

Estimate of the Number of Persons Living with HIV in Massachusetts

Christian Hague, MPH

Supervisor, HIV Surveillance

Massachusetts Department of Public Health



Disclosures

Presenter(s) has no financial interest to disclose.

This continuing education activity is managed and accredited by Professional Education Services Group in cooperation with HSRA and LRG. PESG, HSRA, LRG and all accrediting organization do not support or endorse any product or service mentioned in this activity.

PESG, HRSA, and LRG staff has no financial interest to disclose.



Learning Objectives

At the conclusion of this activity, the participant will be able to:

1. Describe different methods of estimating a jurisdiction's undiagnosed HIV positive population.
2. Outline the variations of prevalence estimates using different methods.
3. Communicate the value of applying more than one estimation method.

Agenda

- Surveillance background
- State of the HIV epidemic in MA
- Methods of HIV prevalence estimation
- Methods used by MA
- Results
- Conclusion

Key Massachusetts Dates

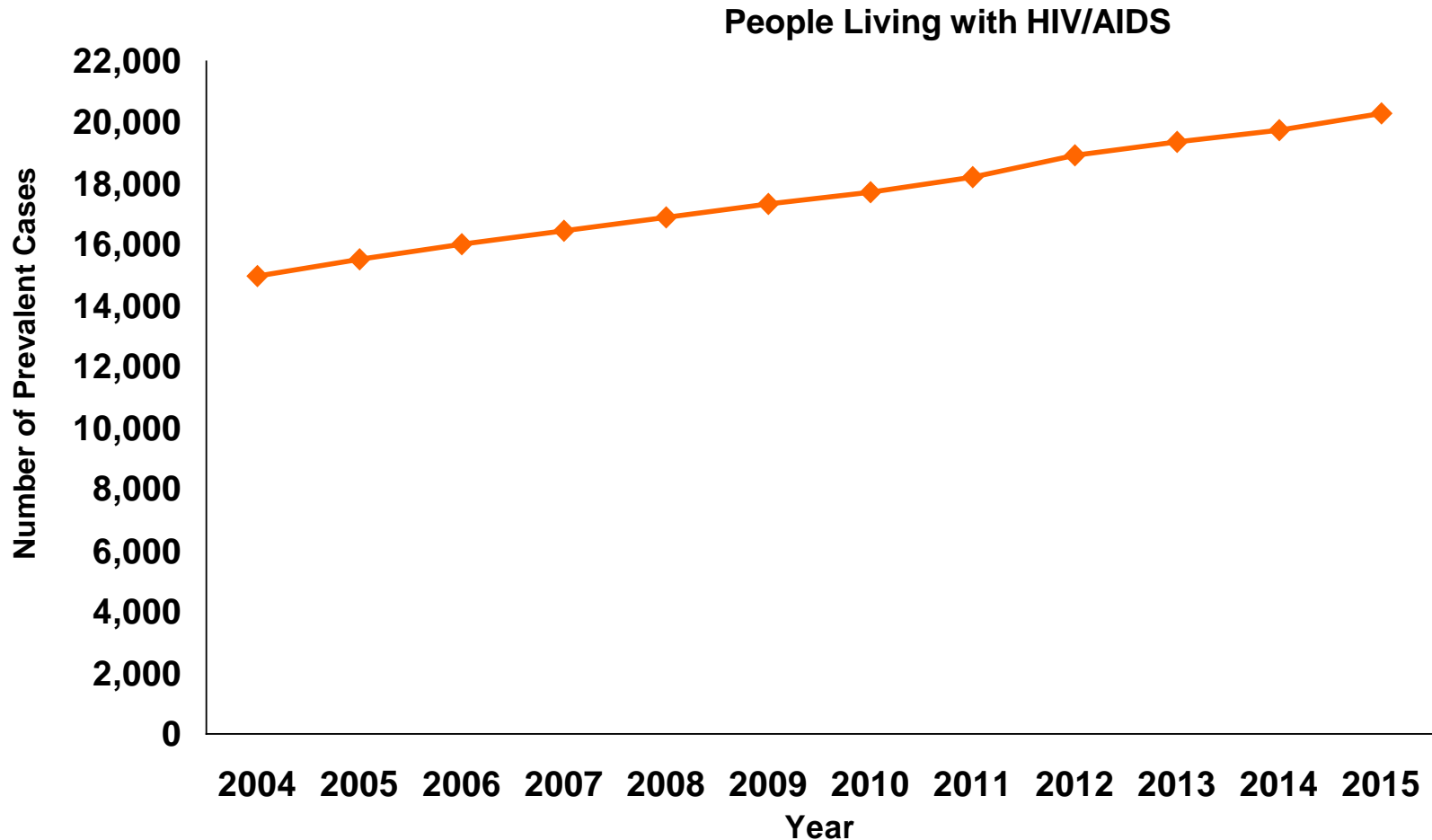
- 1983: AIDS reportable by name
- 1994: First state-funded NEX program
- 1999: HIV reportable by code
- 2001: Medicaid expansion for PLWH
- 2006: State Health Care Reform
- 2006: Syringe deregulation
- 2007: HIV and AIDS reportable by name
- 2012: All viral loads and CD4 results reportable
- 2013: Electronic Laboratory Reporting

Massachusetts HIV/AIDS Epidemic at a Glance

- As of February 23, 2016 a cumulative total of 34,023 individuals have been diagnosed and reported with HIV/AIDS in MA.
 - 20,293 are living with HIV/AIDS
 - 13,730 have died
 - An additional 3,815 MA residents living with HIV/AIDS were first diagnosed in another state
- 629 new diagnoses reported in 2014 (9.3/100,000)
- Median viral load (most recent) is <20 copies
- Median CD4 count (most recent) is 547 cells/mm³

Data Source: MDPH HIV/AIDS Surveillance Program, Data as of 3/01/16

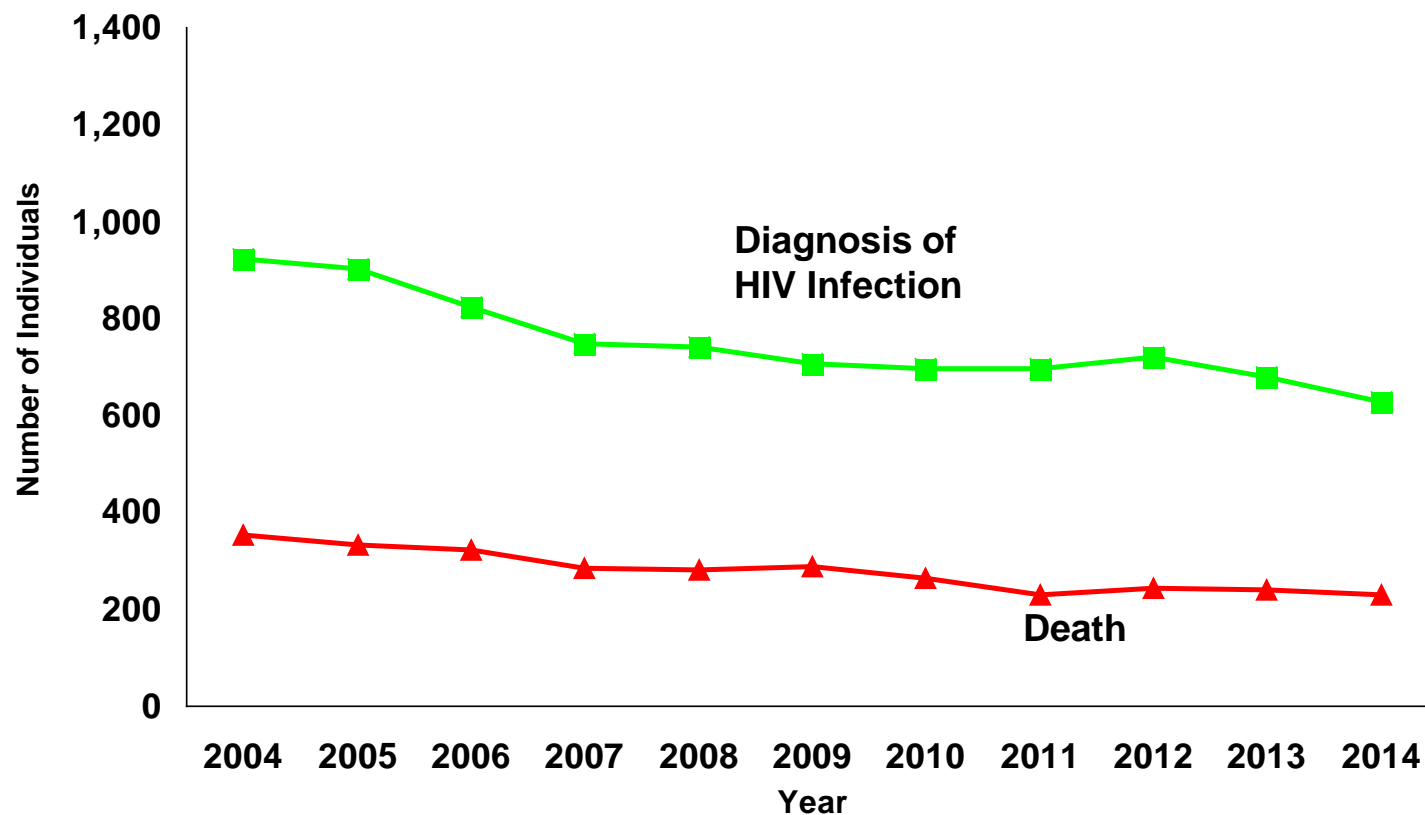
Trends in HIV/AIDS Prevalence by Year: Massachusetts, 2004–2015



Data Source: MDPH HIV/AIDS Surveillance Program, Data as of 3/01/16



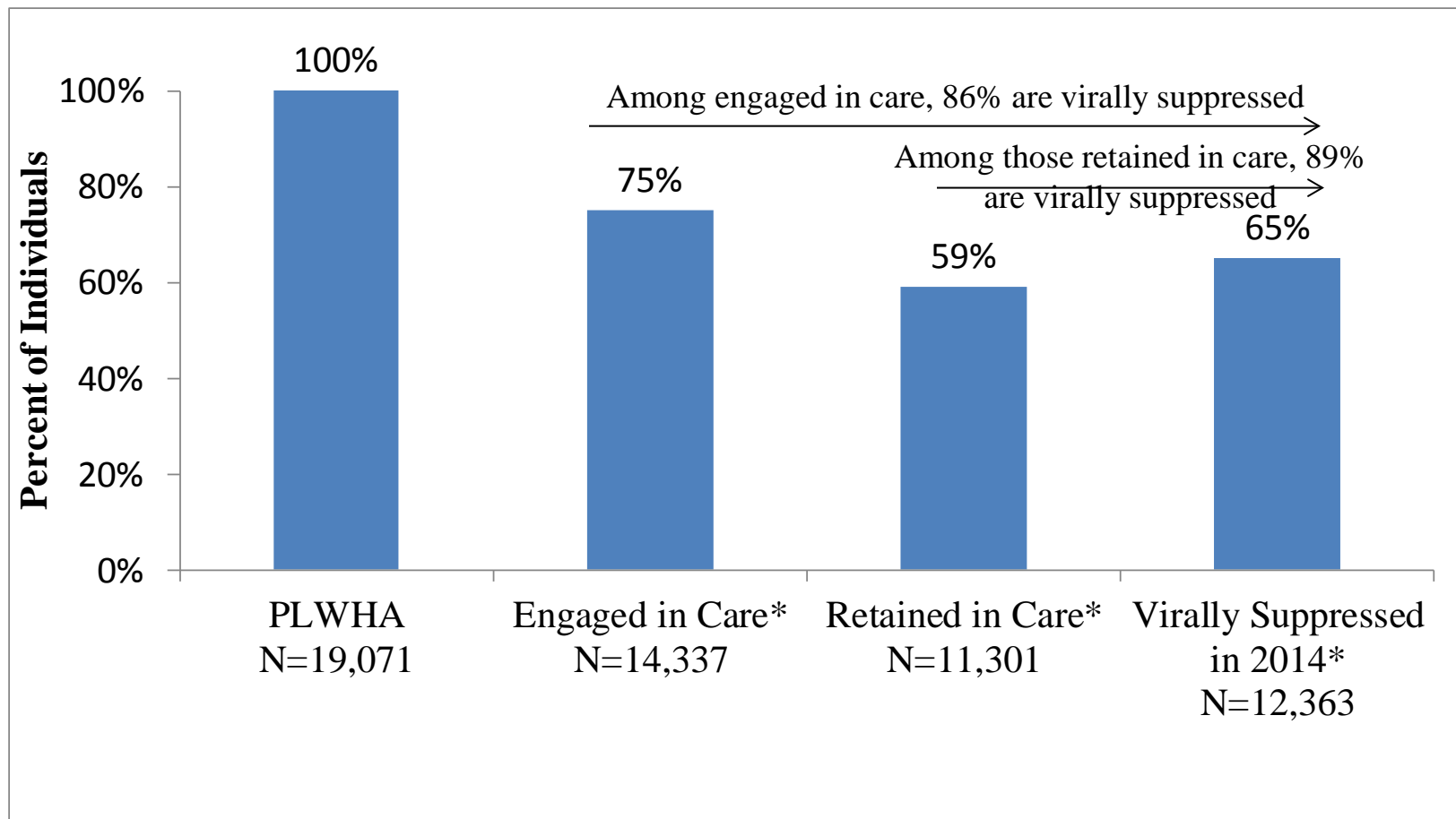
Trends in HIV Infection and Death among People Reported with HIV/AIDS by Year: Massachusetts, 2004–2014



Data Source: MDPH HIV/AIDS Surveillance Program, Data as of 3/01/16



Stages of HIV Care Among People Living with HIV/AIDS in Massachusetts¹

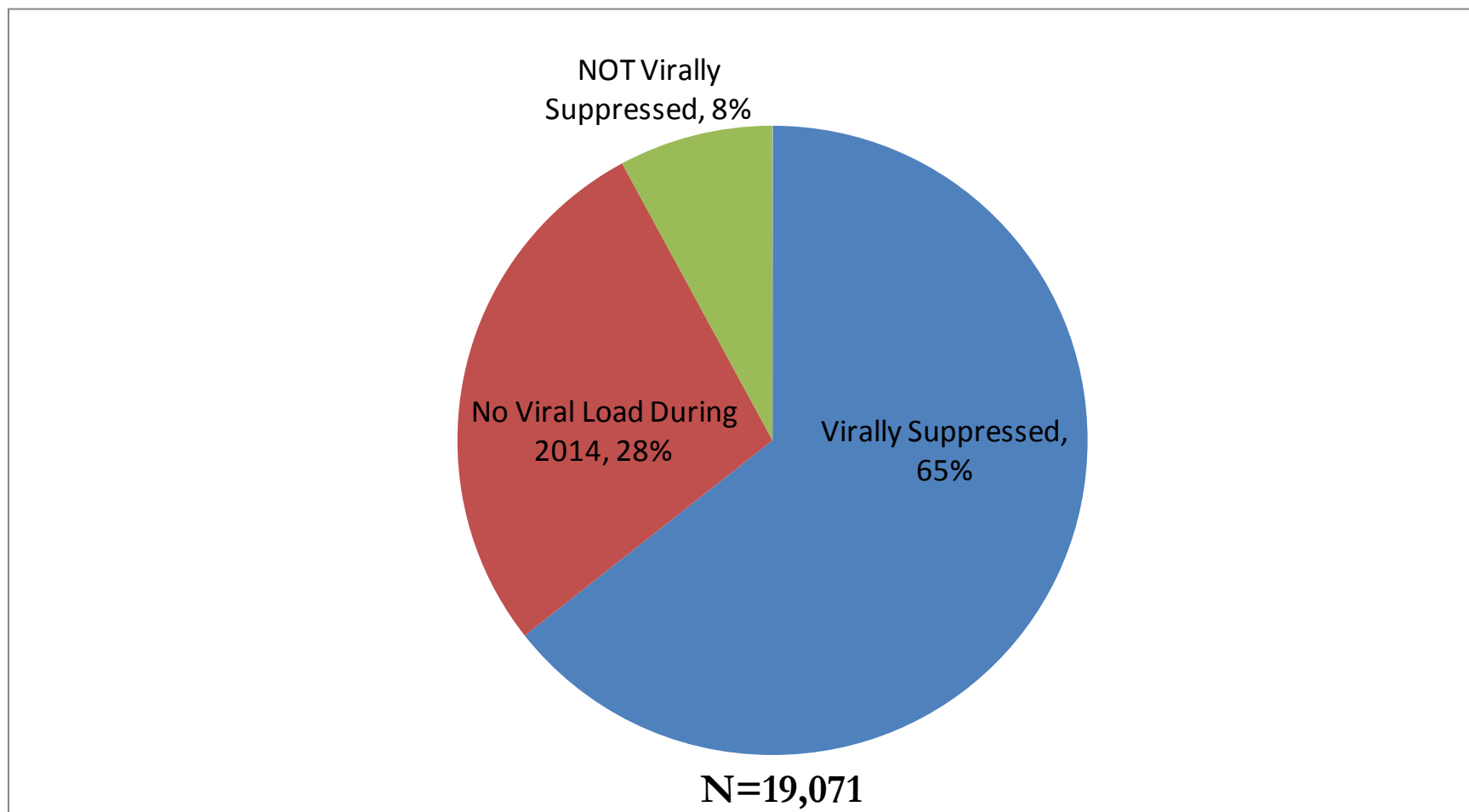


* Lab received by MDPH

¹ Includes individuals diagnosed through 2013 and living in MA as of 12/31/14, based on last known address, regardless of state of diagnosis

• Data Source: MDPH HIV/AIDS Surveillance Program, cases reported through 1/1/16

Distribution of PLWHA in Massachusetts by viral load¹



¹ Includes individuals diagnosed through 2013 and living in MA as of 12/31/14, based on last known address, regardless of state of diagnosis

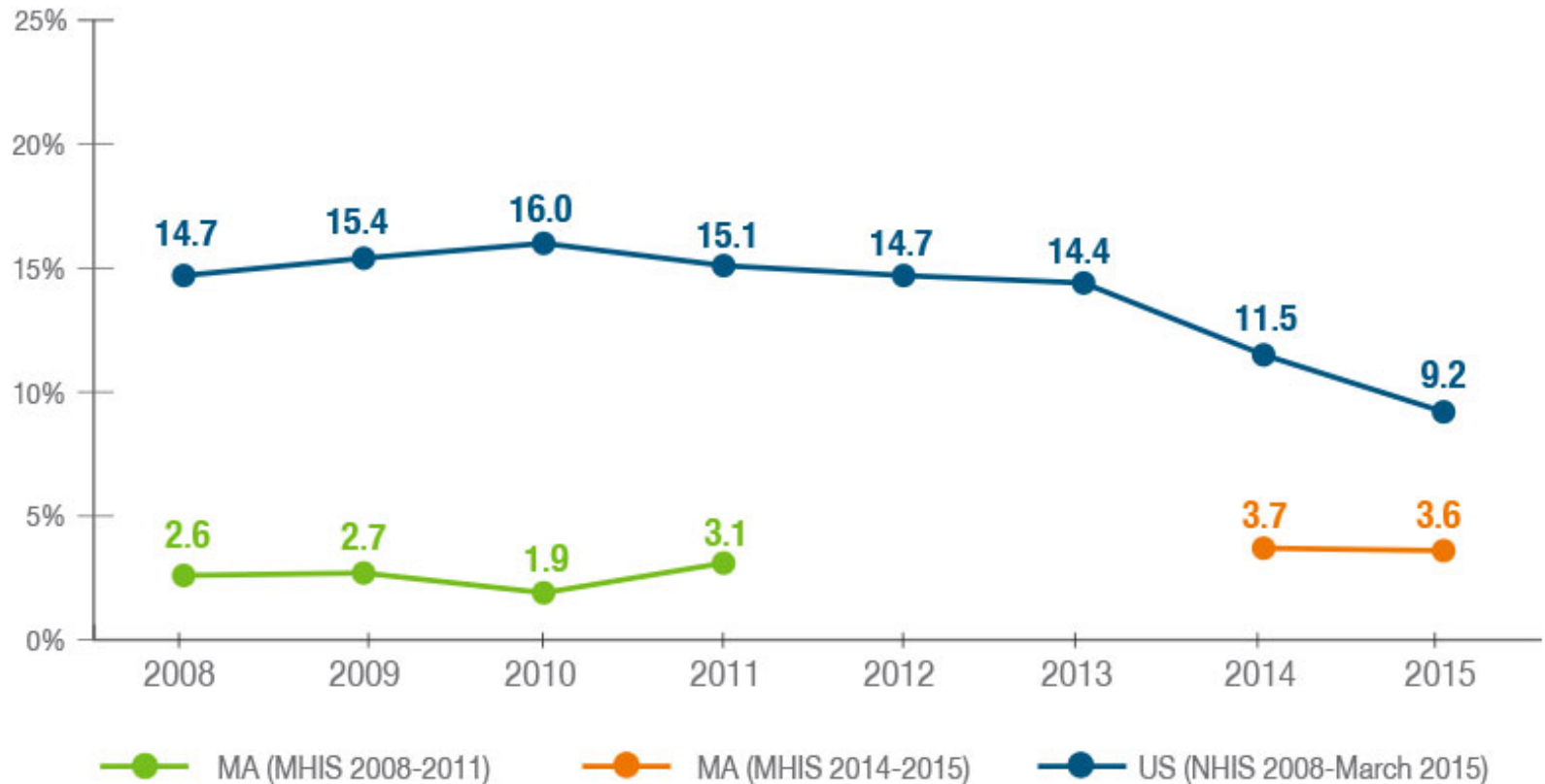
• Data Source: MDPH HIV/AIDS Surveillance Program, cases reported through 1/1/16

Why estimate undiagnosed HIV infection?

- More than 1.2 million people in the United States are living with HIV infection (CDC).
 - It is estimated that almost 1 in 8 (12.8 percent) don't know they are infected (CDC).
 - People unaware of HIV status contribute to 1/3 of ongoing HIV transmissions (CDC)
- First bar of HIV Care Continuum
 - Include undiagnosed when measuring disease burden
- Critical blind spot in HIV care and prevention

Comprehensive Health Care Reform (2006)

Uninsurance at the Time of the Survey for all Massachusetts Respondents and the Nation as a Whole, 2008-2011, 2014 and 2015



Source: www.chiamass.gov

Share experience from your jurisdiction

- Has your jurisdiction calculated undiagnosed HIV?
- What estimation methods do you employ?
- In what ways do you use this estimate?



Why look at different methods?

- The Massachusetts setting includes:
 - Health care reform
 - Incidence decline
 - Reduced mortality
 - Low seroprevalence in counseling and testing data

Methods of Estimating PLWHA

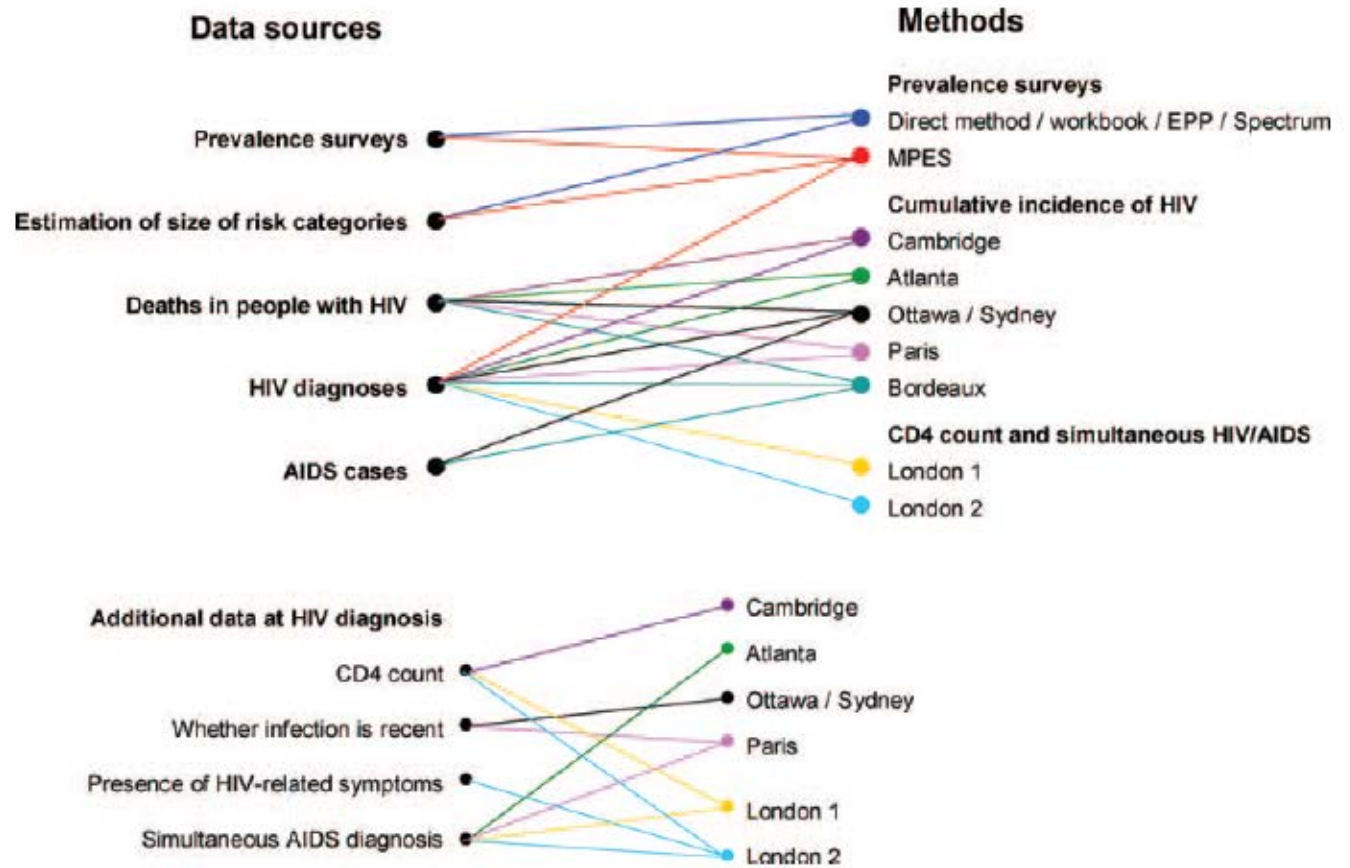


Fig. 1. Summary of available methods and the data required.

Source: Working Group on HIV Prevalence Estimates in Europe, AIDS 2011

DOI:10.1097/QAD.0b013e3283467087



Multiple Methods of Estimating PLWHA

- Based on prevalence surveys
 - UNAIDS/WHO (EPP)
 - Multi-parameter Evidence Synthesis
- Based on diagnoses and incidence data
 - Cambridge
 - CDC back-calculation
 - Ottawa/Sydney
 - Paris
 - Bordeaux
- Based on CD4 counts and concurrent diagnosis
 - London 1
 - London 2
- Based on transmission models



Methods Adapted for Use in MA

- Multi-parameter Evidence Synthesis
- Seattle-King County Method
- CDC Back-Calculation
- Modified London-1

Multi-Parameter Evidence Synthesis

- Seroprevalence by risk population (MSM, IDU, etc)
 - Surveillance and CTR data
- Estimated number of persons in each of the high risk populations
 - Capture-recapture method
- Prevalence surveys and estimation of transmission risk populations
 - Allows for multiple sources of data

DOI:10.1097/QAD.0b013e3283467087

Multi-Parameter Evidence Synthesis Adapted for Massachusetts

- MA adapted method to use race and ethnicity data by age
- Data sources
 - State Counseling, Testing, and Referral (CTR) data
 - HIV Surveillance

DOI:10.1097/QAD.0b013e3283467087



Multi-parameter Evidence Synthesis Results

- Estimates overall prevalence
- Uses seroprevalence by risk
- We used by race from counseling and testing

Race/Ethnicity	%	N
White non-Hispanic	0.3%	15796
Black non-Hispanic	0.7%	3041
Hispanic	0.9%	5649
Total		~24500

DOI:10.1097/QAD.0b013e3283467087



Seattle-King County Method

- Using HIV testing history data
- Time between last negative HIV test and 1st positive result
 - Date of last negative
 - Date of diagnosis
- Estimating Time from Infection to Diagnosis (TID)
- Sources of HIV testing data
 - Case Surveillance (eHARS)
 - HIV Incidence Surveillance (eHARS)
 - Partner Services data

Fellows, I. PLoS One DOI;10.137/Journal.pone.0129551 July 21, 2015

Seattle-King County Method Adapted for Massachusetts

- Software for this methodology was available through R and was made available to the public on GitHUB.
- MA used HIV case and incidence surveillance data 2007-2014 diagnosis.

Fellows, I. PLoS One DOI;10.137/Journal.pone.0129551 July 21, 2015

Seattle Method Results

Measure	Min.	1 st Qu.	Median	Mean	3 rd Qu.	Max.
Incidence (Base Count)	286	321	345	339	363	377
Incidence (Upper Bound)	314	341	360	356	374	383
Undiagnosed (Base Case)	1338	1746	2043	1954	2187	2499
Undiagnosed (Upper Bound)	3083	3750	3928	3934	4203	4685

Fellows, I. PLoS One DOI;10.137/Journal.pone.0129551 July 21, 2015

CDC Back Calculation

- SAS macro/programs, R programs provided by CDC
- Three step process:
 - Reporting delay weights
 - Multiple imputation
 - Back Calculation
- eHARs data (HIV Surveillance data)
- Estimate the prevalence of person ≥ 13 with HIV infection, currently residing in MA, data up to 12/31/2013 reported as of 12/31/2015

CDC Back Calculation cont.

- Reporting Delay weights
 - Measures elapsed time before a diagnosis or death is reported to CDC
 - Estimates the distribution of delay in reporting diagnosis and death.
- Multiple Imputation
 - Imputes values for observations with missing info.
- Back Calculation
 - Data are adjusted for reporting delays, missing risk info, incorrect dx dates and under-reporting of HIV cases

CDC Back-Calculation Results

Year	Prevalence		Undiagnosed		% of diagnosed	
	No.	95% CI	No.	95% CI	%	95% CI
2011	32,100	(31,500-32,500)	4,400	3,600-5,000	86.3	84.5-88.7
2012	32,600	(32,000-33,200)	4,200	3,200-5,000	87.1	84.6-89.7
2013	33,200	(32,300-34,100)	4,000	3,000-5,000	88	84.7-90.7

London-1 Method

- Estimate person infected with need for treatment (CD4 <200)
- Number of diagnosed persons with symptoms related to HIV infection, regardless of CD4 count
- Applies incidence rate of HIV related symptoms per person year from a seroconversion cohort

Lodwick et al. 2015 PLOS ONE DOI:10.1371/journal.pone.0121992

Modified London-1 Adapted to Massachusetts

- Data sources
 - eHARS
 - CD4 at diagnosis
 - Counseling and Testing
- # HIV diagnosed persons by Country of Birth
 - Recent 3 years
 - By CD4 count

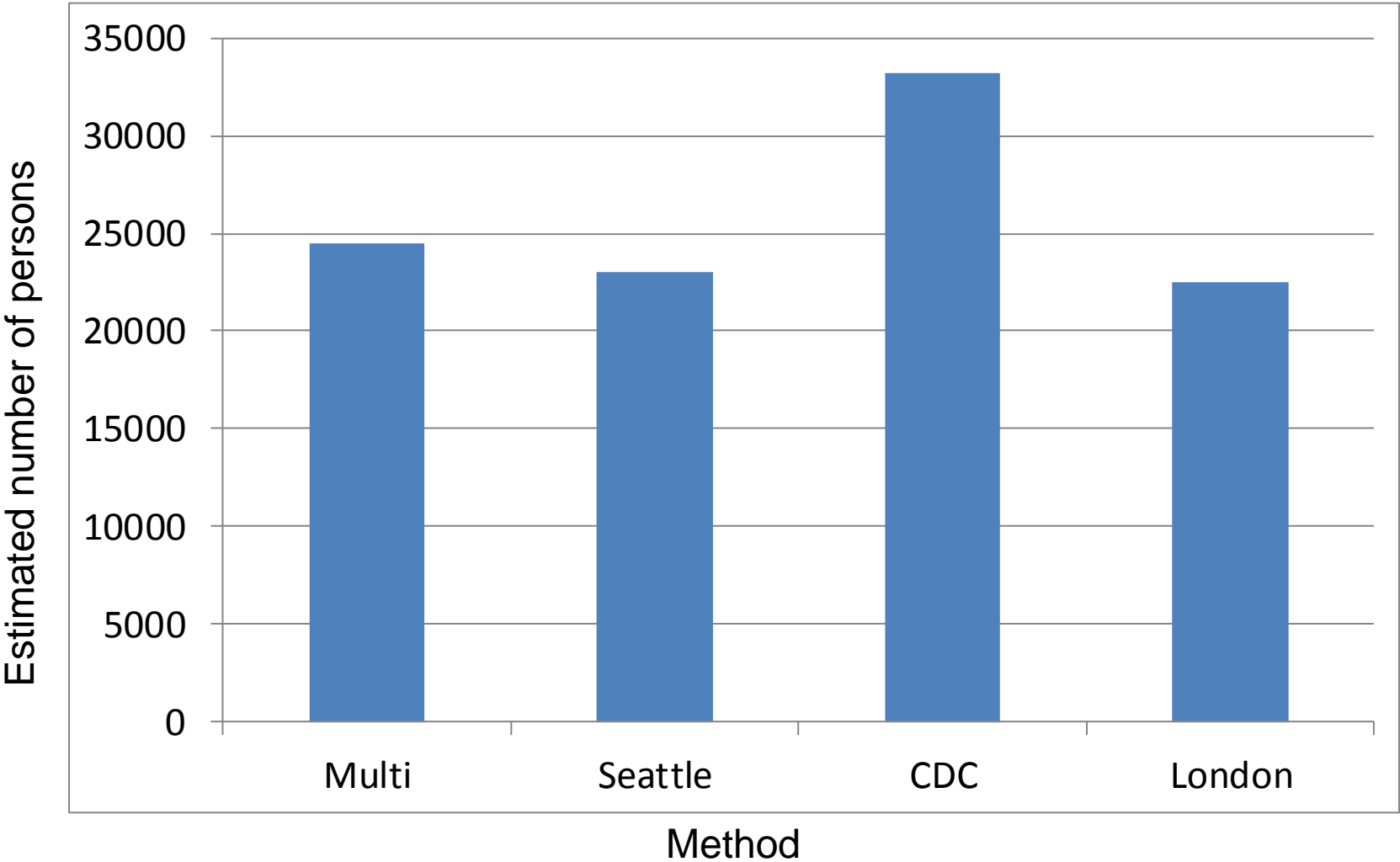
Lodwick et al. 2015 PLOS ONE DOI:10.1371/journal.pone.0121992

Modified London-1- Results

Country of Birth	N
US born	1,339
US dependency	152
Other	969
Total Est Undiagnosed	2,460

Prevalence Estimate	N
Total Est Undiagnosed	2,460
Prevalent	~20,000
Total	~22,500

Summary of Estimate by Method





Conclusions

- Useful in testing multiple methods to get a better range or representation of PLWHA
- More consistent with collection of indicators (death trends, incidence trend, seroprevalence)
- Methods can be applied by any surveillance program or jurisdiction
- Each method has its strengths and weakness but using multiple methods gives you a range
 - Result is stronger than any one given method
 - Permits greater confidence when multiple methods yield consistent estimates

Contributors:

- Christian Hague, MPH- Supervisor, HIV Surveillance Program, MDPH
- Betsey John, MPH- Director, HIV & STD Surveillance
- Monina Klevens, DDS, MPH, Research and Evaluation Director, Bureau of Infectious Disease and Laboratory Sciences, MDPH
- Dawn Fukuda ScM, Director, Office of HIV/AIDS, MDPH
- Alfred DeMaria, Jr., MD, State Epidemiologist & Medical Director, Bureau of Infectious Disease and Laboratory Sciences, MDPH
- Kevin Cranston MDiv, Assistant Commissioner, Director, Bureau of Infectious Disease and Laboratory Sciences, MDPH



Obtaining CME/CE Credit

If you would like to receive continuing education credit for this activity, please visit:

[Link to obtain credit](#)