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Using Surveillance Data to assess the HIV Tipping Point in the United States

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Abstract

Tipping point ratios <1 with fewer annual HIV infections than persons initiating HIV treatment indicate favorable epidemiologic situations to reduce HIV incidence. Using HIV surveillance data on persons newly diagnosed and virally suppressed in 2011 for 10 US jurisdictions, the tipping point ratio was 1.5 overall and ranged from 0.6 to 2.7. This indicates some jurisdictions have reached the point where the number of persons achieving viral suppression outpaces the number diagnosed with HIV. Expansion of treatment for all persons diagnosed with HIV as indicated in current treatment guidelines will benefit people living with HIV as well as prevention.

Keywords

HIV; incidence; viral load; antiretroviral therapy

Antiretroviral therapy (ART) reduces HIV morbidity, mortality, and infectiousness. Observational and modeling studies suggest increased treatment coverage can substantially reduce HIV incidence in a population [1–3], and a clinical trial has demonstrated that ART treatment can substantially reduce the risk of sexual transmission to uninfected partners [4]. One suggested measure of sufficient coverage, the “tipping point”, is used by the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR) and other organizations to determine progress in controlling HIV with ART as part of high-impact HIV combination prevention strategies [5,6]. The tipping point is defined as having fewer annual new infections than persons initiating ART, with a “tipping point ratio” defined as the annual number of new infections divided by the number of persons who initiated ART [5,6]. We used HIV surveillance data to calculate tipping point ratios for 9 states and the District of Columbia.

In the United States, data on HIV incidence and ART use are not readily available for all jurisdictions. However, local health departments collect standardized data for the Centers

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for Disease Control and Prevention's (CDC) National HIV Surveillance System that can be used to estimate the tipping point ratio using the number of persons newly diagnosed with HIV divided by the increase in number of persons with viral suppression. Viral suppression may be a more accurate measure of reduced transmission potential than number of persons initiating ART. For example, in the United States, about 51% of persons living with diagnosed HIV receive regular care, and 78% of persons prescribed ART have a suppressed viral load [7,8].

While all states, the District of Columbia, and U.S. territories collect data on persons newly diagnosed with HIV, not all jurisdictions have laws that mandate reporting of all values of CD4 or viral load test results [7] or have implemented complete reporting of results from laboratories or to CDC. Using data reported through December 2012 from 10 jurisdictions with complete reporting of all viral load data, which represent about 17% of cases diagnosed in the United States that year, we determined the number of persons newly diagnosed with HIV in 2011 and the number of persons newly suppressed from 2010 to 2011. Viral suppression was defined as a viral load of <200 copies/mL based on the most recent test result available for that year. Persons newly suppressed included persons who were living with diagnosed HIV in 2010 and newly suppressed in 2011, and persons newly diagnosed in 2011 who achieved viral suppression in 2011. We determined the tipping point ratio for the 10 jurisdictions combined and for each individual jurisdiction. We also used previously published estimates on 2010 incidence (47500) and increase in viral suppression from 2009 to 2010 (25859) from supplemental surveillance to determine the tipping point for the entire United States [8].

In 2011, overall 6,985 persons were newly diagnosed with HIV in the jurisdictions included in the analyses. Of these, 31% achieved viral suppression in 2011. In addition to the 75,307 persons living with HIV with viral suppression in 2010 and 2011, 18,297 persons living with HIV at the end of 2010 achieved viral suppression in 2011. However, the net increase in persons with viral suppression from 2010 to 2011 was 4,621. Compared to a total of 6,985 new diagnoses in 2011, the overall tipping point ratio was 1.5, with a range from 0.6 to 2.7 among the jurisdictions (Table). Estimates from survey sampling data yield a U.S. tipping point of 1.8.

Theoretically, a tipping point ratio <1 indicates a favorable epidemiologic situation as was previously documented in San Francisco, with increased viral suppression correlated with decreases in HIV diagnoses [9]. Differences in tipping points may reflect jurisdiction specific efforts to address care and treatment, similar to jurisdiction differences in death rates among persons with HIV, as well as differences in the age distribution among persons living with HIV, where younger persons may not have been prescribed ART and are therefore less likely to achieve viral suppression [7]. Keeping pace with new infections by assuring an equal or larger number of people achieve viral suppression, as found among half of the jurisdictions included in these analyses, may eventually eliminate HIV, where HIV prevalence is reduced with the number of infections lower than the number of deaths.

Our analyses were subject to at least two limitations. First, we reported data from 10 jurisdictions, which may limit generalizability. Currently, 12 states do not have laws for

reporting of all viral load test results and many areas are still implementing lab reporting. Once lab reporting is completely implemented, all U.S. jurisdictions could determine progress towards the tipping point. However, our result for the tipping point overall using these data is similar to the tipping point based on representative survey sampling data. Second, trends in HIV diagnoses can reflect changes in testing practice as well as incidence. We used the number of diagnoses in lieu of new infections because data on new infections were not available. However, it is unlikely that testing will decrease in the near future due to ongoing programmatic efforts and increased health insurance coverage, and with relatively stable testing rates, diagnoses are likely to reflect incidence, albeit with a time delay [10]. If testing rates increased, more persons previously unaware of their infection would be diagnosed and using diagnoses in the tipping point measure would more closely represent incidence.

A reduction in the number of persons living with HIV with viral suppression may occur when the actual number with viral suppression decreases, persons with HIV move out of jurisdiction or die, or when laboratory reporting is incomplete. Our data indicate that among those who had a suppressed viral load in 2010 but not in 2011, viral suppression does not necessarily reflect sustained viral suppression among the same persons. In addition, as more people receive treatment for HIV, it may be harder to achieve viral suppression among the remaining population with HIV because people who have been diagnosed but not engaged in care for an extended period may have more challenges with accessing care or remaining adherent to treatment than people who are already accessing the healthcare system

However, in this analysis, about 20% to 30% of persons living with HIV with evidence of ongoing care did not achieve viral suppression (data not shown), which well exceeds the number of new diagnoses. In addition, transmission risk, treatment, and viral suppression differ by population subgroup [11,12]. With a high percentage of persons with HIV aware of their infection in the United States (84%) public health agencies are expanding interventions along the continuum of care to ensure that persons with HIV receive regular care and are offered treatment and support to achieve and maintain viral suppression [7]. It is important that such interventions include populations at high risk for HIV transmission and poor clinical outcomes, and address disparities in HIV prevalence and treatment as outlined in the National HIV/AIDS Strategy [13].

In summary, results indicated that in the jurisdictions overall, the tipping point ratio was above the point where the increase in the number of persons with viral suppression is higher than the number of persons newly diagnosed with HIV (tipping point ratio <1); however, half of the jurisdictions were at or below the tipping point. Expansion of treatment for all persons diagnosed with HIV as indicated in the current treatment guidelines, and support for ongoing retention in care will benefit the health of people living with HIV as well as prevention [14].

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Table.

Number of persons living with HIV and viral suppression, and persons newly diagnosed, 2010–2011, 10 US jurisdictions

	VL <200 copies/mL							
	2010				2011			
	Among persons with VL <200 copies/mL in 2010	No.	Among persons with VL <200 copies/mL in 2010	No.	Among persons with no VL in 2010	No.	Among persons newly diagnosed in 2011	No.
Total No.	No.		No.		No.		Total No.	
District of Columbia	4,332	951	664	220	6,167	762	716	0.9
Indiana	3,306	636	412	135	4,489	465	465	1.0
Iowa	780	122	97	39	1,038	138	114	0.8
Missouri	3,196	518	524	105	4,343	-464	514	>1
New York	49,542	8,180	3,179	1,280	62,181	2,704	3,908	1.4
North Dakota	74	5	10	3	92	0	11	>1
San Francisco	7,994	776	603	151	9,524	423	408	1.0
South Carolina	5,543	918	517	218	7,196	536	742	1.4
West Virginia	444	67	93	29	633	35	93	2.7
Wyoming	96	16	9	7	128	22	14	0.6
Total	75,307	12,189	6,108	2,187	95,791	4,621	6,985	1.5

A tipping point ratio <1 indicates success towards reducing incidence.

Numbers of persons with VL <200 in 2011 among those with a VL in 2010 may not add to total in 2010 due to fewer persons with VL <200 or deaths.