

# Estimates of CDC-Funded and National HIV Diagnoses: A Comparison by Demographic and HIV-related Factors

Amy Krueger<sup>1,2</sup>  · Patricia Dietz<sup>1</sup> · Michelle Van Handel<sup>1</sup> · Lisa Belcher<sup>1</sup> · Anna Satcher Johnson<sup>1</sup>

Published online: 21 January 2016  
© Springer Science+Business Media New York (outside the USA) 2016

**Abstract** To determine whether CDC-funded HIV testing programs are reaching persons disproportionately affected by HIV infection. The percentage distribution for HIV testing and diagnoses by demographics and transmission risk group (diagnoses only) were calculated using 2013 data from CDC's National HIV Surveillance System and CDC's national HIV testing program data. In 2013, nearly 3.2 million CDC-funded tests were provided to persons aged 13 years and older. Among persons who received a CDC-funded test, 41.1 % were aged 20–29 years; 49.2 % were male, 46.2 % were black/African American, and 56.2 % of the tests were conducted in the South. Compared with the characteristics of all persons diagnosed with HIV in the United States in 2013, among persons diagnosed as a result of CDC-funded tests, a higher percentage were aged 20–29 years (40.3 vs 33.7 %) and black/African American (55.3 vs 46.0 %). CDC-funded HIV testing programs are reaching young people and blacks/African Americans.

**Keywords** Human immunodeficiency virus · CDC-funded · HIV testing · HIV diagnoses

## Introduction

Approximately 1.2 million persons are living with HIV infection in the United States, of which 13 % are estimated to be unaware of their infection [1]. HIV testing identifies persons infected with HIV and can lead to treatment, decreased risk behaviors, and reduced risk of transmission [2–5]. Blacks/African Americans, Hispanics/Latinos, gay, bisexual, and other men who have sex with men (collectively referred to as MSM), and young people are disproportionately affected by HIV. For example, blacks/African Americans represent only 13 % of the U.S. population but accounted for 46 % of all HIV diagnoses in 2013 [6, 7]. Persons aged 13–29 years accounted for 38 % of the HIV diagnosis, while persons aged 15–29 years account for 20.8 % of the population in 2013 [6, 7]. The highest number of HIV infections continue to be attributed to male-to-male sexual contact [6].

The Centers for Disease Control and Prevention (CDC) funds state and local health departments and community-based organizations (CBOs) to support HIV prevention activities, including HIV testing. In this paper, we examine the extent to which CDC-funded HIV testing programs are reaching persons disproportionately affected by HIV infection in the United States.

We assessed the characteristics, age, sex, race/ethnicity, and region of residence or test site location of persons who received a CDC-funded HIV test. We compared the characteristics of persons newly diagnosed with HIV infection with a CDC-funded test with persons aged 13 years and older diagnosed in the United States in 2013. We hypothesized that persons newly diagnosed with HIV infection in 2013 by a CDC-funded test were more likely to be male, younger, black/African American, Hispanic/Latino, or MSM compared with all persons diagnosed with HIV

---

✉ Amy Krueger  
akrueger@cdc.gov

<sup>1</sup> Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC, 1600 Clifton Road, NE, Mailstop E-59, Atlanta, GA 30333, USA

<sup>2</sup> School of Health Sciences, University of Tampere, Tampere, Finland

infection in the United States. This analysis provides information about which groups disproportionately affected by HIV infection are being reached and which groups are underserved by CDC-funded HIV testing programs.

## Methods

### Data Sources

National HIV Prevention Program Monitoring and Evaluation (NHM&E) test data are reported to CDC by state and local health departments and directly funded CBOs funded to conduct HIV testing. These health departments and CBOs collect and report information on demographics, HIV transmission risk, the HIV test type, and test result. Records were included for valid testing events conducted in the United States (3,217,600/3,343,633 [96.2 %]). A valid testing event (hereafter referred to as tests) included records with a reported test technology or test result. Test technologies included a conventional, NAAT/RNA, or rapid test. A new HIV diagnosis from the NHM&E data was defined as a test with a positive result in which the client did not self-report having previously tested positive. NHM&E data are test-level and do not include personal identifiers. However, because persons who reported a previous positive result are excluded from the ‘HIV diagnosis’ definition, the estimates for NHM&E HIV diagnoses data are considered to be at the person level, rather than test level.

We compared HIV diagnoses data from the National HIV Surveillance System (NHSS) published in the 2013 *HIV Surveillance Report* with 2013 NHM&E test data. NHSS reports estimates of the number of persons diagnosed with HIV infection and the total number of persons living with diagnosed HIV infection in the United States [6]. We analyzed NHSS estimates of persons aged 13 years and older who were diagnosed with HIV infection in one of the 50 states or the District of Columbia in 2013. These 2013 estimates are based on data reported to CDC through June 2014 and are adjusted to account for reporting delays. Persons aged 13 years and older were included from NHM&E and NHSS.

### Demographic and HIV-related Factors

For each data source, age, sex, race/ethnicity, region, and transmission risk were either self-reported (NHM&E) or collected from various resources (e.g., medical records, other surveillance databases for NHSS). Race/ethnicity was calculated by combining race and ethnicity variables into the following categories: Hispanic or Latino (regardless of race), white, black/African American, and other (including

Asian, American Indian, Alaska Native, Native Hawaiian, Pacific Islander, and multiple race/ethnicities). Transmission risk groups were calculated into hierarchical categories: men who reported having sex with a man, persons who reported any injection drug use (IDU), men who reported having sex with a man and any IDU, and heterosexual contact. For NHM&E, heterosexual contact combines both high risk (clients who reported heterosexual contact and at least one risk behavior other than injection drug use) and low risk sex (clients who reported heterosexual contact but did not report any other risk behaviors). Risk behaviors for high risk transmission include: sex without using a condom, sex with a person who is an injection drug user, sex with a person who has male-to-male-sexual contact (females only), and sex with a person who is HIV-positive [8]. For NHSS, high-risk heterosexual contact is sexual contact with a person known to have, or to be at high risk for, HIV infection (e.g. an injection drug user) [6]. NHM&E collected information on transmission risks occurring in the last 12 months and NHSS included information on transmission risks if the persons had ever engaged in the risk. Transmission risk is not available for all CDC-funded testing events, but is collected for all persons testing HIV-positive. Those that did not provide transmission risk were excluded from analyses on transmission risk. For NHSS, multiple imputation was used to assign a transmission category for HIV diagnoses reported to NHSS without transmission risk information [9].

### Data Analysis

First, we calculated the percentages of CDC-funded tests (NHM&E data) by age, sex, race/ethnicity, and region. Second, we compared the estimated percentage of U.S. persons diagnosed with HIV in 2013 (NHSS data) with persons diagnosed with a CDC-funded HIV test in 2013 (NHM&E data) by age, sex, race/ethnicity, region, and transmission category.

Statistical testing to assess the differences in the national estimates of persons diagnosed compared with CDC-funded diagnoses could not be completed because the samples are not independent. CDC-funded tests resulting in diagnoses are included in the diagnoses reported in NHSS and could not be separated. All data analyses were conducted using SAS version 9.3 (Cary, NC).

## Results

### CDC-funded HIV Testing Characteristics

In 2013, nearly 3.2 million CDC-funded tests were provided to persons aged  $\geq 13$  years. Among persons who

received a CDC-funded test, 41.1 % were aged 20–29 years followed by those aged 30–39 years at 22.9 %; 49.2 % were male, 46.2 % were black/African American, 21.4 % were Hispanic/Latino, and 56.2 % of the tests were conducted in the South (Table 1).

### CDC-funded HIV Diagnoses Compared with Diagnoses reported to the National HIV Surveillance System

Among the 15,695 persons aged  $\geq 13$  years newly diagnosed with HIV infection with a CDC-funded test in 2013, 40.3 % were aged 20–29 years, 81.4 % were male, 55.3 % were black/African American, 19.7 % were Hispanic/Latino, 56.9 % were diagnosed in the South, and 58.9 % were men who reported sex with a man in the last 12 months (Table 2). Among males newly diagnosed with

a CDC-funded test, 3178 (25 %) were missing transmission risk data. Among females diagnosed with a CDC-funded test, 838 (29 %) were missing transmission risk data. Nationally, an estimated 47,165 persons aged  $\geq 13$  years were diagnosed with HIV infection in 2013, of whom 33.7 % were aged 20–29 years, 80.3 % were male, 46.0 % were black/African American, 21.4 % were Hispanic/Latino, 51.4 % were diagnosed in the South (includes persons aged  $< 13$  years [ $n = 187$ ]; age by region stratification not reported), 65.3 % were males whose HIV infection was attributed to male-to-male sexual contact and 0.4 % had an unreported transmission risk or a risk attributed to other factors after imputation for those missing transmission risk information. Without the imputation performed on the NHSS diagnoses data, the percentage missing transmission risk information is similar to the percentage missing information in the NHM&E CDC-funded testing data; approximately 25 % [6, 9].

**Table 1** Demographics of persons who received CDC-funded HIV tests (NHM&E), United States, 2013

Factor	CDC-funded	
	Tests total	
	n	% of total
Total <sup>a</sup>	3,187,072	100
Age (years)		
13–19	270,440	8.5
20–29	1,310,861	41.1
30–39	729,456	22.9
40–49	441,210	13.8
50–64	374,410	11.7
$\geq 65$	60,695	1.9
Sex		
Male	1,556,374	49.2
Female	1,608,229	50.8
Race/ethnicity		
Black/African American	1,425,442	46.2
Hispanic/Latino	660,954	21.4
White	885,011	28.7
Other <sup>b</sup>	111,115	3.6
Region <sup>c</sup>		
Northeast	591,271	18.6
Midwest	373,558	11.7
South	1,789,913	56.2
West	432,330	13.6

NHM&E National HIV Prevention Program Monitoring and Evaluation System

<sup>a</sup> Due to rounding, totals may not add to 100

<sup>b</sup> Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and multiple races

<sup>c</sup> As defined by the U.S. Census [http://www.census.gov/geo/maps-data/maps/pdfs/reference/us\\_regdiv.pdf](http://www.census.gov/geo/maps-data/maps/pdfs/reference/us_regdiv.pdf)

### Discussion

The results of this study partially support our hypotheses; CDC-funded tests are diagnosing a greater percentage of persons in some populations disproportionately affected by HIV infection, specifically young adults and blacks/African Americans [6, 10–12]. The percentage of Hispanics/Latinos diagnosed was lower among those tested with a CDC-funded test than nationally. Additionally, the percentage of diagnoses as a result of a CDC-funded test among MSM was lower than the percentage of diagnoses among MSM nationally. However, the percentages for MSM may be more similar if one accounts for the unknown transmission risk group among diagnoses in the CDC-funded test group.

Over 25 % of CDC-funded diagnoses for males were unknown, invalid, missing or unclassified for transmission risk. If a large percentage of these records with unknown risk are MSM, then this would almost eliminate the gap between the percentage of diagnoses among MSM nationally and diagnoses made with CDC-funded tests. Decisions on prevention successes derived from CDC-funded HIV testing programs would benefit from improving data quality for transmission risk. NHSS also has a similar proportion of persons missing transmission risk information and has developed an approach to impute this information [9]. The imputation of NHM&E diagnoses missing transmission risk information is not finalized but we believe it would be similar to NHSS distribution of missing. NHSS also uses a longer time frame to assess transmission risk factors than NHM&E (ever verses last 12 months), this may increase the NHSS estimates of diagnoses among MSM.

**Table 2** Newly identified HIV-positive tests through CDC-funded tests (NHM&E) and estimated HIV diagnoses (NHSS), United States, 2013

Factor	CDC-funded diagnoses		All diagnoses	
	n	% of total	Estimated n	% of total
Total <sup>a</sup>	15,695	100	47,165	100
Age (years)				
13–19	543	3.5	1908	4.0
20–29	6320	40.3	15,878	33.7
30–39	3856	24.6	11,023	23.4
40–49	2791	17.8	9781	20.7
50–64	1998	12.7	7530	16.0
≥65	187	1.2	1045	2.2
Sex				
Male	12,579	81.4	37,887	80.3
Female	2877	18.6	9278	19.7
Race/ethnicity <sup>b</sup>				
Black/African American	8441	55.3	21,714	46.0
Hispanic/Latino	3005	19.7	10,104	21.4
White	3300	21.6	13,075	27.7
Other	529	3.5	2272	4.8
Region <sup>c,d</sup>				
Northeast	2550	16.3	8909	18.8
Midwest	1656	10.6	6109	12.9
South	8934	56.9	24,323	51.4
West	2555	16.3	8013	16.9
Transmission category <sup>e</sup>				
Male				
Male-to-male sexual contact	6733	58.9	30,689	65.3
Injection drug use	186	1.6	1942	4.1
Male-to-male sexual contact and injection drug use	301	2.6	1270	2.7
Heterosexual contact <sup>f</sup>	2181	19.1	3887	8.3
Female				
Injection drug use	128	1.1	1154	2.5
Heterosexual contact <sup>f</sup>	1911	16.7	8031	17.1

NHM&E, National HIV Prevention Program Monitoring and Evaluation System; NHSS, National HIV Surveillance System

<sup>a</sup> Due to rounding, totals may not add to 100

<sup>b</sup> Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and persons of multiple races

<sup>c</sup> Denominator for NHSS includes persons aged <13 years old (<0.4 %) for region of residence

<sup>d</sup> As defined by the U.S. Census [http://www.census.gov/geo/maps-data/maps/pdfs/reference/us\\_regdiv.pdf](http://www.census.gov/geo/maps-data/maps/pdfs/reference/us_regdiv.pdf)

<sup>e</sup> Diagnoses with unknown transmission risk have been excluded from analysis: CDC-funded tests-25 % and NHSS-0.4 %

<sup>f</sup> For NHM&E, heterosexual contact combines both high risk and low risk sex. For NHSS, heterosexual contact is defined as sex with a person at high risk for HIV infection

In 2013, CDC-funded HIV testing programs diagnosed HIV infection in over 15,000 persons. The results of our analysis suggest that, in 2013, approximately one-third of all HIV diagnoses in the United States may have resulted from a test funded by CDC. CDC-funded programs tested a higher percentage of young adults aged 18–24 years and diagnosed a higher percentage of young adults aged 20–29 years compared with all persons tested and

diagnosed in 2013. CDC-funded testing programs also diagnosed a higher percentage of blacks/African Americans compared with all persons diagnosed in the United States. The finding for young adults is supported by a study by Inunga et al. (2011) that documented 32 % of young adults who had ever been tested for HIV were tested in public clinics [13]. Young adults who are concerned about privacy may seek testing at CDC-funded settings since

most CDC-funded tests do not require insurance and anonymity is possible [14]. In addition, CDC has funded CBOs, directly and indirectly through health departments, to focus testing efforts on reaching young MSM.

CDC has also funded testing programs to reach persons disproportionately affected by HIV, such as blacks/African Americans, Hispanics/Latinos, and MSM. These initiatives may have contributed to the higher percentage of blacks/African Americans tested and diagnosed with CDC-funded tests compared with persons tested and diagnosed nationally in 2013. High testing was observed for Hispanics/Latinos but higher diagnoses were not observed. Higher diagnoses were observed among males; however, fewer diagnoses were seen among MSM. Strategies, (e.g., more targeted testing) to increase HIV diagnoses among Hispanics/Latinos and MSM are needed. In addition, approximately one in four males did not report transmission risk in the CDC-funded testing data. For MSM, this may be due to the stigma associated with being gay or bi-sexual [15]. Improvement in the quality of data on transmission risk is needed to fully understand who is receiving CDC-funded HIV tests.

This study is subject to at least three limitations. First, persons newly diagnosed with a CDC-funded test are based on self-report and subject to misclassification bias as some persons may not admit to a previous diagnosis. One study of drug users found 27 % did not accurately report their HIV status [16]. Thus, our estimates may overestimate the number of new HIV diagnoses from CDC-funded tests. A large percentage of transmission risk information is missing in both data systems but NHM&E was not able to impute for records with missing information and this may underestimate the number of MSM CDC-funded tests diagnosed. Lastly, NHM&E data are not mutually exclusive from NHSS. Therefore, differences found in age, race/ethnicity, and sex percentages would be greater if the data from CDC-funded tests were mutually exclusive of data from NHSS.

## Conclusion

Overall, we found that CDC-funded HIV testing programs are reaching some populations at increased risk of living with undiagnosed HIV infection, specifically younger persons and blacks/African Americans [1]. Males, specifically MSM, and Hispanics/Latinos, are not being reached sufficiently. CDC-funded HIV testing programs should use strategies to increase HIV testing and diagnoses among MSM and Hispanics/Latinos.

**Acknowledgments** The authors would like to thank all of the participating health department and localities.

## Compliance with Ethical Standards

**Conflicts of Interest** The authors have no conflicts of interest to disclose.

## References

- Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 Dependent Areas—2013. 2015;20(2). <http://www.cdc.gov/hiv/library/reports/surveillance/>. Accessed 31 Dec 2015.
- Marks G, Crepaz N, Janssen R. Estimating sexual transmission of HIV from persons aware and unaware that they are infected with the virus in the USA. *AIDS*. 2006;20(10):1447–50.
- Marks G, Crepaz N, Senterfitt JW, Janssen R. Meta-analysis of high-risk sexual behavior in persons aware and unaware they are infected with HIV in the United States: implications for HIV prevention programs. *J Acquir Immune Defic Syndr*. 2005;39(4):446–53.
- Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med*. 2011;365(6):493–505.
- Skarbinski J, Rosenberg E, Paz-Bailey G, Hall HI, Rose CE, Viall AH, et al. Human immunodeficiency virus transmission at each step of the care continuum in the United States. *JAMA Intern Med*. 2015;175:588–96.
- Centers for Disease Control and Prevention. HIV Surveillance Report, 2013; vol 25. Atlanta, GA. February 2015. <http://www.cdc.gov/hiv/library/reports/surveillance/>. Accessed 31 Dec 2015.
- U. S. Census Bureau. Total Population 2013 [December 16, 2015]. Available from: [http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_13\\_1YR\\_S0101&prodType=table](http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_1YR_S0101&prodType=table).
- Centers for Disease Control and Prevention. HIV testing at CDC funded sites United States, Puerto Rico, and U.S. Virgin Islands, 2011. Atlanta, GA: 2013.
- Harrison KM, Kajese T, Hall HI, Song R. Risk factor redistribution of the national HIV/AIDS surveillance data: an alternative approach. *Public Health Rep*. 2008;123(5):618–27.
- Johnson AS, Beer L, Sionean C, Hu X, Furlow-Parmley C, Le B, et al. HIV infection - United States, 2008 and 2010. *MMWR Surveill Summ*. 2013;62(Suppl 3):112–9.
- Prejean J, Song R, Hernandez A, Ziebell R, Green T, Walker F, et al. Estimated HIV incidence in the United States, 2006–2009. *PLoS One*. 2011;6(8):e17502.
- An Q, Prejean J, Hall HI. Racial disparity in U.S. diagnoses of acquired immune deficiency syndrome, 2000–2009. *Am J Prev Med*. 2012;43(5):461–6.
- Inungu J, Lewis A, Mustafa Y, Wood J, O'Brien S, Verdun D. HIV testing among adolescents and youth in the United States: update from the 2009 behavioral risk factor surveillance system. *Open AIDS J*. 2011;5:80–5.
- Committee on Pediatric AIDS, Emmanuel PJ, Martinez J. Adolescents and HIV infection: the pediatrician's role in promoting routine testing. *Pediatrics*. 2011;128(5):1023–9.
- Centers for Disease Control and Prevention. Stigma and Discrimination: National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention; 2010 [updated March 10, 2015; cited 2015 March 16th]. <http://www.cdc.gov/msmhealth/stigma-and-discrimination.htm>.
- Latkin CA, Vlahov D. Socially desirable response tendency as a correlate of accuracy of self-reported HIV serostatus for HIV seropositive injection drug users. *Addiction*. 1998;93(8):1191–7.