The effect of depression on missed HIV medical visits among patients in the CFAR Network of Integrated Systems (CNICS) cohort in the United States

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Depression is common and consequential

- 20-30% prevalence among HIV-infected patients
- Strongly and consistently associated with
  - Reduced ARV adherence
  - Lack of viral suppression
  - Clinical progression
  - Mortality
- Relationship with missed HIV visits less well understood

Missed HIV Visits are Common

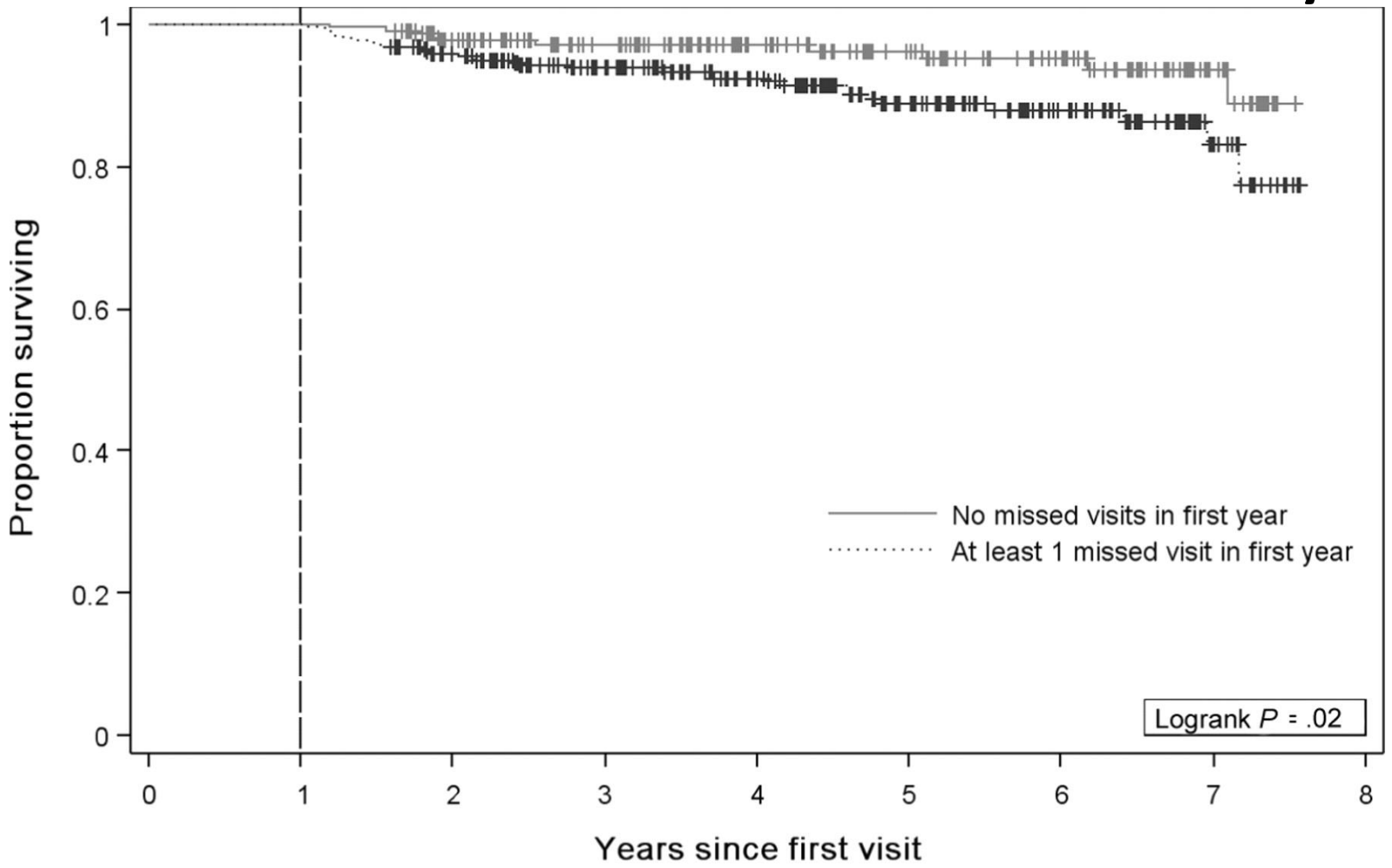
Indicators of HIV care attendance among 10,053 HIV-infected patients at 6 HIV clinics over 12 months, 2008-2009

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…

Association of missed visits with mortality



	Patients	Died	Censored
No missed visits in first year	218	5% (10)	95% (208)
At least 1 missed visit in first year	325	10% (32)	90% (293)

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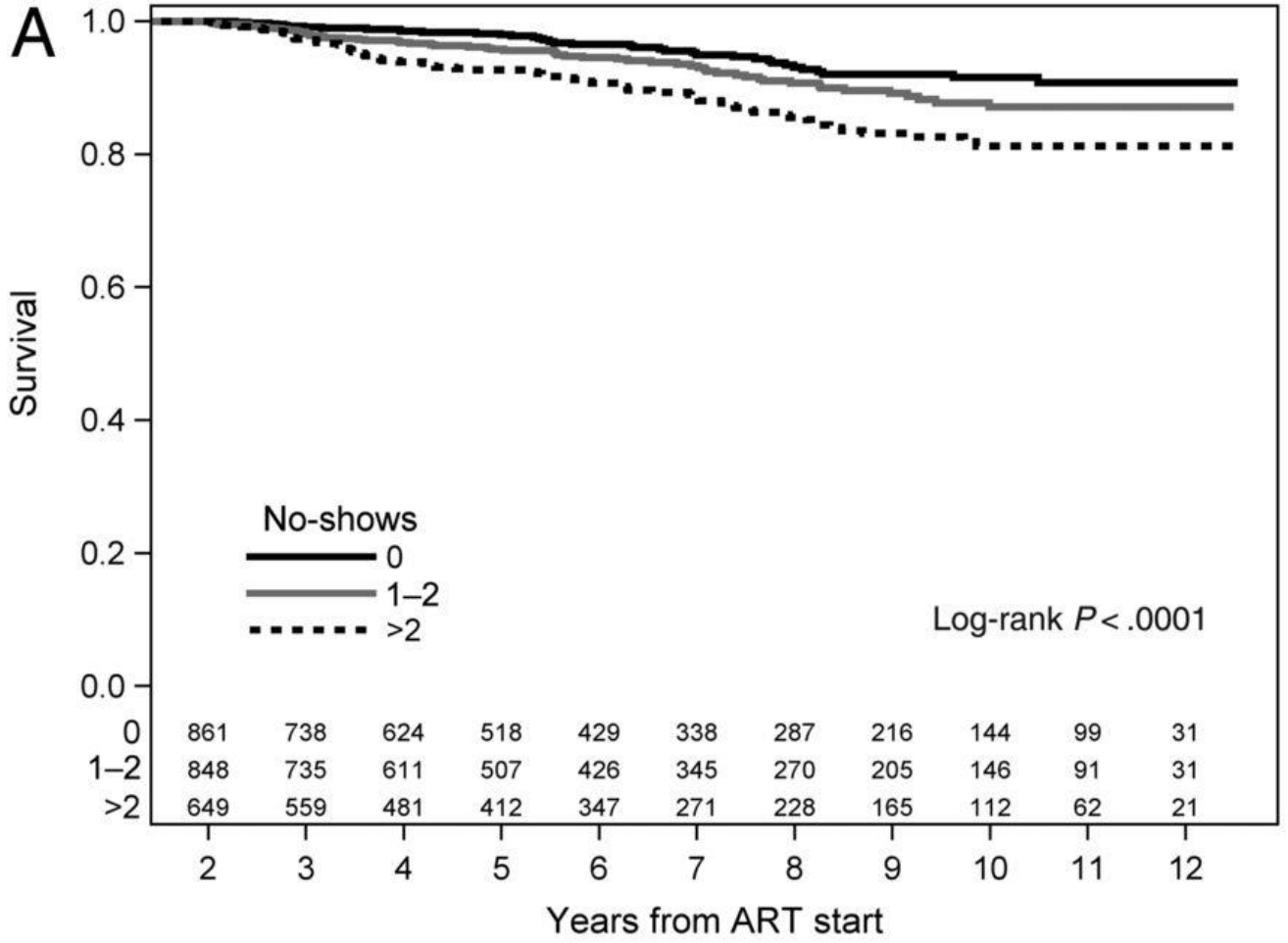
CID 2009

… Even for patients meeting retention benchmarks

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



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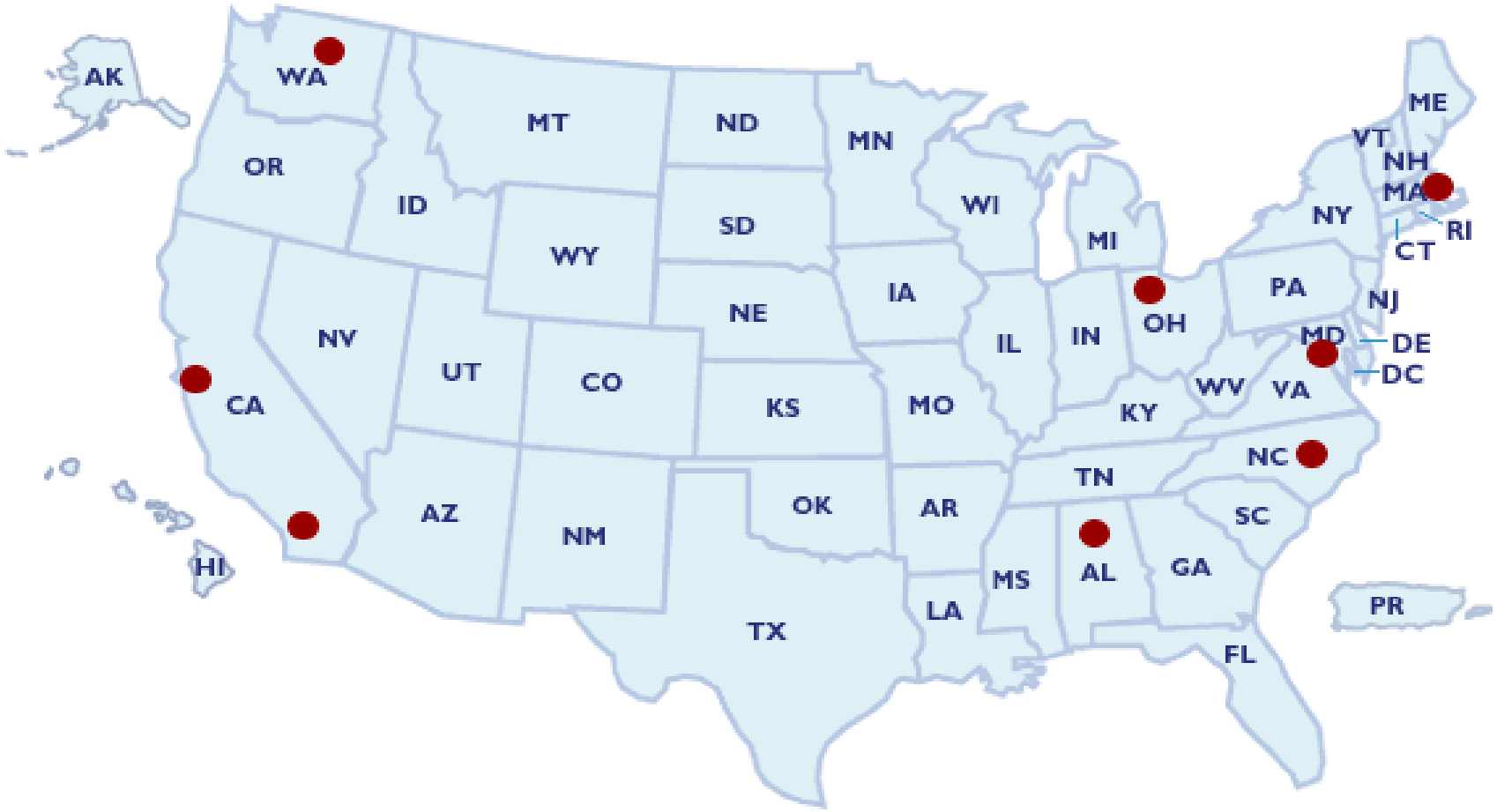
CID 2014

Research question

What is the effect of depression on missed visits and retention in HIV care?

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 (PRO) data (~ every 6 months)
  - Depression, anxiety, substance use, alcohol use
  - ARV adherence

Sample

- All patients with ≥1 attended HIV medical appointment with ≥1 depression assessment (PHQ-9) between 2005-2013

- Patients followed from first PHQ-9 to earliest of:
  - Death
  - Administrative censoring (2014)
  - Loss to care (>12 months with no attended HIV appointment)

Measures

- Unit of analysis: Each attended appointment
- Outcomes: At each attended appointment, identified
  - Whether next scheduled appointment was attended or missed (excluding bounced, canceled, and rescheduled visits) (no-show)
  - Whether patient had ≥2 visits ≥90 days apart over next 12 months (HRSA HAB measure)
  - Missed visit proportion over next 12 months (MVP)
- Only visits with ≥12 months of subsequent follow-up before censoring were included for HAB and MVP measures
- Exposure: Probable depression (PHQ-9 total score ≥10)

Analysis

- To address confounding and identify causal effect: Marginal structural model (MSM) fit using inverse probability of treatment weights (IPTW)
  - Goal of MSM is to use weights to achieve balance in covariates between exposed and unexposed groups
  - Unadjusted (weighted) analysis then yields causal contrast between exposure groups, akin to RCT
- IPTW created by fitting a model with depression status (PHQ-9 ≥ 10) on the left and potential confounders on the right
- Weighted analysis mimics intent-to-treat RCT analysis of “randomized to depression at baseline” vs. “randomized to no depression”

Analysis

- To address nonrandom loss to follow-up: Inverse probability of censoring weights (IPCW)
- Both sets of weights stabilized by the appropriate marginal probability (of treatment or censoring)
- Two sets of weights multiplied to create single IPTC weight
- Pooled generalized linear models to estimate risk differences, risk ratios, and mean differences, accounting for multiple observations per person

Inputs into weight models

Treatment weights

- Site
- Age*, gender, race/ethnicity
- CD4, suppressed VL*
- ART status, antidepressant status*
- Anxiety, alcohol use, drug use PROs*
- Chart diagnoses: Mental health, CVD, diabetes
- Time since entry into analysis sample*

Censoring weights

Same inputs as well as

- Depression PRO*

* Time-updated

Sample

	N
Patients	9,752
Person-years	26,155
Age (mean, SD)	43 (11)
Male gender	85%
Black non-Hispanic	29%
Hispanic	16%
Ever depressed	37%

Unweighted characteristics

	Ever depressed person-time	Never depressed person-time
Male gender	84%	86%
Suppressed VL	74%	78%
Recent drug use (PRO)	21%	13%
Anxiety diagnosis	29%	19%
On antidepressants	41%	21%

Effect of weighting

	Unweighted person-time		Weighted person-time	
	Ever depressed	Never depressed	Ever depressed	Never depressed
Male gender	84%	86%	85%	85%
Suppressed VL	74%	78%	77%	79%
Recent drug use (PRO)	21%	13%	18%	19%
Anxiety diagnosis	29%	19%	26%	25%
On antidepressants	41%	21%	35%	30%

Effect of depression on visit attendance (weighted analysis)

Outcome	Exposure	Risk	Difference	Ratio
Next visit missed (no show)	Depressed	16%	3% (1-4%)	1.18 (1.08-1.29)
	Not depressed	13%	0 (ref)	1 (ref)

Effect of depression on visit attendance (weighted analysis)

Outcome	Exposure	Risk / Mean	Difference	Ratio
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	Not depressed	13%	0 (ref)	1 (ref)
Missed visit proportion, next 12 mo.	Depressed	16%	3% (1-4%)	n/a
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Effect of depression on visit attendance (weighted analysis)

Outcome	Exposure	Risk / Mean	Difference	Ratio
Next visit missed (no show)	Depressed	16%	3% (1,4%)	1.18 (1.08,1.29)
	Not depressed	13%	0 (ref)	1 (ref)
Missed visit proportion, next 12 mo.	Depressed	16%	3% (1,4%)	n/a
	Not depressed	13%	0 (ref)	n/a
Out of care, next 12 mo. (HRSA HAB)	Depressed	18%	-1% (-3,1%)	0.92 (0.84,1.03)
	Not depressed	19%	0 (ref)	1 (ref)

Assumptions for calling this an “effect”

- Exchangeability (no unmeasured confounding)
- Consistency (“depressed” and “not depressed” are well defined and consistent conditions)
- Positivity (no one was structurally unable to be depressed or to be not depressed)
- Good measurement (PHQ-9 ≥ 10 is a good measure of depression)

Interpretation and Conclusions

- Depression had an effect, albeit small in magnitude, on missed visits
- No effect (or possibly a protective effect) on minimum retention in care (HRSA HAB measure)
- Supports other research suggesting that missed visits and minimum retention are separate phenomena
- Suggests that depression care should be a component of a multifaceted strategy to pre-empt no-shows

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