HIV Prevalence Predictions Users Guide

Note: This tool is an estimate based on current knowledge of rates of HIV transmission, and calculations based on surveillance data. Such estimates do not offer definitive accuracy in HIV prevalence predictions, but may be helpful in planning HIV prevention interventions.

To estimate δ (the diagnosis rate)

First find u (the number undiagnosed in the target year)

- Divide the HIV prevalence (the number of people living with HIV or PLWH) in your jurisdiction by the CDC estimate for the percent diagnosed in your state from the MMWR Vol. 64 / No. 24 "Prevalence of Diagnosed and Undiagnosed HIV Infection — United States, 2008–2012" http://stacks.cdc.gov/view/cdc/31714. For example, in Georgia the diagnosed HIV estimate is 81.3%. Divide the number diagnosed by the percent diagnosed to find the total living with HIV
    - 49,922 diagnosed/0.813 percent diagnosed = 61,404 total PLWH
- Subtract the number diagnosed from the total:
    - 61,404 – 49,922 = 11,482 number of undiagnosed

Next, find δ (diagnosis rate)

- Divide the number of new diagnoses in your jurisdiction for a given year by the number undiagnosed that year. For example in Georgia:
    - 2,631 new diagnoses /11,482 undiagnosed = 0.23

To estimate τ (HIV transmission rates)

- We used rates estimated by Skarbinski, et al. http://archinte.jamanetwork.com/article.aspx?articleid=2130723
- Since most jurisdictions don't know which PLWH in care are on ART and not on ART, we combined these 2 categories (in care on ART but not VS and in care not on ART) to create a average rate for in care, not suppressed
- The resulting transmission rates are
  τ_u = from undiagnosed = 0.066
  τ_n = from those in care, not suppressed =0.022
  τ_s = from those with viral suppression on last viral load (VL) = 0.004
  τ_m= from those not in care (no VL in 12 months or VL "missing") = 0.053

If new science emerges, or you prefer to use different transmission rates from other sources, you can simply insert different values for τ

To estimate σ, o_n, o_s, ρ, ϵ_n, and ϵ_s

- Using eHARS data, create a cohort of people diagnosed with HIV by the end of a given year (in this example, diagnosed by 12/31/12).
- Determine how many persons in this cohort were virally suppressed (VS)

(VL <200), not VS (i.e., VL >=200), and had no VL by the end of 2013.

- Of those in these three categories, determine their VL status at the end of 2014, that is, how many remained in that category, or transitioned to another category by the end of 2014. In other words, complete the following table:

	2014			
2013	**VS (VL<200)**	**Not VS (VL>=200)**	**VL Missing (No VL in 12 months)**	**Total**
VS (VL<200)				
Not VS (VL>=200)				
VL Missing (No VL in 12 months)				
Total				

Example: Georgia 2013-2014

	2014			
2013	**VS (VL<200)**	**Not VS (VL>=200)**	**VL Missing (No VL in 12 months)**	**Total**
VS (VL<200)	18,089	1,729	2,723	22,541
Not VS (VL>=200)	2,762	2,720	1,791	7,273
VL Missing (No VL in 12 months)	2,382	1,557	17,799	21,738
Total	23,233	6,006	22,313	48,994

From this you can estimate the rate of σ, o_n, o_s, ρ, ϵ_n, and ϵ_s as follows:

To estimate σ (rate of transition from not VS to VS):
σ = NVS 2013 ->VS 2014/total NVS 2013 = 2762/7273 = 0.38

To estimate ρ (rate of recividism, or transition from VS to not VS):

ρ = VS 2013->NVS 2014/total VS 2013 = 1729/22541 = 0.077

To estimate o_n (rate of transition from not VS to out of care [no VL in 12 month]):

o_n = NVS 2013 -> VL Missing 2014/total NVS 2013 = 1791/7273= 0.25

To estimate o_s(rate of transition from VS to out of care [no VL in 12 month])

o_s**=** VS 2013-> VL Missing 2014/total VS 2013 = 2723/22541 = 0.12

To estimate ϵ_n (rate of re-entry from VL MIssing to not VS)
ϵ_n = VL Missing2013 -> NVS 2014/total VL Missing 2013 = 1557/21738 =0.07

To estimate ϵ_s (rate of re-entry from VL Missing to VS)
ϵ_s = VL Missing 2013-> VS2014/total VL Missing 2013 = 2382/21738 = 0.11

To estimate μ (mortality for each group):

- Tally the number of PLWH who died during the target year or the most recent year for which you have reliable data
- Stratify this number of PLWH who died during the target year by last VL during target year into VS, Not VS, or VL Missing (no VL in 12 months)
- Calculate death rate for each of these groups by dividing the number of deaths by the number of PLWH in that group

In Georgia, we used 2012 mortality data allow to allow for delay in mortality reporting and most recent match of eHARS data with Vital Statistics, Social Security Death Match, and/or National Death Index.

For example:

Deaths by viral load category in 2010, Georgia

Last VL in 2010	**Total persons**	**Number of deaths**	**Rate (%)**
VS (VL<200)	13,050	153	0.0117
Not VS (VL>200)	7,664	434	0.0566
Missing VL	21,682	326	0.0150

μ_n (Mortality rate for NVS) = 0.0566

μ_s (Mortality rate for VS) =0.0117

μ_m (Mortality rate for VL Missing) = 0.015

To set a value for μ_u, we assumed individuals living with undiagnosed HIV died from non-HIV related causes at the same rate as their age-cohort in Georgia (which we obtained from Georgia's Online Analytical Statistical Information System, although other sources could be used. This may underestimate mortality for the HIV+ undiagnosed because of other lifestyle risk factors. For the age group 55 and older (55+) we limited our calculations for the undiagnosed to those aged 55-75.

Estimating death rates among undiagnosed PLWH, Georgia, 2012

Age Group (years)	Death Rate from OASIS	Number of undiagnosed PLWH	Estimated number of deaths by age group for undiagnosed
13-24	67/100,000	1,909	1.3
25-34	110/100,000	2,737	3.0
35-44	183/100,000	1,946	3.6
45-54	459/100,000	1,459	6.7
55 +	2,157/100,000	584	12.6

We estimated 27 deaths/10,694 undiagnosed = 0.0025 death rate among the undiagnosed (μ_u).

The variables n, s, and m for diagnosed PLWH from eHARS for the year of interest

n = number with VL>=200 (NVS)

s = number with VL<200 (VS)

m = number with VL missing (no VS in 12 months)

For Georgia in 2014 these values are:

n = number with VL>=200 (not VS) = 5,693

s = number with VL<200 (VS) = 22,612

m = number with VL missing (no VS in 12 months) = 21,617

Start Year, End Year, and Vertical Limit are options chosen by you.

Enter all the required information to see the estimated projection of trends and the number of PLWH in the categories of undiagnosed, in care but not suppressed, not in care, VS achieved, and total of all PLWH if the initial conditions you entered for the starting year continue unchanged. You can vary parameters, e.g., increase the rate of re-entry of out of care (VL Missing) persons into care, or decrease the rate at which previously VS persons become not VS by implementing programs shown to improve ART adherence, to see how this affects future HIV prevalence, and estimate the future need for medical and social services.