

## Counting the cold ones: A comparison of methods measuring total alcohol consumption of Managed Alcohol Program participants

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### **Conflicts of interest**

We declare receipt of funding from Shelter House, Thunder Bay and also Vancouver Coastal Health for preliminary pilot research. This was a small proportion of all funds received for this project and these particular funds were fully spent before the initiation of the main project. TS declares (i) receipt of research funds from Systembolaget, the Swedish government retail alcohol monopoly, for a study of the public health impacts of its policies (ii) receipt of travel expenses from IOGT-NTO, the Swedish Temperance Foundation to attend an annual research meeting.

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### **Accepted Manuscript**

*The accepted manuscript (AM) is the final draft author manuscript, as accepted for publication by a journal, including modifications based on referees' suggestions, before it has undergone copyediting, typesetting and proof correction. This is sometimes referred to as the post-print version.*

**Abstract (249 words)**

**Introduction and Aims:** Managed Alcohol Programs (MAPs) aim to reduce harms experienced by unstably housed individuals with alcohol use disorders by providing regulated access to beverage alcohol, usually alongside housing, meals and other supports. This study compares two methods of estimating participants' outside alcohol consumption in order to inform program policies and practices around alcohol dosing and reducing risks of alcohol-related illnesses.

**Methods:** The total alcohol consumption of 65 people participating in Canadian MAPs was assessed comparing daily MAP records (1903 client days) with researcher-administered surveys over the same time period. A sub-sample of more complete daily MAP records for 39 people (696 client days) was also compared with the equivalent survey data on drinking.

**Results:** Significantly more standard drinks per day (SDs, 1 SD=17.05ml ethanol) were reported in research interviews than recorded by program staff, whether for program administered drinks alone (means 16.04 vs 8.32 SDs,  $t=5.79$ ,  $P<0.001$ ) or including outside-program drinks as reported to staff (16.04 vs 8.89 SDs,  $t=5.37$ ,  $P<0.001$ ). Consistent results were found in the sub-sample. The number of outside drinks estimated by comparing program records with the research interviews, varied between 2.71 and 9.94 mean drinks per day per site.

**Discussion and Conclusions:** At two sites, MAP participants reported consuming more than twice the amount of alcohol administered on the program. At most sites, there was significant under-reporting of outside drinking. Addressing the problem of outside drinking and total daily consumption is critical for achieving program goals of both short and long-term harm reduction.

**Key words:** Managed Alcohol Programs, alcohol consumption, self-report measures, harm reduction.

## 1. Introduction

People with unstable housing often experience problems related to alcohol and other drug use, which can create barriers to obtaining and retaining stable accommodation. Among unstably housed people experiencing alcohol use disorders, consumption often exceeds 20 standard drinks per day [1, 2] and inexpensive and easily accessible forms of alcohol are often sought to prevent withdrawal symptoms such as seizures. Consumption of non-beverage alcohol (NBA) such as rubbing alcohol or mouthwash may also be consumed at times when no other forms of beverage alcohol are accessible. As these patterns of drinking are often occurring in street-based settings they can further compound the harms associated with heavy alcohol use such as trauma [3], chronic illness [4] and death [1] arising from acute intoxication and/or long-term use.

Managed alcohol programs (MAPs) in Canada are designed to provide regulated access to beverage alcohol, usually alongside housing, meals and other supports [5, 6]. A scheduled number of alcoholic drinks are dispensed to participants throughout the day to help prevent withdrawal symptoms, to reduce binge drinking episodes, and decrease or eliminate the need for NBA use. While the primary goal is usually not to eliminate or even significantly decrease overall alcohol consumption, the regulated doses of alcohol provided by the programs are intended to reduce the harmful patterns of consumption described above and provide a safer drinking environment in contrast to drinking outside the program in street-based settings that have previously contributed to negative outcomes. Epidemiological research makes clear that risks of serious alcohol-related diseases and premature death are directly related to the volume of alcohol consumed over time [7]. The present research is motivated by a concern that level of total alcohol consumption by MAP clients also needs to be carefully monitored, including alcohol consumed outside of the program.

To enter a MAP, participants need to meet program eligibility criteria based on indications of an alcohol use disorder using tools such as the AUDIT [8], SADQ [9], consumption of NBA, a history of homelessness or unstable housing, failed treatment attempts, a pattern of harm to themselves or the community, and frequent use of emergency services (e.g. emergency rooms, police) [6]. More information on Canadian MAPs can be found in Pauly et al. [5] in this special issue of *Drug and Alcohol Review*.

To date, there is limited but promising evidence for effectiveness of MAPs. Findings from MAP pilot evaluations in two Canadian cities showed reductions of NBA use,

improvements in quality of life and varying outcomes in liver health among participants [6, 10, 11]. However, alcohol was consistently consumed in addition to the regular doses provided by the MAPs [6, 10, 11] and sometimes in substantial quantities [11]. Research by Podymow et al. [12] on a MAP in another Canadian city showed reductions in emergency department visits and police encounters as well as significant decreases in alcohol consumption. On average, participants' total recorded alcohol consumption decreased significantly from 48 drinks to eight drinks per day. However, participants were not asked about their drinking outside of the MAP and blood markers of alcohol use did not vary significantly after program entry raising doubt about an actual reduction in overall alcohol consumption.

The Canadian MAPs in the current study have a variety of policies designed to deter participants from drinking alcohol over and above the doses provided by the programs. All of the MAPs had a policy of not providing alcohol to visibly intoxicated participants and two program required clients to be on the premises for at least one hour before being administered a drink. All of the MAPs had policies to discourage participants bringing outside alcohol into the program. For example, in two programs, room searches were conducted to discourage participants from bringing in outside alcohol. Some MAPs conduct pat downs of participants following outings, while others had an explicit policy where repeated instances of drinking outside the MAP could lead to a review of participants' eligibility to be in the program.

Program managers and staff noted the challenges around collecting information on participants' alcohol use outside of the MAP [6]. Accurate information on outside drinking is important for program managers as they strive to support clients to reduce alcohol-related harms. Outside drinking is likely to be more hazardous in terms of risks of violence, overdose, contacts with police, hospitalisation, and use of NBA. It adds to total daily consumption and risk of long-term alcohol-related illnesses (e.g. liver disease and cancers) [7]. It also raises questions for program managers whether the amount of alcohol administered is adequate and whether more effective policies are required to manage outside drinking. In turn, this information is important for policymakers and researchers to understand the potential benefits and harms of MAPs for this vulnerable population.

The purpose of our analysis was to provide an accurate estimate of participants' total alcohol consumption in order to (i) inform program policies and practices pertaining to alcohol consumption both within and outside the program and (ii) inform discussions about the overall

goals of MAPs in relation to reducing both short and longer terms harms from alcohol use. Specifically, we tested three hypotheses: 1) there is substantial alcohol consumption occurring outside of the doses provided by the programs; 2) program records underestimate participants' outside alcohol consumption, and 3) the extent of outside drinking and its underestimation by program staff would vary across sites. We took advantage of the opportunity to directly compare daily program records of clients' alcohol consumption with amounts reported in independent, confidential research interviews over a comparable 30-day period matched for each participant.

## **2. Methods**

### **2.1 Design**

We compared two sources of information to estimate participants' total alcohol consumption. We used a comparison sample cross-sectional design [13] using survey data on alcohol consumption collected by research staff for a national study on the effectiveness of Canadian MAPs described in more detail elsewhere in this special issue. This was compared to participants' alcohol consumption recorded by staff as part of the program records. The research team assisted program staff at each site to implement a systematic approach to recording outside alcohol consumption in addition to the daily dosing information they already collected. All clients on these MAPs were approached and invited to participate in the larger research study. We focus here on a sub-sample of relatively new MAP participants.

For the present analysis, we selected a 30-day period of time for each participant to compare total alcohol consumption between a) staff's program records data and b) research interview data. Within each participant's data, we ensured that we were comparing the same 30-day period, by referring to the date of the research interview and finding the equivalent period in the program records data. The period selected occurred approximately 6 months after enrolment in the study (mean 5.03, range 1 to 7 months) to allow time to settle into the program, stabilise their drinking patterns and for staff to learn to implement the new recording system.

The study was approved by the University of Victoria's human research ethics board (protocol #13-002) and by each of the MAP sites.

### **2.2 Sample**

At five different MAP sites in five Canadian cities, a total of 76 new MAP residents were approached of whom 72 agreed to participate in monthly follow-up interviews. Of these, 65 provided self-reported alcohol consumption data for a 30-day period to the research team that could be matched with program records of alcohol consumption for the same time period. Two sites had 12 participants each, two sites had 20 each and one had a single participant for this analysis. These 65 individuals collectively provided 1903 days of program record data on drinks administered and outside drinks reported to staff, with a range of between 12 and 30 days of program data per participant (mean=29.28 days). In addition, data were analysed separately for a sub-group of 39 individuals for whom complete records were kept by staff about alcohol consumption outside the program across 696 days.

### 2.3 Measures

#### *(i) Program Records Data*

MAP staff recorded the number of drinks administered to each person each day. In addition, when the first drink of the day was administered, staff asked whether the client had consumed alcohol outside of the program on the previous day (Yes/No/Unsure) and, if “Yes” to document the total amount and type of alcohol consumed outside in the previous 24 hours. This was later converted by the research team into numbers of Canadian standard drinks (SDs, 1 SD=17.05mL ethanol). These outside-program drink amounts were then combined with the recorded number of program drinks administered to that client the previous day to arrive at a total daily number of SDs for that day.

The program data on outside drinking was of variable quality across the different sites. Positive or negative reports of outside drinking were entered on only 36.6% of the available 1903 days of alcohol administration data analysed for this study. We learned that at several sites most staff only entered data if any outside drinks were reported and otherwise left the forms blank. These data were therefore analysed separately under two assumptions about these missing data: a) that a failure to record outside drinking always meant there had been no outside drinking or b) it was uncertain whether alcohol had been consumed outside the program where records of this were not completed. In the first instance, all 1903 days of drinking were included for all 65 clients. In the second instance, a more conservative approach was taken and only days with complete data were used, resulting in a subsample of 696 days of data for 39 clients.

*(ii) Research Interview Data*

The date of each interview was recorded so it was possible to link the 30-day period covered to exactly the same period from the program alcohol records described above. Participants were asked: “*In the past 30 days, on those days when you drank, how much did you usually have?*” Their responses were recorded carefully with prompts from the research assistants to obtain details of amounts and beverage types to be later converted into SDs.

## 2.4 Analysis

The date of each participant’s research interview was used to determine the same 30-day period from which to gather program records data. Paired t-tests were used to test for statistical significance of differences between the daily amounts of alcohol estimated from the two sources [14]. We first transformed all measures into natural log-transformed formats and modeled these log-transformed measures in order to test any significant effects of skewed distribution on the estimates. All statistical analyses were performed using SAS 9.3 [15].

The mean total drinks per drinking day was calculated from both the program records and the research interviews for each participant and then compared statistically, both for the full sample of 65 and subsample of 39 participants. These comparisons were also analyzed separately by site to see whether there were any site differences in extent of estimated outside drinking and coverage of this in program records. Estimates of outside drinking were calculated by subtracting the total number of drinks recorded as administered on the program for each participant from their total daily consumption reported in the research interviews.

## **3. Results**

### 3.1. Demographic characteristics

Mean age of the sample was 49.45 years (Std Dev: 12.05, Min: 21 and Max: 74). The majority of subjects were male (83%). White individuals accounted for 56% of the participants, Indigenous for 36% and other ethnicities for 8%. Mean SADQ score was 31.39 (Std Dev: 13.77, Min: 8 and Max: 57), a score indicative of “severe” alcohol dependence.

### 3.2. Program records vs Research interviews (n=65)

Table 1 presents data for all 65 participants under the assumption that missing data on outside drinking indicated that outside drinking had not occurred. A mean of 8.89 SDs per drinking day (95% CI: 8.02, 9.76) was recorded by program staff when both program-administered and outside drinks reported to staff were counted. This was significantly lower than the 16.04 SDs per drinking day (95% CI: 13.44, 18.64) reported in the research interviews (paired t-test  $t=5.37$ ,  $P<0.001$ ; natural logged t-test  $t=11.99$ ,  $P<0.001$ ). The mean of 8.32 SDs per drinking day administered directly by program staff was also significantly lower than the 16.04 reported in research interviews (paired t-test  $t=5.79$ ,  $P<0.001$ ; natural logged t-test  $t=10.47$ ,  $P<0.001$ ).

**Insert Table 1 about here**

3.3. Program records vs Research interviews (n=39 subsample)

Table 1 also presents the results restricted to 696 days among 39 participants for whom program staff explicitly recorded whether outside drinking was reported. A consistent pattern of results was observed to that obtained with the full sample of 65 participants. Program records indicated a mean of 9.33 SDs per drinking day. Compared with the 15.26 SDs reported in the research interviews for these 39 individuals, the difference was again statistically significant (paired t-test  $t=2.93$ ,  $P=0.01$ ).

3.4. Program records vs Research interviews by site (n=65)

Significant differences between the total drink amounts derived from program records compared to research interviews were found for two of the four sites examined (see Table 2). One site was dropped from this analysis due to having one participant. Statistically significant differences were found for Site C (paired t-test  $t=4.25$ ,  $P<0.001$ ) and Site D (paired t-test  $t=4.31$ ,  $P<0.001$ ), while Site A (paired t-test  $t=0.91$ ,  $P=0.37$ ) and Site B's (paired t-test  $t=1.13$ ,  $P=0.26$ ) program records did not significantly differ from the information collected in the research interviews.

The estimate of outside drinks, by subtracting program-administered drinks from daily consumption reported in the research interviews, suggests that both Sites A and B also had the lowest amount of outside drinking of the five sites examined with outside drinks ranging from 2.71 to 6.28. Outside drinking for Sites C and D were estimated to be 9.74 and 9.94 SDs per

drinking day respectively (see Table 2). There were significant differences across sites in the extent of outside drinking recorded, but not for estimates of these differences based on the research interviews or records of program dispensed drinks. Nonetheless, differences in estimates of mean outside drinks per drinking day and per drinker were large.

**Insert Table 2 about here**

#### **4. Discussion**

In this study we compared two independent estimates of the total daily alcohol consumption per drinking day of 65 people attending Canadian MAPs, taking account of both program administered drinks and drinking outside the program. These two estimates were made for a matched 30-day period selected for each participant. The first published study on a MAP reported a significant reduction in daily alcohol use for participants but did not attempt to assess outside alcohol use [12]. Having an accurate assessment of total consumption is important because a) outside consumption carries greater risks of short-term harms to the drinker and b) total daily consumption directly predicts risk of serious longer-term health risks. The information is important for program managers developing protocols for best practice in reducing alcohol-related harms and also for policy makers evaluating the potential risks, benefits and challenges of MAPs.

The program records of drinks administered and of reported outside drinking might be expected to yield a more accurate representation of MAP clients' overall drinking than the more global report of average daily consumption per drinking day over a 30-day period provided to the research team [16]. However, we found that amounts reported in the research interviews tended to be consistently higher. Our main finding was that, overall, the MAP clients reported almost double the daily alcohol consumption in research interviews than was recorded in the program records data. We further explored whether this discrepancy might have been due to a false assumption that missing data on outside drinking within the program records data was equivalent to no outside drinking (an assumption supported by program staff). However, similar results were confirmed when we restricted analyses to 696 days and 39 clients for whom we had complete outside drinking data recorded by staff. We conclude that even with attempts to gather clients' reports of outside drinking in the program records, it will often not be an adequate reflection of overall consumption. This discrepancy thereby impacts the staff's ability to properly

gauge whether a) the amount of alcohol provided on the MAP is sufficient to reduce and/or replace outside drinking or b) whether participants are increasing their overall consumption through program participation and hence their risk of serious alcohol-related illnesses.

We further explored the discrepancies between estimates of outside drinking across the different sites comparing program records alone and research interview estimates after subtracting program-administered drinks from the latter. In two sites (Sites A and B) we found no significant differences between the estimates by staff and the research team. However, across Sites C and D the differences were substantial and significant. While it should be noted that Sites C and D were larger resulting in more statistical power, it may be relevant that both Sites A and B implemented particularly strict protocols for discouraging outside drinking, namely only administering alcohol if an individual had been present for at least 60 minutes and conducting occasional room searches for hidden alcohol. Site A also has a strict policy where repeated instances of outside drinking could lead to being removed from the program. These stricter policies may have played a role in decreasing the amount of outside drinking resulting in the smaller discrepancies between program records and research interviews found in Sites A and B, however they may also have resulted in some underreporting as well.

It appears that self-report data collected by a trained and independent researcher consistently provides higher consumption estimates. To improve recording of outside alcohol consumption it may work better to have staff who are not involved in the administration of alcohol, such as nurses or on-site research assistants, collect this information in a private one-on-one setting and using a general last 30-day question as in the research interviews. Given the potential for outside drinking to be more hazardous in terms of its context (e.g. risk of violence), to be more likely to involve NBA, and higher intoxication levels, it is important for program managers to develop protocols to deter outside drinking, such as those in place at Sites A and B. Consideration might also be given as to whether the level of alcohol administration on the program is sufficient. Higher levels of consumption also increase risks of serious alcohol-related diseases such as liver cirrhosis. In an earlier program evaluation we observed high levels of outside drinking accompanied with mostly worsening liver function tests [11]. By contrast, an earlier evaluation of Site B (which has a stricter protocol for outside drinking) found evidence of mostly improving liver functioning among participants [6]. It is possible that stricter protocols may lead to some reluctance to report outside drinking, however, the improved liver functioning

at Site B provide some support for the interpretation that alcohol consumption at that site is actually lower than in the other sites, although further confirmatory analyses are needed.

We acknowledge the limitation of this study that self-report responses are dependent on the recall ability of MAP clients. Participants on MAPs have long histories of heavy alcohol use, the effects of which can cause difficulties in comprehension and impaired cognitive capacities [1]. However, drinking is a central feature of their lives and a key focus of their activities. “Usual” drinking amounts can also be difficult for some participants to estimate due to wide variations in the type and quantity of beverage and NBA consumed over a given 30-day period. We note, however, that potential biases in the two self-report data sources (yesterday recall of outside drinking for program records and usual consumption for research interviews) should run counter to our observed findings of higher amounts recalled in the research interviews according to published comparisons [16].

We suggest it is important for programs to understand the type and extent of outside drinking as this impacts the harm reduction objectives of MAPs and, more specifically, decisions about tailoring amounts of alcohol administered to each client. Given the substantial and dose dependent negative consequences of alcohol consumption in relation to a wide range of serious diseases, injuries and poisonings, it is vital that research on the health and safety benefits as well as risks of MAPs attempts to capture the extent of alcohol consumption both within and outside the program. This study suggests that it is difficult for MAP staff to adequately collect these data using current program protocols and that additional supports may be required to improve accuracy of their records. The type of alcohol consumed and pattern of consumption on the program is likely to be much safer than their previous experience of drinking on the streets [17], thus reduction in outside drinking should lead to further reductions in alcohol-related harms, maximizing the benefits of these harm reduction programs.

We conclude that in order to achieve the harm reduction objectives of MAPs it is important that protocols are developed to reduce the extent of outside alcohol consumption. We also suggest that MAPs seek to reduce the risk of future harms by monitoring and supporting participants to drink safer varieties of alcohol, in safer quantities and, ultimately, at lower levels of overall consumption. It is equally important that future studies of MAPs incorporate measures of outside alcohol consumption.

## **Acknowledgements**

This research was funded by grants from the Canadian Institutes for Health Research by way of a Public Health Systems Improvement grant (application # 293577), the Michael Smith Foundation for Health Research, Shelter House (Thunder Bay, Ontario) and Vancouver Coastal Health. We are grateful to all the participants from each program that participated, the many agencies that supported our research and the countless ethics committees that approved our protocols.

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**Table 1.** Mean number of standard drinks per drinking day in the past 30 days among MAP clients

Measures	Program Records				Research Interviews				Paired-t statistic, P †
	Mean (95% CI)	Std Dev	Min	Max	Mean (95% CI)	Std Dev	Min	Max	
<i>Among 65 MAP clients (1903 days reported)</i>									
Program drinks/drinking day	8.32 (7.46, 9.18)	3.49	0.15	16.46	N/A				5.79, <0.001
Outside drinks/drinking day	0.85 (0.28, 1.41)	2.30	0.00	12.31	N/A				
<b>Total drinks/drinking day</b>	<b>8.89 (8.02, 9.76)</b>	<b>3.54</b>	<b>0.15</b>	<b>16.46</b>	<b>16.04 (13.44, 18.64)</b>	<b>10.59</b>	<b>3.30</b>	<b>80.52</b>	<b>5.37, &lt;0.001</b>
<i>Among 39 MAP clients with outside drinks data (696 days reported)</i>									
Program drinks/drinking day	7.91 (6.79, 9.03)	3.50	0.00	16.31	N/A				3.61, <0.001
Outside drinks/drinking day	1.41 (0.50, 2.32)	2.84	0.00	12.31	N/A				
<b>Total drinks/drinking day</b>	<b>9.33 (8.04, 10.63)</b>	<b>4.04</b>	<b>0.00</b>	<b>16.46</b>	<b>15.26 (11.26, 19.26)</b>	<b>12.51</b>	<b>3.30</b>	<b>80.52</b>	<b>2.93, =0.01</b>

Note: † Paired t-test was performed to test any difference between program records and research interviews.

Counting the cold ones

**Table 2.** Mean number of standard drinks per drinking day in the past 30 days by site of residence among 65 clients

Site of residence	N	Mean drinks per drinking day in past 30 days (Std Dev)				Paired t-test value and P comparing (3) & (4)	Differences between survey and program SDs/day (Std Dev)	
		Program (1)	Out of program (2)	Total records (3)	Research interview (4)		Non-program drinks (4) minus (1)	(4) minus (3)
Site A <sup>abcd</sup>	12	7.99 (2.86)	0.02 (0.07)	8.01 (2.86)	10.70 (6.26)	0.91, 0.37	2.71 (5.99)	2.69 (5.99)
Site B <sup>ab</sup>	12	7.14 (2.63)	4.39 (3.71)	10.08 (3.04)	13.42 (5.26)	1.13, 0.26	6.28 (6.85)	3.34 (6.03)
Site C <sup>d</sup>	20	9.59 (3.87)	0.00	9.59 (3.87)	19.33 (6.53)	<b>4.25, &lt;0.001</b>	9.74 (6.93)	9.74 (6.93)
Site D <sup>d</sup>	20	8.09 (3.77)	0.08 (0.27)	8.14 (3.79)	18.02 (15.91)	<b>4.31, &lt;0.001</b>	9.94 (16.41)	9.88 (16.27)
Total	65	8.32 (3.49)	0.85 (2.30)	8.89 (3.54)	16.04 (10.59)	<b>5.37, &lt;0.001</b>	7.72 (10.83)	7.15 (10.82)
F-test value and P across sites †		1.52, 0.22	<b>25.77, &lt;0.001</b>	1.35, 0.27	2.41, 0.08		1.55, 0.21	2.20, 0.10

Note: † One of the sites was excluded in these analyses due to small sample sizes.

<sup>a</sup> Only administers alcohol if client present for at least 60 minutes prior.

<sup>b</sup> Conducts occasional room searches for hidden alcohol.

<sup>c</sup> Outside drinking can lead to removal from MAP.

<sup>d</sup> Conducts pat downs of clients for hidden alcohol after outings.