Retention in HIV care predicts subsequent retention and predicts survival well after the first year of care: a national study of US Veterans

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Abstract #137

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Background

- Retention in HIV care during the initial years of care impacts survival. [1,2]

- Whether subsequent retention continues to influence survival is unknown.

- The impact of prior poor retention on subsequent retention is also poorly described.

- The VA system is one of the largest single providers of HIV care in the US.[3]

- We sought to identify if poor retention predicted future poor retention and whether retention in later years of HIV care impacts survival.

[1]Giordano, *Clinical Infectious Diseases* 2007; 44:1493
[2]Mugavero et al. *Clin Infect Dis 2009;48:248-56*
[3]Backus, *Arch Intern Med* 2010; 170:1239-1246.

Methods

- <u>Design</u>: Retrospective cohort study.

- <u>Data source</u>: Clinical Case Registry (CCR), a national VA database of all HIV-infected veterans who received care at all VA facilities; each case is locally validated as HIV-positive.[4]

- <u>Time frame</u>: Persons identified in VA with HIV between January 1998 and December 2008, with follow-up through December 2009.

- <u>VA HIV date</u>: The date of identification of HIV-positive status in the VA, using laboratory, pharmacy, and ICD-9 data.

- <u>Retention in care</u>: Number of 4-month blocks per year with ≥1 visit (0, 1, 2, or 3 of 3).

- <u>Exposure Period</u>: Retention in care, median VL, and median CD4 from the year prior to the year of interest. To ensure measurement of variables during the exposure period, persons who died during the exposure period were excluded.

- <u>Analysis of Subsequent Retention in Care</u>: Ordinal logistic regression (4-level outcome) for predictors of current retention in care, using retention in care in the previous year as a predictor.

- <u>Retention over Time</u>: Graphically demonstrated with a Kaplan-Meier analysis of time to first gap in care >180 days.

- <u>Analysis of Survival</u>: Cox proportional hazards regression models of death after Year 1 with Retention in Care measured as a time up-dated variable reflecting the proportion of four-month blocks during follow-up with a visit, lagged one year.

[4]Backus, *Arch Intern Med* 2010; 170:1239-1246.

Results

22,880 unique patients
with first HIV date after 1/1/1998

Unreliable death dates (n=74)
- usage >90 d after death
- differing date of death by >90 d
- dead in CCR but not in Vital Status file

Ineligible for follow-up (n=324)
- HIV diagnosis and death in same hospitalization
- died before first HIV date

Uncertain about HIV status (n=405)
- only indication of HIV is single ICD-9 code

No opportunity for follow-up (n=1384)
- first HIV date after 12/31/2008

HIV diagnosis in US Territory (n=325)

Died before first year of follow-up completed (n=1266)

19,102 unique patients
in analysis (83.5% of original cohort)

Figure 1: Defining the Cohort

Table 1: Baseline Characteristics

	%
Sex	
Females	2.9
Males	97.1
Race	
Black	50.8
White	35.3
Hispanic	5.3
Other, unk.	8.7
Age	
<40	23.1
40-49	37.8
50+	39.1
Mean (SD)	46.9 (10.4)

	%
CD4 cell count (first)	
≤ 200	28.5
200-500	34.0
> 500	24.2
Missing	13.3
Mean (SD)	370 (290)
HIV viral load (first)	
< 500	24.3
500-100k	40.1
> 100,000	18.4
Missing	17.3
Year of first HIV	
1998-2000	31.1
2001-2008	68.9
Follow-up after first yr (yrs)	5.1 (3.1)

Table 2: Retention in Care over Time

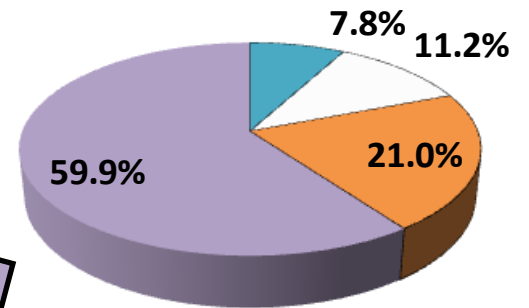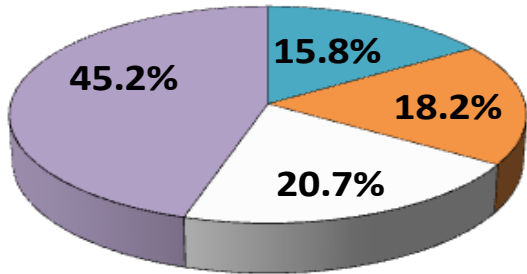|	Percent
Retention in Care Baseline, Yr 1 (n=19,111)	
3/3 blocks with appt	63.5
2/3 blocks with appt	17.7
1/3 blocks with appt	12.2
0/3 blocks with appt	6.6
Retention in Care , Yr 3 (n=15,120)	
3/3 blocks with appt	56.3
2/3 blocks with appt	17.7
1/3 blocks with appt	10.2
0/3 blocks with appt	15.8
Retention in Care , Year 5 (n=11,409)	
3/3 blocks with appt	56.3
2/3 blocks with appt	17.7
1/3 blocks with appt	9.1
0/3 blocks with appt	16.8
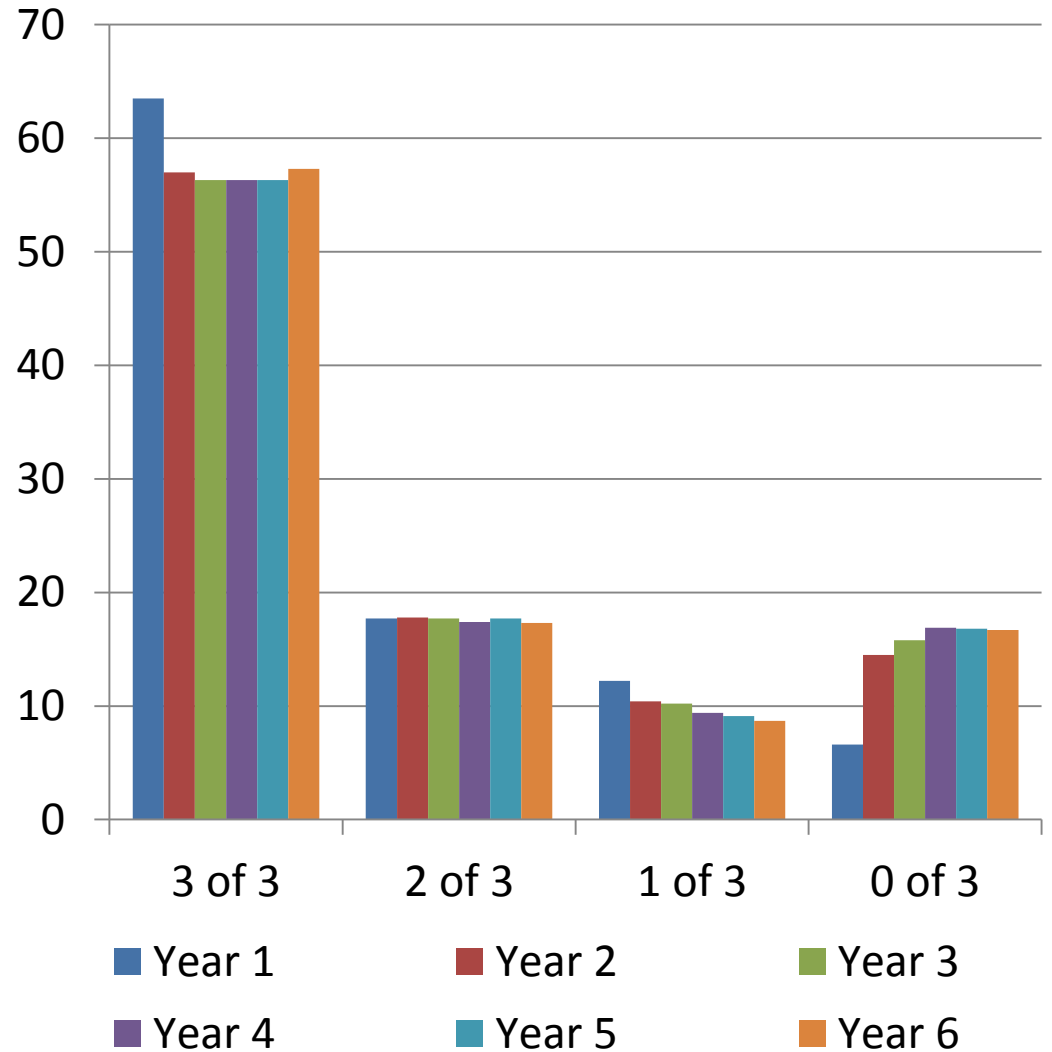
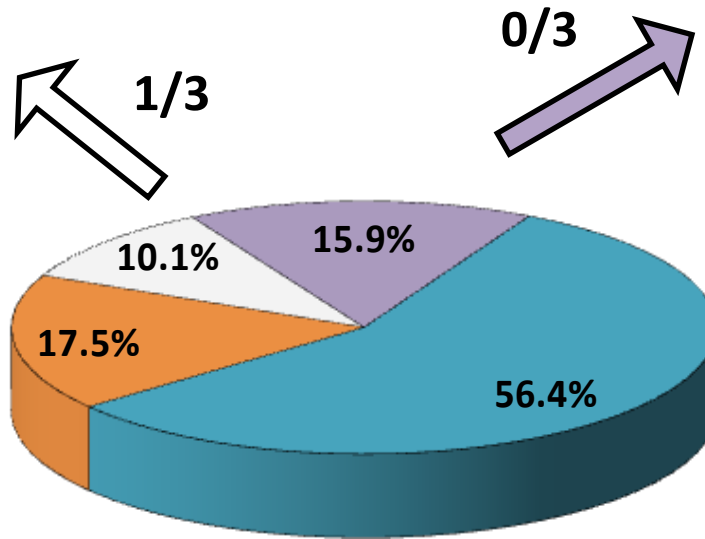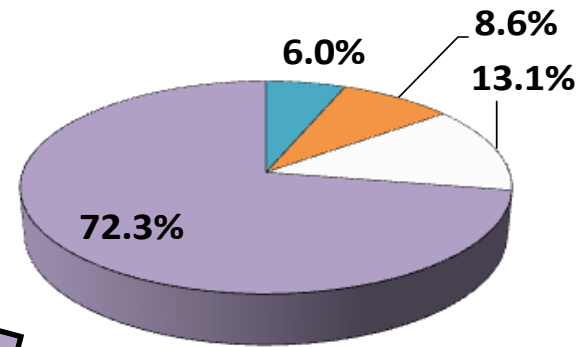# Time to First Gap in Care >180 days
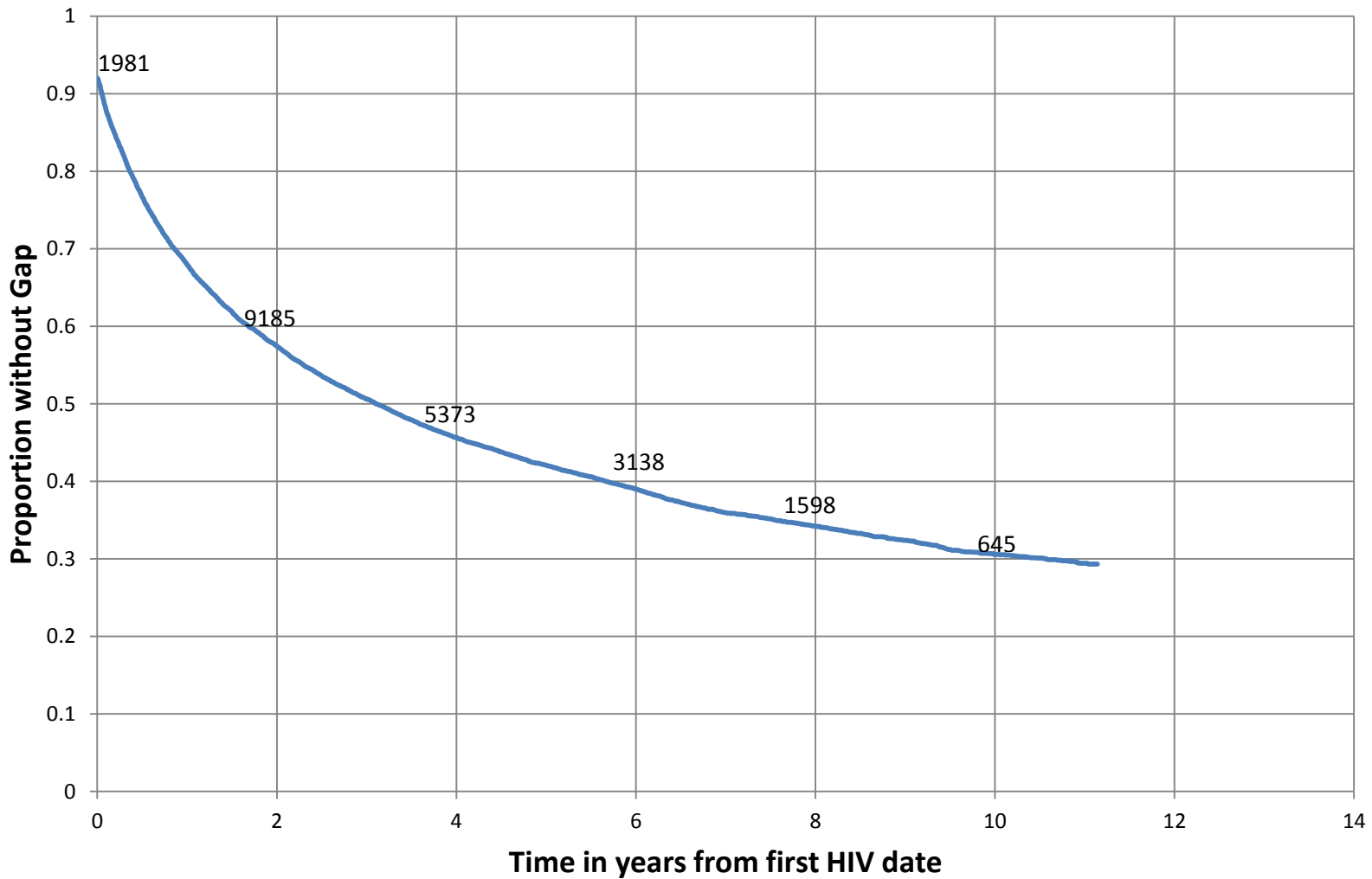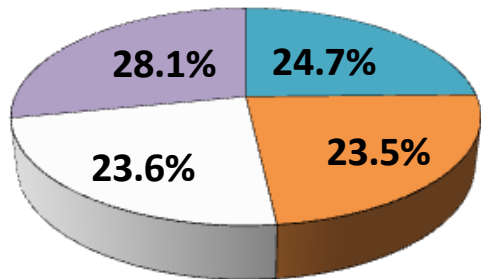

- Mean follow-up 5.1 years (SD 3.1) after Year 1
- 3765 deaths in follow-up after Year 1

Year 1 to Year 2

Year 3 to Year 4

1/3

0/3

2/3

3/3

Top-left pie: 24.7%, 23.5%, 23.6%, 28.1%

Top-right pie: 6.0%, 8.6%, 13.1%, 72.3%

Center pie: 15.9%, 56.4%, 17.5%, 10.1%

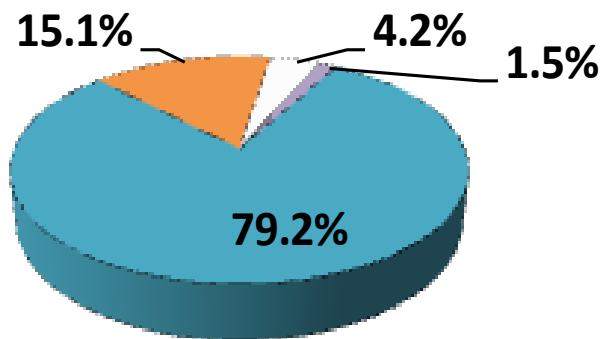Bottom-left pie: 46.4%, 29.1%, 14.6%, 9.9%

Bottom-right pie: 15.1%, 4.2%, 1.5%, 79.2%
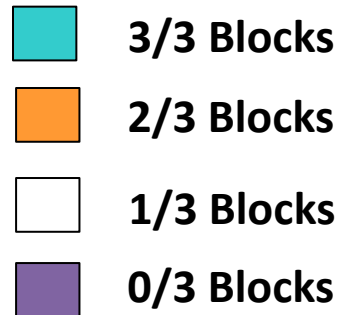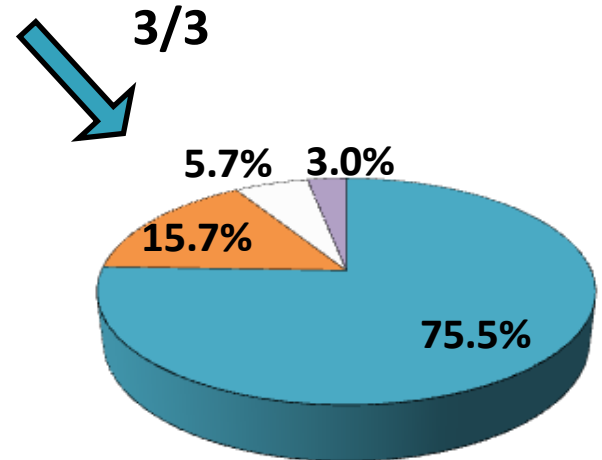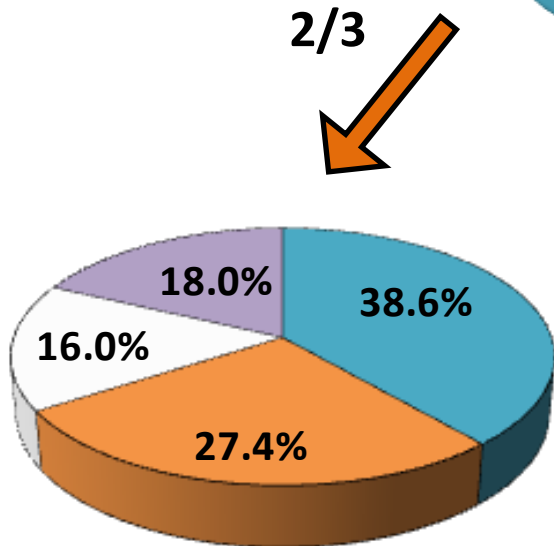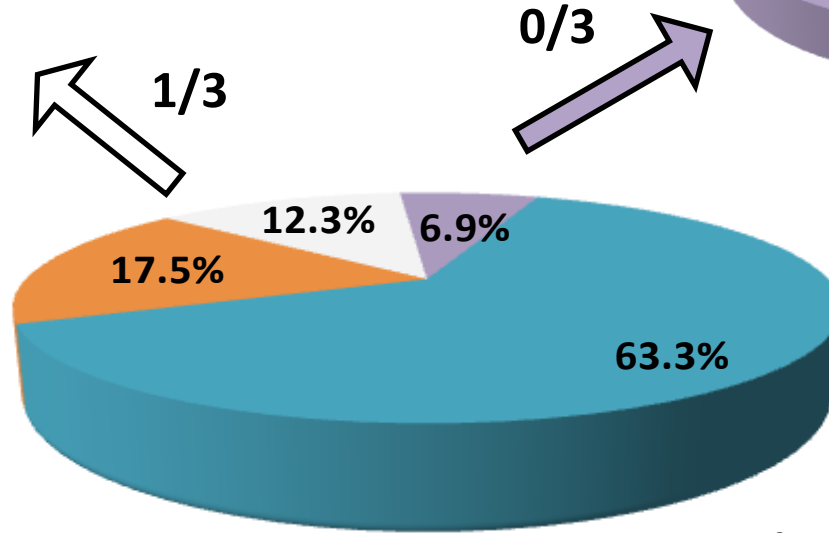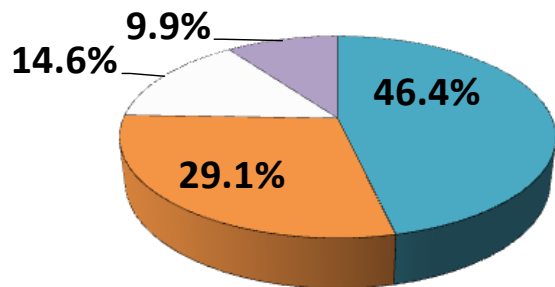
Legend:
- 3/3 Blocks
- 2/3 Blocks
- 1/3 Blocks
- 0/3 Blocks

Year 5 to Year 6

- 3/3 Blocks (teal)
- 2/3 Blocks (orange)
- 1/3 Blocks (white)
- 0/3 Blocks (purple)

Top-left pie (1/3): 29.5%, 27.4%, 20.2%, 22.9%

Top-right pie (0/3): 4.9%, 8.4%, 12.5%, 74.2%

Center pie: 56.7%, 17.4%, 8.9%, 17.0%

Bottom-left pie (2/3): 48.0%, 30.4%, 14.0%, 7.7%

Bottom-right pie (3/3): 80.2%, 14.3%, 4.2%, 1.3%
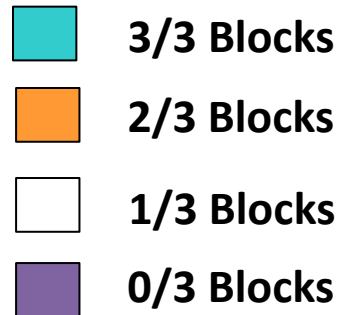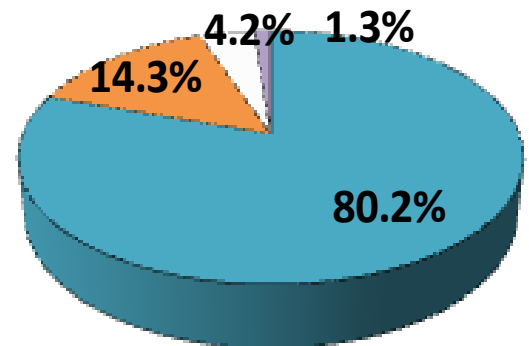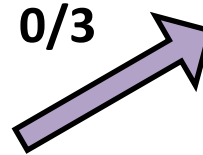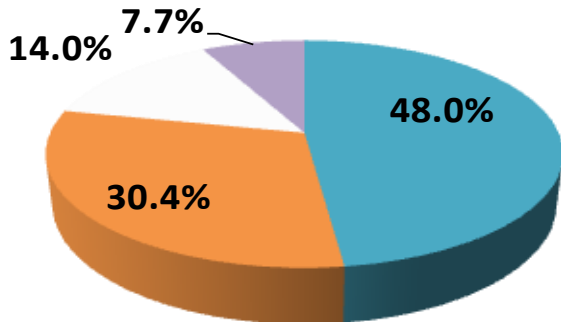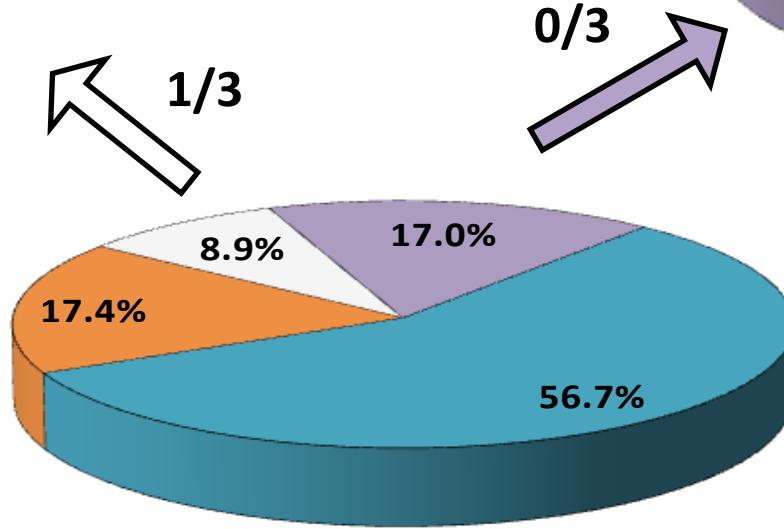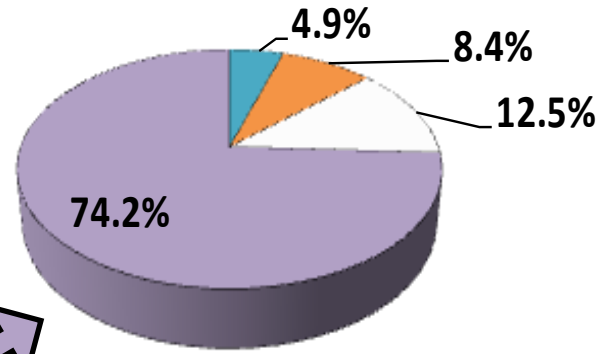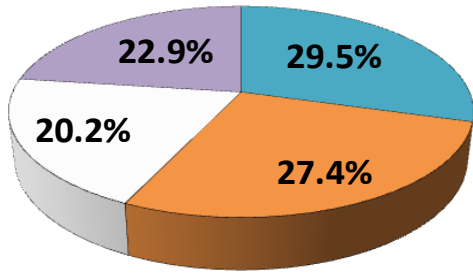
Table 3: Previous Retention Predicts Subsequent Retention

	Predicting Better Retention in Care in Years 2, 4, and 6	
	Adjusted Odds Ratio (95% CI)	**P-value**
Year 2 Model		
3/3 blocks with appt in Year 1	20.5 (18.2, 23.1)	<0.0001
2/3 blocks with appt in Year 1	6.69 (5.93, 7.56)	<0.0001
1/3 blocks with appt in Year 1	2.33 (2.06, 2.63)	<0.0001
0/3 blocks with appt in Year 1	Referent	
Year 4 Model		
3/3 blocks with appt in Year 3	43.0 (38.0, 48.6)	<0.0001
2/3 blocks with appt in Year 3	15.8 (14.0, 17.9)	<0.0001
1/3 blocks with appt in Year 3	6.57 (5.78, 7.46)	<0.0001
0/3 blocks with appt in Year 3	Referent	
Year 6 model		
3/3 blocks with appt in Year 5	42.7 (37.0, 49.3)	<0.0001
2/3 blocks with appt in Year 5	16.8 (14.5, 19.4)	<0.0001
1/3 blocks with appt in Year 5	8.41 (7.23, 9.80)	<0.0001
0/3 blocks with appt in Year 5	Referent	0.96 (0.85, 1.09)
All models adjusted for sex, race, age, era, baseline CD4, baseline VL, previous year's CD4, and previous year's VL.		

Table 4: Cumulative Retention Predicts Mortality

	Predicting Mortality	
	Adjusted Hazard Ratio (95% CI)	**P-value**
Retention in Care (Time-updated, cumulative percent of 4-month intervals with at least one visit, lagged one year)		
81-100%	Referent	
61-80%	1.43 (1.30, 1.56)	<0.0001
41-60%	1.64 (1.47, 1.83)	<0.0001
21-40%	1.83 (1.64, 2.04)	<0.0001
0-20%	1.55 (1.39, 1.72)	<0.0001
Model adjusted for sex, race, age, era, baseline CD4, and baseline VL.		

Discussion

- Retention in care drops quickly in the first 2 years of care, then drifts down more slowly.

- Prior retention in care strongly predicts future retention in care.

- Some persons with excellent retention in care appear to sustain that, but 25% are at risk for a decrease in status.

- Some persons with very poor retention in care appear to improve that, but most do not.

- With a mean of over 5 years follow-up, cumulative retention in care during follow-up continues to predict survival, even after adjusting for baseline CD4 cell count and VL.

- Limitations:
  - Cannot account for care outside the VA system (though all deaths are captured).

Conclusions

- Prior retention in care strongly predicts future retention in care.

- Retention in care during all phases of HIV care, not just the initial years, predicts survival.