Who will show?

Predicting missed visits in the CFAR Network of Integrated Clinical Systems (CNICS) cohort of patients in HIV care in the United States

Brian Pence*, Stephen Boswell, Katerina Christopoulos, Stephen Cole, Heidi Crane, Elvin Geng, Jeanne Keruly, W. Christopher Mathews, Michael Mugavero for the CNICS Collaboration

* Associate Professor, Dept. of Epidemiology, UNC-Chapel Hill

11th International Conference on HIV Treatment and Prevention Adherence, Ft Lauderdale FL, 9-10 May 2016

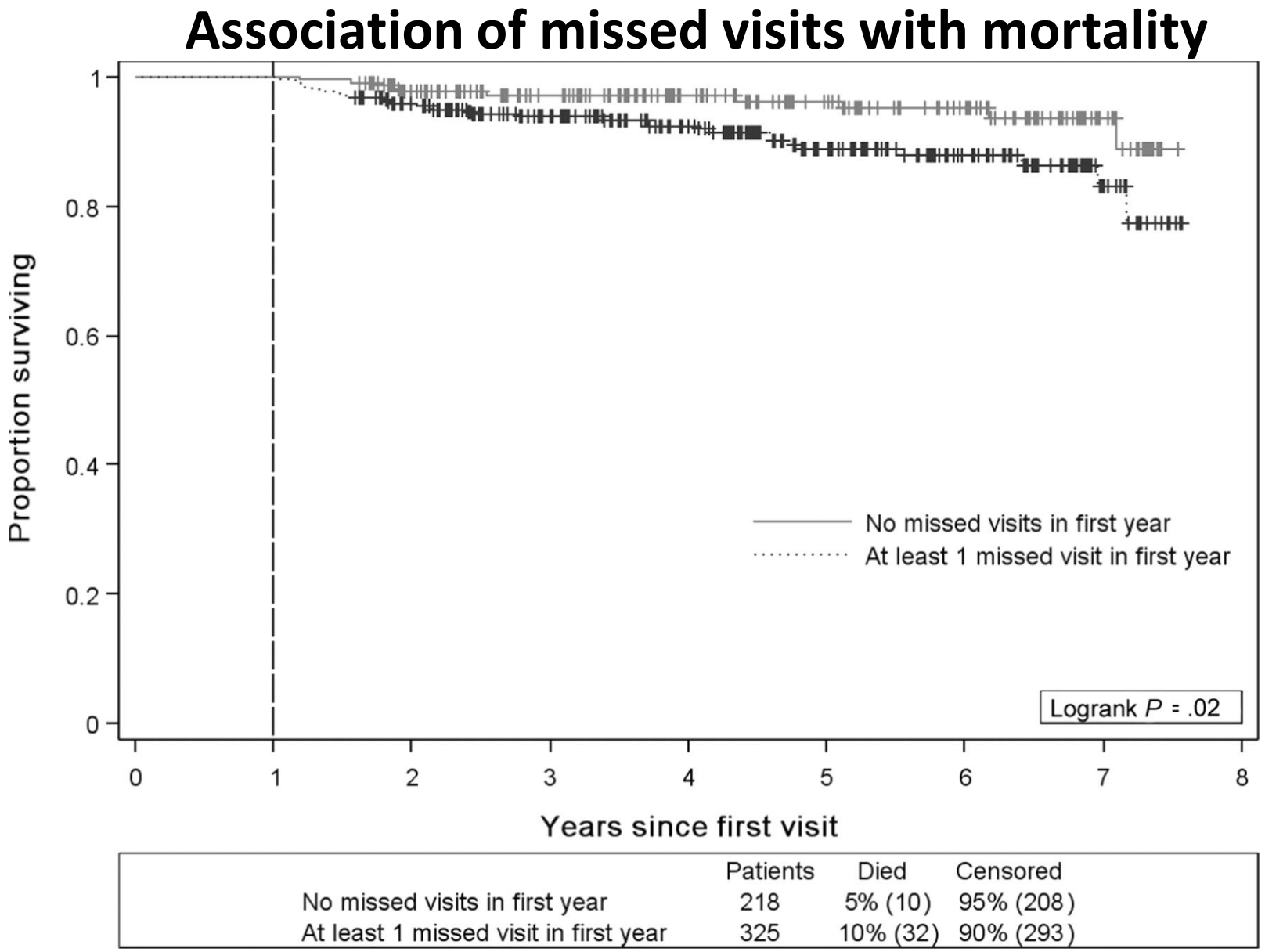
Missed HIV Visits are Common

Indicators of HIV care attendance among 10,053 HIV-infected patients at 6 HIV clinics over 12 months, 2008-2009

Indicator	Percent of patients or appointments
≥1 no-show visit	67%
Missed visit proportion	31%
No 4-month constancy	49%
≥6 month gap between appointments	32%
Not retained by HRSA HAB measure (≥2 visits ≥90 days apart)	23%

Mugavero JAIDS 2012

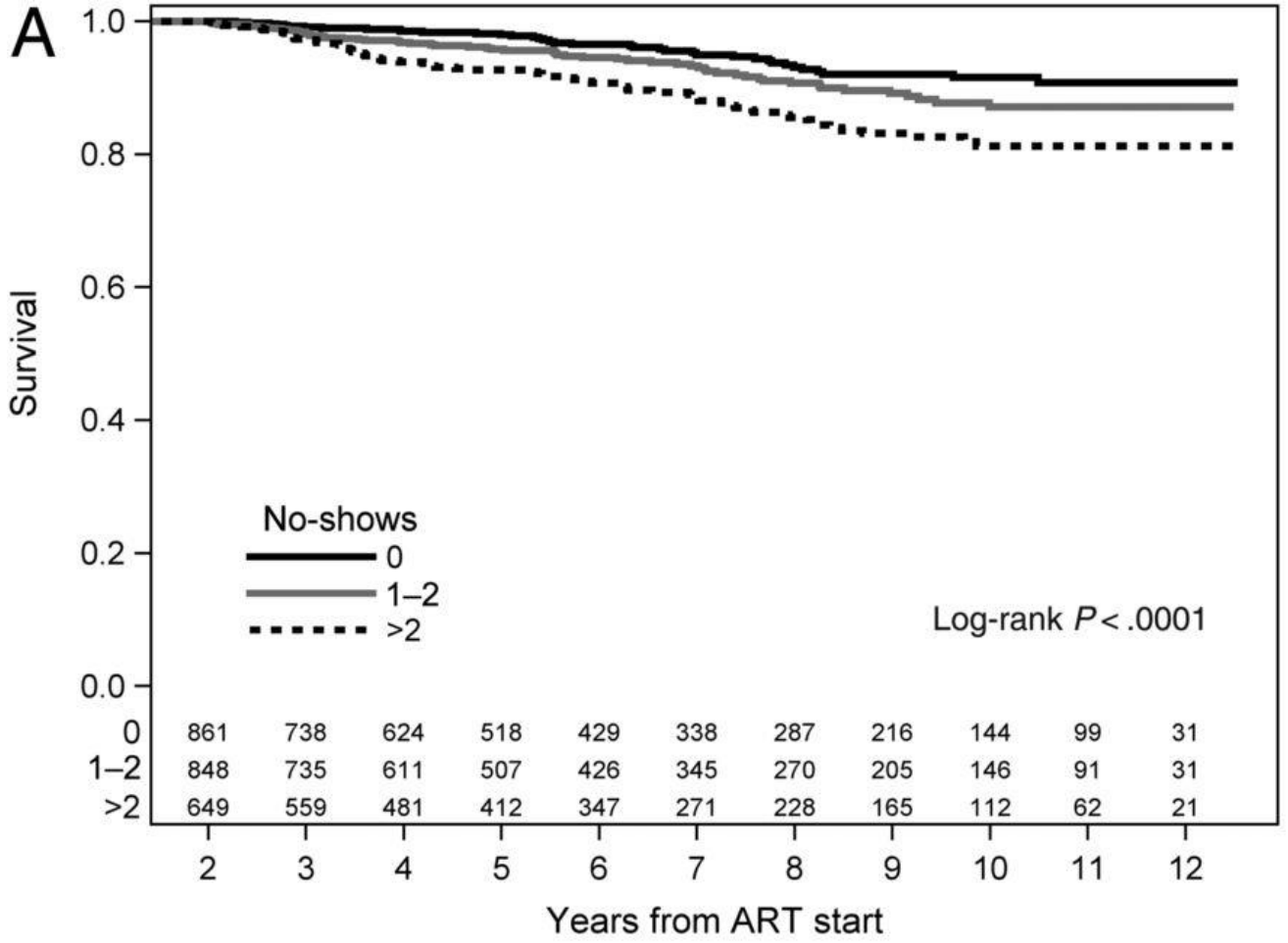
Missed Visits Matter…



Mugavero
CID 2009

… Even for patients meeting retention benchmarks

Association of missed visits with mortality among patients meeting HRSA HAB retention criterion



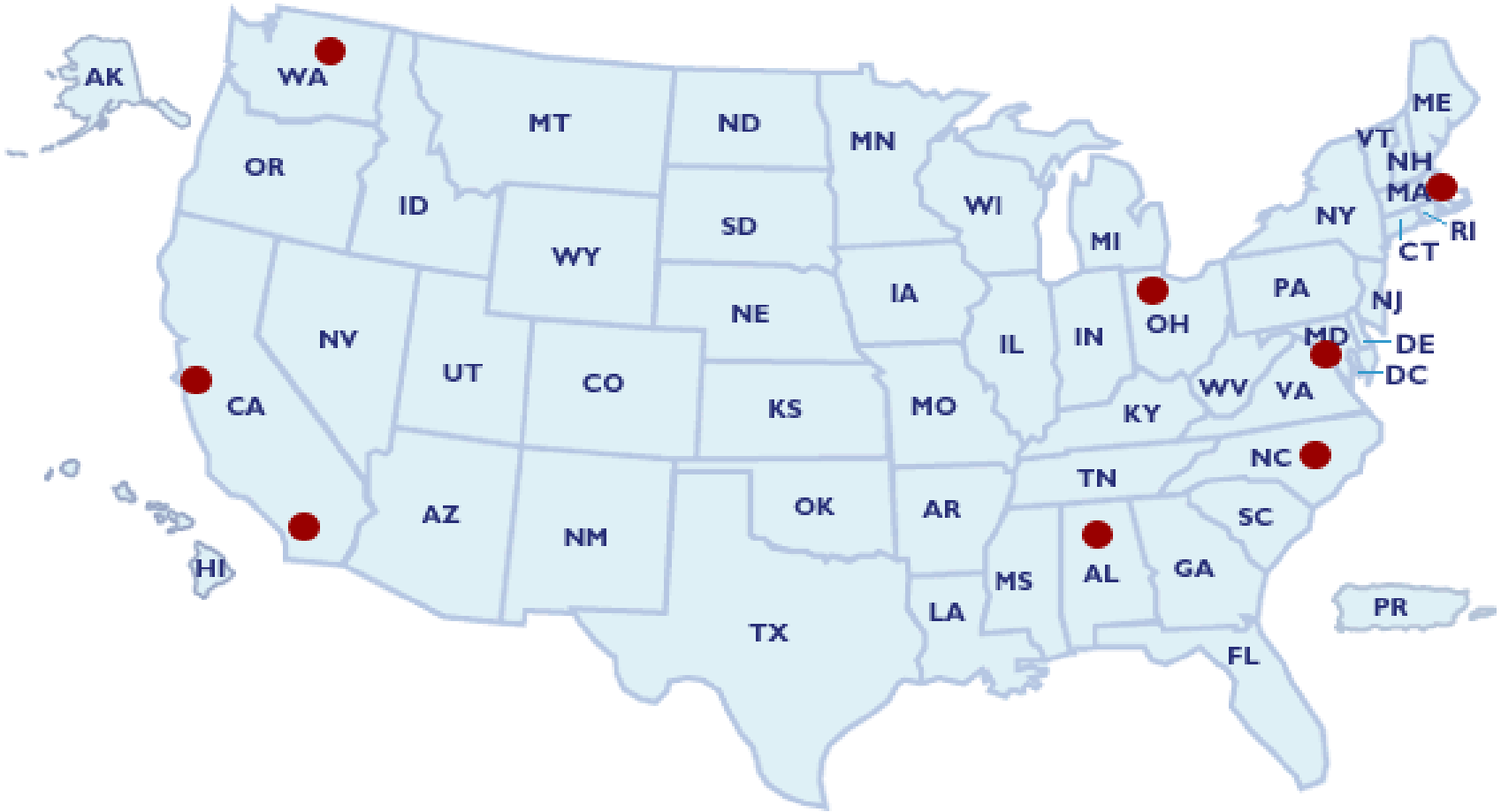
Mugavero
CID 2014

Research question

Can we predict who will no-show for his or her next appointment?

And proactively target resources?

Data source: CFAR Network of Integrated Clinical Systems (CNICS)



CNICS Data Elements

- Electronic Health Records data
  - Demographics
  - Appointment attendance
  - Labs
  - Medications
  - Diagnoses
- Patient-Reported Outcome data (~ every 6 months)
  - Depression, anxiety, substance use, alcohol use
  - ARV adherence

Sample

- All patients with ≥1 attended HIV medical appointment with PRO data between 2005-2014
- Included all visits with current PRO data (<6 months old)
- Separately considered patients in care at CNICS site <1 year vs. ≥1 year

Methods

- Unit of analysis: Each attended appointment
- Outcome: Whether next scheduled visit was attended or missed (after excluding bounced, canceled, and rescheduled visits)
- Fit predictive logistic regression models using predictors specified *a priori*
- Used robust variance to account for multiple observations per patient
- Created risk scores from models' predicted probabilities
- Compared model predictive power using area under the curve (AUC) and sensitivity and specificity at various cutpoints

Potential predictors

Demographic / Contextual	Clinical	Psychosocial (PROs)
Site	CD4	Depression
Age	HIV RNA < 75 c/mL	Anxiety
Gender	Time in care at CNICS site	Substance use
Race / Ethnicity	ARV status	Alcohol use
	Past-year missed visit proportion*	ARV adherence

* Only for patients in care at CNICS site ≥1 year

Sample

	N	Mean (SD) or %
Patients	11,552	
Age		40 (10)
Male gender	9,402	81%
Black non-Hispanic	4,315	38%
Hispanic	1,461	13%
Person-years	52,285	4.5 (4.1)
Appts with current PRO data	70,928	7.6 (7.2)
Next appointment missed	11,139	16%
Appt. in 1st year of CNICS care	12,694	18%

Results: Missed visits more likely if…

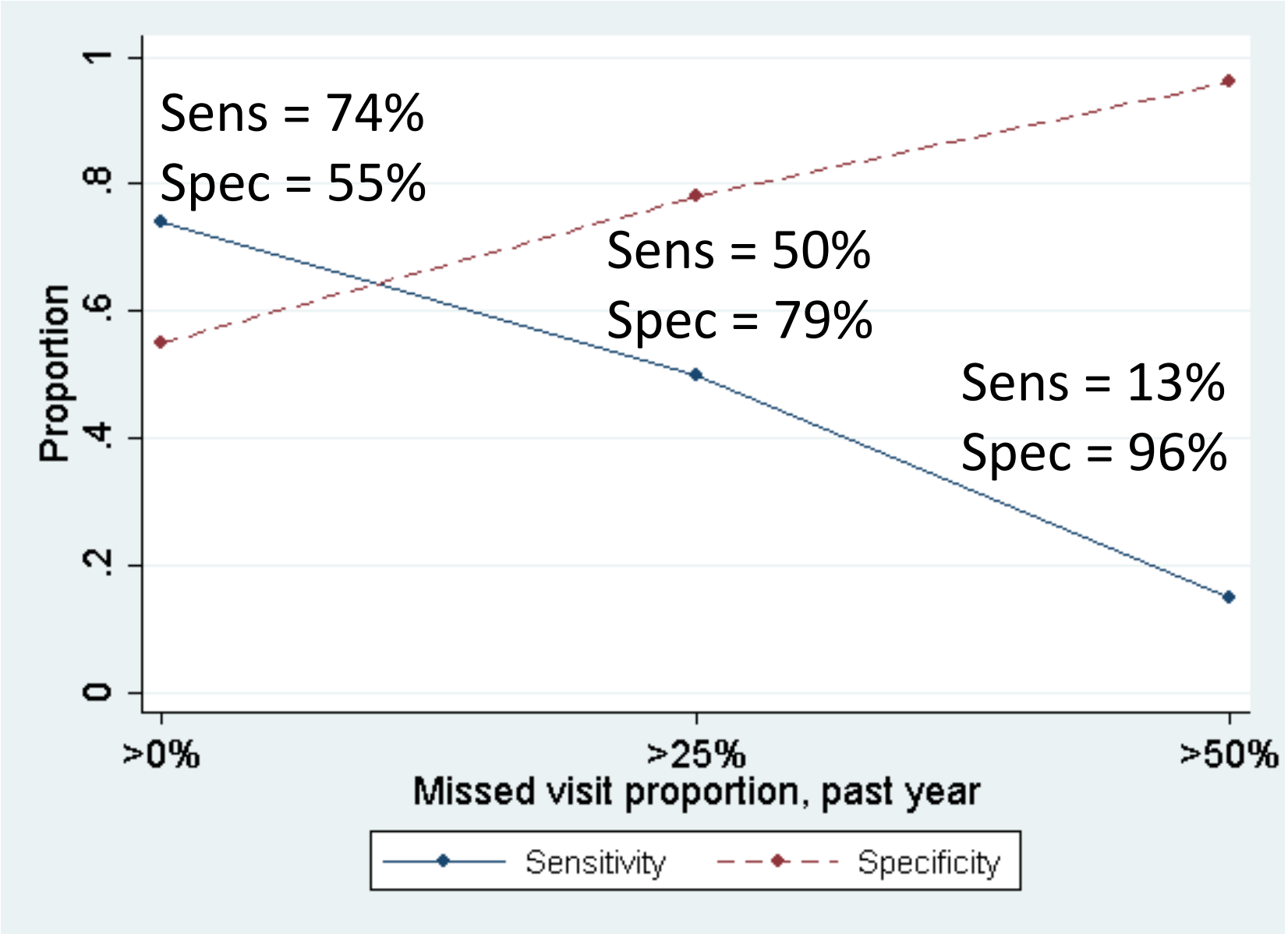
- Missed visits in past year
- Current drug use
- Younger age
- Black non-Hispanic
- Female
- Lower CD4, higher VL
- Not on ART, or on ART but nonadherent
- High depressive symptoms
- High panic symptoms

<u>Weak or no association with:</u>

- Calendar year
- Alcohol use
- Time in care at CNICS site

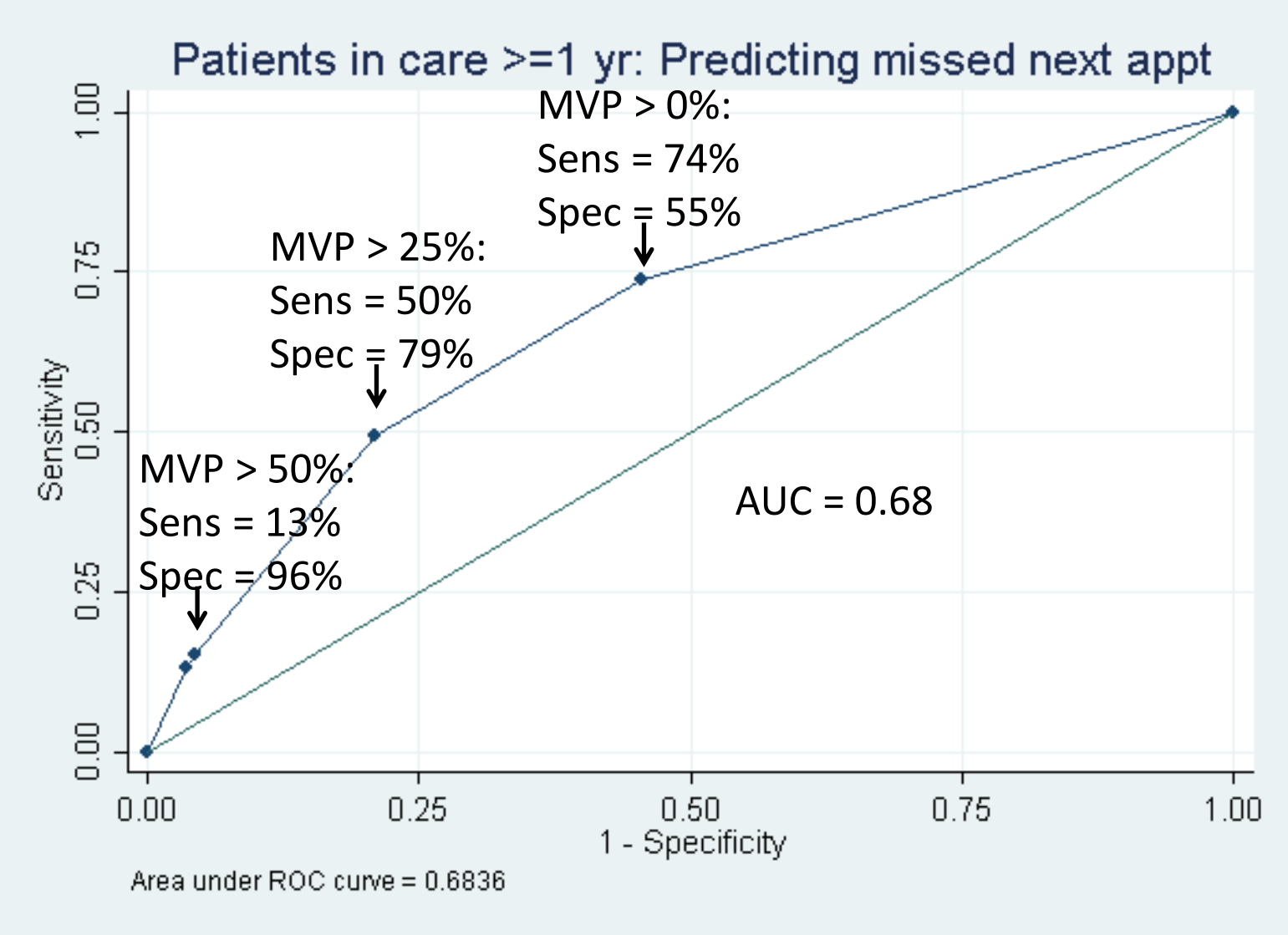
Past-year MVP as predictor of missing next visit

(For patients in care at CNICS site ≥1 year)



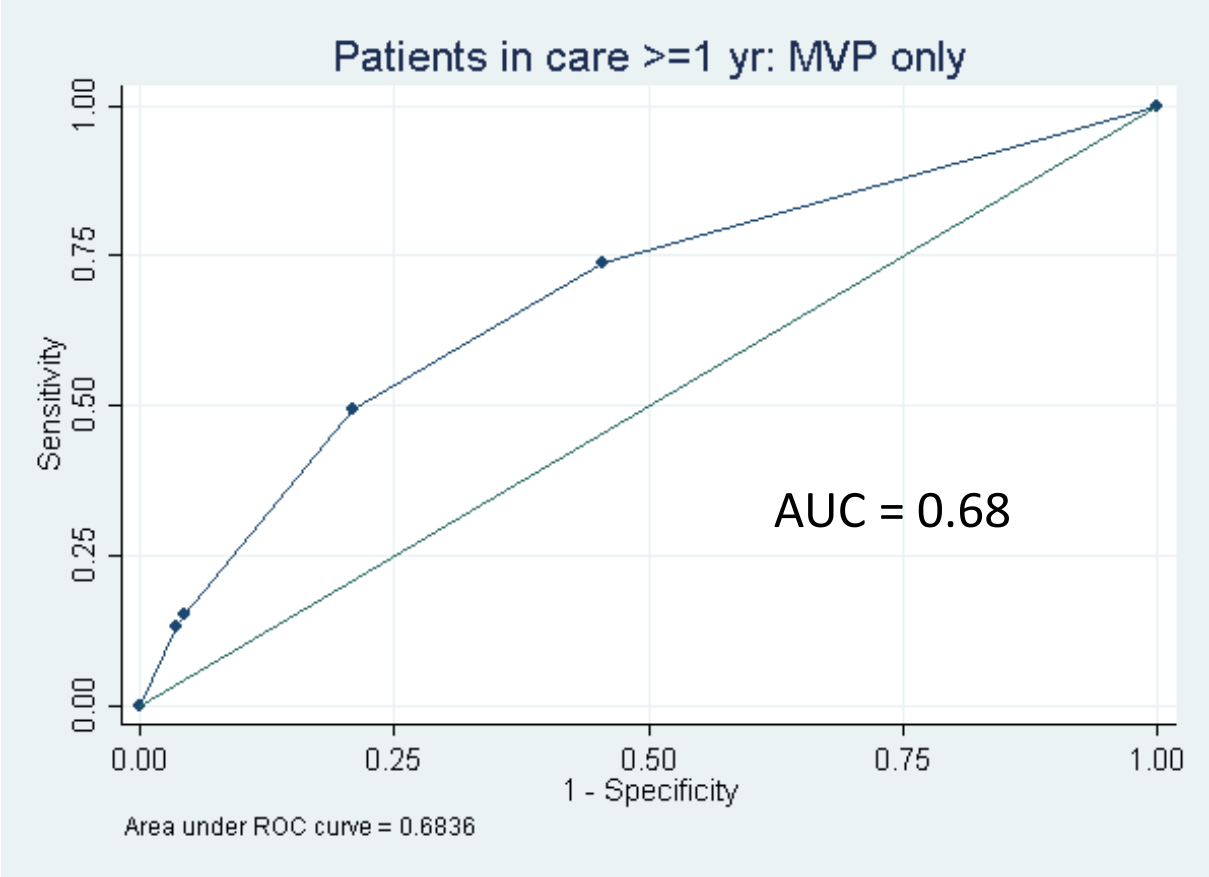
Predictive power of past-year MVP

(For patients in care at CNICS site ≥1 year)

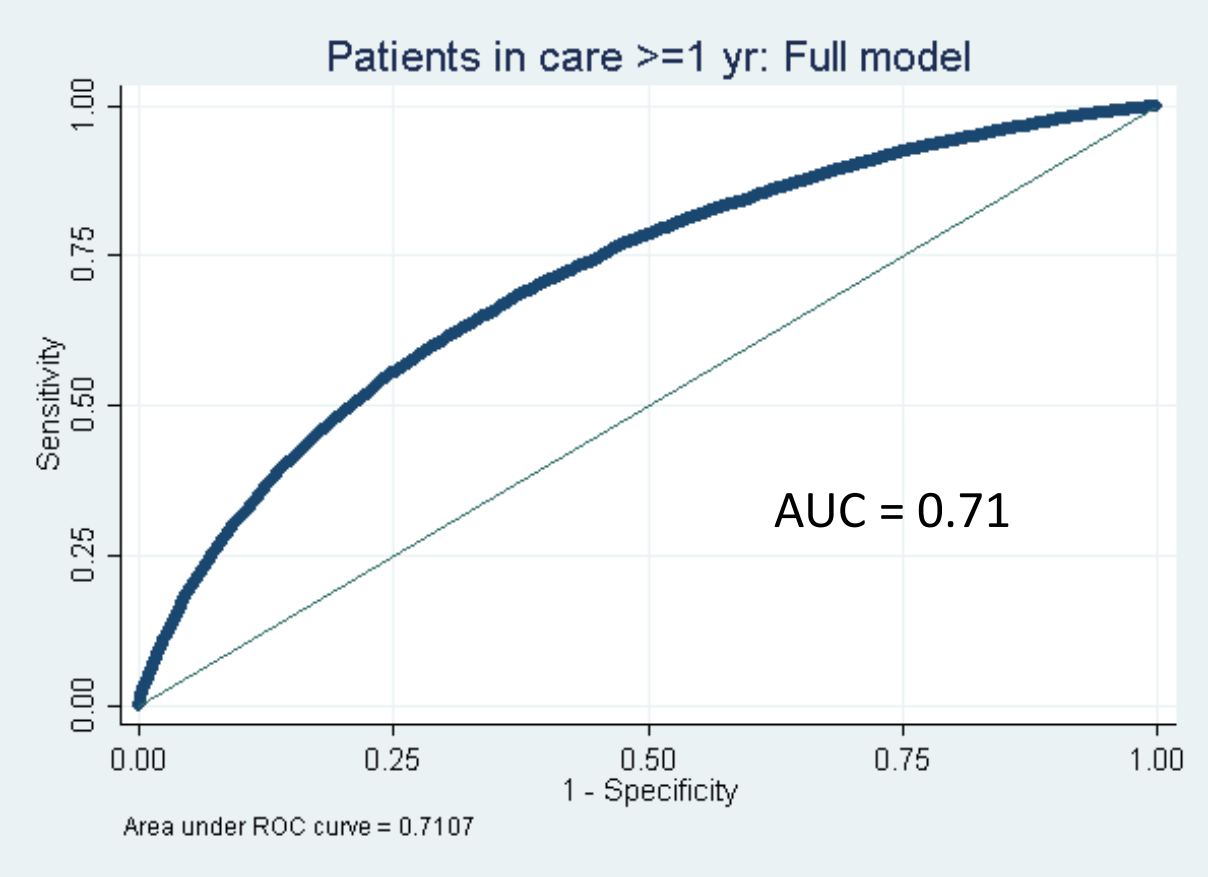


Predictive power of full predictive model

(For patients in care at CNICS site ≥1 year)

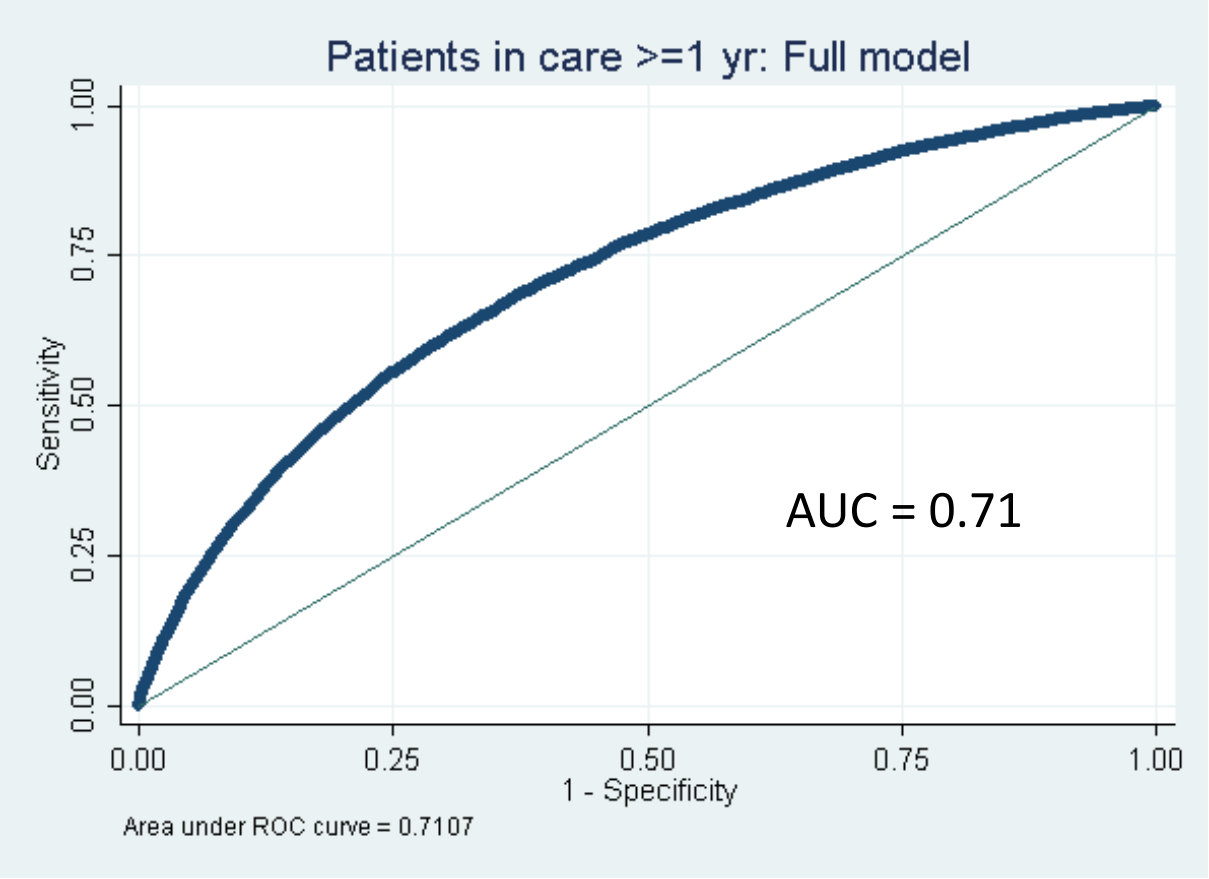


MVP only

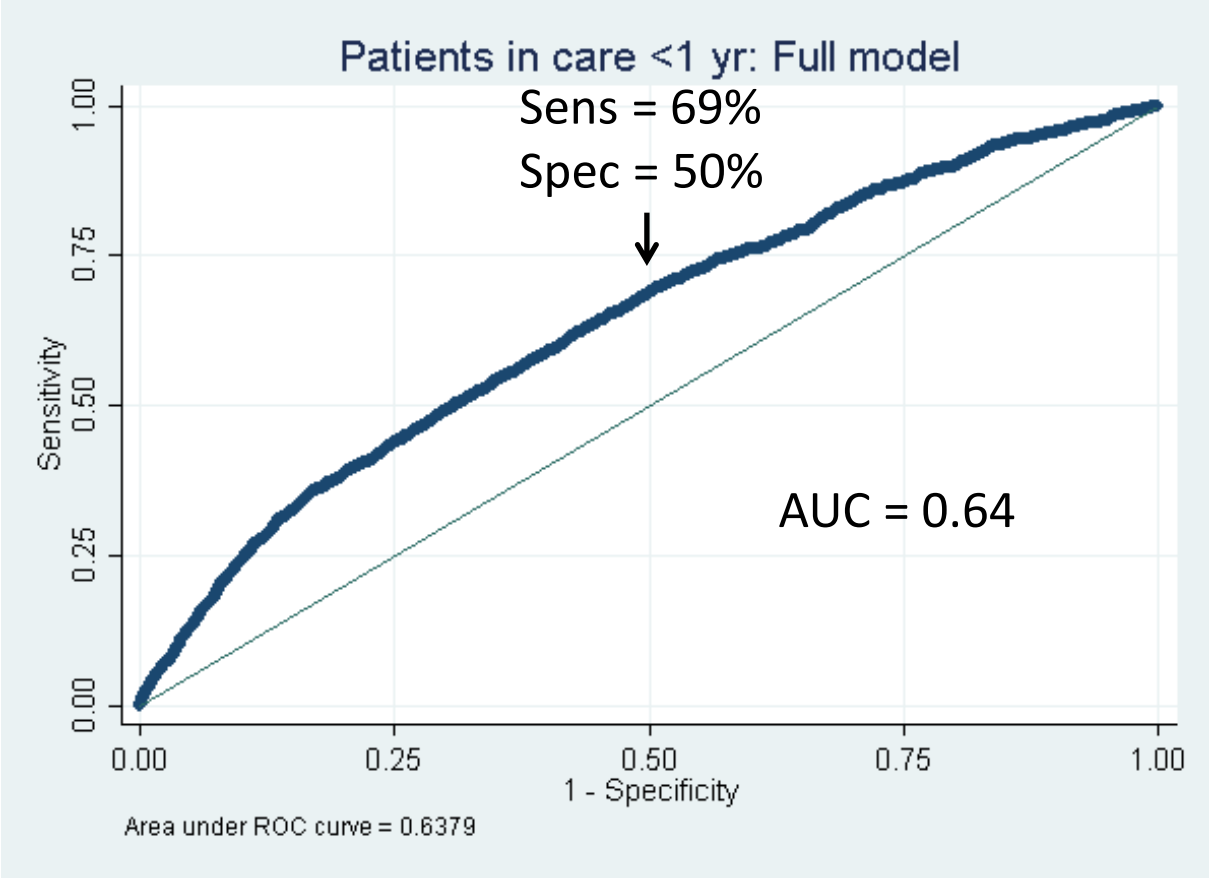


Full model

Predictive power of model for patients in care <1 year



Full model (including MVP)

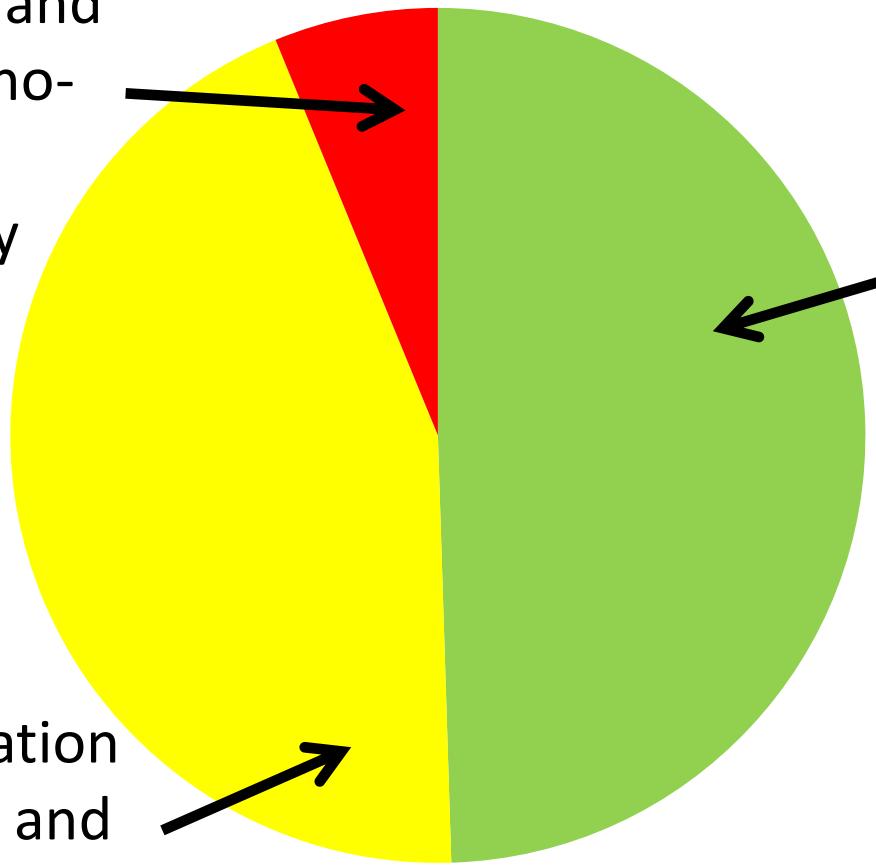


Full model (no MVP)

Opportunity to target resources

6% of the clinic population has a 43% no-show risk and accounts for 15% of all no-shows

→ High-intensity intervention



49% of the clinic population has a 9% no-show risk and accounts for 26% of all no-shows

→ Standard care

44% of the clinic population has a 23% no-show risk and accounts for 59% of all no-shows

→ Low-intensity intervention

Past-year MVP 0%

Past-year MVP 1-50%

Past-year MVP 51-100%

Implications and Conclusions

- Characteristics measurable when a patient is in clinic can predict whether the patient will miss his or her next appointment
- Past missed visits are a strong predictor of future no-shows
- Demographic, clinical and psychosocial variables can modestly improve prediction of future no-shows
- Use of a multi-level risk score approach can focus increasing levels of resources on those at increasing risk of missed visits
- Opportunity to target resources to preempt missed visits and improve HIV care outcomes

Many thanks to…

- NIH: R01 MH 100970; CNICS platform grant R24 AI 067039
- Co-authors and other CNICS collaborators
- IAPAC conference organizers
- CNICS participants

Contact: bpence@unc.edu