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HIV Infection Treatment Costs Under Medicaid in Michigan

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Synopsis

The Michigan Medicaid Program payment records generated in the period 1985–89 by 783 persons were analyzed for services related to human immunodeficiency virus (HIV) infection. Other data from death records and the Michigan AIDS Surveillance Registry were available for a subset of those persons. The average monthly payment in 1989 dollars for HIV-related services was $1,302.57. Services determined to be unrelated to HIV infection accounted for 12.5 percent of the total amount for health care received and another 2.5 percent was questionable. The average monthly expenditure for men was roughly twice that for women. The discrepancy did not exist among persons identified in the AIDS Surveillance Registry. Sex differences ceased to exist when Medicaid eligibility (disability versus Aid to Families with Dependent Children) was controlled for by analysis of variance.

There were no significant differences between payments to those infected through male-to-male sexual contact and those infected through intravenous drug use. Payments for HIV treatments rose with age to about 40 years, and declined slightly among older adults. The sharpest rise was for those ages 19–25 years and 26–35 years. Large sex differences existed among those who received zidovudine (AZT), 61.4 percent of the men and 19.1 percent of the women. Controlling for Medicaid eligibility moderated those differences, but they remained statistically significant. Differences in zidovudine usage were not found between men and women in the subset identified in the AIDS Surveillance Registry nor among persons infected through male-to-male sexual contact and intravenous drug use.

As the number of people needing treatment for human immunodeficiency virus (HIV) infection grows, the total cost of their health services is increasing sharply. Treating all those with HIV infection nationwide in 1991 has been estimated to have cost $5.8 billion (in 1990 dollars) (*1*).

The financial and social impact of HIV infection will increase significantly in the near future with an estimated 1 to 1.5 million persons now infected (*2*) and with the long latency period of the disease. Whereas HIV infection in the past predominantly affected young gay men, it is now occurring in a much more diverse population. Death records indicate that HIV infection is the 10th leading cause of

Process of Record Selection for the Sample of 783 HIV-Infected Patients in the Michigan Medicaid Program, 1985–89

3,716	Identified in initial screen
945	ICD-9-CM code 42.XX to 44.XX or 279.19
814	Clear indication of HIV infection, based on review by registered nurse
843	29 identified from AIDS Surveillance Registry, but with no clear indication of HIV infection, based on review by registered nurse
783	Received Medicaid-paid services for at least 2 months in period
759	Received Medicaid-paid services after zidovudine became available through the program in April 1987 (used in analyses of zidovudine usage)

death among women of reproductive age. It is expected shortly to become the 5th leading cause (*3*).

Growing evidence points to significant differences in the amount and nature of the HIV-related health care that is being received by persons of differing demographic groups (*4–6*). With the advent of more effective treatment for HIV and its complications, access to appropriate care is critical.

In 1987 the Health Care Financing Administration estimated that about 40 percent of all persons with acquired immunodeficiency syndrome (AIDS) were being served at any one time by the Medicaid Program (*7*). With a growing number of women and intravenous drug users (IVDUs) of both sexes becoming infected with HIV, the proportion of HIV-infected persons receiving their health care through Medicaid is likely to increase.

In this investigation, we focused on the health care costs and use of services by HIV-infected persons in the Michigan Medicaid Program. Michigan Medicaid payment records and data obtained from the Michigan AIDS Surveillance Registry and Michigan Death Registry were analyzed. The study was an extension of an earlier study of HIV-related health services provided through the Michigan Medicaid system (*4*). We addressed the following issues:

1. How much HIV-related health care was used by patients in the Michigan Medicaid Program and what did it cost? What percentage of the health care received by HIV-infected persons was treatment for HIV or complications of HIV? What was the cost of treating people for HIV prior to and after they were diagnosed with AIDS, as defined by Centers for Disease Control (CDC)?
2. Were there differences in HIV-related health care payments among sex, racial, age, and risk groups or by the program through which a person gained Medicaid eligibility?
3. What percent of HIV-infected persons had received zidovudine? Did use of zidovudine differ among demographic groups and Medicaid eligibility categories? How much was spent for zidovudine?
4. How was HIV-related health care distributed across the major types of health care providers?
5. How was the intensity of HIV-related services distributed during the course of the infection?

Methods

Health care cost and utilization data were obtained from Michigan Medicaid payment records. Payment records were obtained for persons who received services in the period 1985–89. Each record contained information on a single health-related service that was billed to the Medical Services Administration. Included in the records were the type of provider, the date a service was provided, the primary and secondary diagnosis codes (using the International Classification of Diseases codes, ICD-9-CM [*8*]), an indication of the procedure that was performed, and the payment amount. Pharmaceutical records indicated the medicinal agent prescribed. The accompanying box shows the stages of the sample selection process.

All payment records processed from March 1987 through April 1989 were screened for diagnosis codes and prescribed drugs that suggested HIV infection. The screen included all immune deficiency, commonly HIV-related infections, and pharmacy payments for zidovudine or aerosolized pentamidine. The screen identified 3,716 persons. All Medicaid payment records for them generated in the period 1985–89 were retrieved by the Medical Services Administration. Demographic data for them, including date of birth, sex, race, and county of residence, were obtained from the Michigan Department of Social Services.

Payment data were merged with data from the Michigan Death Registry and the AIDS Surveillance Registry maintained by the Michigan Department of Public Health. To maintain confidentiality, their employees merged death records for those whose cause of death suggested HIV infection with records from the AIDS Surveillance Registry, using names and social security numbers. The combined

data set, stripped of personal identifiers, was given to the authors, who merged the data with payment record data. The merge was based on an identifier formed from a combination of date of birth, sex, race, and county of residence. The merge process identified 149 persons with payment records that suggested HIV infection, who were in the AIDS Surveillance Registry, and who had died as of January 1, 1990; 69 persons who were in the AIDS Surveillance Registry and had not died as of January 1, 1990; and 5 persons who had died but were not in the AIDS Surveillance Registry.

An initial review of a subset of the payment records for the Medicaid recipients identified by the screen suggested most had no firm indication of HIV infection. For this reason, only records of persons who had payments during the period 1985–89 for treatment of HIV infection (ICD-9-CM codes 279.19 and 42.XX–44.XX), or pharmacy payments for zidovudine, were selected for further review. While this secondary screen was narrow, we believed it was more useful to exclude records of subjects with HIV infection than to include those of some without HIV infection.

The process yielded a selection of the records of 945 persons. The payment records were evaluated by a registered nurse under the guidance of a physician who had experience with and knowledge of HIV infection. The nurse identified 814 persons for whom the payment records clearly indicated that they had received HIV-related services. Most of the 131 persons who were judged not to have received HIV-related services had payment records of an enzyme-linked immunosorbent assay (ELISA) test with a diagnosis code for HIV and no other indication of HIV infection. The diagnosis code reflects the practice, believed common, for health care providers to record the diagnosis that they are looking for, even though the results are negative, owing to their belief that the likelihood of payment will be increased. Another 29 persons were identified from the AIDS Surveillance Registry who did not have payment records with a diagnosis code for HIV infection or payments for zidovudine. They were added to the data set.

Based on the primary and secondary diagnoses, and the prescribed drugs and procedures, the reviewers separated the payment records into four service categories, as follows.

(*1*) Pre-HIV services, those provided prior to the first service determined to be HIV related;

(*2*) HIV-unrelated services, those determined clearly unrelated to HIV infection, but delivered after the first evidence of an HIV infection;

'Given the evidence of the effectiveness of zidovudine as a treatment for HIV, we need to identify why men are much more likely than women to receive it.'

(*3*) Possibly HIV-related services, those potentially related to an HIV infection;

(*4*) HIV-related services, those provided for conditions highly likely to be related to an HIV infection.

About 6,000 payment records were reviewed by a second reviewer. The agreement among the reviewers in coding the payment records into the four service categories was 87.6 percent. Service-related payments analyzed in the study were based on actual payments to providers. Payments were adjusted based on the medical portion of the consumer's price index in December 1989 dollars. To help control for the natural history of each person's HIV infection, average monthly costs and utilization amounts were considered. The numbers of services shown in this report reflect the number of payments for services within particular categories.

People who had received services for HIV infection for fewer than 2 months were not included in the analysis of cost and service utilization. Because there were relatively few non-black minority members identified, only whites and blacks were included in analyses involving race. Age at time of first HIV-related claim was categorized in five age groups, birth–18, 19–25, 26–35, 36–45, and 46 years and older. All statistical tests were performed at the $\alpha = 0.05$ level.

Results

The average monthly Medicaid payment prior to the first HIV-related service was \$261 ± \$803 (mean ± standard deviation). Subsequently, the payments were \$192 ± \$761 for HIV-unrelated services, \$38 ± \$270 for possibly HIV-related services, and \$1,303 ± \$2,082 for HIV-related services. The median monthly payments for HIV-unrelated services were \$15 and \$548 for HIV-related services. Fewer than half of the Medicaid recipients received pre-HIV and possibly HIV-related payments. After the first HIV-related payment, 12.5 percent of payments were coded HIV-unrelated, 2.5 percent as possibly HIV-related, and 85.0 percent as HIV-related.

Table 1. Monthly HIV-related payments under the Michigan Medicaid Program, 1985–89, by age group

Age (in years)[1]	Mean	SD	Median	Number of persons
Birth—18	$ 477	$ 898	$126	$130
19–25	596	1,218	110	72
26–35	1,302	1,691	685	301
36–45	1,864	2,838	937	223
46 and older	1,516	2,034	761	52

[1] Ages of 5 persons were not available.
NOTE: SD = standard deviation.

Table 2. Monthly HIV-related payments under the Michigan Medicaid Program, 1985–89, by risk group[1]

Risk group	Mean	SD	Median	Number of persons
Gay or bisexual	$2,212	$2,510	$1,521	86
IVDU	2,686	3,357	1,748	57
Gay IVDU	2,689	2,081	1,987	17
Hemophiliac	693	643	630	5
Heterosexual	5,401	4,375	4,622	6
Child	1,101	1,003	657	11
Unknown	2,350	1,433	1,753	7

[1] Designation of risk group for 594 persons was not available.
NOTE: IVDU = intravenous drug user.

Table 3. Monthly HIV-related payments under the Michigan Medicaid Program, 1985–89, for men and women, by Medicaid eligibility category[1]

Category	Mean	SD	Median	Number of persons
AFDC:				
Men	$ 538	$ 857	$ 234	74
Women	475	1,299	70	132
Disability:				
Men	1,779	2,399	1,023	381
Women	1,896	1,891	1,379	55

[1] Information on sex or eligibility category for 141 persons was not available.
NOTE: SD = standard deviation. AFDC = Aid for Families with Dependent Children Program.

There were 185 Medicaid recipients identified from the AIDS Surveillance Registry for whom a date of CDC-defined AIDS diagnosis was available. The average monthly payment for HIV-related services prior to the AIDS diagnosis was $1,279 ± $2,501, with a median monthly HIV-related payment of $290. The average monthly payment for HIV-related services after the AIDS diagnosis was $3,391 ± $5,292, with a median monthly HIV-related payment of $1,863.

An analysis of variance was used to assess demographic differences, such as race, sex, and age, in the size of HIV-related payments. Statistically significant age and sex differences existed in the size of payments. Race and the interactions among the factors were not statistically significant.

Table 1 shows the summary statistics in the payments for HIV-related conditions among the five age groups. The payments rose steadily with age through the 36–45-years-old group, declining slightly among older adults. Men received services costing an average of $1,522 ± $2,245 per month, with a median monthly cost of $792. Women received services costing an average of $777 ± $1,470 per month, with a median monthly cost of $119.

Information on mode of disease transmission was available from the Michigan AIDS Surveillance Registry for 189 persons. Table 2 shows a breakdown of the average HIV-related payments per month.

Records of a total of 52 men and 22 women showed IV drug use, including IVDUs and gay IVDUs, as the mode of HIV infection. The average monthly payment for male IVDUs was $3,001 ± $3,566 per month and $1,943 ± $1,278 for women. The differences were not statistically significant. The monthly median payment for men was $1,793 and $1,601 for women.

There were large differences in the cost of HIV-related health services among those who became eligible for Medicaid through disability and those who became eligible through Aid to Families with Dependent Children (AFDC). Since women were more likely than men to be eligible through AFDC, an analysis of variance was conducted with eligibility and sex as factors and monthly HIV-related payments as a dependent variable. Eligibility was significant while sex and sex by eligibility were not. Table 3 shows the average monthly payments for men and women in the two eligibility categories.

Zidovudine was approved as a treatment for HIV infection by the Food and Drug Administration in April 1987. A total of 759 of the 783 recipients received at least one Medicaid-paid service after April 1987 and theoretically they could have received zidovudine through the Medicaid Program. Of them, 61.4 percent (308 of 502) of the men had received at least one Medicaid paid prescription for zidovudine, compared with 19.1 percent (49 of 257) of the women. Of the 66 recipients whose records listed IV drug use as the mode of transmission and who had received services after April 1987, 53.3 percent (24 of 45) of the men had at least one Medicaid paid prescription for zidovudine, compared with 47.6 percent (10 of 21) of the women. The average monthly payment for zidovudine was

Table 4. HIV-related payments and claims under the Michigan Medicaid Program, 1985–89, by major provider types and by sex of patient[1]

Category	Payments (dollars)			Number of claims		
	Mean	SD	Median	Mean	SD	Median
Physician:						
Men	$ 126	$ 215	$ 29	1.89	2.40	1.14
Women	76	158	15	1.13	1.66	0.54
Home health:						
Men	22	71	0	0.09	0.24	0.00
Women	13	47	0	0.06	0.16	0.00
Pharmacy:						
Men	156	212	84	2.43	2.44	1.82
Women	35	65	9	1.38	1.82	0.66
Outpatient:						
Men	60	108	31	2.76	3.56	1.57
Women	32	55	12	1.33	1.81	0.64
Inpatient:						
Men	1,096	2,006	355	0.14	0.18	0.08
Women	553	1,072	0	0.07	0.13	0.00

[1] Sample was 519 men and 259 women. Sex of 5 persons was not available.

$422 ± $352. The median monthly payment for those receiving zidovudine was $319.

Among those who became eligible for Medicaid through AFDC, 38.0 percent (27 of 71) of the men and 9.8 percent (13 of 132) of the women had received zidovudine. Among those who became eligible owing to disability, 68.9 percent (253 of 367) of the men had received zidovudine, compared with 45.3 percent (24 of 53) of the women. Fitting a loglinear model indicated significant effects for sex and program; however, the interaction between sex and program was not significant.

Table 4 shows the average monthly payments and number of claims filed for men and women in five major provider types. The bulk of the costs associated with treating persons with HIV infection was for inpatient hospital services. Among men the next highest cost was for pharmaceuticals. Among women, physician fees were the next largest expense. Relatively little was spent on home health care for either men or women.

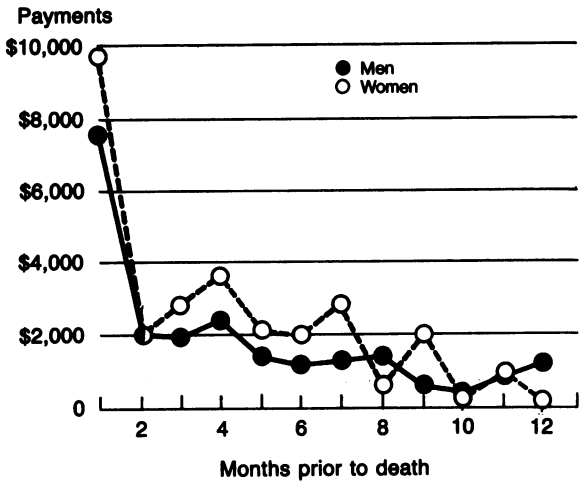
Of the 149 persons for whom death records were available, 122 (100 men and 22 women) received Medicaid-paid services for at least 12 months prior to death. The figure shows their average HIV-related Medicaid payment per month for each month prior to death. A repeated measures analysis of variance was used to test for differences in payments across the months prior to death for men and women. There was no statistically significant effect for sex or for time by sex. There was a statistically significant time effect.

While women tended (the difference is not statistically significant) to use more HIV-related services than men during the 7 months before death, sex was completely confounded with race in the data set. All 22 women for whom death records were available were black. That does not reflect the racial makeup of the total sample of females. In the total sample of women who were Medicaid recipients with HIV-related payments, 94 (36.3 percent) were white, 152 (58.7 percent) were black, and 13 (5.0 percent) were of other races. The racial distribution for men among the subset for whom death records were available was similar to the total sample of men. Among the men for whom death records were available, 48 (48.0 percent) were white, 51 (51.0 percent) were black, and 1 (1.0 percent) was of another race. For the total sample of men, 279 (53.9 percent), were white, 211 (40.7 percent) were black, and 28 (5.4 percent) were of other races.

Discussion

The findings indicate that HIV-related health care provided through the Michigan Medicaid Program costs about $1,300 per month per person, an amount substantially lower than other estimates (*9*). There were a number of possible explanations for the differences. Our data were from a fixed period and included many persons who were still in the early stages of infection at the end of the data collection period. The protocol excluded the high costs associated with the end stages of the disease for a portion of the sample. The difference was highlighted by the differences in the average monthly payments before and after an AIDS diagnosis among those identified in the AIDS Surveillance Registry.

Average monthly HIV-related payments in year prior to death, sample of 759 HIV-infected patients in the Michigan Medicaid Program, 1985–89



There were regional variations in the cost of health services. Health care in Michigan tends to be relatively inexpensive. Medicaid tends to reimburse at a lower rate than commercial insurers. Our estimates included only payments judged to be HIV-related. Many estimates of the cost of treating HIV were based on the total amount of health care received, and generally only after the recipient had been diagnosed with AIDS.

Most estimates of the cost of treating HIV or AIDS did not reflect the fact that some of the health care received by people with HIV infection was unrelated to HIV. For some persons, hemophiliacs for example, health care for non-HIV-related factors is quite substantial. Based on a review of the payment records, on average, 12.5 percent of the cost of the health care received by patients after their first HIV-related service was unrelated to HIV and another 2.5 percent was questionable. Policy analysts evaluating the costs of treating HIV infection should consider the possibility that estimates based on the total cost of health services received by HIV-infected persons may be inflated as much as 12 to 15 percent by costs unrelated to HIV.

The number of services and their costs differed sharply among age and sex groups. The costs of treating HIV infection rose steadily through middle age and declined for older adults. There was a large increase in the cost and the number of services for the 19–25-year-old through the 26–35-year-old groups. Because of the median period of 9.2 years for seropositive adults to develop the AIDS stage of the disease (*2*), the large increase in health service usage may reflect those who were infected during young adulthood and became seriously ill in their late twenties and early thirties.

The results of the study confirm the discrepancy between men and women in the number and cost of HIV-related services identified in our study of 1984–87 Medicaid payment records (*4*). We hypothesize, based on the results of our earlier work, that the large discrepancy in health services use observed between men and women is attributable to differences between gay males and IVDUs of both sexes (*10*). Owing to the epidemiology of AIDS, the majority of men in that study were gay and the majority of women were either IVDUs or the sexual partners of IVDUs (*11*). We had no direct way of testing the hypothesis based on data from our earlier study.

In our later data set, information on risk groups was available on a subset of those who were identified in the AIDS Surveillance Registry. We compared both those in different risk groups and men and women who were IVDUs. Gay or bisexual men received slightly more services per month costing slightly less than did IVDUs of both sexes. Men who were IVDUs received slightly fewer services than female IVDUs; however, the costs associated with those services were higher for men, although the difference was not statistically significant. In summary, the limited data available did not tend to support the hypothesis that sex differences in service usage were in fact a proxy for differences in service usage between gay males and IVDUs.

Note that those for whom risk group identification was available had CDC-defined AIDS. While the substantial differences in use of services between men and women existed during early stages of infection, they tended to disappear in late stages of the disease. This seemed to be the case in terms of access to zidovudine.

While there were large differences in the percentages of men and women receiving the drug in the total sample, virtually the same percentage of men and women in the AIDS surveillance registry had received the drug. Men (or possibly gay men) may be more aggressive about seeking health care than women or IVDUs and more compliant in following prescribed treatments while they are relatively free of the symptoms and complications of AIDS. In the late stages of the infection, when symptoms are severe enough for them to be forced to seek medical attention, the differences between the demographic groups may tend to disappear.

The finding of no statistically significant differences in payments when men and women were compared month by month backwards in time from the date they died tends to support this hypothesis. Again, this analysis was based on the subset of those for whom death records were available and sex was confounded with race.

The way in which a person became eligible for Medicaid was highly related to the amount of health care they received for HIV treatment. Those who became eligible for Medicaid because of disability tended to use more than three times the amount of services in terms of cost than did those who became eligible through AFDC. After controlling for eligibility using analysis of variance, the sex differences in cost disappeared. The reason a person became eligible for Medicaid likely is related to the severity of their illness. While the records of all those in the sample had clear indications of HIV infection in the health services that they received, those who were eligible because of disability may have had a more advanced infection than those who became eligible through the AFDC Program.

As was found in our earlier analyses of Michigan Medicaid data, as well as by Scitovsky and coworkers (*12*), the cost of treating HIV rises drastically just prior to death. Disease stage clearly plays a major role in the costs of treating HIV infection. While not surprising, that factor suggests that estimates of the costs of treating HIV infection need to take it into account. To the extent possible, cost data from the full course of the disease should be used as a basis for determining lifetime costs and the impact of increasing survival time on the costs of treating HIV.

As noted, there was a disturbing sex difference in the use of zidovudine. The percentage of men who had at least one pharmacy payment for zidovudine was three times as high as the percentage for women. Zidovudine usage among men in the sample was fairly consistent with the percentage of persons with AIDS taking zidovudine nationwide (*9*).

Owing to recent evidence of the efficacy of zidovudine among asymptomatic persons with HIV infection, access to zidovudine in the early stages of infection is a critical concern (*13*), and further research into causes of the discrepancies is needed. Eligibility was related to whether a person received zidovudine through the Medicaid system. While those who became eligible because of disability were more likely to have received zidovudine, men were more likely than women to have received zidovudine within each of the eligibility categories.

The size of payments for men were about twice those for women in all provider categories. Proportionately the largest sex difference is for pharmacy payments. The difference may, in part, reflect the fact that a much higher percentage of men received zidovudine than did women. Payments for inpatient services accounted for the bulk of the cost of treating HIV as well as the bulk of the absolute dollar difference in payments found between men and women.

As noted, large sex differences in HIV-related health care were observed in our earlier study (*4*). We tried to explain the sex differences in this study using the expanded set of payment records and the additional information from death records and the Michigan AIDS Surveillance Registry. The sex differences however, persisted, and we were unable to provide a clear-cut explanation of their cause. Although not conclusive, there was evidence of differences in disease stage that may explain observed sex differences in cost and service usage. There was evidence that differences between men and women, and possibly between gay men and IVDUs, tended to be more extreme during the earlier stages of infection.

Differences in disease stage do not appear to provide as good an explanation for the differences in access to zidovudine. While the sex difference in access to zidovudine was moderated by controlling for eligibility criteria, it was still large and statistically significant. Only among the small subset of the sample that was identified in the AIDS Surveillance Registry was the percentage of women receiving zidovudine similar to the percentage for men. There is a growing amount of evidence that zidovudine treatment increases survival (*14–17*) as well as the quality of life (*18*) of those with HIV infection. Given the evidence of the effectiveness of zidovudine as a treatment for HIV, we need to identify why men are much more likely than women to receive it.

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Inappropriate Lubricant Use with Condoms by Homosexual Men

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Synopsis

Use of condoms has been advocated as an important method of reducing the risk of human immunodeficiency virus (HIV) transmission among high-risk groups such as homosexual and bisexual men, prostitutes, intravenous drug users, adolescents, and hemophiliacs. Despite risk-reduction education campaigns directed to gay men since the early 1980s, evidence shows continued deficits in condom-use skills and knowledge among gay men. Because most failures in the use of condoms are attributed to errors in use, increasing knowledge and skills in condom use is important in preventing HIV infection.

Two groups of homosexual and bisexual men were sampled, those entering a risk-reduction education program and participants in a Gay Pride event. They were surveyed on their current sex practices and their efforts to reduce their risk of HIV infection. They were asked about their numbers of sex partners, specific sexual behaviors, use of condoms, types of condoms used, and lubricants used for genital-anal sex. The characteristics of those surveyed were similar to those of respondents in other studies of risk reduction among gay men.

The use of an oil-based lubricant with condoms has been shown to weaken latex and to increase the likelihood of condom breakage, which use of water-based lubricants does not. Among respondents who reported having genital-anal sex, 60 percent reported use of an oil-based lubricant with a condom at least once during the year before the survey. Gay men in sexually exclusive relationships