Michigan Department of Community Health

MDCH

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ESTIMATES OF HIV INCIDENCE RATES IN MICHIGAN, 2006-2010

Introduction

Since 2005, Michigan has participated in a Centers for Disease Control and Prevention (CDC)-funded initiative called STARHS (Serologic Testing Algorithm for Recent HIV Seroconversion). The goal of STARHS is to estimate HIV incidence, or number of new infections occurring each year, nationally as well as at the state level. HIV incidence data differ from traditionally reported prevalence data and from number of new diagnoses. Incidence data estimate the total number of diagnosed and undiagnosed new infections in a particular year. Prevalence data measure everyone living with HIV, including newly diagnosed cases that may have been infected at any time.

HIV incidence data have important public health implications because they provide information on where recent infections are occurring. The data assist in evaluating HIV intervention and prevention programs for effectiveness; in targeting prevention efforts associated with ongoing transmission; and in allocating resources to populations in greatest need of prevention efforts.

In 2008, HIV incidence rates were initially estimated nationally and in the state of Michigan for the year 2006. Since that time, more data have been collected and the estimation procedure used nationwide has undergone significant refinements. Using these improved methods, MI released estimates for 2007 through 2009 in 2012, along with an updated estimate for 2006.[1] The MI report paralleled the release of national estimates by CDC in 2011.[2]

Presented in this document are Michigan's updated incidence estimates for 2006 through 2009 as well as initial estimates for 2010. For the first time, we are able to include estimates for select sub-populations, such as men who have sex with men (MSM) by race. This report parallels the national report released by CDC in December 2012.[3] The national data are extrapolated from an incidence surveillance group comprised of 18 states, including Michigan, and two cities, representing approximately 72% of all cases diagnosed in the U.S.

Methods

STARHS uses results of the BED Assay (a laboratory test for incidence), and data collected on newly diagnosed cases' testing history and antiretroviral use to estimate incidence for the whole population, including those not yet diagnosed. The BED incidence test is performed on available leftover serum from diagnostic, confirmed-positive specimens. The remnant serum is sent without name to the New York State STARHS Lab for testing after HIV infection has been confirmed. If the original diagnostic specimen is not available, a subsequent blood specimen obtained within three months of HIV diagnosis is obtained for testing.

The BED Assay is an enzyme immunoassay that classifies each HIV infection as recent or long-standing based on the amount of HIV-specific antibody present in each sample. A recent incidence result indicates HIV infection in approximately the last six months. Test results are not reliable enough to report on an individual basis, but across a large population they do provide the foundation to estimate the number and rate of new HIV infections occurring each year in the population.

We used a set of statistical programs provided by CDC to estimate HIV incidence at the state level.[4,5] These programs use a stratified extrapolation approach (inference of incidence rates by subgroups) with multiple imputation (statistical technique for analysis of incomplete data). Reporting delay weights were calculated to account for cases diagnosed but not yet reported to the surveillance program by January 2013.

KEY FINDINGS

- Michigan's total HIV incidence rate was stable overall for 2006-2010 and was roughly half the national rate. In 2010, Michigan had an estimated 656 new infections or 8.0 new infections per 100,000 population versus 18.8 per 100,000 nationally.
- Consistent with national rates, Michigan males, black persons, 25 to 34 year olds, and men who have sex with men (MSM) have the highest incidence rates and counts.

Rates per 100,000 population were calculated for all cases greater than 12 years of age at infection using the estimated population for each year found in the "Bridged-Race Population Estimates", calculated by the National Center for Health Statistics and based on the U.S. Census Bureau population estimates[6]. Data are presented in this report for subgroups (such as sex, race, age and risk) where there are a minimum of 200 reported HIV cases, 40 incidence tests (or 20% completeness), and ten recent incidence results. Age groups are based on *age at infection*, which is derived from age at diagnosis and BED result. Risk groups include men who have sex with men (MSM, excluding MSM/IDU), injection drug users (IDU, including MSM/IDU), and heterosexuals. Since reliable denominator data are not available for risk groups, counts are reported instead of rates for those groups. Counts and/or rates were considered stable if their confidence intervals (CIs) overlapped. This indicates that the counts and/or rates did not change significantly over time. CIs are not shown in this report except in figure 2.

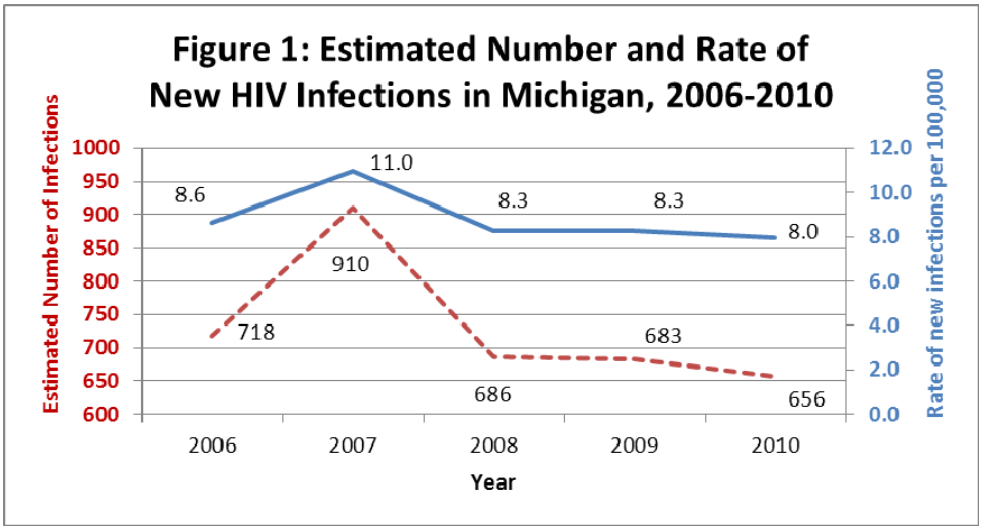
Results

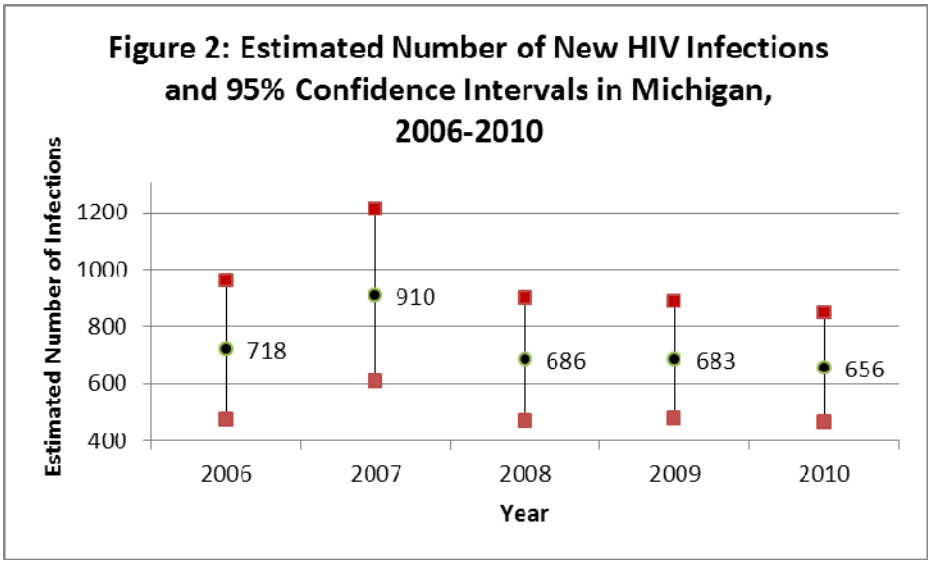
Incidence Estimates Overall, 2006-2010

Michigan's HIV incidence rates were roughly half of those seen nationally and were stable through the five year period of 2006 to 2010 (table 1). During that period, Michigan's incidence rates ranged from 8.0 to 11.0 infections per 100,000 population, while the overall national rates ranged from 17.8 to 21.4 infections per 100,000 population.

There were no significant changes in Michigan overall or in any of the reported subgroups during the five year period. Consistent with national rates, Michigan males, black persons, 25 to 34 year olds, and MSM have the highest incidence rates and counts. We are unable to report estimated counts or rates for Hispanics and other racial/ethnic groups due to insufficient data to produce reliable estimates (numbers do not meet 200/40/10 minimum criteria described in methods).

Both nationally and in Michigan, 2007 stands out as an unusual year where the estimated count and rate of new infections were higher than other years (figure 1). Counts and rates returned to more typical levels in 2008. In Michigan, among the years assessed, 2006 to 2010, no statistically significant changes were observed overall or between individual years (this includes 2007).





To demonstrate the lack of significant change of new infections in Michigan, 95% confidence intervals (CIs) for the count estimates are presented in figure 2. The upper and lower bounds of the CIs capture the true number of new HIV infections for each year with 95% certainty.

Values are statistically significantly different only if their 95% CIs do not overlap. All the CIs presented in figure 2 overlap, therefore in Michigan, there were no significant changes in estimated new HIV infections. The CIs are quite large due to the estimation process.

Table 1: Estimated Number and Rate of New HIV Infections in Michigan and the U.S., 2006-2010

Category	2006[¶]			2007				2008				2009				2010			
	N*	%	MI Rate[†]	N*	%	MI Rate[†]	U.S. Rate[§]	N*	%	MI Rate[†]	U.S. Rate[§]	N*	%	MI Rate[†]	U.S. Rate[§]	N*	%	MI Rate[†]	U.S. Rate[§]
Sex																			
Male	529	74	13.1	726	80	18.0	32.6	507	74	12.6	28.9	521	76	13.0	27.7	537	82	13.4	30.7
Female	190	26	4.5	185	20	4.3	10.7	179	26	4.2	9.4	162	24	3.8	8.2	120	18	2.8	7.3
Race/ethnicity																			
White	254	35	3.8	305	34	4.6	9.9	176	26	2.7	8.2	277	41	4.2	8.3	242	37	3.7	8.7
Black	355	65	30.8	504	55	43.6	79.4	447	65	38.7	73.8	352	52	30.5	64.9	352	54	30.4	68.9
Age																			
13-24	151	21	8.7	286	31	16.5	21.2	233	34	13.6	21	222	33	13.1	20.9	237	36	14.1	23.7
25-34	197	27	16.2	269	30	22.5	40.2	177	26	15.0	36	190	28	16.3	31.9	222	34	19.0	34.9
35-44	192	27	13.3	251	28	1.9	35.9	141	21	10.4	29.3	122	18	9.3	28.2	67	10	5.3	27.3
45+	177	25	4.5	N/A**	N/A**	N/A**	N/A[¶]	136	20	3.4	N/A[¶]	149	22	3.7	N/A[¶]	130	20	3.1	N/A[¶]
Risk																			
MSM	457	64	N/A^	624	69	N/A^	N/A^	426	62	N/A^	N/A^	438	64	N/A^	N/A^	488	74	N/A^	N/A^
IDU	N/A**	N/A**	N/A^	N/A**	N/A**	N/A^	N/A^	122	18	N/A^	N/A^	97	14	N/A^	N/A^	63	10	N/A^	N/A^
Heterosexual	187	26	N/A^	220	24	N/A^	N/A^	140	20	N/A^	N/A^	148	22	N/A^	N/A^	104	16	N/A^	N/A^
MSM by race																			
Black MSM	229	32	N/A^	304	33	N/A^	N/A^	279	41	N/A^	N/A^	202	30	N/A^	N/A^	243	37	N/A^	N/A^
White MSM	172	24	N/A^	239	26	N/A^	N/A^	122	18	N/A^	N/A^	202	30	N/A^	N/A^	197	30	N/A^	N/A^
Black MSM, 13-24	96	13	N/A^	130	14	N/A^	N/A^	151	22	N/A^	N/A^	110	16	N/A^	N/A^	140	21	N/A^	N/A^
Black MSM, >24	133	19	N/A^	175	19	N/A^	N/A^	128	19	N/A^	N/A^	92	13	N/A^	N/A^	102	16	N/A^	N/A^
White MSM, >24	151	21	N/A^	189	21	N/A^	N/A^	87	13	N/A^	N/A^	161	24	N/A^	N/A^	146	22	N/A^	N/A^
Race/sex																			
Black Males	273	38	50.8	383	42	71.0	110	340	50	63.1	102.7	242	35	45.0	94.6	271	41	50.1	103.6
White Males	183	25	5.7	252	28	7.8	16.8	140	20	4.4	14.2	246	36	7.7	14.4	212	32	6.7	15.8
Black Females	82	11	13.3	122	13	19.8	52.4	107	16	17.4	48.3	110	16	17.9	38.6	82	13	13.3	38.1
TOTAL	**718**		**8.6**	**910**		**11.0**	**21.4**	**686**		**8.3**	**18.9**	**683**		**8.3**	**17.8**	**656**		**8.0**	**18.8**

* Numbers have been adjusted for reporting delay

† Rate per 100,000 population for ages 13 and older, Vintage 2011 Bridged-Race Postcensal Population Estimates[6].

§ U.S. Rates are from Estimated HIV Incidence in the United States, 2007-2010, HIV Surveillance Supplemental Report 2012[3].

¶ National data not reported in 2007-2010 HIV Surveillance Supplemental Report 2012[3]. For example, CDC did not include a 45+ age group; included 45-54 and 55+ age groups.

**Insufficient data to report this group; did not meet minimum 200/40/10 criteria described in Methods

^ Rates are not reported for risk categories because no reliable denominator data exist for these groups

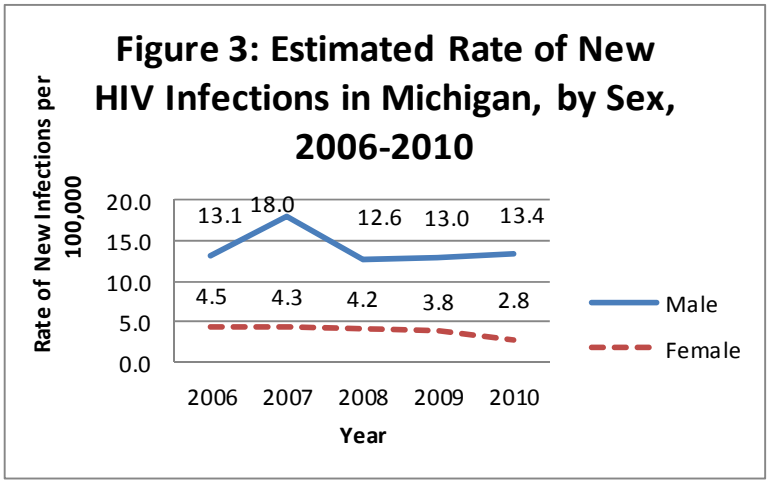
Incidence Estimates by Demographic Groups 2006-2010

Incidence Estimates by Sex

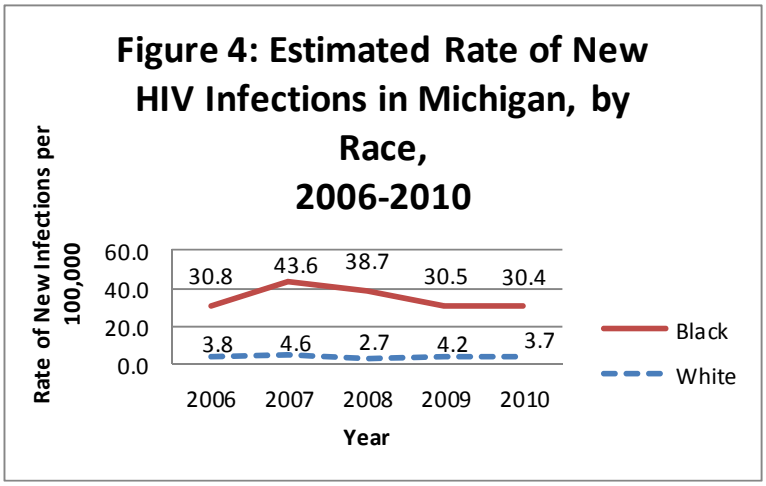
The estimated rate of recent infection for males in Michigan was 4.8 times the rate for women in 2010. This is comparable to differences between the sexes seen nationally where the rate for men was 4.2 times the rate for women in 2010.

There were no significant changes in estimated rates of new infections for males or females in Michigan between 2006 and 2010 (figure 3).

Nationally, rates among women decreased significantly by 21% between 2008 and 2010.[3]



Incidence Estimates by Race



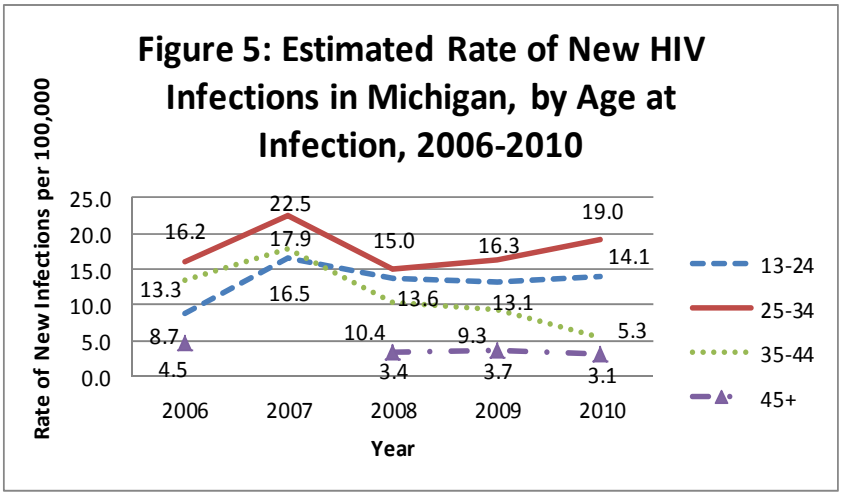
There were no significant changes in the estimated rate of new infections for white or black persons between 2006 and 2010 (figure 4).

In Michigan, as at the national level, black persons continue to be disproportionately affected by HIV infection. The estimated rate of new infection for black persons in Michigan was 8.2 times the rate among white persons in 2010.

Incidence Estimates by Age at Infection

In Michigan, as at the national level, the highest rates of HIV infection are among 25-34 year olds (figure 5). Since 2008, Michigan 13-24 year olds have experienced the second highest rates of infection. There were too few incident cases in the 45+ age group in 2007 to be included in this report.

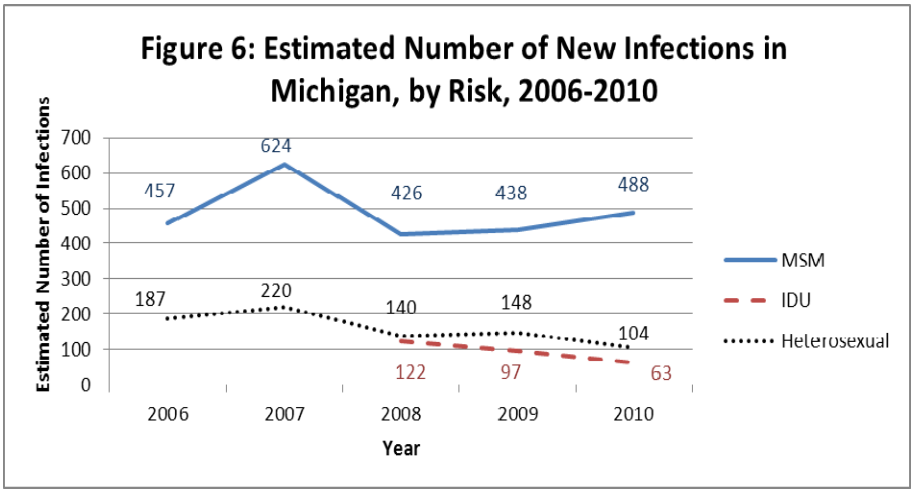
There were no significant changes in infection rates for any age group between 2006 and 2010.



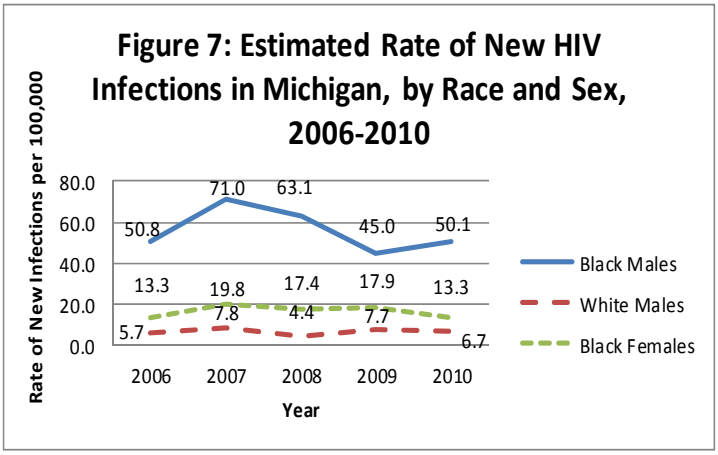
Incidence Estimates by Risk Group

As in the national data, MSM represent the largest number of new infections in Michigan. There were no significant changes in the estimated number of new infections per year for any risk group between 2006 and 2010 (figure 6). There were too few IDU incident cases in 2006 and 2007 to be included in this report.

National data for 2008-2010 showed a significant increase in MSM overall and MSM aged 13-24 years. A significant decrease in females with infection attributable to heterosexual contact was also seen at the national level.[3]



Incidence Estimates by Race and Sex

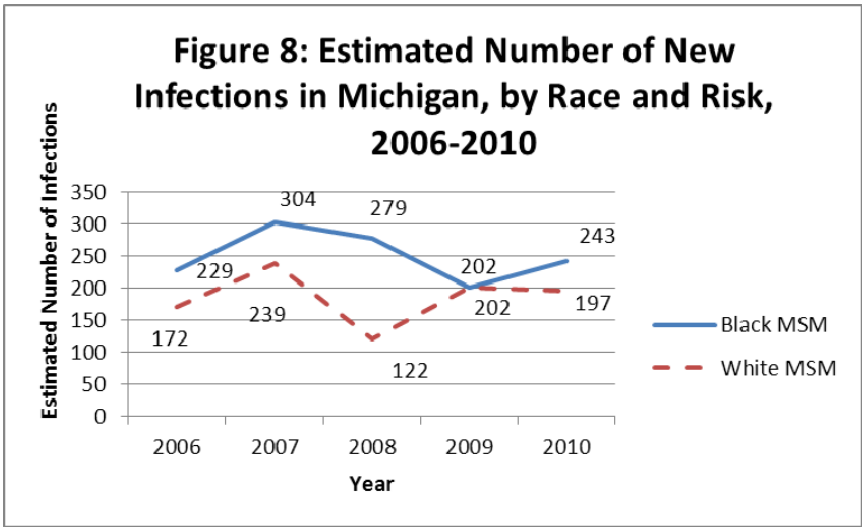


Overall, rates of HIV infection were stable for black males, white males, and black females between 2006 and 2010. White females had too few incident cases to be included in this report. Figure 7 demonstrates the disproportionate impact of HIV on the black population in Michigan. In 2010, the rate of black males was 7.5 times the rate of white males, and the rate of black females was nearly double the rate of white males.

Nationally between 2008 and 2010, there was a significant 21% decrease of new HIV infection among black females.[3]

Incidence Estimates by Race and Risk

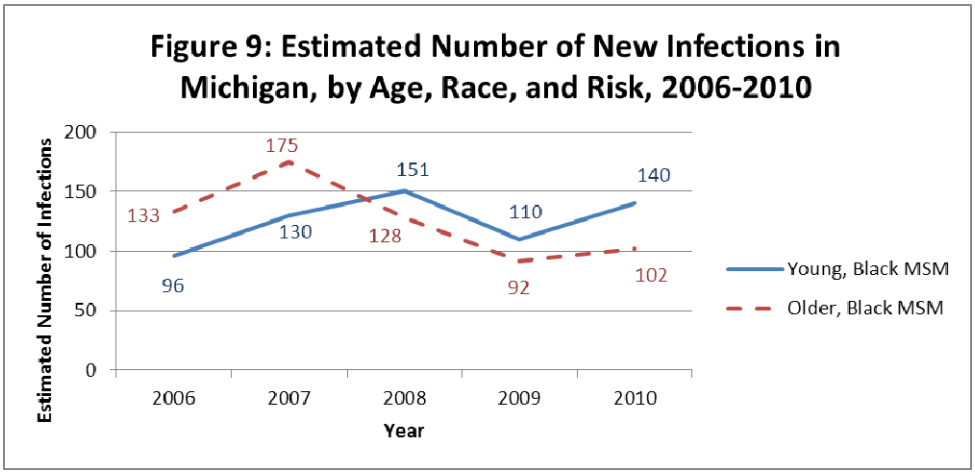
In figure 8, men who have sex with men (MSM) were stratified by race. Overall, the numbers of black and white MSM were stable between 2006 and 2010. In 2010, the estimated number of new infections in black MSM was 18.9% higher than white MSM.



Incidence Estimates by Age, Race and Risk

Black MSM were further stratified by age at infection (figure 9). "Young" refers to 13-24 year olds and "older" refers to those ages 25 and above.

In the national report CDC noted, "The greatest number of new HIV infections among MSM occurred in young black/African American MSM aged 13-24 years."[3] This suggests the importance of observing trends in new infections among this group in Michigan as well as at the national level.



Summary

This HIV incidence report should be interpreted along with prevalence[7] and trend[8] reports issued by MDCH. It is yet another descriptive tool to analyze the trajectory of the epidemic over time. Rates and counts were stable between 2006-2010 overall and for each subgroup analyzed. However, the large confidence intervals produced by the complex estimation process may mask real changes that are occurring. Thus, significant changes in the national data should be noted[3]:

National decreases among females, black females, females with infection attributed to heterosexual contact
National increases among MSM and 13-24 year old MSM

Also, significant changes in Michigan Trends should be noted[8]:

Statewide decreases among females, black females, IDU, heterosexuals, 40-44 year olds
Statewide increases among males, white persons, 20-24 year olds, 25-29 year olds

Michigan will closely monitor these groups going forward.

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[1]"Estimates of HIV Incidence Rates in Michigan, for 2006-2009" Michigan Department of Community Health HIV/AIDS web -site: http://www.michigan.gov/documents/mdch/20120425_Incidence_383658_7.pdf

[2] "Estimated HIV Incidence in the United States, 2006-2009" in the online journal, PLos One, August 2011, Volume 6, Issue 8, e17502. (www.plosone.org)

[3] Centers for Disease Control and Prevention. Estimated HIV incidence in the United States, 2007–2010. *HIV Surveillance Supplemental Report* 2012;17(No. 4). Published December 2012. http://www.cdc.gov/hiv/topics/surveillance/resources/reports/#supplemental .

[4] Hall HI, Song R, Rhodes P, et al; HIV Incidence Surveillance Group. Estimation of HIV incidence in the United States. JAMA 2008;300:520--9. (http://jama.ama-assn.org/content/300/5/520.full)

[5] Karon JM, Song R, Brookmeyer R, Kaplan EH, Hall HI; Estimating HIV incidence in the United States from HIV/AIDS surveillance data and biomarker HIV test results. [Journal Article, Research Support, N.I.H., Extramural] *Stat Med 2008 Oct 15; 27(23):4617-33.*

[6] Vintage 2011 Bridged-Race Postcensal Population Estimates, July 2012; Division of Vital Statistics National Center for Health Statistics: http://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm

[7] January 2013Michigan HIV/AIDS Analysis, Michigan Department of Community Health HIV/AIDS website: http://www.michigan.gov/documents/mdch/January_2013_ALL_408513_7.pdf

[8]Annual Review of HIV Trends in Michigan, 2006-2010: http://www.michigan.gov/mdch/0,4612,7-132-2940_2955_2982_46000_46003-36304--,00.html

For more information: Michigan Department of Community Health HIV/AIDS Surveillance Program
Marianne O'Connor, HIV Incidence Coordinator: 248-424-7922 (**www.michigan.gov/hivstd** –> HIV/AIDS –> Statistics and Reports)