

# HIV Testing and Entry into HIV Care in Lviv, Western Ukraine 2005-2013

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## Abstract

**Background:** Ukraine has one of the largest burdens of HIV in the European region. Over the past decade, significant strides have been made to successfully decrease the rate of HIV transmission. This analysis of HIV testing and entry into care in Western Ukraine provides data in an understudied region of Ukraine.

**Methods and findings:** We analyzed records of HIV testing by category performed within the Lviv Oblast between 2005 and 2013. We also analyzed aggregate registration data from the Lviv Regional AIDS Center. The three highest HIV risk testing categories and their relative percent positive were 1) sexual contact with known HIV partner (20.5%) 2) current or past intravenous drug use (IDU) (13.5%) and 3) history of incarceration (11.5%). The rates of positive tests for IDU and incarcerated patients decreased over this time period. Evaluation of registration into care demonstrated that between 2005-2008, 36.6 % of positive tests resulted in registration into care compared to 54.5% between 2009-2013.

**Conclusions:** New HIV diagnoses have shifted from within predominantly IDU and incarcerated populations to more broad based screening categories consistent with the known shift to a generalized HIV epidemic. The overall rate of registration into care remains low. More efforts are needed to target HIV positive patients to engage them to register for care.

**Keywords:** HIV epidemiology; Ukraine; Eastern Europe

## Introduction

Ukraine, a country of 45 million people, has one of the largest burdens of HIV in Eastern Europe [1]. Current estimates place Ukraine's HIV prevalence at approximately 0.8% down from 1.4% in recent years [2]. In 2013, Ukraine was recognized as the first Eastern European country to stabilize their new rates of HIV infection [2,3]. In 2013, HIV incidence in Lviv oblast was 16.5 per 100,000 (418 people in absolute terms) [4]. However, there is concern that, following military conflict in the east and the migration of internally displaced persons to the central and western regions of the country, these gains will be lost [5].

In order to effectively address the future of HIV transmission, it is important to recognize the dynamics of past and current HIV transmission as well as entry into care. The epidemic of HIV in Eastern Europe and specifically Ukraine is unique in that it had a rapid and explosive onset. In Ukraine there were 1673 reported cases of HIV infection in 1995 and two years later the reported cases jumped to 27,671, a 16-fold increase [6-8]. In Ukraine the HIV epidemic was initially driven by injection drug use (IDU), however over time it has shifted from a more concentrated HIV epidemic to a generalized one [9,10].

The health system in Ukraine is a vertical, silo system with little integration between services [11]. Although HIV clinics in some areas have started to integrate services such as opiate substitution and latent tuberculosis treatment much more remains to be done to fully address the primary care, mental health, and substance abuse-related needs of those with HIV [12,13].

The Lviv Oblast, situated in Western Ukraine, has lower rates of HIV and IDU than other parts of the country [8]. As of 2011 the capital of the oblast, Lviv, had an official registered population of 760,000 people

and there were a little over 2.5 million living in the region [14]. In order to tailor local interventions to meet the needs specific to people of the Lviv region, it is vital to understand the HIV epidemic as it has unfolded in this part of Ukraine. In addition, as newly-displaced populations move from higher HIV-incidence settings to lower HIV-incidence settings, it will be important to understand local transmission and HIV care dynamics [5].

Although Lviv city and Lviv oblast have traditionally seen lower levels of IDU, it is important to take a closer look at the risk factors for infection in Lviv and the region [15]. This research aims to assess recent HIV testing trends, rates of HIV positive tests and populations with an increased risk of a positive test result in the Lviv Oblast.

## Methods

### Research setting and design

We conducted a descriptive analysis of HIV testing codes and results over a nine-year period from 2005-2013 in the Lviv Oblast of Ukraine. We report information that was collected in the Lviv Regional AIDS Center (LRAC) in its role as Lviv Oblast AIDS Center. The system for HIV testing and reporting in Ukraine is based upon the Soviet health care system, defined by centralized reporting divided into oblasts. Each

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oblast has an identified AIDS Center(s). As reporting in Ukraine is linked to confirmatory laboratory testing, preliminary positive HIV tests in the Lviv Oblast are referred to the Lviv Regional AIDS Center for Western Blot laboratory confirmation. All HIV tests are categorized at the time of sample collection for the primary indication for the HIV test and labeled with a corresponding code (see Table 1). If there is more than one indication that applies, only one code is chosen.

In addition to coded HIV testing data, we also looked at the yearly registration data for HIV patients registered in care at the Lviv Regional AIDS Center (LRAC) over the same time period. In Ukraine, HIV infected patients must register at their respective regional AIDS Center before they are eligible for treatment. The LRAC is the central facility in the Lviv oblast and any patients that were tested there would be required to register there.

HIV registration data includes the total numbers of patients registered per year and the number of new registrants. Those registered are categorized by age, gender, and urban or rural residence. The number of patients who drop from registration yearly is recorded, and such patients are categorized as deceased from AIDS, deceased from another cause, or relocated out of the region.

As this was a descriptive analysis we did not use any advanced statistical software. We used EpiTools (<http://epitools.ausvet.com.au>) to calculate the 95% Confidence Intervals for sample proportions using the Asymptotic (Wald) method.

## Results

### HIV testing over time

From 2005 to 2013, a total of 969,762 HIV tests were performed in the Lviv oblast, with the number of annual tests steadily increasing during that time. Of these, 6,444 tests were confirmed positive. The majority of all HIV tests performed were on pregnant women undergoing prenatal screening (52.5%) and blood or organ donations (24%).

HIV tests of patients with an HIV infected sexual partner, of IDUs,

and of incarcerated persons were the mostly likely to return positive results. Of those with an HIV-infected sexual partner, 20.5% (95% CI 17.6-23.5) tested positive, the highest positivity rate of any category. A total of 13.5% (95% CI 12.8-14.1) of all tests performed for incarcerated persons were positive, and 11.6% (95% CI 10.9-12.4) of tests performed for past or current IDUs were positive (see Table 1).

The percentage of positive HIV tests out of the total tests performed in incarcerated persons and IDUs declined steadily during the observation period. This was despite a stable or increasing number of IDUs and incarcerated persons tested each year. HIV tests given to imprisoned persons declined from a peak positivity rate of 40.5% (131/323) in 2006 to 4.3% (106/2467) in 2013. In 2007, 30.3% (82/271) of all IDUs tested were found to be HIV positive. In 2013, this rate fell to 3% (66/2199) (see Table 2).

Examining trends in patient registration into care at the LRAC developed crude estimates for the percentage of newly diagnosed HIV patients who entered into care. Both the number of positive HIV tests and the number of people registered for HIV care increased each year (Figure 1).

In order to account for procedural delays between HIV diagnosis and subsequent registration into care, we also divided the data into two periods in time; 2005-2008 and 2009-2013. We compared the number of positive HIV tests to the total number of new HIV patients registered at the LRAC in each same time period. Between 2005-2008, 36.6% (95% CI 34.6-38.6) of positive tests were registered at the LRAC. In the next time period from 2009-2013, the number had increased to 54.8% (95% CI 53.3-56.4), showing a trend for an increased percentage of newly diagnosed HIV patients registering into care (Figure 2).

The number of persons receiving an HIV test who were identified as having male homosexual contact as a risk factor for HIV was extremely low between 2005-2012: A total of 105 people testing were placed in this category of which 9 tested positive. However, in 2013 the number of HIV tests coded in this category increased to 623 with an additional 7 patients testing positive in that year (Table 2).

HIV TESTING CATEGORIES	Total Tested	Total Positive	Percent of total	95% CI
Sex with a known HIV positive partner (101)	685	141	20.6	17.6-23.6
Individuals with current or past Intravenous Drug Use (102)	6835	795	11.6	10.9-12.4
Homosexual sexual partner with HIV (103)	728	16	2.19	1.1-3.3
Persons with STD symptoms (104)	14686	150	1.02	0.9-1.2
Persons with high risk sexual contact (105)	11202	145	1.29	1.1-1.5
Military recruits (106)	13881	9	0.064	0-0.1
Other high risk groups - to obtain certificate (107)	26489	165	0.62	0.5-0.7
Blood donors (108)	234130	215	0.09	0.1-0.1
Pregnant Women Tested (109)	509594	568	0.11	0.1-0.1
Children born to HIV-infected mothers (110)	1927	604	31.34	29.3-33.4
Tested first time (110.1)	1089	531	48.76	45.8-51.7
Tested second time (110.2)	692	0	0	0
Children tested for risk of HIV exposure (111)	6385	22	0.34	0.2-0.5
Individuals Tested While Incarcerated (112)	9867	1328	13.46	12.8-14.1
Individuals Tested Based Clinical Indication (113)	70972	1341	1.89	1.8-2.0
Individuals Tested Anonymously (114)	15316	679	4.43	4.1-4.8
Risk of HIV from medical procedure (115)	1466	0	0	0
Individuals Tested For Prevention (116)	64438	243	0.38	0.3-0.40
Individuals Tested after death (119)	112	7	6.25	1.8-10.7
Miscellaneous tests (120)	15119	16	0.11	0.1-0.2

Table 1: total HIV tests by category; 2005-2013.

Year	Testing Category																			
	Individuals Tested While Imprisoned		Individuals Tested Because of Intravenous Drug Use		Voluntary Testing		Homosexual Contact		Persons with STD Symptoms		Persons with high risk sexual contact		Military recruits		Other high risk groups		Blood Donors		Sex with a known HIV positive partner	
	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)	Tested N	Positive N (%)
2005	508	84 (16.54)	399	93 (23.31)	369	5 (1.36)	4	1 (25)	1909	16 (0.84)	104	0	145	0	1651	9 (0.55)	24444	26 (0.11)	16	7 (43.75)
2006	323	131 (40.56)	281	79 (28.14)	880	3 (0.34)	1	0	1493	16 (1.07)	107	3 (2.8)	203	0	2258	19 (0.84)	23056	21 (0.09)	17	5 (29.41)
2007	440	144 (32.73)	271	82 (30.26)	670	6 (0.90)	2	0	1377	13 (0.944)	209	6 (2.87)	3	0	2593	18 (0.69)	25314	17 (0.07)	30	7 (23.33)
2008	683	141 (20.64)	280	56 (20)	4049	30 (0.74)	2	0	1384	19 (1.37)	234	5 (2.14)	5	0	2697	21 (0.78)	23985	18 (0.08)	23	5 (21.74)
2009	1117	232 (20.77)	469	131 (27.93)	6362	50 (0.79)	11	0	1453	22 (1.51)	372	6 (1.61)	2435	2	3353	33 (0.98)	25662	36 (0.14)	64	10 (15.63)
2010	1258	227 (18.05)	680	126 (18.53)	10785	44 (0.41)	23	2 (8.71)	1482	11 (0.74)	819	15 (1.83)	2206	2	3672	21 (0.57)	26731	28 (0.10)	107	33 (30.84)
2011	898	124 (13.81)	683	84 (12.30)	12093	36 (0.30)	3	1 (33.33)	1419	21 (1.48)	1187	21 (1.77)	2163	1	4413	18 (0.41)	27430	21 (0.09)	114	29 (25.44)
2012	845	139 (16.45)	778	78 (10.03)	11332	40 (0.353)	43	5 (11.63)	2060	18 (0.87)	2882	37 (1.28)	3063	2	5218	26 (0.50)	28284	24 (0.08)	98	30 (30.61)
2013	2467	106 (4.3)	2199	66 (3)	17655	29 (0.16)	623	7 (1.12)	1959	14 (0.71)	5143	52 (1.01)	3649	2	469	0 (0)	29009	24 (0.08)	75	15 (20)

Table 2: HIV testing in high-risk categories by year.

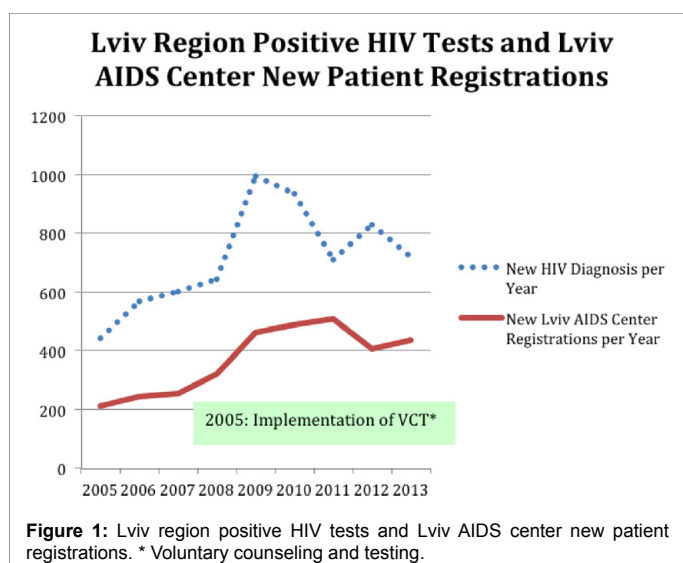


Figure 1: Lviv region positive HIV tests and Lviv AIDS center new patient registrations. \* Voluntary counseling and testing.



Figure 3: Registrations of men compared to women by year.

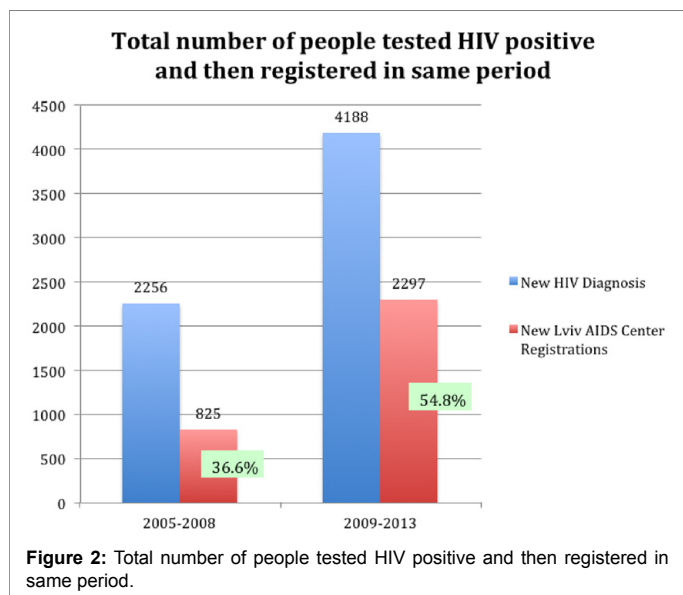


Figure 2: Total number of people tested HIV positive and then registered in same period.

Overall, the number of men registering for services at the Lviv Regional AIDS Center increased between 2005 and 2013, and men consistently outnumbered women registrants, although grouped analysis by time period was not statistically significant (Figure 3).

## Discussion

In the Lviv region of Ukraine, the rate of HIV testing steadily increased from 2005 to 2013. This trend coincides with the introduction of the country's first national voluntary HIV testing and counseling protocol, which was released by the Ministry of Health in 2005 but was gradually implemented [3,9]. This fact may also account for the significant increase in testing in 2008 and the increase in the number of positive HIV tests during that year. The overall number of positive HIV tests decreased after 2009 and this was likely due to improved testing coverage in the previous year and diagnosis of long-standing infections.

The high rates of HIV infection observed among incarcerated people and IDUs at the LRAC confirms the existence of an epidemic historically understood to have started in the IDU community [16,17]. However, the data also reveals that the percentage of positive tests in this population decreased substantially during the period from 2005 to 2013. We suspect that some of this decrease is related to variability in the testing population. For example, as testing was introduced, many undiagnosed people were identified and over time the new positive tests were more likely to represent new infections rather than undiagnosed long standing infections. The number of IDUs tested each year is still rising. This may be due to significant community interventions in the Lviv region, including non-profit harm reduction organizations that serve IDUs and other high-risk populations.

In Figure 1, it can be noticed that there appears to be a decline in the amount of people who were both diagnosed with HIV and registered

into care over the years 2011-2012. This may represent the time period when the percentage of positive tests decreased, likely related to expanded testing resulting in the diagnosis of previously undiagnosed patients, leaving less new cases to be identified.

Overall, the rate of registration into care for newly diagnosed HIV patients is low. This is a key finding from this study, as the death rate from AIDS in the Lviv oblast is increasing yearly despite the availability of effective, life-saving treatment on the global drug market. More research into the barriers that deter registration for care is needed.

Nearly twice as many men who tested positive registered for care, compared to women. This may be partially explained by the national statistics on HIV infected persons in Ukraine, which, in 2013, included 87,000 women over age 15 and approximately 123,000 men in the same age range [2]. However, this does not completely account for the high number of men registered. Unfortunately the coded HIV testing data did not record patient gender. Therefore, we are unable to determine the true number of men and women who tested positive. We do know a large number of tests are performed in pregnant women; however the rate of HIV in this population is generally low.

Evaluating recent trends for new HIV-positive tests provides insight into where best to concentrate HIV testing efforts. Evaluating the registration of newly infected HIV patients into care is critical to both treating individual patients as well as preventing secondary vertical and horizontal transmission. With new methods available to prevent HIV transmission, including treatment as prevention, it is now more important than ever to identify past and current transmission trends in HIV testing and gaps in registering to care [18,19].

The low representation of men who have sex with men (MSM) among people tested for HIV suggests this group is not self-identifying their risk factors. It is possible that some of this population may be misrepresented in other testing categories. In addition, the surge in recorded tests among MSM testing in 2013 remains unexplained. More analysis should be performed to see where these tests were collected and whether there was a change in implementation, which affected these statistics.

## Future Areas of Research

This data shows some important trends, which are useful for targeting further research and implementation of programs to reach most at risk populations. One such population is MSM. In the US and Europe, rates of HIV transmission are still increasing in this population. There is likely a hidden HIV epidemic among MSM in Ukraine, which may be strengthening transmission networks [20]. Some research has suggested that MSM may hesitate to openly discuss their risk factors for HIV and this may adversely affect the care they receive for HIV [20]. More research is needed to better understand these features of Ukraine's HIV epidemic.

An evaluation of the HIV care cascade is also needed. The barriers to registration into care for recently diagnosed patients need to be identified. More research is needed to target existing obstacles to care and improve registration into the LRAC.

## Limitations

This data was not linked to any individual identifiers. It was epidemiologic data collected for yearly reports to Ukraine's Ministry of Health. This data was, therefore, subject to possible physician or health provider bias in determining the placement of coding categories for HIV testing. In addition, as each person could only receive one

code, there is no way to account for people who may have multiple risk factors and reasons for HIV testing, which may have led to the under-reporting of known at-risk populations, such as IDU and MSM. Due to these limitations in the data we were unable to pursue more than a descriptive analysis. Any multivariate analysis of the data had the potential of being misleading.

The HIV testing data was also limited with no breakdown of males and females tested. The registration data was limited in determining the duration of a person's diagnosis prior to registration. We were also unable to assess the number of duplicate tests performed for individual persons, which may have led to the underestimation of the proportion of positive tests and the percent of patients registering into care.

## Conclusions

There has been a significant increase in overall HIV testing in the Lviv region between 2005 and 2013. The percentage of positive HIV tests that is attributed to IDU and incarcerated populations has decreased consistent with the known shift to a generalized HIV epidemic. The overall rate of registration into care is still low. More efforts should be made to target HIV positive patients to engage them to register for care. MSM remain underrepresented in HIV testing records, however a significant increase in testing among MSM in 2013 suggests this trend may be changing.

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