Past Behavior Outperforms Demography and Geography As Predictor of Missed HIV Care

Poster # 0902

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BACKGROUND

- Missed HIV care provider visits are associated with increased mortality beyond core indicators of retention in care and are an immediately actionable event[1].
- Previous prediction models for missed visits have not incorporated data beyond the individual level[2].

METHODS

Study Population

- Adults living with HIV (PLWH) with ≥1 visit in the Center for AIDS Research Network of Integrated Clinical Systems (CNICS) from 2010-2016.

Study Definitions

- Potential predictors were identified at the individual-, clinical site-, community-, and structural-levels.
- **Individual-level data** included demographics, time-updated laboratory measurements, patient-reported outcomes (PRO; tobacco use, AUDIT-C, drug use, patient health questionnaire-9, EuroQOL Health Related Quality of Life-5D, HIV symptom index), concurrent medical diagnoses, insurance type, and prior visit adherence.
- **Clinical site-level data** were collected prospectively using a REDCap form completed by site clinical and administrative leadership (clinic volume, messaging regarding retention in care, patient outreach activities, and administrative services).
- **Community-level data** were obtained from the American Community Survey using ZIP Code tabulation area of residence.
- **Structural-level data** included HIV criminalization laws, Medicaid expansion, and proportion of budget dedicated to AIDS Drug Assistance Programs by state of residence.

Statistical Analysis

- Outcome of interest: Missing next visit (yes/no).
- Candidate predictive models were developed using random forest techniques with 10-fold cross-validation.
- The selected model was that with the best average mean squared error across the 10 replications; this model was re-fit to the entire dataset to create a final predictive model.
- Discriminatory ability was estimated by the area under the receiver operating characteristic curve (AUC).
- Models were also fit using generalized estimating equations and yielded similar results (data not shown).

RESULTS

Table 1. Baseline Description of Study Population

Characteristic	N=24030
Age (years), Median (IQR)	39 (31, 47)
Male Birth Sex	19,892 (83%)
Transgender	291 (1%)
Race	
Black, non-Hispanic	8,862 (37%)
Hispanic	3,267 (14%)
Other/Unknown	1,535 (5%)
White, non-Hispanic	10,366 (43%)
HIV Risk Factor	
Heterosexual	5,836 (24%)
IDU	3,539 (15%)
MSM	13,696 (57%)
Other/Unknown	959 (4%)
Baseline CD4+ count, Median (IQR)	367 (173, 575)
Missing	1,488 (6%)
HIV copies/mL, Median (IQR)	33,770 (5,377, 129,972)
Undetectable (N, %)	5,202 (22%)
Missing (N, %)	2,432 (11%)
Insurance type	
Public	4,783 (23%)
Private	8,747 (42%)
Ryan White	10,500 (48%)
Uninsured	3,614 (17%)
Missing	3,665 (18%)
Unknown	3,221 (13%)
Follow-up Duration (years), Median (IQR)	5.7 (2.4-11.0)
Follow-up Visits, Median (IQR)	23 (10-49)
Time to first follow-up visit (days), Median (IQR)	28 (14-47)
First follow-up appointment status	
Arrived	21,479 (89%)
No-show	2,551 (11%)

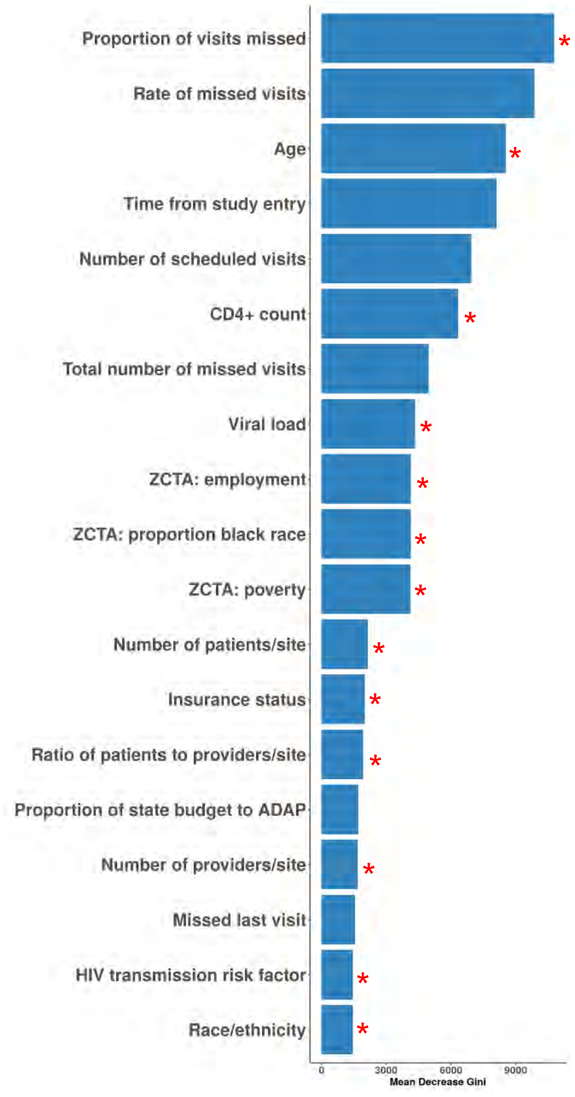
Table 2. Candidate Models and Discriminatory Ability

Description of Variables in Model	AUC	Visit Number*
Full model with all data included	0.73	183,888
PRO data excluded	0.75	382,548
Only PRO data included	0.55	183,888
PRO and visit adherence data excluded	0.68	382,548
Simplified model	0.74	382,548

*PRO data were only available for 183,888 of 382,548 (48%) visits.

RESULTS (continued)

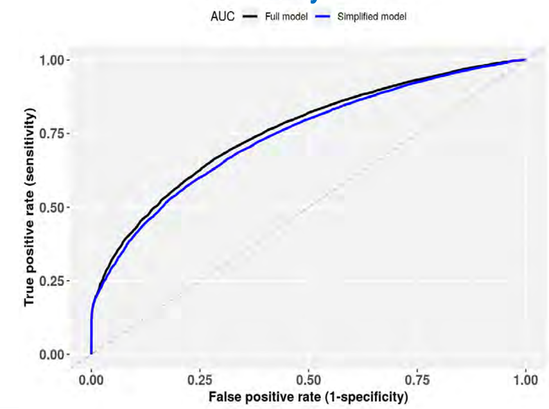
Figure 1. Full Model Variable Importance Plot



*Variables denoted with an **asterisk** were identified from >50 variables in the full model *a priori* for inclusion in a simplified model based on their ease of collection at the point-of-care and the mean decrease in their Gini coefficient. The more the accuracy of the random forest decreases due to the exclusion of a single variable, the more important that variable is deemed, and therefore variables with a large mean decrease in their Gini coefficient are more important for classification of the data.

RESULTS (continued)

Figure 2. Full and Simplified Model Discriminatory Ability



LIMITATIONS

- Patient reported outcomes (PRO) data are not collected at similar intervals across CNICS sites and are limited by social desirability bias.
- Study population is receiving HIV medical care at facilities associated with academic medical centers and results, therefore, may not be generalizable to other settings.

CONCLUSIONS

- Prediction models validated using multi-level data in a population representative of US PLWH had a similar AUC to previous models developed using only individual-level data.
- Strongest predictors were individual-level variables, particularly prior visit adherence, though community-level variables were also predictive.
- Though additional behavioral, social, structural, or clinical data may be desirable, at a minimum, PLWH with previous missed visits should be targeted by interventions to improve visit adherence.

REFERENCES

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[2] Pence BW et. al. Who Will Show? Predicting Missed Visits Among Patients in Routine HIV Primary Care in the United States. AIDS Behavior 2019 Feb;23(2):418-426.

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CNICS CFAR Network Of Integrated Clinical Systems