



# Suicide Risk Among Youngsters Receiving High-Risk Family Services in Taiwan

A nationwide matched cohort study of 39,939 children and adolescents, 2011–2018

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39,939

children and adolescents aged 0–17 entering Taiwan’s High-Risk Family (HRF) program, 2011–2018, matched 1:10 to 399,390 peers

5.5×

higher rate of **Suicidal Behavior** over 5 years among adolescents aged 13–17

5.8×

higher rate of **All-Cause Mortality** over 5 years among children enrolled at ages 0–6

3.2×

adjusted risk of **Suicidal Behavior** among children aged 7–12 enrolled in 2015–2018 vs 2011–2014

## 1 Study question and background

Why suicide risk after preventive child-welfare contact is still unquantified

- Family adversity — maltreatment, neglect, parental substance use, domestic violence — is among the most consistent antecedents of suicidal behavior in young people.
- Taiwan’s High-Risk Family (HRF) program is a nationwide preventive child-welfare service: schools, hospitals, police and social workers refer families judged to be at elevated risk of maltreatment or family dysfunction, and referred families are offered case management, counseling, and welfare support.
- HRF referral therefore marks a large, administratively identifiable population of adversity-exposed children. Whether they remain at elevated risk after the program engages them has not been quantified nationally.
- Existing evidence comes mainly from clinical or child-protection samples selected on severity, which rarely follow children into adolescence or link to mortality records.

### THE QUESTION

Do children served by the High-Risk Family program **have higher rates of suicidal behavior, suicide, and all-cause mortality** than matched peers?

Does **any excess differ by age** at intervention, **by sex**, and **by time** since enrollment?

## 2 Methods

Linked nationwide child-welfare, National Health Insurance and mortality databases, Taiwan

### Design and cohorts

- Retrospective matched cohort built from Taiwan’s linked nationwide child-welfare, National Health Insurance and death-registry databases.
- HRF-exposed cohort:** 39,939 children and adolescents aged 0–17 who entered the High-Risk Family program between 2011 and 2018.
- Comparison cohort:** 399,390 peers with no HRF record, matched 1:10 on sex, birth year-month, region, and index year-month.
- Index date = date of HRF enrollment; all participants followed for up to 5 years, with 1-, 3- and 5-year windows analyzed separately.

### Outcomes and covariates

- All-cause mortality:** national death registry.
- Suicide:** national death registry, intentional self-harm as underlying cause.
- Suicidal behavior:** suicide attempt or self-harm recorded in emergency department or inpatient National Health Insurance claims, or suicide death.
- Suicide-related outcomes were restricted to children aged ≥7 years at index (n = 26,685 exposed), below which such events are not meaningfully ascertained.
- Covariates:** sex, age at index, intervention period (2011–2014 vs 2015–2018), and low-income household status.

### Statistical analysis

- Incidence rates (IR) per 1,000 person-years (PY) (mortality, suicidal behavior) or per 100,000 PY (suicide), with crude incidence rate ratios (IRRs) comparing exposed children with matched peers.
- Rates estimated separately within each follow-up window and stratified by age at index (0–6, 7–12, 13–17 years).
- Cox proportional hazards models fitted within the HRF-exposed cohort. Model 1 adjusts for sex, age, and intervention period; Model 2 adds household low-income status.
- Smoothed hazard functions describing how risk evolves month by month over the 36 months after enrollment.

## 3 Key findings

### A Who entered the HRF and outcome prevalence?

| Characteristic, %                    | HRF-exposed<br>n = 39,939 | Comparison<br>n = 399,390 |
|--------------------------------------|---------------------------|---------------------------|
| Male                                 | 53.2                      | 53.2                      |
| Aged 0–6 at index HRF intervention   | 33.2                      | 33.2                      |
| Aged 7–12 at index HRF intervention  | 39.7                      | 39.7                      |
| Aged 13–17 at index HRF intervention | 27.1                      | 27.1                      |
| Enrolled 2015–2018                   | 54.7                      | 54.7                      |
| All-cause death within 5 y, ‰        | <b>4.23</b>               | 0.99                      |
| Suicide death within 5 y, ‰ †        | <b>0.41</b>               | 0.10                      |
| Suicidal behavior within 5 y, ‰ †    | <b>5.92</b>               | 1.21                      |

Table 1. Cohorts were matched 1:10 on sex, birth year-month, region, and index year-month, so those rows are identical by design; all between-cohort differences in outcomes p < 0.0001. † Suicide outcomes restricted to children aged ≥7 years at index (n = 26,685 exposed, 266,850 comparison).

### B Incidence and crude rate ratios over 5 years

| Outcome and age at index                  | IR HRF       | IR comparison | Crude IRR (95% CI) |
|-------------------------------------------|--------------|---------------|--------------------|
| <b>ALL-CAUSE MORTALITY — per 1,000 PY</b> |              |               |                    |
| Aged 0–6 at index                         | <b>0.80</b>  | 0.14          | 5.82 (4.15–8.16)   |
| Aged 7–12 at index                        | <b>0.67</b>  | 0.16          | 4.21 (3.05–5.80)   |
| Aged 13–17 at index                       | <b>1.17</b>  | 0.33          | 3.57 (2.68–4.76)   |
| <b>SUICIDAL BEHAVIOR — per 1,000 PY</b>   |              |               |                    |
| Aged 7–12 at index                        | <b>0.70</b>  | 0.17          | 4.14 (2.97–5.71)   |
| Aged 13–17 at index                       | <b>1.92</b>  | 0.35          | 5.48 (4.27–7.00)   |
| <b>SUICIDE DEATH — per 100,000 PY</b>     |              |               |                    |
| Aged 7–12 at index                        | <b>1.26</b>  | 0.88          | 1.44 (0.18–11.71)  |
| Aged 13–17 at index                       | <b>18.52</b> | 3.53          | 5.25 (2.44–11.28)  |

Table 2 / Figure 1. Incidence over 5 years of follow-up. Diamond = crude IRR, whiskers = 95% CI; the whisker for suicide at ages 7–12 extends beyond the axis. All IRRs for mortality and suicidal behavior p < 0.0001.

### C How does suicidal behavior risk unfold after HRF enrollment?

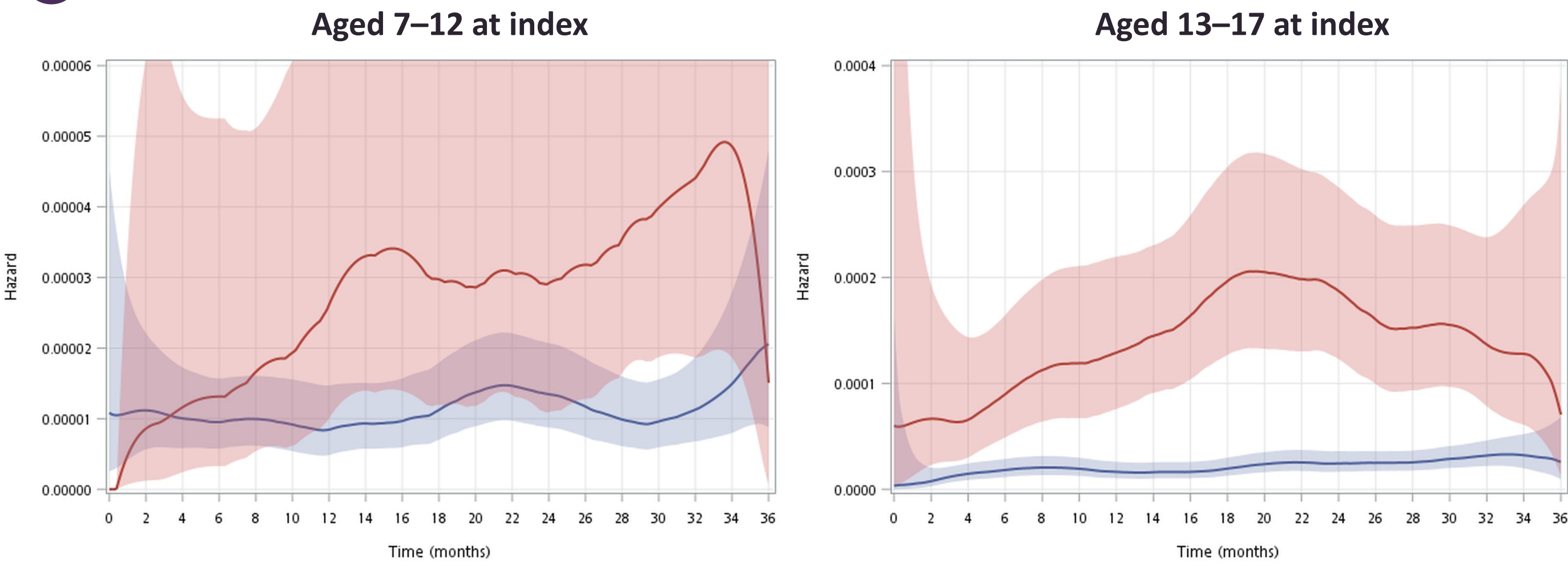


Figure 2. Smoothed hazard of suicidal behavior over the 36 months following HRF enrollment; shaded bands = 95% CI. Note the different vertical scales. The gap between exposed and comparison children is present from the first months and does not narrow with time since enrollment.

### D What predicts suicidal behavior and death for the HRF recipients?

| Characteristic          | Suicidal behavior (aHR) |                         | All-cause mortality (aHR) |                         |                         |
|-------------------------|-------------------------|-------------------------|---------------------------|-------------------------|-------------------------|
|                         | Aged 7–12               | Aged 13–17              | Aged 0–6                  | Aged 7–12               | Aged 13–17              |
| <b>3-YEAR FOLLOW-UP</b> |                         |                         |                           |                         |                         |
| Male (ref: female)      | <b>0.14 (0.04–0.58)</b> | <b>0.29 (0.15–0.54)</b> | 1.32 (0.73–2.39)          | 2.10 (0.94–4.71)        | 2.26 (1.00–5.14)        |
| Age at index, per year  | <b>1.91 (1.28–2.85)</b> | 1.17 (0.96–1.43)        | <b>0.68 (0.58–0.80)</b>   | <b>1.28 (1.02–1.60)</b> | 1.24 (0.93–1.64)        |
| Enrolled 2015–2018      | 2.94 (0.96–8.98)        | 1.61 (0.92–2.80)        | 1.34 (0.71–2.56)          | 2.14 (0.98–4.71)        | 1.00 (0.47–2.14)        |
| Low-income household    | 0.38 (0.09–1.52)        | 0.79 (0.42–1.47)        | 0.92 (0.46–1.84)          | 0.79 (0.34–1.84)        | 0.81 (0.33–1.98)        |
| <b>5-YEAR FOLLOW-UP</b> |                         |                         |                           |                         |                         |
| Male (ref: female)      | <b>0.19 (0.10–0.38)</b> | <b>0.37 (0.24–0.56)</b> | 1.15 (0.67–1.98)          | <b>2.08 (1.15–3.77)</b> | <b>2.44 (1.41–4.20)</b> |
| Age at index, per year  | <b>1.67 (1.37–2.02)</b> | 1.08 (0.93–1.25)        | <b>0.69 (0.59–0.80)</b>   | <b>1.25 (1.06–1.48)</b> | <b>1.23 (1.02–1.48)</b> |
| Enrolled 2015–2018      | <b>3.21 (1.73–5.98)</b> | <b>1.66 (1.10–2.48)</b> | 1.17 (0.66–2.08)          | 1.34 (0.77–2.33)        | 0.99 (0.60–1.63)        |
| Low-income household    | 0.63 (0.33–1.20)        | 0.91 (0.59–1.41)        | 0.93 (0.49–1.77)          | 1.11 (0.61–2.00)        | 1.09 (0.63–1.88)        |

Tables 3–4. Cox proportional hazards models fitted among HRF-exposed children only, each adjusted for all characteristics shown (Model 2). Suicidal behavior was not modeled for children aged 0–6 at index. **Red = 95% CI excludes 1.**

- Adolescents enrolled at ages 13–17 carry the heaviest absolute burden:** 1.92 suicidal-behavior events/1,000 PY, 5.5× the matched rate, and 18.5 suicides/100,000 PY.
- The excess does not fade with time since enrollment — the gap in month 36 is as wide as in month 6, well beyond the period of active case management.**
- Girls account for most suicidal behavior** (aHR for male sex: 0.19–0.37); **boys account for most deaths** (aHR: 2.08–2.44).
- The disparity is widening — the risk of suicidal behavior in the 2015–2018 cohort is 1.7x to 3.2x that of the 2011–2014 cohort.**

## 4 Conclusion and implications for Zero Suicide practice

### Conclusion

- Children and adolescents served by HRF program died and harmed themselves at four to six times the rate of matched peers throughout five years of follow-up.
- Preventive child-welfare contact identified the right children but did not, on its own, bend their risk trajectory: the excess persisted well beyond active case management and widened across successive cohorts.

### What this means for suicide prevention

**IDENTIFY:** embed suicide-risk screening in High-Risk Family intake and every later case-management contact, with re-screening as children reach adolescence.

**ENGAGE AND TREAT:** deliver mental-health assessment and treatment inside child-welfare case management rather than referring out, with sex-specific attention — self-harm pathways for girls, injury and mortality risk for boys.

**IMPROVE:** link child-welfare, health and mortality records so that suicidal behavior after program exit becomes a routine Zero Suicide indicator rather than an unmeasured outcome.

### Limitations

- Suicidal behavior came from emergency and inpatient claims; attempts not reaching care are missed.
- No measure of the severity or chronicity of family adversity, or of the HRF service dose received.
- Matching was demographic only, so residual confounding is likely; suicide deaths were too few for precise subgroup estimates.

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