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Validating alcohol use measures among male Drinkers in Goa: Implications for research on alcohol, sexual risk, and HIV in India

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Abstract

Assessment of heavy drinking patterns is vital for HIV/AIDs studies in India and developing countries. A population survey in northern Goa included urban and rural male drinkers (n = 743) who completed a new Fractional Graduated Frequencies (F-GF) alcohol patterns measure assessing 7 beverage types and drink sizes for the largest daily amount, then drinking frequencies at fractional amounts. The new measure was compared to a simpler quantity-frequency (QF) summary and in a validity subsample of hazardous drinkers (n=56), 28-day diaries of drinking events. Approximately 56% of total volume came from peak drinking (averaging 60 g ethanol/day). For AUDIT-based Hazardous Drinkers, QF and F-GF volumes (drinks/day) were not significantly different from diary volume (correlations .65 and .57, respectively). F-GF well captured the profile of daily amounts in drinking event data. In addition, the F-GF showed evidence of better predicting any sexual risk behavior or partner violence perpetration than the QF measure. Summary drinking pattern measures, especially the new F-GF, are more cost efficient than intensive event records, and appear valid when carefully assessing quantities with local beverage types and drink ethanol content.

Keywords

alcohol use patterns; measurement; validity, Goa; survey; HIV/AIDS; risk factors

INTRODUCTION

Increasing trends both in alcohol production and consumption are documented for India [1]. On the one hand, abstention, especially in women, remains common [2], but on the other, there is a substantial prevalence of drinking among men with up to half found to meet criteria for heavy use [3]. Although an emerging public health “crisis” [4], alcohol misuse until recently has not been highly attended to in India [5-7]. Relevant to the present paper, challenges in measuring alcohol intake patterns in developing countries [8] are a significant barrier to conducting research on the health risks associated with alcohol misuse.. In India,

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these challenges include that related to accurately measuring alcohol content in the numerous and locally varying types of alcoholic beverages consumed, many of them informally produced[9].

Alcohol use patterns of alcohol consumption are particularly relevant to mortality and morbidity involving a wide range of diseases [10] at huge cost in terms of the global burden of disease [11]. Likewise, specific patterns of consumption may be associated with HIV risk and transmission as well as with disease progression and antiretroviral adherence among HIV-infected persons with alcohol problems [12]. Other alcohol use factors, such as for men, venues in which alcohol is purveyed could carry enhanced risk of sexual transmission of the virus [13]. Poverty and social inequality intensify the risks of infectious diseases like TB and HIV/AIDS [14].

In India, as in other Asian countries [15], the percent of adults living with HIV who are women is increasing considerably (estimated to have risen from 26 to 37% between 2002 and 2006). Women's risk is attributed to partners engaging in unsafe practices since over 90% of women acquired HIV during long-term relationships [16]. Given their high alcohol abstention rates 17, the HIV-related alcohol risk factors for women appear to involve excessive alcohol use by their partner rather their own drinking 18. Additionally, attitudes and behaviors linked to power dynamics and men's violence against their female partner or partners appear critical in increasing women's HIV risk16, [19-21].

Nayak et al. 22 summarized studies linking male partners' heavy drinking to spousal violence against women, finding such drinking patterns to be a significant risk factor for violence experienced by married women in India (see also 23). Regular alcohol consumption by the partner has also been associated with women's poor mental health 24; the husband's regular drunkenness increased risk lifetime exposure to violence during pregnancy three-fold in women aged 15 to 49 25.

Central to the measurement of alcohol consumption patterns is the concept of what comprises a unit of alcohol. Many epidemiological surveys in the developed world have relied on self-report alcohol measures using the metric of a country-specific "standard drink" 8. However, even in countries such as the US where "a drink" may be defined for respondents, significant variation in the content of ethanol in commonly consumed alcoholic beverages, e.g., for home pours 26 and bars 27. This substantiates that the ethanol in what respondents report as "a drink" is by no means standard; individual and ethnic-cultural differences abound [28]. In a country like India, where there are diverse languages and cultural practices, drinking patterns vary greatly by state and even within states (e.g., urban versus rural areas in the case of Goa), further compounding the measurement of drinking patterns. .

Alcoholic beverage variations and a variety of containers and vessels used for drinking represent a challenge which our group has begun to address in several different settings in India [9]. Here we lay out some methodological approaches to measuring intake patterns and provide preliminary validation results. The purpose is to better inform the next generation of HIV/AIDS studies seeking to take account of heavy alcohol consumption in regard to behavioral research on HIV transmission as well as disease progression and medication compliance. We base our discussion of approaches to measurement on a specific empirical example based on research conducted from 2004 to 2007: a community survey in Northern Goa covering urban and rural areas.

Broadly, this paper explores methodological issues regarding the measurement of alcohol consumption patterns. Using findings from different methods to measure total consumption and patterns of heavy consumption, we seek to illustrate a) why drinking amounts are important; discuss what kind of studies can benefit from assessing drinking patterns;

whether other methods can be validated against these measures and other alternative possibilities for estimation. b) How much we need to know of drinking patterns for use in prevention planning c) How is accurate alcohol consumption measurement important for policy decisions regarding regulations and when is it critical to assess drinking pattern (not only volume) and take full account of locally determined indicators of excessive drinking when investigating negative consequences? e) How important for HIV/AIDS studies and interventions is precision of measurement in assessing drinking patterns (it will be noted that, for example, amount of alcohol appears to affect metabolism of ARV medication and also medication compliance)? Finally, we make recommendations regarding practical steps that may be taken to improve measurement of alcohol use patterns and associated problem behaviors in India. In our community survey we used identical measures to estimate drinking by both genders, finding only a small minority (4%) of women reported drinking any alcohol during the previous 12 months, a situation similar to other Indian states [2]. Thus, we limit consideration here to measurement of male drinking patterns.

Specific aims are to present alcohol consumption results for the new Fractional Graduated Frequencies (F-GF) measure used in the Goa Community Survey; present details on the type of alcoholic beverages consumes in northern urban and rural Goa; compare results for several distinct measures, particularly the usual Quantity Frequency measure (QF) and the F-GF and compare these results with those found in a sample of hazardous drinkers on whom we obtained detailed drinking diaries over 4 weeks; and finally, using the outcome of sexual risk behavior or interpersonal partner violence (seen as risk factors for transmission of HIV) to examine the predictive validity of QF-based pattern measures (volume and frequency of heavy drinking) with the equivalent measures derived from the new F-GF measure explicitly designed to capture drinking patterns.

METHODS

Sample

The study site was northern Goa, the smallest state on the west coast of India with a population of 1.4 million living in an area of 3702 Sq Kms, with a high level of economic and social development compared to other states [29]. Alcohol is cheap and available given alcohol policies influenced by Portuguese colonial influence as recently as the 1950s, with widespread local distillation of cashew-based spirits. Prior studies in Goa with male industrial workers [30] and primary care patients [31] estimate hazardous alcohol use in at least 30% of all drinkers.

Men aged 18 to 49 years (separately from women, data reported elsewhere 25) were randomly selected from the rural and urban communities for a population-based survey. Two-staged probability sampling based on addresses in 2004 and 2006 electoral rolls, was used to select rural and urban households, with respondents selected at random from the eligible age range in households. A house was deemed unavailable when no respondents were available at the randomly selected dwelling after three attempts at participant recruitment. The first house on the right hand side of the house deemed unavailable was selected as the replacement household (n=546; 28.8%). Refusals from randomly selected households were not replaced. The majority of respondents were from randomly selected households (71.3%, n=1353), while replacement houses were more likely to be in urban areas (59.4% vs. 36.9% $p<0.001$), have lower standard of living score (mean score 0.95 vs. 1.00; $p<0.01$) and be of non-Goan ethnicity (22.8% vs. 14%, $p<0.001$). There was no significant difference between randomly selected and replaced households on hazardous alcohol use or any other study measures.

Procedure

Following informed consent procedures, respondents completed first and second stage interviews administered by male interviewers, in private, in the respondents' homes. First stage (Screening) interviews took about 15 minutes and second stage (Main) interviews just over 60 minutes to complete. Both interviews were completed on the same day for the large majority of respondents (98.8%). The study protocol and measures were approved by the research ethics committees at Sangath in Goa, the Public Health Institute in the US, and the Indian Council of Medical Research. Figure 1 provides a flow chart of enrolment indicating response rates, which were very high (Male response rates were 98.2% for the screener and 99.2% for Main interview). On an experimental basis some of the screening (12%) was conducted with Palm Pilot software; here data are pooled since no differences were observed. A random group of hazardous male drinkers, as defined by the AUDIT measure (n=56), provided complete data on a 28-day drinking diary.

Measures

Demographic factors assessed included age, area of residence (urban/rural), ethnicity (Goan nativity or not), religion, marital status, household size and number of children. Socio-economic factors assessed included education, employment, housing situation (rented or own house), experiencing hunger in the past 3 months due to lack of money or having money problems, and being in debt. Additionally, consistent with other national surveys in India [32, 33], we assessed household assets to compute an asset-based index of standard of living.

Hazardous alcohol use was assessed during the Screening Interview using the Alcohol Use Disorders Identification Test (AUDIT), administered to men who reported at least one alcoholic drink during the past one year [3]. The AUDIT is a 10-item questionnaire developed for international use by the World Health Organization to detect hazardous and harmful drinkers [34, 35]. The AUDIT has been used previously in Goa with industrial workers [30, 36] and primary care samples [31]. In the AUDIT there are 3 items assessing alcohol use and 7 items on alcohol problems – alcohol dependence symptoms and consequences such as alcohol-related injuries [37]. Alcohol items include frequency of drinking (drinking days), and two quantity questions (usual quantity and frequency of consuming 60 g. ethanol per occasion). For assessing these quantities, since "drinks" are not culturally defined in Goa, we systematically assessed beverage-specific and related drink-size information in a preliminary study [9] and used a detailed beverage-specific checklist with associated pour/vessel sizes (e.g., 30 ml half peg and 60 ml full peg) and conversions to grams pure ethanol. Alcohol concentration of numerous samples of various beverages such as Indian Manufactured Foreign Liquor (IMFL), country-made Urrack (once distilled) and Feni (twice distilled) Cashew spirits (as well as Coconut Feni) were assayed in Percent Alcohol by Volume (%ABV) using chemical analyses performed at the Goa Directorate of Food and Drugs Administration and by us using an Analox AM3 analyzer [38]. This preliminary study of available beverages also assessed pour (and vessel) sizes associated with use of the Goan beverage types [9]. Implementation of the AUDIT [37] defines a "drink" as 10 g (a common unit in Australia and the UK, but one generally smaller than empirically defined drinks consumed). Also consistent with standard AUDIT recommendations and our evaluation of its performance in this study in Goa, we use a cut-off score of 8 or more to denote hazardous alcohol use [3].

Alcohol Consumption Pattern Measures—Given that a major objective was validation of self-report intake measures [39], in addition to the AUDIT items just discussed three other measures were included in the Main interview and a fourth event-specific measure was included in a drinking diary substudy limited to Hazardous Drinkers. First was

an adapted version of the beverage-specific Knupfer Series (KS). This asks frequency of drinking each common beverage type (7 in Goa): Beer, Wine, Spirits (IMFL or imported), Caju Feni, Coconut Feni, Urrack, and Mixed Drinks, then asks for each the proportion of times one consumes each of three quantity levels (i.e., 1-2, 3-4, 5 or more drinks) see40. We use the KS here only to depict the population 'market share' of each beverage. The second measure included here is the simplest volume measure, perhaps the most commonly used worldwide, often termed the quantity-frequency (QF) measure, which can have various reference periods, typically 30 days or 12 months39 . The QF measure we used asks usual frequency of drinking any alcoholic beverage in the last 12 months (F = number of days drinking taken as the mid point of ten categories from "every day or nearly every day", "3 or 4 days a week", down to "2 times in the last 12 month", "1 time, etc.", or "never in the last 12 months"), and then the usual quantity (Q = typical amount on a day when you drink, implemented as described for the AUDIT quantity items above). Volume is simply Q times F.

The third measure was a new adaptation of the Graduated Frequencies (GF) measure [40] designed to overcome several limitations of the standard GF identified in the literature 41. Difficulty with implementing the GF has been especially acute in countries without common definition of a "standard drink" 39 or any culturally understood notion of a drink, as in India. The aim of a GF measure is to provide a profile of drinking or the frequency of drinking various amounts—does one drink often a large amount and seldom small ones, or vice versa, usually a small quantity but occasionally exceptionally large ones, as often seen in many developed countries 42. The GF measure goes beyond "binge drinking" measures such as the AUDIT's frequency of drinking at the 60 g level, by considering larger maximum amounts [43]. Drink ranges are 1-2, 3-4, 5-7, 8-11, 12+ drinks in the standard GF measure. Implementation is impossible where a "drink" concept is not in common usage. The solution was to establish the maximum amount consumed on any day in the prior 12 months by asking, for the seven Goan beverage types, the numbers of various drink pours associated with the type using the grid mentioned earlier, predetermined by the earlier study [9], so that the grams ethanol for the maximum could be readily summed. Table 1 provides the grid used. Once the maximum is determined, the profile is developed by asking how often did you drink about this amount (the maximum); then and about how often did you drink about three-quarters of that amount (3/4 the maximum); followed by identical questions for "about half that amount" and finally "about one quarter of that amount." The resultant measure is termed the Fractional GF (F-GF) since the amount levels are relative to the maximum rather than fixed at a given drink–quantity range, as in the US where the standard measure performs well [40]. Pilot testing revealed that even in rural areas, familiarity with weights and measures for food purchases meant three quarters, half and a quarter of an amount (here the maximum) were well understood; however, to aid respondents a visual aid card depicted a beaker with fluid levels at ¾, ½ and ¼ of the full beaker (the greatest amount).

Several variables were constructed. Total volume of consumption was constructed for both the F-GF and the QF measures and, in addition, a measure of the frequency of drinking 65 or more grams per day (roughly 5+ drinks/day in US studies). For the QF measure, this frequency was the respondent's usual frequency of drinking when their usual quantity was larger than 65 grams and was 0 otherwise. For the F-GF measure, it was the sum of the frequencies for each of the up to 4 fractional consumption levels if greater than 65 grams and 0 if their maximum quantity was less than 65 grams.

28-day Drinking Diary—Event specific reports on a daily basis have been used to validate summary measures and specifically in the US have confirmed reasonable accuracy of the data collected using the standard GF 39, 44, [45]. Here the diary of amounts drunk for

each of 28 days was collected by four in-person interviews conducted on a weekly basis asking recall of drinks and amounts consumed in each of the prior 7 days (using the grid of the 7 beverage types and associated sizes when needed). In all 56 of the 58 diary cases provided complete data for 28 days and so were included in the analyses.

Sexual Risk Behavior—A dichotomous indicator variable was also constructed that assessed whether the respondent engaged in any sexual risk behavior or perpetrated any violence (either physical or sexual) toward a partner in the past 12 months. Sexual risk behavior was coded if at least one of the following 5 behaviors was affirmed in the prior 12 months: 2+ sexual partners, had Sex with both Men and Women, Sex with Commercial Sex Worker (CSW), received money for sex, or paid money for sex.

Analysis

We applied design-related weights to the data to adjust for sampling procedures, village or area population size and age distribution based on the electoral rolls, number of adults aged 18-49 in the household, non-response, and under-sampling of non drinkers in the second stage interviews. Weights were also rescaled to separately represent urban and rural sample sizes.

In order to assess the predictive validity of measures derived from the F-GF compared to those derived from the QF, a simple logistic regression model was used to predict a constructed variable indicating any violence or sexual risk behavior in the past 12 months. Controlling for urban (vs rural) stratum, age, whether the respondent was in a romantic relationship, and a 3-level standard of living index (poorest 40% of a Standard of Living Index [SLI], Middle 40% SLI, top 20% SLI) the F-GF and QF volume and frequency of 5+ measures (in separate models) were each entered in two different sequences — (1) F-GF, then QF variable (2) QF, then F-GF variable (either volume or 5+ frequency in each instance) — to assess whether the second measure improved prediction of the outcome, controlling for the other measure. For further information about this testing strategy, see 43.

RESULTS

The maximum amount reported by male drinkers on the F-GF measure (n=743) had a mean value of 65.8 g (SD = 56.9) ethanol in any day (see Table I) with a skewed distribution extending to 500 g ethanol any day in the prior 12 months. While the modal maximum was less than 50 g ethanol in any day (about 28%) more than half the male drinkers reported peak drinking above 60 g on at least one day during the prior 12 months (results not shown). Men's largest number of drinking days (mean 41.7 days in a year) though with high variability (SD = 86.5 days) is devoted to drinking "at about" the largest amount, the next most typical drinking amount being "about half" of that maximum amount, with a mean frequency of 38 days, also highly variable (SD 85.6). Put another way, about 38% of the overall mean of 109 drinking days in the year involve consuming about the largest amount, and in all 53% of the days involve at least ¾ of the maximum a man drinks. Therefore, most men's drinking days involve drinking relatively larger amounts, and the smallest proportion of drinking days (under 12%) involve drinking at only a quarter of their largest amount. Table I also provides the distribution of the male group's mean volume derived from the maximum and the three fractional levels (¾, ½ and ¼) of that maximum amount (right column). Congruent with the amounts and rates just described, a majority (56.1%) of male's average volume derives from "about the maximum" amount, which on average (and more often than not) is a hazardous (>60 g ethanol / day) quantity. Only about a quarter (24.1%) of the overall volume consumed by males is associated with drinking "about half" their maximum amount, with remaining volume deriving more from "about ¾" of the maximum

(12.1%) and less than a tenth (7.4%) associated with relatively lighter drinking at "about ¼" of the maximum. Thus, men's profile of drinking based on the F-GF measure confirms and refines the patterns described in prior reports: when northern Goan men drink, they generally drink heavily, more than half the time exceeding hazardous amounts and only on a minority of the drinking occasions drinking at lower levels. In sum, the bulk of the male drinking population's alcohol consumption is consumed hazardously.

Turning to what beverages are drunk, we see from Table II that among 549 drinkers consuming alcohol at least monthly, beer is drunk by the largest number of males, both in rural (169 of 254) but especially in urban (250 of 342) northern Goa. Conversely, overall, beer accounts for just under 13% of the group's aggregate yearly ethanol volume (10.8 Liters ethanol), the biggest contributors in order being Caju Feni (9.9 L on average among the 196 drinking it) and IMFL (averaging 7.2 L in 284 drinkers), the ethanol content of each being from 36 to 42 %ABV, and Urrack (5.1 L, 195 drinkers) and Coconut Feni (2.2 L ethanol with only 14 drinkers), each from 22 to 27 %ABV. Together these four spirits account for approximately 86.3% of the overall intake of at least monthly drinkers (not counting mixed drinks and wine which account for very little volume). In sum, this is a distilled spirits drinking culture, with beer drunk by many of the lighter drinkers but accounting for lower overall volume). Caju Feni and Urrack are particularly prominent beverages drunk by proportionally more and at higher relative volumes in the northern rural areas where they are produced.

Turning to the comparison of measures, Table III provides the respective results for the mean volumes found by the simple QF measure versus the F-GF. While in North America the GF outperforms the typical Q x usual F in accounting for higher volume this is less true in India. Although given the standard deviations of the measures which are high, and the results are not significantly different, the QF yields only a slightly lower mean than the F-GF. The typical Q, in Goa is high, as indicated by the F-GF; it is at or close to the maximum for many individual drinkers. In fact the unusual amounts are the lighter amounts. Thus, QF may reflect quite well the person's true volume. One factor contributing to the small difference is that the usual frequency is only a bit lower in the simple assessment than the frequency based on summing the four frequencies (being careful not to allow exceeding 365 days) of the F-GF quantities. The slight difference in frequencies is enough to account for the difference in volumes seen. Nonetheless, the F-GF, although resulting in a higher volume than the QF, shows less of an advantage in India than in the US.

Next, we compared the days at particular amounts based on the F-GF with the results from the detailed event-based data on the diaries among hazardous drinkers (n=56). For Hazardous drinkers, QF and F-GF assessed volumes in drinks/day (prorated to 28 days from 12 months) were slightly (but not significantly) lower and higher than diary-based volume, respectively (i.e., differing less than half a 12 oz bottle of beer). Individual volumes assessed by the QF and F-GF were correlated with the diary-based volumes .67 and .57, respectively. Thus on an individual basis, the simple QF volume seems more congruent with the diary-based volume than the F-GF. In regard to the frequency of drinking among the hazardous drinkers, as assessed by the F-GF and the QF compared to the diaries, The F-GF yielded the largest proportion of drinking days (6.2% more) followed by Diary and QF usual frequency (1.6% less). The F-GF yielded a maximum quantity differing little and not significantly (2.5 grams lower) from the Diary maximum but variability was great and the correlation only modest (.54). (Note that the QF does not produce a maximum for such a comparison.) Based on the hazardous drinker validity sample with complete data (n=56), the F-GF is extremely good at reproducing as a summary measure the distribution of quantity levels observed in the daily records, as seen in Figure 2. At least for hazardous drinkers in this validation

sample, the F-GF on a sample basis well captures the quantity profile of the group based on the daily records.

Finally, in predicting sexual risk behaviors or violence in the past 12 months, four variables were first entered in logistic regression models as demographic control variables, specifically: urban vs. rural stratum, age, whether the respondent was in a romantic relationship, and a 3-level standard of living index (SLI). Then each of the QF and F-GF measures (volume and frequency of 5+ drinks/day) were entered in separate models, in a different order to assess whether each improved model prediction above and beyond the variable already entered. For volume, entering the F-GF volume first resulted in a significant decrease in the model χ^2, indicating improved model fit ($p<.001$, 1 df) but entering QF volume in a subsequent block did not significantly improve model fit ($p=.51$, 1 df). Conversely, while entering the QF volume first significantly improved model fit ($p<.001$, 1 df), entering the F-GF volume in a subsequent block marginally improved model fit ($p=.052$, 1 df). Examining measures of 5+ drinks/day, this differential predictive effect was stronger. Entering the F-GF 5+ measure first significant improved model fit ($p<.001$, 1 df) and entering the QF 5+ measure in a subsequent block did not improve model fit ($p=.73$, 1 df). However, although entering the QF 5+ measure first resulted in significant model improvement ($p<.001$, 1 df), entering the F-GF 5+ measure in a subsequent block significantly improved model fit ($p=.004$, 1 df) above and beyond the contribution of the QF 5+ measure.

DISCUSSION

As mentioned in the introduction, culturally appropriate self-report measures of alcohol consumption that promise greater precision are needed for many HIV/AIDS studies both in relation to characterizing risk of infection and disease progression. A expert consensus group sponsored by WHO and the US CDC meeting in Cape Town in 2009 found sufficient evidence for alcohol's causal involvement in illness progression but not yet for its causal involvement in HIV transmission [46], for which there was suggestive but not definitive evidence from behavioral studies. The experts viewed event-specific measures such as those used in the diary component here as important for future studies. We agree, because they have the potential when coupled with reports of sexual behavior to unravel the causal sequences. However, such assessments are labor intensive and can be prohibitive to mount in some studies. For many epidemiological purposes in developing countries, efficient look-back summary measures which well capture the details of the drinking pattern (rates of drinking various quantities) besides just the overall average intake volume or high usual quantity, are also needed. While no substitute for event-based measures of drinking and sexual encounters, the summary pattern of drinking measures such as the new F-GF, when validated, represent a promising step forward. We have shown that for hazardous drinkers, those most prone to exhibit sexual risk behaviors and spousal violence (Pillae et al, unpublished manuscript), the F-GF well reproduces the drinking pattern seen in prospective 28-day consumption diaries.

In the present study we added a further validation step to compare predictive performance of the simple QF-based measures and the F-GF-based ones (in both instances volume and frequency of drinking 65 g ethanol or more) in relation to sexual risk behavior or violence toward the partner. The findings indicate that for volume, with marginal significance and for the frequency of heavy drinking measures with clear significance, the F-GF-based measures are superior to the QF-based measures. This lends some predictive validity to the new F-GF drinking pattern measure as suitable for use in HIV/AIDS and sexual risk studies.

For certain studies in developing countries like India, if drink size and alcohol content of the full range of available alcoholic beverage types are carefully attended to 9, the simpler QF format may be substituted if, as in the AUDIT, there is also a question on frequency of drinking larger amounts (> 60 g in a day). Deriving volume by summing days when the amount is above the 60 g threshold and the amount due to the below threshold "typical" amounts for remaining days is recommended to improve precision47. However, a problem is that the above threshold amount is an undefined guess 39, particularly if maximum 48 has not been ascertained as in the AUDIT, making four items necessary to adequately assess drinking patterns. When greater precision of measurement is needed, the F-GF is a useful candidate. It is efficient, involving essentially five items. The first task is to carefully assess the ethanol consumed on the heaviest drinking occasion in the prior 12 months (or other reference period such as last 30 days) by asking about the relevant range of locally consumed beverage types and related sizes of drinking vessels determined from preliminary studies 9 incorporating pictures of glassware used or employing a measuring beaker if needed 49. The heaviest drinking occasion often stands out too and is remembered by respondents either because it is the usual amount (as found in this Goan community survey) or conversely because it is an unusual or unique event, as more often true in developed countries 43. After this single detailed assessment focused on ethanol intake of the largest amount, only four questions are needed, asking frequencies of drinking about this (the largest) amount, and the three fractional levels below that amount. An individual or group (Figure 2) drinking pattern can easily be derived.

For prevention planning and evaluation of outcomes, such information on drinking patterns is very valuable. First, it is important for targeting messages. Generally, but not always abstinence is a goal of intensive treatment programs aimed at alcohol dependent individuals, but the client goals and capacities must be taken account of [50]. Prevention programs will most often aim at reductions in amounts consumed in high risk situations, implicitly a contextualized aspect of drinking pattern. In predicting problem outcomes, questions about the social and venue characteristics surrounding drinking events, and individual and cultural preferences for drinking in certain contexts [51] are especially important to augment the diary or summary measures such as the F-GF but full discussion of these is beyond the scope of this paper.

For both HIV transmission and course of illness studies, when accurate self-report measures of alcohol use patterns are important, we believe the methodologies described here offer useful guidance in developing countries. A limitation with summary QF will be that recall is known to diminish over time, though less so when the pattern is more routinized 39. All self-report summary measures tend to suffer from undercoverage when compared to aggregate sales data, and one advantage of prospective diaries if they can be recorded daily is that recall of yesterday's drinking in detail may partly overcome this limitation [52]. In addition to showing that the F-GF volume and simple heavy drinking frequency measure derived from it are somewhat superior to those assessed by the more typical QF measure, we believe that for studies of HIV transmission it is important to examine the extent to which men and women in a given culture (such as India) drink in private (e.g., home, others' parties) versus public (e.g., restaurant and bars) venues [53].

CONCLUSIONS

A promising, efficient new self-report measure summarizing alcohol use patterns that was incorporated into a community epidemiological survey of alcohol and sexual risk taking in Goa, India was validated for hazardous drinkers against intensive daily records of drinking amounts in a 28-day 'diary' obtained during weekly in-person interviews. Results were also compared with simpler quantity-frequency measures which can assess volume but fall short

of capturing pattern of drinking. In this study however, the QF measure performed quite well since the usual amount was typically the same as the largest amount, given the heavy drinking pattern of Goan males. The new Fractional graduated Frequencies (F-GF) measure revealed this pattern in detail and was for the full group of hazardous drinkers included in the diary validation sample, highly congruent with the daily records. We cautiously recommend consideration of this approach to measuring alcohol use patterns for further epidemiological and prevention studies of sexual risk and HIV/AIDS in India. The validity analyses will need to be replicated by other investigators working in other populations and study contexts.

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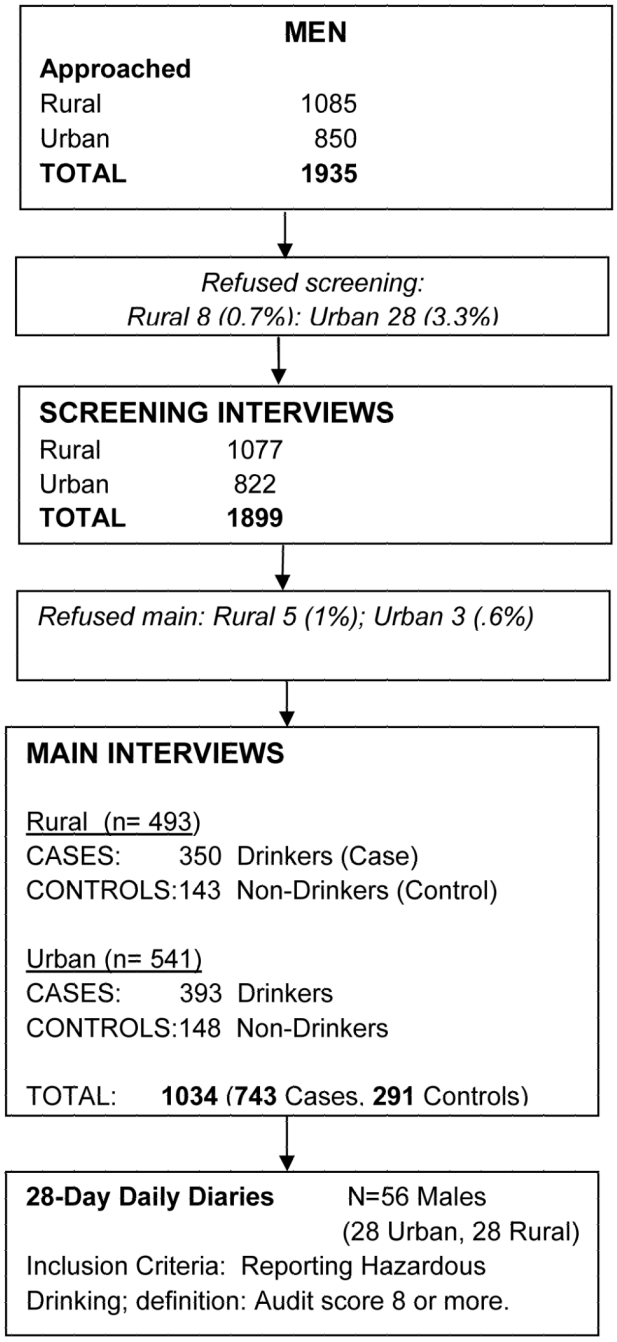

Figure 1.
Study Sampling Design (For Males Only)

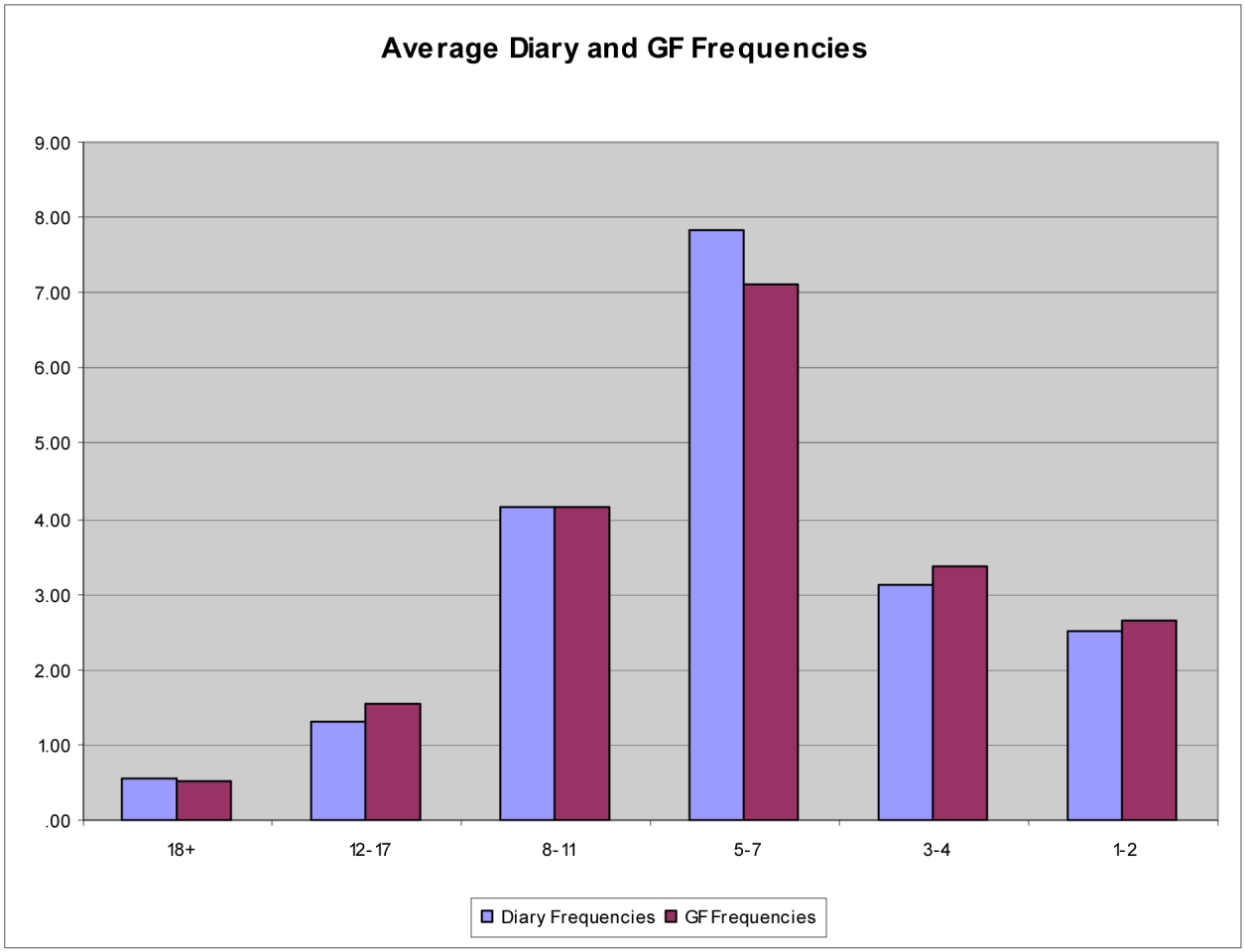

Figure 2.

Correspondence between Mean Frequencies (Y Axis: Mean Days) at various Quantity Levels (Y Axis: Metric is 12 g Ethanol "Drinks") based on Fractional Graduated Frequencies (F-GF) and 28-Day Diary of Daily Drinking Data (Validity Sample is n = 56 Hazardous Drinkers, see Text).

Table I

The Fractional Graduated Frequencies (F-GF) Measure: Mean Quantities and Frequencies and other Statistics at four Levels of F-GF Measure

Drinking Level About …	Mean (SD) Quantity, Grams ETOH	Mean (SD) Quantity, Liters ETOH	Mean (SD) Frequency, Days in Year	Percent of Total Frequency	Percent of Total Volume
the Maximum	65.8 (56.9)	3.6 (10.2)	41.7 (86.5)	50.4%	56.1%
¾ Maximum	49.4 (42.6)	1.8 (7.8)	16.4 (55.9)	11.8%	12.1%
½ Maximum	32.9 (28.4)	2.6 (7.6)	38.0 (85.6)	27.6%	24.4%
¼ Maximum	16.5 (14.2)	0.6 (2.7)	12.9 (49.2)	10.2%	7.4%

Table II

Beverage Types Consumed by Males Drinking at least Monthly: Overall (Bold), Urban and Rural, based on the Beverage-Specific Knupfer Series (KS) Measure

Beverage Type	No. Reporting Consumption Overall, Urban, Rural	Monthly Mean (SD) Volume, Liters ETOH Overall Urban, Rural	Percentage of Total Volume Overall Urban, Rural	Mean Monthly Frequency Overall Urban, Rural
Wine	**103** 82, 21	**0.01 (0.05)** 0.016 (0.051), 0.008 (0.005)	**0.4** 0.6, 0.1	**0.6** 0.5, 1.0
Beer	**419** 250, 169	**0.15 (0.26)** 0.17 (0.27), 0.12 (0.21)	**12.9** 19.3, 7.4	**3.7** 4.0, 3.2
Spirits (IMFL* or imported)	**284** 175, 109	**0.60 (0.90)** 0.58 (.86), 0.65 (.96)	**35.5** 47.3, 26.5	**8.9** 8.8, 9.1
Caju Feni	**196** 89, 107	**0.83 (1.09)** 0.66 (.98), 0.97 (1.16)	**32.2** 14.6, 26.0	**11.8** 9.5, 13.7
Coconut Feni	**14** 11, 3	**0.18 (0.76)** 0.22 (.83), 0 (0)	**0.53** 1.1, 0.0	**1.8** 2.2, 0
Urrack	**195** 87, 108	**0.42 (1.00)** 0.11 (0.20), 0.67 (1.27)	**17.0** 4.4, 27.0	**5.9** 2.2, 8.8
Mixed Drinks	**45** 40, 5	**0.01 (0.01)** 0.009 (0.013), 0.021 (0.014)	**0.1** 0.2, 0.1	**0.5** 0.4, 1.2

* IMFL = Indian Manufactured Liquor

Table III

Comparison of Mean Volume and Frequency for Quantity-Frequency (QF), Fractional Graduated Frequency (F-GF) and Knupfer Series (KS Beverage Specific Measures for Males Drinking: (a) Once or more in Prior 12-months, (b) at least Monthly [*]

Drinking Measure	Mean Volume (SD) Liters ETOH In 12 Months	Mean Frequency Drinking Days In 12 Months
Among Males Drinking at least Yearly (n=743)		
QF	7.27 (13.77)	104.9
F-GF	8.58 (16.27)	109.1
Among Males Drinking at least Monthly (n=542)		
QF	9.8 (15.3)	140.1
F-GF	11.7 (18.1)	146.9
KS – Beverage Specific	10.8 (15.5)	167.5

[*] KS Measure for Monthly Drinkers only (see also Table II)