

A black and white photograph of two men from the waist down, wearing plaid shirts and jeans, holding hands. The background is a textured, light-colored surface.

HIV Behavioral Surveillance in the Denver Metro Area

Understanding HIV Risk
and Prevention Behaviors
Among Gay, Bisexual,
and Other Men Who
Have Sex With Men



Colorado Department
of Public Health
and Environment

DENVER
HEALTH



Michael B. Hancock
MAYOR



City and County of Denver

OFFICE OF THE MAYOR
CITY AND COUNTY BUILDING
DENVER, COLORADO • 80202-5390
TELEPHONE: 720-865-9000 • FAX: 720-865-8787
TTY/TTD: 720-865-9010

July 18, 2014

Dear Neighbors,

For the first time since the beginning of the HIV/AIDS epidemic, an AIDS-free generation is within our reach. In Denver, the number of new HIV infections has been steadily declining over the past several years. This is an encouraging trend.

As more and more people are tested for HIV and those who are infected are treated, we will get closer and closer to zero new infections. Treatment not only prevents the spread of the virus, but it also gives a person who has the virus the ability to live a long and healthy life.

This report provides a comprehensive assessment of HIV risk behaviors and HIV prevention utilization of some of our citizens. By identifying those most likely to be at risk for HIV, prevention and testing efforts can be maximized by focusing on those at highest risk.

Over the past three decades, far too many lives have been lost to AIDS. I lost my own brother to AIDS in 1996. Things have changed since then, and the end of the AIDS epidemic is now truly in sight. I urge each of you to get tested and encourage your family and friends to get tested.

Respectfully,

A handwritten signature in blue ink, appearing to be "Michael B. Hancock", written over a circular blue stamp or seal.

Michael B. Hancock
Mayor

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ACKNOWLEDGEMENTS

This study was completed by the joint efforts of many individuals at Denver Public Health, with contributions from the Colorado Department of Public Health and Environment and the University of Denver.

Denver Public Health

Alia Al-Tayyib, PhD, NHBS Principal Investigator

Charles Chen, Field Supervisor

Toby LeRoux, Field Supervisor

Theresa Mickiewicz, MSPH, Data Manager

Mark Thrun, MD, Director of HIV/STD Prevention and Control

Colorado Department of Public Health and Environment

Ralph Wilmoth, MPH, MPA, [former] STI/HIV Section Chief

University of Denver

N. Eugene Walls, PhD, Ethnographer for NHBS-MSM3

Eric Benotsch, PhD, Ethnographer for NHBS-MSM2

Thanks to the following individuals for their data collection efforts

Stuart Cooper, Alex Delgado, Marshall Gourley, Katie Langland, Emerson Easley, Steven Linenberger, Joseph Longo, Vincent Rietmeijer, Diana Scott, Ernest Vang, Dan Drabik, Daniel Olameda, Don Pults, Brandy Walega, Jennifer Woodard, Andrew Roice, Scott Harris, Aleana Williams, Allison Holden, Beau Laurence, Brandon Brooks, Cleo Lucas, Curtis Fischer, David Lipson, Faustino Payan, Isabell Pacheco, Kelly Costello, Kim Farely, Laura Ginnett, Nina Xiong, Stephanie Edwards, Vicente Alfonso, Amy Siders

This report was prepared by Tara Wass, Kaia Gallagher, and Sarah McGuire at the Center for Research Strategies.

EXECUTIVE SUMMARY

In alignment with the National HIV/AIDS Strategy, Denver Public Health (DPH) is committed to reducing the number of new HIV infections, improving health outcomes for people living with HIV, and reducing HIV-related health disparities. As part of the National HIV Behavioral Surveillance System (NHBS), DPH has compiled behavioral surveillance data since 2004 for three populations most at risk for HIV infection: gay, bisexual, and other men who have sex with men (collectively referred to as MSM), injection drug users (IDU), and heterosexuals at increased risk for HIV (HET).

In collaboration with the Centers for Disease Control and Prevention (CDC) and the Colorado Department of Public Health and Environment (CDPHE), DPH uses NHBS data to monitor HIV prevalence, HIV risk, and HIV-related prevention behaviors in populations heavily affected by HIV.

In Denver, new cases of HIV infection have steadily decreased since 2005. However, the number of those living with HIV and AIDS is at an all-time high. MSM represent approximately 75% of those infected with HIV. Between 15 to 20% of those infected are unaware of their infection. Our goal is to identify and offer testing to those most at risk for HIV in order to increase awareness of infection status. In doing so, we can link HIV-positive individuals to HIV care providers who can help them live long, healthy lives. In addition, identifying those unaware of their HIV infection helps prevent future HIV transmission.

In this report, we highlight findings from three cycles of data collection within the MSM community in the Denver metropolitan area from 2005, 2008, and 2011. We note areas where we have been successful as well as challenges we face in addressing the needs of MSM. We also identify the following trends in MSM risk behavior:

- Condomless anal sex between MSM is the sexual behavior most associated with risk of HIV transmission. While just over half of MSM (51.2%) reported having condomless anal sex in 2005, more than two-thirds (67.6%) of those surveyed in 2011 reported this behavior, a significant 32% increase.



- There has been a significant increase in the percentage of MSM who report having had sex with more than three male sex partners in the past 12 months. In 2005, 43.7% of MSM engaged in sex with more than three male sex partners. By 2011, 52.7% of MSM indicated that they had three or more sexual partners in the past 12 months, a 21% increase.
- Despite these changes in risk behavior, the HIV prevalence was similar for the years in which HIV testing was conducted as part of NHBS: 16.9% in 2008 and 16.3% in 2011.

To examine patterns of risk, HIV negative MSM were placed into four risk group [greatest, high, moderate, and low] based on the number of risk behaviors they reported engaging in during the 12-month period prior to participating in the survey. Risk behaviors included:

- Condomless anal sex
- Receptive anal sex
- More than three male sex partners
- Injection drug use
- Methamphetamine use
- Not tested for HIV infection within the past 12 months
- Diagnosed with an STI in past 12 months
- Last sexual partner's HIV status was positive or unknown

Across the three cycles, the mean number of risk behaviors increased significantly from 2.21 in 2005 to 2.45 in 2008 to 2.58 in 2011 ($p < 0.001$). Collapsing across the three cycles, the number of risk behaviors ranged from 0 to 7 with an average of 2.4 risks reported (median = 2.0).

- MSM in the greatest risk group were almost twice as likely (40.5%) as other risk groups to report never testing or not testing for HIV within the past 24 months. By comparison, not testing or testing more than 24 months ago was reported by 28.9% of the high risk group, 22.1% of the moderate risk group and only 9.5% of the low risk group.
- MSM in the greatest risk group were less likely to have visited a health care provider in the past 12 months compared to MSM in the other risk groups. In 2005, 69.1% of MSM at greatest risk for HIV reported visiting a health care provider compared to 81.4% of MSM in the other risk groups. This discrepancy is compared to 64.9% vs. 79.3% in 2008 and 67.3% vs. 78.4% in 2011.

MSM at greatest risk for HIV infection were almost twice as likely as MSM at lower risk to report never testing or not testing for HIV within the past 24 months.

- Fewer than half of all MSM who saw a health care provider reported that the provider offered an HIV test at their last visit. MSM at greatest risk for HIV were the least likely to report that their provider offered them an HIV test during their last visit (25.0% in 2005, 31.1% in 2008, and 47.1% in 2011), however, this percentage increased over the years.

In response to these trends, key parts of our strategy to reduce the number of new HIV infections and improve health outcomes for those living with HIV include:

- Increasing opportunities for testing to enable those with HIV to know their status and link to appropriate HIV medical care.
- Encouraging MSM to assess their risk based on the eight risk behaviors outlined above and seek HIV testing as needed.
- Educating providers about the need to engage in conversations around HIV with their patients and offer testing when appropriate.



Vision for the National HIV/AIDS Strategy

The United States will become a place where new HIV infections are rare and when they do occur, every person, regardless of age, gender, race/ethnicity, sexual orientation, gender identity or socio-economic circumstance, will have unfettered access to high quality, life-extending care, free from stigma and discrimination.

In July 2010, the White House released the National HIV/AIDS Strategy,¹ a comprehensive roadmap for responding to HIV and AIDS in a broad-reaching and coordinated manner. The Strategy has three goals:

1. Reducing new HIV infections.
2. Increasing access to care and improving health outcomes for people living with HIV.
3. Reducing HIV-related health disparities.

Denver Public Health (DPH) is committed to addressing these goals through surveillance activities and by providing outreach, testing, and care services to residents living in the Denver metropolitan community. A first step toward slowing the spread of HIV and improving the health of people living with HIV is to understand trends in risk behaviors, HIV testing, HIV prevalence, and patterns of care-seeking among those most at risk for infection. Many Coloradans continue to bear the burden of HIV/AIDS, but gay, bisexual, and other men who have sex with men (MSM) remain the group most impacted.

According to the Colorado Department of Public Health and Environment, gay, bisexual, and other men who have sex with men (MSM), including those who have a history of injection drug use (MSM/IDU), have always had the greatest burden of HIV in Colorado, accounting for almost three quarters (73%) of the cases.²

As of December 2013, 12,623 Coloradans were living with HIV, with 302 individuals newly diagnosed in that year.³ Three-quarters (75%) of these individuals reside in the Denver metropolitan area (Adams, Arapahoe, Denver, Douglas, and Jefferson counties). Of those newly diagnosed with HIV in 2013, approximately 79% were MSM, including 6% who also reported injection drug use.

To monitor HIV trends, the Centers for Disease Control and Prevention (CDC) funds the National HIV Behavioral Surveillance (NHBS) system. NHBS was established in 2003 and is now conducted in 20 sites across the United States, including the Denver metro area. NHBS monitors risk behaviors and access to prevention services among three populations at high risk for HIV: MSM, injection drug users (IDU), and heterosexuals at increased risk for HIV (HET). Jurisdictions participating in NHBS conduct surveillance activities within these three populations on an annual rotating basis. In Denver, NHBS is locally known as REACH (Risk Education Aimed at Community Health).

The Colorado Department of Public Health and Environment (CDPHE), the state health department, receives funding from CDC to participate in NHBS and contracts with DPH, the local health department for the City and County of Denver, to conduct NHBS in the Denver metro area. Before each cycle, DPH conducts formative research to learn more about populations at risk for HIV and to inform data collection. Participants in each cycle complete a standardized anonymous questionnaire regarding HIV-related risk behaviors, HIV testing, and the use of HIV prevention services.

Since 2007, HIV testing has also been offered to all NHBS participants. DPH uses information from NHBS to guide prevention, HIV counseling, and testing services in the Denver metro area. Across the United States, CDC uses NHBS data to track behavioral trends and better understand patterns in HIV surveillance data.

By providing information on the following topics, NHBS offers a perspective on how risk behaviors are changing over time as well as whether groups at risk are utilizing prevention services:

- The prevalence and trends in sexual and drug-use risk behaviors
- The prevalence of, and trends in, HIV testing
- The exposure to, and use of, prevention services
- The impact of prevention services on behavior
- Missed opportunities for prevention
- The prevalence of, and trends in, HIV positivity
- Behaviors associated with HIV status

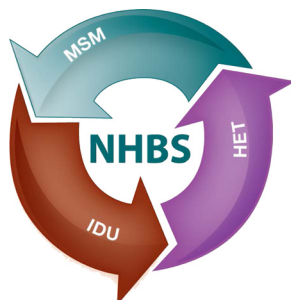
DPH relies on NHBS as the primary source of data for monitoring behaviors among populations at risk for HIV infection in Denver, including MSM. By examining NHBS behavioral data and HIV test results, DPH can describe HIV-related trends among MSM, including patterns in HIV risk and testing behaviors and gaps in prevention efforts.

NHBS data are used to provide a behavioral context for trends in HIV surveillance data. Through systematic surveillance in groups at increased risk for HIV infection, NHBS is critical for monitoring the impact of the National HIV/AIDS Strategy, which focuses on decreasing HIV incidence, improving linkage to care, and reducing disparities.⁴



The DPH team implemented NHBS among MSM living in the Denver metro area at three points in time: 2005, 2008 and 2011 [collectively referred to as MSM1, MSM2, and MSM3].

NHBS cycles among IDU occurred in 2006, 2009 and 2012, and HET cycles took place in 2007, 2010 and 2013. Data collected in these cycles allow DPH to monitor each at-risk population for trends in HIV risk behaviors, HIV testing, HIV prevalence, unrecognized HIV infection, and participation in prevention programs.



NHBS participants were not asked to disclose any personally identifying information other than their birth date and zip code. To be eligible for NHBS-MSM cycles, participants must be over 18 years of age, live within the targeted metropolitan area, report an assignment of male sex at birth, self-identify as male, and be able to complete the survey in either English or Spanish. Those who previously completed an NHBS survey were not eligible to do so again in that cycle. In 2011, participation was further limited to men who reported having oral and/or anal sex with another male in the past 12 months.

Using a standardized questionnaire designed by the CDC, trained interviewers conducted face-to-face interviews using a hand-held computer. All participants were offered a free, anonymous HIV test, the results of which were linked to the individual's survey responses. HIV testing was conducted in 2008 and 2011. In both cycles, DPH utilized oral fluid specimens for rapid and confirmatory HIV testing. Rapid testing was conducted in the field using the OraQuick ADVANCE[®] Rapid HIV 1/2 Antibody Test and confirmatory testing with Western Blot was performed by the CDPHE laboratory.

Sampling Method

Survey participants were recruited using a time-space venue-based sampling method. DPH team members started this process by identifying locations [venues] frequented by MSM including bars, dance clubs, fitness centers, parks, and restaurants. They then conducted initial interviews at prospective sites to determine the proportion of venue attendees who self-identify as MSM.

In 2005 and 2008, venues were included in the NHBS “venue universe” if at least 75% of attendees were MSM; in 2011 this criterion was changed to 50%.

Next, the team determined the best days of the week and times [typically in four-hour periods] for interviewing eligible men at each venue. This information was used to identify potential sampling events and a broader sampling frame. Events were selected at random from these choices. Non-random events were also conducted to ensure inclusion of specific sub-groups who could otherwise be missed. The DPH team completed an average of 14 sampling events in each month of data collection.

Data Collection

During sampling events, NHBS staff counted every person entering the venue who appeared to be male and at least 18 years of age. All men who entered a pre-determined area in the venue were approached to determine their interest in the survey. Men who accepted this approach were escorted to a private area where they were screened for eligibility; verbal consent for the study was obtained from eligible individuals. HIV testing was offered in 2008 and 2011, with consent documented separately from study consent. Information provided in the consent process included a brief description of the survey purpose, the HIV test process, and the incentives for completing the survey and the HIV test.

The survey included questions related to demographic characteristics, HIV testing experiences, sexual and drug use behaviors, other health conditions such as hepatitis and sexually transmitted infections, and use of HIV prevention services and programs. Those completing the survey received a \$25 gift card for their participation. Participants who consented to HIV testing received an HIV test, counseling, and an additional \$25 incentive. The survey and HIV testing process took approximately one hour.

Table 1. Number of Individuals Approached, Screened and Included in Report Analyses

	MSM1 [2005]	MSM2 [2008]	MSM3 [2011]
Approached	---	1580	1709
Screened	1,054	760	680
Reported male sex in past 12 months	869	545	547
Documented consent to survey	*	647	583
Documented consent to HIV testing	---	540	536
Complete records included in analysis	869	545	547

*During MSM1, informed consent was not obtained due to NHBS being considered public health surveillance and not research.



Participants

Table 1 presents the number of eligible MSM participants with complete records for each MSM cycle. Across the three cycles, data from a total of 1,961 participants are included in this report: 869 from MSM1 in 2005, 545 from MSM2 in 2008 and 547 from MSM3 in 2011.

Process indicator records available from MSM2 and MSM3 provide insight into the acceptability of NHBS among MSM [this information was not available for MSM1]. In MSM2, 45.4% of those approached about the study agreed to complete screening. In MSM3 39.7% agreed to be screened.



Across the United States, CDC reports that condomless anal sex among MSM increased from 2005 to 2011. In 2011, one third of HIV-positive MSM who did not know they were infected reported recent condomless anal sex with a partner who was HIV negative or of unknown status.⁵

In this analysis, we compiled survey data and HIV test results from the three MSM cycles into a single data file to allow comparisons across the three points in time. For example, participants surveyed in 2005 were asked a series of questions about their last main, casual, and exchange male sexual partners. In 2008 and 2011, participants were asked one set of questions about their last sexual partner (regardless of type). In the final merged file, last sexual partner (available in all data files) was extracted from the data file, while data on other sexual partners was excluded.

Thus, we accepted some loss of data in exchange for the substantial benefit of being able to examine trends in behavior over time. Not all important variables could be aligned across the three cycles because some questions were not asked in each cycle and other questions were asked in a manner that could not be reconciled across all cycles. For more information on the alignment of data across the three cycles, contact Denver Public Health.

The purpose of the current report is to provide key stakeholders with information on how risk behaviors and HIV prevalence has changed over time in the MSM population. We utilized chi-square analyses to test whether risk behaviors changed across the three cycles when indicated throughout the report. We then examined patterns in HIV prevalence according to race/ethnicity and age groupings.

Participant demographics across the three NHBS MSM cycles are described in Table 2. Over time, the DPH team was able to enhance the diversity of those interviewed:

- The proportion of young MSM (18-29) surveyed increased from 23.5% in 2005 to 35.8% in 2011.
- Representation by Black, non-Hispanic/Latino MSM increased from 5.4% in 2005 to 10.8% in 2011.
- Similarly, the proportion of Hispanic/Latino MSM increased from 19.2% to 26.7% over time.

Table 2. Participant Demographics

	2005 [N = 869]		2008 [N = 545]		2011 [N = 547]	
Characteristic	n	%	n	%	n	%
Age						
18-29	204	23.5	167	30.6	196	35.8
30-39	290	33.4	153	28.1	148	27.1
40-49	253	29.1	127	23.3	118	21.6
50+	122	14.0	98	18.0	85	15.5
Race/Ethnicity						
Black, Non-Hispanic/Latino	47	5.4	22	4.2	59	10.8
Hispanic/Latino	167	19.2	149	27.3	146	26.7
White, Non-Hispanic/Latino	567	65.2	337	61.8	299	54.7
Other/Multiple Races/Missing	88	10.1	37	6.8	43	7.9

CORE INDICATORS

NHBS participants answered questions about sexual risk behaviors and other factors associated with increased risk of HIV infection, including whether behaviors or other factors occurred within the past 12 months. We analyzed data from the three MSM cycles for trends that could indicate changing HIV risk behaviors and factors among Denver MSM. As detailed in Table 3, these indicators are:

- Having condomless male-male anal sex (CAS)
- Having more than three male sex partners
- Using injection drugs
- Using non-injection drugs, including methamphetamines and marijuana
- Not testing for HIV
- Receiving a diagnosis for a sexually transmitted infection
- Having sex with someone of unknown HIV status or with someone who is HIV-positive

The percentage of MSM who reported engaging in sexual risk behaviors increased over the three cycles [See Table 3]. With the exception of marijuana use, reports of injection and non-injection drug use did not significantly change.

- Among all sexual behaviors, CAS carries the greatest risk of HIV transmission for MSM. The proportion who reported this key risk behavior significantly increased by 32%, from 51.2% in 2005 to 67.6% in 2011.
- There was a significant [21%] increase in the percentage of MSM who reported sex with more than three male partners within the past year. This indicator increased from 43.7% in 2005 to over half [52.7%] of those surveyed in 2011.
- About one in ten MSM responded that they had used injection drugs in the past year [9.7% in 2005 and 10.1% in 2011].
- The proportion of MSM reporting methamphetamine use declined from 10.8% in 2005 to 8.0% in 2011.
- By comparison, use of marijuana increased substantially over this time period from 36.5% of MSM in 2005 to 44.8% in 2011.

Because MSM who are sexually active are at increased risk for HIV infection, CDC recommends that they seek at least annual HIV testing. Patterns of HIV testing among Denver MSM have not significantly changed [See Table 3]. Participants' awareness of the HIV status of their last partner remained similar across the three cycles. However, the percentage of participants reporting a positive STI diagnosis in the past 12 months appears to have increased from 2005 to 2011.

Table 3. HIV-related Risk Behaviors and Other Factors Within the the Past 12 Months⁶

	2005 [N = 869]		2008 [N = 545]		2011 [N = 547]		P Value
Characteristic	n	%	n	%	n	%	
Condomless male-male anal sex	445	51.2	323	59.3	370	67.6	<.05
More than three male sex partners	380	43.7	249	45.7	288	52.7	<.01
Used injection drugs	84	9.7	59	10.8	55	10.1	NS
Used non-injection drugs							
Methamphetamine	94	10.8	62	11.4	44	8.0	NS
Marijuana	317	36.5	206	37.8	245	44.8	<.001
Not tested for HIV infection within the past 12 months	373	42.9	233	42.8	244	44.6	<.001
Diagnosed with an STI in the past 12 months	21	2.4	46	8.4	32	5.9	NS
Last partner's status was HIV-positive or unknown	393	45.2	240	44.0	249	45.5	NS
Last partner's status was unknown	300	34.5	175	32.1	186	34.0	NS

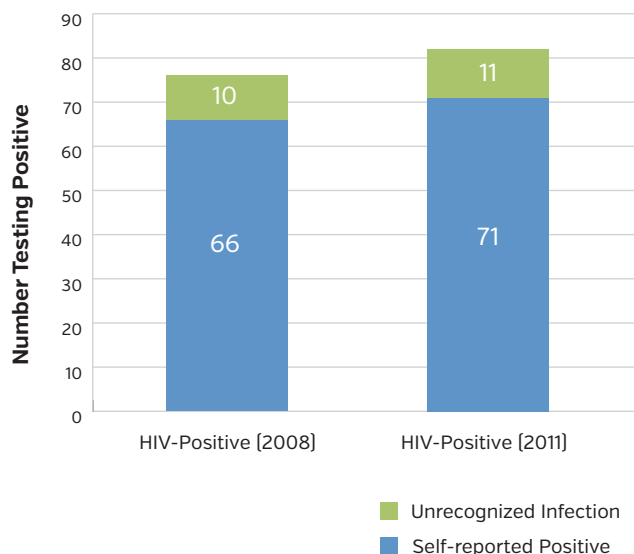
- Just over half of MSM in all three cycles reported having been tested for HIV in the past year: 57.1% in 2005, 57.2% in 2008, and 55.4% in 2011.
- Participants' awareness of their most recent partner's HIV status remained unchanged. In 2005 through 2011, 45.2 to 45.5% either knew that their last partner was HIV positive or acknowledged that they did not know. About a third did not know the status of their last partner: 34.5% in 2005, 32.1% in 2008 and 34.0% in 2011.
- The percentage of participants reporting a positive STI diagnosis increased from 2.4% in 2005 to a high of 8.4% in 2008 and decreased slightly to 5.9% in 2011. Overall, this indicator significantly increased.

HIV Prevalence

In 2008 and 2011, the proportion of participants who consented to HIV testing was high and HIV prevalence was similar in both years [16.9% in 2008 and 16.3% in 2011]. In both cycles, 13% of positive test results reflected a new diagnosis. [See Figure 1]

- In 2008, 82.6% of participants agreed to be tested for HIV. Of the 450 participants tested for HIV in this cycle, 76 tested HIV-positive, resulting in an overall HIV prevalence of 16.9%. Of these, 13.2% [or ten] of all who tested positive for HIV were unaware of their HIV infection.

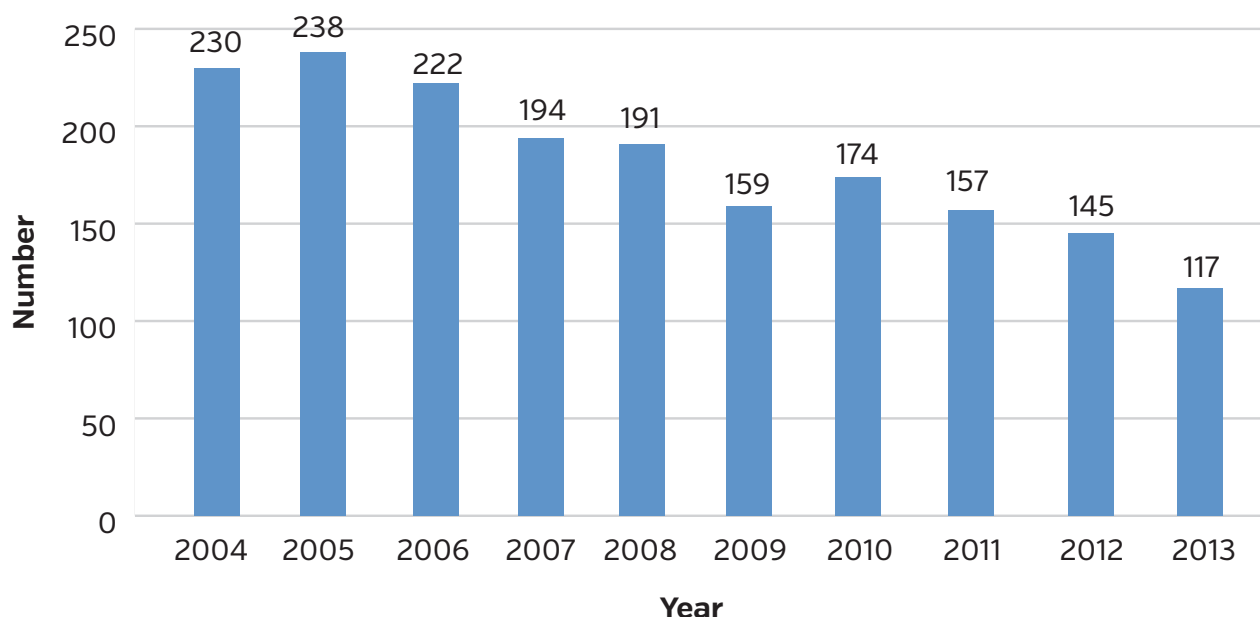
Figure 1. HIV Prevalence and Unrecognized Infection, 2008 and 2011



- In 2011, 92.1% of survey participants agreed to be tested for HIV. Of the 504 MSM tested for HIV, 82 men tested HIV-positive for an overall HIV prevalence of 16.3%. Among the 82 MSM testing positive, 13.4% [or 11] of those who tested positive for HIV were unaware of their HIV infection.

Overall, the number of newly diagnosed cases of HIV infection has declined substantially in the Denver metro area. Figure 2 displays the number of newly diagnosed cases of HIV in Denver residents between 2004 and 2013.

Figure 2. Number of New Diagnoses of HIV Infection by Year for Denver County Residents



HIV Prevalence by Race

Among all MSM groups, Black [23.1%] and Hispanic/Latino [19.4%] NHBS participants had the highest prevalence of HIV in 2011. [See Table 4] By contrast, the HIV prevalence for white MSM [13.9%] in 2011 is lower than the average for all MSM. The 2011 HIV prevalence for White MSM of 13.9% also represents a decline from the 2008 rate of 17.2%.

- HIV prevalence among Black NHBS participants decreased from 31.6% in 2008 to 23.1% in 2011. Of the 19 Black participants tested in 2008, six [31.6%] tested positive. In 2011 52 Black MSM were tested, of whom 12 [23.1%] were HIV positive.
- The HIV prevalence for Hispanic/Latino MSM increased from 14.0% in 2008 to 19.4% in 2011, a 38.5% increase. Among 121 Hispanic/Latino MSM tested in 2008, 17 [14.0%] had an HIV positive result. Of the 129 Hispanic/Latino MSM tested in 2011, 25 [19.4%] were HIV positive.
- Between 2008 and 2011, HIV prevalence among White MSM participants declined by 19.2%. In 2008, 48 [17.2%] of the 279 White MSM tested for HIV were

According to the Colorado Department of Public Health and Environment, Black persons continue to be disproportionately affected by HIV, representing 14% of persons living with HIV/AIDS but only 4% of Colorado's population.⁷

positive. By comparison in 2011, of the 281 White MSM tested, 39 [13.9%] had a positive result. Overall in 2011, HIV prevalence for white MSM was 14.7% lower than the HIV prevalence for all MSM tested.

- HIV prevalence among multiracial or "other" race MSM was consistent with the overall rate in 2008 but lower in 2011.

Table 4. HIV Prevalence by Race/Ethnicity and Age 2008 and 2011

2008								
Characteristic	Black		White		Hispanic/Latino		Multiracial/Other	
	n/#tested	%	n/#tested	%	n/#tested	%	n/#tested	%
Age								
18-29	2/5	40.0	6/74	8.1	3/52	5.8	2/12	16.7
30-39	1/6	16.7	14/74	18.9	9/35	25.7	1/9	11.1
40-49	3/7	42.9	16/62	25.8	5/29	17.2	1/5	20.0
50+	0/1	0.0	12/69	17.4	0/5	0.0	1/5	20.0
Total	6/19	31.6	48/279	17.2	17/121	14.0	5/31	16.1

2011								
Characteristic	Black		White		Hispanic/Latino		Multiracial/Other	
	n/#tested	%	n/#tested	%	n/#tested	%	n/#tested	%
Age								
18-29	1/21	4.8	5/94	5.3	5/49	10.2	2/18	11.1
30-39	2/6	33.3	9/75	12.0	3/40	7.5	2/13	15.4
40-49	8/17	47.1	15/61	24.6	13/31	41.9	1/3	33.3
50+	1/8	12.5	10/51	19.6	4/9	44.4	1/8	12.5
Total	12/52	23.1	39/281	13.9	25/129	19.4	6/42	14.3



Across all NHBS sites, 67% of participants with an HIV negative/unknown status in 2011 reported an HIV test in the past 12 months; only 55.4% of Denver participants in 2011 reported an HIV test in the past year. There is a need to promote HIV testing on at least an annual basis among MSM.⁸

HIV Prevalence by Race and Age

In 2011, HIV prevalence among those tested was the highest in men 40-49 years of age for all racial and ethnic groups. This was also true in 2008 for Black and White MSM, but among Hispanic/Latino participants, HIV prevalence was highest in the 30-39 age category.

- Among Black MSM, HIV prevalence was highest for those between the ages of 40 and 49 (42.9% in 2008 and 47.1% in 2011). In 2011, prevalence for the 40-49 year old age group was more than double the overall rate for Black MSM.
- Hispanic/Latino MSM were similar to other 2011 participants with the highest HIV prevalence in men aged 40-49. In that year, 13 (41.9%) of the 31 MSM in the 40-49 age group were HIV positive compared to

an overall rate of 19.4% among Hispanic/Latino MSM. In 2008, HIV prevalence was highest among Hispanic/Latino MSM between the ages of 30 and 39.

- Among White MSM, the highest HIV prevalence was also for those between the ages of 40 and 49 (25.8% in 2008 and 24.6% in 2011). Of the 62 MSM tested in this age category in 2008, 16 tested positive while in 2011, 61 were tested and 15 were HIV positive.
- Similar to the other racial/ethnic groups, HIV prevalence among multiracial participants was highest in the 40 to 49 year olds.
- Across all racial/ethnic groups, approximately 9.1% of MSM between the ages of 18 and 29 were HIV positive in 2008 and 7.1% were positive in 2011.



SOCIAL DETERMINANTS AND PREVENTION BEHAVIORS

Socioeconomic Characteristics

Previous research has shown that social determinants, including housing, employment, education, income, and access to health care influence risk behavior patterns for those at risk for HIV or STI infection.⁹ Examining social risk characteristics among participants in the three MSM cycles allows the DPH team to tailor prevention strategies to the changing needs of the MSM population. [See Table 5]

- Across the three survey cycles, roughly one in four participants had a high school degree or less.
- A quarter of participants reported income levels below \$20,000: 24.4% in 2008 and 30.0% in 2011 [data not collected in 2005].
- One in ten participants was unemployed. In 2008, 12.3% of participants reported being unemployed compared to 11.7% in 2011 [data not collected in 2005].
- While relatively few participants reported being homeless in the past 12 months in 2005, 8.6% of participants in 2008 and 6.8% of participants in 2011 reported being currently homeless.¹⁰



Table 5. Education and Socioeconomic Characteristics

	2005 (N = 869)		2008 (N = 545)		2011 (N = 547)	
Characteristic	n	%	n	%	n	%
Education						
High school graduate or less	174	20.0	155	28.4	142	26.0
Some college or more	695	80.0	390	71.6	405	74.0
Annual Income [\$]						
≤ \$19,999	---	---	133	24.4	164	30.0
\$20,000-\$49,000	---	---	219	40.2	208	38.0
≥ \$50,000	---	---	192	35.2	175	32.0
Missing	---	---	1	0.2	0	0.0
Homeless in past 12 months	4	0.5	47	8.6	37	6.8
Currently unemployed	---	---	67	12.3	64	11.7

Health Care Access

Having access to a regular source of health care is an important determinant of good health. While proportionately high numbers of NHBS survey participants report having health insurance and a regular source of medical care, relatively few were offered an HIV test at their last visit. [See Table 6]

- Three out of four participants reported having health insurance. This was true for 77.9% in 2005, 72.3% in 2008 and 72.0% in 2011.
- Participants were only asked whether they had a regular source of medical care in 2011. In this year, three quarters (or 78.2%) reported that they had a provider they regularly used for health care services.
- Most participants had visited a health care provider in the past 12 months: 81.4% in 2005, 79.3% in 2008 and 78.4% in 2011.
- Despite their use of health services, less than half of participants had been offered an HIV test at their last visit: 37.6% in 2005, 42.6% in 2008 and 48.0% in 2011.
- Not all MSM reported disclosing their sexuality to their doctors. Disclosure ranged from 76.9% in 2005, to 79.8% in 2008 and 79.9% in 2011.



Three out of four participants reported having health insurance.

Table 6. Health Care Access, HIV Testing, and Disclosure

Characteristic	2005 (N = 869)		2008 (N = 545)		2011 (N = 547)	
	n	%	n	%	n%	%
Have health insurance	677	77.9	394	72.3	394	72.0
Have a regular source of medical care	---	---	---	---	428	78.2
Visited health care provider in last 12 months	707	81.4	432	79.3	429	78.4
Health care provider offered HIV test ¹	266	37.6	184	42.6	206	48.0
'Out' to health care provider	668	76.9	435	79.8	437	79.9

Overview of Risk

MSM who engage in risk behaviors are at greater risk for HIV infection. In this section of the report, we highlight NHBS survey results for MSM whose behavior is considered at highest risk, yet who were not currently infected with HIV or did not know their HIV status at the time of the interview. We compiled data from the three cycles of the survey to categorize HIV-negative individuals based on the number of risk behaviors they engaged in during the 12 month period prior to participating in the survey, with the following behaviors considered:

- Condomless anal sex
- Receptive anal sex
- More than three male sex partners
- Used injection drugs
- Used methamphetamines¹²
- Not tested for HIV infection within the past 12 months
- Diagnosed with an STI in the past 12 months
- Last partner's HIV status was positive or unknown

Across all cycles, the number of risk behaviors reported ranged from zero to seven¹³ with an overall mean of 2.4 risk behaviors (median = 2.0). The mean number of reported risk behaviors increased significantly across the three cycles from 2.21 to 2.45 to 2.58, $F(2, 1663) = 13.04$, $p < .001$.

Using this information, MSM were categorized into four risk categories based upon the number of risk behaviors they reported. Groups were defined as follows:

1. Low risk: zero or one risk behavior in the past 12 months
2. Moderate risk: two risk behaviors in the past one to two months
3. High risk: three risk behaviors in the past 12 months
4. Greatest risk: four or more risk behaviors in the past 12 months

The proportion of MSM in the greatest risk group increased from 2005 to 2011 and the percentage of participants in the low risk group declined. [See Table 7]

- From 2005 through 2011, the proportion of MSM in the greatest risk group increased by 42.9% from 14.9% to 21.3%.
- Similarly, the percentage of participants in the high risk group increased from 23.2% in 2005 to 31.0% in 2011, a 33.6% increase.
- The percentage of MSM in the moderate risk group decreased from 32.7% in 2005 to 28.7% in 2011.
- The proportion of MSM categorized as having low risk declined from 29.2% in 2005 to 19.0% in 2011.

Table 7. Number and Percentage of Men in Each Risk Category

	2005 [N = 740]		2008 [N = 452]		2011 [N = 474]	
	n	%	n	%	n	%
Low Risk	216	29.2	110	24.3	90	19.0
Moderate Risk	242	32.7	142	31.4	136	28.7
High Risk	172	23.2	106	23.5	147	31.0
Greatest Risk	110	14.9	94	20.8	101	21.3

Participant Demographics Among MSM at Greatest Risk

Across cycles, MSM in the greatest risk group tended to be slightly younger than those in the lower risk groups. The most notable difference between the greatest risk group and the remainder of risk group participants in each cycle is that Black and Hispanic/Latino participants make up a greater proportion of the greatest risk group than they do in the other groups. [See Table 8]



Table 8. Participant Demographics for HIV-Negative MSM at Greatest Risk

	2005 [N =110]		2008 [N =94]		2011 [N =101]	
Characteristic	n	%	n	%	n	%
Age						
18-29	34	30.9	34	36.2	34	33.7
30-39	31	28.2	31	33.0	33	32.7
40-49	33	30.0	20	21.3	23	22.8
50+	12	10.9	9	9.6	11	10.9
Race/Ethnicity						
Black, Non-Hispanic/Latino	8	7.3	5	5.3	13	12.9
Hispanic/Latino	29	26.4	33	35.1	32	31.7
White, Non-Hispanic/Latino	59	53.6	47	50.0	48	47.5
Other/Multiple races/ Missing	14	12.7	9	9.6	8	7.9

HIV Testing

To elucidate patterns in HIV testing, data were collapsed across all three cycles. HIV testing behaviors varied substantially across the four risk category groups. MSM in the greatest risk group were most likely to report not being tested for HIV in the past two years. [See Figure 3]

- MSM in the greatest risk group were almost twice as likely as other risk groups to have NOT been tested or to have not sought testing within the past 24 months; 40.5% reported never testing or not testing within the past 24 months.

- The percentage of respondents reporting never testing or not testing within the past 24 months increased with each risk group [9.5% vs. 22.1% vs. 28.9% vs. 40.5%]

Figure 4 shows that while the proportion of non-testers declined for moderate and high risk MSM over the three cycles of data collection, the rate of non- or delayed testing among individuals at greatest risk for HIV remains consistently high across all three cycles.

Figure 3. Testing Frequency for HIV-negative MSM Collapsed Across Years

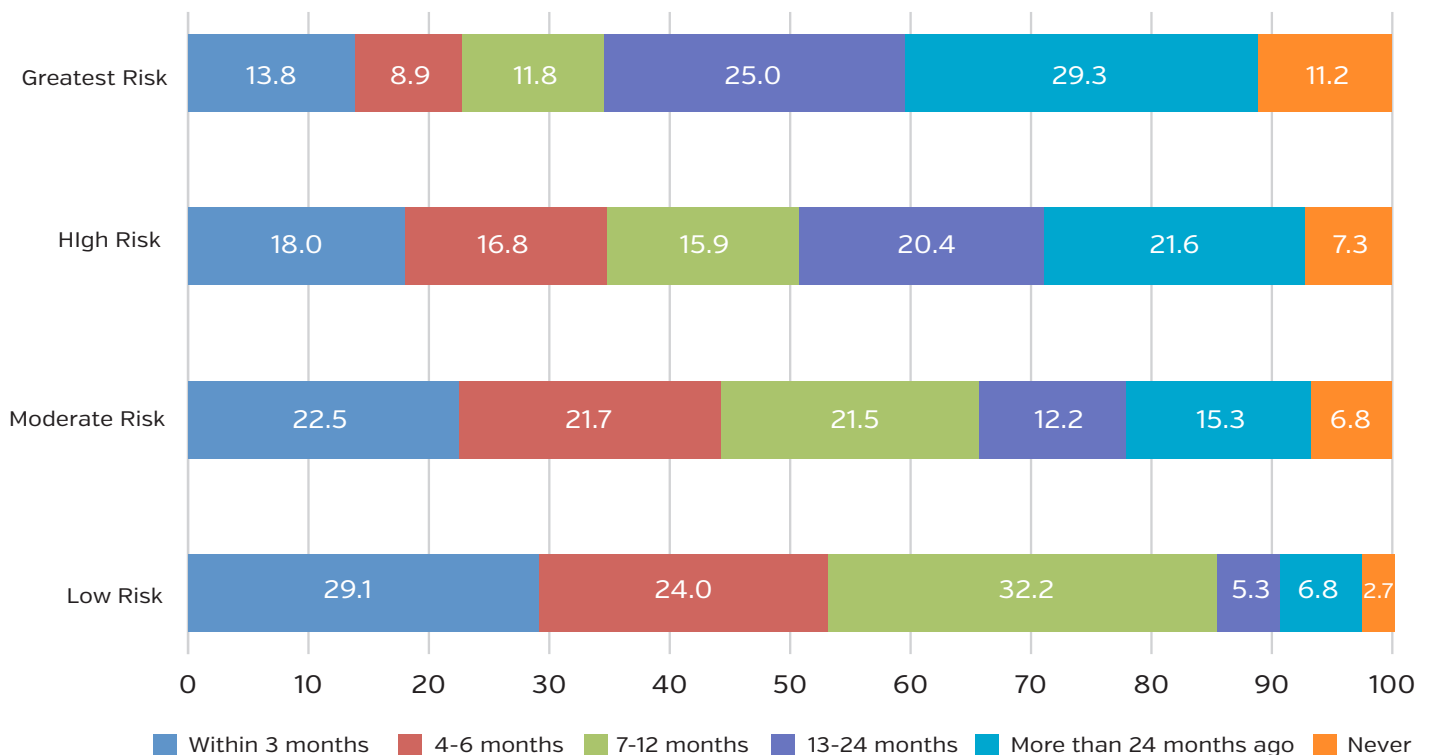
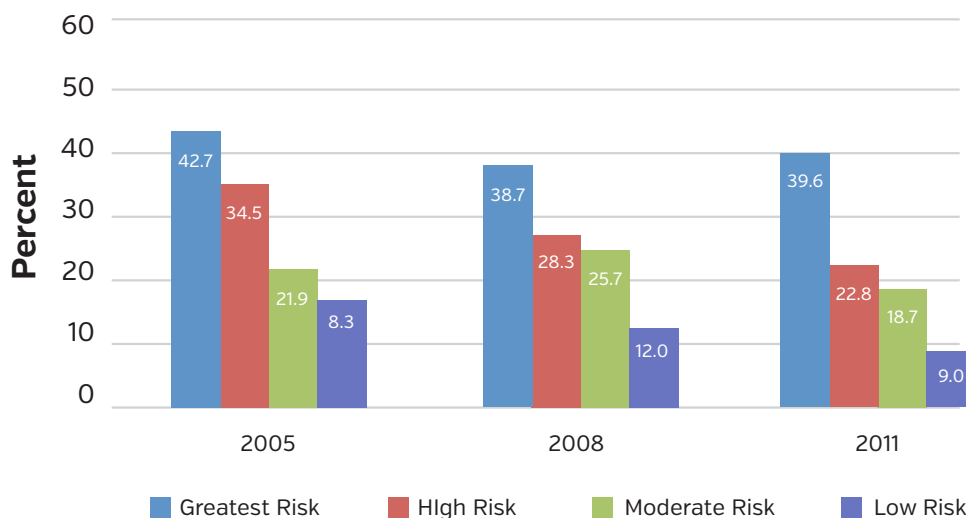


Figure 4. Percentage of HIV-negative MSM Who Reported No HIV Test in Prior 24 Months by Year



Core Indicators

By our definition, MSM at greatest risk for HIV are those who have engaged in four or more risk behaviors within the past 12 months. Therefore, it is not surprising that many HIV risk behaviors are common among this group. (See Table 9)

- MSM at greatest risk for HIV are very likely to engage in condomless anal sex. CAS was reported by 79.1%, 85.1%, and 90.1% of MSM in the greatest risk group in 2005, 2008, and 2011, respectively. By comparison, 67.6% of all MSM in 2011 reported CAS.
- Over the same time period, MSM at greatest risk reported being slightly less likely to have sex with more than three male sex partners, with this behavior declining from 91.8% in 2005 to 79.2% in 2011. By contrast, slightly more than half (52.7%) of all MSM had sex with more than three male sex partners in 2011.
- Among MSM at greatest risk, patterns of drug use declined between 2005 and 2011. Still nearly one in four MSM at greatest risk reported using injection drugs (22.8%) and methamphetamine (23.8%) in 2011. These rates of drug use are more than double those for all MSM at 9.7% [injection drug use] and 8.0% [methamphetamine].

- Similar to all MSM, those at greatest risk were more likely to use marijuana with the proportion increasing by 27% from 44.5% in 2005 to 56.4% in 2011. Among all MSM, 44.8% reported using marijuana in 2011.

Despite the CDC recommendation that MSM seek at least annual HIV testing, two-thirds of MSM at greatest risk report not having been tested in the past year.

- Compared to 2005, a slightly higher proportion of MSM at greatest risk in 2011 report not having had an HIV test in the past 12 months [64.5% vs. 68.3%]. By contrast, this was true for 44.6% of all MSM in 2011.
- The prevalence of reported STI diagnoses fluctuated across the three cycles with 3.6% of MSM at greatest risk reporting an STI in 2005, 22.3% in 2008, and 12.9% in 2011. The spike in 2008 is likely associated with the syphilis outbreak that occurred in Denver during that same time.
- Three out of four MSM at greatest risk did not know their last partner’s HIV status or had sex with someone who was HIV-positive (77.3% in 2005 and 77.2% in 2011.) By comparison, only a third of all MSM did not know their last partner’s status.

Table 9. HIV Risk Behaviors Within the Past 12 Months for HIV-Negative MSM at Greatest Risk

	2005 [N = 110]		2008 [N = 94]		2011 [N = 101]	
Characteristic	n	%	n	%	n	%
Condomless male-male anal sex	87	79.1	80	85.1	91	90.1
More than three male sex partners	101	91.8	80	85.1	80	79.2
Used injection drugs	27	24.5	21	22.3	23	22.8
Used non-injection drugs						
Methamphetamine	39	35.5	30	31.9	24	23.8
Marijuana	49	44.5	42	44.7	57	56.4
Not tested for HIV infection within the past 12 months	71	64.5	60	63.8	69	68.3
Diagnosed with STI in the past 12 months	4	3.6	21	22.3	13	12.9
Last partner’s status was HIV-positive or unknown	85	77.3	71	75.5	78	77.2

Patterns of risk behavior among MSM at lower risk are concerning, but less prevalent than the risk behaviors found among MSM at greatest risk for HIV. [See Table 10]

- Similar to MSM at greatest risk, MSM at lower risk are more likely to be engaging in CAS, with the proportion of mean reporting CAS increasing from 44.8% in 2005 to 61.4% in 2011.
- The proportion of MSM at lower risk reporting having had more than three male sex partners in the past 12 months also increased. Whereas in 2005, this was true for only 33.0%, by 2011 44.8% of MSM at lower risk had more than three male sex partners.
- Drug use among MSM at lower risk remains low for injection drugs and methamphetamine, but nearly half [or 41%] report having used marijuana in 2011.
- In all three years, approximately one in three MSM at lower risk report not having been tested for HIV in the past 12 months.
- Finally, a third of MSM at lower risk report not knowing their last partner's status, a pattern that is similar from 2005 to 2011.



Table 10. HIV Risk Behaviors within the Past 12 Months for HIV-Negative MSM in the Lower Risk Categories

Characteristic	2005 [N = 630]		2008 [N = 358]		2011 [N = 373]	
	n	%	n	%	n	%
Condomless male-male anal sex	282	44.8	183	51.1	229	61.4
More than three male sex partners	208	33.0	127	35.5	167	44.8
Used injection drugs	31	4.9	14	3.9	6	1.6
Used non-injection drugs						
Methamphetamine	27	4.3	14	3.9	7	1.9
Marijuana	209	33.2	122	34.1	153	41.0
Not tested for HIV infection within the past 12 months	205	32.5	122	34.1	122	32.7
Diagnosed with STI in the past 12 months	7	1.1	13	3.6	12	3.2
Last partner's status was HIV-positive or unknown	218	34.6	107	29.9	124	33.2

Social Determinants Among MSM at Greatest Risk

Some social characteristics of MSM at greatest risk likely increases their risk for HIV infection, in particular lower education, lower income and higher rates of homelessness. [See Table 11]

- MSM at greatest risk reported lower educational achievement relative to the entire sample of participants in 2005 and 2011. [2005: 20.9% vs. 20.0%; 2008: 42.6% vs. 28.4%; 2011: 34.7% vs. 26.0%]. Notably, the percentage of respondents in the entire sample who reported a high school degree or less remained relatively stable across cycles.
- Over one-third of MSM at greatest risk reported annual household income less than \$20,000 in 2008 and 2011. This is a higher proportion than was observed in the overall sample. In 2008, 35.1% of participants in the greatest risk group reported an income of less than \$20,000 while in 2011 this was true for 38.6%. Overall, only a quarter of all MSM participants reported income levels below \$20,000 [24.4% in 2008 and 30.0% in 2011.]
- Unemployment among MSM at greatest risk was comparable to the overall percentage reported by MSM interviewed. In 2011, one in ten MSM participants was unemployed, both in the greatest risk group and overall. The unemployment rate in the greatest risk group was 19.1% in 2008 and 12.9%



- in 2011. While the overall unemployment rate was lower in 2008 [12.3%], the rate in 2011 was 11.7%, only slightly lower than the rate for MSM at greatest risk.
- In 2008, 19.1% of MSM at greatest risk reported being homeless compared to 12.9% in 2011. Both proportions are higher than those for the overall sample [8.6% in 2008 and 6.8% in 2011].

Table 11. Education and Socioeconomic Characteristics of HIV Negative MSM at Greatest Risk

	2005 [N =110]		2008 [N =94]		2011 [N =101]	
Characteristic	n	%	n	%	n	%
Education						
High school graduate or less	23	20.9	40	42.6	35	34.7
Some college or more	87	79.1	54	57.4	66	65.3
Income						
≤ \$19,999	---	---	33	35.1	39	38.6
\$20,000-\$49,000	---	---	40	42.6	35	34.7
≥ \$50,000	---	---	21	22.3	27	26.7
Homeless in past 12 months	1	0.9	18	19.1	13	12.9
Currently unemployed	---	---	23	24.5	15	14.9

Health Care Access, HIV Testing, and Disclosure of HIV-negative MSM at Greatest Risk

Compared with all MSM interviewed, those in the greatest risk category were less likely to have health insurance and were less likely to have visited a health care provider in the past 12 months. [See Table 12]

- Only half of MSM in the greatest risk category reported having health insurance. Whereas the proportion of MSM at greatest risk with health insurance was 68.2% in 2005, it was only 55.4% in 2011. By comparison, the overall proportion of MSM with health insurance was 77.9% in 2005, 72.3% in 2008, and 72.0% in 2011.
- Nearly three out of four [71.3%] MSM at greatest risk reported having a regular source of medical care in 2011. This compares with 78.2% of all MSM participants during that same year.
- While MSM at greatest risk reported having a regular source of care, they were less likely than other participants to have visited a health care provider in the past 12 months. In 2005, 69.1% had made a health care visit in the past year, with 64.9% doing so in 2008, and 67.3% in 2011. Among all MSM, the proportions who had a health care visit were 81.4% in 2005, 79.3% in 2008, and 78.4% in 2011.
- Similar to all MSM, relatively few MSM in the greatest risk group reported having been offered an HIV test at their last health care visit: 25.0% in 2005, 31.1% in 2008, and 47.1% in 2011. These proportions were slightly lower than those reported for all MSM, among whom offers for an HIV test were made to 37.6% in 2005, 42.6% in 2008, and 48.0% in 2011.
- MSM at greatest risk were less likely than other MSM participants to disclose their sexuality to their doctors. Among this group, 72.7% reported their sexuality in 2005, 69.1% in 2008, and 65.3% in 2011.

Table 12. Health Care Access, HIV Testing, and Disclosure of HIV-negative MSM at Greatest Risk

	2005 [N = 110]		2008 [N = 94]		2011 [N = 101]	
Characteristic	n	%	n	%	n	%
Have health insurance	75	68.2	52	55.3	56	55.4
Have a regular source of medical care	---	---	---	---	72	71.3
Visited health care provider in the last 12 months	76	69.1	61	64.9	68	67.3
Health care provider offered HIV test*	19	25.0	19	31.1	32	47.1
“Out” to health care provider	80	72.7	65	69.1	66	65.3

*Only those who visited a health care provider in the last 12 months were included in the calculation of the percentage of individuals who were offered an HIV test by their provider.

Limitations

NHBS data collection activities occur in a wide array of venues and at varied points in time. While this time-space, venue-based sampling method provides a perspective on risk behaviors, HIV testing patterns, and HIV prevalence among the MSM who were interviewed, the results may only be representative of MSM who attend the venues where data collection activities occurred.

It is unknown to what extent these results apply to MSM who did not attend the venues on occasions other than the times that were sampled. Moreover, it is unclear to what extent the findings would apply to MSM who do not frequent these locations.

To an unknown degree, MSM who frequent the survey venues may be changing, thus having an impact on the resulting risk profile of NHBS MSM participants. Those at lowest risk for HIV may be less likely to frequent these venues. Moreover, there is some evidence that MSM are searching for partners online and socializing outside of gay venues. Without being able to compare to the NHBS sample all Denver MSM for each survey cycle, we cannot know the extent to which the survey results conveyed in this report represent behavior changes in the underlying population, or alternatively, only changes occurring among those who visit these venues.

Similar to any interview process, NHBS survey results can be influenced by the participants' willingness to report on behaviors considered to be socially undesirable. Finally, changes in the survey instruments over time may have had an impact on the results that were obtained.

Major Findings

DPH will use findings from this report to identify opportunities to improve HIV prevention, testing, outreach, and care services, particularly among MSM who are engaged in high risk sexual behaviors. MSM engaging in condomless anal sex place themselves at increased risk for HIV infection and other sexually transmitted infections such as syphilis, chlamydia, and gonorrhea. Similarly, MSM who report having had sex with more than three male sex partners may be making incorrect assumptions about the HIV status of their partners.



While trends in HIV prevalence have remained relatively stable from 2005 through 2011, we will not be fully able to reduce new infections without encouraging all MSM to be tested for HIV on an annual basis, gain access to a regular source of care, and disclose their sexuality without fear or discomfort.

This is particularly true for MSM who are engaging in the highest number of risk behaviors, whom we have identified as MSM at greatest risk for HIV. The proportion of these individuals is increasing. From 2005 through 2011, the proportion of MSM engaged in greatest risk behavior increased by 42.9%, from 14.9% to 21.3%. Additionally, men in this group are most likely to be disenfranchised in a number of ways:

- MSM in the greatest risk group were almost twice as likely as other risk groups to have NOT been tested or to have not sought testing within the past 24 months. Within this group, 40.5% of MSM reported delaying or not having had an HIV test. By comparison, 28.9% of the high risk group, 22.1% of the moderate risk group, and 9.5% of the low risk group reported delaying or not testing for HIV.

- While MSM at greatest risk reported having a regular source of care, they were less likely to have visited a health care provider in the past 12 months compared with their peers. In 2005, 69.1% had made a health care visit in the past year, with 64.9% doing so in 2008 and 67.3% in 2011. Overall, the proportion of men who had a health care visit were 81.4% in 2005, 79.3% in 2008, and 78.4% in 2011.
- Similar to all MSM, few participants in the greatest risk group reported having been offered an HIV test at their last visit with a health care provider: 25.0% in 2005, 31.1% in 2008 and 47.1% in 2011. These proportions were slightly lower than those reported for all MSM, among whom offers for HIV test were made to 37.6% in 2005, 42.6% in 2008, and 48.0% in 2011.
- MSM at greatest risk were less likely than other participants to disclose their sexuality to their doctors. Among this group, 72.7% reported their sexuality in 2005, 69.1% in 2008, and 65.3% in 2011. By comparison, the overall rates of disclosure were 76.9% in 2005, 79.8% in 2008, and 79.9% in 2011.

For the goals of the National HIV/AIDS Strategy to be achieved, all MSM need to have access to quality prevention services and care, regardless of age, race/ethnicity, sexual orientation, or socio-economic circumstance.

Key Takeaways

Among gay, bisexual, and other men who have sex with men in the Denver metro area, risk behaviors appear to be increasing. Specifically, more men are reporting having condomless anal sex and more than three male sexual partners in the past 12 months.

Several factors can put men at increased risk for HIV including: condomless anal sex, receptive anal sex, having more than three male sexual partners, injection drug use, methamphetamine use, not being tested for HIV infection, being diagnosed with a sexually transmitted infection, not knowing the HIV status of a sexual partner, and having sex with an HIV-positive partner.

- Men who have four or more of these risk factors during the past 12 months are at greatest risk for HIV.
- The proportion of MSM at greatest risk for HIV recruited at gay venues has increased from 14.9% in 2005 to 20.8% in 2008 to 21.3% in 2011.
- MSM at greatest risk for HIV infection were almost twice as likely as MSM at lower risk to report never testing or not testing for HIV in within the past 24 months

One in three men did not know the HIV status of their last sexual partner.

¹ The White House [2010] The National HIV/AIDS Strategy. http://www.cdc.gov/hiv/pdf/policies_nhas.pdf. Accessed 3/4/14.

² Luerrson, S. and Walsh, A. [2012] 2011 HIV Care and Treatment Needs Assessment Report. Denver, CO: Colorado Department of Public Health and Environment.

³ Colorado HIV Surveillance Quarterly Report, 4th Quarter 2013, Colorado Department of Public Health and Environment. Retrieved from <http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheadname1=Content-Disposition&blobheadname2=Content-Type&blobheadvalue1=inline%3B+filename%3D%22HIV+4Q+2013.pdf%22&blobheadvalue2=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251936194638&ssbinary=true> on February 14, 2014.

⁴ Centers for Disease Control and Prevention, National HIV Behavioral Surveillance [NHBS]. <http://www.cdc.gov/hiv/dhap/bcsb/nhbs/>. Accessed 3/3/14.

⁵ Centers for Disease Control and Prevention. [2013] HIV Testing and Risk Behaviors Among Gay, Bisexual and Other Men Who Have Sex with Men – United States. *Morbidity and Mortality Weekly* [11/29/13] 62[47]:958-962.

⁶ Risk behaviors are not exclusive and individuals could report engaging in multiple risk behaviors. N's indicate the number of people in the entire cycle sample who reported engaging in each risk behavior. People who did not answer the question are included in the denominator used to calculate percent.

⁷ Colorado Department of Public Health and Environment [2009] HIV and AIDS in Colorado, Integrated Epidemiological Profile of HIV and AIDS Prevention and Care Planning Reported Through December 2009. Denver, CO.

⁸ Centers for Disease Control and Prevention, op.cit.

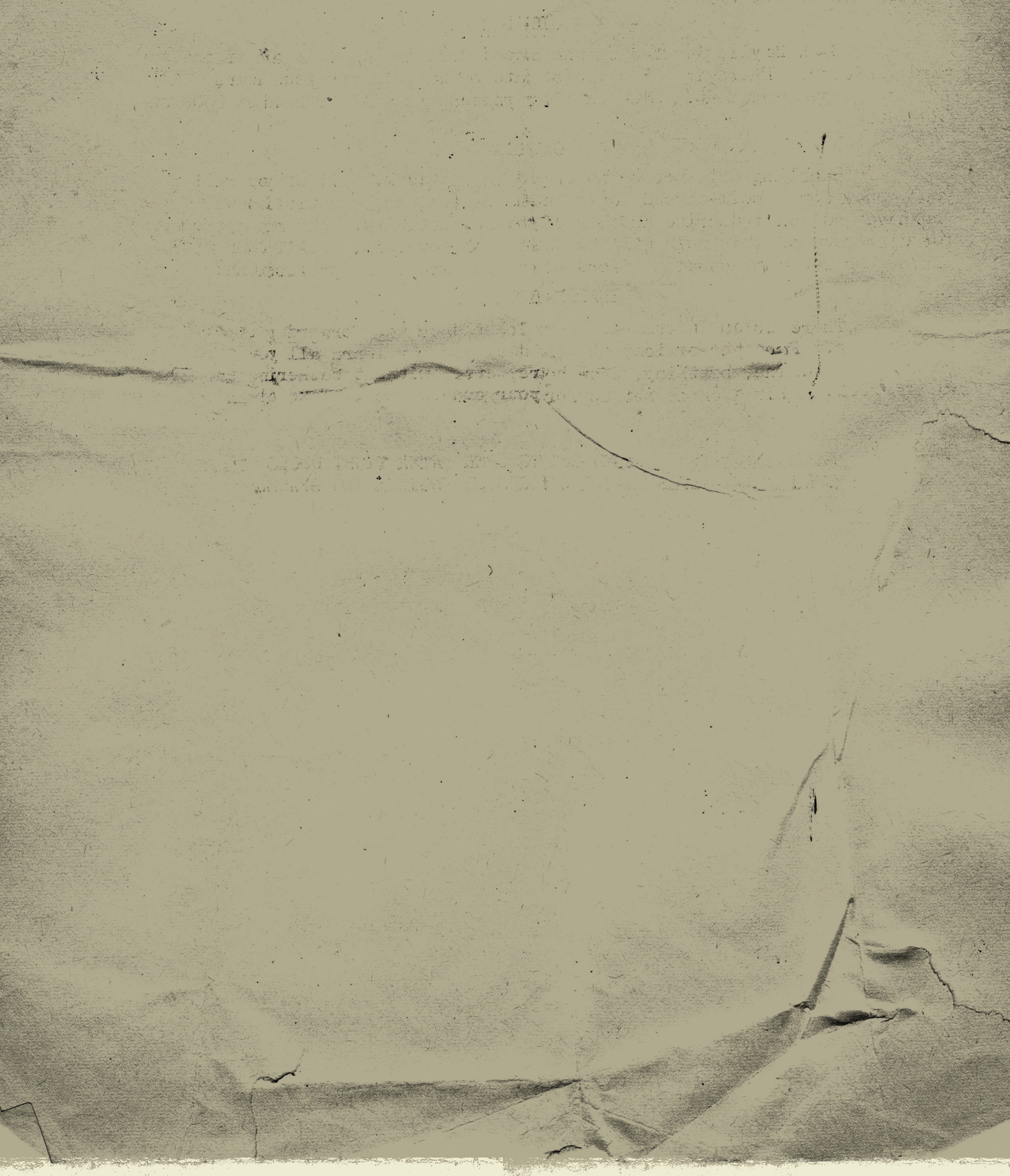
⁹ Centers for Disease Control and Prevention [2010] Establishing a Holistic Framework to Reduce Inequities in HIV, Viral Hepatitis, STDs, and Tuberculosis in the United States. Atlanta [GA]: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; October 2010.

¹⁰ The increase in percent of respondents reporting they were homeless in the past 12 months is likely an artifact of how the question was asked across the three cycles. In 2005, respondents were asked to indicate whether they always had a regular place to live in the past 12 months; 9.7% reported they did not always have a regular place to live in the past 12 months. In 2005 respondents were also asked about their current living situation, with homeless listed as one option which is the value reflected in Table 7. In 2008 and 2011, respondents were specifically asked whether they were ever homeless in the past 12 months, which is a broader question than whether they are currently homeless. Change in this social determinant over time should be interpreted cautiously.

¹¹ Only those who visited a health care provider in the last 12 months were included in the calculation of the percent of individuals who were offered an HIV test by their provider.

¹² Use of marijuana was not included in the risky behaviors for the purpose of identifying risk groups.

¹³ Some respondents did not answer all the questions that contributed to the risk score, however the maximum number of items missing was three. In general, participants in 2008 and 2011 had complete data [99.3% and 98.7% with complete data], while data quality was less optimal for 2005 [78.9% with complete data].



For more information:
[DenverPublicHealth.org/NHBS](https://denverpublichealth.org/NHBS)