual practices versus risky sexual practices over time?” To answer it, we develop trajectories of HIV risk based on persistence in and movement among these risk groups. We are most concerned with men who move from lower-risk groups into higher-risk groups and exhibit behavior patterns of increasing risk.

Our third research question is “how do these risk groups and transitions among groups over time relate to STDs?” To answer it we analyzed the percent of members in each risk group in 1995 who reported ever being diagnosed with an STD, being diagnosed in the last 12 months, and having positive Chlamydia test results in 1995. In addition we examine whether various combinations of risk group membership across time are associated with ever being diagnosed with an STD by 1995. These analyses are used to validate whether the emergent clusters indicate higher STD/HIV risk for young men.

Results

Predictor and Outcome Variable Descriptive Findings

As reported in Table 1, across the three waves, the “no heterosexual sex” group declines as a percent of the sample (approximately 40%, 16%, and 6% for 1988, 1991, and 1995 respectively). The sexual risk variables of interest were measured on men who reported sexual experience and are reported in the lower half of Table 1.

 Insert Table 1 about Here

The share of sexually experienced men who engage in risky sexual behaviors in the last year increases in middle adolescence (ages 15-19) and peaks in late adolescence (ages 17-22) for all four risk measures pertaining to partners and then decreases in early adulthood (ages 21-26) suggesting a ‘settling down’ effect (Table 1). For instance, young men reporting concurrent partners in the last year increased from 13 to 20 percent and then decreased to 13 percent in the last wave. Condom use declines over time with nearly one-in-four acts unprotected in the first wave, nearly one-in-two unprotected in the second

wave, and nearly three-in-five unprotected in the final wave. This increase in unprotected sex may indicate either (1) increasing risk for respondents who engage in other sexual risk behaviors, or (2) decreasing risk for respondents who form stable, monogamous sexual relationships in early adulthood.

The percent of young men who report ever being diagnosed with an STD increases from 1.7 in 1988 to 6.6 in 1991 and 11.5 in 1995. This trend can be explained in part by the increase in sexually experienced men over time and in part by the increase in unprotected sex across waves. Compared to the cumulative 'ever' STD diagnosis measure, results in 1995 for STD diagnosis in the past year (1.3%) and positive Chlamydia tests (3.6%) are lower because the reference time is much shorter (not lifetime).

Cluster Composition

We began by specifying a five-cluster solution, but found that a four-cluster solution worked better because it yielded two lower-risk and two higher-risk groups differentiated on sexual partner characteristics and condom use — two important dimensions of HIV and STD risk described in the literature. We also attempted a three-cluster solution, but it did not capture as much variation along all of these dimensions of risk. The final four-cluster solution explained 24 percent of the variation of these five variables. With the addition of the 'no heterosexual sex' men to the four-cluster solution results, a total of five risk groups are assessed below and described in Table 2 according to sexual risk variables of interest.

 Insert Table 2 about Here

Two emergent clusters are considered "low risk" on all four partnering measures for the last year (number of partners, stranger partners, risky partners, and concurrent partners). The protective measure — condom use — differentiates these two low-risk clusters: one group engages in unprotected sex at a relatively high rate — 93 percent of sexual acts on average — compared to the average 15 percent unprotected sex acts of the other group. For this reason we refer to these groups as "low risk — high protection" and "low risk — low protection", respectively.

Two higher-risk clusters also emerge. One high-risk group resembles the low risk – high protection group on all variables except one: the number of risky partners in the last year. We refer to this high risk group as “risky partners – high protection.” It appears that this high-risk group of young men engage in safer sex practices relative to the other high-risk group “many partners – some protection”. Men in the “risky partners – high protection” high-risk group have sex with sexual partners at elevated risk for STDs and HIV – sex workers, IV drug users, one-time partners, persons with HIV/ AIDS – but, they have sex with fewer partners concurrently and overall and engage in relatively high condom use (on average 17% of their sex acts are unprotected). Men in the other high risk group, “many partners – some protection,” have markedly high reports on three of the four sexual partner risk variables in the last year: stranger partners, total number of female partners, and number of months with concurrent partners. The men in this group report a moderate number of risky sexual partners relative to the other three clusters. In addition to the risky nature of their sexual partnering practices, these men use condoms during substantially less than half of their sex acts (over 61 percent of their sexual acts are unprotected, on average). For this reason we refer to this group as “many partners – some protection.” To put this risk group into context with respect to the other three clusters, men in the “many partners – some protection” group report, on average, more than 7 female sexual partners in the last year; this is nearly four times the number of partners reported by other high-risk men (“risky partners – high protection”). Furthermore, these men spend nearly two-thirds of the last year with two or more concurrent sexual partners whereas men in the low-risk groups and men in the “risky partners – high protection” group report less than one month with concurrent partners.

Risk Group Membership Stability and Change

Across the three waves, the majority of the respondents are in either the no sex category or the two lower-risk clusters (Table 3). Both low-risk groups increase over time. Membership in “low risk – high protection” increases from nearly 19 percent in 1988 to 37 percent in 1995. A greater increase over the three survey waves occurs for the “low risk – low protection” group whereby membership increases nearly two-fold between 1988 (17%) and 1991 (31%) and nearly three fold between 1988 and 1995

(48%). These trends may mark a ‘settling’ down effect – especially among men in the low risk – low protection group – attributable in part to increasing stable, committed monogamous relationships as men enter into cohabiting and marital unions as they transition from adolescence into young adulthood.

 Insert Table 3 about Here

Turning to high-risk groups, a different pattern emerges whereby membership in both high risk groups increases from 1988 (24%) to 1991 (32%) and then decreases in 1995 (9%). This ‘peaking’ of risk has been observed in the literature and recognized as the ‘sexual experimentation’ period of later adolescence. The patterns for the high-risk groups, however, differ in degree even though the peaked nature is common to both. For “risky partners – high protection”, group membership begins relatively high in 1988 at 20 percent (the largest of the sexually experienced risk groups) and increases slightly to 22 percent in 1991 followed by a dramatic decline to 2 percent in 1995. For “many partners – some protection,” group membership begins fairly low in 1988 (nearly 5%), more than doubles in 1991 to 10 percent, and declines somewhat to nearly 7 percent in 1995, a value higher than in 1988 .

The distribution of men comprising high-risk groups change over time. Eighty-one percent and 68 percent of the men thought to be high risk are members of the “risky partners – high protection” in 1988 and 1991 respectively. In 1995, the distribution reverses such that 75 percent of high-risk men have membership in the other cluster, “many partners – some protection.” Even though the overall percent of men falling within high-risk groups reaches an all-time low in 1995, it appears that men who still engage in high-risk sexual behaviors at later ages (21-26) engage in the numerous risk behaviors that define the “multiple partners – some protection” risk group. On average, 61 percent of the sexual acts of these men do not involve condoms. This is alarmingly high. And, this group peaks to 10 percent of the sample in 1991 (ages 17-22). Though this group’s share drops slightly with maturation, it drops only to 7 percent in 1995 (ages 21-26). Approximately one in 15 men is exposed to two sources of risk: numerous partners and condom non-use.

In terms of transitions patterns (Table 4) between risk group membership in 1988 to 1991, the diagonals (i.e. those whose clusters are stable) are the highest values for each risk group except for the “risky partners – high protection” cluster. This means that four of the five risk groups have marked stability over time with ‘low risk – low protection’ having 61 percent and ‘many partners – some protection’ having 48 percent of young men with the same group membership over the two waves. What is alarming is that 23 percent of heterosexually inexperienced young men in 1988 (ages 15-19) move into one of the high risk groups in 1991 (ages 17-22). In contrast, the second largest transition for both high risk groups is a transition into low risk – low protection (35% and 28% of young men in risky partners – high protection and many partners – some protection, respectively, in 1988).

 Insert Table 4 about Here

Many young men move from high risk groups to low risk groups between 1991 and 1995. Over 80 percent of men in the ‘many partners – some protection’ group in 1991 and nearly 90 percent of men in the “risky partners – high protection” group in 1991 move into one of the low risk groups in 1995. Less than one percent of heterosexually inexperienced men in 1991 move into either high risk group in 1995 compared to the 23 percent who transitioned into high risk between 1988 and 1991. The bulk of men in the NSAM do not engage in risky partnering behaviors at any point in time, as seen by lower membership in the two high risk groups in all three waves of the survey relative to the other three risk groups.

Linking Risk Group Membership with STD History and Current Status

Our examination of self-reports of STD diagnoses suggests that men in the higher-risk groups defined by our cluster analysis are in fact at higher risk for STD contraction and transmission. Briefly, when examining STD self-reports of ever having an STD across the three survey waves for each of the risk groups, we found that for each group, their reports of ever having an STD increased monotonically from 1988 to 1991 to 1995. This finding (not shown) is consistent with what would be expected of the

natural developmental progression. Given the survey's expanded measures of STD diagnoses and the availability of clinical STD urine tests collected in 1995, below we focus on 1995 STD findings.

 Insert Table 5 about Here

As depicted in Table 5, STDs diagnoses in the last year and positive Chlamydia tests are higher for men in both high risk groups relative to both low risk groups. Men in the “many partners – some protection” cluster have the highest STD rates. Nearly two-times as many in this group report recent STD diagnoses and over three-times as many have positive urine tests compared to men in the other high risk group, “risky partners – high protection.” Using Kruskal-Wallis nonparametric tests of significance to compare risk groups for each STD measure, we found statistical significance among the groups for both STD measures. Given that Kruskal-Wallis tests, like one-way ANOVAs, serve as an omnibus test revealing whether any difference among the groups is significant, we followed-up these tests with pair-wise comparison and discovered that “many partners – some protection” significantly differed from both low risk groups but not from “risky partners – high protection” for both measures. The smaller sample size of “risky partners – high protection” coupled with the limited sample tested for Chlamydia further reduces the power of detecting differences between this group and the other risk groups.

Although membership in a high risk group is associated with relatively high STD rates, these high risk groups do not account for all of the positive STD diagnoses in the last year and Chlamydia tests in the NSAM. For instance, some men in both low risk groups test positive for Chlamydia at rates comparable to men in the ‘risky partners – high protection’ cluster. Although not statistically significantly different across these three groups and most likely an artifact of the notably smaller group membership for this high risk group, the non-zero STD results for low risk groups cannot be ignored. This further emphasizes the point that low risk does not equate to no-risk. The ‘no heterosexual sex’ group does evince the lowest risk among the five groups.

To further validate the power of our high risk clusters in predicting self-reported and actual STD

infection, we examine cluster membership across the three waves of data. We created four categories using respondent risk group membership in all three waves. For the 1,290 respondents who participated in all three waves, we determined whether the respondent was (a) always in one of the three lower risk groups (no heterosexual sex, low risk – high protection, low risk – low protection), (b) ever in the “risky partners – high protection” group without ever being in the other high risk group, (c) ever in the “many partners – some protection” group without ever being in the other high risk group, or (d) ever in both high-risk groups over the three survey waves. Then, we assessed the percent in each group who was ever diagnosed with an STD by 1995, diagnosed with an STD within the last year, and tested positive for Chlamydia via urine analysis. These results and statistically significant group differences are denoted by superscript letters in Table 6.

 Insert Table 6 about Here

A majority of young men do not have membership in either high-risk group during any of the three waves. Over 50 percent of young men who participated in all three waves were always members of one of the three lower risk groups, and this group of men report the lowest STD diagnoses by 1995 and within the last year. Nearly five percent of men in the “always in a low risk group” tested positive for Chlamydia, reconfirming that low risk does not mean lack of risk.

Nearly 40 percent of men participating in all three waves, however, were members of the “many partners – some protection” group at some point between 1988 and 1995 and nearly one-third of these men reported ever being diagnosed by a doctor with an STD by 1995, nearly four percent had been diagnosed within the last year, and three percent tested positive for Chlamydia. Less than six percent of men were ever members of both high risk groups; yet, one-in-five reported ever being diagnosed with an STD, nearly five percent had been diagnosed within the past year, and over 10 percent tested positive for Chlamydia.

Men with membership in *both* high-risk groups have significantly higher reports on all three STD

measures relative to men who always have low risk membership and men who have only been members of “risky partners – high protection.” Men with membership in “many partners – some protection” have significantly higher reports on two of the three STD measures relative to both men only in low risk groups and men only in “risky partners – high protection.” These findings support the theory that compounding and chronic risk-taking is related to higher infection histories and current infection status.

Trajectories of Risk for HIV/STD Transmission

To further elaborate on the four group membership (e.g., ever in one or more high risk groups) presented above and in Table 6, we explored lifetime STD status (ever diagnosed with an STD by 1995) for risk-group transitions across all three waves. Overall, there are 85 possible trajectories across the three waves. By tracing membership stability in and shifts among risk groups as young men move from adolescence into early adulthood, we take full advantage of the longitudinal nature of the NSAM for men who participated in all three waves. These HIV/ STD risk trajectories are defined by movements into and out of the five risk groups over the three waves of the survey.

We highlight three findings (not shown). First, there are many trajectories. In total, 39 trajectories characterize 90 percent of the men. In contrast to other work on the sequencing of statuses (24), we do not observe a large plurality (20 or 30 percent) of men falling in one or two common trajectories that might therefore be described as normative. The largest group we observed (not engaging in heterosexual sex in 1988 and 1991 and then being in “low risk, high protection” in 1995) only characterized 7.4 percent of the men and the percentages fall off quickly for subsequent trajectories. General patterns do emerge even though individual trajectories are small in size. Eight out of ten of the largest trajectories have only low-risk group membership across the three waves, and men in these trajectories constitute approximately 41 percent of the sample. A total of 17 percent of the sample delayed heterosexual sex for at least two waves. It is important to note that high-risk sexual activity did occur. Nearly 10 percent of the sample (two of the top ten most common trajectories) have memberships in “risky-partners high-protection” during either the first or second wave.

Second, turning our attention to cumulative history of STDs, we confirm the results shown in

Table 6 that ever being in one of the two higher risk groups is associated with STD risk. This is evident in the fact that nine of the top 12 transitions with high levels of STD experience reported membership in at least one high-risk group at some point in the survey.

Third, there is some evidence for a dose-response association between the behavioral risk-groups and STD status. Those who are characterized as high risk in all three waves of the survey and those who have high risk membership in 1991 and 1995 report the highest levels of experience with STDs by 1995.

Discussion

Effective strategies to reduce HIV and STD risk in young men must consider several dimensions of sexual behavior, including condom use, partner concurrency, the number and frequency of sex partners, and the types of sex partners whom men choose. Men's level of risk in one of these dimensions does not necessarily reflect risk in another dimension, and thus changing one set of risky behaviors does not necessarily change behaviors in other areas.

Our findings suggest there is a subgroup of men who have sex with "risky partners" and also use condoms quite frequently with these partners whereas another subgroup of men engage in multiple partnering—sex with strangers, concurrent partners, and many partners – and tend to use condoms with substantially less frequency. In short, we found that the two high-risk groups were distinct and should not be considered 'equal' in terms of STD/HIV outcomes. Both high risk groups are characterized by higher reports of STDs relative to low risk groups; but, men with membership in "many partners – some protection" for one or more waves report markedly higher past and current STD diagnoses.

Even though two groups are interpreted as low risk, men in these groups continue to experience STDs, and what is most alarming is the fact that a non-negligible percent of them tested positive for Chlamydia and reported not being diagnosed by a physician in the past or in the last year. These men are carriers of STDs without considering themselves at risk or presenting symptoms and their partners or their behavior may be more risky than they perceive and report. Efforts to reduce HIV and STD risk should focus on a different mix of strategies—e.g., increasing condom use, changing partner selection, and reducing the number of sexual partners—for different groups of men.

Refinement of Safe-Sex Messages

The results of this study suggest that safe-sex messages should not only include recommendations for consistent condom use but should likewise highlight the need to be aware of how the number and types of partners with whom a person has sex influences their level of risk for sexually transmitted infections. If we consider condom use recommendations as the central safe-sex message in the past and present, this study uncovers both good and bad news with respect to men's sexual behaviors during adolescence and across the transition into adulthood.

First, the condom use safe sex message seems to be reaching most of the people who need it with the unfortunate caveat that men in the "risky partner – high protection" group are not applying this message to a significant minority (17%) of their sex acts. This risky partner group comprises about one-fifth of the sample through age 21. Based on these findings, the following refinement of safe-sex messages may be necessary for these men. Men with risky partners have done fairly well with condom use practices, but they must do even better. Even if they use condoms 80 percent of the time, the 20 percent of the time they do not is putting them at high risk, given the nature of their partners.

Second, condom use messages seem to fall short with men in the "many partners – some protection" group. Well over half of the sexual acts of these men do not involve condoms. These men are exposed to two sources of risk: numerous partners and condom non-use. These findings support the following recommendation for safe-sex messages. For men who are having sex with many partners, some have adopted the message about using condoms; but, the majority of them have not. The reasons for the lack of condom use among this risk group need to be explored and addressed.

Third, across adolescence and into adulthood, men transitioned from high risk groups to low risk groups and vice versa. The overarching trend is a downward shift in risk for men across development. Conversely, albeit smaller in magnitude, men transitioned from low risk into high risk groups over time. It is important to recognize that even though some groups of men would differentially benefit from various safe-sex messages, the fact is that these men most likely will shift in their membership among the groups and would benefit greatest from messages about safe sex that address numerous dimensions of

risk.

Future Directions

Effective STD and HIV program design and evaluation can be guided by the notion that sexual behavior is dynamic, with some men showing higher risk in adolescence, and others showing higher risk in adulthood. In our analysis of NSAM data, more than five percent of men who engaged in relatively low risk behaviors in their late teens had moved to fairly persistent levels of high risk by their early twenties and an additional 3.5 percent engaged in high risk both in 1988 and 1995. Addressing risk in teenagers does not necessarily guarantee that risk behaviors will not increase in early adulthood. Given our findings, young men who practice at least one dimension of the two safer sex behaviors, having fewer partners and/or using condoms consistently – fare better than men who adopt neither dimension (members of the “many partner – some protection” group). Young men who adopt both dimensions in their sexual practices across multiple time points appear to fare the best with respect to STD outcomes. Questions for future research remains: what are the barriers to young men adopting both messages; how do these barriers differ across various groups of men, and how can these be successfully addressed?

Limitations and Contributions

The longitudinal nature of the NSAM is both a strength and limitation. It allows us to assess stability and change over the developmental course from adolescence into adulthood. But, we also recognize that a substantial proportion of the original sample was lost to follow-up in Waves 2 and 3. Although we used weights to adjust not only for sampling and design effects but for selective attrition, some of our cell-sizes for high risk groups were quite reduced by 1995. This reduction in power resulted not only from attrition but also from natural developmental processes as young men ‘age out of risk.’ We, however, found meaningful and significant patterns in young men’s sexual practices that apply to prevention and intervention efforts that we believe will contribute to moving the field forward and potentially resulting in STD risk reduction for young men. Next logical steps to add to these longitudinal analyses of sexual practices would be to use risk clusters at earlier waves to predict STD status at later waves and to examine whether and how age and race/ ethnicity influence the results we found for the total

sample. Both sets of analyses were not included in the scope of this paper, but lend themselves to future inquiry.

The last round of interviews with men in the NSAM was in 1995. Potentially, the results we report may not apply to more recent cohorts. We, however, are able to compare our 21-26 year-olds to men of the same age in 2002 in the National Survey of Family Growth (NSFG). We found that men in 2002 reported an average of 1.9 female sexual partners in the last 12 months. After weighting for attrition and oversampling, the 1995 cohort of men in NSAM reported 2.0 female partners in the last 12 months. This similarity suggests that there may be applicability of our trajectory results to later cohorts. The forthcoming fourth wave of NSAM currently in the field will allow us to continue examining these trajectories into middle adulthood.

These analyses are intended to help health and other professionals design and evaluate effective strategies to reduce HIV and STD risk in young men. Our findings demonstrate the need for effective programs to consider a range of risk behaviors—rather than a single indicator—in both their design and evaluation. The findings also demonstrate the need to conceptualize and measure risk behavior as a dynamic process that changes over a young man's life course.

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Table 1: Sexual Risk and STD Variables by Wave - Weighted

	1988 Wave 1 (age 15-19)	1991 Wave 2 (age 17-22)	1995 Wave 3 (age 21-26)
Share Who Had No Heterosexual Sex (%)	612 (39.6%)	222 (16.2%)	67 (5.9%)
Sexual Risk Measures Among Sexually Experienced Men:	657	1230	1243
1. Share with one or more sexual partners known less than one day at first intercourse (%)	1.0	1.8	0.6
2. Female Sexual Partners in Last Year (mean number)	1.1	2.4	2.0
3. Share with One or More Risky Partners in the Last year (%)	1.7	2.5	1.3
4. Share with 2 or More Concurrent Partners for at Least One Month in Last Year (%)	13.0	20.2	13.0
5. Unprotected Sex Acts (mean %)	24.3	48.9	59.0
Measures of Sexually Transmitted Diseases:	657	1230	1243
1. Ever Diagnosed with an STD by Wave (%)	1.7	6.6	11.5
2. Diagnosed with an STD in the Last Year (%)	--	--	1.3
3. Tested Positive for Chlamydia (%)	--	--	3.6
Number of Cases Used in Cluster Analysis	1269	1452	1310

Table 2: Sexual Risk Variables by Risk Group across All Waves – Unweighted Descriptive Statistics

Sexual Risk Variables within the Last Year	Risk Groups					Total
	No Heterosexual Sex	Low Risk - High Protection	Low Risk - Low Protection	Risky Partners - High Protection	Many Partners - Some Protection	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Partners Knew Less than One Day (#)	0 (0)	0.0 (0.2)	0.1 (0.3)	0.1 (0.3)	0.4 (0.8)	0.1 (0.4)
Female Sexual Partners (#)	0 (0)	1.4 (1.2)	1.7 (1.3)	1.9 (1.7)	7.4 (7.0)	2.1 (5.4)
Risky Partners (#)	0 (0.1)	0 (0)	0.3 (0.4)	1.1 (0.3)	0.6 (0.6)	0.4 (0.5)
Months with 2 or more Partners (#)	0 (0)	0.3 (0.8)	0.4 (1.0)	0.4 (0.9)	7.5 (3.6)	1.1 (2.7)
Unprotected Sex Acts (%)	0 (0)	14.7 (19.0)	93.2 (11.0)	17.0 (25.3)	61.3 (33.9)	42.0 (42.0)
% total observations in cluster	18.3	24.5	28.8	18.6	9.8	

NOTE: N= 4,927 observations across the three waves of data

Table 3: Risk Group Distribution by Wave – Weighted

Risk Group	1988 Wave 1 (age 15-19) N=1875	1991 Wave 2 (age 17-22) N=1675	1995 Wave 3 (age 21-26) N=1377
	%	%	%
No Heterosexual Sex	39.6	16.2	5.9
Low Risk - High Protection	18.8	20.9	37.0
Low Risk - Low Protection	17.3	30.7	48.3
Risky Partners – High Protection	19.8	22.0	2.2
Many Partners - Some Protection	4.5	10.2	6.7

NOTE: With respect to risk group sizes, we want to acknowledge the relatively small group sizes for “no heterosexual experience” in 1995 (N=67) and “risky partners – high protection” in 1995 (N=45). We are mindful of these relatively small group sizes when interpreting the results.

Table 4: Transitions Across Groups for Consecutive Waves – Weighted Percents

Risk Group Membership in 1988 - Wave 1 (age 15-19)	Percent in Group in 1991 - Wave 2 (age 17-22)					Total in 1988
	No Heterosexual Sex	Low Risk - High Protection	Low Risk - Low Protection	Risky Partners - High Protection	Many Partners – Some Protection	
No Heterosexual Sex	39.0	20.6	17.4	21.5	1.5	40.3
Low Risk - High Protection	0.3	37.4	28.4	21.3	12.7	18.5
Low Risk - Low Protection	1.0	7.8	61.0	16.8	13.5	16.9
Risky Partners - High Protection	1.6	20.0	35.0	29.2	14.1	19.8
Many Partners – Some Protection	0.0	10.5	27.9	14.1	47.5	4.6
Total in 1991	16.3	21.0	30.8	21.8	10.2	
Risk Group Membership in 1991 - Wave 2 (age 17-22)	Percent in Group in 1995 - Wave 3 (age 21-26)					Total in 1991
	No Heterosexual Sex	Low Risk - High Protection	Low Risk - Low Protection	Risky Partners - High Protection	Many Partners – Some Protection	
No Heterosexual Sex	32.7	42.9	23.7	0.4	0.2	17.8
Low Risk - High Protection	0.0	44.9	50.5	0.4	4.2	21.3
Low Risk - Low Protection	0.0	21.4	67.2	2.9	8.5	30.0
Risky Partners - High Protection	0.2	49.8	37.6	4.1	8.3	22.4
Many Partners – Some Protection	0.0	25.7	55.3	2.5	16.5	8.5
Total in 1995	5.9	37.0	48.3	2.2	6.7	

NOTE: The sample size for the 1988 - 1991 transitions is 1671. The sample size for the 1991 - 1995 transitions is 1,290.

Table 5: STD Results by Wave 3 Group – Weighted Percents

Risk Group	1995 Wave 3 (age 21-26)	
	STD in the Last Year N=37	Positive Chlamydia Test N=68
	%	%
No Heterosexual Sex	0.0	0.0
Low Risk - High Protection	1.6 ^b	3.4 ^b
Low Risk - Low Protection	0.5 ^b	3.1 ^b
Risky Partners – High Protection	3.7	2.7
Many Partners - Some Protection	6.0 ^a	8.2 ^a
Total	1.3	3.6

NOTE: Different superscripts letters denote statistically significant group differences at $p < 0.05$. Hence, within the same column, groups with different superscripts differ from each other and groups with the same superscripts do not differ from each other.

Table 6: STD Reports by Status of Ever being in a High Risk Group – Weighted Percents

Status of Ever Being in One or More High Risk Groups	Full Data Subsample N=1290	1995 - Wave 3 STD Reports (age 21-26)		
		STD by 1995 N=229	STD in the Last Year N=36	Positive Chlamydia Test N=65
		%	%	%
Always in Low Risk	51.6	6.4 ^b	0.8 ^b	4.6 ^b
Ever in “Risky Partners – High Protection” High Risk Group Only	10.3	11.5 ^c	0.8 ^b	1.3 ^b
Ever in “Many Partners – Some Protection” High Risk Group Only	38.6	32.1 ^a	3.8 ^a	3.1
In both High Risk Groups	5.6	20.9 ^a	4.5 ^a	10.1 ^a
Total	--	11.5	1.3	3.6

NOTE: Different superscripts letters denote statistically significant group differences at $p < 0.05$. Hence, within the same column, groups with different superscripts differ from each other and groups with the same superscripts do not differ from each other.

Footnotes:

- * During the cluster analysis, we excluded 1991 data from two of the respondents due to extraordinarily high numbers of partners reported that would unduly influence analyses.
- ** In 1988, risky sexual partners include partners in the last year with whom the respondent had sex only once regardless of how long the respondent knew the partner prior to sex (hereafter "*one-time partners*"), prostitutes, intravenous drug users, and male sex partners. In 1991 and 1995, risky partners include one-time partners, prostitutes, solicitors (if the respondent himself was a prostitute), intravenous drug users, persons with HIV/AIDS, and male sex partners.
- *** The k-means procedure, part of the STATA software package, is an iterative partitioning cluster analysis method that arbitrarily assigns cases into a specified number (k) of clusters (Aldenderfer, M.S., & Blashfield, R.K. (1984) *Cluster Analysis*. Beverly Hills: Sage Publications). The centroids of the clusters are computed and Euclidean distances are calculated between the cases and the centroids. Cases are then moved from the cluster in which they were initially placed to the cluster with the nearest centroid. After reassignment, new centroids are computed and cases are again moved if there is a nearer centroid. This process continues until no more cases are reassigned.
- **** Initially we created clusters separately for each wave and, after examining descriptive statistics for each of the five measures used to create the clusters, we determined that the meaning of risk for each cluster changed across time. The meaning of risk changed over time in terms of mean values on all five variables defining the clusters. For example, in Wave 1 youth classified as 'high risk' had lower mean values on variables relative to 'high risk' cluster at wave 2. This meant that what was considered 'high risk' in wave 1 was considered less risky in wave 2. We decided to create the clusters using observations across all three waves because we wanted to ensure the mean value on the variables of interest were the same for each cluster across the waves. This allowed us to avoid calling 'low risk' men at wave 2 high risk at wave 1 because the clusters at different time points had the same mean values on the five variables.