Supplementary Appendix 1

RCT evaluating the efficacy of non-specialist health worker-delivered interventions to reduce alcohol use among PLHIV

A review of the international literature revealed 12 randomised controlled trials (RCTs) that have evaluated the efficacy of non-specialist health worker-delivered interventions to reduce alcohol use among PLHIV (see Table S1).

Author	Publication date	Study population	% on ART	Country	Finding of significant reduction in current/problem drinking
Hasin et al. [1]	2013	HIV primary clinic	Unknown	USA	Yes
Chander et al.[2]	2015	Hospital HIV clinic	67.6	USA	Yes
Wandera et al.[3]	2015	Hospital infectious disease clinic	76.6	Uganda	Yes, but only among women
Papas et al.[4]	2011	HIV clinic	61.3	Kenya	Yes
Kahler et al.[5]	2018	Urban community health centre	93.9	USA	Yes
Edelman et al.[6]	2019	VA HIV clinics	Unknown	USA	No
Huis in t' Veld et al.[7]	2019	HIV primary clinics	84.8	South Africa	No
Satre et al.[8]	2019	Kaiser Permanente Northern California HIV clinic	Unknown	USA	Yes, but only in persons who reported lower levels of motivation to reduce drinking at baseline
Madhombiro et al.[9]	2020	HIV outpatients	84.7	Zimbabwe	Yes
Papas et al.[10]	2020	HIV clinic	84.7	Kenya	Yes
Kane et al.[11]	2021	Urban hospital HIV clinic	Most	Zambia	Yes
Myers et al.,[12]	2022	HIV clinic in primary health facilities	All	Western Cape, South Africa	Yes

Table S1: List of randomised controlled trials (RCTs) that have evaluated the efficacy of non-specialist health worker-delivered interventions to reduce alcohol use among PLHIV

Modifications made to the original protocol

A detailed description of the trial can be found at Parry et al.[13] Table S2 describes modifications made to the original protocol.

Date approved	Modification
01 Sep 2014	Revised screening tool for hazardous/harmful drinking from 10 item AUDIT to AUDIT-3
11 Sep 2015	Due to funding constraints, revised follow-up assessments from 3 timepoints (3, 6, and 12 months) to two timepoints (3 and 6 months), eliminated Wellness intervention arm, eliminated CD4 tests. We also revised screening tool for hazardous/harmful drinking from AUDIT-3 to AUDIT-C, eliminated EtG testing and revised target subsample for PEth test from 33% to 50% and revised the order of procedures from blood drawing then baseline assessment interviews to baseline assessment interviews then blood drawing procedures.
09 March 2015	Revised method of screening for cognitive impairment from use of the International HIV Dementia Scale to subjective judgment of patients, by trained fieldworkers, on the following dimensions: level of consciousness (alertness, drowsiness), attention, orientation (person, place, and situation), language use, and comprehension.

Table S2: Modifications to protocol

Table S3 below provided details of the four training modules that comprised the intervention package and which were conducted over two days.

Structure of Intervention Package	4 modules delivered over two individual contact sessions of counselling based on motivational interviewing (MI) and problem-solving therapy (PST). PST content covered approaches to solving 3 types of problems that often underpin alcohol use. The intervention content did not focus on adherence. Participants had a four-week window to complete these modules before timing out of the intervention
Structure of intervention sessions and components	
Session #1, Module #1	• Assess alcohol use with the AUDIT • Provide feedback on alcohol use assessment • Increase knowledge of alcohol use and impact on HIV, including impact on ART adherence • Assess readiness for changing drinking behavior • Explore pros and cons of change • Goals setting and develop a change plan
Session #1, Module #2	• Describe the link between problems and alcohol use and the rationale for problem solving therapy (PST) • Categorising problems into those that can be solved, those that cannot be solved, and negative thoughts and feelings • Describe the PST Steps • Conduct first problem busting session • Describe Take Home Activity
Session #2, Module 3	• Patient check-in using MI • Review activities from previous session • *Coping with negative thoughts and feelings*: Describe how negative emotions and thinking impact on alcohol use Teach strategies for managing negative thoughts and emotions. Conduct 2nd problem busting session
Session #2, Module 4	• *Advance process of acceptance*: teach how to deal with problems that are important and cannot be solved. Explain how these problems affect alcohol use • Conduct 3rd problem busting session • Summary and Way Forward
Training	40-hour training on alcohol use disorders, basic counselling skills, screening, MI-PST intervention, dealing with distressed participants and referral pathways
Characteristics of Supervisor	• Qualified research psychologist

Table S3: Intervention Package

Construction of primary outcome

The primary outcome, the number of drinks consumed in the past 30 days was constructed by multiplying two variables: (1) "On how many days have you drunk alcohol during the past month?" with (2) How many drinks containing alcohol do you have on a typical day when you are drinking? (Please note that one standard drink is equivalent to one can or bottle of beer, cider or cooler, one glass of wine or one tot of spirits. One quart (750 ml) of beer is equal to 2.2 drinks" The response categories were '1 or 2', '3 or 4', '5 or 6', '7 to 9', '10 or more' and 'Other, please specify. If you drink homebrew/traditional beer please indicate the name of the homebrew/traditional beer, type of container, and quantity consumed.'. For response categories with a range the mid-point of the range was selected and 12 drinks was selected if the response category '10 or more' was chosen. At none of the time points did respondents choose "Other'. A graphic comprising different commonly used drink containers was used as an aid to participants' estimation of the number of standard drinks consumed.

Results from Model 2

For the second approach, Model 2, we modelled the outcomes longitudinally across all time points using GEE (Generalized Estimated Equations). We assumed exchangeable correlation structure between time points and robust standard errors were used. We fitted a parameter for the treatment arm, as well as a categorical time-effect and the interaction between the two. The interaction terms produced for both 3MFU and 6MFU can be interpreted as the

difference in change from baseline to post-intervention between the treatment and controls. In the case of the negative binomial and logistic models the interaction terms are the ratios of the changes from baseline to post-intervention. All models were adjusted for Gender, Age, Marital status, Education and the Site at which the participant was enrolled.

The results for Method 2 are presented in Table S4 below. For the primary outcome, the average number of drinks consumed over the past 30 days at the 6MFU decreased by 0.43 units on the log scale more from baseline in the intervention arm than in the control arm ($p<0.05$). This translates to a risk ratio in the change from baseline to 6MFU for intervention vs control of 0.65 (exp(-0.43)). It indicates that the intervention arm had a 35% greater relative reduction from baseline in average number of drinks consumed per month, as compared to the relative reduction in the control arm. In terms of the secondary outcomes, the average number of drinks consumed over the past 30 days at the 3MFU decreased marginally significantly by 0.26 units on the log scale more from baseline in the intervention arm than in the control arm ($p<0.064$). For total AUDIT scores, the decrease from baseline to follow-up for the treatment arm was significantly greater than that of the control arm at 3MFU ($p<0.05$), but only marginally significantly greater at 6MFU ($p=0.060$). That is, the decrease in total AUDIT from baseline to follow-up was 0.85 points lower for the treatment arm as compared to the control at 3MFU, and 0.79 points lower than the control arm at 6MFU. The decrease in the AUDIT-C score was significantly greater at both time points in the intervention arm (p,0.05). Participants in the intervention arm had a 0.30 and 0.31 lower adjusted log odds of having elevated PEth scores at the 3MFU and 6MFU respectively, while controlling for baseline sample characteristic differences (e.g., age, sex). However, the change in PEth scores in the intervention arm was not significantly different from that in the control arm at both 3MFU and 6MFU ($p>0.05$). There were no statistically significant intervention effects for adherence to ART or viral load, with the exception of SRSI, where the change in adjusted log odds of having a 'poor' score on SRSI decreased significantly (-0.87) more in the intervention arm than the control arm at the 3MFU, but no difference was noted at the 6MFU.

	3 month follow up vs baseline			6 month follow up vs baseline		
Variable	Estimate[b]	95% CI	p-value	Estimate[b]	95% CI	p-value
Primary outcome						
Ave # drinks/month				-0.427	-0.744; -0.11	0.008*
Secondary outcomes						
Ave # drinks/month	-0.255	-0.525; 1.015	0.064			
Total AUDIT	-0.845	-1.644; -0.046	0.038*	-0.789	-1.613; 0.034	0.060
PEth ≥ 50[c]	-0.302	-0.769; 0.164	0.203	-0.306	-0.809; 0.197	0.233
SRSI[d]	-0.867	-1.635; -0.099	0.027*	-0.688	-1.586; 0.210	0.133
ACTG < 0.95	-0.343	-0.951; 0.266	0.270	0.170	-0.483; 0.824	0.609
VAS < 95	0.063	-0.365; 0.491	0.774	-0.034	-0.449; 0.382	0.874
CASE <11	-0.117	-0.6; 0.366	0.634	-0.017	-0.516; 0.482	0.947
Viral load ≥ 50[e]	---	---	---	0.162	-0.220; 0.543	0.406
AUDIT-C	-0.484	-0.879; -0.089	0.016*	-0.538	-0.968; -0.108	0.014*

[a] Method 1: Longitudinal models (GEE) modelled ACROSS ALL time points, with Time*Treatment interaction. Effect reported: Interaction effect between time and treatment group at both F/U points, essentially the difference in change from baseline to follow-up (on log scale for non-normal outcomes), adjusted for Gender, Age, Marital Status, Education and Site.

[b] Estimates are parameter estimates on log scale

[c] 50% of participants, assessed at baseline, 3 months and 6 months

[d] Binary (Poor=1)

e Assessed at baseline and 6 months

* $p<0.05$

Table S4: Imputed longitudinal GEE models comparing intervention (MI/PST) to control (Overall) for Method 2

For Model 2 additional sensitivity analysis was undertaken for PLHIV on ART who had AUDIT scores ≥ 8 at baseline (n=299) (Table S5). Findings were very similar to that of the whole sample. The decrease in average number of drinks consumed per month at the 6MFU (primary outcome) was 0.48 units on log scale less respectively in the intervention arm compared to the control arm ($p<0.05$). In terms of the secondary outcomes, the decrease in average number of drinks consumed per month at the 3MFU was 0.33 units on log scale less respectively in the intervention arm compared to the control arm ($p<0.05$). Significant differences in the change in log odds from baseline for total AUDIT scores were found for the intervention arm (Table S5), with the intervention arm having significantly greater decreases in total AUDIT scores at 3MFU and 6MFU ($p<0.05$). There were no statistically significant intervention effects for the biomarker PETh, or on adherence to ART medication or viral load. The intervention arm, similar to the whole sample, had a greater decrease in the log odds of a `poor' SRSI score at 3MFU, but not at 6MFU.

	3 month follow up vs baseline			6 month follow up vs baseline		
Variable	Estimate[b]	95% CI	p-value	Estimate[b]	95% CI	p-value
Primary outcome						
Ave # drinks/month				-0.481	-0.890; -0.072	0.021*
Secondary outcomes						
Ave # drinks/month	-0.334	-0.654; -0.014	0.041*			
Total AUDIT	-1.373	-2.538; -0.208	0.021*	-1.361	-2.574; -0.148	0.028*
PEth ≥ 50[c]	0.139	-0.630; 0.908	0.723	0.065	-0.785; 0.915	0.881
SRSI[d]	-1.052	-1.934; -0.170	0.019*	-0.908	-2.050 ; 0.234	0.119
ACTG < 95	-0.344	-1.112; 0.423	0.379	-0.001	-0.883; 0.881	0.998
VAS < 95	0.050	-0.552; 0.651	0.872	0.162	-0.412; 0.735	0.550
CASE <11	-0.205	-0.857; 0.447	0.537	-0.334	-0.976; 0.308	0.308
Viral load ≥ 50[e]				0.044	-0.469; 0.556	0.868
AUDIT-C	-0.832	-1.397; -0.267	0.004*	-0.865	-1.495; -0.234	0.007*

[a] Method 1: Longitudinal models (GEE) modelled ACROSS ALL time points, with Time*Treatment interaction. Effect reported: Interaction effect between time and treatment group at both F/U points, essentially the difference in change from baseline to follow-up on log scale, adjusted for Gender, Age, Marital Status, Education and Site.

[b] Estimates are parameter estimates on log scale

[c] 50% of participants, assessed at baseline, 3 months and 6 months

[d] Binary (poor=1)

e Assessed at baseline and 6 months

* p<0.05

Table S5: Imputed longitudinal GEE models comparing intervention (MI/PST) to control (Overall) (AUDIT≥8) for Method 2

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