Baseline study of alcohol dependence among general drivers and drunk driving offenders in Guangzhou, China

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Abstract

This study aimed to investigate drink driving in a sample of general drivers and convicted drunk driving offenders in Guangzhou, China. The study also aimed to explore some potential factors that impact on alcohol-related driving behaviour. Samples of 406 general drivers and 101 drunk driving offenders were recruited between May and October 2012. A survey was used to collect information about demographic characteristics, knowledge, attitudes and practices related to drink driving. The Alcohol Use Disorders Identification Test (AUDIT) was used to assess possible drinking problems. The average age reported for starting to drink alcohol for both groups of participants was around 19 years old. The mean AUDIT score of general drivers was 7.4 ($SD = 5.4$) representing a low level of alcohol problems, and for convicted drunk driving offenders was 11.1 ($SD = 5.9$) representing a medium level of alcohol problems (significant difference between means, $t = 5.75$, $p < 0.001$). AUDIT scores indicated that a substantial proportion (65%) of the offenders had medium to high levels of alcohol use disorders, compared with 38.5% among general drivers. Offenders who knew the drunk driving legal limit had a lower AUDIT score ($M = 9.8$, $SD = 5.16$) than those who did not know it ($M = 12.2$, $SD = 6.257$, $t = -1.987$. $p = 0.05$). In addition, offenders who were novice drivers (licensed less than 2 years) had a higher AUDIT score ($M = 16.4$, $SD = 7.6$) than the other three driver experience categories used.

Introduction

Alcohol-related driving is a longstanding, serious problem in China (Li, Xie, Nie, & Zhang, 2012; Wang, 2011; Hao, 2005; Hao, 2007). There are two blood alcohol concentrations (BACs) defined for legal purposes. The lesser offence of "drink driving" occurs when a driver has a BAC between 20mg/100ml and 80mg/100ml (or 0.02-0.08 g/100ml in the units used in Australia); the more serious offence of "drunk driving" occurs when 80mg/100ml is reached or exceeded. In 2010, there were 1958 deaths related to drinking driving in China, accounting for 3% of all road fatalities (MT, 2011). However, research in two southern cities found that at least 20 percent of serious road crashes were alcohol related. It is considered that the national published figure for fatal crashes caused by drinking and driving is low because of measurement difficulties (Li, Xie, Nie, & Zhang, 2011). In 2011, the fatality rate related to drink driving decreased 0.1% compared with 2010 (MT, 2012). In the same year there were more than 235 million drivers in China, 414,359 drink/drunk driving offenders were apprehended, and of these 49,834 were drunk drivers (MPS, 2012). On 1st May 2011 a national law was introduced to criminalise drunk driving (BAC 80mg/100ml or above), and serious penalties, including jail, were imposed. Driving with a BAC of 20mg or above and less than 80mg/100ml (drink driving) remained illegal but continued not to be treated as a criminal offence. In 2011 Guangzhou, the capital city in Guangdong province had a population of 12.78 million and experienced 2664 serious traffic crashes which resulted in 930 fatalities and 3017 injuries (Ministry of Public Security, 2012). According to a local traffic police report, there were 37 traffic accidents related to drink driving in 2011 in Guangzhou, accounting for 21 deaths and 42 injuries. Drunk driving has been confirmed to have a significantly higher risk of leading to fatal/serious injury accidents in Guangdong province (Zhang, Yau, & Chen, 2013). A total of 4750

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drink drivers were detected, and 877 drunk drivers in the city in the twelve months after the introduction of the amended law on 1 May 2011 to 30 April 2012. This is quite high, even though the annual rate of drink and drunk driving in Guangzhou reportedly decreased by 56.3% and 70.13% respectively after the legislation change (Kong, 2012). These data shows that alcohol-related driving is still a critical problem for road safety in the city, even though numbers of detections are reported to have reduced.

However, there is limited information available about Chinese drivers' knowledge, attitudes and practices with respect to drink and drunk driving. Given that motorisation is occurring rapidly, there is a need to better understand the factors that contribute to impaired driving in order to address it through education, legislation and enforcement. Further, the degree of involvement of alcohol problems in driving in China is unknown, even though this information has implications for the nature and delivery of drink/drunk driving countermeasures. The research described in this paper is part of a larger program of research aimed at developing a better understanding of drink/drunk driving in China from multiple perspectives: general drivers, convicted offenders and police, in two contrasting cities. The results outlined here are confined to the city of Guangzhou, and to samples of general drivers and convicted drunk drivers. In particular, we are interested in exploring the degree to which alcohol problems are involved in drink/drunk driving because research from other countries has demonstrated a link between alcohol dependence and drink driving (Conley, 2001), as measured by the Alcohol Use Disorders Identification Test (AUDIT), which the World Health Organization (WHO) recommends to screen hazardous and harmful drinking (Babor, 1989; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001; Chen, Chen, & Cheng, 2005). AUDIT has previously been used in China to examine drinking among factory workers (He 1997; Ma, 1998), hospital patients (Tasi, 2005; Wu, 2008) and community residents (Leung, 2000; Guo, 2008). However there is a gap in our knowledge about the association between alcohol use/misuse and drunk driving in China. Other work has shown that drink driving is influenced by age, gender, attitude, education and drinking behaviour (Eensoo, Paaver, Harro & Harro, 2005; Freeman, 2005; Freeman, Schonfeld & Sheehan, 2007). In this study, we are also interested in the relationships between alcohol use (defined by AUDIT scores) and demographic characteristics, knowledge, attitudes and driving practices of drunk driving offenders and general drivers.

Method

Between May and June, 2012, a sample of 406 general drivers was recruited with assistance of Guangdong Institute of Public Health. Participants were recruited including drivers who did annual physical examinations in Haizhu District Centre for Occupational Disease Control and Prevention and in Haizhu District Centre for Disease Control and Prevention (CDC). In addition, participants also were recruited from Guangdong CDC. During May to October, 2012, with the assistance of the Guangzhou Police and Guangdong Institute of Public Health, 101 drunk driving offenders (in detention due to drunk driving) were also recruited. All were aged 18 or more and were either licensed drivers or currently drove motor vehicles. They completed 15 minute self-report surveys about demographic characteristics and their knowledge, attitudes and practices in relation to drinking and driving.

Many studies over many years have noted the association of serious and repeat drink driving with problem levels of drinking. Conley (2001), in a study of construct validity with alcohol problem screening tests found that using the AUDIT cut off score of 8 (hazardous drinking), nearly all the large sample of recidivist drink drivers were identified as having an alcohol disorder. The present study will be the first to use AUDIT to assess alcohol problems in drunk drivers in China. There have been a few studies in China looking at drinking problems and using AUDIT (Tsai et al, 2005, Leung & Arthur 2001) though none have used that tool to investigate drunk driving offenders. The WHO scale was selected for the present study to enable comparisons with previous research. The

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AUDIT scale assesses hazardous drinking levels using the WHO cut-off scores (0-7.9: Low; 8-15.9: Medium; 16-19.9: High; 20+: Need further diagnostic evaluation for alcohol dependence). There are 10 questions, each with a value of 0 to 4 points, for a total maximum score of 40 points. A basic element of the AUDIT is the calculation of alcohol consumption level based on numbers of standard drinks consumed. Because there is no "standard unit of alcohol consumption" concept in China, we made use of local measurements (e.g. a Liang is about 50ml) and local alcohol content of common beverages which were converted to standard units to calculate the AUDIT score.

In order to confirm these drivers' knowledge of drink driving and related legislation, we asked 11 questions. Some were specifically about the legislation. i.e. whether they knew drunk driving had become a criminal offence in 2011; what the two legal limits are; and whether people under 18 years old are allowed to purchase and consume alcohol beverages. We also examined their knowledge of alcohol metabolism, using questions developed from Stronach, & Mcdonald (2002). Finally, we asked where they had obtained their information.

Based on previous work by Ferguson, Schonfeld and Sheehan (2001) and Bishop (2011), participants' drink driving attitudes were also assessed. The attitude of drink driving scale had good internal consistency with a Cronbach alpha coefficient of 0.82 for general drivers and 0.88 for drunk driving offenders.

Drinking and driving behaviours and whether or not they had been penalized for drinking and driving were assessed with nine questions. For the drunk driving offenders group, the Cronbach alpha for these items was 0.7, however, the general drivers' Cronbach alpha was only 0.5.

Means for continuous variables were compared using parametric t-tests and one-way ANOVAs. The non-parametric Pearson Chi-square was used to test categorical variables. Bivariate correlations between continuous variables utilised Pearson's product moment correlation (r). All analyses were evaluated at a significance level of $\alpha = 0.05$, with asterisk(s) indicating * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard multiple regression was used to explore the relationship between AUDIT score and five independent variables: age, gender, attitude score, marital status and education level for the drunk driving offenders and general drivers respectively. Analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 21.0. The study was approved by the QUT Human Research Ethics Committee.

Results

Socio-demographic characteristics

As Table 1 shows, a total of 507 participants were recruited for the project including 406 general drivers (35.7 years, $SD = 9.1$, males 66.5%) and 101 drunk driving offenders (33.6 years, $SD = 8.7$, males 90.1%). The average age of the drunk driving offenders was 2.1 years younger than the general drivers sample, which was significant ($t = 2.05$, $n = 505$, $p < 0.05$). Occupational profiles differed between the samples. About one-third of general drivers were professional, technical; this category, together with the next largest (commercial) accounted for half the sample. The largest category among drunk driving offenders was hospitality industry (about a fifth); for defined categories, the next two most common categories (manual workers and professional, technical) together with hospitality industry account for half the drunk driving offender sample. It is worth noting that about one-sixth of drunk driving offenders were classified as other occupations, much higher than for the general driver sample. Overall drunk driving offenders had lower income, but they also had a significantly higher representation in the highest income category.

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Table 1. Socio-demographic characteristics

Item		General drivers		Drunk driving offenders		X²
		N	%	N	%	
Gender	Male	270	66.5	91	90.1***	21.963
	Female	136	33.5	10	9.9***	df = 1
Age	(in years)	*35.7*		*33.6**		*t = 2.05*
Occupations	Professional, technical	140	34.5	15	14.9***	45.150
	Leader of state, party, mass and organisations, enterprises and units.	32	7.9	5	5.0	df = 9
	General white collar	47	11.6	4	4.0	
	Commercial	57	14.0	10	9.9	
	Hospitality industry	48	11.8	21	20.8***	
	Agriculture, forest, fishery	3	0.7	2	2.0	
	Manual	39	9.6	16	15.8	
	Students, unemployed	9	2.2	7	6.9***	
	Other	25	6.2	17	16.8***	
Marital status	Married	308	76.0	64	63.4*	9.818
	Single	85	21.0	29	28.7	df = 3
	Divorced	7	1.7	6	5.9*	
	Widowed	5	1.2	2	2.0	
Education	Primary School	16	4.0	11	10.9***	43.641
	Middle School	26	6.4	22	21.8***	df = 3
	High School	116	28.7	35	34.7	
	Bachelor degree or above	246	60.9	33	32.7***	
Employed	Permanent	335	82.5	54	53.5***	39.860
	Temporary/Casual	48	11.8	29	28.7***	df = 3
	Retired	3	0.7	1	1	
	Unemployed	20	4.9	17	16.8***	
Driver's licence	Yes	368	92.5	93	92.1	
	No	30	7.5	8	7.9	
	Missing	8	2.0			
Years licensed	(in years)	8.6		8.4		
Professional driver	Yes	53	13.2	20	19.8	
	No	349	86.8	81	80.2	
Vehicle driven	Company car	70	17.2	27	26.7*	8.023
	Private car	264	65.0	51	50.5*	df = 2
	Other	71	17.5	23	22.8	
Monthly income (RMB)	Less than 1300	16	3.9	10	10.0***	34.937
	1300-2000	33	8.1	17	17.0***	df = 7
	2001-3000	61	15.0	21	21.0	
	3001-4000	71	17.5	12	12.0	
	4001-6000	72	17.7	10	10.0	
	6001-8000	62	15.3	7	7.0***	
	8001-10000	57	14.0	5	5.0***	
	More than 10000	34	8.4	18	18.0***	

Note: significant differences evaluated at the level of 0.05 have been highlighted for ease of reference.
 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Knowledge about drinking and driving

Table 2 presents the results of questions on knowledge about drink driving. The majority (84% for general drivers and 84.2% for drunk drivers) of both samples knew that drunk driving had become a criminal offence in May 2011, but knowledge about legal limits for drink driving (19.3% and 28.3%) and drunk driving (21.2% and 41.4%) was surprisingly low, though it was better amongst the offenders.   Both groups had very little knowledge about how many drinks would keep their BAC under the legal limit. More offenders (76.2%) than general drivers (54.4%) knew that drinking on an empty stomach leads to a higher BAC. Most learned about the Criminal law change and about the risks of drinking and driving via television, although a range of other sources were also reported.

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Table 2. Knowledge about drinking and driving

Key Measures		General drivers		Drunk driving offenders		X²
		N	%	N	%	
Know BAC level for drink driving	Right answer	78	19.3	28	28.3*	13.056
	Wrong answer	94	23.3	33	33.3	df = 5
	Do not know	232	57.4	38	38.4*	
Know BAC level for drunk driving	Right answer	86	21.2	41	41.4**	19.205
	Wrong answer	233	57.5	39	39.4	df = 5
	Do not know	86	21.2	19	19.2**	
Know how many drinks would keep you UNDER the limit	<u>Spirits</u>					
	Right	15	3.7	2	2.0	
	Wrong	30	7.4	30	29.7	
	Do not know	337	83.0	68	67.3	
	<u>Wine</u>					
	Right	26	6.4	7	6.9	
	Wrong	20	4.9	16	15.8	
	Do not know	338	83.3	77	76.2	
	<u>Beer</u>					
	Right	13	3.2	1	1.0	
	Wrong	46	11.3	30	29.7	
	Do not know	330	81.3	69	68.3	
Empty stomach, higher BAC	True	221	54.4	77	76.2***	26.159
	False	22	5.4	8	7.9	df = 3
	Do not know	163	40.1	15	14.9***	
People with a small body mass register higher blood alcohol concentrations than people with a big body mass	True	64	15.8	23	22.8	
	False	133	32.8	34	33.7	
	Do not know	204	50.2	44	44.6	
Allowed <18 years purchase alcohol for you	Yes	70	17.2	35	34.7***	12.874
	No	335	82.5	66	65.3***	df = 2
Allowed <18 years purchase alcohol for themselves	Yes	78	19.2	36	35.6**	15.102
	No	326	80.3	65	64.4**	df = 2
Know drunk driving as Criminal offence 2011	Yes	340	84.0	85	84.2	
	No	65	16.0	16	15.8	
Where first learned of the Criminal law change	TV	230	56.7	62	61.4	
	Radio	22	5.4	6	5.9	
	Newspapers	66	16.3	13	12.9	
	Internet	56	13.8	6	5.9**	
	Flyers, brochures, etc	6	1.5	0	0	
	Driving school	4	1.0	0	0	
	Relative/friends	10	2.5	2	2.0	
	Others	10	2.5	12	11.9	
Received information about the risks of drink driving	Yes	257	64.3	69	68.3	24.628
	No	112	28.0	26	25.7	df = 8
	Cannot remember	31	7.8	6	5.9	
Where learned about the risks of drinking and driving	TV	199	58.4	51	54.3	20.625
	Radio	15	4.4	2	2.1	df = 7
	Newspapers	47	13.8	9	9.6	
	Internet	45	13.2	10	10.6	
	Flyers, brochures, etc	8	2.3	0	0	
	Drive school	3	0.9	3	3.2	
	Relative/friends	12	3.5	9	10.6**	
	Others	12	3.5	9	9.6**	

Note: significant differences evaluated at the level of 0.05 have been highlighted for ease of reference.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Attitudes towards drinking and driving

Drivers' attitudes towards drinking and driving were measured with 11 items. Each item is scored 1-5 so the maximum possible score for each item is 5, and for the overall attitude scale is 55. Scale

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means were generally high, indicating positive attitudes (i.e. not favouring drink driving). Followings are the 11 items.

1. I think it is safe for me if I drive after drinking alcohol.
2. My mother would drive after drinking if she had a motor vehicle.
3. My father would drive after drinking if he had a motor vehicle.
4. My friends would drive after drinking if they had a motor vehicle.
5. My staff/colleagues would drive after drinking if they had a motor vehicle.
6. You will have a good time when you drive after drinking.
7. I think it is safe if I am a passenger of a driver who has been drinking.
8. Imagine you go with some of your friends to a party. They all drink lots of alcohol at the party. When the party is over, they offer to drive you to home, would you go with them?
9. Imagine you go to a party with some of your friends. You drink lots of alcohol at the party. When the party is over, will you drive them home?
10. Imagine you have a party with your friends, would you drink if you were going to drive?
11. If I am completely honest with myself, I will probably drink and drive in the future.

Taking the overall scale scores, there was a significant difference between general drivers ($M = 48.7$, $SD = 6.3$) who had more positive (pro-safety) attitudes than drunk driving offenders ($M = 43.2$, $SD = 9.2$, $t = 4.916$, $p < 0.01$). The attitude score and AUDIT score had a medium to strong negative correlation for general drivers ($r = -0.35$, $p < 0.01$) and for drunk driving offenders groups ($r = -0.526$, $p < 0.01$). That is, drivers with higher alcohol dependence scores were more likely to have less safe attitudes about drink driving.

Drinking and driving practices

Table 3 presents results of the drink and driving practices questions. The average age that participants started drinking alcohol was similar for general drivers (19.7 years) and drunk driving offenders (19.5 years). As noted earlier, one Liang is about 50 ml alcohol. Drinking one or two Liang of spirits (or three/four Liang of wine, or two/three cans of beer) would take a driver to the minimum legal BAC limit of 0.02, and a high proportion of drunk driving offenders admitted that they have driven a car (41.6%) or motorbike (47.5%) after drinking at least this much, while proportions for general drivers were much lower (14.8% and 11.3%). In the past month and the last 12 months, drunk driving offenders drove a car, motorbike or other motor vehicle on a public road after drinking to over the legal BAC more times than general drivers did. Drunk driving offenders were more likely to have driven over the legal BAC in both the past month and the last 12 months, and to have been a passenger of a drink driver. In the last three years, less general drivers (0.7%) were caught drink driving.

Table 3. Drinking and driving practice

Question of practice of drinking and driving	Choice and answer		General drivers		Drunk driving offenders		X^2
			N	%	N	%	
After drinking one or two Liang* spirits (or 3-4 Liang wine; or 2-3 cans of beer), have you ever driven:___?	A car	Yes	60	14.8	42	41.6***	36.349
		No	255	62.8	42	41.6***	df = 3
	A motorbike						
		Yes	46	11.3	48	47.5***	71.023
		No	248	61.1	33	32.7***	df = 3

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Question of practice of drinking and driving	Choice and answer	General drivers		Drunk driving offenders		X^2
		N	%	N	%	
How often have you driven a car, motorbike or other motor vehicle on a public road after drinking to over the legal BAC?	In the past month					
	Never	336	82.8	49	48.5***	62.291
	Once	19	4.7	17	16.8***	df = 7
	Twice	15	3.7	13	12.9***	
	3-5 times	7	1.7	4	4.0	
	6-8times	2	0.5	5	5.0***	
	9 times or more	1	0.2	2	2.0***	
	Do not know	25	6.2	9	8.9	
	In last 12 months					
	Never	329	81.0	53	52.5***	44.232
	1-5 times	41	10.1	23	22.8***	df = 8
	6 -10 times	9	2.2	7	6.9***	
	11-15 times	1	0.2	2	2.0***	
	16-20 times	1	0.2	1	1.0	
	21-25 times	1	0.2	2	2.0***	
	26 times or more	2	0.5	4	4.0***	
	Do not know	18	4.4	8	7.9	
How often have you been a passenger in a car, motorbike or other motor vehicle when you know that the driver has been drinking?	In the past month					
	Never	289	71.2	52	51.5***	40.046
	Once	25	6.2	9	8.9	df = 7
	Twice	17	4.2	11	10.9***	
	3-5 times	8	2.0	3	3	
	6-8 times	0	0	3	3***	
	9 times or more	1	0.2	4	4***	
	Do not know	66	16.3	18	17.8	
	In last 12 months					
	Never	267	65.8	42	41.6***	41.211
	1-5 times	52	12.8	21	20.8***	df = 7
	6 -10 times	14	3.4	6	5.9	
	11-15 times	0	0	3	3.0***	
	16-20 times	2	0.5	1	1.0	
	21-25 times	2	0.5	2	2.0	
	26 times or more	2	0.5	3	3.0***	
	Do not know	67	16.5	21	20.8	
How often have you kept track of your drinks if you were driving?	Always	106	26.1	29	28.7	36.759
	Often	54	13.3	22	21.8***	df = 6
	Sometimes	32	7.9	20	19.8***	
	Occasionally	12	3.0	8	7.9***	
	Never	19	4.7	5	5.0	
	N/A	182	44.8	17	16.8***	
In the last three years, have you been caught drink driving?	Yes	3	0.7	21	20.8***	78.153
	No	216	53.2	55	54.5	df = 3
	N/A	180	44.3	23	22.8***	
In the last twelve months, how many times have you been stopped by police conducting breath alcohol testing?	Never	254	62.6	0	0***	
	1 time	53	13.1	73	73.2***	
	2 times	27	6.7	19	18.8***	
	3 and more	32	7.9	9	8.9	
When you were last tested by police, was your alcohol reading above the legal limit?	Yes	5	1.2	78	77.2***	350.186
	No	137	34.0	9	8.9***	df = 3
	Do not know	10	2.5	6	5.9	
	Never been tested	251	62.3	8	7.9***	
Have you been jailed for drink driving?	Yes	6	1.5	22	21.8***	74.622
	No	261	64.6	64	65.3	df = 2
	N/A	137	33.9	12	12.2***	
Has your licence been ____due to drink driving?	Confiscated	3	0.8	15	15.0***	117.533
	Suspended	3	0.8	14	14.0***	df = 3
	Disqualified	7	1.8	11	11.0***	
	None of these	387	96.8	60	60.0***	

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Note: *one Liang is about 50 millilitres water in Chinese. People usually use this unit to estimate how much they drink, especially for spirits.
 *** $p < 0.001$.

Alcohol use (AUDIT), bivariate and multivariate analysis results

Table 4 presents the AUDIT score distribution. The mean AUDIT score of general drivers is $M = 7.4$, $SD = 5.4$ and for convicted drink driving offenders is $M = 11.1$, SD 5.9 representing a medium level of alcohol problems. There is a significant difference between general drivers and convicted drinking driving offenders (mean difference 3.8, $t = 5.75$, $p < 0.001$). There is a slight correlation between age and AUDIT scores for general drivers, $r = 0.1$, $n = 406$, $p < 0.05$). For drunk driving offenders, there was a moderate negative correlation between age and their AUDIT scores, $r = -0.3$, $n = 101$, $p < 0.01$. Knowledge of the legal BAC limit for drink driving was not associated with AUDIT scores for either driver group. However, offenders with knowledge of legal BAC limits had a significantly lower mean AUDIT score (M = 9.8, SD = 5.16) and than those who did not know ($M = 12.2$, $SD = 6.257$, $t = -1.987$, $p = 0.05$).

The distribution of AUDIT scores indicated that a substantial proportion (62.7%) of the general drivers had low levels of alcohol use disorders compared with 38.5% for drunk drivers. For general drivers, the mean AUDIT score for males ($M = 8.4$, $SD = 5.5$) was significant higher than for females ($M = 4.2$, $SD = 3.8$, $t = 6.617$, $p < 0.001$). There was no gender difference for drunk driving offenders (male 11.1, female 11.6). Comparing AUDIT scores between the groups within gender, both male and female drunk driving offenders had higher AUDIT scores than male and female general drivers (males: $t = 3.758$, $p < 0.001$; females: $t = 4.107$, $p < 0.01$).

Table 4. Distribution of AUDIT Scores for general drivers and drink driving offenders

Alcohol problem severity	AUDIT score	General drivers		Drunk drivers		X^2
		Numbers	%	Number	%	
Low	0-7.9	158	62.7	35	38.5***	17.195
Medium	8-15.9	74	29.4	45	49.5***	df = 3
High Level	16-19.9	16	6.3	7	7.7	
Need further diagnostic evaluation for alcohol dependence.	20 or more	4	1.6	4	4.4	

Drivers were divided into four groups according to the length of time for which they had been licensed: novice drivers (licensed for less than two years); 2-5 years; 6-10 years; and 11 years or more. Tables 5 and 6 present average AUDIT scores by years licensed for the two groups.

Table 5. Years licensed and AUDIT score, general drivers

| Years licensed	n	AUDIT Mean	Mean difference from Group 1 (1-G)	SD	P (1-G)
1. Novice driver (<2 years)	18	4.6	0	4.5	
2. Licensed 2-5 years	84	6.2	-1.6	4.2	>0.05
3. Licensed 6-10 years	64	7.5	-2.9	5.0	>0.05
4. Licensed 11 years or more	77	9.3	-4.7	6.8	<0.01
Total	243	7.4		5.5	
			Group 2 to Group 4		
			-3.1		<0.01

Among general drivers, novice drivers had a significantly lower mean AUDIT score than drivers licensed for more than 11 years, as do drivers licensed 2-5 years ($F (3, 239) = 6.353$, $p < 0.001$) (Table 5).

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Table 6. Years licensed and AUDIT score, drunk driving offenders

Group	n	AUDIT Mean	Mean difference from Group 1 (1-G)	SD	P (1-G)
1. Novice driver (<2 years)	13	16.4	0	7.6	
2. Licensed 2-5 years	26	11.3	5.1	6.0	<0.05
3. Licensed 6-10 years	30	9.9	6.5	4.0	<0.01
4. Licensed 11 years or more	26	8.7	7.7	4.3	<0.01
Total	95	11.1		5.9	

Among offenders, the mean AUDIT score of the novice driver group was significantly higher than the other three groups ($F_{(3, 91)} = 6.5$, $p < 0.01$). There were no differences between the other groups (Table 5).

There is an interesting pattern of differences between general drivers and drunk driving offenders (see Figure 1). Higher AUDIT scores were found among the least experienced (licensed < 2 years) drunk driving offenders. With increasing years of licensure, AUDIT scores of offenders decreases gradually. This is the reverse of the pattern for general drivers, whose AUDIT scores are lowest for novice drivers and then gradually increase. Notably, there appears to be no difference between AUDIT scores for general drivers and drunk driving offenders who have been licensed for 11 years or more. Furthermore, among offenders, recidivist drink drivers had a higher mean AUDIT score ($M = 15.1$, $SD = 6.48$) than first time convicted offenders ($M = 9.9$, $SD = 4.9$; $t = 3.532$, $p = 0.01$).
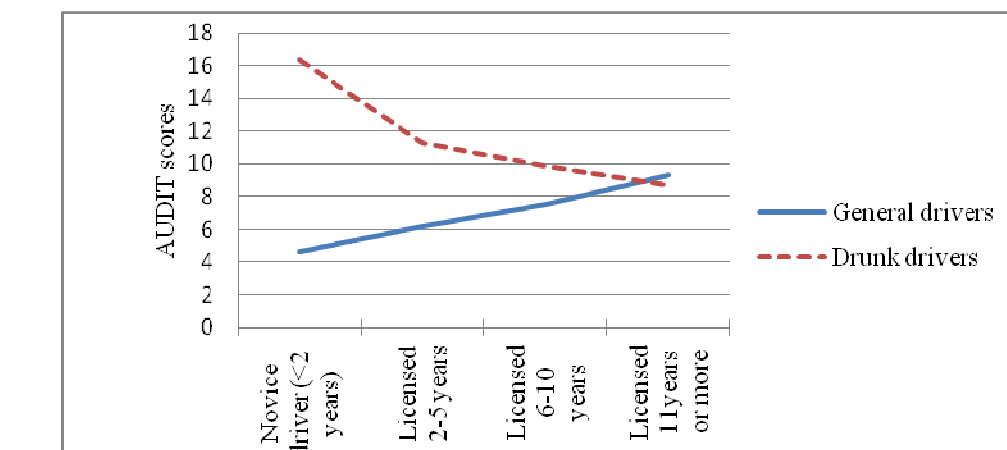
Figure 1. Years licensed and AUDIT Score for general drivers and drunk drivers

There were no differences between AUDIT scores for general drivers and drunk driving offenders with respect to marital status, education, employment status, driver licence status, professional driver/not and kind of vehicle driven. However, general drivers with high monthly income (more than 10000RMB), had a higher AUDIT score ($M = 10.9$, $SD = 8.5$) than other income groups ($F = 2.527$, $p < 0.05$).

Standard multiple regression was used to explore the relationship between AUDIT score and five independent variables: age, gender, attitude score, marital status and education level for the drunk driving offenders and general drivers respectively. For the drunk driving offenders group, the regression model explained 79% of the variance in AUDIT score ($F_{(5, 70)} = 52.565$, $p < 0.001$). The AUDIT score had statistically significant relationships with attitude (beta = -0.984, $p < 0.01$); gender (beta = 0.638, $p < 0.001$); education level (beta = 0.537, $p < 0.01$); age (beta = 0.493, $p < 0.05$) and marital status (beta = 0.251, $p < 0.05$). For general drivers, the regression model explained 67.1 % of the variance in AUDIT score ($F_{(5, 150)} = 61.228$, $p < 0.001$). The AUDIT score had statistically significant relationships with age (beta = 0.779, p < 0.01); education level

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(beta = 0.464, $p < 0.05$); gender (beta = -0.360., $p < 0.05$); and marital status (beta = 0.239, $p < 0.05$), with no significant contribution from attitude.

Discussion

This is the first time the AUDIT has been used to assess alcohol problems for general drivers and drunk driving offenders in China. It also represents the first comparison of offenders/non-offenders with regard to knowledge, attitudes and practices relating to drink driving in China and was conducted approximately one year after the change in penalties for the more severe offence of drunk driving in one major Chinese city. Given the high proportion (more than 80%) of people who drive in China are males (Wei & JinNan, 2012), and the higher proportion who are current drinkers 56% of males vs 15% of females (Tang, 2013), it was not surprising that the majority of respondents in both groups were male, although the proportion was much higher for offenders (90.1% compared with 66.5% for general drivers). Significant differences between offenders and general drivers were noted across a range of variables including age, gender, marital status, education and monthly income. General drivers had significantly lower mean AUDIT scores than offenders and those offenders had scores representing medium level alcohol problems. There was a small positive correlation between age and AUDIT for general drivers, which implies that the prevalence of alcohol problems increases with age, whereas for offenders there was a negative correlation between age and AUDIT, which may indicate that younger offenders had more alcohol problems. The finding that AUDIT scores were the same for general drivers and drunk drivers licensed for 11 years or more merits some further research is somewhat unexpected.

Within the offender group, the males and the females have similar AUDIT scores, reflecting that both genders had medium level alcohol problems on average. The average AUDIT score for male general drivers was at the beginning of the medium cutoff range (38.5% of general drivers and 65% of offenders fell within this category or above it). This finding is in contrast with recent WHO estimates in China of 6.9% for males and 0.2% for females (Tang, et al., 2013), and was also higher than found in other studies conducted in China. For instance, in Hong Kong, the proportion of medium level or higher AUDIT scores was 5.3% in a university sample 6.2% in a community sample, and 14.5% in a hospital sample using a cut-off point of 8 for Hazardous/harmful drinking (Leung & Arthur, 2000). Another study examined drinking among 3171 residents in Lhasa, Tibet Autonomous Region. Results indicated that 22.4% fell within or above the medium range of alcohol problems (Guo et al., 2008). The highest positive rate in Chinese society previously documented was found among a sample of 112 in Taiwan; 31.3% within or above the medium range, a result similar to our findings for general drivers, but much lower than our offender sample (Tsai, Tsai, Chen, & Liu, 2005). While it is recognised that levels of alcohol consumption may vary across China, our results provide the first documented evidence of problematic levels of alcohol use in Guangzhou, particularly among drunk driving offenders.

Although drunk drivers were represented across each of the nine occupational groups examined, results revealed that three groups in particular accounted for the majority of offenders where occupation was known hospitality industry staff, manual workers and professional, technical staff. This finding is partially consistent with results reported by traffic police officers when asked their opinions about drunk drivers in Guangzhou (Jia et al., 2013). In that study, police reported that from their experience, most drunk drivers were private enterprise owners, individual business owners, and were less likely to be public servants and public institute staff. The nature of the sampling and the small numbers of offenders make comparisons with general drivers difficult, but it is worth noting that professional, technical staff comprised about a third of the general driver sample and so were under-represented among the drunk drivers.

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Encouragingly, a large proportion of both samples (84% of general drivers & 84.2% of offenders) knew that drunk driving became a criminal offence in May 2011. However, knowledge about the actual legal limits for drink driving and drunk driving offences was surprisingly low. Only one fifth of general drivers correctly nominated BAC levels for both offences while 28% of offenders knew the drink driving level and 41% knew the drunk driving level. There is little published literature regarding driver awareness of drink driving in China. However, one study in Nanning and Liuzhou in 2007 conducted a baseline survey of drink driving and found that only 4.8% of over 10,000 drivers were aware of the legal BAC limit for drink driving (Yuan, Li, & Zhang, 2013). It should be noted however, that the study was conducted before the 2011 legislative changes and, therefore, the levels of publicity regarding drink driving may have been different to those experienced by our sample. We also found that both groups in our study had little knowledge of how to keep their BAC under the legal limit. It is clear that both general drivers and drunk drivers need further education on this important information.

Finally, differences were noted within the drunk driving group. Recidivist drunk driving offenders had significantly higher AUDIT scores than first time convicted offenders. Studies conducted in Australia revealed that recidivists had alcohol problems and recidivist offenders are noted as a difficult group to manage and that addressing underlying alcohol problems is a key factor in their studies (Freeman, 2007; Freeman et al., 2005). Our results suggest that interventions and alcohol treatment programs need to be considered in China, since they have shown positive results among recidivist offenders elsewhere (Raub, Lucke, & Wark, 2003).

There were some limitations in the study. Firstly, a convenience sample was recruited instead of random sampling participants for the general drivers group. Secondly, the number of drunk drivers is relatively small, limiting the degree to which data could be broken down. Thirdly, there was missing data, especially for items asking about illegal behaviours. Finally, this study uses self-reported data, and therefore may have been subject to reporting bias or lapses in memory.

As noted earlier, the rate of alcohol-related driving in China has decreased significantly since 2011. Our findings highlight the need for ongoing policy development and education about many aspects of alcohol-related driving and a particular need to address problematic drinking among many drunk driving offenders.

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