# The Impact of Celebrity Suicide on Subsequent Suicide Rates in the General Population of Korea from 1990 to 2010

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The association between celebrity suicide and subsequent increase in suicide rates among the general population has been suggested. Previous studies primarily focused on celebrity suicides in the 2000s. To better understand the association, this study examined the impacts of celebrity suicides on subsequent suicide rates using the data of Korean celebrity suicides between 1990 and 2010. Nine celebrity suicides were selected by an investigation of media reports of suicide deaths published in three major newspapers in Korea between 1990 and 2010. Suicide mortality data were obtained from the National Statistical Office of Korea. Seasonal autoregressive integrated moving average models with intervention analysis were used to test the impacts of celebrity suicides, controlling for seasonality. Six of the 9 celebrity suicides had significant impacts on suicide rates both in the total population and in the same gender- or the same age-subgroups. The incident that occurred in the 1990s had no significant impact on the overall suicide rates, whereas the majority of the incidents in the 2000s had significant influences for 30 or 60 days following each incident. The influence of celebrity suicide was shown to reach its peak following the suicide death of a renowned actress in 2008. The findings may suggest a link between media coverage and the impact of celebrity suicide. Future studies should focus more on the underlying processes and confounding factors that may contribute to the impact of celebrity suicide on subsequent suicide rates.

Keywords: Suicide; Celebrity; Werther Effect

## INTRODUCTION

A considerable amount of research has investigated the association between celebrity suicides and subsequent suicidal behaviors or suicide rates in the general population of various societies. Suicidal ideation (1), attempts (2,3), and rates/risks (4-6) were found to significantly increase in the general population following the publicized suicide death of a well-known figure. Some of the prior investigations have reported that such increase may persist for longer than 1 year (7,8). Based on these findings, it has been suggested that celebrity suicide might be a critical risk factor for suicide attempts in the general population.

The impact of celebrity suicides on the general population of Korea has been reported by several studies (3,5,7,9). Korea has the highest suicide rates among OECD countries (10). Suicide rates have remarkably increased in Korea over the past 20 years, while many other OECD countries showed decreases in suicide rates since 1990 (10,11). This unique situation of Korea could help better understand the impact of various risk factors for suicide, including the impact of celebrity suicide (11). The previous investigations on the impact of celebrity suicide in Korea primarily focused on the suicide of entertainment celebrities that occurred in the 2000s (3,5). To further extend the understanding of the impact of celebrity suicide, it is needed to investigate the impact of celebrity suicide that occurred before and after 2000 and to include different types of celebrities.

The significant increase in suicide following a celebrity suicide was shown to be more salient among specific subgroups. Suicide rates were particularly elevated in the same gender and the same age group as the celebrity and the use of the same suicide method was increased after celebrity suicide (5,6,9,12). However, evidence supporting this subgroup-specific impact is rather inconclusive. Some studies have failed to observe gender-specific effects (13) and findings regarding age-specific effects are even more mixed (13-16). The observed duration of the subgroup-specific impact also varied in the literature and the range of the reported duration was 2 to 24 weeks (5,6,9,14). These mixed findings may be due to confounding factors such as type of celebrity, the quality of media reporting on the suicide, and cultural attitudes and values toward suicide (17).

To better understand the impact of celebrity suicide on subsequent suicide in the general population as well as in the specific subgroups, the present study examined the association between celebrity suicide and subsequent suicide rates in Korea using the data of various types of celebrity suicides that occurred between 1990 and 2010. The influence of celebrity suicide on

subsequent suicide rates was assessed during the initial 30-day period and a subsequent 30-day period (i.e. the 31st to the 60th days) after suicide of each celebrity.

## MATERIALS AND METHODS

### Celebrity data

To select a representative sample of celebrity suicides, media reports of suicide deaths published by three major newspapers in Korea – *Chosun Ilbo, Joongang Ilbo,* and *Donga Ilbo* – between January 1, 1990 and December 31, 2010 were investigated. Through the investigation, 312 incidents of suicide were identified and data related to each incident were collected. The data included names, date of death, specific methods of suicide, sites where the incident occurred, and publicized reasons for committing suicide. The incidents were comprised of suicide deaths of a wide range of people including students, housewives, workers, business owners, teachers, farmers, police officers, prisoners, politicians, artists, singers, actors/actresses, bankers, athletes, medical doctors, and military personnel. The magnitude of influence that each incident of suicide death had on the public was then assessed by three independent investigators as low, medium, or high. Subsequently, nine incidents of suicide were rated as having high influence on the public by all three investigators and defined as celebrity suicides for the present study. The celebrities included one business executive (a former chairperson of a Korean conglomerate), one singer/song writer, one singer, and six actors/actresses; related information is presented in Table 1. Of the celebrities, 56% were female and the ages at time of death ranged from 24 to 54 years. One of the nine celebrity died in 1996 (Incident 1) whereas the remaining eight died in the 2000s.

### Suicide data

Suicide mortality data from January 1, 1996 to December 31, 2010 were obtained from the database of the National Statistical Office of Korea (http://www.kostat.go.kr/). Deaths by suicide were defined as deaths by deliberate self-harm or self-injury. Demographic data including gender, age, and the date of death

for each suicide were also collected. In order to estimate the suicide rate, the total population of Korea from the same time period was also obtained from the Korean Statistical Information Service (http://kosis.kr). It was shown that 150,736 people died by suicide in Korea between 1996 and 2010. The suicide rate per 100,000 people was 12.9 in 1996 and 32.1 in 2010 (Fig. 1).

### Statistical analysis

To examine the impact of the nine celebrity suicides among the general population, the suicide rates per 100,000 people were calculated for the reference period (i.e., the 30 days prior to the celebrity suicide), the first 30 days after the celebrity suicide (Phase 1), and the second 30 days after the celebrity suicide (Phase 2; from the 31th day to the 60th day after the suicide). We used a seasonal autoregressive integrated moving average (SARIMA) model with intervention analyses to test the influence of the nine celebrity suicides (18,19). The SARIMA models identified appropriate models, tested the fit of the selected models, and yielded the final model that provided intervention effect estimates for the suicide data of the individual celebrities. When we fitted the models, Ljung-Box $\chi^2$ test (one of Portmanteau tests) was used in order to test the absence of autocorrelation in the residuals. The maximum likelihood method was utilized as well. We fitted and checked each model using SAS 9.3 which utilizes ML method for estimation. For stabilizing variance, the log transformed data were used when appropriate.

To analyze the impacts that each incident of celebrity suicide had on the total population and on each subgroup, we identified a suitable model that was subject to phase 1 or 2, respectively. Because we fitted a total 72 models (8 groups * 9 celebrity suicides) separately, the level of significance was not adjusted for the subgroup-analyses. As we tried to find the best fitted model for the influences that each celebrity had on each subgroup, the fitted models varied. For example, Incident 6 who had the greatest impact on the subsequent suicide rates among the nine celebrities had the following SARIMA (ARIMA[1,1,2][1,1,1]) (12) with an intervention model. In this model, both seasonal and

**Table 1.** Demographic characteristics and related information of celebrity suicides

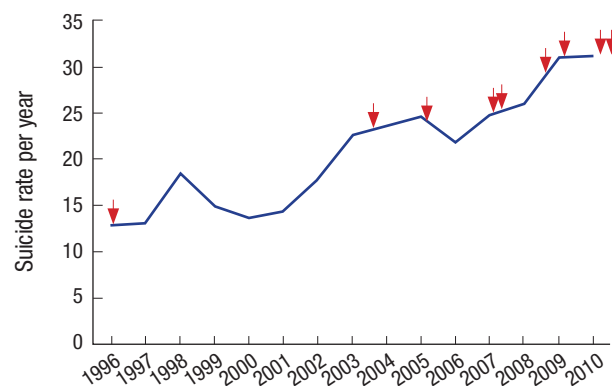| Incident No. | Gender | Occupation | Year of death | Age at the time of death |
|---|---|---|---|---|
| 1 | Male | Singer/Song writer | 1996 | 31 |
| 2 | Male | Business Executive | 2003 | 54 |
| 3 | Female | Actress | 2005 | 24 |
| 4 | Female | Singer | 2007 | 25 |
| 5 | Female | Actress | 2007 | 26 |
| 6 | Female | Actress | 2008 | 39 |
| 7 | Female | Actress | 2009 | 29 |
| 8 | Male | Actor | 2010 | 39 |
| 9 | Male | Actor | 2010 | 32 |



**Fig. 1.** Suicide rate per 100,000 in Korea between 1996 and 2010. Red arrows indicated celebrity suicides.

first differences are applied to achieve stationary. The model is expressed as

$$\nabla_{12}\nabla \log(Y_t) = \frac{w_0}{1-\delta B}\nabla_{12}\nabla P_t^{(T)} + \frac{(1-\phi_1 B - \phi_2 B^2)(1-\phi_{12}B^{12})}{(1-\theta_1 B)(1-\theta_{12}B^{12})}$$

In this equation, T denotes the 30 days after the celebrity suicide (T = 204), $P_t^{(T)}$ denotes a pulse function, and $w_0$, $\delta$ is transition parameters. $\frac{w_0}{1-\delta B}\nabla_{12}\nabla P_t^{(T)}$ is a transition function for intervention effect, and $\frac{(1-\phi_1 B - \phi_2 B^2)(1-\phi_{12}B^{12})}{(1-\theta_1 B)(1-\theta_{12}B^{12})}$ is a Seasonal ARIMA model part.

The resulting estimates were interpreted as the magnitude of impact that a celebrity suicide had on subsequent suicide rates in each particular time period. After controlling for seasonal variations, the overall impact of each of the nine celebrity suicides on subsequent suicide rates was examined and the analyses of subgroup-specific impacts were conducted according to gender (male and female) and age (aged < 20, aged 20-34, aged 35-49, aged 50-64, and aged ≥ 65 years). All analyses were conducted using SAS 9.3 (SAS Institute, Cary, NC, USA).

## RESULTS

### The impact of celebrity suicides on subsequent suicide rates in the total population

As presented in Table 2, six celebrity suicides (Incidents 2, 3, 4, 5, 6, and 9) significantly influenced overall suicide rates during the 30 days immediately after each of the suicide events (Phase 1). Of the six celebrity suicides, four incidents (Incidents 2, 3, 4, and 6) continued to have significant impact during the second 30 days after the events (Phase 2), although the magnitudes of impact for each were less than during Phase 1. The impact of Incident 1, the only incident occurred in the 1990s, was not significant either during Phase 1 or during Phase 2. Of the six suicides with a significant impact, Incident 6 had the strongest in-

fluence on subsequent suicide rates in the total population during both Phases 1 and 2.

### The impact of celebrity suicides on subsequent suicide rates in the gender subgroups

It was found that four celebrity suicides (Incidents 2, 3, 4, and 6) significantly influenced subsequent suicide rates in the male and female subgroups during Phases 1 and 2 (Table 2). For all four incidents, the magnitudes of impact during Phase 1 were greater than during Phase 2. Moreover, the magnitudes of the impacts during Phases 1 and 2 were greater in the gender corresponding to the celebrity than in the opposite gender, except for Incident 2. Incident 2 had a greater impact on males than females during Phase 1, but this gender-specific effect did not continue into Phase 2. Incident 2 had a greater influence on females than males during Phase 2.

None of the incidents had a significant impact on suicide rates in only the male subgroup during Phases 1 and 2, except for Incident 8 which significantly impacted males during Phase 2. In contrast, three of the celebrity suicides (Incidents 5, 7, and 9) were found to have a significant impact on only the female subgroup during Phase 1. Of these three incidents, Incident 7 continued to have an impact on females in Phase 2 whereas the others (Incidents 5 and 9) did not.

### The impact of celebrity suicides on subsequent suicide rates in the age subgroups

A majority of the suicide incidents had a significant impact on suicide rates in two or more age subgroups, including the same age subgroup as the corresponding celebrity. Incident 6 significantly influenced every age subgroup during Phases 1 and 2, except for those aged 65 years and older during Phase 2. Incident 2 had significant influences on those aged 50-to-64 and those aged 65 years and older in both Phases 1 and 2. Additionally, although the magnitudes of impact were lesser than in the older age subgroups, Incident 2 also had a significant impact

**Table 2.** The impacts of celebrity suicides on subsequent suicide rates in the total population and subgroups according to gender and age

| Incident No. | Total | | Male | | Female | | Aged less than 20 | | Aged 20 to 34 | | Aged 35 to 49 | | Aged 50 to 64 | | Aged 65 and older | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Phase 1 | Phase 2 | Phase 1 | Phase 2 | Phase 1 | Phase 2 | Phase 1 | Phase 2 | Phase 1 | Phase 2 | Phase 1 | Phase 2 | Phase 1 | Phase 2 | Phase 1 | Phase 2 |
| 1 (M, 31)* | 0.16† | | 0.15 | | 0.21† | | 0.11‡ | | 0.07† | | 0.10† | | 0.07† | | 0.52†,ǁ | |
| 2 (M, 54)* | 0.27†,§ | 0.19†,‡ | 0.30†,§ | 0.18†,‡ | 0.26†,‡ | 0.24†,ǁ | 0.02 | | 0.28†,‡ | | 0.25† | 0.21†,ǁ | 1.24ǁ | 0.62‡ | 1.77ǁ | 1.15§ |
| 3 (F, 24)* | 0.36ǁ | 0.29†,ǁ | 0.30†,§ | 0.25†,ǁ | 0.46†,ǁ | 0.34†,ǁ | 0.14§ | | 0.81†,ǁ | 0.56†,ǁ | 0.39†,§ | 0.23†,‡ | 0.08† | | -0.17 | |
| 4 (F, 25)* | 0.45†,ǁ | 0.31†,ǁ | 0.26†,§ | 0.20†,§ | 0.71†,ǁ | 0.46†,ǁ | 0.59‡ | 0.40‡ | 0.45†,ǁ | | 0.37†,§ | | 0.09 | | 0.38 | 0.03 |
| 5 (F, 26)* | 0.21†,‡ | 0.22† | 0.11† | | 0.46†,ǁ | 0.02† | 0.12‡ | | 0.67†,ǁ | | 0.33†,§ | | 0.18† | | -0.37 | |
| 6 (F, 39)* | 0.56†,ǁ | 0.37†,ǁ | 0.41†,ǁ | 0.32†,ǁ | 0.84†,ǁ | 0.47†,ǁ | 0.12§ | 0.11ǁ | 0.89†,ǁ | 0.64†,ǁ | 0.67†,ǁ | 0.43†,ǁ | 0.46†,ǁ | 0.37†,ǁ | 2.01ǁ | 0.80 |
| 7 (F, 29)* | 0.11† | | 0.03† | | 0.32†,‡ | 0.24†,ǁ | 0.16ǁ | 0.15ǁ | 0.27† | 0.24†,ǁ | 0.17† | | 0.01† | | -0.03† | |
| 8 (M, 39)* | 0.06† | | 0.18† | 0.17†,ǁ | 0.18† | 0.14† | 0.08 | | 0.34†,‡ | 0.27†,§ | 0.25† | 0.20†,‡ | 0.49 | 0.18 | -0.67 | |
| 9 (M, 32)* | 0.23†,‡ | 0.11† | 0.16† | | 0.30†,‡ | 0.10† | 0.00 | | 0.22† | | 0.19† | | 0.31 | | 0.20† | |

Phase 1, estimates of changes in suicide rates per 100,000 people during the initial 30 days after a particular celebrity suicide; Phase 2, estimates of changes in suicide rates per 100,000 people during the second 30 days after the first 30 days following a particular celebrity suicide; In order to yield the most appropriate model for each incident, the results at Phase 1 alone were included in the analysis for the incidents who do not have a significant impact on gender- and age-specific subgroups at Phase 2.
*Inside the bracket (gender, age at the time of death): M, Male; F, Female; †Log-transformed rates; ‡$P < 0.05$; §$P < 0.01$; ǁ$P < 0.001$.

among those aged 20-to-34 during Phase 1 and those aged 35-to-49 during Phase 2.

Three female celebrities – Incidents 3, 4, and 5 – who died in their mid-20s had a significant impact on three age subgroups during Phase 1; those aged less than 20 years, aged 20-to-34, and aged 35-to-49. The impact of Incident 3 continued during Phase 2 for those aged 20-to-34 and aged 35-to-49. Furthermore, Incident 7 had a significant impact on people aged less than 20 years during Phases 1 and 2 and people aged 20-to-34 during Phase 2, while Incident 8 significantly influenced those aged 20-to-34 during Phases 1 and 2 and those aged 35-to-49 during Phase 2. Incident 1 had a significant impact on people aged less than 20 years and those aged 65 years and older during Phase 1. Incident 9 did not have a significant age-specific impact on subsequent suicide rates.

## DISCUSSION

Since Phillips used the term "the Werther effect" which was named after the suicidal protagonist of Goethe's famous novel to describe the impact of celebrity suicide on subsequent suicide rates (20), celebrity suicides have been repeatedly associated with an increase in suicide rates in the general population (4-6). In particular, high suicide rates in Korea and its relation with celebrity suicide have caught the attention of several researchers (3,5,7,9). To further extend the understanding of the Werther effect, the present study investigated the association between celebrity suicide and subsequent suicide rates in the general population of Korea from 1996 to 2010.

The present study used celebrity data from the 1990s, a time period relatively unstudied by recent investigations, to the 2000s. To our knowledge, the present study is the first to include Incident 1. The celebrity of Incident 1 was one of the best singer/song writers in Korea who died in 1996. However, his suicide death did not have a significant impact while the majority of celebrity suicide in this study that occurred in the 2000s had a significant influence on subsequent suicide rates. It must be noted that the year of 1996 was when the Internet and its associated network technology were neither greatly developed nor prevalent in Korea. The lack of accessible information about Incident 1 may have affected the present results. This line of reasoning is consistent with prior findings that the number of media reports of a celebrity suicide was significantly associated with subsequent suicides among the general population (9,21,22).

It is interesting that only one out of the nine celebrity suicides in this study took place in the 1990s and that there was no celebrity suicide occurred before 1996. Since Incident 2 occurred in 2003, celebrity suicide was publicized almost every year and its impact on subsequent suicide rates in the general population reached its peak following Incident 6 in 2008. A possible explanation about the increase in the number of celebrity suicide dur-

ing the 2000s is that an incident of celebrity suicide may have led to another incident of subsequent celebrity suicide. Further research may be needed to more clearly understand the increased celebrity suicides in Korea during the last decade.

Previous studies primarily focused on the suicide of entertainment celebrities (3,5) and suicide of entertainment celebrities has been suggested to have the greatest impact on subsequent suicide among various types of celebrities (23). However, the non-entertainment celebrity suicide in the present study (Incident 2) had as significant impacts as the other entertainment celebrity suicides had. Incident 2 even had one of the strongest impacts on the same and similar age subgroups among the nine celebrity suicides. These results indicate that diverse factors other than types of celebrity may determine the significance and magnitude of the impact of celebrity suicide.

In the present study, the magnitude and duration of the impacts of a celebrity suicide differed according to the particular celebrity and this is consistent with the previous findings (5,6). For example, Incident 9 had a significant impact on the overall suicide rates for 30 days, while Incident 3 not only had a greater impact, but also a longer-term impact than Incident 9. The dissimilar impact of celebrity suicides may be due to individual degree of identification with a particular celebrity. In addition, some of the incidents occurred within a relatively short period of time and might have influenced the individual impact of each. For instance, Incident 4 preceded Incident 5 by only 20 days. It is likely that the longer-term impact of Incident 4 was affected by the immediate influence of Incident 5. Therefore, it is important to identify such confounding factors as the degree of identification with a specific celebrity or overlap of the studied time periods for different celebrity suicides.

The celebrity suicides in the present study had a significant impact on subsequent suicide rates among both male and female subgroups and that the magnitude of the impact of a celebrity suicide was greater in the same gender subgroup as the celebrity. Because some of the celebrity suicides in the present study had no gender-specific impact, the results of the present study partially support those of prior studies demonstrating the gender-specific influence of celebrity suicide (5,6). The present study also showed that a majority of nine celebrity suicides had a greater impact in the female subgroup than the male subgroup (Incidents 3-7, 9). The finding suggests that females are more likely to be affected by the suicide of a famous figure.

As observed in a previous study (5), celebrity suicides in the present study had a significant impact on the same and similar age subgroups. Also, the younger subgroups were influenced to a greater degree by celebrity suicide than the older subgroups as reported by prior investigation (14). Given that the present study did not include teenage celebrities who died by suicide, it is noteworthy that a significant increase in suicide rates was found among teenagers. These findings are consistent with prior stud-

ies showing that teenagers were more susceptible to the publicized suicides of celebrities (24,25).

However, two celebrity suicides in the present study did not have an age-specific impact. One of them is Incident 1 which might not have been extensively covered in media due to the reason we supposed, and the other is Incident 9. Given that Incident 9 had a significant impact on the total population and the female subgroup, it is plausible that being the same gender or same age as the celebrity might not be the most important risk factors for subsequent suicide. Rather, celebrity suicide may have a greater impact on those who had been previously exposed to the celebrity, regardless of their age and gender. Again, confounding factors, including the degrees of prior exposure to and identification with the celebrity by the public, should be taken into consideration in order to fully understand the relationship between a celebrity suicide and subsequent suicide rates.

Notably, Incident 6 had the greatest influence on the suicide rates of all subgroups in the present study. The celebrity of Incident 6 was one of the most renowned actresses in the country and had numerous starring roles in the most-watched television drama series throughout the late 1990s and the early 2000s. In 2008, there were over 2,000 news items during the first week after her suicide (5). Given that the media industry in Korea was reported to sensationalize suicide by mentioning it in the headline and detailing the method used more frequently than the media industry in other countries (26), both the nationwide popularity of this particular celebrity and the extensive media coverage about her suicide might have played a role in the greater magnitude and broadened range of the impact that her suicide had on subsequent suicide rates.

It is inspiring that the magnitudes and significance of the impact of the celebrity suicides that occurred after Incident 6 were less than those before the incident. The unexpected death of this eminent actress may have raised a nationwide alarm regarding suicide and led to increased awareness of the responsibility of media reports on suicide. The reduced influences of celebrity suicide observed since Incident 6 could be a desirable consequence of the elevated awareness of and national efforts towards suicide prevention since Incident 6. More solid evidence will be necessary to confirm the suggested association between Incident 6 and the subsequent decrease in the impacts of other celebrity suicides.

There were several limitations to the present study. Because the actual cause of suicide in the general population was not directly investigated, it remains unclear whether individuals who committed suicide after a celebrity suicide had been exposed to or influenced by it. However, some studies addressed this issue and provided evidence partially supporting for the causal relationship between celebrity suicide and subsequent suicidal behaviors (1,2,21). In the present study, only nine celebrity suicides were included and two types of celebrity were investigat-

ed. To improve the generalizability of the results, more number and other types of celebrity suicide should be addressed in future studies. Moreover, although the present study controlled for the confounding effects of seasonal variations, other covariates such as unemployment rates and secular trends were not addressed. These variables might have also influenced the results.

The present study attempted to expand the understanding of the relationship between celebrity suicide and subsequent suicide rates of the general population by investigating nine celebrity suicides of Korea from 1996 to 2010. The results of the study helped observe the change in the impacts of celebrity suicide over the past two decades. The non-significant impact of the celebrity suicide in 1996 as well as the increased number of celebrity suicide and its significant impact after 2000 may suggest a possible link between the rapid development of the Internet/media network and the impact of celebrity suicide. Regardless of the type of the celebrity, the majority of the nine celebrity suicides appeared to have significant impacts on suicide rates both in the total population and in the same gender- or the same age-subgroups. However, each celebrity suicide had a different influence on subsequent suicide in terms of its significance, magnitude, and duration. To further improve the knowledge about the Werther effect, more attention should be paid to the underlying processes or confounding factors that may contribute to the impact of celebrity suicide on subsequent suicide rates.

## DISCLOSURE

The authors have no potential conflicts of interest to disclose.

## AUTHOR CONTRIBUTION

Study design and protocol: Lee YJ. Literature searches: Kim SJ, Kim S, Lee HJ. Statistical analysis: Choi N, An H. Writing: Park J. Agreeing with manuscript results and conclusions: all authors.

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