Estimating the Risk for Suicide Following the Suicide Deaths of 3 Asian Entertainment Celebrities: A Meta-Analytic Approach

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Objective: Evidence suggests that there is an increase in the suicide rate following incidents of celebrity suicide in different countries, but there are no data on the overall suicide risk across countries. The duration of increased suicide rates is usually assumed to be on a monthly basis, but the weekly increase remains uncertain. This study aims at estimating the risk for suicide after the suicide deaths of entertainment celebrities in Asia during the first 4 weeks after the celebrity suicides and on a weekly basis.

Method: An ecological, retrospective time-series analysis and a meta-analysis of the suicide deaths in 3 Asian regions: Hong Kong (from 2001 to 2003), Taiwan, and South Korea (both from 2003 to 2005).

Results: The combined risks for suicide were found to be 1.43 (95% CI = 1.23 to 1.66), 1.29 (95% CI = 1.12 to 1.50), and 1.25 (95% CI = 1.08 to 1.45) in the first, second, and third week, respectively, after suicides of entertainment celebrities, while adjusting for secular trends, seasonality, economic situation, and temporal autocorrelation. The same-gender and same-method specific increases suggest that as people identify more with the celebrity, their risk for suicide rises. A medium-term rise in suicides up to 24 weeks after the incidents of celebrity suicide is also evident.

Conclusion: This study is the first to estimate risk for suicides following celebrity suicides across 3 Asian regions. The results provide important information for public health policy makers in assessing the elevated risk associated with excessive media coverage of celebrity suicide and developing timely evidence-based interventions.

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Evidence shows a surge in the suicide rate or suicide attempts following incidents of celebrity death or suicide[1–5] as well as after publicized news stories of celebrity suicides.[6–8] Such an increase following the suicides of entertainers is found to be higher than that with other types of celebrities[7,8]—and more salient among specific genders or age groups, or among those who died by the same suicide method as the celebrity did.[2,5,9] These specific modeling effects could be understood by the social cognitive theory.[10]

Minimizing unnecessary reporting of suicides in mass media has been suggested by the World Health Organization (WHO) as one of the strategies for preventing suicides.[11] The WHO has specifically recommended cautious reporting of celebrity suicide.[12] A few media intervention programs have demonstrated some efficacy to reduce suicide rates or change the way the media represents suicides.[13–15]

However, no study has yet precisely estimated the elevated risk for suicide brought by media influences and/or celebrity suicide. Also, none of the preceding studies has attempted to evaluate such suicide risk across incidents occurring in more than one country. The lack of this important information is not conducive to developing effective intervention strategies for preventing harmful media effects on suicidal behavior, which is a global effort advocated by the WHO.

To obtain an accurate estimation of elevated suicide risk, some methodological concerns should be addressed first. All previous studies used incomparable data analysis strategies and different indicators for effect, unit of duration of effect, and covariates. Two quantitative reviews have analyzed the research findings from all previously published studies, but their unit of analysis is whether or not a finding represents a statistically significant or insignificant relationship, rather than an explicit numerical value of suicide risk.[16,17] A few narrative reviews have attempted to address the question of the extent of the suicide risk, but their findings cannot be presented in a quantitative way.[18–21] Second, studies on rare events like suicides may have been limited by infrequent episodes or insufficient statistical power to distinguish a true effect from random fluctuation, particularly while stratifying the data into specific subgroups like age, gender, method, or

their interactions. Another consequence of the lack of statistical power is the difficulty in investigating effects over smaller time durations, e.g., by the week. This difficulty is probably part of the reason why existing research routinely used month as the unit of analysis to help boost statistical power. Another weakness of existing studies is the difficulty in eliminating unknown factors that might account for the changes in the suicide rate for each isolated case. Third, longer-term effects of media coverage of celebrity suicides are rarely examined.[9]

This study aims to examine the impact of suicides of entertainment celebrities in Asia by analyzing official raw data using a common methodology, indicators, and covariates, and then estimating the combined risk for suicide across incidents through the application of meta-analysis. The advantages of this approach are 3-fold: (1) it facilitates the estimation of the overall risk in a comparable manner, (2) it increases the statistical power to investigate specific subgroup changes as well as smaller duration changes, and (3) it minimizes the impact of spurious factors such as uncertain random fluctuations or case-specific influential factors and offers a robust solution by pooling results across incidents.

METHOD

Data Collection

First, incidents of death by suicide of Asian entertainment celebrities were identified. Following the definition from *Webster's Dictionary*, *celebrity* was defined as a person who is "widely known." Newspaper archives were used as a tool to identify the suicides of widely known entertainers. Using LexisNexis news archives (http://www.lexisnexis.com) of Asia Pacific News (APAC News), news stories were retrieved by keyword searches for *celebrity suicide*, *actor's suicide*, *actress' suicide*, *singer's suicide* or *star's suicide* for the time period between 2000 and 2005. Australian news was excluded in this study. Finally, 32 news stories were compiled, and, from these news reports, 6 cases of celebrity suicide were identified. The "widely known" criterion was double checked by searching the name of each of the 6 celebrities again through LexisNexis. Three cases (Mr. Masato Furuoya and Ms. Kyoko Togawa in Japan and Mr. Chin Kong Liu in Malaysia) among the 6 retrieved cases were found to have only 1 or 2 stories covering their deaths on 1 single day, which is not substantially different from how an ordinary person's suicide death would be portrayed in the media. On the contrary, each of the remaining 3 cases had from 10 to 30 news reports on the suicide death throughout the period of several months after the incidents. These individuals' prominent media coverage obviously indicated that they were widely known by the general public. Therefore, only the latter 3 entertainment celebrities were included in this study.

We noticed that the suicide deaths of these 3 Asian entertainment celebrities occurred in 3 different places in Asia—Hong Kong, Taiwan, and South Korea—during the period between 2003 and 2005. The Hong Kong male pop singer and artist, Mr. Leslie Cheung, died by jumping from a height on April 1, 2003, at the age of 46.[5] A famous male television actor in Taiwan, Mr. Min-Jan Nee, was found to have died by hanging on May 2, 2005, at the age of 59.[2] South Korea's popular actress, Ms. Eun-ju Lee, died by hanging on February 22, 2005, at the age of 25. Because of the celebrity status of these individuals, extensive local media coverage followed their deaths. Some of those stories were found to be placed on the front pages of media publications, with color photos, sensational stories, and specific details of the suicide method and personal background,[2,5] all of which run counter to media recommendations issued by the WHO[12] and local media guidelines[22] on how to report suicide news.

Suicide data in Hong Kong, Taiwan, and South Korea were collected from the Hong Kong Census and Statistics Department and the Coroner's Court, the Department of Health of Taiwan, and the National Statistical Office of Korea, respectively. Death records coded in the range of E950–E959 (ICD-9) or X60–X84 (ICD-10) were classified as suicide deaths. The year of the corresponding celebrity's suicide death and the preceding 2 years were used for analysis, i.e., data from Hong Kong were from 2001 to 2003, and data from Taiwan and South Korea were from 2003 to 2005. On the basis of the recorded date of certified death, the data were amalgamated into weekly suicide counts. For each dataset, the day after the corresponding celebrity's suicide death and the following 6 days were grouped as the "first week," which was defined as a reference point across incidents.

The monthly unemployment rate in Hong Kong, Taiwan, and South Korea was collected from the Web sites of the Hong Kong Census and Statistics Department; Budget, Accounting, and Statistics, Executive Yuan of Taiwan; and the National Statistical Office of Korea, respectively. The weekly unemployment rate was represented by the rate for the corresponding month.

Statistical Analysis

Stata software, release 10 (StataCorp, College Station, Tex.) was used in all analyses. Interrupted time-series analysis using a Poisson regression was chosen to estimate the relative risk for each incident.[23] The Stata routine we used is designed for epidemiologic time-series count data in which autocorrelation and overdispersion are accounted for.[24,25] In view of the low population growth during the study period, i.e., an annual change of less than 0.6%, the actual suicide count was used as the dependent variable rather than the suicide rate. While an autocorrelation plot for residuals indicated an order 1 to 4 autocorrelation for the weekly data, autoregression terms

from order 1 to 4 were included in all analyses to remove temporal autocorrelation. All models were also adjusted for seasonal variations (4 seasons), secular trends (calendar year), and the unemployment rate for the previous month, which is known as a risk factor for suicide.[26] The effects of celebrity suicides from the first week to the sixth week and during the following 18 weeks were represented by 7 dummy variables. The study period other than these 24 weeks, coded as zero, was the reference period. Poisson autoregressive models were tested for changes in the number of suicides by age group (less than 25 years, 25–39 years, 40–59 years, or 60 years and above), gender (male or female), and suicide method (same suicide method used by the respective celebrity or other method); by age-gender, age-method, and gender-method (second-order interaction); and by age-gender-method (third-order interaction).

An increase among specific subgroups is defined as a rise in suicides among a particular subgroup of the same age or gender as the respective celebrity or the same suicide method used as that celebrity, but no such change was found among the remaining subgroups. For instance, a specific increase in suicides after the suicide death of South Korean actress Ms. Lee was hypothesized to exist among females aged less than 25 years or among those who died by hanging, but no such increases were expected among those aged 25 years or above or among those who died by nonhanging methods. One exception is that of an age-specific increase following the suicide death of Mr. Cheung in Hong Kong; although he died at age 46, the age-specific increase was reported to be among those aged 25 to 39 years rather than among the 40- to 59-year-old group.[5]

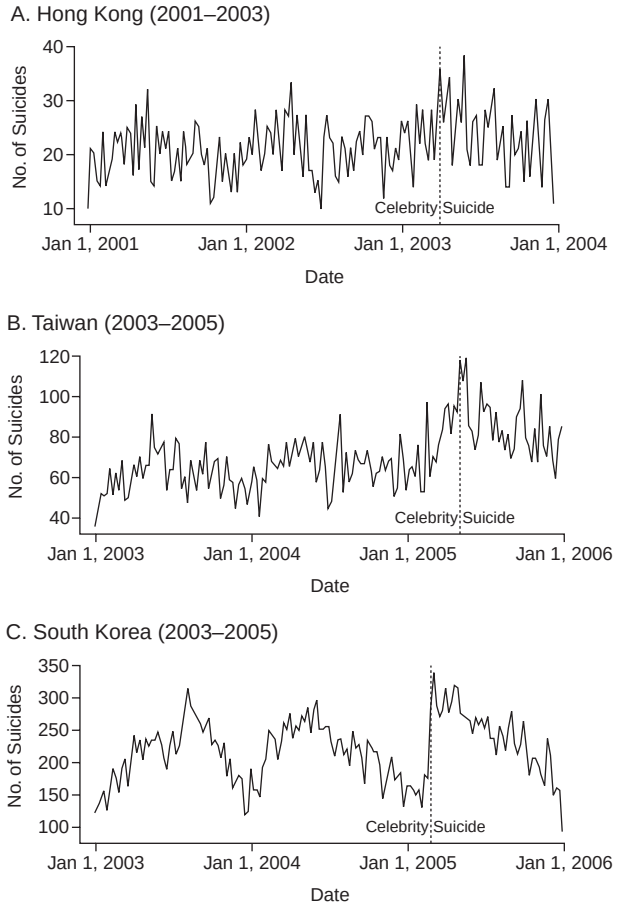
Combined risks for suicide were obtained by employing meta-analysis. In view of the homogeneity in most of the results, inverse-variance–weighted fixed-effect models were used.[27] Results of the combined relative risks and heterogeneity tests[28] are presented in table form and by forest plot.

For easy reference with previous findings using months as the duration,[2,3] we first presented the results on the aggregate change in suicides during the first 4 weeks. Then, weekly changes from the first week to the sixth week were examined. The aggregate change over the following 18 weeks was also explored.

RESULTS

Figure 1 shows the time-series plots for suicides in Hong Kong, Taiwan, and South Korea. The incidents of celebrity suicide in the respective regions are indicated with a vertical dashed line. During the whole study period for each region, the mean (SD) number of weekly suicides in Hong Kong, Taiwan, and South Korea were 21.5 (5.4), 69.7 (15.0), and 219.8 (47.7), respectively. The mean (SD) number of weekly suicides during the first 4 weeks after the incidents were 31.5 (2.0), 107.8 (7.7), and 291.8 (16.1), respectively.

Figure 1. Time-Series Plots of Suicides in Hong Kong, Taiwan, and South Korea[a]



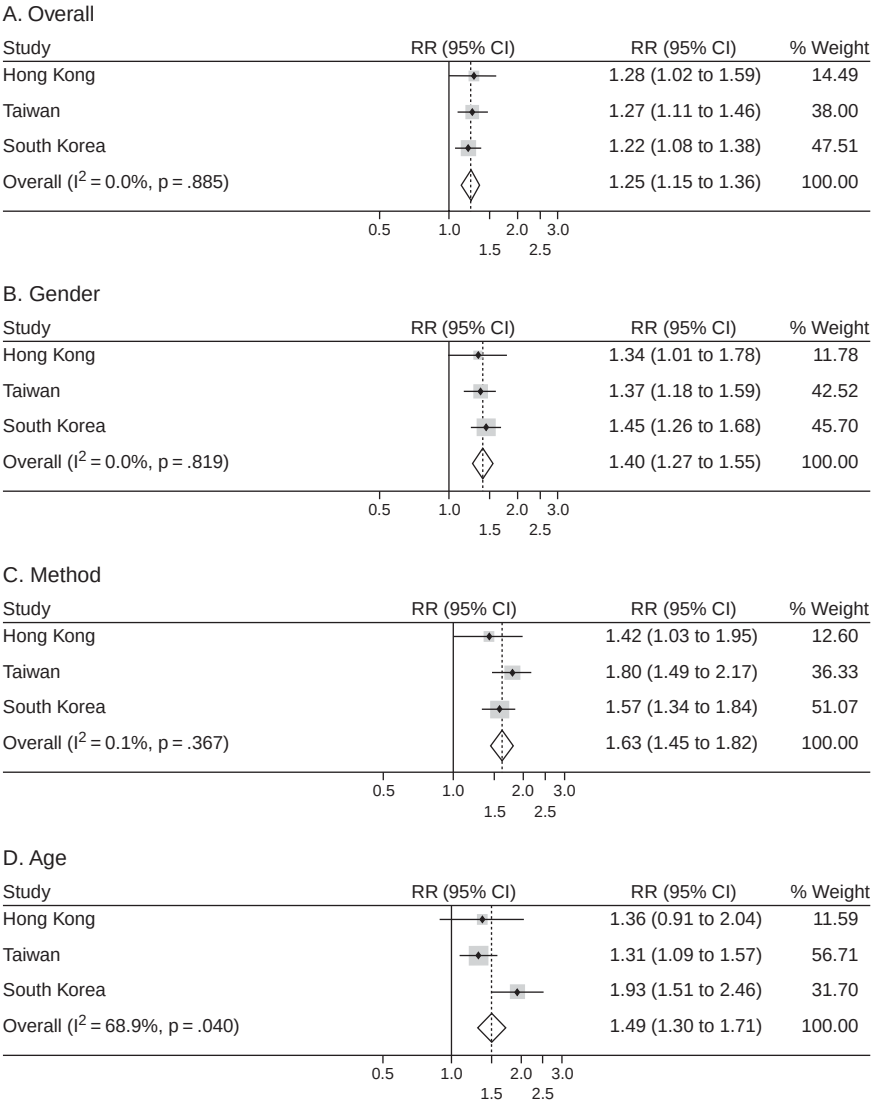
[a]Incidents of celebrity suicide are indicated with a vertical dashed line.

Increase in Suicides During the First 4 Weeks After the Celebrity Suicides

Figure 2 shows the forest plots for relative risk for suicide by overall effect and by specific subgroups. There was a 25% (95% CI = 15% to 36%) increase in the risk for suicide during the first 4 weeks compared with the reference period, i.e., during the study period except for the first 24 weeks after the incidents. Heterogeneity testing indicated a consistent result across the 3 cases (p = .86).

Same-gender specific analysis shows a 40% (95% CI = 27% to 55%) elevation in risk for suicides among groups of the same gender as the corresponding celebrity compared with a statistically nonsignificant change in risk (95% CI = –2% to 24%) among groups of the opposite gender. Same-method specific analysis indicates a marked increase in risk by 63% (95% CI = 45% to 82%) among those who died by the same suicide method as

Figure 2. Forest Plots for Adjusted Relative Risk (RR) for Suicide After Incidents of Celebrity Suicide by Overall Effect and by Age, Gender, and Method Effects (during the first 4 weeks)



celebrities, whereas a nonsignificant change in risk (95% CI = –12% to 10%) was found among those who died by other suicide methods. Both heterogeneity tests indicated consistency across the cases.

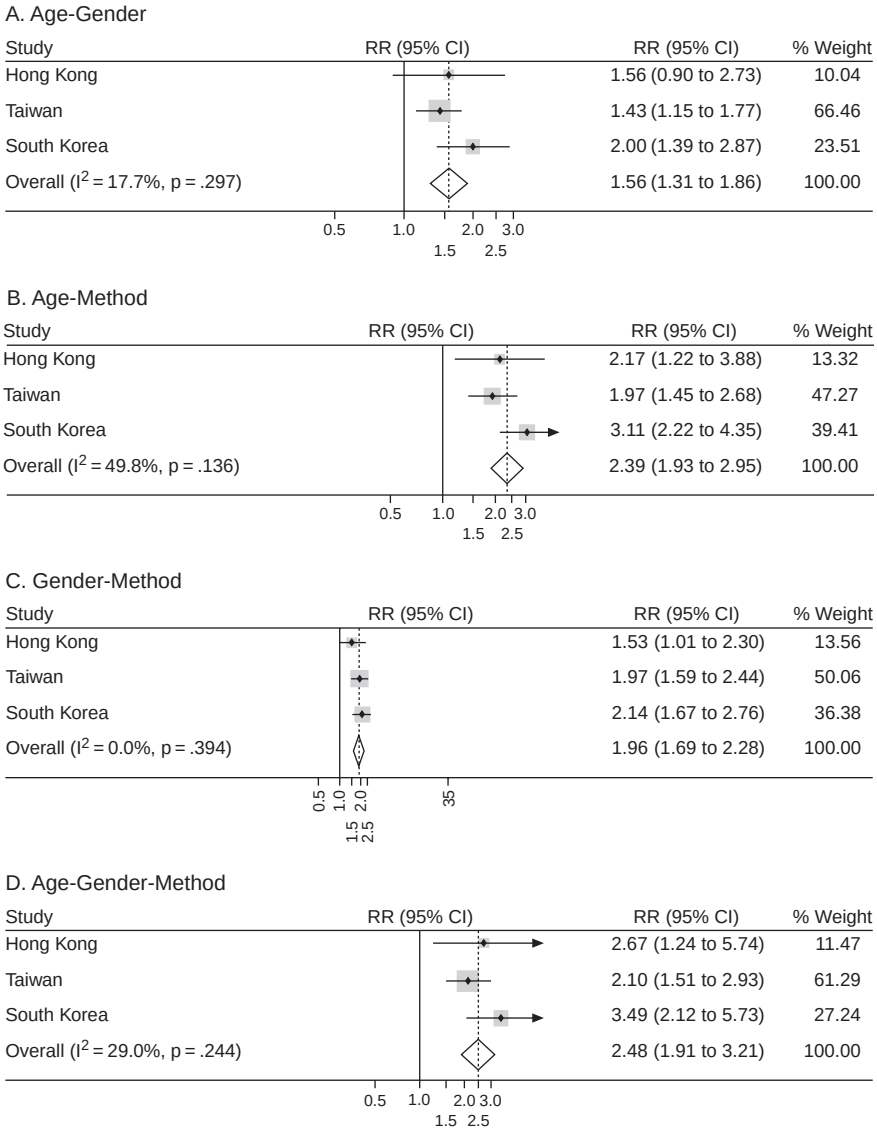
Same-age specific analysis revealed a 49% (95% CI = 30% to 71%) elevation in risk for suicide with marginally heterogeneous results (p = .04). However, among other age groups to which the celebrities did not belong, a significant and relatively mild rise of 21% (95% CI = 10% to 33%) was found. While the 4 different age groups were considered, there were 76% (95% CI = 43% to 117%), 42% (95% CI = 24% to 62%), and 22% (95% CI = 8% to 37%) increases in risk among those aged less than 25 years, 25 to 39 years, and 40 to 59 years, respectively. Nonsignificant change in risk (95% CI = –6% to 27%) was found among those aged 60 years and above.

Figure 3 shows more forest plots for specific analysis of second- and third-order interactions. Elevations in risk for suicide by 56% (95% CI = 31% to 86%), 139% (95% CI = 93% to 195%), and 96% (95% CI = 69% to 128%) were observed among age-gender, age-method, and gender-method specific groups, respectively. The age-gender-method specific analysis showed a dramatic increase in risk by 148% (95% CI = 91% to 221%).

Increase in Suicides Weekly and Medium-Term

In Table 1, results of the overall weekly change show a 43% (95% CI = 23% to 66%) increase in risk for suicides

Figure 3. Forest Plots for Adjusted Relative Risk (RR) for Suicide After Incidents of Celebrity Suicide by Age-Gender, Age-Method, Gender-Method, and Age-Gender-Method Effects (during the first 4 weeks)



in the first week after the incident, which is consistent across incidents. The combined increase in suicide risk was 29% (95% CI = 12% to 50%) in the second week and 25% (95% CI = 8% to 45%) in the third week. In the fourth, fifth, and sixth weeks, the combined risks were no longer statistically significant. A 14% (95% CI = 8% to 21%) rise in risk was seen and sustained for the following 18 weeks.

In Table 1 and Table 2, all specific analyses demonstrate statistically significant increases in risk for suicide in the first, second, and third week after the celebrity suicide. Age-method and age-gender-method specific analyses further show elevations in the fourth week. Beyond that, method and gender-method specific analyses indicate increases throughout the period of 24 weeks after the incidents. Insignificant heterogeneity was found in all tests.

DISCUSSION

Combined Risk for Suicide After Incidents of Celebrity Suicide

This study, using meta-analysis, provides a robust estimation of the relative risk for suicide by pooling results across 3 incidents of suicides of Asian entertainment celebrities. The summary results, which are statistically

Table 1. Adjusted Relative Risk (RR) for Suicide[a] (95% CI) After the Celebrity Suicides by Overall Effect and by Age, Gender, and Method Effects

Effect After the Incidents[b]	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	Following 18 Weeks
Overall							
Hong Kong	1.39 (0.95 to 2.02)	1.09 (0.71 to 1.67)	1.25 (0.84 to 1.86)	1.41 (0.97 to 2.06)	0.74 (0.45 to 1.23)	1.07 (0.69 to 1.66)	1.18 (0.99 to 1.42)
Taiwan	1.38 (1.09 to 1.74)*	1.29 (1.02 to 1.64)*	1.41 (1.12 to 1.77)*	1.01 (0.77 to 1.31)	0.97 (0.74 to 1.27)	0.93 (0.70 to 1.23)	1.11 (1.01 to 1.22)*
South Korea	1.49 (1.19 to 1.87)*	1.35 (1.09 to 1.66)*	1.13 (0.91 to 1.40)	1.06 (0.85 to 1.32)	1.10 (0.88 to 1.37)	1.23 (1.00 to 1.51)	1.16 (1.07 to 1.25)*
Pooled RR	1.43 (1.23 to 1.66)*	1.29 (1.12 to 1.50)*	1.25 (1.08 to 1.45)*	1.09 (0.94 to 1.28)	1.01 (0.86 to 1.19)	1.11 (0.95 to 1.30)	1.14 (1.08 to 1.21)*
Age							
Hong Kong	1.73 (0.93 to 3.23)	0.96 (0.42 to 2.23)	1.69 (0.89 to 3.20)	0.95 (0.41 to 2.20)	0.93 (0.40 to 2.15)	0.64 (0.23 to 1.78)	1.40 (1.01 to 1.93)*
Taiwan	1.64 (1.23 to 2.17)*	1.21 (0.87 to 1.68)	1.29 (0.94 to 1.78)	0.98 (0.69 to 1.38)	0.72 (0.49 to 1.08)	0.81 (0.55 to 1.20)	1.07 (0.95 to 1.21)
South Korea	2.53 (1.68 to 3.81)*	1.97 (1.35 to 2.88)*	1.77 (1.19 to 2.64)*	1.62 (1.08 to 2.45)*	1.31 (0.83 to 2.05)	1.46 (0.95 to 2.25)	1.15 (0.96 to 1.38)
Pooled RR	1.87 (1.50 to 2.32)*	1.44 (1.13 to 1.83)*	1.49 (1.18 to 1.88)*	1.18 (0.92 to 1.52)	0.93 (0.70 to 1.23)	1.02 (0.77 to 1.34)	1.12 (1.02 to 1.23)*
Gender							
Hong Kong	1.50 (0.93 to 2.42)	1.26 (0.75 to 2.12)	1.36 (0.83 to 2.22)	1.26 (0.75 to 2.10)	0.81 (0.43 to 1.51)	1.23 (0.72 to 2.09)	1.19 (0.95 to 1.50)
Taiwan	1.48 (1.15 to 1.91)*	1.48 (1.15 to 1.91)*	1.57 (1.23 to 2.00)*	0.99 (0.73 to 1.34)	1.13 (0.85 to 1.50)	0.98 (0.72 to 1.35)	1.10 (0.99 to 1.22)
South Korea	1.37 (1.04 to 1.82)*	1.22 (0.95 to 1.58)	1.04 (0.80 to 1.36)	1.00 (0.77 to 1.32)	1.05 (0.80 to 1.36)	1.19 (0.92 to 1.53)	1.12 (1.02 to 1.23)*
Pooled RR	1.59 (1.34 to 1.88)*	1.52 (1.29 to 1.79)*	1.46 (1.24 to 1.72)*	1.12 (0.94 to 1.35)	1.14 (0.95 to 1.37)	1.18 (0.99 to 1.42)	1.17 (1.10 to 1.25)*
Method							
Hong Kong	1.68 (0.99 to 2.82)	1.23 (0.68 to 2.20)	1.27 (0.69 to 2.33)	1.48 (0.86 to 2.55)	0.80 (0.39 to 1.64)	1.08 (0.56 to 2.09)	1.40 (1.09 to 1.81)*
Taiwan	2.07 (1.53 to 2.80)*	1.57 (1.11 to 2.20)*	1.97 (1.45 to 2.69)*	1.48 (1.05 to 2.09)*	1.10 (0.75 to 1.62)	1.21 (0.83 to 1.76)	1.13 (0.98 to 1.30)
South Korea	1.90 (1.46 to 2.48)*	1.91 (1.51 to 2.43)*	1.37 (1.05 to 1.78)*	1.31 (1.01 to 1.71)*	1.40 (1.08 to 1.81)*	1.33 (1.02 to 1.74)*	1.23 (1.11 to 1.36)*
Pooled RR	1.93 (1.60 to 2.33)*	1.73 (1.43 to 2.08)*	1.56 (1.29 to 1.89)*	1.38 (1.14 to 1.68)*	1.25 (1.02 to 1.53)*	1.27 (1.03 to 1.56)*	1.21 (1.12 to 1.31)*

[a]Controlled for season, year, unemployment rate (previous month), and temporal autoregression.
[b]Reference group: whole study period except the first 24 weeks after celebrity suicide.
*$p < .05$.

significant, further confirm an increase in risk for suicide after incidents of celebrity suicide and offer strong evidence to support the association between celebrity suicides and a subsequent increase in the suicide rate, while adjusting for known confounding factors, like secular trends, seasonality, economic situation, and temporal autocorrelation. Combined results across cases of celebrity suicide also help to control unknown factors that might have confounded the findings, like random variations and unexplainable and coincidental fluctuations in the number of suicides that would have happened in each individual analysis. This study is also the first to examine the influences of celebrity suicides transregionally.

Evidence also indicates that the combined risk for suicide, except for age-specific influence, appears to be homogeneous across incidents of celebrity suicides; in other words, this suggests that the extent of influence of celebrity suicides on subsequent suicides is seemingly consistent across incidents and thus convincingly supports the reliability of the current findings.

Suicide Increases Among Specific Groups

Specific group analyses further indicate that increases in suicides were observed among those who were the same gender as the celebrity and who used the same suicide method, whereas no such increases were found among groups of the opposite gender and among those who used other suicide methods. Previous studies indicated that the gender effect was ambiguous,[21] and it was observed that there was a rise in using a specific suicide method after a celebrity suicide.[2,5] Current findings show both the same-gender and same-method specific increases concurrently, which strongly suggests that the influence of celebrity suicide is likely to be imitation, consistent with the theory of differential identification—positing that the extent of an individual's identification with the celebrity, either vertically (identifying with a superior) or horizontally (identifying with someone who has a similar social background) or both, is associated with how strong the effect is.[29] Some people may expect that individuals are apt to have stronger attachments to opposite-gender celebrities, but, interestingly, current findings on the effects of celebrity suicide show an increase in same-gender rather than opposite-gender suicides. We speculate that the imitation of celebrities' socially stigmatized behavior, like suicide, seems to have

Table 2. Adjusted Relative Risk (RR) for Suicide[a] (95% CI) After the Celebrity Suicides by Age-Gender, Age-Method, Gender-Method, and Age-Gender-Method Effects

Effect After the Incidents[b]	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	Following 18 Weeks
Age-gender							
Hong Kong	1.72 (0.68 to 4.35)	1.28 (0.44 to 3.73)	2.22 (0.97 to 5.07)	0.99 (0.30 to 3.22)	1.24 (0.43 to 3.59)	0.79 (0.20 to 3.10)	1.52 (0.96 to 2.39)
Taiwan	1.81 (1.31 to 2.50)*	1.33 (0.92 to 1.93)	1.34 (0.93 to 1.94)	1.12 (0.75 to 1.66)	0.88 (0.57 to 1.37)	0.87 (0.55 to 1.38)	1.08 (0.94 to 1.25)
South Korea	2.08 (1.10 to 3.92)*	2.09 (1.20 to 3.64)*	2.00 (1.14 to 3.53)*	1.83 (1.01 to 3.33)*	1.09 (0.53 to 2.24)	1.58 (0.85 to 2.94)	1.31 (0.99 to 1.73)
Pooled RR	1.85 (1.40 to 2.44)*	1.51 (1.12 to 2.03)*	1.58 (1.19 to 2.11)*	1.28 (0.93 to 1.76)	0.96 (0.68 to 1.37)	1.05 (0.74 to 1.50)	1.15 (1.02 to 1.30)*
Age-method							
Hong Kong	2.87 (1.20 to 6.83)*	2.01 (0.75 to 5.42)	1.74 (0.59 to 5.17)	2.08 (0.77 to 5.59)	0.42 (0.05 to 3.35)	0.00 (0.00 to 0.00)	1.59 (0.96 to 2.64)
Taiwan	2.55 (1.59 to 4.09)*	1.49 (0.82 to 2.69)	2.22 (1.33 to 3.72)*	1.55 (0.88 to 2.72)	0.68 (0.30 to 1.56)	0.79 (0.37 to 1.65)	1.05 (0.83 to 1.33)
South Korea	4.39 (2.65 to 7.28)*	3.25 (2.00 to 5.28)*	2.31 (1.35 to 3.95)*	2.75 (1.66 to 4.54)*	1.94 (1.10 to 3.44)*	1.94 (1.10 to 3.44)*	1.38 (1.05 to 1.82)*
Pooled RR	3.23 (2.34 to 4.45)*	2.33 (1.64 to 3.31)*	2.20 (1.55 to 3.13)*	2.13 (1.50 to 3.02)*	1.31 (0.83 to 2.06)	1.39 (0.89 to 2.19)	1.22 (1.03 to 1.44)*
Gender-method							
Hong Kong	1.81 (0.92 to 3.58)	1.52 (0.75 to 3.09)	1.38 (0.63 to 2.99)	1.41 (0.68 to 2.93)	0.97 (0.41 to 2.30)	1.55 (0.74 to 3.23)	1.44 (1.03 to 2.01)*
Taiwan	2.19 (1.55 to 3.10)*	1.78 (1.20 to 2.63)*	2.16 (1.51 to 3.08)*	1.68 (1.12 to 2.50)*	1.33 (0.86 to 2.06)	1.21 (0.77 to 1.91)	1.15 (0.97 to 1.35)
South Korea	3.20 (2.19 to 4.66)*	2.80 (1.97 to 3.99)*	1.69 (1.12 to 2.54)*	1.53 (1.02 to 2.30)*	1.53 (1.03 to 2.29)*	1.70 (1.15 to 2.50)*	1.37 (1.15 to 1.62)*
Pooled RR	2.49 (1.96 to 3.16)*	2.18 (1.70 to 2.78)*	1.87 (1.45 to 2.42)*	1.58 (1.21 to 2.06)*	1.38 (1.04 to 1.82)*	1.48 (1.13 to 1.95)*	1.27 (1.14 to 1.42)*
Age-gender-method							
Hong Kong	2.59 (0.74 to 9.07)	2.94 (0.85 to 10.14)	2.93 (0.86 to 9.98)	2.16 (0.54 to 8.64)	0.73 (0.07 to 7.15)	0.00 (0.00 to 0.00)	2.11 (1.07 to 4.17)*
Taiwan	2.94 (1.82 to 4.75)*	1.21 (0.59 to 2.46)	2.31 (1.35 to 3.96)*	1.75 (0.96 to 3.19)	0.67 (0.26 to 1.70)	0.81 (0.36 to 1.81)	1.09 (0.85 to 1.41)
South Korea	3.93 (1.87 to 8.27)*	4.08 (2.02 to 8.22)*	2.56 (1.19 to 5.51)*	3.46 (1.72 to 6.95)*	1.84 (0.78 to 4.32)	1.61 (0.66 to 3.95)	1.56 (1.02 to 2.38)*
Pooled RR	3.14 (2.14 to 4.61)*	2.33 (1.47 to 3.71)*	2.44 (1.62 to 3.70)*	2.32 (1.51 to 3.58)*	1.13 (0.61 to 2.07)	1.10 (0.61 to 2.01)	1.26 (1.03 to 1.55)*

[a]Controlled for season, year, unemployment rate (previous month), and temporal autoregression.
[b]Reference group: whole study period except the first 24 weeks after celebrity suicide.
*$p < .05$.

same-gender specific targets of identification, rather than those of celebrity attachments in general, e.g., opposite-gender romantic attachment. But further study is needed to confirm the speculation.

While previous findings show that younger-aged people are more susceptible to the influence of celebrity suicides[21] and being middle-aged is a protective factor against media influence,[29,30] current findings uncover increases in suicides among both those who are the same age as the celebrity and the other ages. But the risk for suicide among those who are the same age as the celebrity appears to be higher than that among other ages. With this result, there is less evidence to support an age-specific increase. We speculate that, unlike gender, the true age of a celebrity is not an explicitly expressed demographic feature and the entertainment celebrity often looks younger than his or her true age anyway. Thus, the age identification might have become less specific to the celebrity's true age group. It might be, rather, with people younger than the celebrity.[2]

Previous results show media impact on elderly people,[29] but current findings reveal that those aged 60 years and above were less susceptible to celebrity suicides. This finding may be attributable to the fact that no elderly entertainment celebrity died by suicide during the entire study period. Older adults are thus more immune to the influences.

The differential identification thesis is reinforced by the observed significant increases among both gender-method and age-gender-method specific groups. Combined risks among these interaction groups were seen to be relatively higher than those among the first-order groups, i.e., gender- or method-specific. This further bolsters the notion that when people identify with a celebrity in more specific characteristics, the risk for suicide triggered by the suicide of that celebrity is subsequently elevated.

When we look only at Hong Kong data, no such specific subgroup changes, which were hypothesized to show an increase in suicides, were observed. We understand that the issue is one of statistical power, since weekly suicide deaths in Hong Kong, only 21.5, is low compared to 70 in Taiwan and 220 in South Korea. Subgroup analysis on the suicide data of Hong Kong may not have sufficient statistical power to distinguish a small random fluctuation or to detect the hypothesized increase. That is also the reason why we need meta-analysis to aggregate the results.

Weekly Increase in Suicides

Earlier studies[2,3,7,8] often aggregated the effect duration to be a month—or 4 weeks' time. Another study[31] found the effect of publicized suicide stories on daily suicides seen only on certain days within a week, but the finding was criticized as "statistical artifacts" due to clustering of media reports and actual suicides on specific days of the week or on a holiday.[32]

In this current study, since pooling results across incidents of celebrity suicide by means of meta-analysis maximizes the statistical power, influences over smaller time durations could be thoroughly examined and vigorously estimated. In addition to the aggregate changes in suicides during the first 4 weeks, which have been presented above, changes in suicides from the first to the sixth week after the incidents of celebrity suicides were analyzed. Results show that the influences seem to last for the first 3 weeks after the incident and thus reveal a relatively more precise effect duration than what earlier studies assumed, i.e., a month. The risk for suicide appeared to be the largest in the first week and to diminish weekly until a statistically insignificant risk was observed in the fourth week. A longer-lasting effect on the increase in suicides, including the fifth and sixth weeks after the incidents of celebrity suicides, was seen among the method and gender-method specific groups. The ultimate time duration seems to be attributable to the duration and the intensity of media coverage of celebrity suicides.

Medium-Term Increase in Suicides

The medium- or longer-term impact of media coverage of celebrity suicides has rarely been studied,[9] and it is a relatively unexplored research area. This study pooled results across incidents of celebrity suicides and confirmed a consistent pattern of increasing suicides over the medium term, lasting for a period of at least up to 24 weeks after the incidents, while adjusting for known confounders and covariates. This implies that the celebrity suicide seems to be followed not only by a short-term increase in the subsequent suicide rate but also, probably, by an increasing trend of suicide, at least in the medium term up to 24 weeks after the incidents. A recent single study[9] already has shown a long-term (a year or more) influence of media coverage of celebrity suicide on suicidal ideation, in which greater anxiety symptoms, fewer reasons for living, and more focus on irrational values can moderate the effect. To this end, it is worth studying further the duration of such medium-term increases by using a longer study period.

In this connection, Durkheim[33] and some previous studies[3,6] suggested the "displacement hypothesis," such that the imitative effect might cause suicides to occur earlier than would normally have been the case. However, no significant dip in suicides was found from both the monthly and weekly results, and, thus, there was no evidence to substantiate this claim.

Limitations of the Study

A limitation of this study is that the findings were obtained from an ecological analysis and were derived from aggregate data. Therefore, in principle, a causal link between individual behavior and media influence cannot be established.[34] However, in view of the ethical and methodological difficulties in undertaking suicide research by randomized clinical trials,[35] the ecological time-series study, while controlled for known confounders, may be one of the most feasible research design options for this kind of study and is able to provide robust evidence to support the research hypothesis.[36] Results inferred from ecological association are also essentially justified while the unit of analysis is theoretically a group,[37] e.g., grouping by gender or suicide method used. Moreover, previous evidence already supports the connection between an individual's exposure to celebrity suicide and suicide risk through the qualitative study of the suicide note[5] and clinical interview of suicide attempters.[1]

Some may be concerned that too few cases of celebrity suicide were included in this study and may question the generalization of the results. Celebrity suicide, using the definition of "widely known," is a relatively infrequent event, and, expectedly, a limited number of cases could be identified for this study after an exhaustive news archive search. Considering that this study is one of the most comprehensive and thorough studies to examine the risk for suicide following the suicides of Asian entertainment celebrities, we believe the current findings on combined risks, duration of effect, and medium-term influence are vitally important to inform the community and mental health professionals about the potential negative effects of celebrity suicides and excessive media reporting. But we do suggest that readers interpret the findings and their generalizations cautiously.

Previously used covariates, humidity and temperature, were not considered in this study. The former was shown to have an insignificant effect on the suicide rate,[2] and the latter's role in increased suicides seems inconclusive.[38,39] The impact of the temperature factor is partly considered by taking the seasonal effects as a covariate. Certain undetermined factors might still affect the increased suicides.

Date of certified death was used instead of date of injury, i.e., the date when the suicide actually took place, which is more relevant to the current study. However, this information is often not available in the official data. Discrepancies between the date of certified death and the date of injury, if any, might have impacted the results, but using weekly suicide data rather than a daily total helped to minimize such an impact.

Hong Kong and Taiwan use coroner systems to determine causes of death, but in South Korea, suicide death is certified by medical institutions.[40] This variation might only affect the suicide rate in each country, but the effect

on the temporal variation within the country would be minimal and would not have any effect on the findings in this study.

Implications of the Study

This study establishes a scientific generalization of results across 3 Asian countries and strongly suggests an increasing risk for suicide in the community after incidents of celebrity suicide. The duration of effect can be precisely estimated, mostly from the first week through the third week, as well as lasting for 6 months. Such increases were found mostly among the same gender groups and the same suicide method groups.

These findings are all important information for public health policy makers to assess the elevated risk for suicide, and its duration, associated with excessive media coverage of celebrity suicide. A precise assessment of the risk is conducive to development of timely intervention for minimizing possible harmful effects in times of death of celebrities. Results suggest that effort should be targeted toward preventing same-gender and same-method suicides. The first 3 weeks seem to be the crucial period for such intervention. Development and evaluation of such intervention programs are suggested for future research. It is also worthwhile to examine the influence of celebrity suicide further within and beyond Asian cultures in the future.

For the sake of minimizing harm to media users, journalists should be informed about the potential risk of reporting celebrity suicide and pay special attention to the methods they use to present stories about celebrity suicide. For the best practices in suicide reporting, WHO media recommendations[12] can serve as a benchmark reference, but development of local media guidelines[22,41,42] that are culturally sensitive and practical, with joint collaboration between local media professionals and the suicide prevention community, is equally important. Raising public awareness about the effect of mass media is also suggested.

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