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CD4 Count Patterns Over Time Identify Long-Term HIV Care Trajectories in South Africa

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BACKGROUND

- The benefit of ART in improving outcomes for people living with HIV (PLWH) in South Africa is limited by gaps in engagement across the HIV care continuum.
- Most measurements of engagement use point-in-time assessments and do not capture the dynamic care trajectories of people newly diagnosed with HIV.
- Predicting who may have a poor CD4 response over time can be useful in designing interventions that improve long-term engagement.

OBJECTIVE

- To use CD4 counts to characterize long-term care trajectories for PLWH.
- To determine baseline contextual, clinical and sociobehavioral factors associated with a worse CD4 trajectory.

METHODS

Study Setting and Participant Enrollment

- Data were collected from the Sizanani Trial (NCT01188941).
- Patients recruited at time of HIV testing at four clinical sites in Durban, South Africa from August 2010-January 2013.
- Patients enrolled were 18 years or older, English or Zulu speaking and not known to have HIV. Pregnant women were excluded.

Data Collection

- Prior to HIV testing results, patients completed a questionnaire about demographics, emotional health, social support and self-identified barriers to health care engagement.
- Participants who were diagnosed with HIV were screened for TB and underwent CD4 testing.
- Longitudinal CD4 counts were ascertained over 5 years of follow-up from the National Health Laboratory Service. Mortality status was from the South African National Population Register.

Statistical Analysis

- We built a series of group-based trajectories models based on longitudinal CD4 data and used Bayesian Information Criteria to identify the model with optimal number of CD4 trajectories.
- Trajectory modeling was conducted using square roots of CD4 values to reduce variability.
- Multinomial logistic regression was used to identify predictors of membership in CD4 trajectories.
- Model variables included age, gender, number of cohabitants, TB status, number of domains of self-identified barrier to care (related to service delivery, financial, personal health perception, logistical, and structural), ART initiation within 3 months of diagnosis and mortality.
- 64% were excluded from trajectory analysis due to less than two CD4 measurements during the follow-up period.

RESULTS

- The best fit model included four trajectories (see Figure 1).
- Compared to the reference Low increasing CD4 group, those in the Moderate stable CD4 and High increasing CD4 groups were younger, less likely to have TB, and reported fewer domains of barriers to care.
- Compared to the reference Low increasing CD4 group, those in the Low stable CD4 group were less likely to start ART within 3 months.

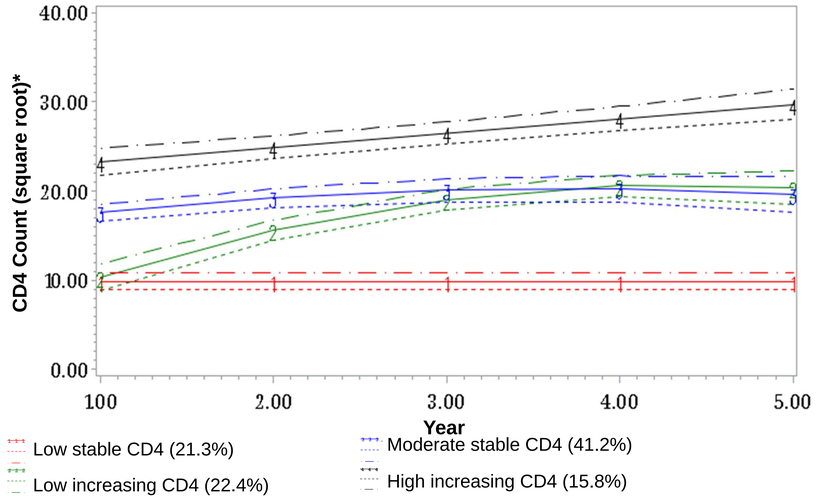
~ 1 in 5 people newly diagnosed with HIV in South Africa have poor long-term CD4 trajectories

Table 1. Baseline patient characteristic for each trajectory group

	Study total (N=688)*	Low stable CD4 (N=116)	Low increasing CD4 (N=158)	Moderate stable CD4 (N=325)	High increasing CD4 (N=85)
Age, ≤25 years, n (%)	133 (19.3)	20 (13%)	5 (4%)	78 (26%)	28 (29%)
Gender, male, n (%)	351 (51.0)	35 (30.2)	68 (43.0)	188 (57.9)	56 (65.9)
Baseline CD4 Median (IQR)	218 (94-368)	72 (31-146)	79 (31-124)	294 (217-396)	617 (492 -742)
Education, n (%)					
Primary school or less	92 (13.4)	19 (16.4)	33 (20.9)	35 (10.8)	4 (4.7)
High school or greater	596 (86.6)	97 (83.6)	125 (79.1)	290 (89.2)	81 (95.3)
Clinic site					
Urban	102 (14.8)	18 (15.5)	32 (20.3)	38 (11.7)	13 (15.3)
Semi-rural/Rural	586 (85.2)	98 (84.5)	126 (79.8)	287 (88.3)	72 (84.7)
Number of cohabitants					
0	73 (10.6)	32 (27.6)	12 (7.6)	17 (5.2)	12 (14.1)
1	171 (24.9)	30 (25.9)	45 (28.7)	78 (24.0)	18 (21.2)
>2	443 (64.5)	54 (46.6)	100 (63.7)	230 (70.8)	55 (64.7)
Number of domains of self-identified barriers to care, n (%)					
0	359 (52.2)	58 (50)	48 (30.4)	196 (60.3)	55 (64.7)
1	80 (11.6)	16 (13.8)	17 (10.8)	36 (11.1)	10 (11.8)
2	46 (6.7)	4 (3.5)	16 (10.1)	20 (6.2)	6 (7.1)
3	71 (10.3)	12 (10.3)	20 (12.7)	34 (10.5)	5 (5.9)
4	72 (10.5)	20 (17.2)	27 (17.1)	21 (6.5)	4 (4.7)
5	60 (8.7)	6 (5.2)	30 (19.0)	18 (5.4)	5 (5.9)
TB at diagnosis, n (%)	191 (27.8)	43 (37.2)	101 (63.9)	32 (9.9)	15 (17.7)
ART initiation within 3 months, n (%)	108 (15.7)	4 (3.5)	58 (36.7)	42 (12.9)	4 (4.7)
Death prior to study completion, n (%)	57 (8.3)	26 (22.4)	13 (8.2)	16 (4.9)	2 (2.4)

*Among the 688 participants in the analysis, four could not be assigned a trajectory based upon CD4 counts.

Figure 1. CD4 Trajectories



*Group-based trajectory modeling was conducted using CD4 square roots for data stability.

Table 2. Predictors of trajectory assignment

	Odds Ratio	95% CI	
Low stable CD4			
Age(<25)	3.77	0.61	23.11
Gender, male	1.82	0.67	4.95
TB coinfection	0.55	0.19	1.61
Started ART by 3 months	0.05	0.01	0.23
#domains of barriers to care	0.82	0.63	1.07
Moderate stable CD4			
Age	6.88	1.24	38.35
Gender, male	0.88	0.33	2.37
TB coinfection	0.09	0.03	0.32
Started ART by 3 months	0.12	0.03	0.49
#domains of barriers to care	0.66	0.51	0.85
High increasing CD4			
Age	7.18	1.33	38.61
Gender, male	0.54	0.21	1.35
TB coinfection	0.18	0.06	0.51
Started ART by 3 months	0.07	0.02	0.26
#domains of barriers to care	0.63	0.49	0.82

CONCLUSIONS

- 1/5 of people newly diagnosed with HIV have poor long-term CD4 trajectories (Low stable CD4); 22% of these had died by 5 years.
- < 40% of people newly diagnosed with HIV had an increasing CD4 trajectory over time (Low increasing CD4 and High increasing CD4).
- Patients in more favorable trajectories (Moderate stable and High increasing CD4) tended to be younger, less likely to have TB and less likely to report barriers to care.