Frailty, Physical Function Impairment, Comorbidity Burden, and Falls are Predictive of Mortality Among Middle-Aged Adults with HIV

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BACKGROUND

Higher than expected rates of frailty and functional impairment are described among people with HIV (PWH)[1]. Whether these impairments, particularly among middle-aged persons, are predictive of poor outcomes including death are not well established.

METHODS

- PWH ages 45-65 with antiretroviral therapy (ART) suppressed HIV-1 RNA were evaluated in 2010-2011 (baseline) using the Fried Frailty Phenotype (composite, grip alone), the Short Physical Performance Battery ([SPBB] composite, chair rise alone time), 400-m walk, Veterans Aging Cohort Study (VACS) Index, and fall history.
- Medical records were reviewed in 2018 to determine participant vital status. Hazard ratios were used to estimate survival by baseline frailty, function, comorbidity burden, or falls, stratified by age ≥/<50 years of age. Patients without confirmed date of death were censored at last follow-up visit.

RESULTS

Of 351 participants:

	Alive (n=245)	Deceased (n=31)	Unknown (n=75)	Overall (n=351)
Gender				
Female	37 (15.1%)	6 (19.4%)	9 (12.0%)	52 (14.8%)
Male	208 (84.9%)	25 (80.6%)	66 (88.0%)	299 (85.2%)
Follow-Up Time (Years)				
Mean (SD)	NA	4.26 (2.17)	3.29 (2.17)	6.68 (2.38)
Baseline Age (Years)				
Mean (SD)	51.7 (5.13)	55.0 (5.91)	51.3 (4.60)	51.9 (5.17)
Race				
American Indian or Alaska Native	8 (3.3%)	1 (3.2%)	3 (4.0%)	12 (3.4%)
Asian	0 (0%)	1 (3.2%)	1 (1.3%)	2 (0.6%)
Black African American	41 (16.7%)	5 (16.1%)	11 (14.7%)	57 (16.2%)
Native Hawaiian/ Pacific Islander	1 (0.4%)	0 (0%)	1 (1.3%)	2 (0.6%)
Other or more than one Category	16 (6.5%)	3 (9.7%)	2 (2.7%)	21 (6.0%)
White	179 (73.1%)	21 (67.7%)	57 (76.0%)	257 (73.2%)
Ethnicity				
Hispanic or Latino	44 (18.0%)	6 (19.4%)	15 (20.0%)	65 (18.5%)
Not Hispanic or Latino	200 (81.6%)	25 (80.6%)	60 (80.0%)	285 (81.2%)
Missing	1 (0.4%)	0 (0%)	0 (0%)	1 (0.3%)
Falls				
More than One	64 (26.1%)	16 (51.6%)	23 (30.7%)	103 (29.3%)
None	181 (73.9%)	15 (48.4%)	52 (69.3%)	248 (70.7%)
VACS Score				
Mean (SD)	16.6 (13.6)	28.6 (15.9)	18.0 (13.3)	18.0 (14.2)
Median [Min, Max]	16.0 [0.00, 67.0]	28.0 [0.00, 60.0]	17.0 [0.00, 68.0]	18.0 [0.00, 68.0]
Frailty				
Non-Frail	122 (49.8%)	7 (22.6%)	35 (46.7%)	164 (46.7%)
Pre-Frail/Frail	123 (50.2%)	24 (77.4%)	40 (53.3%)	187 (53.3%)
BMI				
Mean (SD)	26.7 (5.13)	26.1 (4.21)	26.4 (8.54)	26.6 (5.95)
Grip Strength				
Mean (SD)	39.7 (9.11)	36.5 (9.41)	39.1 (9.11)	39.3 (9.16)
SPBB				
Mean (SD)	11.3 (1.44)	10.3 (1.75)	10.9 (1.68)	11.1 (1.56)
Walk Pace (m/sec)				
Mean (SD)	1.49 (0.289)	1.14 (0.381)	1.45 (0.309)	1.45 (0.318)
Chair Pace (rise/minute)				
Mean (SD)	0.430 (0.147)	0.355 (0.124)	0.396 (0.144)	0.416 (0.146)
Most Recent CD4 (visit 1)				
<200	13 (5.3%)	3 (9.7%)	7 (9.3%)	23 (6.6%)
>500	142 (58.0%)	14 (45.2%)	47 (62.7%)	203 (57.8%)
200-500	89 (36.3%)	14 (45.2%)	21 (28.0%)	124 (35.3%)
Missing	1 (0.4%)	0 (0%)	0 (0%)	1 (0.3%)
Most Recent CD4 (visit 2)				
<200	2 (0.8%)	1 (3.2%)	0 (0%)	3 (0.9%)
>500	28 (11.4%)	5 (16.1%)	14 (18.7%)	47 (13.4%)
200-500	23 (9.4%)	2 (6.5%)	4 (5.3%)	29 (8.3%)
Missing	192 (78.4%)	23 (74.2%)	57 (76.0%)	272 (77.5%)
HIV-1 Viral Load (visit 1)				
<48 Copies/ml	13 (5.3%)	0 (0%)	4 (5.3%)	17 (4.8%)
>48 Copies/ml	232 (94.7%)	31 (100%)	71 (94.7%)	334 (95.2%)
HIV-1 Viral Load (visit 2)				
<48 Copies/ml	0 (0%)	0 (0%)	3 (4.0%)	3 (0.9%)
>48 Copies/ml	54 (22.0%)	8 (25.8%)	15 (20.0%)	77 (21.9%)
Missing	191 (78.0%)	23 (74.2%)	57 (76.0%)	271 (77.2%)

RESULTS

- 23 (7%) were frail and 164 (47%) were pre-frail
- 103 (29%) had a ≥1 fall in the prior year
- 74 (21%) had an SPBB score of ≤10
- 33 (9%) had weak grip
- The mean time to complete 5 chair stands was 10.5 (4.5) seconds and 284 (78) seconds.

Figures 1 and 2: Clinical Measures Comparison
Forest plots describing hazard ratios at the 95% confidence interval. Chair rise pace, 400m pace, SPBB, falls in prior year, and frailty were all significant. BMI and grip strength were not individually significant.
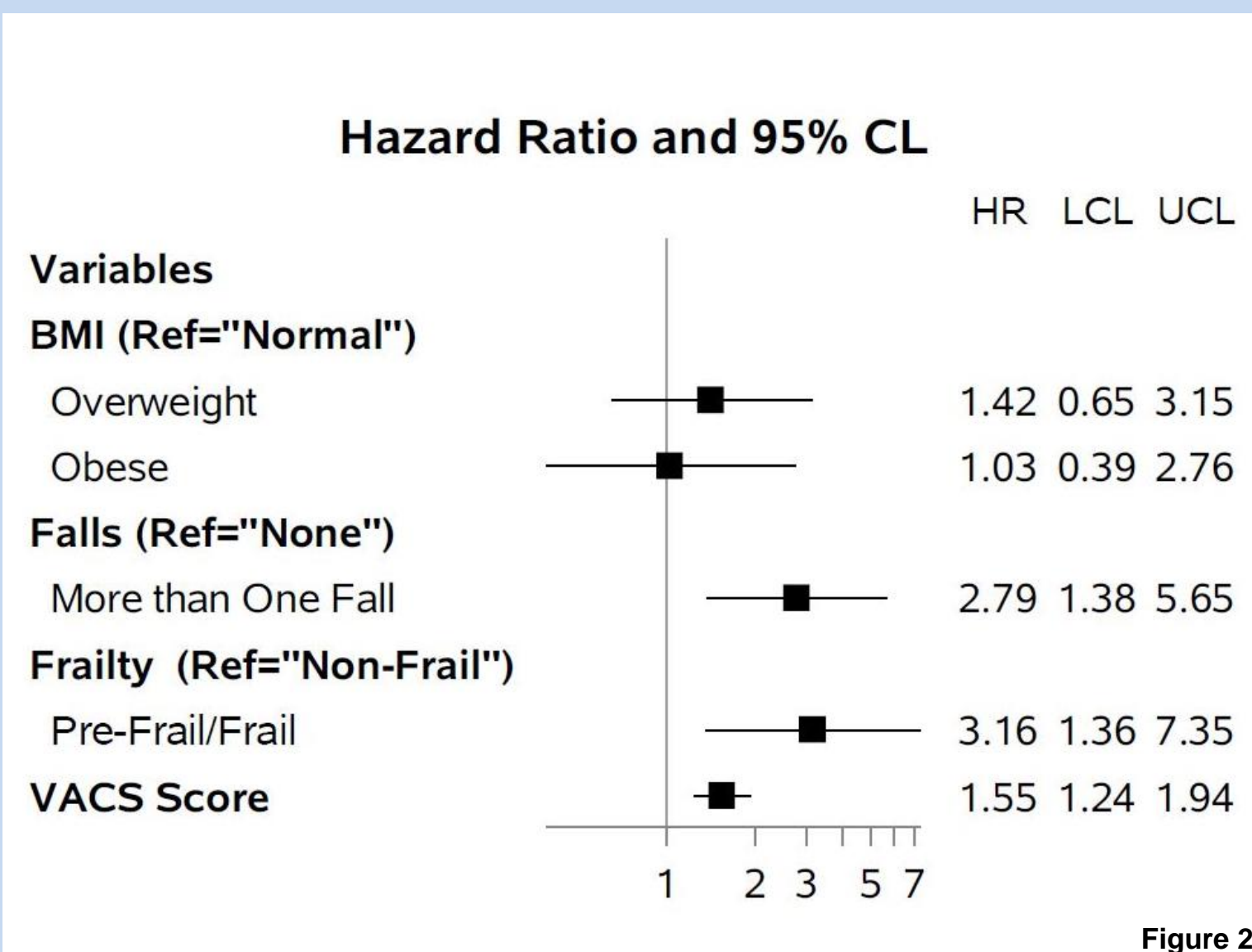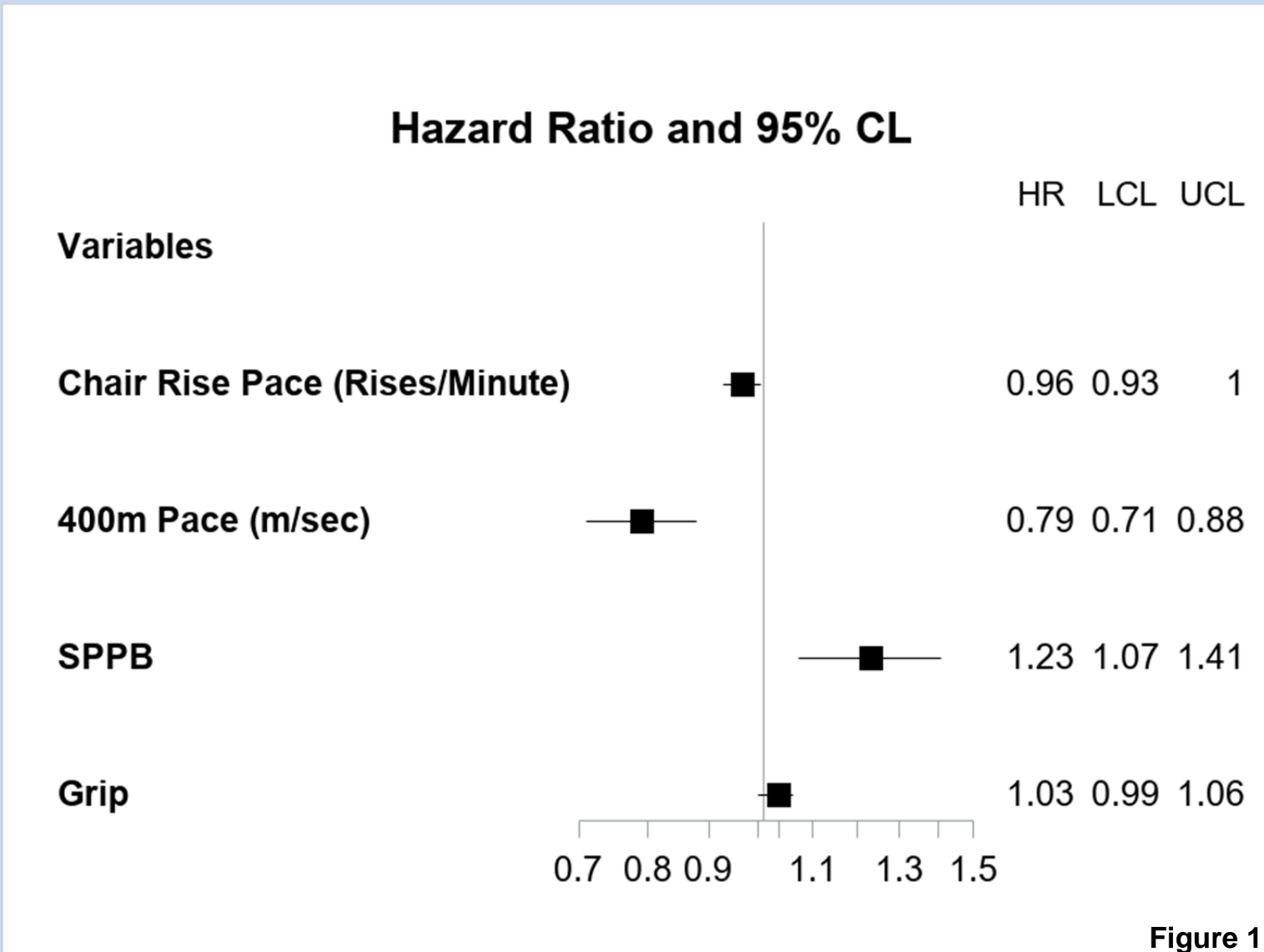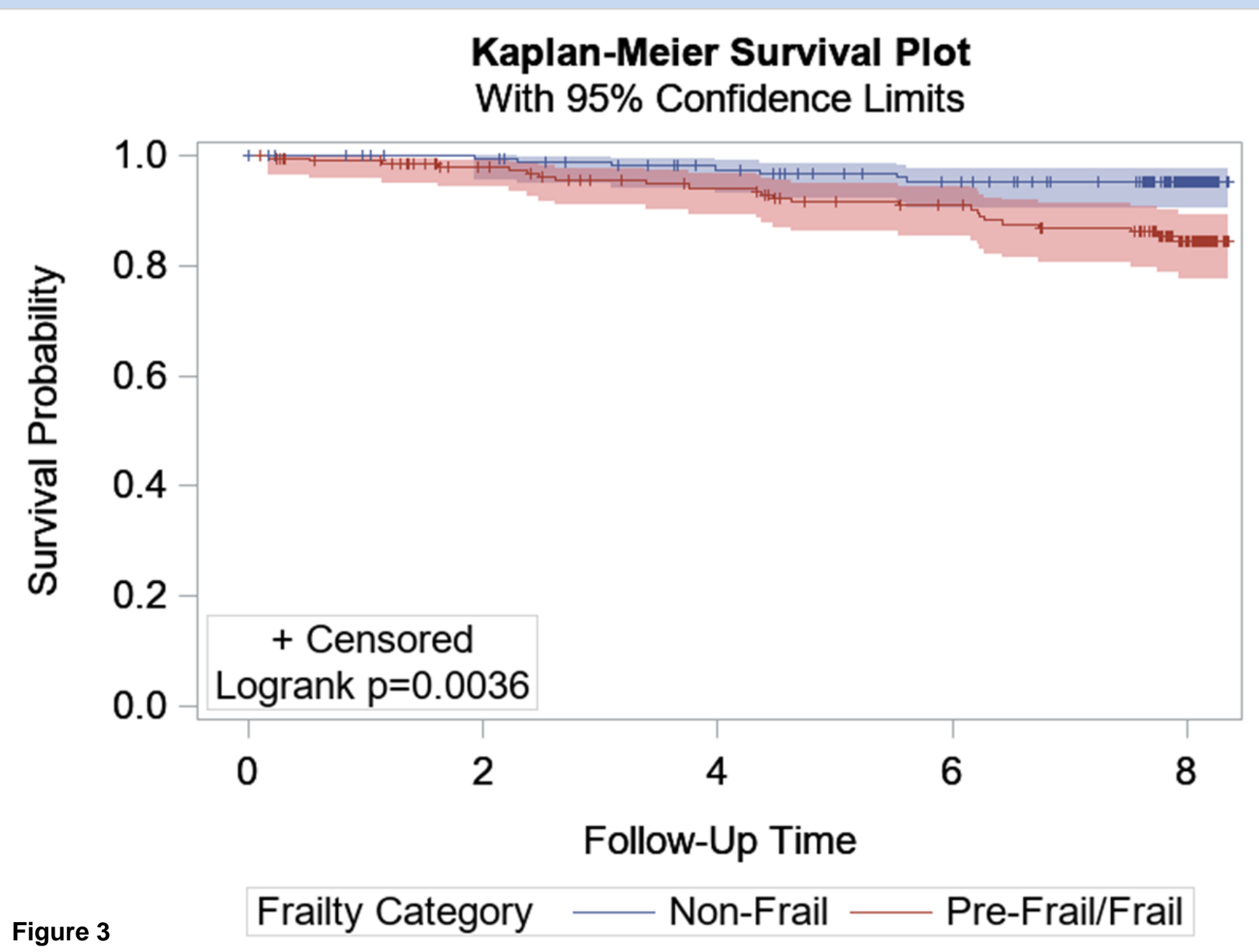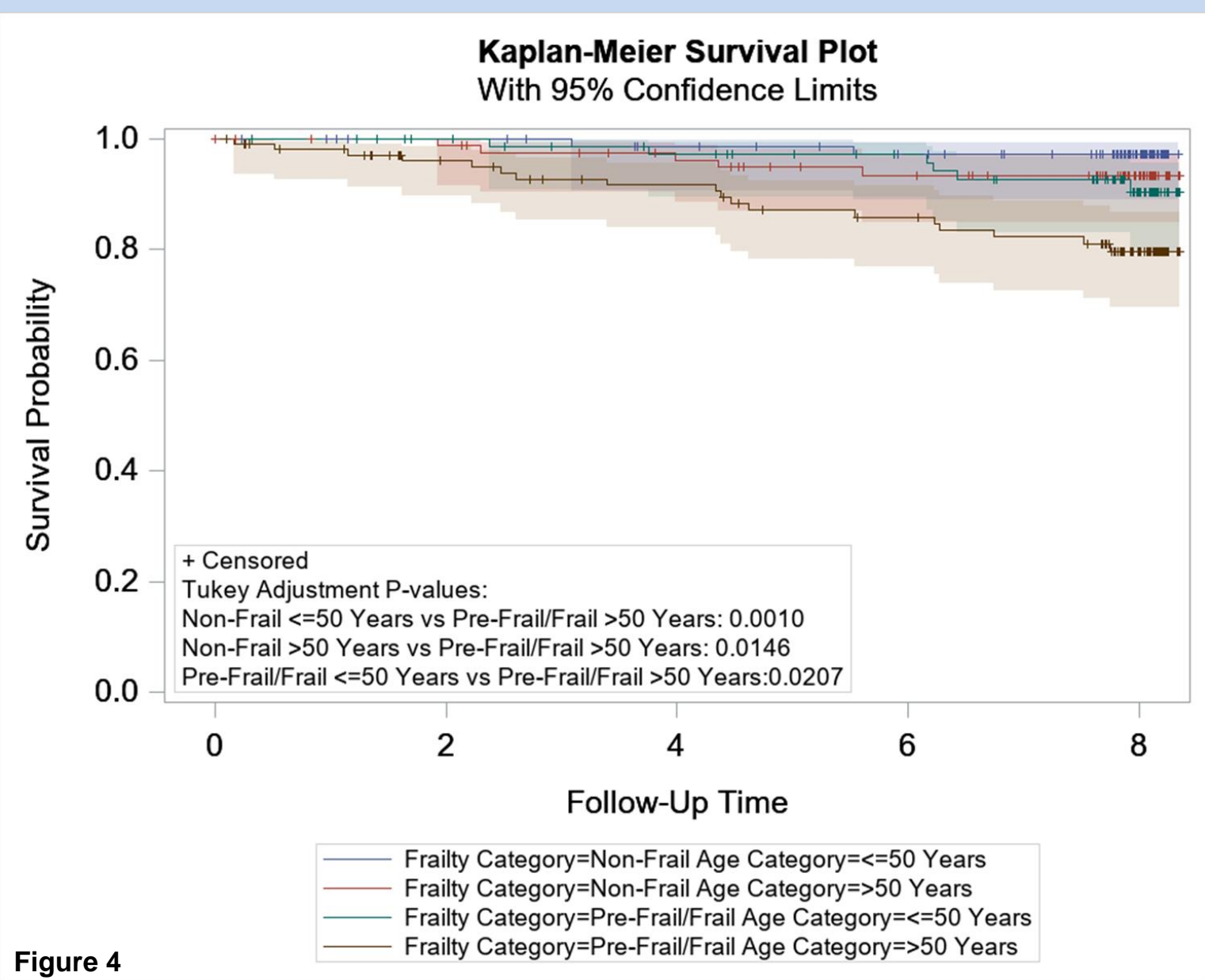

Hazard Ratio and 95% CL

Variables	HR	LCL	UCL
Chair Rise Pace (Rises/Minute)	0.96	0.93	1
400m Pace (m/sec)	0.79	0.71	0.88
SPPB	1.23	1.07	1.41
Grip	1.03	0.99	1.06

Figure 1

Hazard Ratio and 95% CL

Variables	HR	LCL	UCL
BMI (Ref="Normal")			
Overweight	1.42	0.65	3.15
Obese	1.03	0.39	2.76
Falls (Ref="None")			
More than One Fall	2.79	1.38	5.65
Frailty (Ref="Non-Frail")			
Pre-Frail/Frail	3.16	1.36	7.35
VACS Score	1.55	1.24	1.94

Figure 2

Figure 3: Survival in Non-Frail vs. Pre-Frail/Frail Participants
Kaplan Meier curve illustrating divergence of study groups based on frailty.

Kaplan-Meier Survival Plot
With 95% Confidence Limits

+ Censored
Logrank p=0.0036

Frailty Category — Non-Frail — Pre-Frail/Frail

Figure 3

RESULTS CONTINUED

Figure 4: Survival in Groups Stratified by Age and Frailty
Kaplan Meier curve showing divergence of groups based on frailty and age. Stratifying by age illustrates that PWH age ≥50 who are pre-frail/frail have lowest overall survival.

Kaplan-Meier Survival Plot
With 95% Confidence Limits

+ Censored
Tukey Adjustment P-values:
Non-Frail >50 Years vs Pre-Frail/Frail >50 Years: 0.0010
Non-Frail >50 Years vs Pre-Frail/Frail >50 Years: 0.0146
Pre-Frail/Frail <=50 Years vs Pre-Frail/Frail >50 Years:0.0207

Frailty Category=Non-Frail Age Category<=50 Years
Frailty Category=Non-Frail Age Category>50 Years
Frailty Category=Pre-Frail/Frail Age Category<=50 Years
Frailty Category=Pre-Frail/Frail Age Category>50 Years

Figure 4

SUMMARY

- Among middle-aged PWH on effective ART, we found that frailty, physical function, falls, and comorbidity burden (VACS Index) were associated with mortality after up to 8 years.
- Furthermore, frailty was associated with lower survival than age with the lowest survival among those with both frailty and age 50 or greater.
- These results provide support that simple clinical measures are may be useful tools to guide clinical decisions by identifying those with higher mortality risk over the subsequent 5-10 years
- The choice of test can be based on provider

COMIRB APPROVAL AND ACKNOWLEDGEMENTS

WORKS CITED

1. Erlandson, K. M., Schrack, J. A., Jankowski, C. M., Brown, T. T., & Campbell, T. B. (2014). Functional Impairment, Disability, and Frailty in Adults Aging with HIV-Infection. Current HIV/AIDS Reports, 11(3), 279-290.