

# **Expanded HIV Mortality Surveillance**

**Sandy Schwarcz**

**San Francisco Department of Public Health**

**March 15, 2017**

# Presentation Outline

- HIV case surveillance and epidemiology
- Obtaining mortality information
- Rationale and proposed methods for expanded mortality surveillance

# HIV/AIDS Surveillance and Epidemiology, San Francisco

- SF early epidemic center
- HIV/AIDS activism, surveillance, research high priorities
- AIDS case reporting since 1981
- HIV reporting by name since 2006
- Laboratory reporting of confirm HIV antibody positive, CD4 and viral load
- Active reporting at large public and private facilities, passive reporting from VCT
- Active follow-up 12-24 months for ART, OIs, addresses
- 'Test and Treat' with active follow-up for linkage and retention initiated 2010

# Mortality Data Sources

- Deaths obtained from:
  - Local vital statistics
  - Annual computer matches with California social security death file (one year delay)
  - Annual computer matches with National Death Index (NDI; two year delay)
  - Vital Record Business Intelligence System (VRBIS; 2015 only)
- Death certificate data linked to HIV/AIDS case registry
- Causes of death obtained from NDI and VRBIS

# Standard US Death Certificate

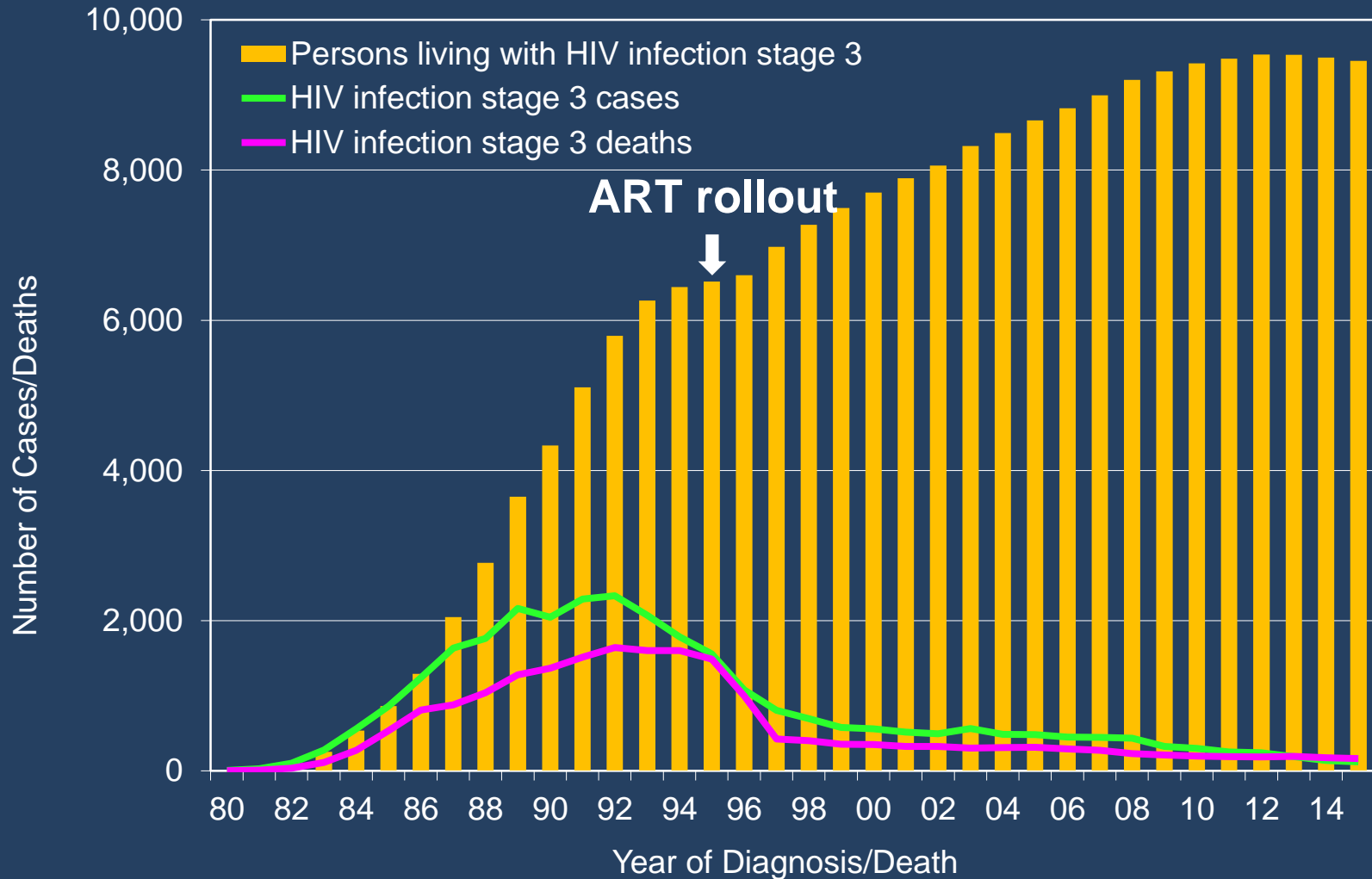
<b>ITEMS 24-28 MUST BE COMPLETED BY PERSON WHO PRONOUNCES OR CERTIFIES DEATH</b>		24. DATE PRONOUNCED DEAD (Mo/Day/Yr)	25. TIME PRONOUNCED DEAD
26. SIGNATURE OF PERSON PRONOUNCING DEATH (Only when applicable)		27. LICENSE NUMBER	28. DATE SIGNED (Mo/Day/Yr)
29. ACTUAL OR PRESUMED DATE OF DEATH (Mo/Day/Yr) (Spell Month)	30. ACTUAL OR PRESUMED TIME OF DEATH	31. WAS MEDICAL EXAMINER OR CORONER CONTACTED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>CAUSE OF DEATH (See instructions and examples)</b> 32. PART I. Enter the <u>chain of events</u> --diseases, injuries, or complications--that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.  IMMEDIATE CAUSE (Final disease or condition -----> resulting in death) a. _____ Due to (or as a consequence of):  Sequentially list conditions, if any, leading to the cause listed on line a. Enter the <b>UNDERLYING CAUSE</b> (disease or injury that initiated the events resulting in death) <b>LAST</b> b. _____ Due to (or as a consequence of):  c. _____ Due to (or as a consequence of):  d. _____			Approximate interval: Onset to death  _____  _____  _____  _____
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I		33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
		34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
35. DID TOBACCO USE CONTRIBUTE TO DEATH?  <input type="checkbox"/> Yes <input type="checkbox"/> Probably  <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year  <input type="checkbox"/> Pregnant at time of death  <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death  <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death  <input type="checkbox"/> Unknown if pregnant within the past year	37. MANNER OF DEATH  <input type="checkbox"/> Natural <input type="checkbox"/> Homicide  <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation  <input type="checkbox"/> Suicide <input type="checkbox"/> Could not be determined	

To be Completed By:  
MEDICAL CERTIFIER

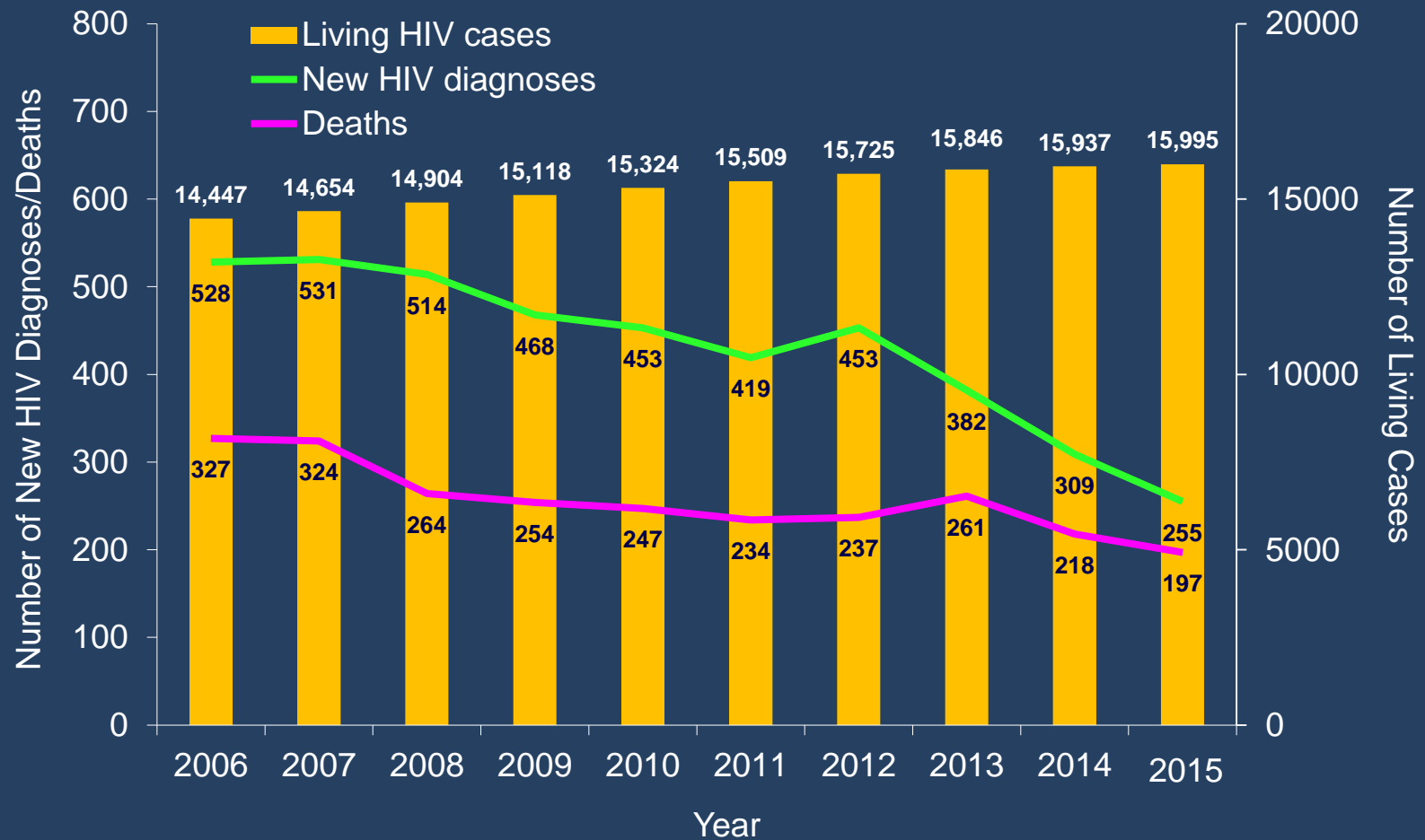
# Assigning Causes of Death

- Death certificate completed by person pronouncing death
  - Identifies sequence of events leading to death and the underlying cause
  - Assigns manner of death
- National Death Index
  - Uses all causes of death information from death certificate
  - Computer algorithm applied to consistently select the underlying cause of death according to international rules
  - Retains all 'significant conditions contributing to death'

# HIV infection stage 3 (AIDS) cases, deaths, and prevalence, 1980-2015, San Francisco



# New HIV diagnoses, deaths, and prevalence, 2006-2015, San Francisco

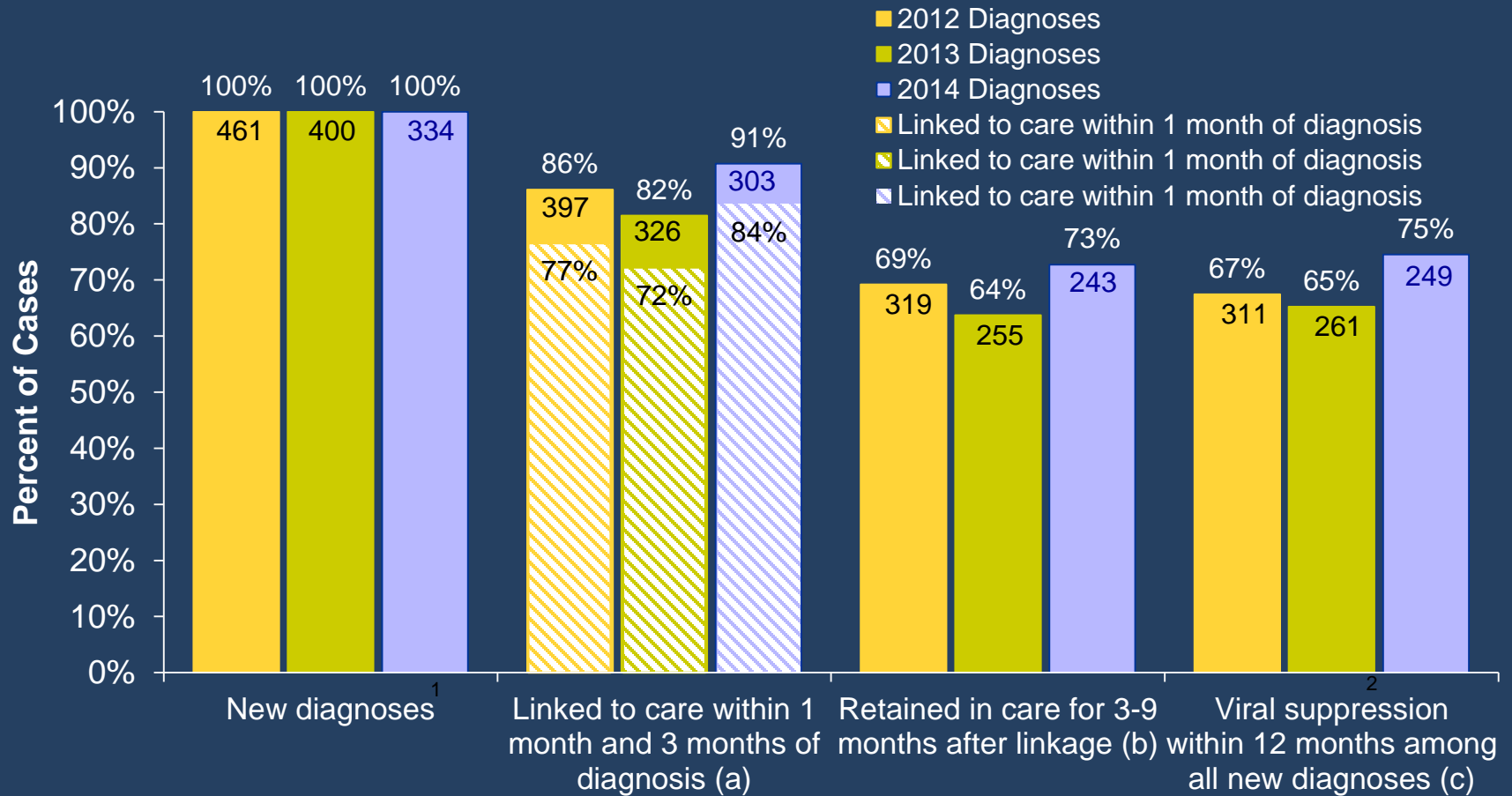




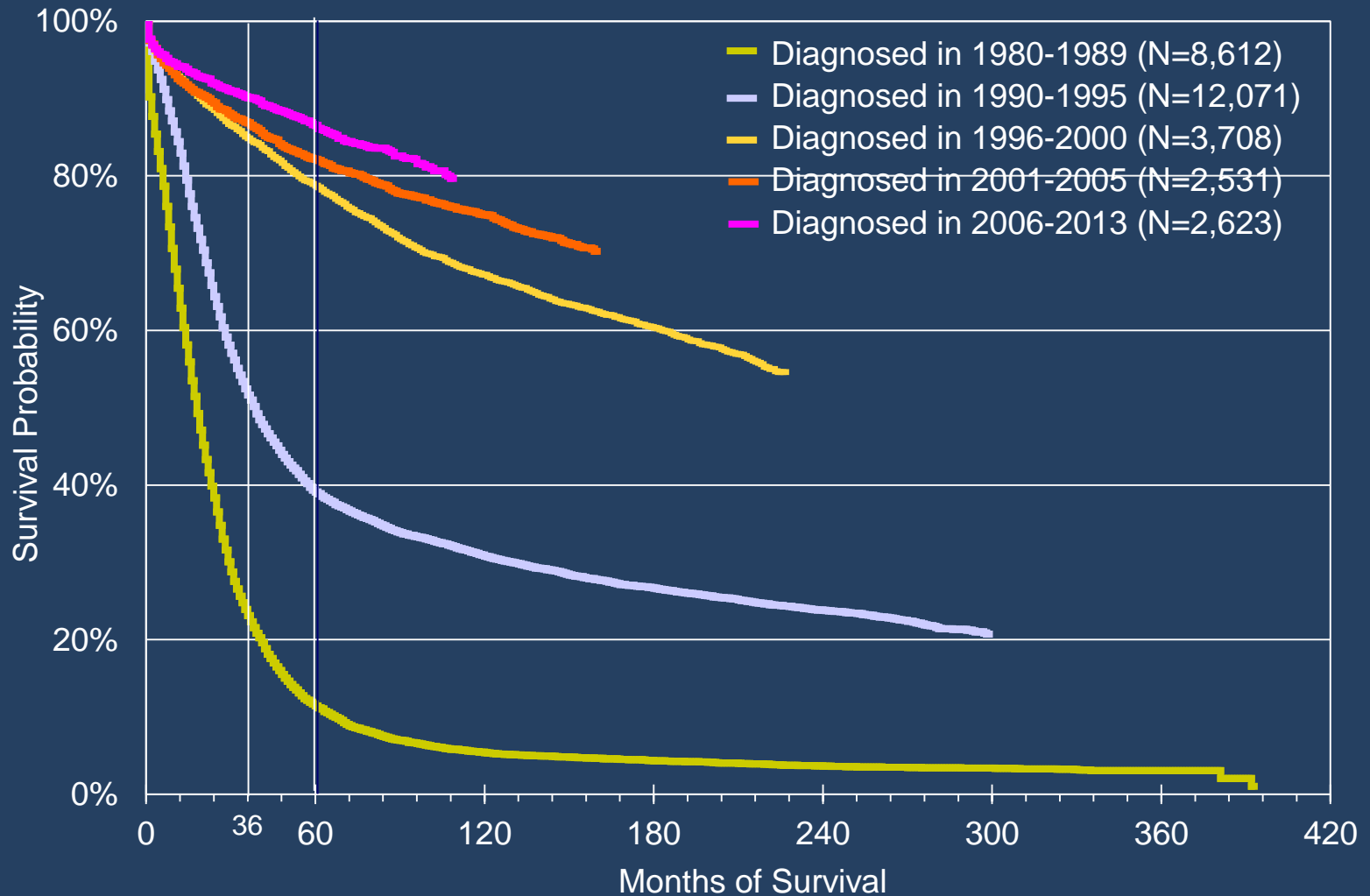
# Deaths in persons with HIV infection, by demographic and risk characteristics, 2011-2015, San Francisco

	Year of Death					Cumulative Totals as of 12/31/2015
	2011	2012	2013	2014 <sup>1</sup>	2015 <sup>1</sup>	
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)	
<b>Gender</b>						
Male	209 ( 89)	211 ( 89)	222 ( 85)	186 ( 85)	175 ( 89)	19,873
Female	18 ( 8)	18 ( 8)	29 ( 11)	20 ( 9)	21 ( 11)	844
Transfemale <sup>2</sup>	7 ( 3)	8 ( 3)	10 ( 4)	12 ( 6)	1 ( 1)	270
<b>Race/Ethnicity</b>						
White	128 ( 55)	149 ( 63)	149 ( 57)	121 ( 56)	110 ( 56)	15,280
African American	54 ( 23)	45 ( 19)	50 ( 19)	50 ( 23)	38 ( 19)	2,672
Latino	32 ( 14)	31 ( 13)	37 ( 14)	34 ( 16)	24 ( 12)	2,209
Asian/Pacific Islander/ Native American	6 ( 3)	3 ( 1)	9 ( 3)	3 ( 1)	8 ( 4)	542
Multi-Race	14 ( 6)	9 ( 4)	16 ( 6)	10 ( 5)	17 ( 9)	284
<b>Transmission Category</b>						
MSM	130 ( 56)	134 ( 57)	150 ( 57)	125 ( 57)	107 ( 54)	15,320
PWID	37 ( 16)	42 ( 18)	49 ( 19)	37 ( 17)	37 ( 19)	1,740
MSM-PWID	60 ( 26)	50 ( 21)	54 ( 21)	48 ( 22)	46 ( 23)	3,372
Heterosexual	4 ( 2)	7 ( 3)	5 ( 2)	8 ( 4)	5 ( 3)	236
Other/Unidentified	3 ( 1)	4 ( 2)	3 ( 1)	0 ( 0)	2 ( 1)	319
<b>Age at Death (years)</b>						
0 - 29	3 ( 1)	2 ( 1)	3 ( 1)	4 ( 2)	6 ( 3)	1,109
30 - 39	25 ( 11)	12 ( 5)	13 ( 5)	10 ( 5)	9 ( 5)	7,340
40 - 49	63 ( 27)	58 ( 24)	56 ( 21)	34 ( 16)	31 ( 16)	7,633
50 - 59	81 ( 35)	83 ( 35)	100 ( 38)	80 ( 37)	75 ( 38)	3,373
60 - 69	42 ( 18)	60 ( 25)	66 ( 25)	62 ( 28)	51 ( 26)	1,182
70+	20 ( 9)	22 ( 9)	23 ( 9)	28 ( 13)	25 ( 13)	350
<b>HIV Disease Stage</b>						
Stage 0, 1, 2, or unknown	33 ( 14)	43 ( 18)	55 ( 21)	38 ( 17)	32 ( 16)	535
Stage 3 (AIDS)	201 ( 86)	194 ( 82)	206 ( 79)	180 ( 83)	165 ( 84)	20,452
<b>Cause of Death<sup>3</sup></b>						
HIV/AIDS-related	101 ( 43)	84 ( 35)	103 ( 39)	--	--	--
Non-HIV/AIDS-related	123 ( 54)	150 ( 63)	151 ( 58)	--	--	--
Unknown	10 ( 4)	3 ( 1)	7 ( 3)	--	--	--
<b>Total</b>	<b>234 ( 100)</b>	<b>237 ( 100)</b>	<b>261 ( 100)</b>	<b>218 ( 100)</b>	<b>197 ( 100)</b>	<b>20,987</b>

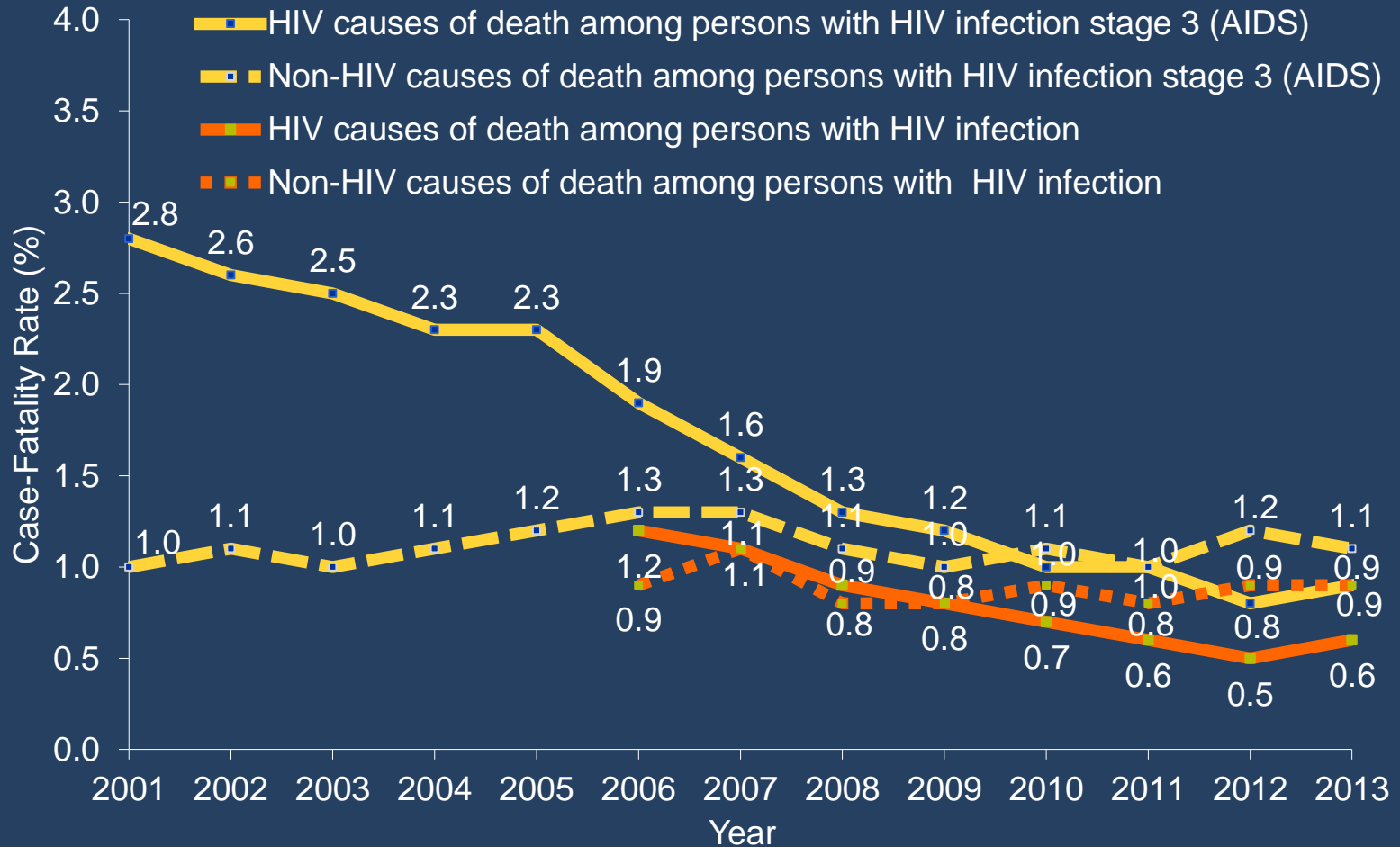
# Continuum of HIV care among persons diagnosed with HIV, 2012-2014, San Francisco



# Trends in survival for persons diagnosed with HIV infection stage 3 (AIDS), San Francisco



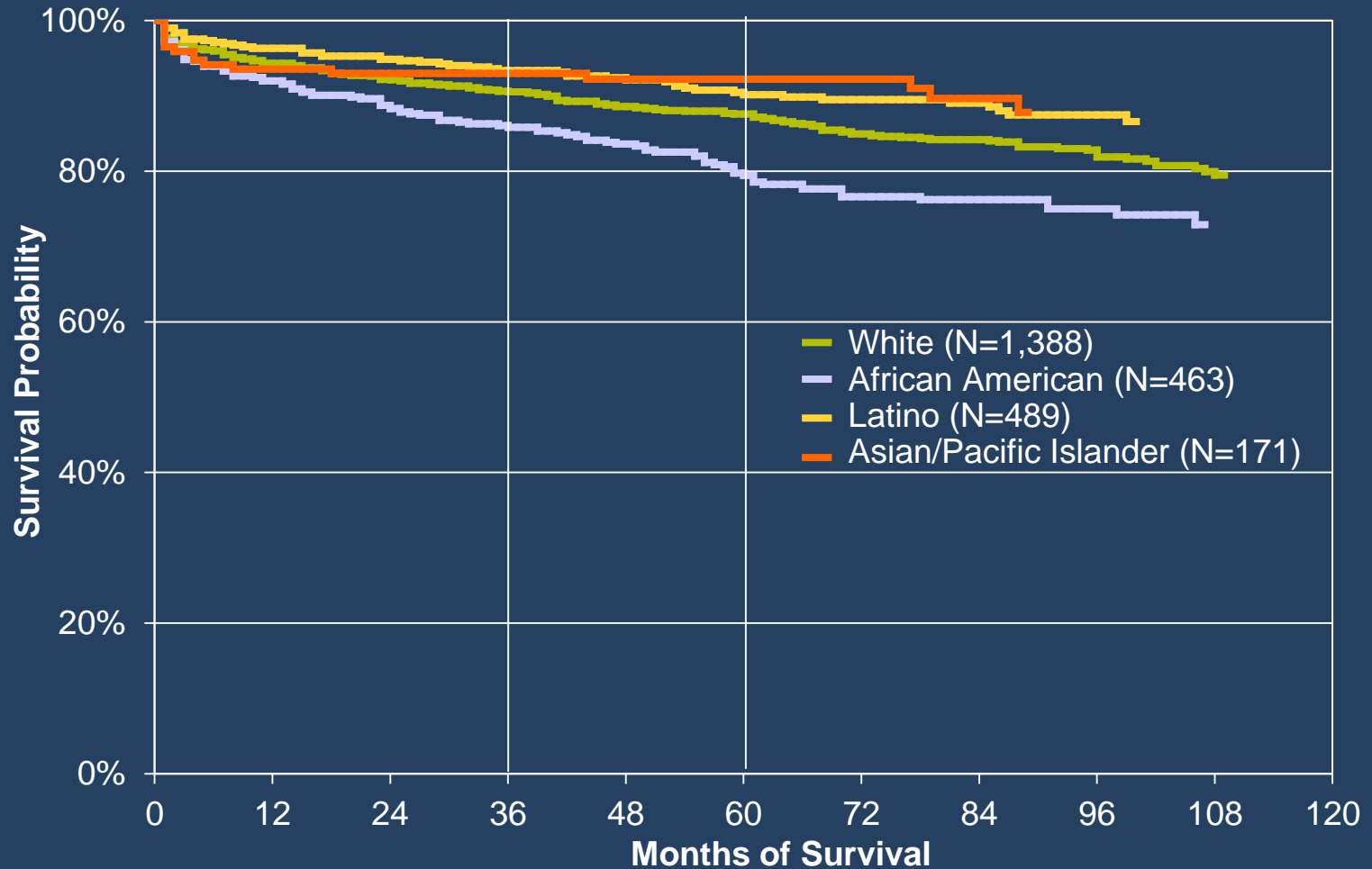
# Case-fatality rates<sup>1</sup> due to HIV-related and non-HIV-related causes among persons diagnosed with HIV infection, 2001-2013, San Francisco



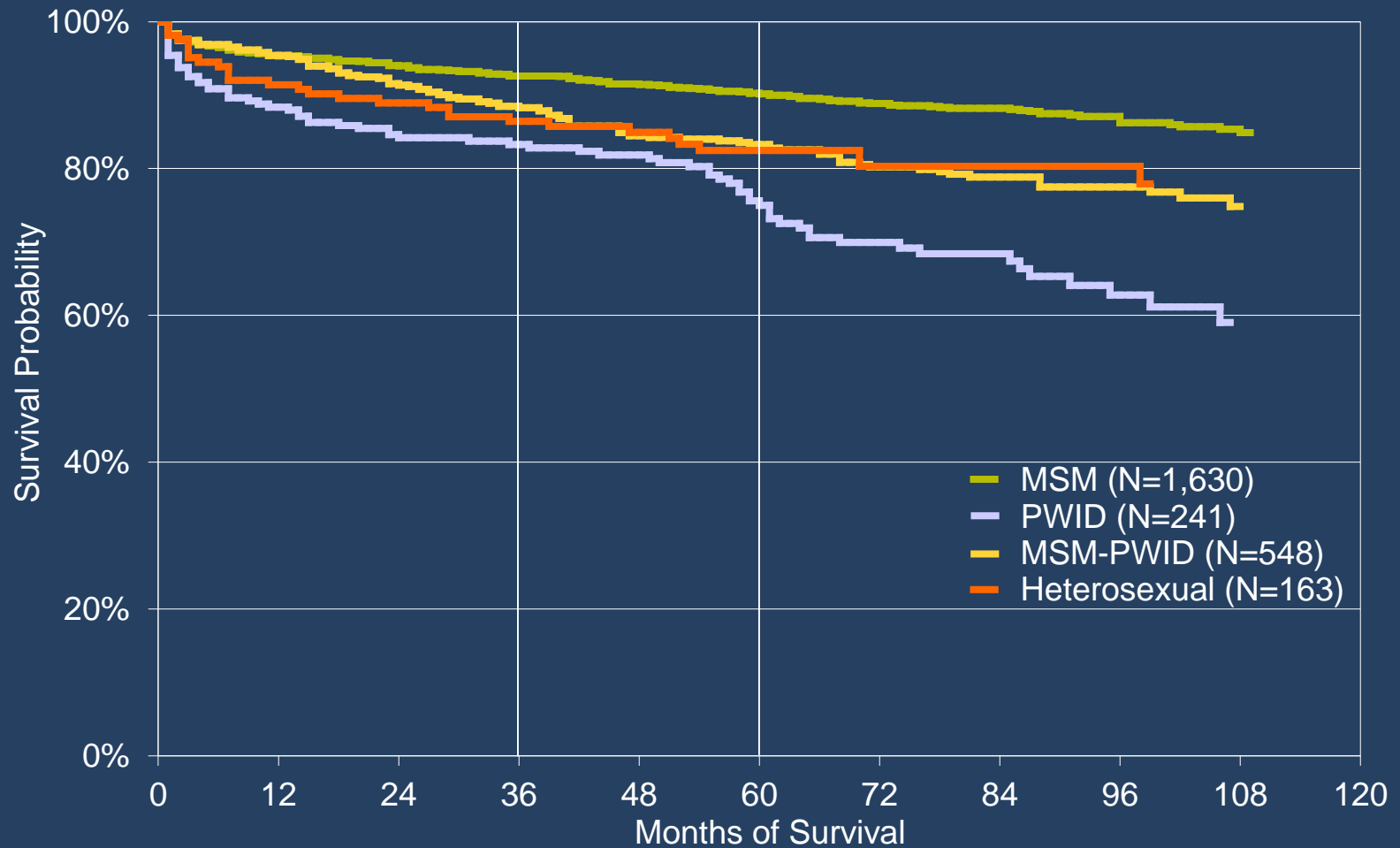
# Care indicators among persons newly diagnosed with HIV in 2014 by demographic and risk characteristics, San Francisco

Characteristics	Number of diagnoses <sup>1</sup>	% Linked to care within 1 month of diagnosis <sup>2</sup>	% Linked to care within 3 months of diagnosis <sup>2</sup>	% Retained in care 3-9 months after linkage <sup>2</sup>	% Virally suppressed within 12 months of diagnosis <sup>2</sup>
<b>Total</b>	<b>334</b>	<b>84%</b>	<b>91%</b>	<b>73%</b>	<b>75%</b>
<b>Gender</b>					
Male	313	85%	90%	72%	74%
Female	14	64%	93%	93%	79%
Transfemale	7	71%	100%	86%	71%
<b>Race/Ethnicity</b>					
White	143	87%	94%	76%	76%
African American	<b>36</b>	<b>67%</b>	<b>81%</b>	<b>64%</b>	<b>53%</b>
Latino	96	81%	88%	71%	78%
Asian/Pacific Islander	42	88%	93%	76%	86%
Other/Unknown	17	94%	94%	65%	65%
<b>Age at Diagnosis</b>					
13-24	<b>37</b>	<b>76%</b>	<b>84%</b>	<b>65%</b>	<b>73%</b>
25-29	54	93%	98%	81%	81%
30-39	101	75%	85%	63%	67%
40-49	81	89%	91%	79%	78%
50+	61	87%	97%	77%	77%
<b>Transmission Category</b>					
MSM	253	84%	91%	75%	78%
PWID	<b>19</b>	<b>79%</b>	<b>95%</b>	<b>63%</b>	<b>63%</b>
MSM-PWID	<b>37</b>	<b>86%</b>	<b>89%</b>	<b>65%</b>	<b>57%</b>
Heterosexual	11	82%	100%	82%	91%
Other/Unidentified	<b>14</b>	<b>79%</b>	<b>86%</b>	<b>57%</b>	<b>57%</b>
<b>Housing Status</b>					
Housed	298	<b>83%</b>	<b>90%</b>	73%	77%
Homeless	36	89%	94%	<b>69%</b>	<b>53%</b>

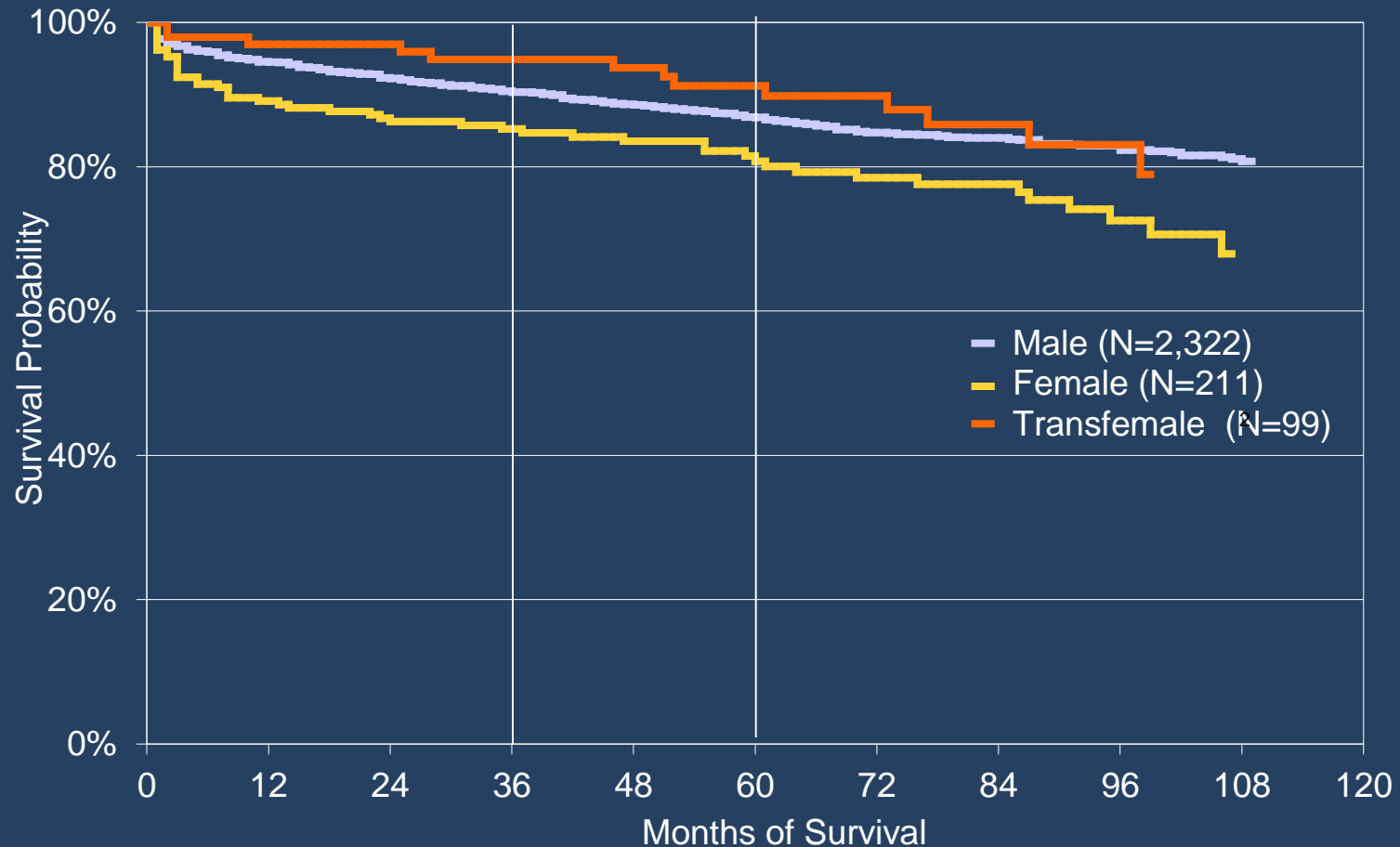
# Kaplan-Meier survival curves for persons diagnosed with HIV infection stage 3 (AIDS) between 2006 and 2013 by race/ethnicity, San Francisco



# Kaplan-Meier survival curves for persons diagnosed with HIV infection stage 3 (AIDS) between 2006 and 2013 by exposure category, San Francisco



# Kaplan-Meier survival curves for persons diagnosed with HIV infection stage 3 (AIDS) between 2006 and 2013 by gender, San Francisco





# Multiple Causes of Death , by gender , San Francisco, 1996-2013

	Female N=499	Male N=5,588	Transfemale N=181	P value
<i>Infectious/Bacterial</i>				
HIV/AIDS (all)	<b>365 (73.2)</b>	<b>4479 (80.2)</b>	<b>143 (79.0)</b>	<b>0.001</b>
Pneumonia	73 (14.6)	745 (13.3)	25 (13.8)	0.71
Septicemia	<b>59 (11.8)</b>	<b>499 (8.9)</b>	<b>28 (15.5)</b>	<b>0.002</b>
Viral hepatitis	<b>66 (13.2)</b>	<b>594 (10.6)</b>	<b>28 (15.5)</b>	<b>0.03</b>
<i>Substance related</i>				
Alcohol-related	8 (1.6)	78 (1.4)	2 (1.1)	0.92
Drug-related (including drug overdose)	<b>55 (11.0)</b>	<b>281 (5.0)</b>	<b>8 (4.4)</b>	<b>&lt;0.001</b>
Mental disorders due to substance abuse	<b>66 (13.2)</b>	<b>336 (6.0)</b>	<b>20 (11.1)</b>	<b>&lt;0.001</b>
<i>Intentional and other external causes</i>				
Accident (excluding drug-related)	9 (1.8)	79 (1.4)	3 (1.7)	0.84
Assault	5 (1.0)	60 (1.1)	3 (1.7)	0.65
Suicide	<b>3 (0.6)</b>	<b>158 (2.8)</b>	<b>4 (2.2)</b>	<b>0.003</b>
Undetermined intent	3 (0.6)	23 (0.4)	1 (0.6)	0.48
<i>Cardiopulmonary</i>				
Cerebrovascular	<b>26 (5.2)</b>	<b>138 (2.5)</b>	<b>6 (3.3)</b>	<b>0.001</b>
Chronic obstructive pulmonary disease	<b>43 (8.6)</b>	<b>224 (4.0)</b>	<b>5 (2.8)</b>	<b>&lt;0.001</b>
Heart disease <sup>‡</sup>	117 (23.5)	1142 (20.4)	37 (20.4)	0.28
<i>Malignancies</i>				
AIDS defining cancer <sup>‡</sup>	<b>20 (4.0)</b>	<b>790 (14.1)</b>	<b>16 (8.8)</b>	<b>&lt;0.001</b>
Non-AIDS defining cancer <sup>‡</sup>	<b>32 (6.4)</b>	<b>704 (12.6)</b>	<b>13 (7.2)</b>	<b>&lt;0.001</b>

# Trends in drug-related causes of death among San Francisco residents, 2010-2015

Year of death	Deaths among SF residents who were not reported with HIV <sup>1</sup>			Deaths among SF residents reported with HIV <sup>1</sup>			Deaths among all SF residents
	Non-drug-related deaths		Drug-related deaths	Non-drug-related deaths		Drug-related deaths	
	N=31,246		N=969	N=855		N=156	
	Number	Number	(%)	Number	Number	(%)	
2010	5,115	139	(2.7)	152	22	(12.6)	5,428
2011	5,283	161	(3.0)	144	28	(16.3)	5,616
2012	5,276	157	(2.9)	139	33	(19.2)	5,605
2013	5,252	182	(3.4)	143	29	(16.9)	5,606
2014	4,987	198	(3.8)	135	21	(13.5)	5,341
2015	5,333	132	(2.4)	142	23	(13.9)	5,630

# Proposed Expanded Mortality Surveillance Objectives

1. Identify modifiable factors associated with risk of death
  - Tobacco use
  - Drug and alcohol use
  - Compliance with care
  - ART use and adherence
  - Mental illness
2. Standardize classification and interpretation of underlying and contributory causes of death
3. Assess biases and limitations of death certificate data

# Coding Cause of Death (CoDe) in HIV Project

- Objective: standardize assigning underlying cause of death and contributory factors in observational studies
- Data collection tool and centralized review process
- Data collection form completed by health care provider or staff
- Centralized data reviewed independently by two trained reviewers
  - Assign immediate, contributory, and underlying causes of death
  - Disagreement between reviewers or if cause of death unknown, referred to additional reviewers

## CoDe Data Collection Form

- Background demographics
- Data sources used
- Risk factors
  - Cigarette smoking
  - Excessive alcohol use
  - Active illicit injection and non injection drug use
  - Opiate substitution
- Co-morbidities
  - Hypertension
  - Diabetes mellitus
  - Dyslipidemia
  - Heart disease
  - History of depression
  - History of psychosis

## CoDe Data Collection Form

- Co-morbidities (cont.)
  - Chronic HBV, HCV, HDV infections
  - History of liver decompensation
  - Clinical signs of liver failure in 4 weeks before death
  - Liver histology results
- Cause of death
- Autopsy results
- ART and laboratory results prior to death
- Adverse effects of medical treatment

# Proposed Methods

- Adaptation of CoDe data collection tool to include:
  - Types of drugs used and poly-substance use
  - Compliance with medical care (12 months prior to death and ever)
  - Victim of intimate partner violence
  - Living situation in 12 months prior to death (alone, partner, on streets)
  - Incarcerated (12 months prior to death and ever)
  - Receipt of hospice care
  - Suicide attempt or ideation (12 months prior to death and ever)
  - Panic attacks (12 months prior to death and ever)
  - Unspecified mental illness (12 months prior to death and ever)
  - End-stage renal disease
  - Non-AIDS defining cancers (type and date)

## Proposed Methods (cont.)

- Adaptation of CoDe protocol:
  - Trained nurse reviews medical records at SF facility of death and all SF facilities where decedent received care and completes form
  - Does not assign causes of death
  - Trained physician reviews assign causes of death without viewing death certificate



# Proposed Preliminary Analysis

- Compare immediate, underlying, and contributory causes of death from physician review to death certificate
- Compare underlying and contributory ('multiple') causes of death with NDI causes
- Frequency distribution of risk factors by causes of death

# Next Steps

- Additional input on data collection form
- Pilot test random sample of deaths from 2017 and 2015 (for comparison with NDI)
- Revise data collection form and protocol as needed
- Address funding