

# Non-fatal repetition of self-harm in Taipei City, Taiwan: cohort study

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## Background

Repeat self-harm is an important risk factor for suicide. Few studies have explored risk factors for non-fatal repeat self-harm in Asia.

## Aims

To investigate the risk of non-fatal repeat self-harm in a large cohort of patients presenting to hospital in Taipei City, Taiwan.

## Method

Prospective cohort study of 7601 patients with self-harm presenting to emergency departments (January 2004–December 2006). Survival analysis was used to examine the rates, timing and factors associated with repeat self-harm.

## Results

In total 778 (10.2%) patients presented to hospital with one or more further episodes of self-harm. The cumulative risk of non-fatal repetition within 1 year of a self-harm episode

was 9.3% (95% CI 8.7–10.1). The median time to repetition within 1 year was 105 days. Females had a higher incidence of repeat self-harm than males (adjusted hazard ratio 1.25, 95% CI 1.05–1.48) but males had shorter median time to repetition (107 v. 80 days). Other independent risk factors for repeat self-harm within 1 year of an index episode were: young age, self-harm by medicine overdose and increasing number of repeat episodes of self-harm.

## Conclusions

The risk of non-fatal repeat self-harm in Taipei City is lower than that seen in the West. Risk factors for repeat non-fatal self-harm differ from those for fatal self-harm. The first 3 months after self-harm is a crucial period for intervention.

## Declaration of interest

None.

Non-fatal self-harm is one of the strongest risk factors for further acts of suicidal behaviour.<sup>1,2</sup> Other consistently reported socio-demographic risk factors for non-fatal self-harm include female gender, younger age and being unmarried.<sup>3,4</sup> Risk of repetition is highest in the first year after an episode of self-harm, with an estimated median proportion of 15–16% of individuals repeating.<sup>1</sup> Knowledge of these risk factors is crucial to provide an evidence base to inform risk assessment and public health prevention strategies.<sup>5</sup> However, it is unclear whether the risk factors identified in Western populations or the timing of risk are similar in Asians.

Unlike the high rates of repeat self-harm found in the West, figures reported in Asian countries, although scarce, are generally much lower.<sup>6–8</sup> For example, a study conducted in rural Taiwan reported a 5.7% 1-year risk of non-fatal repetition.<sup>7</sup> Studies from Sri Lanka, a low-/middle-income country, indicate that less than 10% of patients who self-harm have done so previously.<sup>6,8</sup> A possible contributor to the difference in repetition risk may be the frequent use of pesticides for self-poisoning in many Asian countries.<sup>9–12</sup> Case fatality following pesticide poisoning is considerably higher than that following medicine overdose, meaning a high proportion of individuals at risk of repetition are removed from the population at risk of repetition in Asia.

Recent evidence from Hong Kong shows a different picture.<sup>13</sup> The reported 6-month repetition rate was 16.7%, a figure similar to findings from the West, with self-poisoning by medicine (mainly painkillers and sleeping pills) being the most common method used. However, the Hong Kong study recruited cases from a single hospital and had a small sample size ( $n = 92$ ). A recent study based on Taiwan's national health insurance data-set found a low rate of repeat self-harm (8%) within the first year of follow-up.<sup>14</sup> However, this study relied on insurance claim data to ascertain self-harm cases and was based on hospital admissions only. Specifying cause of injury/disease (such as self-harm or accident) is not mandatory for insurance reimbursement in Taiwan and this is likely to have led to an underestimate of the incidence of

self-harm and self-harm repetition.<sup>15</sup> No representative large-scale, community-based study of the risk of repeat self-harm in an urban area of a high-income country in Asia has been published; risk of non-fatal repetition in such a setting might be predicted to be different from that of rural or low- and middle-income Asian countries.

A less-studied area is the timing of repetition. Examining the time to repetition among different subgroups might help identify patient characteristics associated with a higher risk of repetition soon after an attempt, thereby facilitating targeted and specific interventions. A multicentre study in the UK has estimated that among individuals who repeat self-harm within 1 year, the median time to repetition is 73.5 days, with 10% repeating within 5 days.<sup>16</sup> No similar study can be found in Asia, where nearly 60% of the world's suicides occur.<sup>11</sup>

The current study focused on non-fatal repetition of self-harm in a cohort of patients presenting to the emergency department in Taipei City, Taiwan. The study investigated the risk and timing of non-fatal repetition, as well as associated risk factors, especially within the first year. In an earlier study of suicide risk in this cohort we found that the key risk factors for suicide were being male, aged >45 years and use of hanging or charcoal burning in the index episode of self-harm.<sup>15</sup>

## Method

### Study population

Patients presenting to emergency departments after an episode of self-harm were identified from the Taipei City self-harm surveillance system, a service-based suicide prevention programme run by the city's Suicide Research and Prevention Centre. Taipei City (population 2.6 million) is Taiwan's capital city. All emergency departments in the city, including 8 university-affiliated medical centres and 18 regional general hospitals, were

required to report any presentation of self-harm/suicide regardless of whether the person was admitted. Self-harm includes attempts regardless of the degree of suicide intent or medical seriousness. Emergency department staff are required to complete a structured case-note sheet for all self-harm presentations. The form records basic sociodemographic data and method of self-harm. These are then forwarded to the surveillance system of the Suicide Research and Prevention Centre. Case managers from the centre then followed up the reported self-harm cases and provided aftercare. Suicide risk assessment and supportive psychotherapy were offered. Depending on the estimated risk of suicide, the follow-up frequency may range between two to three times per week and one to two times a month (further information about the content of services provided by case managers available at <http://tspc.health.gov.tw/about4.html>). Further referral to psychiatrists or the social welfare system was provided as needed.

Altogether, 8343 people presenting with self-harm to emergency departments in Taipei City between January 2004 and December 2006 were identified. Individuals who died in the index attempt ( $n=202$ , 2.4%) were aged  $\leq 15$  years ( $n=60$ , 0.7%) and were not Taiwanese citizens ( $n=98$ , 1.2%); or for whom national identity numbers were not available ( $n=382$ , 4.6%) were excluded from the analysis. Our analysis is therefore based on a sample of 7601 self-harm cases. A patient's first self-harm presentation during this period was defined as their index episode. The unique national identity number was used to identify repeat episodes. The national identification number in Taiwan is issued at the time of birth registration; it is unique to each individual. This number is used in virtually all activities and government functions that require verification of identity (e.g. healthcare, school admission, voting, marriage registration, opening a bank account).

All patients were followed up to the end of 2006, no matter when they first presented. Methods of self-harm were categorised into solid/liquid poisoning, self-cutting/piercing, concurrent use of medication overdose and self-cutting/piercing, charcoal burning, hanging, and other methods. Solid/liquid poisoning was further classified into medicine, pesticide and other poisons. Except for concurrent use of medication and self-cutting/piercing, if an individual used more than one method of self-harm, we used a hierarchical algorithm based on method lethality. For example, if a person used hanging combined with medication overdose, hanging was identified as the key method of self-harm as it is a more lethal method than medication overdose. The study was approved by the institutional review board of Taipei City Hospital (TCHIRB-1001202-E).

### Statistical analysis

All patients registered on the surveillance system regardless of length of follow-up period were included in the survival analysis. The Kaplan–Meier method was used to estimate risk of repetition and median time to repetition following index episode. The risks were given by Kaplan–Meier cumulative failure functions ( $F(t) = 1 - S(t)$ ), with associated 95% confidence intervals.

Factors associated with repetition within 1 year were investigated by proportional rates/means models.<sup>17</sup> These models were Cox proportional hazard type models,<sup>18</sup> specifically for recurrence data. The proposed method does not restrict to first repetition following index episode. All repeat episodes for a given individual were included, such that information could be fully utilised to estimate the risk factors associated with repeat self-harm. Inference was based on robust sandwich variance estimates such that the models did not require any specific structure of dependence among recurrent events (non-fatal repetitions) within the same patients. However, time-varying covariates were allowed, which

gave us the opportunity to investigate the hazard ratio (HR) of patients with increasing number of repeat self-harm presentations. Univariable models were first fitted and the interaction effect of each factor with gender was also examined to determine whether there were any gender differences in the associations. A multivariable model was then used to identify independent risk factors of non-fatal repetition within 1 year.

The median time to repetition in this study was also estimated through the Kaplan–Meier method and was restricted to patients who repeated within 1 year of the index event. For example, if a 1-year risk of 20% was observed through the Kaplan–Meier curve, the median time to repetition was defined as the time when 10% of patients with self-harm had repeated.

All analyses were conducted using SAS version 9.3 for Windows. Patients were right-censored if they died by any cause during the follow-up period. The assumption of proportional hazard was tested by plotting standardised score process for each covariate, using the ASSESS statement of PROC PHREG in SAS.<sup>19</sup> No evidence of violation was detected.

## Results

### Patient characteristics

The annual rate of non-fatal self-harm in Taipei City during 2004–2006 was 135.2 per 100 000 population (male: 81.5; female: 185.2). Based on the sociodemographic characteristics of patients during their index episodes (Table 1), most patients were female, with a female-to-male ratio of 2.28:1. Their ages ranged from 15 to 96 years, and half of the patients were 25–44 years old. The mean age was 38.22 years (s.d. = 18.36) for males and 35.31 years (s.d. = 14.23) for females. The follow-up period ranged from 1 day to 3 years, with an average of 1.43 years (s.d. = 0.82). Patients with self-harm in Taipei City were more likely to be never-married. The most common means of self-harm in the index episode was solid/liquid poisoning by medication overdose (57.4%), followed by self-cutting/piercing (22.0%) and charcoal burning (5.8%).

Approximately 10% ( $n=778$ ; 611 female, 167 male) of patients had one or more self-harm attempts after the index episode (Table 1). Pearson's  $\chi^2$  was used to investigate differences between the single-episode group and repeat-episode group. The repeat-episode group tended to be female, younger, single or divorced/separated, and used medicine or medicine and self-cutting/piercing combined as their means of self-harm. Among the 778 patients who repeat self-harmed, 555 (71.34%) repeated once, 133 (17.10%) twice, 52 (6.68%) three times and 38 (4.88%) repeated four or more times within the 3 years (maximum) of follow-up. In total, 1185 repeat self-harm episodes were recorded.

### Risk of non-fatal repetition

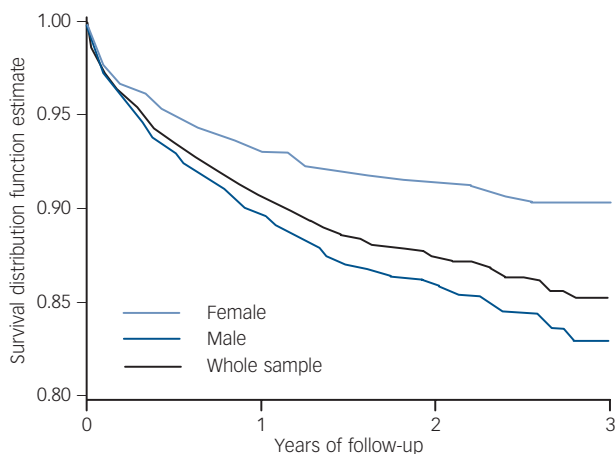
Figure 1 shows the probability of surviving a non-fatal repetition from the Kaplan–Meier analysis and Table 2 summarises the 1-year risk across different subgroups estimated using the Kaplan–Meier method. For the overall sample, the risk of repetition was 9.3% (95% CI 8.7–10.1) within 1 year following an index episode and 14.8% (95% CI 13.5–16.1) during the whole follow-up period. The risk of repetition within 1 year was 10.4% (95% CI 9.5–11.3) for females and 6.9% (95% CI 5.9–8.1) for males (Table 2) (unadjusted HR = 1.47, 95% CI 1.19–1.81,  $P=0.0003$ ). The cumulative risk during the entire follow-up period for females and males was 17.1% (95% CI 15.4–18.9) and 9.7% (95% CI 8.2–11.4) respectively, and was consistently higher in females than in males (Fig. 1).

We also plotted the Kaplan–Meier survivor functions for those who repeatedly self-harmed (Fig. 2). The risk of repetition

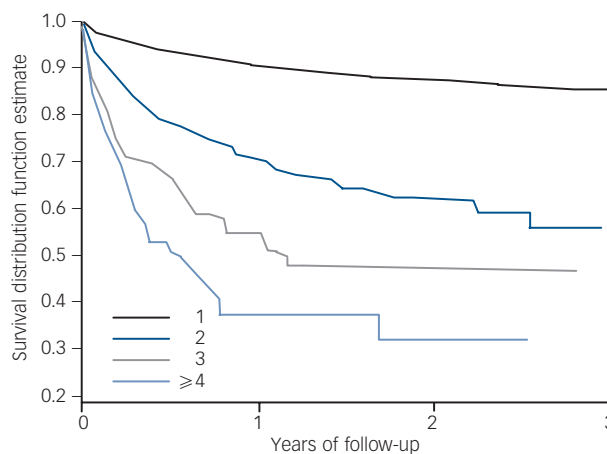
increased sharply with increasing number of repeat self-harm presentations ( $\chi^2(\text{trend}) = 802.94$ , d.f. = 1,  $P < 0.0001$ ). The 1-year repetition risk increased to 29.4% (95% CI 26.0–33.2) among those who had repeated once already (i.e. patients with two self-harm presentations) (unadjusted HR = 5.86, 95% CI 4.88–7.03,  $P < 0.0001$ ) and was 45.2% (95% CI 37.8–53.2) among those who had repeated twice (unadjusted HR = 13.55, 95% CI 10.37–17.70,  $P < 0.0001$ ), and then to 62.7% (95% CI 54.1–71.3) for patients who presented four times or more (unadjusted HR = 24.69, 95% CI 17.86–34.13,  $P < 0.0001$ ). There was no evidence of a gender difference in risk of repetition in relation to the number of repeat episodes ( $\chi^2(\text{interaction}) = 3.19$ , d.f. = 3,  $P = 0.36$ ).

**Factors associated with repetition**

Univariable models showed that the repetition risk differed across age groups ( $\chi^2 = 40.35$ , d.f. = 3,  $P < 0.0001$ ), marital status ( $\chi^2 = 24.05$ , d.f. = 3,  $P < 0.0001$ ) and method of self-harm ( $\chi^2 = 55.25$ , d.f. = 7,  $P < 0.0001$ ). The hazard of repeat self-harm was lower among those aged 45–64 years and >65 years than the younger age groups (Table 3). Compared with those aged 45–64 years, the unadjusted HR was 0.42 (95% CI 0.24–0.72) in patients aged >65, whereas for those aged 25–44 years it was 1.66 (95% CI 1.27–2.16). Divorced/separated or never-married individuals had a higher risk of repetition when compared with those who were married or cohabitated. Regarding means of self-harm, medication overdose, self-cutting/piercing and the



**Fig. 1** Kaplan–Meier estimates of survival curve, for the whole sample and by gender.



**Fig. 2** Kaplan–Meier estimates of survival curve, stratified by number of previous self-harm episodes.

**Table 1** Comparison of sociodemographic and clinical characteristics between those with a single episode and those with repeat episodes of self-harm

	All patients n (%)	Single-episode group n (%)	Repeat-episode group n (%)	Pearson $\chi^2$	d.f.	P
Gender						
Both	7601 (100)	6823 (100)	778 (100)	33.17	1	<0.0001
Female	5285 (69.5)	4674 (68.5)	611 (78.5)			
Male	2316 (30.5)	2149 (31.5)	167 (21.5)			
Age group <sup>a</sup>				49.86	3	<0.0001
15–24 years	1956 (25.8)	1732 (25.5)	224 (28.8)			
25–44 years	3778 (49.8)	3338 (49.1)	440 (56.6)			
45–64 years	1321 (17.4)	1226 (18.0)	95 (12.2)			
65+ years	528 (7.0)	509 (7.5)	19 (2.4)			
Marital status <sup>b</sup>				23.82	3	<0.0001
Married/cohabitating	2132 (35.1)	1913 (35.9)	219 (29.6)			
Never married	2772 (45.7)	2399 (45.0)	373 (50.3)			
Divorced/separated	996 (16.4)	855 (16.0)	141 (19.0)			
Widowed	169 (2.8)	161 (3.0)	8 (1.1)			
Means of self-harm in index episode <sup>c</sup>				44.24	7	<0.0001
Solid/liquid poisoning						
Medicine	4365 (57.4)	3898 (57.1)	467 (60.0)			
Pesticide	122 (1.6)	117 (1.7)	5 (0.6)			
Other poisons	303 (4.0)	282 (4.1)	21 (2.7)			
Self-cutting/piercing	1672 (22.0)	1498 (22.0)	174 (22.4)			
Medicine + self-cutting/piercing	295 (3.9)	240 (3.5)	55 (7.1)			
Charcoal burning	440 (5.8)	410 (6.0)	30 (3.9)			
Hanging	83 (1.1)	77 (1.1)	6 (0.8)			
Other <sup>d</sup>	319 (4.2)	299 (4.4)	20 (2.6)			

a. Age not known for 18 individuals.  
 b. Marital status not known for 1532 individuals.  
 c. Means of self-harm not known for 2 individuals.  
 d. Other included jumping from a height (91), domestic gas (57), drowning (54), head banging (25), vehicle exhaust gas (18), lying on the rails (17), injecting unknown substances (9), self-immolation (9), tongue biting (5), hit by a car (4), swallowing coins (3), electric shock (1), ingesting poisonous plants (1), jumping out of a car on a highway (1), using a firearm (1), other unspecified methods (23).

**Table 2** Estimated risk of repetition (from Kaplan–Meier method) within 1 year following index self-harm

	Repetition risk, % (95 CI)		
	Male	Female	Total
All	6.9 (5.9–8.1)	10.4 (9.5–11.3)	9.3 (8.7–10.1)
Age group			
15–24 years	6.7 (5.0–8.9)	12.4 (10.6–14.4)	10.5 (9.1–12.0)
25–44 years	8.3 (6.6–10.5)	11.3 (10.1–12.6)	10.5 (9.5–11.6)
45–64 years	6.7 (4.5–9.8)	6.7 (5.2–8.8)	6.7 (5.4–8.4)
65+ years	3.2 (1.6–6.2)	3.8 (1.9–7.6)	3.5 (2.1–5.6)
Marital status			
Married/cohabitating	7.3 (5.4–9.8)	10.6 (9.0–12.5)	9.6 (8.3–11.1)
Never married	8.6 (6.9–10.7)	14.3 (12.7–16.2)	12.4 (11.1–13.8)
Divorced/separated	10.3 (6.5–16.0)	14.3 (11.8–17.2)	13.4 (11.3–15.9)
Widowed	9.6 (3.2–27)	1.6 (0.4–6.2)	3.2 (1.4–7.6)
<i>Means of self-harm in index episode</i>			
Solid/liquid poisoning			
Medicine	8.0 (6.4–9.8)	10.4 (9.3–11.5)	9.8 (8.9–10.7)
Pesticide	4.8 (1.5–14.3)	2.4 (0.3–16.1)	4.0 (1.5–10.4)
Other poisons	7.9 (4.2–14.8)	7.2 (4.0–12.8)	7.5 (4.9–11.5)
Self-cutting/piercing	6.2 (4.3–8.9)	10.4 (8.6–12.4)	9.1 (7.7–10.7)
Medicine + self-cutting/piercing	5.1 (1.7–15.0)	20.3 (15.5–26.4)	17.4 (13.3–22.5)
Charcoal burning	5.5 (3.0–9.8)	7.7 (4.6–12.7)	6.5 (4.4–9.6)
Hanging	4.5 (1.1–16.9)	6.3 (1.6–22.8)	5.4 (2.1–13.8)
Other <sup>a</sup>	5.7 (2.9–11.2)	5.3 (2.5–10.8)	5.5 (3.3–9.0)

a. Other included jumping from a height, domestic gas, drowning, head banging, vehicle exhaust gas, lying on the rails, injecting unknown substances, self-immolation, tongue biting, hit by a car, swallowing coins, electric shock, ingesting poisonous plants, jumping out of a car on a highway, using a firearm, other unspecific methods.

**Table 3** Unadjusted and adjusted hazard ratios (HRs) for the risk of self-harm repetition within the first follow-up year, from proportional rates/means model (number of episodes = 8786, number of patients = 7601)

	Univariable model			Multivariable model		
	Unadjusted HR (95% CI)	Test for heterogeneity		Adjusted HR (95% CI)	Test for heterogeneity	
		(d.f.)	P		(d.f.)	P
Gender		13.22 (1)	0.0003		6.76 (1)	0.0093
Male	1.00			1.00		
Female	1.47 (1.19–1.81)*			1.26 (1.06–1.49)**		
Age group		40.35 (3)	<0.0001		20.85 (3)	0.0001
15–24 years	1.55 (1.17–2.05)*			1.17 (0.87–1.55)		
25–44 years	1.66 (1.27–2.16)*			1.30 (1.03–1.65)**		
45–64 years	1.00			1.00		
65+ years	0.42 (0.24–0.72)*			0.48 (0.30–0.79)*		
Marital status		24.05 (3)	<0.0001		6.85 (3)	0.0769
Married/cohabitating	1.00			1.00		
Never married	1.39 (1.15–1.69)*			1.18 (0.97–1.42)***		
Divorced/separated	1.52 (1.17–1.96)*			1.22 (1.00–1.48)***		
Widowed	0.36 (0.16–0.81)**			0.62 (0.29–1.32)		
<i>Previous means of self-harm<sup>a</sup></i>		55.25 (7)	<0.0001		26.09 (7)	0.0005
Solid/liquid poisoning						
Medicine	1.00			1.00		
Pesticide	0.29 (0.11–0.77)**			0.52 (0.21–1.32)		
Other poisons	0.71 (0.47–1.07)			0.79 (0.53–1.19)		
Self-cutting/piercing	0.99 (0.83–1.19)			0.97 (0.82–1.15)		
Medicine + self-cutting/piercing	1.86 (1.43–2.42)*			1.50 (1.15–1.94)*		
Charcoal burning	0.56 (0.39–0.81)*			0.62 (0.43–0.89)*		
Hanging	0.41 (0.16–1.07)***			0.56 (0.22–1.40)		
Other <sup>c</sup>	0.56 (0.36–0.88)**			0.69 (0.44–1.06)***		
Number of repeat self-harm presentations		802.94 (1) <sup>b</sup>	<0.0001		670.78 (1) <sup>b</sup>	<0.0001
1	1.00			1.00		
2	5.86 (4.88–7.03)*			4.49 (3.71–5.43)*		
3	13.55 (10.37–17.70)*			10.01 (7.61–13.15)*		
4 or more	24.69 (17.86–34.13)*			16.75 (12.40–22.62)*		

a. Unlike means of self-harm in index episode (which was fixed to an individual), it referred to a time-varying (or episode-varying) covariate which may change when the individual repeated their act of self-harm.  
b. Test for trend.  
c. Other included jumping from a height, domestic gas, drowning, head banging, vehicle exhaust gas, lying on the rails, injecting unknown substances, self-immolation, tongue biting, hit by a car, swallowing coins, electric shock, ingesting poisonous plants, jumping out of a car on a highway, using a firearm, other unspecific methods.  
\**P* < 0.01; \*\**P* < 0.05; \*\*\**P* < 0.1.

**Table 4** Median time to repetition within 1 year after index self-harm

	Median time, days (95% CI)		
	Male	Female	Total
All	80 (48–137)	107 (89–124)	105 (88–121)
Age group			
15–24 years	50 (15–137)	97 (71–122)	88 (56–115)
25–44 years	130 (52–194)	111 (83–128)	112 (84–130)
45–64 years	89 (20–190)	135 (85–236)	123 (83–177)
65+ years	39 (1–196)	233 (99–321)	99 (11–283)
Marital status			
Married/cohabitation	89 (29–171)	133 (111–190)	126 (104–157)
Never married	99 (50–151)	105 (80–134)	104 (80–125)
Divorced/separated	131 (52–284)	106 (74–144)	118 (78–160)
Widowed	55 (11–196)	132 (99–NA)	99 (11–196)
<i>Previous means of self-harm</i>			
Solid/liquid poisoning			
Medicine	73 (39–137)	116 (90–135)	111 (84–128)
Pesticide	114 (1–364)	126 (NA–NA)	126 (1–364)
Other poisons	151 (92–321)	95 (7–343)	151 (49–310)
Self-cutting/piercing	70 (45–250)	89 (70–144)	88 (69–133)
Medicine + self-cutting/piercing	1 (1–19)	107 (58–194)	99 (49–187)
Charcoal burning	40 (1–352)	83 (17–309)	52 (17–275)
Hanging	11 (1–NA)	129 (22–NA)	22 (1–129)
Other <sup>a</sup>	176 (168–339)	131 (35–205)	175 (86–336)

NA, 95% CI cannot be determined as number of repetition was too small.  
a. Other included jumping from a height, domestic gas, drowning, head banging, vehicle exhaust gas, lying on the rails, injecting unknown substances, self-immolation, tongue biting, hit by a car, swallowing coins, electric shock, ingesting poisonous plants, jumping out of a car on a highway, using a firearm, other unspecified methods.

concurrent use of medication overdose and self-cutting/piercing were associated with elevated risk of self-harm repetition. There was no evidence that the risk of repeat self-harm in relation to the risk factors investigated differed in males *v.* females ( $P_{(\text{interaction})} = 0.29\text{--}0.87$ ).

After adjusting for other variables, the effect of marital status on future risk of non-fatal repetition was greatly attenuated. Associations with gender, age and method of self-harm persisted, although these too were somewhat weaker than those seen in the univariable analysis (Table 3). Patients who adopted concurrent use of medication and self-cutting/piercing have a 50% higher risk (adjusted HR = 1.50; 95% CI 1.15–1.94) than those who use medication poisoning. History of self-harm was still the strongest risk factor. Increasing number of repeat self-harm presentations after the index episode was strongly associated with non-fatal repetition.

### Timing of non-fatal repetition

Table 4 shows the estimates of the median time to repetition, restricted to those who repeated within 1 year. For the entire patient cohort, the estimated median time to non-fatal repetition among patients who repeated within 1 year following an index episode was 105 days (95% CI 88–121). The risk was highest within the days immediately after the index self-harm episode. Approximately 1 in 10 patients who repeated did so within 4 days.

Although the repetition risk was higher in females than in males, males tended to repeat earlier than females. The median time to repetition in males (80 days; 95% CI 48–137) was 4 weeks shorter than that in females (107 days; 95% CI 89–124), but the statistical evidence for the difference was marginal ( $P = 0.09$ ). The gender difference in time to repetition was most marked in older adults, with older men repeating the fastest (males aged > 65 = 39 days, 95% CI 1–196; females aged > 65 = 233 days, 95% CI 99–321;  $P = 0.0051$ ). The median times to repetition were considerably shorter in males across all age groups, except those aged 25–44.

## Discussion

### Main findings

The risk of non-fatal repetition 1 year after an episode of self-harm in Taipei City was 9.3% – higher than that reported in previous studies from Taiwan<sup>7,14</sup> but lower than findings in the West.<sup>1,16</sup> The risk was particularly high within the first year following an episode of self-harm. Risk of repeat self-harm was higher in females than males, but males appeared to repeat their act more quickly. Risk of repeat self-harm was also higher in younger patients and those who used medication overdose or concurrent use of self-cutting and medication overdose in their last episode of self-harm. The risk of repeat self-harm increased markedly with increases in the number of repeat self-harm presentations after the index episode and tended to be associated with shorter intervals between episodes of self-harm.

### Strengths and limitations

This is the largest investigation of non-fatal repeat self-harm among a representative cohort of patients in an urban setting in Asia. The large sample size meant we had sufficient statistical power to investigate risks of repetition in a number of different subgroups. Furthermore, as the study was based on patients presenting with self-harm to the emergency department and the surveillance register covered the whole of Taipei City, selection bias and loss to follow-up was reduced.

However, the study has a number of limitations. The surveillance system records only limited demographic information and details of the method used for self-harm. No information on risk factors identified in previous studies (e.g. unemployment, clinical diagnosis, childhood sexual or physical abuse) is recorded.<sup>13,16,20</sup> The second limitation is that our cohort was based on people presenting to hospital emergency departments following self-harm; individuals who did not present to hospital or consult with private doctors would not be captured by the



system, leading to underestimation of the risk of repeat self-harm. Last, movement out of the study catchment area by cohort members who left Taipei City may influence the estimated rate of self-harm repetition. However, only 2% of Taipei City residents move to other cities every year, so this is unlikely to have a major impact on our estimates.<sup>21</sup>

### Risk and timing of non-fatal repetition following self-harm

Following index self-harm presentations to the emergency department, 9.3% of patients repeated their act of non-fatal self-harm within 1 year and 14.8% did so within 3 years. If fatal cases are included, the 1-year rates of repetition in our sample would increase to 10.9%.<sup>15</sup> These figures were high when compared with previous findings from rural Asia or low- and middle-income Asian countries, with figures ranging from 3.0% to 9.5%,<sup>7,8</sup> but were lower than findings from the West where the risk of repetition within 1 year is approximately 15%.<sup>1</sup>

Although the risk of repeat self-harm was higher in females than males, we found some evidence that males tended to repeat sooner than females, a finding in keeping with a previous study from the UK.<sup>16</sup> The estimated median time to repetition among those who repeated within 1 year in our study was 105 days (males, 80 days; females, 107 days); the UK finding was 73.5 days (males, 67.5 days; females, 84 days). The time to repetition seems to be particularly short (39 days) in older men (>65 years). Few previous studies have explored timing of self-harm repetition, however both studies support the notion that the first 3 months following a self-harm episode had the highest elevated risk of repetition and was thus the critical period for intervention.

The pattern of non-fatal repetition by age was similar to previous studies across countries. The younger age group was associated with higher risk of repetition for both males and females.<sup>16,22</sup> However, the proportion of middle and older age groups was higher in our self-harm cohort; approximately 24% of our cohort were 45 years or older; the equivalent figures in previous UK studies were less than 15%.<sup>16,23</sup> This may partially contribute to the lower rates of non-fatal repetition in our study, as older age groups are less likely to repeat self-harm.

Methods of self-harm in our Taipei City sample were different from those reported by Chen *et al* in their study of self-harm in rural Taiwan.<sup>7</sup> In the index episode, a higher proportion of patients self-poisoned using medication and other chemicals in Taipei City (61.6%) than in rural Taiwan (43.9%) but this was compensated by the much smaller proportion for those who ingested pesticides (1.6% *v.* 24.4%), probably due to its limited accessibility in urban areas. This might also explain the larger risk of non-fatal repetition in Taipei City. Pesticide ingestion was associated with a decreased risk of non-fatal repetition in rural Taiwan,<sup>7</sup> and patients who overdosed were somewhat more likely to repeat. This may be due to the relatively higher case fatality of pesticide ingestion than medication overdose (case fatality for pesticides in Taiwan was estimated to be 5–10%; medication overdose was generally lower than 5%).<sup>24–26</sup> Our previous study on fatal repetition in this self-harm cohort shows that the risk of fatal repetition for those who self-harmed by pesticide was two times higher than the group who used medication overdose in the first year after the index episode.<sup>15</sup> The highest-risk patients who self-poison with pesticides are therefore removed from the group at risk of repetition. Furthermore, repeat pesticide poisoning would likely lead to a fatal, rather than a non-fatal outcome.

The proportion using medication overdose in the index self-harm episode in Taipei City was lower than the figures observed in Western countries, where approximately 80% of patients who

self-harmed used medication overdose. In contrast, self-cutting was slightly more common in Taipei City than in the West (19.3% *v.* 12–15%).<sup>16,20,27</sup> Charcoal burning, which accounted for 5.8% of self-harm in our sample, was rarer in rural Taiwan (2.9%)<sup>7</sup> and is a method rarely used in Western countries. The variations in methods of self-harm may contribute to the area or country differences in risk of self-harm repetitions.

Self-harm using medication overdose and self-cutting/piercing together was associated with higher risk of non-fatal repetition. Of individuals adopting these two methods in their index self-harm episode, 9.1–17.4% would repeat within 1 year and 14.9–25% would do so within 3 years. This finding was consistent with a previous study in rural Taiwan in which self-cutting and the use of drugs or other chemicals as means of self-harm increased future risk of non-fatal repetition in a similar manner.<sup>7</sup> Some clinicians regard self-cutting as a ‘manipulative’ self-harm act rather than ‘real’ suicidal behaviour, thereby neglecting their future suicide risk.<sup>28</sup> However, several recent studies from the West showed that self-cutting significantly increased future risk of suicide mortality,<sup>29,30</sup> especially among children and adolescents.

The newly introduced aftercare programme for self-harm (90% of patients were followed up as part of this initiative) may have contributed to the lower rate of self-harm repetition in Taipei City. In studies carried out in England,<sup>31,32</sup> the rate of psychosocial assessment following a self-harm presentation was 50–60% and the rate of mental health referral was even lower. Indeed, one study from Taiwan has shown that patients who received aftercare services following an episode of self-harm had a significantly reduced risk of suicide when compared with those who did not.<sup>33</sup> One further explanation for the lower rate of self-harm repetition in Taipei City is the difference in help-seeking behaviour between Eastern and Western countries.

Consistent with previous findings, a history of self-harm is the strongest risk factor for future repetition. Findings in the present study show that the risk of repeat self-harm rises with increasing number of previous episodes. This perhaps provides support for the interpersonal-psychological theory of suicidal behaviour,<sup>34</sup> which suggests that repeated exposure to self-harm may further reduce one’s feeling of fear and pain towards the act, making repetition more likely; effective early intervention in first-episode cases may help break this cycle of behaviour.

It should be noted that the groups at highest risk of suicide (men, older people and those using more lethal methods)<sup>15,35–38</sup> differed from those who repeated self-harm (i.e. female, younger age groups and those using methods of low lethality).<sup>15,39</sup> Hence, different targets are required for strategies aiming to prevent suicide from those targeted at reducing repeat non-fatal self-harm.

### Clinical implications

The risk of non-fatal repeat self-harm in Taipei City is lower than in the West. Among patients who repeat within 1 year following an index episode, approximately half do so in the first 3 months, indicating the high-risk and critical period for interventions. Risk of repetition is higher in females than males, but time to repeat is shorter in males. Patients who use medicine overdose or combine self-cutting and medication overdose are more likely to repeat. Number of repeat self-harm presentations also increased the risk of repetition. The group at greatest risk of non-fatal self-harm repetition is distinct from the high-risk group of suicide; hence, risk assessment should be guided by knowledge of the different risk factors for these separate outcomes.

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