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## Racial and ethnic disparities in sustained viral suppression and transmission risk potential among persons aged 13–29 years living with diagnosed HIV infection, United States, 2016

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### Abstract

**Background:** In 2016, persons aged 13–29 years represented 23.1% of the U.S. population, yet accounted for 41.7% of HIV diagnoses. Racial/ethnic minorities are disproportionately affected by HIV. Sustaining viral suppression helps persons living with diagnosed HIV infection (PLWDH) stay healthy and reduces the risk of transmitting HIV. We examined racial/ethnic disparities in sustained viral suppression and transmission risk potential among PLWDH aged 13–29 years.

**Methods:** We analyzed data from the National HIV Surveillance System reported through December 2018 from 42 jurisdictions with complete laboratory reporting. We included persons aged 13–29 years who received an HIV diagnosis by December 31, 2015, most recently resided in one of the 42 jurisdictions, and were alive at the end of 2016. Sustained viral suppression was defined as viral load <200 copies/mL for all tests in 2016. Transmission risk potential was estimated using the number of days with viral loads >1,500 copies/mL.

**Results:** Of the 90,812 PLWDH aged 13–29 years included in the analysis, 41.5% had sustained viral suppression in 2016. Across age, sex, and most transmission categories, blacks had the lowest prevalence of sustained viral suppression. Among the 28,154 who were in care but without sustained viral suppression, the average number of days with viral load >1,500 copies/mL was 206 days (56.4% of the 12-month period).

**Conclusion:** Sustained viral suppression was suboptimal and transmission risk potential was high for PLWDH aged 13–29 years. Racial/ethnic disparities were apparent, calling for strengthening tailored interventions to improve care outcomes.

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## Keywords

youth and young adults; persons living with HIV; sustained viral suppression; transmission risk potential; racial/ethnic disparities

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## INTRODUCTION

Advances in HIV prevention and treatment allow for a once-in-a-generation opportunity to end the HIV epidemic in the United States.<sup>1</sup> Using data to identify disparities can effectively guide prevention, treatment and care efforts for achieving the goal of ending the HIV epidemic. Adolescents and young adults are disproportionately affected by HIV in the United States. In 2016, persons aged 13–29 years represented 23.1% of the U.S. population,<sup>2</sup> yet accounted for 41.7% of HIV diagnoses.<sup>3</sup> HIV diagnosis rates per 100,000 population varied substantially among those aged 13–14 years (0.3), 15–19 years (8.0), 20–24 years (30.7), and 25–29 years (34.6).<sup>3</sup> Additionally, HIV diagnosis rates were 3 to 17 times higher among blacks/African Americans (blacks), Hispanic/Latinos and other races than among whites.<sup>3</sup> Of HIV infections diagnosed in 2016 among persons aged 13–29 years, 78.5% were attributed to male-to-male sexual contact; of which 48.8% were among black men who have sex with men (MSM), 26.9% were among Hispanic/Latino MSM, and 18.0% were among white MSM.<sup>3</sup>

Simpler, more potent and tolerable antiretroviral therapy (ART) has helped many persons living with diagnosed HIV infection (PLWDH) to achieve and sustain viral suppression, stay healthy, reduce mortality, and decrease the risk of transmitting HIV.<sup>4–7</sup> However, adolescents and young adults are the least likely of any age group to be linked to care in a timely manner,<sup>8</sup> to be prescribed ART,<sup>9</sup> and to achieve and sustain viral suppression.<sup>8–10</sup> Identified barriers to care and treatment include transition to adult care, ART management challenges, lack of health insurance, inexperience with and infrequent access to medical care, dissatisfaction with the health team/system, perceived stigma, illicit substance use, mental health issues, lack of support, behavioral and conduct problems, poverty, low education, homelessness, and living in more disadvantaged areas.<sup>11–14</sup> Youth and young adults with perinatally acquired HIV may have unique experiences and barriers to care and treatment compared to those with behaviorally acquired HIV.<sup>11</sup> Racial/ethnic minority youth and young adults at various bio-psychosocial and cognitive developmental stages may also experience different barriers to HIV care, ART use, and viral suppression<sup>11–14</sup> as each race and ethnicity has unique cultural values, beliefs and practices that may contribute to disparities in HIV care. Without sustaining viral suppression, adolescent and young adults may experience longer time with a viral load level (e.g., >1,500 copies/mL) which increases the risk for transmitting HIV.<sup>15</sup>

Several studies examined viral suppression among racial/ethnic groups<sup>15–17</sup> and among young age groups.<sup>18–20</sup> There is no study to our knowledge specifically focused on PLWDH aged 13–29 years of different racial/ethnic groups and examines sustained viral suppression and transmission risk potential by narrower age groups, sex, behavioral transmission categories, and perinatally acquired HIV. In this report, we used CDC's National HIV

Surveillance System (NHSS) to conduct more refined analyses to gauge disparities and identify needs for tailored interventions.

## METHODS

We used NHSS data through December 2018 from 42 jurisdictions that had complete laboratory reporting. The 42 jurisdictions are Alabama, Alaska, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, and Wyoming. These jurisdictions accounted for 89.5% of all persons aged 13–29 years living with diagnosed HIV infection at year-end 2016 in the United States. The analytic cohort included persons aged 13–29 years who received an HIV diagnosis by December 31, 2015, most recently resided in one of the 42 jurisdictions, and were alive at the end of 2016.

Sustained viral suppression was defined as all viral load test results <200 copies/mL in 2016.<sup>15</sup> For persons who had only one viral load test in 2016, sustained viral suppression was defined as a viral load test result of <200 copies/mL for the 2016 test and for the last viral load test in 2015. Persons with no viral load tests in 2016 were presumed not suppressed.<sup>15</sup> All persons aged 13–29 years with HIV diagnosed through 2015 who were living at the end of 2016 were included in the denominator for determining the percentage with sustained viral suppression.

Among persons who received HIV medical care (defined as having at least one CD4 or viral load test in 2016)<sup>8</sup> without sustained viral suppression in 2016 (i.e., not all viral load test results <200 copies/mL), we estimated HIV transmission potential based on the number of days that a person's viral load was >1,500 copies/mL.<sup>15,21,22</sup>

Both outcomes were stratified by race/ethnicity and examined by age, sex, behavioral transmission category, and perinatally acquired HIV. We categorized race/ethnicity into the following groups: black, Hispanic/Latino, white, and other. Using the standard method in HIV surveillance reports,<sup>3,8</sup> Hispanics/Latinos can be of any race. The Other category includes American Indians/Alaska Natives, Asians, Native Hawaiians/other Pacific Islanders and persons reporting multiple races.

## Results:

The analytic cohort consisted of 90,812 PLWDH aged 13–29 years, including 55.3% blacks, 22.0% Hispanic/Latinos, 15.9% whites, and 6.8% other races (Table 1). The majority were male (80.4%), MSM (68.9%), aged 25–29 years (64.3%), and persons with behaviorally acquired HIV (91.7%). The median number of viral load tests in 2016 was two, with 52,677 (58.0%) persons having two or more tests, 13,200 (14.5%) having one test, and 24,935 (27.5%) having no test in 2016. The percentage of persons without a viral load test in 2016 was 29.5% among blacks, 25.2% among Hispanics/Latinos, 25.6% among whites, and 22.8% among others.

Of the 90,812 PLWDH aged 13–29 years, 41.5% had sustained viral suppression in 2016 (Table 1). Overall, the lowest prevalence of sustained viral suppression was among blacks (36.1%), compared with Hispanics/Latinos (46.7%), others (47.3%), and whites (50.8%). The prevalence of sustained viral suppression varied by age within racial/ethnic groups. Among blacks and Hispanics/Latinos, persons aged 20–24 years had the lowest prevalence of sustained viral suppression (34.1% and 43.7%) compared to the other three age groups. For whites, PLWDH aged 13–14 years and 15–19 years had the lowest prevalence of sustained viral suppression (both 48.6%). Among persons of other races, those aged 15–19 years had the lowest prevalence of sustained viral suppression (42.0%). Across all racial/ethnic groups, more males than females had sustained viral suppression in 2016 (43.0% vs. 35.6% overall). MSM had the highest prevalence of sustained viral suppression (44.3%), whereas persons who inject drugs (PWID) had the lowest prevalence of sustained viral suppression overall (30.9% for males, 32.0% for females) and within each of the racial/ethnic groups. Prevalence of sustained viral suppression was higher among those with behaviorally acquired HIV than those with perinatally acquired HIV (42.2% vs. 34.6%). This pattern was seen within each of the racial/ethnic groups. Across all age groups, sex, behavioral transmission categories (except Other transmission category), and perinatally acquired HIV, blacks had the lowest prevalence of viral suppression compared to the other three racial/ethnic groups. Among all subgroups across racial/ethnic groups and selected demographic characteristics, black PWID had the lowest prevalence of sustained viral suppression (24.4% for males and 27.5% for females).

About one third (31.0%; 28,154/90,812) received HIV medical care but without sustained viral suppression in 2016. Among the 28,154 PLWDH, the average number of days with viral loads >1,500 copies/mL was 206 days (56.4% of the 12-month period, Table 2). Blacks experienced a longer period (213 days, 58.3% of the 12-month period) with viral loads >1,500 copies/mL, than did others (199 days, 54.5%), Hispanics/Latinos (198 days, 54.2%) and whites (184 days, 50.4%). Across all racial/ethnic groups, female PWID experienced the longest period with viral loads >1,500 copies/mL. The number of days with viral load >1,500 copies/mL were comparable between those with perinatally and behaviorally acquired HIV.

## DISCUSSION

Among PLWDH aged 13–29 years, about two in five persons (41.5%) achieved sustained viral suppression in 2016. More than one in four (27.5%) did not have a viral load test in 2016 which, in part, may be due to inadequate HIV care. Racial/ethnic disparities in sustained viral suppression were apparent across age, sex, most behavioral transmission categories, and perinatally acquired HIV. Black youths and young adults had the lowest prevalence of sustained viral suppression. Among those who were in care but did not sustain viral suppression, blacks experienced a longer time with viral loads >1,500 copies/mL than other racial/ethnic groups, a circumstance that may increase transmission risk.

While MSM, in general, had the highest prevalence of sustained viral suppression across all transmission categories, black MSM who accounted for 53.8% of MSM aged 13–29 years living with diagnosed HIV infection had the most suboptimal outcome with only 38.0%

sustained viral suppression. Evidence from the Medical Monitoring Project (MMP) showed that ART prescription increased among young black men during 2009–2014; however, there were no significant increases in ART adherence or sustained viral suppression during the same period.<sup>23</sup> MMP data also showed that a high proportion of young black men were living at or below the poverty level, were homeless, and had higher prevalence of unmet need for transportation assistance, housing, and food and nutrition.<sup>23,24</sup>

Other subgroups who had low prevalence of sustained viral suppression and warrant attention are male and female PWID and persons who acquired HIV perinatally. Although PWID represented 2.6% of PLWDH aged 13–29 years, fewer than one in three male and female PWID sustained viral suppression in 2016. Similarly, around one in three PLWDH with perinatally acquired HIV sustained viral suppression. Suboptimal outcomes may be the result of loss of care in transitioning to adult care, burn out, stigma, mental health comorbidities, poor adherence, and illicit substance use which are common in these groups.<sup>11,12,25–27</sup>

Taken together, our findings indicate that PLWDH aged 13–29 years have not fully benefited from HIV care and treatment. Sustaining viral suppression is a challenge across the HIV population.<sup>22</sup> It can be even more challenging for PLWDH aged 13–29 years who are less experienced with medical care than older adults and who face additional barriers associated with various bio-psychosocial and cognitive developmental stages.<sup>11–14</sup> Ending the HIV epidemic is unlikely to be achieved unless effective programs are established and expanded to improve sustained viral suppression and decrease disparities among PLWDH aged 13–29 years. Two evidence-based interventions (EBIs)<sup>28</sup> show that a centralized service model with a multi-disciplinary team of adolescent care providers, social workers, and case managers<sup>29</sup> and a tightly coordinated medical-social support network<sup>30</sup> are effective in improving retention in HIV care by delivering developmentally and culturally appropriate care and services that address medical, physical, psychosocial, environmental, and financial needs of adolescent and young adult PLWDH. Another strategy that has shown promise in improving medication adherence, care visit, and viral suppression is the use of mobile phone technology and social media.<sup>31,32</sup> PLWDH aged 13–29 years could also benefit from education about Undetectable = Untransmittable (U=U) to further strengthen motivation to initiate and adhere to ART.<sup>33</sup> Understanding there is effectively no risk of transmitting HIV through sex for persons taking ART as prescribed and achieving and maintaining viral suppression might alleviate potential self-stigma surrounding potential transmission for PLWDH aged 13–29 years with sustained viral suppression.<sup>33</sup> Given that adolescents and young adults have the lowest knowledge of HIV status,<sup>34</sup> wide dissemination of U=U messages to this group might facilitate discussion of HIV prevention options (e.g., pre-exposure prophylaxis), reduce HIV stigma, and motivate HIV testing among those who are uncertain about their serostatus.<sup>33</sup> Improving sustained viral suppression and reducing HIV transmission risk among PLWDH aged 13–29 years is possible. However, it will require implementing and scaling up developmentally appropriate EBIs, wide dissemination of U=U message, involvement of clinicians and services providers, transitioning youth to adult care and services, and utilizing innovative strategies (e.g., mobile technology, mHealth) to reach and engage this age group.

Our results are subject to the following limitations. First, analyses were limited to 42 jurisdictions with complete laboratory reporting which might not be representative of all persons aged 13–29 years living with diagnosed HIV infection in the United States. Second, ART initiation and status are not well captured in NHSS, therefore patient-level ART data are not available. Third, transmission risk potential was estimated for PLWDH who had an indication of care ( 1 CD4 or viral load laboratory test). Having a laboratory test does not necessarily indicate whether the person received appropriate HIV medical care or not.

In summary, our findings highlight suboptimal outcomes of sustained viral suppression and transmission risk potential among PLWDH aged 13–29 years of different racial/ethnic groups. Disparities are apparent, calling for strengthening tailored interventions that are developmentally and culturally appropriate in addressing barriers to care and unmet needs of PLWDH aged 13–29 years.

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**Table 1:**

Sustained viral suppression among persons aged 13–29 years with HIV infection diagnosed through 2015 who were alive at year-end 2016, by race/ethnicity and selected characteristics – National HIV Surveillance System, 41 states and the District of Columbia

Characteristics	Overall			Black			Hispanic/Latino			White			Other <sup>a</sup>								
	Total	Sustained viral suppression	Total	Sustained viral suppression	Total	Sustained viral suppression	Total	Sustained viral suppression	Total	Sustained viral suppression	Total	Sustained viral suppression	Total	Sustained viral suppression							
	No	column %	No	row %	No	column %	No	row %	No	column %	No	row %	No	column %	No	row %					
<b>Total</b>	90,812	100	37,723	41.5	50,205	100	18,135	36.1	19,940	100	9,315	46.7	14,437	100	7,332	50.8	6,213	100	2,939	47.3	
<b>Age (years)</b>																					
13–14	636	0.7	282	44.3	405	63.7	169	41.7	94	14.8	43	45.7	72	11.3	35	48.6	65	10.2	35	53.8	
15–19	4,348	4.8	1,762	40.5	2,719	62.5	1,025	37.7	905	20.8	406	44.9	426	9.8	207	48.6	293	6.7	123	42.0	
20–24	27,463	30.2	10,685	38.9	16,055	58.5	5,475	34.1	5,894	21.5	2,574	43.7	3,679	13.4	1,829	49.7	1,829	6.7	806	44.1	
25–29	58,365	64.3	24,994	42.8	31,026	53.2	11,466	37.0	13,047	22.4	6,292	48.2	10,260	17.6	5,261	51.3	4,026	6.9	1,975	49.1	
<b>Sex</b>																					
Male	73,029	80.4	31,385	43.0	39,011	77.7	14,411	36.9	16,891	84.7	8,124	48.1	11,987	83.0	6,339	52.9	5,134	82.6	2,510	48.9	
Female	17,783	19.6	6,338	35.6	11,194	22.3	3,724	33.3	3,049	15.3	1,191	39.1	2,450	17.0	993	40.5	1,079	17.4	429	39.8	
<b>Transmission Category</b>																					
<b>Behaviorally acquired</b>	83,270	91.7	35,117	42.2	45,793	91.2	16,767	36.6	18,117	90.9	8,611	47.5	13,635	94.4	7,006	51.4	5,721	92.1	2,733	47.8	
Male-to-male sexual contact <sup>b</sup>	62,552	68.9	27,736	44.3	33,683	67.1	12,811	38.0	14,461	72.5	7,176	49.6	10,006	69.3	5,532	55.3	4,402	70.9	2,216	50.3	
Male injection drug use <sup>b</sup>	947	1.0	293	30.9	352	0.7	86	24.4	249	1.2	86	34.5	301	2.1	107	35.5	46	0.7	15	32.6	
Male-to-male sexual contact and injection drug use <sup>b</sup>	2,875	3.2	1,092	38.0	824	1.6	243	29.5	764	3.8	299	39.1	1,010	7.0	445	44.1	277	4.5	105	37.9	
Male heterosexual contact <sup>b</sup>	2,565	2.8	856	33.4	1,797	3.6	539	30.0	440	2.2	185	42.0	212	1.5	86	40.6	116	1.9	46	39.7	
Female heterosexual contact <sup>b</sup>	11,800	13.0	4,256	36.1	7,861	15.7	2,668	33.9	1,784	8.9	708	39.7	1,455	10.1	603	41.4	701	11.3	277	39.5	

Characteristics	Overall			Black			Hispanic/Latino			White			Other <sup>a</sup>							
	No	column %	Sustained viral suppression	No	column %	Sustained viral suppression	No	column %	Sustained viral suppression	No	column %	Sustained viral suppression	No	column %	Sustained viral suppression					
																Total	row %	Total	row %	Total
Female injection drug use <sup>b</sup>	1,405	1.5	450	32.0	567	1.1	156	27.5	238	1.2	83	34.9	512	3.5	183	35.7	89	1.4	28	31.5
Other <sup>b,c</sup>	1,125	1.2	435	38.7	709	1.4	264	37.2	181	0.9	74	40.9	141	1.0	51	36.2	91	1.5	45	49.5
<b>Perinatally acquired</b>	7,542	8.3	2,606	34.6	4,412	8.8	1,368	31.0	1,823	9.1	704	38.6	802	5.6	326	40.6	492	7.9	206	41.9

<sup>a</sup>Other includes American Indians/Alaska Natives, Asians, Native Hawaiians/other Pacific Islanders and persons reporting multiple races.

<sup>b</sup>Data have been statistically adjusted to account for missing transmission category; therefore values may not sum to column subtotals.

<sup>c</sup>Include hemophilia, blood transfusion, and risk factor not reported or not identified.

Table 2.

Transmission risk potential among persons aged 13–29 years with HIV infection diagnosed through 2015 who were alive at year-end 2016, and received HIV medical care without sustained viral suppression in 2016 by race/ethnicity and selected characteristics – National HIV Surveillance System, 41 states and the District of Columbia

Characteristics	HIV Transmission Risk Potential Estimated as the Mean Number of Days During 2016 with Viral Load Above 1,500 copies/ml				
	Overall N = 8,154	Black N = 7,283	Hispanic/Latino N = 5,604	White N = 3,412	Other <sup>a</sup> N = 1,855
<b>Total</b>	206	213	198	184	199
<b>Age (years)</b>					
13–14	147	162	146	34	128
15–19	193	199	185	181	167
20–24	210	216	202	191	204
25–29	205	213	196	182	201
<b>Sex</b>					
Male	204	213	198	180	197
Female	209	214	196	199	209
<b>Transmission Category</b>					
<b><i>Behaviorally acquired</i></b>	205	213	197	184	200
Male-to-male sexual contact	204	213	195	175	196
Male injection drug use	209	202	221	199	266
Male-to-male sexual contact and injection drug use	211	217	212	205	216
Male heterosexual contact	210	213	220	176	202
Female heterosexual contact	206	210	192	195	204
Female injection drug use	224	227	223	212	272
Other <sup>b</sup>	203	211	221	150	150
<b><i>Perinatally acquired</i></b>	209	217	202	183	193

<sup>a</sup> Other includes American Indians/Alaska Natives, Asians, Native Hawaiians/other Pacific Islanders and persons reporting multiple races.

<sup>b</sup> Include hemophilia, blood transfusion, and risk factor not reported or not identified.