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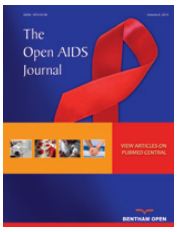

HIV Infection Care and Viral Suppression Among People Who Inject Drugs, 28 U.S. Jurisdictions, 2012-2013

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Abstract:

Objectives:

Assess outcomes along the care continuum for HIV-infected people who inject drugs (PWID), by type of facility and stage of infection at diagnosis.

Methods:

Data reported by 28 jurisdictions to the National HIV Surveillance System by December 2014 were used to identify PWID aged ≥13 years, diagnosed with HIV infection before December 31, 2013. Analyses used the CDC definition of linkage to care (LTC), retention in care (RIC), and viral suppression (VS), and are stratified by age, sex, race/ethnicity, and type of facility and stage of HIV infection at diagnosis.

Results:

Of 1,409 PWID diagnosed with HIV in 2013, 1,116 (79.2%) were LTC with the lowest percentages among males (78.4%); blacks (77.5%) ages 13-24 years (69.0%); those diagnosed in early stage infection (71.6%); and at screening, diagnostic, or referral agencies (60.0%). Of 80,958 PWID living with HIV in 2012, 40,234 (49.7%) were RIC and 34,665 (42.8%) achieved VS. The lowest percentages for RIC and VS were among males (47.1% and 41.3% respectively); those diagnosed with late stage disease (47.1% and 42.4%); and young people. Whites had the lowest RIC (47.0%) while blacks had the lowest VS (41.1%).

Conclusion:

Enhanced LTC activities are needed for PWID diagnosed at screening, diagnostic or referral agencies *versus* those diagnosed at inpatient or outpatient settings, especially among young people and blacks diagnosed in early stage infection. Less than half of PWID are retained in care or reach viral suppression indicating the need for continued engagement and return to care activities over the long term.

Keywords: AIDS, Care continuum, Facility at diagnosis, HIV, Injection drug use, Stage of infection .

INTRODUCTION

The *National HIV/AIDS Strategy for the United States (NHAS)* defines four primary goals: (1) reducing new human immunodeficiency virus (HIV) infections; (2) increasing access to care and improving health outcomes for people living with HIV; (3) reducing HIV-related disparities and health inequities; and (4) achieving a more coordinated

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national response to the HIV epidemic [1]. While people who inject drugs (PWID) make up a relatively small share of the U.S. population, their risk of HIV infection is disproportionately high [2]. In 2010, there were more than 6.6 million people aged 13 years and older who had injected drugs during their lifetime and more than 188,000 who were infected with HIV [3, 4].

While new diagnoses of HIV infection among PWID declined from an estimated 6,004 in 2002 to an estimated 1,795 in 2011 (a 70% decrease) [5] and the number of people living with HIV infection attributed to injection-drug use (IDU) declined from 143,500 to 140,700 from 2008 to 2010 [6], continued vigilance is needed to detect PWID who are infected. In 2013 IDU was the third most commonly reported risk factor for HIV infection in the United States after male-to-male sexual contact and heterosexual contact, and IDU was the only known risk factor for an estimated 6.6% of HIV infection diagnoses (5.1% of males and 12.4% of females) [7]. For both male and female PWID almost half of HIV infections in 2013 were among blacks/African Americans. Among male PWID, Hispanics/Latinos and whites each accounted for just under 25% of HIV diagnoses, while among females whites accounted for 34% and Hispanics/Latinos for 15% [7].

The NHAS recommends engagement in care and integration of services for HIV testing and treatment provided by medical professionals, and mental health and substance abuse agencies and practitioners [7]. Specifically, to address the increased risk of PWID contracting HIV infection the NHAS recommends the development of evidence-based HIV prevention recommendations and voluntary routine testing at substance abuse and mental health clinics. However, recent surveys found that three of four PWID reported not participating in a HIV behavioral prevention program and half reported not having been tested for HIV in the past 12 months [8, 9]. Among PWID attending one of five community-based substance abuse treatment programs that offered free HIV testing, nearly one-third had not been tested in the prior 12 months [10]. Data from the Substance Abuse and Mental Health Services Administration (SAMHSA) indicate that less than 50% of substance abuse treatment programs provide on-site infectious disease screening and that inpatient facilities were more likely than non-inpatient facilities to offer such tests [11]. Notwithstanding these challenges, PWID have the lowest percentage of undiagnosed HIV infection [4].

HIV diagnosis is the entry point to the continuum of HIV care, and the 2013 Presidential Continuum of Care Initiative recommended identification of gaps in the other essential steps of the continuum, including linkage to care, retention in care, and antiretroviral (ARV) treatment to achieve the ultimate goal of viral suppression [12]. One study of outpatients presenting for initial HIV primary care found that the mean duration between HIV infection and presentation for HIV-related medical care is as long as eight years [13]. Torian (2008) found that testing at a community testing site or health department and IDU were risk factors for failure to link to care within 3 months of diagnosis [14]. PWID infected with HIV may also have challenges remaining engaged in care or achieve viral suppression. This analysis assessed linkage to and retention in care and viral suppression among people classified by the National HIV Surveillance System (NHSS) as having the single risk factor of injection-drug use. Analyses included examination of the characteristics of persons diagnosed with HIV linked to care, retained in care, and virally suppressed, linkage to care by type of facility at diagnosis and retention in care and viral suppression by stage of disease at diagnosis. This is the first study we know of to look at these components of the continuum of care for PWID using surveillance data, including place and stage of diagnosis for PWID infected with HIV.

METHODS

All data from the National HIV Surveillance System (NHSS), described elsewhere [15], reported to the CDC through December 2014 were used to identify cases of HIV infection meeting the CDC case definition [16] among PWID aged 13 years and older who had received a diagnosis of HIV infection before December 31, 2013 and whose residence at diagnosis was one of 28 jurisdictions. Data were included from jurisdictions that met three criteria:

1. the jurisdiction's laws/regulations required the reporting of all CD4 and viral load results to the state/city health department;
2. laboratories that perform HIV-related testing for the areas had reported a minimum of 95% of HIV-related test results to the jurisdiction health department; and
3. by December 31, 2014, the jurisdiction had reported (to CDC) at least 95% of all CD4 and viral load test results received from January 2011 through September 2013.

The 28 jurisdictions that met these criteria were Alabama, Alaska, Arkansas, California, District of Columbia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Michigan, Missouri, Nebraska, New Hampshire, New

York, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

The linkage to care analysis was limited to PWID who were diagnosed with HIV infection during 2013. Linkage to care was defined as ≥1 CD4 or VL test within 3 months of diagnosis. The retention in care and viral load suppression analysis included people who were diagnosed before 2012 and were not known to be deceased on December 31, 2012. Data from 2012 were selected to allow for at least 18 months to report both HIV-infected people and deaths. Retention in care was defined as ≥2 CD4 or VL tests performed at least 3 months apart during 2012. Viral suppression was defined as a viral load test result of <200 copies/mL or, if the quantitative value was missing, a test interpretation value of "undetectable", at the time of the most recent viral load test during 2012. Laboratory results with no month and year of specimen collection were excluded from the analysis. If there were two test results for the same month with conflicting viral suppression results, the test result that indicated lack of viral suppression was used. In addition, laboratory tests with a blank result and tests with specimen collection dates prior to the date of HIV infection diagnosis were excluded.

Analyses were adjusted for unknown transmission category [7]. Data were stratified by age group (13-24, 25-34, 35-44, 45-54, ≥55), sex, race/ethnicity (black/African American, white, Hispanic/Latino, other), and type of facility at diagnosis (inpatient, outpatient, screening/diagnostic/referral agency, and other). Stage of disease at diagnosis was categorized as early stage infection (defined as the absence of an HIV Stage 3 [AIDS] diagnosis within 3 months of an HIV diagnosis) or late stage infection (defined as the presence of a confirmed HIV Stage 3 [AIDS] diagnosis within 3 month of an HIV diagnosis). All analyses were conducted using SAS 9.3 (SAS Institute, Inc., Cary, NC).

RESULTS

Of the 1,409 PWID with HIV infection diagnosed during 2013 in the 28 jurisdictions, 1,106 (79.2%) were linked to care ≤3 months after HIV diagnosis (Table **1**). The estimated percentage of males and females linked to care were similar (78.4% and 80.4%, respectively). African Americans/blacks (hereafter referred to as blacks) (77.5%) were linked to care less often than whites (81.6%) and Hispanic/Latinos (81.4%) as were those in younger age groups (*e.g.*, linkage to care 69.0% among those aged 13-24 years *vs*. 81.8% among those aged 45-54years). The percentage linked to care was higher among those diagnosed in late-stage infection (98.1%) compared with those not diagnosed in late-stage infection (71.6%).

Table 1. Linkage to HIV care among people aged ≥13 years who inject drugs[a] and had their HIV infection diagnose during 2013, by selected characteristics-National HIV Surveillance System, 28 jurisdictions[b], United States.

Characteristic	Number of HIV diagnoses	Linked to care[c]	
	No.	No.	(%)
Sex			
Male	842	661	78.4
Female	567	456	80.4
Race/ethnicity			
Black/African American	631	489	77.5
Hispanic/Latino[d]	301	245	81.4
White	391	319	81.6
Other[e]	86	63	73.6
Age group at diagnosis (yrs)			
13-24	131	91	69.0
25-34	315	244	77.5
35-44	306	249	81.4
45-54	384	314	81.8
55+	272	218	80.1
Stage at diagnosis			
HIV infection stage 1, 2 or unknown	1003	718	71.6
HIV infection stage 3 [AIDS]	406	399	98.1
Type of facility at diagnosis			
Inpatient	409	353	86.3
Outpatient	468	377	80.4

(Table 1) contd.....

Characteristic	Number of HIV diagnoses	Linked to care[c]	
	No.	No.	(%)
Screening, diagnostic, referral agency[f]	124	74	60.0
Other/unknown	408	313	76.6
Total[g]	1,409	1,116	79.2

Abbreviation: HIV = human immunodeficiency virus.

[a]Data statistically adjusted to account for missing transmission categories.

[b]Jurisdictions include Alabama, Alaska, Arkansas, California, District of Columbia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Michigan, Missouri, Nebraska, New Hampshire, New York, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

[c]Defined as one or more CD4+ T-lymphocyte or viral load test within 3 months after HIV diagnosis.

[d]Hispanic/Latino can be of any race.

[e]Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and multiple races.

[f]Examples include blood banks, family planning clinics, sexually transmitted disease clinics and case management agencies.

[g]Estimates might not sum to total.

Linkage to care varied depending on the type of care at time of diagnosis (inpatient, 86.3%; outpatient, 80.4%; and screening, diagnostic or referral agency (SDR), 60.0%) (Table **2**). This pattern was observed regardless of sex, race/ethnicity, age at diagnosis, or stage at diagnosis with the greatest absolute difference between inpatient and SDR agencies among those aged 13-24 years (absolute difference 41.9 percentage points), blacks (31.1 percentage points), and females (27.1 percentage points). Males and females diagnosed at inpatient (males=84.5%, females=89.1%), outpatient (males=79.0%, females=81.9%) and SDR (males=58.2%, females=62.0%) facilities were linked to care with similar frequency. Regardless of place of diagnosis, PWID with late stage disease were more likely to be linked to care within three months after care.

Of the 80,958 PWID with HIV infection diagnosed before 2012 and alive on December 31, 2012, 49.7% were retained in care and 42.8% achieved viral suppression (Table **3**). Females were both retained in care (53.8%) and achieved viral suppression (45.2%) more often than males (47.1% and 41.3%, respectively). Whites were slightly less likely to be retained in care (47.0%) when compared to other race/ethnicity groups but more likely to achieve viral suppression (45.5%) (Table **3**). By age group, both retention in care and viral suppression increased with age (retention in care: 13-24 years, 42.7% and 55 years and older, 49.8%; and viral suppression: 13-24 years, 30.6% and 55 years and older, 45.2%). Retention in care among PWID with infection diagnosed in late stage (47.1%) was lower than among those not with late stage disease (50.6%); viral suppression was similar among PWID with infection diagnosed late compared with those without late stage disease (42.4% and 43.0% respectively).

Table 2. Linkage to care by facility at HIV diagnosis among people who inject drugs[a] and had their HIV infection diagnosed during 2013, by selected characteristics-National HIV Surveillance System, 28 jurisdictions[b], United States.

	Type of facility at diagnosis								
	Inpatient			Outpatient			Screening, diagnostic, referral agency[c]		
	Total	Linked to Care[d]		Total	Linked to Care[d]		Total	Linked to Care[d]	
	No.	No.	(%)	No.	No.	(%)	No.	No.	(%)
Characteristic									
Sex									
Male	245	207	84.5	246	195	79.0	67	39	58.2
Female	163	146	89.1	222	182	81.9	57	35	62.0
Race/ethnicity									
Black/African American	184	158	85.6	201	161	80.3	48	26	54.5
Hispanic/Latino[e]	100	87	87.4	89	70	78.5	22	13	59.1
White	96	86	89.2	149	124	83.0	48	32	66.6
Other[f]	29	22	77.5	29	21	72.8	6	3	53.6
Age group at diagnosis (yrs)									
13-24	25	24	93.3	42	27	64.4	25	13	51.4
25-34	68	58	86.1	103	84	81.2	47	28	60.5
35-44	90	80	88.9	96	81	84.0	28	19	69.2
45-54	117	101	86.4	139	114	82.0	18	11	60.6
55+	109	90	82.6	88	71	80.7	6	3	46.6

(Table 2) contd.....

	Type of facility at diagnosis								
	Inpatient			Outpatient			Screening, diagnostic, referral agency[c]		
	Total	Linked to Care[d]		Total	Linked to Care[d]		Total	Linked to Care[d]	
Stage at diagnosis									
HIV infection stage 1, 2	218	167	76.3	358	269	75.1	112	62	55.7
or unknown									
HIV infection stage 3 [AIDS])	190	186	97.8	110	108	97.5	12	12	100
Total[g]	409	353	86.3	468	377	80.4	124	74	60.0

Abbreviation: HIV = human immunodeficiency virus.

[a]Data statistically adjusted to account for missing transmission categories.

[b]Jurisdictions include Alabama, Alaska, Arkansas, California, District of Columbia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Michigan, Missouri, Nebraska, New Hampshire, New York, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

[c]Examples include blood banks, family planning clinics, sexually transmitted disease clinics and case management agencies.

[d]Defined as one or more CD4+ T-lymphocyte or viral load test within 3 months after diagnosis.

[e]Hispanic/Latino can be of any race.

[f]Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and multiple races.

[g]Estimates might not sum to total.

Table 3. Retention in care and viral suppression among people aged ≥13 years who inject drugs[a] and had their HIV infection diagnosed before 2012 and were alive on December 31, 2012, by selected characteristics-National HIV Surveillance System, 28 jurisdictions[b], United States.

	Number of HIV diagnoses	Retained in care[c]		Viral suppression[d]	
	No.	No.	(%)	No.	(%)
Characteristic					
Sex					
Male	49,537	23,324	47.1	20,474	41.3
Female	31,421	16,910	53.8	14,191	45.2
Race/ethnicity					
Black/African American	42,868	21,021	49.0	17,630	41.1
Hispanic/Latino[e]	19,695	9,869	50.1	8,384	42.6
White	14,699	6,905	47.0	6,548	44.5
Other[f]	3,696	2,438	66.0	2,103	56.9
Age group at end of 2011 (yrs)					
13-24	634	270	42.7	194	30.6
25-34	4,887	2,122	43.4	1,672	34.2
35-44	15,067	7,151	47.5	5,865	38.9
45-54	33,375	17,237	51.6	14,743	44.2
≥55	26,995	13,453	49.8	12,192	45.2
Stage at diagnosis					
HIV infection stage 1, 2 or unknown	59,333	30,045	50.6	25,502	43.0
HIV infection stage 3 [AIDS]	21,624	10,189	47.1	9,163	42.4
Total[g]	80,957	40,234	49.7	34,665	42.8

Abbreviation: HIV = human immunodeficiency virus.

[a]Data statistically adjusted to account for missing transmission categories.

[b]Jurisdictions include Alabama, Alaska, Arkansas, California, District of Columbia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Michigan, Missouri, Nebraska, New Hampshire, New York, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

[c]Defined as two or more CD4+ T-lymphocyte or viral load tests at least 3 months apart during 2012.

[d]Defined as a viral load result of ≤200 copies/mL at the most recent viral load test during 2012.

[e]Hispanic/Latino can be of any race.

[f]Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and multiple races.

[g]Estimates might not sum to total.

The higher percentage of retention in care among PWID with infection diagnosed during early stage when compared to those with late stage disease (Table **4**) was also generally true by sex and age. By race/ethnicity, however,

differences by disease severity at diagnosis were small except for Hispanics/Latinos. Hispanic/Latino PWID with HIV diagnosed late were less likely to be retained in care or have a suppressed viral load. By age, PWID aged <45 years and with HIV diagnosed late more commonly had a suppressed viral load compared with those without late stage disease; however, differences were small for older persons.

Table 4. Retention in care and viral suppression by stage at HIV diagnosis among people aged ≥13 years who inject drugs[a], and had their HIV infection diagnosed before 2012, and were alive on December 31, 2012, by selected characteristics-National HIV Surveillance System, 28 jurisdictions[b], United States.

	Diagnosed during stage 1, 2, or unknown					Diagnosed during stage 3 [AIDS]				
	Total	Retained in care[c]		Achieved Viral Suppression[d]		Total	Retained in care[c]		Achieved viral suppression[d]	
	No.	No.	(%)	No.	(%)	No.	No.	(%)	No.	(%)
Characteristic										
Sex										
Male	34,845	16,750	48.1	14,481	41.6	14,692	6,574	44.7	5,993	40.8
Female	24,488	13,296	54.3	11,021	45.0	6,932	3,614	52.1	3,170	45.7
Race/ethnicity										
Black/African American	31,594	15,620	49.4	12,952	41.0	11,273	5,401	47.9	4,678	41.5
Hispanic/Latino[e]	14,072	7,476	53.1	6,213	44.2	5,623	2,393	42.6	2,171	38.6
White	10,871	5,098	46.9	4,769	43.9	3,828	1,807	47.2	1,779	46.5
Other[f]	2,796	1,851	66.2	1,569	56.1	900	587	65.3	535	59.4
Age group at end of 2011 (yrs)										
13-24	571	239	41.8	168	29.4	63	32	50.5	26	40.9
25-34	4,200	1,786	42.5	1,387	33.0	688	336	48.8	285	41.5
35-44	11,750	5,615	47.8	4,503	38.3	3,316	1,536	46.3	1,362	41.1
45-54	24,549	12,900	52.5	10,909	44.4	8,826	4,337	49.1	3,834	43.4
≥55	18,263	9,505	52.0	8,536	46.7	8,732	3,948	45.2	3,656	41.9
Total[g]	59,333	30,045	50.6	25,502	43.0	21,624	10,189	47.1	9,163	42.4

Abbreviation: HIV = human immunodeficiency virus.

[a]Data statistically adjusted to account for missing transmission categories.

[b]Jurisdictions include Alabama, Alaska, Arkansas, California, District of Columbia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maine, Maryland, Michigan, Missouri, Nebraska, New Hampshire, New York, North Dakota, Oregon, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

[c]Defined as two or more CD4+ T-lymphocyte or viral load tests at least 3 months apart during 2012.

[d]Defined as a viral load result of ≤200 copies/mL at the most recent viral load test during 2012.

[e]Hispanic/Latino can be of any race.

[f]Includes American Indian/Alaska Native, Asian, Native Hawaiian/Other Pacific Islander, and multiple races.

[g]Estimates might not sum to total.

DISCUSSION/IMPLICATIONS

This study explores care and treatment among people with HIV infection, reported to the NHSS by December 31, 2014, whose only risk factor was injection drug use, by type of facility and stage of infection at diagnosis. While three of four PWID were linked to HIV care, less than half were retained in care or achieved viral suppression; slightly fewer than care and viral suppression among MSM [4]. Substance use has been linked with HIV infection since the beginning of the epidemic. In people already infected with HIV, substance abuse can impact overall health and accelerate disease progression and mortality [17]. Some studies have found that due to psycho-social instability and co-morbid addictions such as alcohol abuse PWID may be less willing to start or adhere to ARV medications than persons who do not actively inject drugs [17].While measuring adherence can be challenging [18], another study found that PWID were over three times as likely (OR 3.49; 95% CI, 1.45-8.40) to use ARV when enrolled in drug or alcohol treatment programs [19]. Comprehensive prevention strategies that address the complex or syndemic interaction of health, social, and environmental needs of HIV-infected PWID are needed [20 - 23] and should include HIV testing and counseling and treatment for substance abuse [24].

Similar to other studies, our analysis showed considerable variation in care use between demographic groups. Male PWID were as likely to link to care as female PWID but were less likely to receive regular care and achieve viral suppression. Whites were linked to care more often than blacks and Hispanic/Latinos; however, whites were least likely

to be retained in care, although viral suppression was similar for all racial and ethnic groups (range 41.3%-43.7%) with the exception of the race/ethnicity of "other". Finally, younger PWID were generally less likely to be linked to and retained in care and achieve viral suppression than older PWID [4, 25]. Implementing effective interventions among minorities, males, and youth could improve outcomes for HIV-infected PWID along the continuum of care [24].

In 2010 the National HIV/AIDS Strategy established a target that by 2015 the proportion of persons with HIV linked to care within 3 months of HIV diagnosis increase to 85% [1]. Our results indicate that in 2013, linkage to care was still well below this 2015 target for PWID. In comparing our findings to the continuum of care for men who have sex with men (MSM) [25], we noted that linkage to care among PWID (78.6%) was similar to that for MSM (77.5%). Retention in care estimate (MSM: 50.9%, PWID: 49.4%) and viral suppression were also similar for PWID (42.6%) and MSM (42.0%). In 2015 the updated National HIV/AIDS Strategy for the United States renewed that standard through 2020 but reduced the timeframe for linkage to care from three months to one month [26]. Efforts and resources are still needed to monitor and improve outcomes across the HIV continuum of care for these high-priority populations.

Continued focus on linkage to care is needed for those diagnosed in a screening, diagnostic, or referral agency, especially when compared to inpatient and outpatient settings, for every sex, race/ethnicity, age, and stage of diagnosis category assessed. Public clinics that provide these services play an important role in reaching out to people who do not seek care at traditional health care facilities. In addition to having routine HIV testing available, clinics must consider approaches to proactive linkage to care [14]. Ideally, clinic staff will assist people with HIV with setting up their first appointment and provide or refer PWID to substance abuse treatment programs. Likewise, substance abuse treatment programs could assist by offering on-site infectious disease screening and services for linking people with HIV to care [11]. Access to HIV counseling, testing, and treatment continues to vary widely across drug treatment programs [27], creating a missed public health opportunity to get HIV infections among PWID diagnosed and those living with HIV into care.

More than one in four PWID with HIV had stage 3 [AIDS] HIV infection at the time of diagnosis. Diagnosing HIV early in the course of infection is critical to allow prompt linkage to care and treatment to reduce morbidity and mortality and the potential for the onward transmission of the virus. In addition, diagnosis in the acute stage would benefit prevention as the high viral load levels found in the acute stage substantially increase the risk of transmission [28]. Recent studies found that more frequent and expanded HIV testing for PWID would reduce the number of new infections and be cost effective [29]; however less than half of PWID receive the recommended annual HIV testing [28]. People diagnosed with stage 3 [AIDS] HIV infection (AIDS) may have symptoms and therefore be more likely to be prescribed ARV medications. However, our results indicate that care and viral suppression was low even among PWID with infection diagnosed late.

This study is subject to at least four limitations. First, analysis of NHSS data is limited to 28 jurisdictions (61.4% of all persons aged ≥13 years living with diagnosed HIV infection at year-end 2012, the most recent data) with complete reporting of all levels of CD4 and VL test results and may not be representative of all people who inject drugs in the United States. Second, documentation of the most recent VL might not be indicative of consistent viral suppression in this population over time. Third, not all people with HIV infection are identified and entered in the NHSS, including those who are unaware of their HIV infection status (*i.e.*, not yet diagnosed). Fourth, retention in care does not always mean that people were initiated on ART and thus the percentage of people reaching viral suppression includes both those initiated on ART and those not initiated on ART.

CONCLUSION

CDC has adopted a high-impact prevention approach to advance the goals of the National HIV/AIDS Strategy by using a combination of scientifically proven, cost-effective, and scalable interventions targeted to PWID and other populations at greatest risk for HIV infection [24]. Substance abuse treatment programs, syringe services programs, and community outreach are examples of the behavioral risk reductions and other public health strategies that are critical to the foundation of reducing HIV transmission between PWID and their sex partners [27].

Increasing the proportion of PWID living with HIV who are receiving care is critical for achieving the goals of the National HIV/AIDS Strategy to reduce new infections, improve health outcomes, and decrease health disparities. Greater access to HIV testing and drug treatment facilities as well as targeted strategies for high-risk groups, such as minorities, males and youths, may be needed to achieve improvements at each step of the HIV care continuum.

DISCLAIMER

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

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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Declared none.

REFERENCES

[1] National HIV/AIDS Strategy for the United States. Available at: https://aids.gov/federal-resources/national-hiv-aids-strategy/nhas-update.pdf 2015. [Published July 2015. Accessed August 27, 2015].

[2] U.S. Preventive Services Task Force Screening for HIV: Final Recommendation Statement. AHRQ Publication No. 12-05173-EF-3. Available at: http://www.uspreventiveservicestaskforce.org/uspstf13/hiv/hivfinalrs.htm 2014. [Accessed May 27].

[3] Lansky A, Finlayson T, Johnson C, *et al.* Estimating the number of persons who inject drugs in the united states by meta-analysis to calculate national rates of HIV and hepatitis C virus infections. PLoS One 2014; 9(5): e97596.
[http://dx.doi.org/10.1371/journal.pone.0097596] [PMID: 24840662]

[4] Monitoring selected national HIV prevention and care objectives by using HIV surveillance data-United States and 6 U.S. dependent areas-2013 HIV Surveillance Supplemental Report 20 (No. 2). Available at: http://www.cdc.gov/hiv/pdf/library/reports /surveillance/cdc-hiv-surveillancereport_vol20_no2.pdf 2015. [Accessed May 5, 2015].

[5] Johnson AS, Hall HI, Hu X, Lansky A, Holtgrave DR, Mermin J. Trends in diagnoses of HIV infection in the United States, 2002-2011. JAMA 2014; 312(4): 432-4.
[http://dx.doi.org/10.1001/jama.2014.8534] [PMID: 25038362]

[6] Centers for Disease Control and Prevention. ATLAS online database. Atlanta, GA. Available at: http://www.cdc.gov/nchhstp/atlas [Accessed on May 27, 2014.]

[7] Diagnoses of HIV Infection in the United States and Dependent Areas vol. 25. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. Available at: http://www.cdc.gov/hiv/library/reports/surveillance/2013/surveillance_Report_vol_25.html 2015. [Accessed March 5]

[8] Spiller MW, Broz D, Wejnert C, Nerlander L, Paz-Bailey G. HIV infection and HIV-associated behaviors among persons who inject drugs--20 cities, United States, 2012. MMWR Morb Mortal Wkly Rep 2015; 64(10): 270-5.
[PMID: 25789742]

[9] HIV infection, risk, prevention and testing behaviors among persons who inject drugs – National HIV Behavioral Surveillance: Injection drug use, 20 U.S. cities, 2012 HIV Surveillance Special Report 11. Available at: http://www.cdc.gov/hiv/pdf/G-L/cdc-hiv-HSSR_NHBS_PWID_2012.pdf 2015. [Accessed March 24, 2015].

[10] Kyle TL, Horigian VE, Tross S, *et al.* Uptake of HIV testing in substance use disorder treatment programs that offer on-site testing. AIDS Behav 2015; 19(3): 536-42.
[http://dx.doi.org/10.1007/s10461-014-0864-2] [PMID: 25074737]

[11] National Survey of Substance Abuse Treatment Services. The N-SSATS Report. February 25, 2010. Available at: http://www.dasis.samhsa.gov/dasis2/nssats/n2010_rpt.pdf 2010. [Accessed December 12, 2015]

[12] HIV Care Continuum Initiative. Washington, DC. Available at: http://www.whitehouse.gov/the-press-office/2013/07/15/ executive-order-hiv-care-continuum-initiative 2013. [Released July 15, Accessed Dec 12, 2015.]

[13] Samet JH, Freedberg KA, Savetsky JB, Sullivan LM, Stein MD. Understanding delay to medical care for HIV infection: the long-term non-presenter. AIDS 2001; 15(1): 77-85.
[http://dx.doi.org/10.1097/00002030-200101050-00012] [PMID: 11192871]

[14] Torian LV, Wiewel EW, Liu KL, Sackoff JE, Frieden TR. Risk factors for delayed initiation of medical care after diagnosis of human immunodeficiency virus. Arch Intern Med 2008; 168(11): 1181-7.
[http://dx.doi.org/10.1001/archinte.168.11.1181] [PMID: 18541826]

[15] Karch DL, Chen M, Tang T. Evaluation of the national human immunodeficiency virus surveillance system for the 2011 diagnosis year. J Public Health Manag Pract 2014; 20(6): 598-607.
[http://dx.doi.org/10.1097/PHH.0000000000000033] [PMID: 24253405]

[16] Revised Surveillance Case Definition for HIV Infection-United States 2014; 63(RR03): 1-10. Apr 11

[17] Liappis AP, Laake AM, Delman M. Active injection drug-abuse offsets healthcare engagement in HIV-infected patients. AIDS Behav 2015; 19(1): 81-4.
[http://dx.doi.org/10.1007/s10461-014-0757-4] [PMID: 24710959]

[18] Arnsten JH, Demas PA, Farzadegan H, *et al.* Antiretroviral therapy adherence and viral suppression in HIV-infected drug users: comparison of self-report and electronic monitoring. Clin Infect Dis 2001; 33(8): 1417-23.
[http://dx.doi.org/10.1086/323201] [PMID: 11550118]

[19] Strathdee SA, Palepu A, Cornelisse PG, *et al.* Barriers to use of free antiretroviral therapy in injection drug users. JAMA 1998; 280(6): 547-9.
[http://dx.doi.org/10.1001/jama.280.6.547] [PMID: 9707146]

[20] Rhodes T, Singer M, Bourgois P, Friedman SR, Strathdee SA. The social structural production of HIV risk among injecting drug users. Soc Sci Med 2005; 61(5): 1026-44.
[http://dx.doi.org/10.1016/j.socscimed.2004.12.024] [PMID: 15955404]

[21] Strathdee SA, Hallett TB, Bobrova N, *et al.* HIV and risk environment for injecting drug users: the past, present, and future. Lancet 2010; 376(9737): 268-84.
[http://dx.doi.org/10.1016/S0140-6736(10)60743-X] [PMID: 20650523]

[22] Mizuno Y, Purcell DW, Knowlton AR, Wilkinson JD, Gourevitch MN, Knight KR. Syndemic vulnerability, sexual and injection risk behaviors, and HIV continuum of care outcomes in HIV-positive injection drug users. AIDS Behav 2015; 19(4): 684-93.
[http://dx.doi.org/10.1007/s10461-014-0890-0] [PMID: 25249392]

[23] Estimated percentages and characteristics of men who have sex with men and use injection drugs-United States, 1999-2011. MMWR Morb Mortal Wkly Rep 2013; 62(37): 757-62.
[PMID: 24048151]

[24] Integrated prevention services for HIV infection, viral hepatitis, sexually transmitted diseases, and tuberculosis for persons who use drugs illicitly: summary guidance from CDC and the U.S. Department of Health and Human Services. MMWR Recomm Rep 2012; 61(RR-5): 1-40.
[PMID: 23135062]

[25] Singh S, Bradley H, Hu X, Skarbinski J, Hall HI, Lansky A. Men living with diagnosed HIV who have sex with men: progress along the continuum of HIV care-United States, 2010. MMWR Morb Mortal Wkly Rep 2014; 63(38): 829-33.
[PMID: 25254559]

[26] National HIV/AIDS strategy for the United States. Available at: https://www.whitehouse.gov/sites/default/files/uploads/NHAS.pdf 2010. [Published July, Accessed September 29, 2015.]

[27] HIV and Substance Use in the United States. Available at: http://www.cdc.gov/hiv/risk/behavior/substanceuse.html [Accessed September 29, 2015]

[28] Montaner JS. Treatment as prevention: toward an AIDS-free generation. Top Antivir Med 2013; 21(3): 110-4.
[PMID: 23981598]

[29] Cipriano LE, Zaric GS, Holodniy M, *et al.* Cost effectiveness of screening strategies for early identification of HIV and HCV infection in injection drug users. PLoS ONE 2012; 7(9): e45176-114.
[http://dx.doi.org/10.1371/journal.pone.0045176]