EPIDEMIOLOGY

Impact of Different Reference Period Definitions in the Quantification of Alcohol Consumption: Results from a Nationwide STEPS Survey in Mozambique

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Abstract — Aims: To compare the estimates of alcohol consumption in Mozambique obtained with different reference period definitions. This is a critical methodological aspect when measuring alcohol consumption and its impact is likely to vary across settings.

Methods: A nationally representative sample of 3264 Mozambicans aged 25–64 years was evaluated in a community-based cross-sectional study conducted between September and November 2005. Face-to-face interviews were conducted following the World Health Organization-Stepwise approach to Surveillance methodology. The amount of alcohol consumed was estimated among current drinkers, using the previous week (1W) and the 12 months (12M) prior to the data collection as the reference.

Results: Among drinkers, the prevalence of consumption of >14 drinks/week was higher in men (12M: 18.6 vs. 7.8%; 1W: 16.3 vs. 6.1%), although the prevalence of excessive weekly intake (>7 drinks for women and >14 drinks for men) was higher among women (12M: 25.9 vs. 18.6%; 1W: 18.1 vs. 16.3%). The concordance between the reported intakes according to the reference period was low (κ = 0.25). Conclusion: In this setting where alcohol consumption is a male-dominated behaviour, among drinkers the prevalence of gender-defined excessive amounts was higher in women. The concordance between different recall periods was low and this needs to be taken into account when comparing results from different studies.

INTRODUCTION

Alcohol consumption is a major health determinant, being among the leading causes of morbidity and mortality worldwide (Ezzati et al., 2002; Rehm et al., 2003b). The monitoring of alcohol use and trends in drinking patterns are essential to estimate and predict the global burden of disease and alcohol-related mortality (Rehm et al., 1996, 2003a; WHO, 2007).

Regarding the quantification of alcohol consumption, several methodological issues should be taken into consideration in the design and conduct of surveys aiming to assess the intake of alcoholic beverages (Bloomfield et al., 2003; Dawson, 2003; Greenfield and Kerr, 2008). The period of time over which respondents are instructed to summarize their drinking behaviour is one of these critical factors with potential impact on the estimates. It usually ranges between the 12 months, month, week or day that precedes the interview or refers to the most recent occasion of consumption (Dawson, 1998, 2003; WHO Department of Mental Health and Substance Dependence, 2000; Greenfield and Kerr, 2008). The longer reference periods are more likely to be associated with recall bias and the accuracy of the reports depends on the ability of the participants to average their consumption over time (WHO Department of Mental Health and Substance Dependence, 2000; Dawson, 2003; Greenfield and Kerr, 2008). When reference periods are shorter, consumption is easier to recall (Rehm, 1998; Stockwell et al., 2004), but the usual alcohol intake of subjects with an irregular consumption pattern may not be accurately estimated (Wyllie et al., 1994; Rehm et al., 1999; Bloomfield et al., 2003).

The potential impact of the recall period on alcohol consumption estimates may vary across populations with different drinking patterns, educational levels and social and cultural backgrounds (Bloomfield et al., 2003; Greenfield and Kerr, 2003). Since Mozambique is characterized by a high frequency of binge drinking and consumption of homemade beverages, low literacy and many ethnic and religious groups living mostly in rural areas (Padrao et al., 2011a,b), we aimed to compare the estimates of the amount of alcohol consumed obtained with different reference period definitions, in this setting.

METHODS

A nationally representative sample of the Mozambican population aged 25–64 years was evaluated in a community-based cross-sectional study conducted between September and November 2005, as described in detail elsewhere (Damasceno et al., 2009; Gomes et al., 2010; Padrão et al., 2011a; Silva-Matos et al., 2011). Briefly, it relied on a multi-stage sampling design based on the information provided by the 1997 census (INE, 1997) for the selection of 95 geographical clusters and 25 households within each cluster. Trained interviewers evaluated all the eligible subjects in each selected household in a face-to-face interview, following the World Health Organization Stepwise approach to Surveillance (STEPS) to Chronic Disease Risk Factor (WHO, 2011a,b,c).

Assessment of alcohol consumption

The STEPS questionnaire allowed the quantification of alcohol intake through different sets of questions, with the quantification of consumption referring to two distinct reference periods. It was introduced by the sentence ‘The following questions are about alcohol consumption’, and then followed by the question ‘Have you ever consumed any beverage containing alcohol such as beer, wine, “nipa” or homemade fermented beverages?’ Subjects that reported never...
having consumed alcoholic beverages, of any type, were classified as life-time abstainers. Those who reported having consumed alcoholic beverages before were asked if they had any drink in the previous 12 months. The subjects answering positively were further questioned about the frequency of consumption in the 12 months prior to data collection and in the previous week. Those having consumed alcoholic beverages before, but not in the previous 12 months, were classified as ex-drinkers.

**Alcohol consumption in the 12 months prior to data collection**

Subjects that reported consuming at least one drink in the previous 12 months were classified as current consumers. They were asked about the frequency of consumption of at least one alcoholic beverage (<1 day/month; 1–3 days/month; 1–4 days/week and ≥5 days/week), and the usual number of alcoholic drinks drunk in each occasion. Home-made beverages are usually consumed using a receptacle (cabaça) shared by several people in a single occasion. The term ‘cabaça’ does not refer to a specific type of container or a container with a specific capacity, but to the form of consumption in which a container is shared. It is known that the use of those beverages is strongly associated to a binge drinking pattern (these drinks are consumed on festive occasions and the consumption of an amount of beverage above five drinks is the most usual). For that reason, we equated a ‘cabaça’ to five standard drinks, which is the cut-off established for binge drinking among men (Lichtenstein et al., 2006).

The usual frequency of alcohol consumption was defined under the assumption that the midpoint in each category of exposure is a valid estimate of the usual intake among the subjects classified in that group of exposure. The midpoint was computed by adding half the difference between the upper and lower limit of each category to its lower limit. To obtain the number of drinks consumed per week in the previous 12 months, we multiplied the usual weekly frequency of consumption by the number of standard drinks usually consumed on each occasion. For example, if a participant drinks 1–3 days/month, the midpoint of this category is set to 2 days/month (1 + [(3−1)/2] = 2), which corresponded to an average weekly frequency of consumption of 0.5 times/week. This figure is then multiplied by the usual number of drinks consumed on each occasion to obtain the estimated average weekly consumption.

**Alcohol consumption in the previous week**

We also obtained data from current drinkers about the number of standard drinks consumed during each day of the previous week. When the survey was conducted during Ramadan, the individuals were asked about the consumption in a typical week outside this period.

To obtain the number of drinks consumed in the previous week, we added up the consumptions reported for each of the days, from Monday to Sunday.

**Socio-demographic measures**

The classification of the place of residence as urban (in any of 23 cities and 68 towns) or rural (outside cities or towns), and the definition of categories for the highest level of education attained were done in accordance with the 1997 census (INE, 1997) and the highest education level attained was registered and participants grouped in three categories (<1, 1–5 and ≥6 years). The participants were classified into four age groups (25–34, 35–44, 45–54 and 55–64 years).

**Statistical analysis**

Quantitative assessment of alcohol consumption in the previous 12 months and in the previous week was accomplished in 3264 subjects who were considered for the analyses. To define categories of exposure among current drinkers, we used guidelines of the American Heart Association that establish the maximum daily intake of one standard drink for women and two for men (Lichtenstein et al., 2006).

We used a Bland–Altman plot to assess the agreement, regarding the quantity of alcohol consumed, between alcohol consumption reports using the two reference periods for assessing intake. The kappa statistic was computed to quantify the concordance between the reports on the frequency of alcohol consumption in the previous week and the calculated weekly consumption in the previous 12 months.

Prevalence of alcohol drinking and consumption of different amounts of alcoholic beverages were estimated, and multivariate Poisson models (McNutt et al., 2003) were used to compute-adjusted prevalence ratios (PR) for the comparison of the frequencies of alcohol consumption among current drinkers according to socio-demographic characteristics, considering different reference periods. These estimates were obtained accounting for the sampling weights, stratified sampling and clustering at the primary sampling unit level.

All analyses were conducted using STATA, version 11.0.

**Ethics**

The study protocol was approved by the National Mozambican Ethics Committee and written informed consent was obtained from all participants.

**RESULTS**

Over half of the participants answering the questionnaire were women (57.1%), and most lived in rural areas (women: 69.1%; men: 67.0%). Approximately, two-thirds of the subjects were aged 44 years or younger (women: 70.8%; men: 63.9%), with 11.0% of women and 15.2% of men being older than 54 years. About half of the participants had five or less years of formal education, with 44.5% of women and 20.6% of men having completed the first school year.

The overall percentage of current and ex-drinkers was 28.9% [95% confidence interval 95% (CI): 22.6–35.2] and 13.0% (95% CI: 9.3–16.6), respectively, among women, and 57.7% (95% CI: 49.8–65.7) and 14.7% (95% CI: 12.6–16.9), respectively, among men.

**Frequency of alcohol consumption among current drinkers, for different reference periods**

Among women, the proportion of current drinkers reporting a consumption of more than 14 drinks per week during the previous 12 months was 7.8%, and the prevalence was lower
When only the previous week was considered, although this difference was not statistically significant. The prevalence of consumption of less than one standard drink per week was 38.7% when the reference was the 12-month period and 40.8% in the week preceding the interview. Among men, the proportion of current drinkers consuming more than 14 drinks per week was more than twice that of women, irrespective of the reference period (18.6% for the 12-month reference period vs. 16.3% in the previous week), while the proportion of current drinkers reporting to have consumed less than one standard drink per week in the previous 12 months was 20.0%, and higher (25.2%) when the consumption referred to the previous week (Table 1).

However, the prevalence of excessive weekly intake using gender-specific cut-offs (>7 drinks for women and >14 drinks for men) was higher among women (12M: 25.9 vs. 18.6%; 1W: 18.1 vs. 16.3%).

Agreement between alcohol consumption in the previous 12 months and in the previous week

Figure 1 shows the poor agreement between the two methods of assessment across different levels of consumption, and a tendency for higher estimates to be obtained with the 12-month reference period when consumptions are above 14 drinks/week.

Table 2 depicts the concordance between the reports of alcohol consumption in the previous week and weekly consumption in the 12 months prior to data collection, among current drinkers. Overall, about half of the participants reported the same weekly consumption in the previous 12 months and in the previous week, 30.0% reported a higher consumption when the reference period referred to the previous 12 months and 17.5% a higher consumption when the reference was the previous week. The κ statistic was 0.25, and no meaningful variation in concordance was observed according to socio-demographic characteristics of the participants.

PRs for the comparison of the weekly frequencies of alcohol consumption among current drinkers in the previous 12 months and week

As depicted in Table 3, no consistent variation was observed across age groups in men, or according to education or place of residence in both genders. Among women, the estimates obtained from the reports of an intake of more than seven drinks per week in the previous 12 months increased gradually with age (the PR increased from 1.14 for 25–34 vs. 35–44 years to 1.34 for 55–64 vs. 25–34 years), but the differences were not statistically significant. On the other hand, when the reference period was the previous week, the associations were stronger and statistically significant for the age group 35–44 (PR = 2.24, 95% CI: 1.12–4.48) and 45–54 years (PR = 2.06, 95% CI: 1.05–4.05).

DISCUSSION

Nearly two-thirds of men and one-third of women are current drinkers, among whom the prevalence of consumption of >14 drinks/week was higher in men. Nevertheless, the prevalence of gender-defined excessive weekly intake (>7 drinks for women and >14 drinks for men) was higher among women, irrespective of the reference period. The concordance between the intakes reported by each subject when using the 12-month or the 1-week recall period definition was quite low, regardless of the socio-demographic characteristics of the participants. However, the prevalence of
Weekly alcohol consumption in the previous 12 months vs. previous week (three categories of exposure)\footnote{Categories of exposure (women: <1, 1–7, >7 standard drinks/week; men: <1, 1–14, >14 standard drinks/week), defined according to the recommendations of the American Heart Association of a maximum daily intake of one standard drink for women and two for men (Lichtenstein et al., 2006)}. among current drinkers

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Previous 12 months = previous week, n (%)</th>
<th>Previous 12 months &gt; previous week, n (%)</th>
<th>Previous week &gt; previous 12 months, n (%)</th>
<th>( \kappa ) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25–34</td>
<td>346 (53.9)</td>
<td>112 (28.8)</td>
<td>71 (18.2)</td>
<td>0.26 (0.20–0.32)</td>
</tr>
<tr>
<td>35–44</td>
<td>206 (53.0)</td>
<td>112 (28.8)</td>
<td>71 (18.2)</td>
<td>0.26 (0.19–0.33)</td>
</tr>
<tr>
<td>45–54</td>
<td>178 (51.6)</td>
<td>94 (27.2)</td>
<td>73 (21.2)</td>
<td>0.23 (0.16–0.31)</td>
</tr>
<tr>
<td>55–64</td>
<td>97 (49.5)</td>
<td>59 (30.1)</td>
<td>40 (20.4)</td>
<td>0.19 (0.09–0.29)</td>
</tr>
</tbody>
</table>

Place of residence

<table>
<thead>
<tr>
<th>Rural</th>
<th>Urban</th>
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<tbody>
<tr>
<td>534 (50.4)</td>
<td>416 (54.4)</td>
</tr>
<tr>
<td>203 (29.3)</td>
<td>234 (30.6)</td>
</tr>
<tr>
<td>141 (20.4)</td>
<td>114 (14.9)</td>
</tr>
<tr>
<td>0.20 (0.15–0.25)</td>
<td>0.28 (0.23–0.34)</td>
</tr>
</tbody>
</table>

\( 95\% \) CI, 95% confidence interval; \( \kappa \), Cohen’s \( \kappa \) coefficient.

Although it is already known in the world literature that different recall periods can yield different estimates, to our knowledge, this is the first report from Sub-Saharan Africa addressing this point.

Nevertheless, some limitations need to be pointed out. The number of drinks consumed in the day of the highest intake may be misclassified due to the assumption that the \textit{cabáca} corresponds to five standard drinks. However, no important bias is expected because the use of these containers is associated with binge drinking. This is unavoidable due to the cultural specificities of the consumption of traditional beverages in this setting and failing to take them into account would have much worse consequences than the imprecision associated with the quantification of its use. Although the use of homemade traditional beverages cannot be accurately quantified in terms of ‘standard drinks’, because these beverages do not always have the same alcohol content, this is not expected to compromise the validity of the participants’ classification in categories of frequency of consumption. The questionnaire employed the use of the generic term ‘alcoholic

Table 2. Concordance between alcohol consumption reports using different reference periods for assessing intake (previous 12M or previous week), among current drinkers, according to the socio-demographic characteristics

<table>
<thead>
<tr>
<th>Place of residence</th>
<th>n (%)</th>
<th>n (%)</th>
<th>n (%)</th>
<th>n (%)</th>
<th>n (%)</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All participants</td>
<td>765 (52.5)</td>
<td>437 (30.0)</td>
<td>255 (17.5)</td>
<td>0.25 (0.21–0.28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Women</td>
<td>323 (50.2)</td>
<td>190 (29.5)</td>
<td>131 (20.3)</td>
<td>0.22 (0.17–0.28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>442 (54.4)</td>
<td>247 (30.4)</td>
<td>124 (15.2)</td>
<td>0.21 (0.16–0.26)</td>
<td></td>
<td></td>
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<tr>
<td>Age (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>40 (20.4)</td>
<td>0.19 (0.09–0.29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1</td>
<td>160 (47.9)</td>
<td>113 (33.8)</td>
<td>61 (18.3)</td>
<td>0.20 (0.12–0.27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–5</td>
<td>385 (53.8)</td>
<td>197 (27.5)</td>
<td>134 (18.7)</td>
<td>0.26 (0.20–0.31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥6</td>
<td>219 (54.1)</td>
<td>126 (31.1)</td>
<td>60 (14.8)</td>
<td>0.27 (0.20–0.34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place of residence</td>
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<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Table 3. PRs for the comparison of the frequencies of alcohol consumption among current drinkers according to socio-demographic characteristics, considering the different reference periods used to assess intake (previous 12M or previous week)

<table>
<thead>
<tr>
<th>Women, PR(^b) (95% CI)</th>
<th>Men, PR(^b) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>25–34</td>
<td>1.00 (0.75–1.34)</td>
</tr>
<tr>
<td>35–44</td>
<td>1.00 (0.79–1.26)</td>
</tr>
<tr>
<td>45–54</td>
<td>1.12 (0.80–1.58)</td>
</tr>
<tr>
<td>55–64</td>
<td>1.14 (0.54–3.29)</td>
</tr>
</tbody>
</table>

95% CI, 95% confidence interval; \( \phi \), Person–Year ratio; \( \psi \), pretest–posttest coefficient.

The cut-offs of 7 and 14 drinks per week were used for women and men, respectively, taking into account the recommendations of the American Heart Association of a maximum daily intake of one standard drink for women and two for men (Lichtenstein et al., 2006).

PR: prevalence ratio; 95% CI, 95% confidence interval.

\( \ast \)Derived from models including all the variables presented in the table.

\( \ast \)Categories of exposure (women: <1, 1–7, >7 standard drinks/week; men: <1, 1–14, >14 standard drinks/week), defined according to the recommendations of the American Heart Association of a maximum daily intake of one standard drink for women and two for men (Lichtenstein et al., 2006).

\( \ast \)Derived from models including all the variables presented in the table.

Consumption of more than seven standard drinks/week was higher for the 1-year reference period.

Although it is already known in the world literature that different recall periods can yield different estimates, to our knowledge, this is the first report from Sub-Saharan Africa addressing this point.

Nevertheless, some limitations need to be pointed out. The number of drinks consumed in the day of the highest intake may be misclassified due to the assumption that the \textit{cabáca} corresponds to five standard drinks. However, no important bias is expected because the use of these containers is associated with binge drinking. This is unavoidable due to the cultural specificities of the consumption of traditional beverages in this setting and failing to take them into account would have much worse consequences than the imprecision associated with the quantification of its use. Although the use of homemade traditional beverages cannot be accurately quantified in terms of ‘standard drinks’, because these beverages do not always have the same alcohol content, this is not expected to compromise the validity of the participants’ classification in categories of frequency of consumption. The questionnaire employed the use of the generic term ‘alcoholic
beverage’, rather than specific varieties of these beverages which may contribute to inaccuracy reporting, but this has been minimized by providing examples of the main types of drinks consumed in this setting.

The concordance between reports referring to short and long recall periods was consistently low across groups of subjects with distinct socio-demographic characteristics. This may bias the associations towards the null (Rothman et al., 2008), and explain the relatively weak associations observed between socio-demographic characteristics and the amount of alcohol consumed.

Higher amounts of drinking were estimated when the calculation was based on the longer reference period, in accordance with previous observations (Rehm, 1998; Rehm et al., 1999; Dawson and Room, 2000).

In Mozambique home-made traditional fermented beverages are commonly produced by women from rural areas, and this may contribute to explain their higher excessive alcohol consumption, when a gender-specific cut-off is used. Despite more women than men being abstainers or irregular drinkers, during weekends and other social or cultural celebrations (birth of a baby, marriages and funerals) the intake of alcoholic beverages tends to increase sharply, namely among infrequent drinkers (Obot, 2000, 2006; WHO Department of Mental Health and Substance Dependence, 2000; Padrão et al., 2011a). This finds an interesting parallel in the tobacco consumption in Mozambique, where traditional forms of tobacco use, such as hand-rolled or smokeless tobacco, are more frequently consumed by women (Aratújo et al., 2011; Lunet et al., 2011).

The difficulties in measuring accurately the consumption of traditional beverages, the poorer social acceptability of alcohol consumption among women and their irregular consumption, when compared with men, along with the potential differences in the degree of addiction and psychoactive effects of alcohol (Brown et al., 1992; Babor et al., 2000; Del Boca and Noll, 2000) may partially explain some differences in self-reported consumption among women and men (Del Boca and Darkes, 2003).

CONCLUSION

In this setting, where binge drinking and the consumption of home-made beverages are frequent, the concordance of individual reports based on different reference period definitions was low and the longer recall period yielded higher estimates of higher amounts of drinking. This needs to be taken into account to avoid spurious interpretations of alcohol consumption monitoring data, and the assessment of alcohol intake using different reference periods may be needed to ensure a valid comparison across surveys conducted in different moments and settings.

Important challenges remain in adapting measurement techniques to the drinking patterns in developing countries, where drinking may be a communal activity. It is unclear how well existing measurement approaches capture atypical light drinking among subgroups whose predominant drinking pattern is characterized by infrequent heavy drinking.

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REFERENCES


