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The presence of alcohol consumption prior to homicide in Singapore

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ABSTRACT

Objective: To determine the prevalence of alcohol use disorders in people charged with homicide in Singapore. We also sought to determine which historical risk factors were associated with the use of alcohol 24 h prior to the homicide and with the presence of a severe mental illness at the material time of the offence.
Methods: We extracted data from administrative records of all people charged with homicide in Singapore between 2007 and 2014. We used regression models to adjust for known confounding variables and explore the relationship between alcohol use and homicide.
Results: Of 253 homicide offenders, 141 individuals (56%) meeting criteria for alcohol use disorders at the time of the offence. 121 offenders (48%) consumed alcohol within the 24 h preceding the homicide. Of the 149 that met criteria for a psychiatric diagnosis, 35 had a severe mental illness.
Conclusion: Alcohol use disorders are by far the most common disorder diagnosed in people charged with homicide in Singapore. Alcohol use is less common in homicide offenders with SMI.

1. Introduction

Mental disorders and homicide have long been intertwined in public perception (Taylor and Gunn, 1999a,b). However, the causal association between mental disorders and committing homicide is still debatable despite years of epidemiological studies (Martone et al., 2013; Vinkers, 2011). Meta-analyses have shown that having a major mental disorder predisposes an individual to a small but increased risk of being violent (Arseneault et al., 2000; Kooyman et al., 2007; Kuhns et al., 2014). Recent evidence suggests that most homicide offenders were not acutely ill at the time of offending (Flynn et al., 2013; Shaw et al., 2006), suggesting that the temporality criteria for causality is unmet and that variables other than mental illness may be explaining observed links (Skeem et al., 2016). Perceived level of danger is an important contributor to this stigma (Corrigan et al., 2013), and it is likely that media attention inflates public perception (Coverdale et al., 2002). While there have been many studies that have explored the associations between mental disorder and homicide, the prevalence rates vary considerably and it remains difficult to draw conclusions about the causal relationship between the two (Large et al., 2009).

2. Risk factors for homicide

A meta-analysis of five separate studies reported that the risk of homicide was significantly higher in those with psychosis compared to the general population (Fazel et al., 2009a, Fazel et al., 2009b). However, the bulk of the risk is found elsewhere. Personality disorder and substance misuse were found to account for much of the relationship between serious criminal offending and mental disorder (Kuhns et al., 2014; Wallace et al., 1998). The increased effects of affective illness and schizophrenia were minor and often co-mediated and enhanced by co-existing substance misuse (Wallace et al., 2004), a finding replicated since (Fazel et al., 2009a, Fazel et al., 2009b). This particular combination of risk factors appears to be additive with some noting that substances, particularly alcohol, serve to reduce the threshold for violence, while the threshold would already be reduced in those with severe mental illness (Richard-Devantoy et al., 2009).

In general, history of forensic involvement, (Berk et al., 2009) exposure to violence in childhood, (Dahlberg, 1998; Heide and Solomon, 2006) negative peer influence, social isolation, and poverty (Asnis et al., 1997) have all been implicated in increasing the risk of homicide. In a large forecasting study trained on 30,000 cases, having a prior probation case assigned to the mental health unit had the third lowest impacts on forecasting homicide in the 2 year follow-up period, followed by the presence of a prior probation case where psychiatric constraints were imposed, and whether the offender had a fixed address registered on file. The highest contributors in descending order were age, age at first contact with judicial services, having a prior gun charge, being male, having a prior violent charge and the total number of prior charges on record (Berk et al., 2009). Such robust studies

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highlight the insignificant impact of factors typically believed to be major driving forces of homicide.

However, the settings in which these studies were conducted are quite clear, and not universally applicable. Important cultural differences between cultures in the management of alcohol, the judicial system, and the educational system may mean that other factors may emerge in different settings. Given that alcohol use and associated disorders have been increasing in America (Cheng et al., 2018), but have remained stable in Singapore (Cheen et al., 2018) we may expect to see different roles of homicide risk factors.

3. Aim

We sought to determine the prevalence of alcohol use disorders in a population of homicide offenders that had been remanded for assessment between 2007 and 2014. Additionally we sought to elucidate the demographic variables that were associated with alcohol consumption within 24 h prior to the commission of the homicide offence.

We also sought to examine the differences in demographics and past risk factors between those with and without a diagnosis of serious mental illness at the time of the offence.

4. Methods

Our retrospective project uses administrative data to determine the risk factors present in homicide offenders with and without a diagnosis of mental illness and alcohol use. These administrative records were extracted from impartial psychiatric reports submitted into evidence during the court proceedings between 2007 and 2014. We followed the STROBE guidelines for reporting observational studies (Von Elm et al., 2014).

4.1. Timing of the mental illness

It is important to distinguish between the impact of lifetime prevalence of mental illness and the presence of mental illness at the time of the offence. This difference often tends to be conveniently overlooked in media presentations of people who have committed homicide and have a mental illness (Coverdale et al., 2002). In the content that follows, we refer to mental illness diagnosis (primary diagnosis) as the diagnosis the individual had at the time of committing the offence, not the historical diagnosis found on the individual's medical records or the diagnosis given to the individual based on their state the day of the psychiatric examination. Consultant psychiatrists determined the diagnosis at the time of the offence as part of the institutional process of producing court reports. This process was independent of the current study.

4.2. Setting

The Institute of Mental Health (IMH) is the only tertiary psychiatric hospital in Singapore and the only psychiatric specialist center with a forensic psychiatry department. It serves the Singapore population (including locals and foreigners) which has grown from 4,588,600 in 2007 to 5,469,700 in 2014 in a linear trend (Population Trends, 2015). Over this 8 year period, 253 homicide offenders were remanded in the medical wing of a high security prison for psychiatric assessment. Local court rule mandates that all individuals arrested on a charge of criminal homicide, regardless of history of mental illness, receive a thorough psychiatric assessment from a consultant-grade psychiatrist from the IMH within a month of their arrest. This assessment aims to establish, primarily but amongst other things, if the accused had a mental illness at the time of the offence.

4.3. Data sources

Data was extracted from the cases of all homicide offenders remanded between 2007 and 2014. Our sample had to be limited to successfully apprehended cases and offenders above 16 years of age. During the study period nine unsolved cases were pending (Criminal Investigation Department of the Singapore Police Force, 2016). The consultant psychiatrists evaluating the accused offender would arrange investigations and psychological testing while conducting a series of clinical interviews. They would use DSM –IV framework. They had access to all police records and evidence. An established protocol ensured that the police supported the psychiatrists contact with the next of kin to ensure the psychiatrist could collect corroborating evidence. A multi-step peer review process checks the assessment and official report prior to its submission to the courts: first it is completed by the consultant psychiatrist, then vetted by a council of 3 other senior psychiatrists and finally vetted and approved by the institute's Chair of the Medical Board. These official reports are considered impartial, resulting from standard procedures. They are commissioned on behalf of the high court judge rather than the defense or prosecution.

Our raw data constituted the consultant psychiatrist's notes, neurological (Electroencephalogram), psychological (intelligence and personality assessments) and radiological (Computerized Tomography Scans, Magnetic Resonance Imaging Scans) reports, in addition to the official report. A consultant psychiatrist (DY) used a data template to extract systematically all relevant information from these raw data sources. None of the authors had direct contact with the offenders for the purpose of this article.

We obtained ethics approval from the Institute of Mental Health Clinical Review Committee, as well as from Singapore's National Healthcare Group Domain Specific Review Board A (NHG DSRB Ref: 2015/00476).

4.4. Variables

We considered the presence (coded as 1) or absence of alcohol use within 24 h of the offence and, the presence (coded as 1) or absence of severe mental illness as two dependent variables. Binary historical variables were treated as independent variables, including past presence or absence of substance use, severe mental illness, violence, previous criminal record, and self-harm. We defined severe mental illness as it has been defined elsewhere (Swanson et al., 2000) to include psychotic disorders (delusional disorder, schizophrenia, brief psychotic disorder), and affective disorders (major depression and bipolar disorders). Variables used to control for known confounders in each model included age at the time of the offence (continuous), number of years of education (continuous), sex (9.9% female), Singapore citizenship (vs other = 28.5%), employed (vs unemployed = 33.2%), currently married (vs other = 74.4%).

4.5. Analysis

Prevalence is reported as an exact number and as a percent of the entire sample. We relied on regression models to analyze the association between the presence of alcohol use in the 24 h preceding the homicide, the presence of severe mental illness, and the historical risk factors. Multiple logistic regression models were chosen over simple chi squared tests because of the known confounding effect of several measured covariates. For example, it is well established that men have higher rates of criminal activity (Moffitt et al., 2001), and that women have increased likelihood of seeking treatment than men (Mackenzie et al., 2006). Results are expressed as odds ratio interpreted as the odds of someone with alcohol use, or as someone with an SMI having a given historical risk factor. Unadjusted regression results are given in the even numbered tables (Tables 2 and 4) and adjusted values for the confounding variables noted above, are given in the following odd-

Table 1
Prevalence of DSM-IV diagnoses and demographic characteristics of all people charged with homicide (n = 253).

n = 253	Number	Percentage
Diminished responsibility (of those with mental illness)	40	26.8
DSM-IV Diagnosis[a]		
Alcohol use Disorders	141	55.7
Substance use Disorders (excluding alcohol)	23	9.1
Major depression (with or without psychotic features)	22	8.7
Anti-Social Personality Disorder	12	4.7
Schizophrenia	10	4
Conduct Disorder	8	3.2
Adjustment Disorder	4	1.6
Delusional Disorder (persecutory type)	4	1.6
Post-Traumatic Stress Disorder	2	0.8
Acute Stress Disorder	1	0.4
Attention Deficit Hyperactivity Disorder	1	0.4
Bipolar Disorder	1	0.4
Brief Psychotic Disorder	1	0.4
Dementia	1	0.4
Mild Mental Retardation	1	0.4
Pathological gambling	1	0.4
No Mental Disorder	104	41.1
Alcohol consumption within 24 hours of homicide	121	47.8
Sex		
Male	228	90.1
Female	25	9.9
Citizenship Status		
Singaporean	181	71.5
Permanent Resident	1	0.4
Work Permit Holders	52	20.6
Social Visit Pass Holders	7	2.8
Illegal Entrant into Singapore	12	4.7
Age at the time of the offence (Mean SD)	30.5	12.3
Highest Educational Level		
No formal education level attained	39	15.4
Primary	95	37.5
Secondary	79	31.2
Vocational Training	17	6.7
Pre-University	12	4.7
Tertiary (Diploma or Degree)	11	4.3
Marital Status		
Single and Never Married	154	60.9
Currently Married	65	25.7
Divorced	29	11.5
Separated	3	1.2
Widowed	2	0.8
Occupation		
Professional /Managerial	14	5.6
Skilled Worker	90	37.7
Unskilled Worker	65	25.7
Unemployed	84	33.2

[a] Number of diagnoses given, as primary, secondary or tertiary diagnosis.

numbered tables (Tables 3 and 5).

Because of the multitude of comparisons and the exploratory nature of our analysis, we have decided to adjust our level of significance (Streiner and Norman, 2011) to $p = .01$, and report the corresponding 99% confidence intervals. Analyses were conducted in SPSS Version 23, and STATA 15.

5. Results

Of the 253 homicide offenders remanded for a psychiatric assessment between 2007 and 2014, 121 offenders (48%) had consumed alcohol within the 24 h preceding the homicide. Alcohol use disorders were the most common diagnoses, with 141 individuals (56%) meeting criteria for alcohol use disorders at the time of the offence (Table 1). Of the 149 that met criteria for a mental illness diagnosis, 35 had a severe mental illness. Of the entire sample, 104 neither had a history of mental illness nor met the criteria for a mental illness at the time of the offence.

Of those with a diagnosis, 103 had a secondary diagnosis, and 24 had a tertiary diagnosis. Secondary and tertiary disorders were most often alcohol use disorders. Unlike previous studies, schizophrenia and personality disorders were uncommon. Previous estimates of the prevalence of mental disorders in people charged with homicide in Singapore were 11% in 1984, and 48% in 2001. Since 2001 the prevalence of mental disorders has increased moderately to 59% (n = 149) $p = .0295$). Table 1 presents the distribution of diagnoses and demographic details of the entire sample. Ninety percent of the sample was male, and the average age was 30.5 (SD 12.3). No homicides followed by suicide were recorded during the study period.

Simple regression analyses suggest, most notably, that people with severe mental illness had less frequently consumed alcohol in the 24 h prior to the homicide, as did those that had no mental illness (Table 2). However, the multiple logistic regression model in Table 3 suggests that none of the recorded demographic variables significantly relate to the consumption of alcohol in the 24 h that precede homicide once the influence of other variables has been controlled. While being employed and being Singaporean approach significance, they do not have a strong rationale for explaining the link between alcohol consumption and homicide. The multiple logistic regression model only accounts for 10% of the observed variance, suggesting that several unmeasured variables account for the relationship between alcohol consumption and committing homicide.

Simple regression analyses in Table 4 indicate that several demographic factors are associated with having a severe mental illness in offenders, with greater odds of having an SMI existing in women, in older individuals, in those with more education, and in those who had not consumed alcohol in the 24 ours prior. These relationships persist in multiple logistic regression analyses. A relationship also emerges between those with and without a history of violence, with those who had

Table 2
Distribution of demographic variables between those with and without consumption of alcohol 24 h prior the homicide, along with simple logistic regression model results.

	With history of alcohol use within 24 hours n = 121	Without alcohol use n = 132	Odds Ratio[a]	p =	99% CI
Women n (%)	5 (4.1)	20 (15.2)	0.241	0.006	0.063- 0.917
Age mean (SD)	29.9 (11.8)	31.0 (12.7)	0.992[b]	0.462	0.967- 1.019
Presence of SMI n (%)	5 (4.1)	30 (22.7)	0.147	< 0.0001	0.040- 0.535
Absence of any mental illness n (%)	26 (21.5)	78 (59.1)	0.189	< 0.0001	0.091- 0.394
Singaporean n (%)	95 (78.5)	86 (65.2)	1.954	0.020	0.932- 4.099
Single, never married n (%)	79 (65.3)	75 (56.8)	0.700	0.169	0.358 1.367
Years of school mean(SD)	8.2(3.1)	8.6(3.3)	0.962[b]	0.317	0.869 1.063
Employed n (%)	87 (71.9)	82 (62.1)	1.498	0.134	0.748- 3.000
Diminished responsibility n (%)	7 (5.8)	33 (25.0)	0.184	< 0.0001	0.059 - .571
Past history of self-harm n (%)	5 (4.1)	11 (8.3)	0.474	0.179	0.113- 1.985
Past history of violence n (%)	42 (34.7)	37 (28.0)	1.365	0.254	0.676- 2.755

[a] Simple logistic regression results.
[b] linear regression coefficient.

Table 3
Multiple logistic regression model with alcohol use 24 h prior the homicide as the dependent variable, adjusted for variables noted in Table 2.

	Odds Ratio	Robust Standard Error	p=	99% Confidence Interval	
Women	0.426	0.239	0.128	0.100	1.804
Age	0.999	0.013	0.941	0.965	1.034
SMI	0.312	0.308	0.238	0.025	3.965
Singaporean	1.755	0.554	0.075	0.778	3.956
Single, never married	0.770	0.236	0.394	0.350	1.696
Employed	1.674	0.491	0.079	0.787	3.562
Years schooling	0.985	0.043	0.735	0.881	1.102
Diminished responsibility	0.593	0.521	0.552	0.062	5.702
Past history of self-harm	0.605	0.388	0.434	0.116	3.156
Past history of violence	1.311	0.420	0.398	0.574	2.994
Intercept	1.625	1.489	0.596	0.153	17.208

Pseudo R squared = 10%, correct classification of the model = 62.5%.

Table 5
Multiple logistic regression model with the presence of severe mental illness as the dependent variable, adjusted for variables noted in Table 4.

	Odds Ratio	Robust Standard Error	p=	99% Confidence Interval	
Women	9.237	5.093	< 0.0001	2.232	38.222
Age	1.070	0.020	< 0.0001	1.020	1.124
Alcohol use 24 hours prior to homicide	0.211	0.121	0.007	0.048	0.931
Singaporean	0.450	0.244	0.140	0.112	1.814
Single, never married	0.872	0.476	0.802	0.214	3.552
Employed	0.822	0.373	0.665	0.255	2.645
Years of school	1.161	0.075	0.021	0.983	1.372
Past history of self-harm	1.497	1.370	0.660	0.142	15.817
Past history of violence	3.240	1.673	0.023	0.857	12.249
Intercept	0.001	0.001	< 0.0001	0.000	0.019

Pseudo R squared = 28%, correct classification of the model = 88.1%.

a severe mental illness having increased odds of having a history of violence, though this relationship only approaches significance (Table 5).

6. Discussion

Our retrospective analysis of the characteristics of homicide offenders intended to determine the prevalence of alcohol use disorders in this population and determine the demographic variables that were associated with the use of alcohol within 24 h of the commission of a homicide. We found that, similar to existing literature, alcohol misuse played a greater role than other forms of major mental illness in explaining the relationship between mental illness and homicide (Kuhns et al., 2014; Wallace et al., 2004). In a group of offenders charged with homicide, 55.7% had an alcohol use disorder at the time of the offence. An important finding is that the group of homicide offenders that had severe mental illness less often consumed alcohol in the 24 h before the homicide. While this relationship loses its significance in multiple logistic regression analyses, it does hint to the possibility that alcohol contributed less to the circumstances leading to homicide than it does in people who did not have a serious mental illness. The fact that the relationship re-emerges in multiple logistic regression analyses looking at the differences between those with severe mental illness and those without attests to the difficulty of estimating risk factors, and the importance of sound causal theory. Homicide offenders that had consumed alcohol in the 24 h prior to the offence were 78.9% (99% CI 95.2%–6.9%, Table 5) less likely to have a severe mental illness than other offenders who had not consumed alcohol. However, the ability of our model to explain variance reached only 10%, suggesting that several unmeasured variables explain the variability between alcohol consumption and homicide.

Our secondary goal was to determine the characteristics of homicide offenders that had a severe mental illness. Despite the increase over previous estimates in Singapore (Koh et al., 2006), the prevalence of mental illness amongst offenders charged with homicide remains lower than estimates conducted elsewhere (Schanda et al., 2004; Taylor and Gunn, 1999a,b; Walsh et al., 2002). One possible explanation is the differences in legislation concerning institutionalization and mandatory treatment. Singapore retains a relatively high capacity for inpatient psychiatric treatment compared to other countries. This may mean that people at risk of violent offences may be more consistently institutionalized during the acute phases of their illness. Another important finding to highlight is the fact that those with severe mental illness had higher odds of having a history of violence, though this relationship did not reach significance with a p threshold of 0.01.

Only a small number of individuals in our study had schizophrenia or other severe mental illness at the time of the offence. The literature reports that the majority of violent crimes committed by offenders with a mental disorder occur during a period of crisis or when the offender is not compliant to medication (Bennett et al., 2011; Nielssen and Large, 2010). While some studies have found the opposite, for example being in a manic state is not associated with committing a violent offence (Nielssen et al., 2012), our study supports the postulation that those with a non-severe mental illness have increased odds of committing a homicide if they have consumed alcohol in the 24 h preceding the homicide compared to people without a mental illness and those with a severe mental illness.

A contentious topic often brought up in the public media has been role of mental health services in the treatment of the mentally disordered offender. Often, mental health services were suggested to have

Table 4
Distribution of demographic variables between those with and without a SMI, and simple logistic regression models.

	With a diagnosis of SMI n = 35	Without SMI n = 218	Odds Ratio[a]	p=	99% CI
Women n (%)	11 (31.4)	14 (6.4)	6.678	< 0.0001	2.053 21.727
Age mean (SD)	37.2(12.6)	29.4 (11.9)	1.045[b]	< 0.0001	1.015 1.077
Alcohol use 24 hours prior to homicide n (%)	5 (14.3)	116 (53.2)	0.147	< 0.0001	0.040 - 0.535
Singaporean n (%)	22 (62.9)	159 (72.9)	0.628	0.224	0.235- 1.681
Single, never married n (%)	20 (57.1)	79 (36.2)	2.346	0.021	0.904 -6.088
Years of school mean(SD)	9.4(3.3)	8.2(3.1)	1.139[b]	0.038	0.969- 1.341
Employed n (%)	22 (62.9)	146 (67.0)	0.835	0.633	0.314- 2.216
Diminished responsibility n (%)	35 (100)	5 (2.3)	nc		
Past history of self-harm n (%)	5 (14.3)	11 (5.0)	3.136	0.047	0.714- 13.785
Past history of violence n (%)	14 (40.0)	65 (29.8)	1.569	0.231	0.595- 4.135

[a] simple logistic regression results.
[b] linear regression coefficient; nc Not calculated.

been able to predict or prevent violent tragedies among those with mental disorders, especially those with psychotic illness. Previous reviews of homicide inquires have found that delivery of effective psychiatric services would had prevented homicide from completing in approximately 60% of cases (Munro and Rumgay, 2000; Simpson et al., 2001). While rare events like the commission of homicide are challenging to predict, events where the perpetrator had no prior mental health contact cannot be seen as service failures. However, in our study, we have identified that efforts to target the misuse of alcohol in the community and to limit access to alcohol in certain situations could possibly contribute to reduced occurrences of homicide given the strong association between alcohol use (both misuse and use within 24 h of commission of the offence) and commission of homicide offences.

7. Strengths and limitations

Our study has several strengths. Using a database including the entirety of national cases ensures we have fully covered all potential cases. Additionally, the nation's policy is to have every offender receive a psychiatric evaluation regardless of previous contact with mental health services. Furthermore, using records produced for judicial purposes boost our confidence in the robustness of the diagnoses. The peer reviewed process of determining the diagnosis is more robust than that used for research purposes, by virtue of the weight given to the reports in the judicial proceedings. Our first limitation was our inability to establish the circumstances and timing of offenders' previous contact with psychiatric services. A second limitation is the absence of a nationwide registry of health-service use. This absence means that visits to private psychiatrists, private general practitioners and psychiatric services outside of Singapore could not be tracked or documented. This limitation is likely mitigated by the fact that it is in the offender's interest to report treatment, since this would be part of the report submitted by the psychiatrist and taken into consideration during the proceedings. A final limitation has to do with our decision to consider the risk factors as a whole rather than as individual variables. Stepped regression models may have yielded different results as some variables likely were statistically significant if treated on their own.

Author contribution

Derrick Yeo was responsible for the development of the original idea, the execution of the data collection and discussion of the implications

Timothy Singham was responsible for providing input on statistical methods and discussion.

Daniel Poremski was responsible for providing statistical input, refining the content, and contributing to the discussion and implications.

All authors have reviewed and approved the submitted version of the article.

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