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Transmitted HIV-1 Drug Resistance among Men Who Have Sex with Men—11 U.S. Jurisdictions, 2008–2011

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BACKGROUND

- In 2011, men who have sex with men (MSM) accounted for an estimated two-thirds of newly diagnosed HIV infections in the United States.
- Effective antiretroviral therapy (ART) suppresses viral load and reduces the risk of HIV transmission. However, transmission of drug-resistant HIV strains to ART-naïve persons leads to reduced benefit of ART and treatment failure.
- The Centers for Disease Control and Prevention maintains the U.S. National HIV Surveillance System (NHSS) through which jurisdictions submit HIV case report data: demographics, transmission risk, laboratory and clinical results.
- As an integral component of NHSS, selected jurisdictions also conduct Molecular HIV Surveillance (MHS) and HIV Incidence Surveillance (HIS).
  - MHS jurisdictions submit HIV nucleotide sequences and treatment history data.
  - HIS jurisdictions submit BED HIV-1 Capture EIA (BED) results and HIV testing and treatment history (TTH) data.

OBJECTIVE

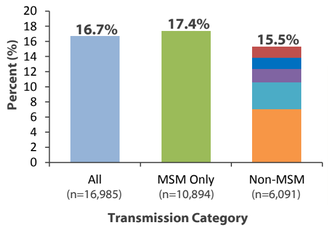
To assess the prevalence of transmitted HIV-1 drug resistance among MSM newly diagnosed with HIV infection from 2008 through 2011.

METHODS

- We analyzed HIV-1 *pol* sequences among persons who
  - Were newly diagnosed with HIV 2008–2011
  - Had no evidence of prior ART use
  - Resided at diagnosis in one of 11 jurisdictions that conduct MHS and HIS
    - California (Los Angeles County only), Colorado, Connecticut, Florida, Illinois (Chicago only), Louisiana, Michigan, New York (New York City only), South Carolina, Texas (excluding Houston), and Washington
  - Had BED and/or TTH data
- We used the CDC HIV-1 surveillance mutation list to identify transmitted drug resistance-associated mutations (TDRM) for
  - Non-nucleoside reverse transcriptase inhibitors (NNRTI)
  - Nucleoside reverse transcriptase inhibitors (nRTI)
  - Protease inhibitors (PI)
- We used BED results and TTH data to classify persons as having a recent or long-standing infection.
  - Absent a BED result, infections were classified as recent if there was evidence of a negative HIV test result (laboratory-documented or self-reported) ≤6 months before the HIV diagnosis.
  - Infections were classified as long-standing for persons diagnosed with AIDS ≤6 months after an HIV diagnosis.
- We hierarchically assigned a transmission category to persons with an identified risk factor and imputed a category for persons with unknown risk.
- Among MSM, we assessed prevalence of TDRM by
  - Age
  - Race/ethnicity
  - Year of diagnosis
  - Municipality of residence at diagnosis (selected vs. other)
  - Duration of infection (recent vs. long-standing)
- We calculated prevalence ratios (PR) and 95% confidence intervals (CI) to compare TDRM prevalence between groups and estimated annual percentage change of TDRM for 2008–2011.

RESULTS

Prevalence of any (≥1) TDRM among all infections*, by transmission category, 2008–2011



MSM had more infections with any TDRM (17.4%) compared with infections among non-MSM (15.5%). PR=1.12 95% CI=1.05, 1.21

*Includes all persons who met the study criteria.

Prevalence of TDRM in infections among MSM, overall and by duration of infection, 2008–2011

	All (n=10,894)		Duration of Infection: Recent (n=3,083)		Duration of Infection: Long-standing (n=7,810)			
TDRM	No.	Col %	No.	Col %	No.	Col %	PR*	95% CI
Any (≥1)	1,894	17.4	580	18.8	1,314	16.8	1.12	1.02, 1.22
NNRTI	984	9.0	336	10.9	648	8.3	1.31	1.16, 1.13
nRTI	722	6.6	199	6.5	523	6.7	0.96	0.82, 1.13
PI	498	4.6	144	4.7	354	4.5	1.03	0.85, 1.24

*For each category, prevalence ratios (PR) reflect prevalence of TDRM among recent vs. long-standing infections as a series of 2x2 tables with "None identified" as the comparison group.

Of 10,894 infections among MSM, 17.4% had any TDRM, 9.0% had TDRM for NNRTI, 6.6% had TDRM for nRTI, and 4.6% had TDRM for PI.

Compared with long-standing infections, recent infections were 1.12 times as likely to have any TDRM and 1.31 times as likely to have TDRM for NNRTI.

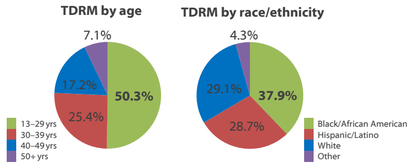
Prevalence of any (≥1) TDRM in infections among MSM, by selected charactistics, 2008–2011

Characteristic	MSM No.	Any TDRM No.	Any TDRM Row %	PR	95% CI
Total	10,894	1,894	17.4	—	—
Age at diagnosis (yr)					
13–29	**5,116**	**952**	**18.6**	**1.17**	**1.04, 1.32**
30–39	2,805	482	17.2	1.08	0.95, 1.23
40–49	2,046	325	15.9	Referent	
50+	927	135	14.6	0.92	0.76, 1.11
Race/ethnicity*					
Black/African American	4,057	717	17.7	1.04	0.94, 1.16
Hispanic/Latino	3,110	544	17.5	1.03	0.93, 1.15
White	3,261	552	16.9	Referent	
Other	466	82	17.6	1.10	0.88, 1.36
Year of diagnosis					
2008	2,379	415	17.5	Referent	
2009	2,991	486	16.2	0.93	0.83, 1.05
2010	3,309	574	17.4	0.99	0.89, 1.12
2011	2,215	419	18.9	1.08	0.96, 1.12
Municipality of residence at diagnosis					
Selected	6,953	1,238	17.8	Referent	
Chicago, Illinois	309	57	18.6	—	—
Dallas, Texas	602	110	18.2	—	—
Denver, Colorado	264	37	14.1	—	—
Detroit, Michigan	488	89	18.2	—	—
Los Angeles, California	1,796	302	16.8	—	—
Miami, Florida	162	27	16.6	—	—
New Orleans, Louisiana	92	12	12.7	—	—
New York City, New York	2,702	486	18.0	—	—
Seattle, Washington	539	119	22.0	—	—
Other	3,941	656	16.6	0.93	0.86, 1.02

*Hispanics/Latinos can be of any race. Other race includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islanders, and persons of multiple races.

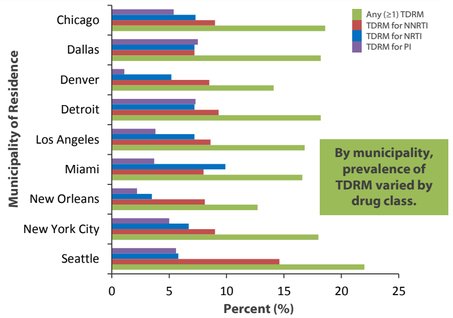
Infections among MSM aged 13–29 had the highest prevalence of any TDRM (18.6%) and had more TDRM than those among MSM aged 40–49.

Age and race/ethnicity distribution among MSM diagnosed with infections with any TDRM, 2008–2011



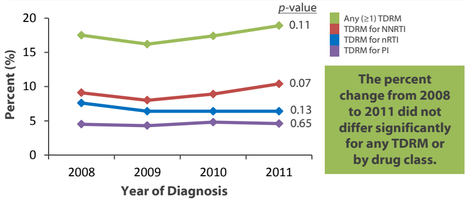
By age, half of the infections with any TDRM were among MSM aged 13–29. By race/ethnicity, more than one-third of infections with any TDRM were among black/African American MSM. However, prevalence of any TDRM did not differ significantly by race/ethnicity.

Prevalence of TDRM in infections among MSM, by municipality of residence at diagnosis, 2008–2011



By municipality, prevalence of TDRM varied by drug class.

Prevalence of TDRM in infections among MSM, by year of diagnosis, 2008–2011



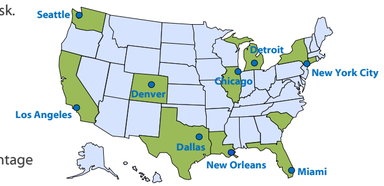
The percent change from 2008 to 2011 did not differ significantly for any TDRM or by drug class.

Prevalence of selected TDRM in infections among MSM, by drug class, 2008–2011

NNRTI		nRTI		PI	
TDRM	%	TDRM	%	TDRM	%
K103N	**70.3**	**M41L**	**24.8**	**L90M**	**29.6**
Y181C	10.0	T69N	19.3	T74S	18.5
G190A	7.7	T215D	14.2	V11I	13.0
K103S	5.8	T215S	13.0	M46I	10.3
K101E	4.4	D67N	8.2	M46L	9.9
P225H	4.3	T69A	7.4	Q58E	9.8
Y188L	3.8	K219Q	7.3	V82A	9.2
G190S	1.2	T215C	7.1	D30N	7.3
V106A	0.8	L210W	6.4	N88D	6.9
V106M	0.6	M184V	6.1	I54V	4.8
G190E	0.5	A62V	6.0	I85V	4.8
L100I	0.4	T215E	5.6	I84V	3.3
K101P	0.4	E44D	5.5	L24I	3.0
M230L	0.4	T69D	3.3	L76V	1.6
Y181V	0.4	K219R	2.3	L23I	1.5
Y188H	0.3	T215Y	1.8	V32I	1.5
Y181I	0.2	K70E	0.6	I47V	1.2
Y188C	0.1	K65R	0.5	T74P	1.0
V106F	0.0	T215F	0.5	V82L	0.9

The most prevalent TDRM were K103 N (NNRTI), M41L (nRTI), and L90M (PI).

U.S. Jurisdictions and Selected Municipalities



LIMITATIONS

- Analysis was based on a convenience sample and was limited to 11 jurisdictions that conducted MHS and HIS from 2008 through 2011. These jurisdictions represented 43% of the persons newly diagnosed with HIV infection in the United States in 2011.
- Sequences were obtained from specimens collected ≤3 months after HIV diagnosis, not at HIV infection, and were analyzed by conventional bulk sequencing. Mutations initially present at infection and minority TDRM might not have been detected, thus underestimating the prevalence of TDRM.
- In the absence of BED results, classification of cases as recent infections relied on the collection and accurate reporting of the date of the last negative HIV test.

DISCUSSION

- Among MSM, the subgroups most affected by transmitted drug resistance (youngest age group and Blacks/African Americans) are the populations that bear the heaviest burden of HIV infection overall.
- The higher prevalence of NNRTI-associated mutations, especially among MSM classified as recently infected, might be a reflection of NNRTI-based regimens as the preferred treatment option for drug-naïve HIV-1 infected persons.
- Higher prevalence of TDRM among recent infections might be indicative of reversion of TDRM to wild-type over time in long-standing infections or to the presence of TDRM below detectable levels.
- Differences in prevalence of transmitted drug resistance among MSM by municipality of residence might be dependent on the proportion of the population that are MSM, on linkage to care, and on patient adherence to ART.
- Timely resistance testing among MSM to identify drug resistance early in infection is crucial for optimal ART provision, viral suppression, and reduced HIV transmission.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention

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