

Population-level Assessment of the Geographic, Demographic, and Health Status related Correlates of Virologic Suppression among all San Franciscans on Antiretroviral Treatment 2005-2007

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ABSTRACT

Background Few jurisdictions assess whether all HIV-infected individuals eligible for antiretroviral therapy (ART) are receiving treatment and whether those on ART achieve virologic suppression.

Methods Using San Francisco's mature, accurate (>95% complete) HIV/AIDS surveillance system and mandatory laboratory reporting of HIV viral loads (VLs), we calculated the percent of all San Franciscans eligible for treatment (defined by CD4 count <350) and the percent of all San Franciscans who are suppressed at two standard clinical cut-offs for achieving virologic suppression (mean VL<75 and mean VL<400). We calculated the Wald adjusted odds ratios for independent variables in two separate models using the different clinical cut-offs.

Results Of the 3,556 individuals eligible for treatment based solely on CD4<350, 3,342 (93.9%) were currently on treatment, 179 (5.0%) have never been treated, and 35 (1.0%) were not currently being treated. Of the 8,144 individuals receiving treatment, 652 (8%) were suppressed at VL<75 and 4,384 (54%) were suppressed at VL<400. Higher log mean CD4 count was significantly associated with virologic suppression at both cut-off points: VL<75 (AOR=2.8, CI=[2.4,3.4]); VL<400 (AOR=3.7,[3.3,4.0]). Engagement in care (defined as seen at least once every six months for the past year) was associated with virologic suppression at the more stringent cutoff VL<75 (AOR=2.2, [1.7,2.8]). Having ever changed one's regimen was significantly associated with decreased odds of suppression only at VL<400 (AOR=0.6, [0.5,0.7]). Being homeless was also associated with significantly decreased odds of suppression at both levels: VL<75 (AOR=0.5, [0.3,0.94]); VL<400 (AOR=0.4, [0.3,0.6]). SF neighborhoods with lowest median household incomes had significantly decreased odds of suppression only at VL<400.

Conclusions In San Francisco, where the vast majority of persons meeting criteria for antiretroviral therapy are on therapy, few are suppressed at VL<75 and just more than half are suppressed at VL<400. These population-level data highlight key areas for public health intervention such as support to maintain engagement in care and increasing access to housing that may maximize virologic response to ART.

BACKGROUND

- Many public health jurisdictions collect clinical, demographic and other key information as part of routine HIV/AIDS surveillance
- In San Francisco, we use a combination of active (chart review) and passive (electronic laboratory reporting of HIV VLs and provider-initiated case reports) surveillance methods to collect a wealth of demographic, transmission risk, socio-economic and clinical data:
 - Sequential viral loads are recorded prospectively and retrospectively from all cases
 - CD4 counts
 - Testing history and earliest known HIV test
 - Initiation and subsequent changes in antiretroviral therapy (ART)
 - History of opportunistic infections
 - Other medical conditions including a Hepatitis C co-infection
- However, few jurisdictions assess, on a population-level, whether all HIV-infected ART-eligible individuals are on treatment and whether those on ART achieve virologic suppression

METHODS

- Using San Francisco's mature, mandatory, and accurate (>95% complete) mandatory laboratory reporting of viral loads, we calculated the percent of all San Franciscans eligible for treatment (defined as CD4<350) and the percent of all San Franciscans virologically suppressed at mean VL<75 and mean VL<400
- We calculated Wald adjusted Odds Ratios for the independent variables in two separate models using the two different clinical cut-offs to find predictors of virologic suppression
- Generalized estimating equations (GEE) with robust standard errors were used to compare the engagement of predictors of viral suppression when the cutoff for suppression was set at mean VL<75 versus mean VL<400

RESULTS

- Of the 3,556 individuals eligible for treatment based solely on CD4 criteria of CD4 <350, 94% were never treated, and 1% were not currently on treatment
- Of 8,144 on treatment, 8% suppressed at mean VL<75 and 54% suppressed at mean VL<400
- Compared to MSM, MSM-IDU and IDU had lesser odds of being suppressed at both clinical cut-offs but results were not uniformly statistically significant
- Public insurance status was significantly associated with an increased odds of suppression at the more stringent mean VL<75 and a decreased odds of suppression at mean VL<400
 - The GEE analysis indicates that the influence of public insurance status was significantly different between the two clinical cut-offs
 - The effect sizes were substantively different and had opposite directionality
- Higher mean of the log CD4 count was significantly associated with odds of suppression at both cut-offs
 - The GEE analysis indicated that the influence of mean of the log CD4 count was statistically different for the two clinical cut-offs
 - However, the effect estimates were substantively similar and had same directionality
- Being transgender was associated with decreased odds of virologic suppression at both clinical cut-offs
- Engagement in care (defined as being seen at least once every 6 months for the past year) was associated with odds of virologic suppression at the more stringent cut-off of mean VL<75 but not mean VL<400
 - This difference was borderline significant by GEE (0.05<p<0.1)
- Having ever changed one's treatment regimen was associated with decreased odds of suppression at mean VL<400
- Being homeless was also associated with significantly decreased odds of suppression at both levels: VL<75 (AOR=0.5, CI=[0.3,0.94]); VL<400 (AOR=0.4, CI=[0.3,0.6]) (data not shown)
- In analyzing SF neighborhoods, communities with lower median incomes had significantly decreased odds of suppression at mean VL<400 (data not shown)

RESULTS (continued)

Table 1: Wald adjusted odds ratios for viral load suppression cutoffs mean VL<75 and mean VL<400 with generalized estimating equation results comparing the two models

Effect	Wald Adjusted Odds Ratios		Model for suppression with viral load <400	General Estimate Equation Analysis p-value
	Model for suppression with viral load <75	Odds Ratios		
	Est.	(95% C.I.)	Est.	(95% C.I.)
Race/Ethnicity				
White	0.93	(0.69,1.25)	0.92	(0.77,1.10)
African-American	1.00	(0.68,1.47)	0.82	(0.65,1.03)
Other	1.52	(1.04,2.23)	1.23	(0.95,1.59)
Latino (reference)				
Behavioral Risk				
IDU	0.74	(0.49,1.10)	0.74	(0.57,0.95)
MSM-IDU	0.89	(0.66,1.19)	0.87	(0.72,1.03)
Other	0.54	(0.33,0.88)	0.95	(0.73,1.25)
MSM (reference)				
Insurance Status				
Public	1.52	(1.03,2.24)	0.66	(0.52,0.84)
Private	0.41	(0.28,0.58)	1.16	(0.95,1.41)
None	2.47	(1.76,3.47)	0.88	(0.71,1.08)
Other/Unknown (reference)				
Log of Average CD4 Count	2.83	(2.37,3.37)	3.65	(3.32,4.01)
Transgender				
Yes vs No	0.60	(0.31,1.17)	0.47	(0.31,0.73)
Ever Change Treatment				
Yes vs No	0.83	(0.60,1.16)	0.59	(0.49,0.71)
Country of Origin				
U.S. born	1.06	(0.57,1.96)	1.30	(0.96,1.78)
Non U.S. born	1.33	(0.69,2.56)	1.32	(0.93,1.86)
Other/Unknown (reference)				
Hepatitis C				
Yes vs No	1.36	(1.06,1.76)	1.04	(0.89,1.22)
Engaged in Care				
Yes vs No	2.20	(1.74,2.78)	1.01	(0.90,1.13)

DISCUSSION

- To our knowledge, this is one of the first population-based analyses using HIV/AIDS surveillance registry data to examine whether all HIV-infected persons eligible for treatment are being treated and are virologically suppressed
- In San Francisco, where the vast majority of persons meeting criteria for ART are on treatment, few are suppressed at mean VL<75 and just more than half are suppressed at mean VL<400
- These population-level data highlight key areas for public health intervention which may serve to maximize virologic response to ART, including:
 - support to maintain engagement in care
 - increase access to housing
 - provide targeted resources to address transgender health inequities

CONCLUSIONS & NEXT STEPS

- In many jurisdictions, monitor-based HIV/AIDS surveillance data are routinely collected to monitor the status of the epidemic but are not generally used to maximize the public's health
- HIV/AIDS surveillance data have the potential to be used to identify individuals who may be candidates for ART, who are not engaged in care, or who are incompletely adherent to ART
- Public health interventions could then be designed to assist these individuals to re-engage in care, be referred to appropriate support services for comorbidities that may impede adherence such as depression and/or substance use, and address other barriers to achieving virologic suppression

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