

## What predicts medical lethality of suicide attempts in Asian youths?



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### ABSTRACT

This study explores youth suicide attempts in Singapore using multiple databases of comprehensive archival records. Three years of medical records related to suicide attempters ( $N = 666$ ) who were admitted to the emergency department of a large teaching hospital in Singapore were subjected to retrospective analysis. Compared to other age groups, a peak in suicide attempts ( $n = 207$ ) was observed in youths aged between 15 and 24 years old (76.3% females; 23.7% males, mean age = 19.30,  $SD = 2.89$ ). The model using recognized risk and protective factors was significant in predicting medical lethality, and correctly classified 62.8% of high lethality cases. Only resolution of precipitant made a unique statistical significant contribution. Analysis was separately conducted for males and females. Implications of the findings are discussed.

### 1. Introduction

Worldwide trends reveal that suicide rates increase with age from adolescence to young adulthood (Lynch et al., 2008; World Health Organization, 2014). Suicide under 14 years of age is rare, rates begin to rise through adolescence into young adulthood (Bertolote and Fleischmann, 2002; Malone et al., 2013; Pritchard, 1995), with corresponding heightened rates of suicidal ideation and attempts (Apter et al., 2009; World Health Organization, 2013). Trends might be associated with onset of schizophrenia and depression in late adolescence (Kerfoot and Butler, 1988; Limosin et al., 2007; Osborn et al., 2008; Palmer et al., 2005), and increased alcohol consumption in youths (Beautrais, 2000; Hawton, 1998; Klerman, 1988; Nock and Kessler, 2006).

Youth suicide rates have been rising faster compared to other age groups (Wasserman et al., 2005; Mittendorfer-Rutz and Wasserman, 2004), with a peak in those between 15 and 24 years old (Blum and Nelson-Mmari, 2004; Tiller et al., 1998). In most Asian countries, suicide rates increase with age in both genders, but with a smaller male preponderance compared to their Western counterparts (Liu and Yip, 2008; Maris et al., 2000; Peng and Choo, 1990). Young females have lower rates of completed suicides than males (Bridge et al., 2006; Li et al., 2008), but higher rates of suicidal ideation and attempts (Fergusson et al., 2000; Grunbaum et al., 2000; Lee and Tsang, 2004; Sung and Kyoung, 2012). This is often attributed to males having multiple risk factors, e.g., comorbid mood and alcohol abuse disorders,

using more lethal suicide methods (Hawton, 2000; Värnik et al., 2009), in lethal suicide attempts (Brent et al., 1998; Gould et al., 1996; Shaffer and Pfeffer, 2001).

Age plays an important role in determining suicide precipitants. Youths tend to be more impulsive, making them more prone to suicidal behaviour (Daniel and Goldston, 2009). Mental illness has been associated with youth suicide (Chia, 1981; Lo, 1992), and for those without mental illness, precipitants were mainly adverse interpersonal circumstances, and stressful life events (Brent et al., 1998; Dieserud et al., 2010). However, explanations of mechanisms leading to suicide remain inadequate. Many biopsychosocial factors interact and lead to suicide attempts (Cantor, 2000; Rohaimi, 2016), suicide epidemiology needs to include an expanded interdisciplinary perspective.

Youths have unique patterns of risk and protective factors. Risk factors include psychopathology e.g., mood and conduct disorders (Lee et al., 2010) and family history of psychopathology/suicide (Bridge et al., 2006; Cash and Bridge, 2009). Psychosocial variables include social isolation, help-rejection, lack of coping skills, hopelessness, impulsivity (Berman and Jobes, 1994), alcohol/drug abuse (Lee et al., 2010; Lester, 2000; Schilling et al., 2009; Sung and Kyoung, 2012), abuse, poor socio-economic circumstances (Gould et al., 2003), lack of support (Teft, 2000), family stresses (Pfeffer, 1986), academic problems (Lee et al., 2006), and chronic illness (Beautrais, 1998; Hoberman and Garkindel, 1988; Poteet, 1987). A combination of risk factors contributes to heightened risk, e.g., stressful life events in youths with conduct disorder, personality disorder, heightened hopelessness, im-

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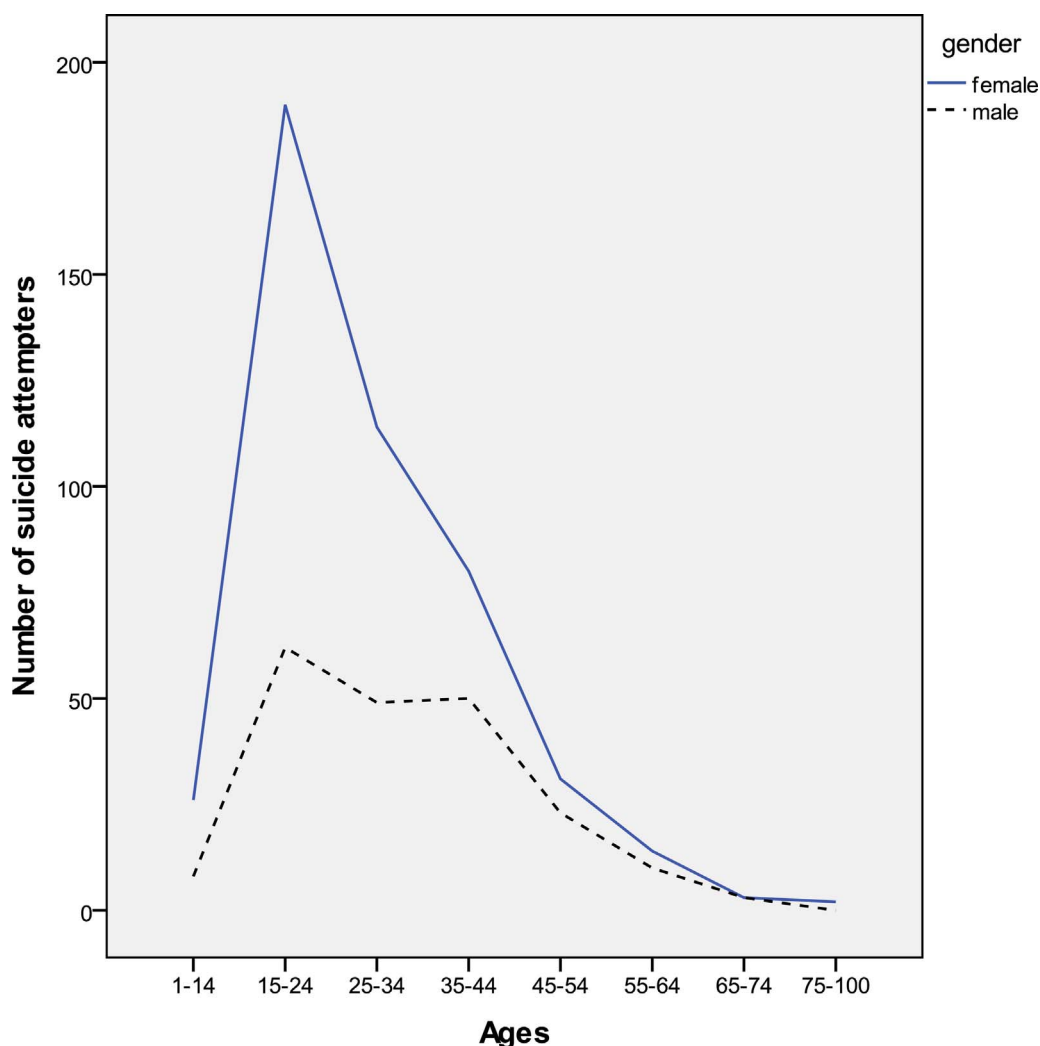


Fig. 1. Graph of suicide attempts by age groups for females and males from 2004–2006.

pulsivity and anger contribute to elevated suicide risk (Males, 2000).

In Asia, prominent risk factors for youth suicides include mental illness, interpersonal conflicts, school problems and stress with military service (Cheok et al., 2000; Chia et al., 2008; Ho and Kua, 1998; Tsoi and Kok, 1982). Recent life and relationship stressors, family problems (Ang et al., 2006; Chia, 1999; Ung, 2003), and academic stress (Loh et al., 2012) predicted youth suicides in Singapore. Suicide attempters often reacted impulsively to a stressor (Kok, 1988). Suicide protective factors in youths is comparatively less researched, these include family cohesion, religious beliefs (Kyle, 2013), positive outlook, self-efficacy in coping, feelings for family (Borowsky et al., 2001; Chan, 1995; Eisenberg and Resnick, 2006; Young et al., 2011), and parental support (Ackard et al., 2006; Borowsky et al., 2001; Brausch and Gutierrez, 2010; Eisenberg et al., 2007; Logan et al., 2011; Taliaferro and Muehlenkamp, 2013).

Most suicide studies were conducted on suicide deaths, thus a study on suicide attempts would enhance understanding of protective factors to reduce the impact of risk factors. Analysis of the prediction of medical lethality could help in identifying high lethality attempts, with the ultimate aim to prevent lethal attempts resulting in death.

This study aims to explore age trends in suicide attempts in Singapore, and analyse the prediction of medical lethality of youth suicide attempts using available risk and protective factors.

The hypotheses are

- A peak in suicide attempts will be noted in youths between 15–24

years old

- Medical lethality in youth suicide attempts will be predicted by a combination of risk and protective factors. Based on evidence in both Western and Asian studies, analysis will be conducted on the following variables, available as part of the Suicide Risk Assessment Form utilized by medical officers at the local hospital where this study took place. The risk factors include: physical illness (e.g., Chong et al., 1992), mental illness (e.g. Judd et al., 2012), alcohol/drug use (e.g., LeardMann et al., 2013), interpersonal conflict (e.g., Chen et al., 2012), protective factors include: emotional support (e.g., Takahashi, 1998), willingness to seek help (e.g., Evans et al., 2005), resolution of precipitants (e.g., Schneidman, 2001), religion (e.g., Kok and Tseng, 1992), regret of the attempt (e.g., Bhugra, 2002), and positive future planning (e.g., Williams and Pollock, 2000).

## 2. Method

### 2.1. Procedure

Ethics approval was obtained from the Domains-Specific Review Board of a local hospital and the Human Research Ethics Committee at James Cook University. The inclusion criteria were suicide attempters admitted to the emergency department from January 2004 to December 2006. This is a retrospective study of archival data extracted from the Patient Psychiatric Assessment Form (PPAF), which includes the suicide

risk assessment form. This data set is the most comprehensive data set available from the hospital, as data containing variables of interest was not available outside the stipulated period. All cases of attempted suicide were assessed by medical officers in the emergency department under the supervision of a consultant psychiatrist, and the interview took approximately 20 min. At the time of the evaluation, the medical officer made a formal psychiatric/medical diagnosis. In this sample, 94% did not have a formal diagnosis during the time of evaluation. The method of suicide attempt was overdose for 78.5% of the suicide attempts. The rest of the attempts included cutting, jumping, stabbing, and hanging.

## 2.2. Measures

The Suicide Risk Assessment Form is a questionnaire used in a semi-structured interview by medical officers. The content includes: demographic information, details of the attempt, mental status examination and psychiatric diagnosis. Risk and protective factors are recorded on dichotomous scales and include: history of physical and mental illness, alcohol or drug abuse, interpersonal conflict; emotional support, willingness to seek help, resolution of precipitant, religion, regret, and positive future planning. It assesses medical severity of the attempt on a 4-point scale (high, moderate, low, no actual attempt). This questionnaire was devised for the collation of information deemed important for clinical usage in suicide risk assessment and recommendation of management plan, and psychometric properties were not available.

## 2.3. Cases of patients

666 patients were admitted for a suicide attempt from January 2004 to December 2006. Fig. 1 indicates a marked rise for suicide attempts in those aged between 15–24 years old in both females and males, with a sharper peak in females. Those aged between 15 and 24 were subjected to further analysis. A total of 264 suicide attempters were between the ages of 15–24. Patients with missing data on key variables were removed from the data set ( $n = 62$ ), resulting in a sample of 207 participants (76.3% females; 53.1% Chinese, 20.3% Malays, 18.4% Indians, 8.2% Others) with mean age of 19.30 ( $SD = 2.89$ ).

## 3. Results

The percentage of patients with risk factors, protective factors, and medical lethality are presented in Table 1. Medical severity of the attempt were recoded: 'high' and 'moderate' were recoded into 'high', while 'low' and 'no actual attempt' recoded into 'low'.

Direct logistic regression was performed to predict medical lethality. The full model containing 10 predictors was statistically significant,  $\chi^2(10, N = 207) = 23.59, p < .05$ , indicating that the model was able to distinguish high and low medical lethality. The model explained between 10.8% (Cox and Snell  $R^2$ ) and 14.4% (Nagelkerke  $R^2$ ) of the variance in medical lethality, and correctly classified 62.8% of the high lethality cases. As shown in Table 2, only resolution of precipitant made a unique statistically significant contribution to the model, with an odds ratio of .33. Those who had resolution of precipitant were .33 times less likely to attempt medically lethal suicide attempts than those who had no resolution of precipitant, controlling for all other predictors in the model.

Two direct logistic regressions were performed, one for each gender, to predict medical lethality. For males, the full model containing nine independent variables (physical illness was not included as a predictor because 0% of males had physical illness) was not statistically significant,  $\chi^2(9, N = 49) = 14.97, p > .05$ , indicating that the model was unable to distinguish attempts with high and low medical lethality.

For females, the full model containing 10 predictors was statistically significant,  $\chi^2(10, N = 158) = 19.60, p < .05$ , indicating that the model was able to distinguish attempts with high and low medical

**Table 1**  
Percentage of patients with risk and protective factors (yes/no), and medical lethality (high/low).

Predictors and criterion	All ( $n = 207$ )		Males ( $n = 49$ )		Females ( $n = 158$ )	
	Yes	No	Yes	No	Yes	No
<b>Risk factors</b>						
1) Physical illness	1.9	98.1	0	100	2.5	97.5
2) Alcohol/drug abuse	11.6	88.4	22.4	77.6	8.2	91.8
3) Mental illness	17.9	82.1	20.4	79.6	17.1	82.9
4) Interpersonal conflict	45.9	54.1	51.0	49.0	44.3	55.7
<b>Protective factors</b>						
1) Emotional support	82.1	17.9	75.5	24.5	84.2	15.8
2) Willing to seek help	69.6	30.4	75.5	24.5	67.7	32.3
3) Resolution of precipitant	52.2	47.8	40.8	59.2	55.7	44.3
4) Religion	36.2	63.8	30.6	69.4	38.0	62.0
5) Expressed regret	84.5	15.5	81.6	18.4	85.4	14.6
6) Positive future planning	82.6	17.4	77.6	22.4	84.2	15.8
<b>Criterion</b>						
Medical lethality [high/low]	50.2	49.8	57.1	42.9	48.1	51.9

lethality. The model explained between 11.7% (Cox and Snell  $R^2$ ) and 15.6% (Nagelkerke  $R^2$ ) of the variance in medical lethality, and correctly classified 63.3% of the high lethality cases. As shown in Table 3, only two of the independent variables made a unique statistically significant contribution to the model (willing to seek help and resolution of precipitant). The strongest predictor of medical lethality was willingness to seek help, with an odds ratio of 2.27. Females who were willing to seek help were 2.27 times more likely to make medically lethal suicide attempts, compared to those who were not willing to seek help, controlling for all other predictors in the model. Another predictor was resolution of precipitant with an odds ratio of .39. Females who had resolution of precipitant were .39 times less likely to attempt medically severe suicide than those who had no resolution of precipitant, controlling for all other predictors in the model.

## 4. Discussion

The study examined age trends and prediction of medical lethality for youth suicide attempts in Singapore. Medical records of 666 suicide attempters were analysed. The hypotheses are firstly, a peak in suicide attempts will be noted in youths between 15–24 years old, and secondly, medical lethality in youth suicide attempts will be predicted by a combination of risk and protective factors. As hypothesized, there was a peak for youths between 15 and 24 years old. As hypothesized, the model using recognized risk and protective factors was significant in predicting medical lethality, and correctly classified 62.8% of the high lethality cases. Only resolution of precipitant made a unique statistical significant contribution, indicating that youths who had resolution of precipitants were less likely to make a medically lethal attempt.

The results suggest that current practice in assessing recognized risk and protective factors seems to suffice in suicide assessment, and indicates support for intervention strategies in helping vulnerable youths to identify and resolve precipitants to their suicide attempt (Ho et al., 1999; Kerr et al., 2006; Shilubane et al., 2012, 2014a,b; Zhang et al., 2011). Future research could explore the impact of

**Table 2**  
Logistic regression predicting medical lethality.

Predictors	B	S.E.	Wald	df	p	Odds ratio	95.0% CI for odds ratio	
							Lower	Upper
<b>Risk factors</b>								
1) Physical illness	-.60	1.06	.32	1	.57	.55	.07	4.37
2) Alcohol/drug abuse	.21	.48	.19	1	.67	1.23	.48	3.18
3) Mental illness	.33	.42	.64	1	.42	1.40	.62	3.17
4) Interpersonal conflict	-.00	.31	.00	1	.99	1.00	.55	1.82
<b>Protective factors</b>								
1) Emotional support	-.45	.42	1.16	1	.28	.64	.28	1.44
2) Willing to seek help	.52	.34	2.40	1	.12	1.68	.87	3.25
<u>3) Resolution of precipitant</u>	-1.1	.34	10.72	1	.00	.33	.17	.64
4) Religion	.46	.32	2.09	1	.15	1.59	.85	2.96
5) Expressed regret	.74	.47	2.50	1	.11	2.09	.84	5.20
6) Positive future planning	-.55	.45	1.50	1	.22	.58	.24	1.39
Constant	.19	.60	.10	1	.75	1.21		

Note. Significant predictor(s) are underlined.

**Table 3**  
Logistic regression predicting medical lethality (females).

Predictors	B	S.E.	Wald	df	p	Odds ratio	95.0% CI for odds ratio	
							Lower	Upper
<b>Risk factors</b>								
1) Physical illness	-.34	1.13	.09	1	.76	.71	.08	6.47
2) Alcohol/drug abuse	-.48	.67	.50	1	.48	.62	.17	2.32
3) Mental illness	.29	.50	.33	1	.57	1.33	.50	3.54
4) Interpersonal conflict	.02	.35	.00	1	.95	1.02	.51	2.05
<b>Protective factors</b>								
1) Emotional support	-.76	.51	2.26	1	.13	.47	.17	1.26
2) <u>Willing to seek help</u>	.82	.39	4.43	1	.04	2.27	1.06	4.88
<u>3) Resolution of precipitant</u>	-.94	.39	5.95	1	.02	.39	.18	.83
4) Religion	.21	.36	.33	1	.57	1.23	.61	2.50
5) Expressed regret	.57	.55	1.02	1	.31	1.74	.59	5.13
6) Positive future planning	-.76	.54	1.95	1	.16	.47	.16	1.36
Constant	.61	.77	.62	1	.43	1.84		

Note. Significant predictor(s) are underlined.

precipitants on vulnerable youths and factors that could mitigate their impact.

When results were analysed separately for both genders, the model was not significant for males, possibly due to the relatively small sample size. Future studies could use a larger sample size for males or use in-depth interviews to explore male suicidality.

The model was significant in predicting medical lethality for females, and correctly classified 63.3% of high lethality cases, suggesting that current practice in assessment seems to suffice for females. The strongest predictor of medical lethality for females was willingness to seek help. This result that females willing to seek help were more likely to make medically lethal suicide attempts may seem counterintuitive, but consideration of literature on youths' help-seeking behaviour offer further insight into female suicide attempts.

Youths tend to seek help from friends/family, rather than from professionals (Boldero and Fallon, 1995; Kalafat, 1997; Kalafat and Elias, 1995; Sawyer et al., 2000). However, help-seeking from peers may not always be beneficial (Offer et al., 1991) and youths may not receive the help that they require, as peers often might be poorly equipped to provide appropriate. What some youths view as peer support may reinforce antisocial behaviour and maladaptive emotional coping (Kerr et al., 2006). Suicidal youths often form poor quality friendship (Cole et al., 1992), which might increase suicide vulnerability or modelling of maladaptive suicidal behaviours (Deane et al., 2001; Prinstein et al., 2001).

Help-seeking behaviour requires self-awareness of the problem, willingness to seek assistance and social norms that encourage help-seeking (Rickwood et al., 2007). Youths willing to seek help might not have done so prior to the suicide attempt, due to stigma. Fear of stigma is high among youths and prevalent in Asian societies (Chong et al., 2007). Possible factors preventing youths from seeking help include lack of knowledge of available services and difficulty in taking the initiative to seek help (Curtis, 2010). Such factors could be explored in future research.

Although research is needed to further explore help seeking and suicide lethality, current findings offer interesting perspectives for suicide interventions in young females. Targeting help-seeking could be effective for school-based suicide prevention programs (Aseltine et al., 2007; Carlton and Deane, 2000), where information about informal and formal sources of help is disseminated (Strunk et al., 2014). Informal sources include parents and friends (Cauce and Srebnik, 2003) who could be gatekeepers and connect youths with professional help. Peers are often the first to know of a youth's suicidality, but are often unsure about what to do (Mazza, 2006). Programs could equip gatekeepers to support suicidal youths. Training in early identification of warning signs and referral options could reduce stigma on help-seeking (Budinger et al., 2014), enhance gatekeepers' preparedness to offer help (Baber and Bean, 2009; King and Smith, 2000; Wyman et al., 2008), improve gatekeepers' ability to assist distressed youths (Frederico and Davis, 1996), and ultimately prevent



suicide (Shilubane et al., 2014a,b). This is helpful when youths are disconnected from social support (Bourke and Evans, 2000).

Limitations of the study include the reliance on self-report, and the usage of discrete items on dichotomous scales, which place constraints on the depth and types of information obtained. Future research could employ qualitative interviews to uncover the processes underlying help seeking, suicide lethality, resolution of precipitants and other factors relevant for understanding youth suicide attempts.

It is desirable to have a multi-level modelling analysis to identify different layers of factors contributing to medical lethality in youth suicide, which take into account the social cultural environment, and other contextual factors, that might impact on suicide attempters, e.g. socioeconomic status (Gould et al., 2003), and whether the youths came from dysfunctional family backgrounds (e.g., Ackard et al., 2006; Borowsky et al., 2001; Brausch and Gutierrez, 2010; Eisenberg et al., 2007; Logan et al., 2011; Taliaferro and Muehlenkamp, 2013). As local youths aged between 15 and 24 years old may be either schooling or in employment or serving mandatory National Service, these factors may affect the kind of stress experienced and in turn contribute to suicide vulnerability (Cheok et al., 2000; Chia et al., 2008; Ho and Kua, 1998; Lee et al., 2006; Tsoi and Kok, 1982). However, there are constraints as such data was not collected. Future research could gather further information and employ multi-level modelling analysis to give further understanding into youth suicides.

In conclusion, the findings have implications for informing suicide assessment and primary prevention for youth suicides. A peak was seen in suicide attempts for youths aged between 15 and 24 years old, drawing attention to the need for primary suicide prevention for at-risk youths. The parsimonious model using recognized risk and protective factors was significant in predicting medical lethality in youths, and correctly classified 62.8% of the high lethality cases, with good clinical utility, building the evidence base for brief suicide assessment. Only resolution of precipitant made a unique statistical significant contribution, indicating that youths who had resolution of precipitants were less likely to make a medically lethal attempt, suggesting that this is an important factor to work on in suicide interventions for youths. This study adds to the current literature on youth suicide, building evidence on the usage of recognized risk and protective factors in brief suicide assessment, and casting light on the relevance of resolution of precipitants in interventions for youth suicides, with the ultimate aim to reduce medical lethality and premature death of youths from suicide.

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