

Estimates of HIV Incidence Rates in Michigan, 2009-2013

Key Findings

Michigan's total HIV incidence rate was stable overall for 2009-2013. In 2013, Michigan had an estimated 797 new infections or 9.6 new infections per 100,000 population.

Michigan males, black persons, men who have sex with men (MSM) and 13-24 year olds have the highest incidence rates and counts.

It is unknown whether an apparent increase in the overall incidence estimate for 2013, as well as an increase among young, black MSM is cause for concern at this time. The increases may be attributable to small sample sizes and changes in testing patterns that greatly affect the statistical model used to create the estimates, or it may be a true increase in incidence.

The incidence rate for black women in 2013 is one half the 2008 rate, although the change is not statistically significant.

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 the 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 the 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.

Michigan has released local incidence estimates in parallel with CDC national estimates since the 2006 estimates that were released in 2008. Presented in this document are Michigan's updated incidence estimates for 2009 through 2013. National estimates, when released, will provide greater context for the Michigan data during this time period.

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 acceptable 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.^{1,2} These programs use a stratified extrapolation approach (inference of incidence rates by subgroups) with multiple imputation (statistical technique for analysis of incomplete data). Unlike previous incidence reports, reporting delay weights were not applied to account for cases diagnosed but not yet reported to the surveillance program by January 2015. Reporting of HIV cases for 2009 through 2013 was largely completed by January 2015 and reporting delay weights are noted to not affect incidence estimates to a significant degree.

Rates per 100,000 population were calculated for all cases greater than 12 years of age at diagnosis 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 estimates³.

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. Estimates for select sub-populations are also included, such as counts for men who have sex with men (MSM) by race and age.

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.

Results

Incidence Estimates Overall 2009-2013

Michigan’s HIV incidence rates were stable through the six year period of 2009 to 2013 (Table 1). During that period, Michigan’s incidence rates ranged from a low of 7.7 to a high of 9.6 infections per 100,000 population. Michigan males, black persons, and MSM have the highest incidence rates and counts. By age at infection, 13-24 year olds have highest rates in 2013.

There were no significant changes overall or in any of the reported subgroups over the five year period. In the figures below, 2013 stands out as an unusual year where the estimated count and rate of new infections were higher for certain groups compared to recent years. This may be because the statistical model provided by CDC to produce these estimates is very sensitive to small changes in testing patterns. Additionally, small sample sizes at the state level may produce unstable estimates. Specifically, the number of first time testers who had “recent” results from the incidence test rose from 13 cases in 2012 to 24 cases in 2013. This increase of only 11 “recent” results is the basis of the rise in incidence estimates for 2013. During this period, there were no new or enhanced MDHHS programs to reach more first-time testers and an increase in the number of reported cases in any subgroup has not been detected.

However a 43% increase in syphilis (757 → 1083) was noted between 2012 and 2013.⁶ With the possibility that there may be a true rise in the incidence of HIV, Michigan continues to monitor reporting

data closely on a quarterly basis and anticipates expanded testing, treatment and PrEP as we strive to reach NHAS goals.

We are unable to report estimated counts or rates for Hispanic/Latino 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).

Table 1: Estimated Number and Rate of New HIV Infections in Michigan, 2009 - 2013

Category	2009			2010			2011			2012			2013		
	N	%	Rate†	N	%	Rate†	N	%	Rate†	N	%	Rate†	N	%	Rate†
Sex															
Male	510	76	12.7	521	82	13.0	540	81	13.4	534	81	13.2	692	87	17.1
Female	161	24	3.8	117	18	2.8	123	19	2.9	129	19	3.0	105	13	2.5
Race/ethnicity															
White	263	39	4.0	229	36	3.5	179	27	2.8	264	40	4.1	265	33	4.1
Black	365	54	31.7	353	55	31.4	426	64	37.9	331	50	29.4	473	59	42.0
Age															
13-24	224	33	13.2	236	37	14.1	278	42	16.6	268	40	16.0	383	48	22.8
25-34	194	29	16.6	222	35	19.1	184	28	15.7	207	31	17.6	196	25	16.5
35-44	109	16	8.3	63	10	5.0	108	16	8.7	109	16	8.9	103	13	8.6
45+	144	21	3.5	118	18	2.9	93	14	2.2	78	12	1.8	114	14	2.7
Risk															
MSM	427	64	N/A^	464	73	N/A^	480	72	N/A^	488	74	N/A^	631	79	N/A^
IDU	100	15	N/A^	53	8	N/A^	52	8	N/A^	N/A**	N/A**	N/A^	56	7	N/A^
Heterosexual/Other	144	21	N/A^	121	19	N/A^	131	20	N/A^	122	18	N/A^	109	14	N/A^
Special Populations															
Black MSM	214	32	N/A^	242	38	N/A^	279	42	N/A^	228	34	N/A^	393	49	N/A^
White MSM	189	28	N/A^	183	29	N/A^	152	23	N/A^	202	30	N/A^	194	24	N/A^
Young, Black MSM	112	17	N/A^	142	22	N/A^	186	28	N/A^	134	20	N/A^	209	26	N/A^
Older, Black MSM	102	15	N/A^	100	16	N/A^	93	14	N/A^	95	14	N/A^	104	13	N/A^
Older, White MSM	146	22	N/A^	135	21	N/A^	121	18	N/A^	142	21	N/A^	155	19	N/A^
Black Men	250	37	46.5	271	42	51.7	320	48	61.0	252	38	48.0	424	53	80.7
White Men	232	35	7.3	200	31	6.3	161	24	5.1	221	33	7.0	216	27	6.8
Black Women	115	17	18.7	82	13	13.7	105	16	17.5	79	12	13.2	48	6	8.0
TOTAL	671		8.1	638		7.7	663		8.0	663		8.0	797		9.6

† Rate per 100,000 population for ages 13 and older, Vintage 2014 Bridged-Race Postcensal Population Estimates³.

**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

Figure 1: Estimated Number and Rate of New HIV Infections in Michigan, 2009-2013

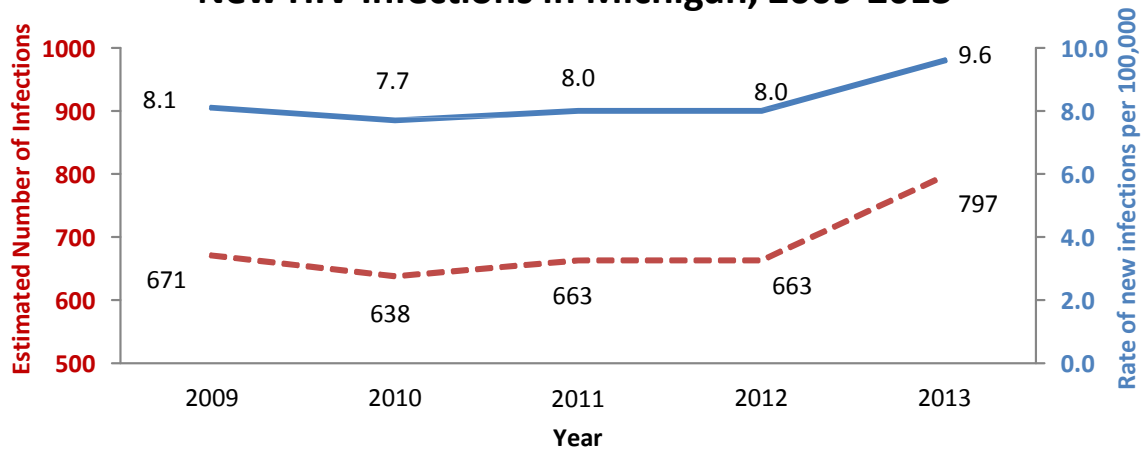


Figure 1. No significant changes in estimates of recent infection were detected for 2009-2013 in Michigan. 2013 appears to be an unusual year where the estimated count and rate of new infections is higher than in recent years. This rise was not statistically significant and may be due to the sensitivity of the model to changes in underlying testing patterns and small sample sizes. Michigan continues to monitor the reporting of new cases closely.

Figure 2: Estimated Number of New HIV Infections and 95% Confidence Intervals in Michigan, 2009 - 2013

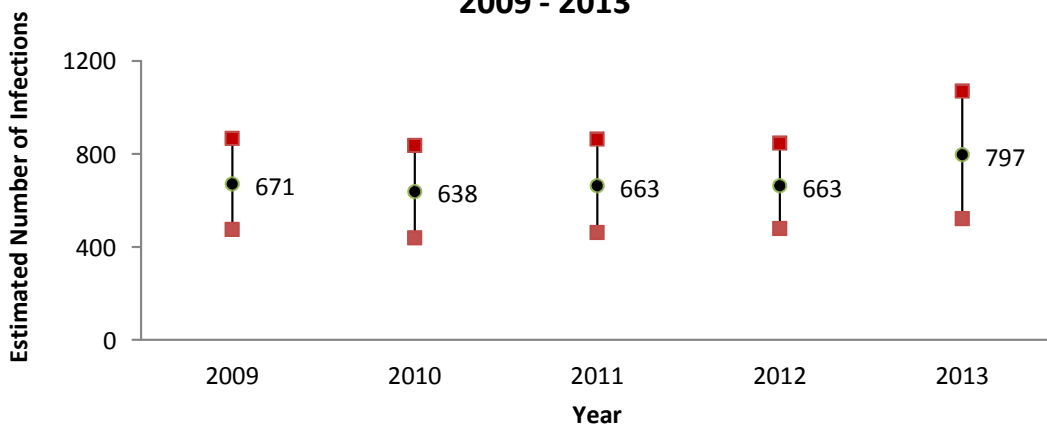


Figure 2. One method to demonstrate that the number of new infections in Michigan did not change significantly over time is to show confidence intervals. The 95% confidence intervals (95% certainty that the true number falls between the upper and lower values) for the number of new HIV infections from 2009 to 2013 are shown in Figure 2. Note that the confidence intervals overlap from year to year, indicating there was not a statistically significant change. The range of values is large due to the estimation process and small sample sizes.

Incidence Estimates by Selected Demographic Groups 2009-2013

Incidence Estimates by Race and Sex:

Overall, rates of HIV infection were stable for black males, white males, and black females between 2009 and 2013. White females had too few incident cases to be included in this report. The increase in 2013 black males (Figure 3) is not statistically significant. The increase may be due to the sensitivity of the model to small changes in underlying testing patterns and test results or may be a true rise in incidence. This data has similar overlapping confidence intervals as seen in Figure 2. None the less, Michigan is monitoring this rate closely.

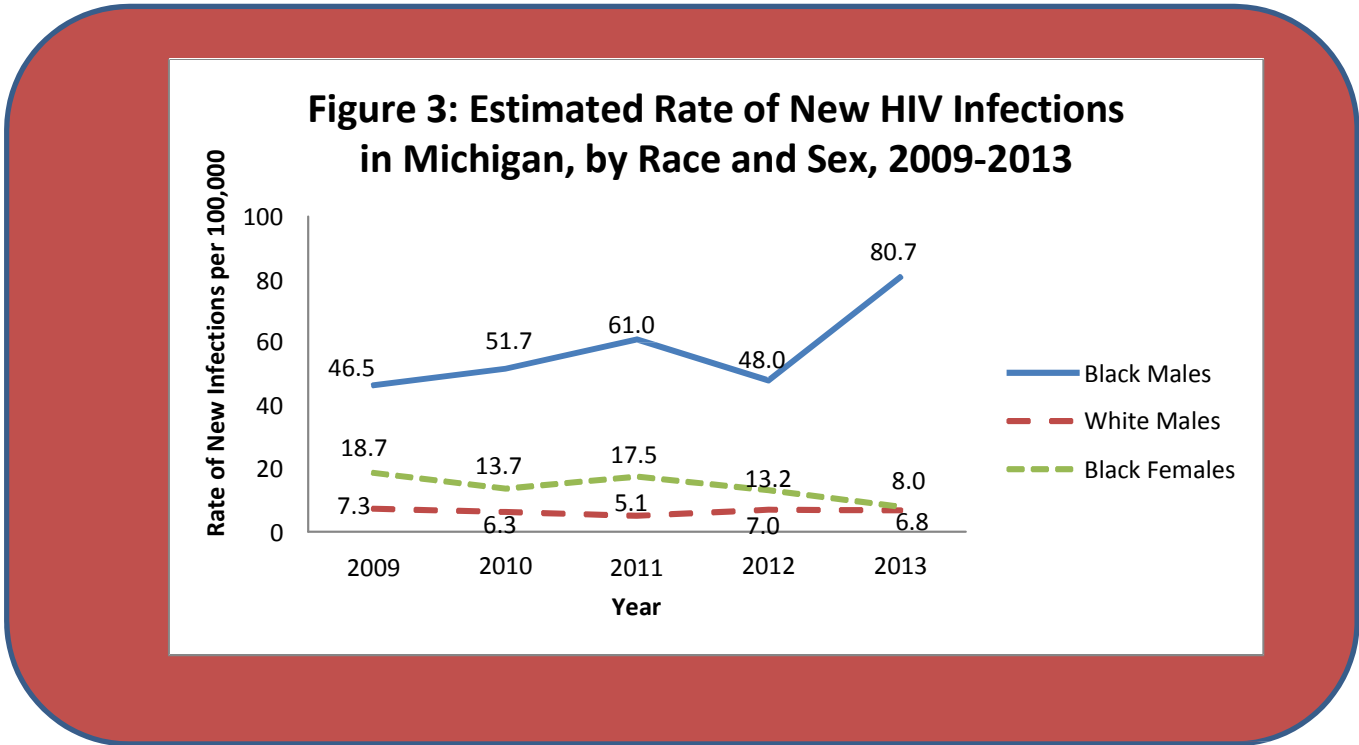


Figure 3. This figure demonstrates the disproportionate impact of HIV on black males in Michigan. In 2013, the rate in black males was 11.9 times the rate of white males. By contrast, the black female rate of 8.0 per 100,000 population in 2013 is reduced by more than half of the 2009 rate of 18.7 per 100,000 though this change is not statistically significant.

Figure 4: Estimated Number of New Infections in Michigan, by Age, Race, and Risk, 2009-2013

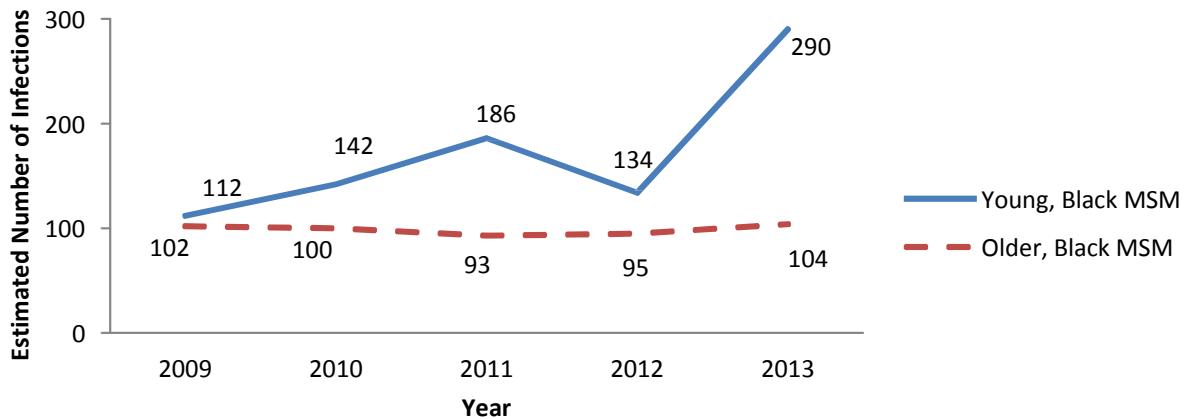


Figure 4. The estimated number of new HIV infections in Black MSM by age at infection are depicted in Figure 4, where “young” refers to 13-24 year olds and “older” refers to those ages 25 and above. In 2013, the estimated number of infections in young, black MSM was nearly triple the estimate of older, black MSM. This suggests the importance of allocating prevention and testing resources to this group.

Summary

This HIV incidence report should be interpreted along with prevalence⁴ and trend⁵ reports issued by MDHHS. It is yet another descriptive tool to analyze the trajectory of the HIV epidemic over time. Rates and counts were stable between 2009-2013, overall and for each subgroup analyzed. Apparent increases in some demographic subgroups in 2013 are not statistically significant changes. The increases may instead be a result of the sensitivity of the statistical model to underlying changes in testing patterns and the lack of large sample sizes. With the possibility that there may be a true rise in the incidence of HIV, Michigan will continue to monitor trends for all demographic groups on a quarterly basis.

¹ 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>)

²Karon 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.

³ Vintage 2014 Bridged-Race Postcensal Population Estimates; Division of Vital Statistics National Center for Health Statistics; http://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm

⁴July 2015 Michigan Department of Health and Human Services Annual HIV Surveillance Report: http://www.michigan.gov/documents/mdch/Statewide_496827_7.pdf

⁵Annual Review of HIV Trends in Michigan, 2009-2013: http://www.michigan.gov/documents/mdch/MIRReport15_487766_7.pdf

⁶ July 2014 Michigan Department of Health and Human Services STD Statistics by County and District. <http://www.mdch.state.mi.us/pha/osr/Index.asp?Id=12>