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Self-report of alcohol use increases when specimens for alcohol biomarkers are collected in persons with HIV in Uganda

Judith A. Hahn, PhD, MA^{1,2}, Robin Fatch, MPH¹, Jane Kabami, MPH³, Bernard Mayanja, MMED, MPH³, Nneka I. Emenyonu, MPH¹, Jeffrey Martin, MD, MPH², and David R. Bangsberg, MD, MPH⁴

¹Department of Medicine, University of California, San Francisco, USA ²Department of Epidemiology and Biostatistics, University of California, San Francisco, USA ³Department of Community Health, Mbarara University of Science and Technology, Uganda ⁴Mbarara University of Science and Technology, Massachusetts General Hospital Center for Global Health, Ragon Institute of MGH, MIT and Harvard, Harvard Medical School

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There is a significant overlap between the problem of heavy alcohol consumption and the HIV epidemic in sub-Saharan Africa (SSA). Heavy alcohol consumption has direct health consequences and increases the risk of HIV transmission, incomplete adherence and disease progression in SSA [1]. However, the criterion validity of patient-reported alcohol consumption by HIV-infected persons in SSA is unknown. Valid report is necessary for implementing interventions to reduce alcohol consumption that could in turn reduce the burden of HIV disease [2].

We investigated the effect of introducing biologic measures on self-report of alcohol consumption among persons on HIV antiretroviral therapy (ART) in Mbarara, Uganda. In Uganda, the adult HIV prevalence is 6.5% and 47% with CD4 counts <350 cells/mm³ are on ART [3]. Participants of a prospective cohort study of HIV ART treatment outcomes were recruited into a nested study. Roughly equal numbers of participants with fully and incompletely suppressed HIV RNA (> or = 400 copies/ml) were selected (29 incompletely suppressed, 32 suppressed), matched on sex (52.5% female) and duration on ART (within six months); all had been enrolled in the parent study for at least six months.

Parent study activities included baseline and quarterly structured interviews and blood draws. Participants were asked at baseline when, if ever, they last consumed any alcohol, and at follow-up, how often they consumed alcohol in the prior three months. We re-categorized these as never, ever but not within the prior three months, and within the prior three months, using the most current survey and all previous surveys.

The nested study activities, which were conducted within a median of 1 day (IQR: 0–30) after a parent study visit, included a structured interview, breath analysis, and blood and urine specimen collection. The nested study survey asked when the participants last consumed alcohol, if ever. The biomarkers examined were phosphatidylethanol (PEth) in

whole blood and ethyl glucuronide/ethyl sulfate in urine (UEtG/UEtS). We previously found that PEth is 88.0% sensitive and 88.5% specific for detecting any alcohol consumption in the prior 21 days, and 76.4% sensitive and 100% specific for detecting any alcohol consumption in the prior three months in persons infected with HIV in Uganda [4]. We conducted breath analysis to determine that breath alcohol was zero, to avoid in-vitro formation of PEth [5]. UEtG has been 89.3% sensitive and 98.9% specific for detecting very recent (prior 1–3 days) alcohol consumption [6], and sensitivity may be increased when combined with UEtS [7].

All protocols were approved by the Institutional Review Boards of the Mbarara University of Sciences and Technology, the Uganda National Council for Science and Technology, and the University of California, San Francisco. All participants gave informed consent for the parent study and, subsequently, for the nested study.

In the parent study, 20% of participants reported drinking any alcohol in the prior three months, 39% reported drinking alcohol more than three months prior, and 41% reported never drinking alcohol (Table 1). In the nested study that included concurrent biomarkers, there was a two-fold increase in reporting any alcohol consumption in the prior three months, from 20% to 41% (McNemar's $p < 0.01$). The results were similar when the sample was limited to those who completed both the parent and nested study interviews on the same day ($n = 30$) and when stratified by viral suppression status (data not shown). We were unable to determine whether self-report validity varied by religion; ten participants were of religions that prohibit alcohol (Moslems and "Saved" Christians). Self report differed by sex (Table 1), with self-reported three-month alcohol consumption increasing from 6.3% to 34.4% ($p < 0.01$) among the women and from 34.5% to 48.3% among the men ($p = 0.13$).

We examined the associations between the biomarkers and self-reported recent alcohol consumption. Few, six in the parent study and ten in the nested study, reported alcohol consumption in the prior three days, therefore we do not report UEtG/UEtS results. PEth was detectable (> 8 ng/ml) for 83% (10/12) and 80% (20/25) of those reporting any alcohol consumption in the three months in the parent and nested studies, respectively. In addition, PEth was detectable for 27% (13/49) and 8% (3/36) of those denying prior three month alcohol consumption in the parent and nested studies, respectively. Furthermore, PEth was detectable in 10 of the 13 (77%) persons who denied prior three month alcohol consumption in the parent study but who later reported drinking in the nested study, corroborating evidence of under-report in the parent study.

Under-report of alcohol consumption may reflect fear that ART will be denied if alcohol consumption is admitted [8], or may reflect social desirability bias. The greater under-report by women is consistent with increased stigma for drinking incurred by women [9]. Alternatively, repeated alcohol consumption questions may increase recall. However, there is a trend in the parent cohort towards decreasing self-reported alcohol consumption over time rather than the opposite (data not shown).

Biomarker procedures discussed during the informed consent process just prior to the nested study survey may have had an impact on self-report. Biological measures have been used to improve the accuracy of self-report previously [10–14] with mixed results. To our knowledge, this is the first study in SSA to show that self-reported alcohol consumption on a survey is increased when biomarker measurement of alcohol exposure is conducted concurrently.

There are important implications of under-reported alcohol consumption for persons infected with HIV. On the individual level, non-disclosure of alcohol use prevents health care providers from providing interventions to protect patients from the direct negative

effects of alcohol or indirect effects on HIV treatment adherence and treatment outcomes. On the population level, under-reported alcohol consumption hampers research of the public health consequences of alcohol.

More work is needed to determine the context in which alcohol consumption is under-reported and to develop methods to improve assessment of alcohol consumption. Research is needed to determine the number and type of biological specimens needed to gain valid self report; it is possible that a minimally invasive and inexpensive measure such as a breath test may suffice.

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Table 1

When last consumed alcohol, by self-report in parent study versus nested study with concurrent specimen collection for biomarkers of alcohol consumption, overall and by sex.

Overall (n=61)				
	Nested study			Total (%)
Parent study	Never	Ever, but not in the past 3 months	Within past 3 months	
Never	6	13	6	25 (41.0)
Ever, but not in the past 3 months	0	17	7	24 (39.3)
Within the past 3 months	0	0	12	12 (19.7)
Total (%)	6 (9.8)	30 (49.2)	25 (41.0)	61 (100)
Among men only (n=29)				
	Nested study			Total (%)
Parent study	Never	Ever, but not in the past 3 months	Within past 3 months	
Never	1	2	0	3 (10.3)
Ever, but not in the past 3 months	0	12	4	16 (55.2)
Within the past 3 months	0	0	10	10 (34.5)
Total (%)	1 (3.5)	14 (48.3)	14 (48.3)	29 (100)
Among women only (n=32)				
	Nested study			Total (%)
Parent study	Never	Ever, but not in the past 3 months	Within past 3 months	
Never	5	11	6	22 (68.8)
Ever, but not in the past 3 months	0	5	3	8 (25.0)
Within the past 3 months	0	0	2	2 (6.3)
Total (%)	5 (15.6)	16 (50.0)	11 (34.4)	32 (100)