

## DIAGNOSIS AND ASSESSMENT

### Paradoxical Changes in Alcohol Consumption and CAGE Ratings Between 1996 and 2006 in the General Population of Geneva

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**Abstract** — **Aims:** To assess changes between 1996 and 2006 in alcohol use and dependence in the general population of Geneva, Switzerland. **Methods:** Postal surveys of alcohol consumption patterns in representative samples of the general population were compared. The four-item CAGE (Cut down, Annoyed, Guilty, Eye-opener) screener was used to estimate alcohol dependence. **Results:** There were 742 participants in 1996 (response rate 75%) and 1487 in 2006 (76%). The proportions of daily drinkers (1996: 18%; 2006: 10%;  $P < 0.001$ ), and of heavy drinkers (>14 drinks/week) decreased between 1996 (13%) and 2006 (7%;  $P < 0.001$ ). However, decreases in heavy drinking were limited to men aged 30+ and women aged 30–49. The average number of drinks/week decreased from 6.4 in 1996 to 5.0 in 2006 ( $P < 0.001$ ). Perception of safe drinking levels decreased between 1996 (4 drinks/day) and 2006 (3 drinks/day,  $P < 0.001$ ). The prevalence of alcohol dependence, defined as a CAGE score  $\geq 2$ , increased among women (1996: 6%; 2006: 14%;  $P = 0.001$ ), but not among men (1996: 18%, 2006: 19%). Two of the CAGE items were endorsed more frequently by women in 2006 than in 1996: ‘guilty’ (1996: 9%; 2006: 15%;  $P = 0.018$ ) and ‘should cut down’ (1996: 12%; 2006: 18%;  $P = 0.04$ ). Drinking and driving did not change significantly over time (2006: 21% of men, 9% of women). **Conclusion:** Alcohol consumption, heavy drinking and perceived levels of safe drinking decreased over these 10 years, but not drink driving or alcohol dependence. Paradoxically, alcohol dependence even increased among women, driven by CAGE items ‘guilty’ and ‘should cut down’, suggesting that changes in CAGE scores reflected changes in the social acceptability of drinking rather than changes in dependence.

## INTRODUCTION

Alcohol abuse and dependence are major factors of mortality, morbidity, disability and social problems in both high- and low-income countries (Mokdad *et al.*, 2004). They impose an enormous cost not only on those directly affected, but also on their families, employers, co-workers and the society (Grant, 2000). The social cost of alcohol abuse is 6.7 billion Swiss Francs in Switzerland (Priez *et al.*, 2005), which corresponds to 930 Swiss Francs for every inhabitant, compared with a gross domestic product of 64,907 Swiss Francs per capita in 2006 (FSO, 2010). This burden is, however, partly preventable by the implementation of effective interventions, in particular, by structural interventions such as tax and price increases, by restrictions on access and availability and by early clinical interventions and effective treatments (Rehm *et al.*, 2006; Wagenaar *et al.*, 2009).

To inform policy, prevention programmes and treatment services, there is a need for up-to-date data on trends in alcohol consumption, dependence and alcohol-related problems. Sales data are available but are not informative about trends in population subgroups (defined by age, sex, education, alcohol consumption level, co-morbidity, etc.). Survey data are necessary, and are available mainly through the Swiss Health Survey, conducted every 5 years since 1992 (Annaheim and Gmel, 2004; Chiolerio *et al.*, 2006; Rehm *et al.*, 2007). These data show that alcohol use has been decreasing for decades among both men and women, but recently ceased to decrease among women. However, little has been published on concurrent trends in alcohol-related consequences or alcohol dependence, which could be assumed to decrease similarly. However, discrepancies between alcohol consumption, alcohol-related consequences

and alcohol dependence have been reported in general population surveys (Grant *et al.*, 2004; Messiah *et al.*, 2008; Midanik and Clark, 1995). To inform local policymakers and prevention organizations, we wanted to describe the situation in Geneva specifically.

Thus, the aim of this study was to assess changes between 1996 and 2006 in alcohol consumption, drinking and driving and alcohol dependence in the general population of the urban canton Geneva, Switzerland.

## METHODS

### Data collection

We conducted two mail surveys, the first one in 1996 and the second one in 2006, in cross-sectional, representative samples of the general population of Geneva, Switzerland. The intended samples included 1000 people in 1996 and 2000 people in 2006, aged 18–70. The samples were drawn at random from the publicly available part of the population register, which includes 86% of the population and excludes the personnel of the United Nations and other international organizations, diplomats, elected politicians and all people who asked not to be listed. This register lists individuals (not households), and we used a simple random sampling method. Up to six reminder questionnaires were sent to non-respondents.

### Questionnaire content

The questionnaires covered tobacco, cannabis and alcohol use, opinions about prevention measures and socio-demographic characteristics, and took ~10 min to complete

(Etter, 2009a, b; 2010). In 1996 and 2006, participants indicated whether they drank alcohol in the previous 12 months (frequency, six response options, Table 1) and the number of alcohol drinks on the days when they drank. Participants answered the CAGE (Cut down, Annoyed, Guilty, Eye-opener) test, a four-item screener for alcohol dependence (Ewing, 1984; Mayfield *et al.*, 1974). Participants also indicated how many glasses per day, in their opinion, represented dangerous alcohol consumption; and the number of times, in the past 12 months, they had driven a motor vehicle while feeling they had drunk too much.

### Analyses

All 1996–2006 comparisons were adjusted for age, sex and school years in multiple linear regression models, with all dichotomous variables coded 0–1. Coefficients of linear regression models were used to compute differences between survey waves (1996–2006) and associated *P*-values after adjustment for covariates. We used the SPSS 16 software (SPSS Inc., Chicago, IL, USA).

## RESULTS

### Participation

We collected 742 questionnaires in 1996 (75% of 987 valid addresses) and 1487 in 2006 (76% of 1945 valid addresses). The average age of participants was 42.3 years in 1996 and 41.0 years in 2006 ( $P=0.015$ ), the proportion of men was 48% in 1996 and 55% in 2006 ( $P<0.001$ ) and the average number of school years was 13.4 in 1996 and 15.3 in 2006 ( $P<0.001$ ).

### Alcohol consumption

Fewer people (both men and women) drank alcohol daily in 2006 than in 1996 (Table 1). Between 1996 and 2006, the average number of alcohol drinks per week decreased in both men and women, and the number of people who drank over 14 glasses of alcohol per week decreased by almost half

in both men and women (Table 2). Decreases in heavy drinking (>14 drinks/week) were limited to men aged 30 years and older and to women aged 30–49 years (Table 2). The mean consumption, on the days when people drank, decreased in men (by an average of 0.3 glasses/day), but remained stable in women (1.5 glasses/day in 1996, 1.6 glasses/day in 2006;  $P=0.10$ ). In 2006, 16% of participants drank half (54%) of all the alcohol consumed by the whole sample, and half (55%) of the participants drank almost all (94%) the alcohol consumed by the whole sample. In 2006, one in every five men and one in every ten women admitted to at least one episode of drinking too much and driving in the previous year, without a statistically significant change between 1996 and 2006 (Table 1).

### Opinions

About one-third of participants (1996: 30%; 2006: 32%;  $P=0.40$ ) found it difficult to decline an alcohol drink when offered one. In 2006, answers to this question were similar in men and women and across income groups. Finally, the level of alcohol consumption that participants considered to be dangerous to health decreased from 4.2 drinks/day in 1996 to 3.2 drinks/day in 2006 ( $P<0.001$ ), and this decrease was observed in both men and women (Table 1).

### CAGE test

Between 1996 and 2006, there was an increase (from 11.6 to 16.2%;  $P=0.008$ ) in the proportion of participants responding affirmatively to at least two questions of the CAGE test, a level suggesting the presence of alcohol dependence (Mayfield *et al.*, 1974). CAGE scores did not change in men, and this increase was observed only in women, in whom the prevalence of CAGE  $\geq 2$  more than doubled, from 6.2% in 1996 to 13.8% in 2006 ( $P=0.001$ ). In particular, in women, the items ‘felt guilty’ and ‘felt you should cut down’ were endorsed more frequently in 2006 than in 1996 (Table 3). Endorsement of the ‘eyes opener’ item was rare in both men and women. In women, the increase over time in the prevalence of CAGE  $\geq 2$  was largest in women in the lower levels

Table 1. Alcohol consumption and drink driving in men and women, Geneva, 1996–2006

	All		<i>P</i> -value	Men		<i>P</i> -value	Women		<i>P</i> -value
	1996	2006		1996	2006		1996	2006	
Number of participants	742	1487		354	813		384	666	
During the past 12 months, did you drink alcohol (beer, wine and other alcoholic drinks)?									
Every day or almost (6–7 days/week)	18.3	10.4	<0.001	24.9	15.5	<0.001	12.5	5.6	<0.001
Several times a week (3–5 days/week)	17.5	17.1	0.85	21.8	21.6	0.94	13.5	13.1	0.88
Once or twice a week	24.9	31.2	0.006	27.7	34.0	0.048	22.4	28.3	0.073
1–3 times per month	16.7	19.4	0.16	12.1	14.1	0.40	20.8	24.3	0.25
<1 time per month	10.9	8.8	0.14	6.8	4.8	0.21	14.6	12.8	0.44
Never	10.4	9.6	0.58	5.4	7.8	0.17	15.1	14.4	0.76
Indicate the number of glasses you drink, on average, on the days when you drink alcohol (glasses/day, mean)	2.0	2.0	0.58	2.6	2.3	0.028	1.5	1.6	0.10
Number of glasses per week (calculated by us as frequency $\times$ quantity, mean)	6.4	5.0	<0.001	9.3	6.9	<0.001	3.8	3.1	0.048
Had >14 drinks/week (%)	12.7	7.4	<0.001	20.9	12.5	<0.001	6.1	3.2	0.031
During the past 12 months, how many times did you drive a motor vehicle feeling you had drunk too much? (1+ times, %)	15.2	13.9	0.51	26.0	20.6	0.09	6.3	9.4	0.15
In your opinion, from how many glasses per day is alcohol consumption (beer, wine and other alcohol drinks) dangerous to health? (mean)	4.2	3.2	<0.001	4.2	3.2	0.001	4.2	3.1	<0.001

All 1996–2006 comparisons were adjusted for age and school years and, in column ‘all’ only, also for sex.

Table 2. Consumption of &gt;14 drinks per week, men and women, Geneva, 1996 and 2006

	All			Men			Women		
	1996 (%)	2006 (%)	P-value	1996 (%)	2006 (%)	P-value	1996 (%)	2006 (%)	P-value
Age									
18–29	6.2	4.6	0.55	11.3	7.8	0.52	2.4	2.3	0.98
30–49	13.4	6.9	<0.001	20.5	12.5	0.007	6.4	0.8	0.001
50+	17.1	11.7	0.10	27.0	15.8	0.030	8.1	7.5	0.88
All	12.7	7.4	<0.001	20.9	12.5	<0.001	6.1	3.2	0.031

All 1996–2006 comparisons were adjusted for school years and, in column ‘all’ only, also for sex.

Table 3. CAGE test, change 1996–2006 in men and women in Geneva

	All			Men			Women		
	1996 (%)	2006 (%)	P-value	1996 (%)	2006 (%)	P-value	1996 (%)	2006 (%)	P-value
Have you ever felt you should cut down on your alcohol drinking?	18.3	21.8	0.10	24.8	25.6	0.79	12.2	17.8	0.040
Have people annoyed you by criticising your alcohol drinking?	9.6	10.8	0.42	15.0	13.8	0.61	4.6	8.0	0.056
Have you ever felt bad or guilty about your alcohol drinking?	14.5	18.7	0.029	20.1	22.1	0.47	9.3	15.3	0.018
Have you ever had an alcohol drink first thing in the morning to steady your nerves or get rid of a hangover?	2.3	1.9	0.50	4.6	2.9	0.13	0.3	1.2	0.056
CAGE score $\geq 2$	11.6	16.2	0.008	17.5	18.9	0.59	6.2	13.8	0.001
CAGE score $\geq 3$	5.6	4.3	0.51	8.8	7.8	0.57	2.7	4.9	0.074

All 1996–2006 comparisons were adjusted for age and school years and, in column ‘all’, also for sex.

of income and education (in women with  $\leq 12$  school years (lowest quartile): CAGE  $\geq 2$  in 1996: 5.3%; 2006: 13.4%;  $P = 0.009$ ). Richer and more educated women scored equally high on the CAGE test in 1996 and 2006 (in women with 18+ school years (highest quartile): CAGE  $\geq 2$  in 1996: 12.1%; 2006: 14.3%;  $P = 0.69$ ).

Endorsement of the CAGE items ‘guilty’ and ‘should cut down’ increased over time in moderate drinkers only ( $\leq 14$  drinks/week; ‘guilty’: 1996: 10%; 2006: 17%;  $P = 0.001$ ; ‘cut down’: 1996: 13%; 2006: 20%;  $P = 0.002$ ). Endorsement of all CAGE items remained unchanged in heavy drinkers ( $> 14$  drinks/week; e.g. ‘guilty’: 1996: 42%; 2006: 41%;  $P = 0.9$ ; ‘cut down’: 1996: 46%; 2006: 45%;  $P = 0.8$ ). By age group, the only statistically significant change in CAGE items was observed for the item ‘annoyed’ in the 18–29 year olds (1996: 10%; 2006: 18%;  $P = 0.043$ ).

## DISCUSSION

Between 1996 and 2006, in a representative sample of the urban Swiss canton of Geneva, we observed a decrease in the proportion of people who drank alcohol daily, a decrease in the number of alcohol drinks per week, an almost two-fold decrease in the proportion of people who drank  $> 14$  drinks per week, and a decrease in the amount of drinking that people thought was dangerous to health. These changes were observed in both men and women, and they occurred in spite of a decrease in taxes and prices of imported alcoholic drinks that took place in 1999 (Heeb and Gmel, 2003). However, no reduction in heavy drinking was observed in the 18–29 year olds, and in women, reductions

in heavy drinking were limited to the 30–49 year olds. This suggests that interventions targeted at young adults and at the 50+ year olds, who drink the most, should be intensified. Furthermore, drink driving remained frequent, and did not change between 1996 and 2006, in spite of the decrease in alcohol consumption. This suggests that additional efforts should be taken to tackle this important public health problem.

This overall decrease in alcohol consumption and heavy drinking is in agreement with other survey data from Switzerland (Annaheim and Gmel, 2004), and with sales data (Eidgenössische Alkoholverwaltung, 2009). Surprisingly, this decrease in alcohol use and heavy drinking was not mirrored by a parallel decrease in dependence ratings as measured by the CAGE screening test. Paradoxical trends between alcohol consumption and a diagnostic of alcohol dependence have also been found in general population surveys in the USA and in France (Grant *et al.*, 2004; Messiah *et al.*, 2008; Midanik and Clark, 1995). One possible interpretation is that when alcohol use decreases, the threshold of what is perceived as acceptable consumption changes in parallel, and levels of consumption that were previously seen as acceptable are then perceived as problematic. Alternatively, the social acceptability of drinking may have changed first, followed by a decrease in consumption. The cross-sectional nature of our data does not enable us to disentangle these alternative interpretations. In support of these hypotheses, we found that endorsement increased only for the CAGE items that reflect social pressure or social acceptability (‘guilty’ and ‘should cut down’). On the other hand, endorsement of the ‘eye opener’ item, an item that most closely addresses a symptom of dependence, remained

stable, suggesting that in fact alcohol dependence did not increase (but very few respondents endorsed this item). This interpretation is corroborated by the decrease in rates of daily drinking and heavy drinking (>14 drinks/week). Interestingly, the increase in the CAGE items reflecting social pressure ('guilty' and 'should cut down') were observed in women and in moderate drinkers only. These results are in agreement with data from France (Messiah *et al.*, 2008), and suggest that social norms about drinking for women have changed recently in both France and French-speaking Switzerland, possibly as a result of prevention campaigns. The perceived threshold for dangerous alcohol consumption decreased from four to three daily drinks between 1996 and 2006, which also supports the interpretation that the awareness of alcohol risks has changed over time in this population.

These paradoxical results suggest that the CAGE reflects social intolerance to heavy drinking rather than problem drinking, and that it may not be an optimal tool to assess alcohol dependence in the general population (Bisson *et al.*, 1999; Bloomfield *et al.*, 2002). Although the CAGE has been shown to be a reliable and valid screener in clinical populations, its diagnostic and screening value in general population surveys has been criticized, because in this context, the CAGE may not be a specific measure of dependence, but may also reflect social intolerance to heavy use (Bisson *et al.*, 1999; Buhler *et al.*, 2004; Koppes *et al.*, 2004). However, this problem may not be specific to the CAGE, as several other questionnaires assessing alcohol dependence or abuse also include items that may be affected by social norms. For example, surveys in US national samples showed that even though alcohol use decreased over time, self-reports of dependence symptoms and social consequences increased (Midanik and Clark, 1995). Another US study, based on the Alcohol Use Disorder and Associated Disabilities Interview Schedule, showed that alcohol abuse increased over 10 years, while alcohol use and dependence declined (Grant *et al.*, 2004). These findings suggest that self-reports of alcohol abuse and social consequences are influenced more by changing social norms than by actual alcohol-related problems. Almost all screening instruments contain items covering concerns by others, guilt about drinking or attempts to cut down (e.g. the Alcohol Use Disorder Identification Test; Bush *et al.*, 1998). Thus, instruments used for the diagnosis of alcohol use disorders may produce paradoxical results due to changing social norms, and prevalence data based on surveys in the general population using these instruments should, therefore, be interpreted with caution. In addition, the CAGE is a screening test, not a diagnosis test. Ideally, people screened positive should be assessed more thoroughly, which is however impractical in population-based studies.

#### Study limitations

A first limitation is that even though the response rates were relatively high for mail surveys in the general population (Asch *et al.*, 1997), one quarter of the intended sample did not return the questionnaires. The existence and direction of a possible non-response bias are difficult to establish (Etter and Perneger, 1997). A second limitation is that most questionnaire items were developed for this survey and have not

been validated. Third, questionnaire surveys may underestimate alcohol consumption, compared with sales data (Midanik, 1988). Finally, analyses were adjusted for potential confounders (age, sex, school years), but unmeasured confounders can still explain some of the differences between 1996 and 2006 (e.g. mental health, distress). However, the observed changes between 1996 and 2006 were not explained by changes in unemployment rates in Geneva (6.8% in 1996, 7.0% in 2006; OCSTAT, 2010). These changes may be explained only marginally by changes in the Muslim population in Geneva (2.2% in 1990, 4.3% in 2000, the most recent year available; Swiss Federal Office of Statistics, 2010), considering in addition that many of these immigrants are not French-speaking and may, therefore, not have answered the questionnaire. Rather, these changes may result from historical trends and from prevention policies.

#### Conclusions

During these 10 years, alcohol consumption and heavy drinking decreased in Geneva in both men and women, and the perceived level of safe or acceptable drinking also decreased. In spite of progress made over the past decade, much remains to be done to alleviate the burden imposed on society by alcohol use, particularly in men aged 50+ (the category with the highest alcohol consumption) and in young adults (as heavy drinking did not decrease in people aged <30). Drink driving remained frequent in both men and women and should be addressed more effectively. Paradoxically, among women, alcohol dependence even increased, driven by the items 'guilty' and 'should cut down', suggesting that changes in CAGE scores reflected changes in the social acceptability of drinking rather than changes in dependence.

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