






Cumulative effect of unemployment on suicide mortality in South Korean workers (2018–2019)

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Original Article

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Abstract

Background. While unemployment is known to increase the risk of suicide, its cumulative effect remains underexplored. This study investigates how unemployment affects suicide mortality and whether the effect varies based on the number of unemployment spells using two years of nationwide data.

Methods. Using the data from the National Statistical Office and Employment Insurance Database for 2018 and 2019, we identified an average of 2365 cases of suicide over two years among 7.76 million workers aged 25–64 years who had been employed within one year before their suicide. The number of unemployment spells was counted using the employment history of the past five years. We calculated crude suicide mortality rates per 100 000 population, age- and sex- standardized mortality rates (SMRs), and proportionate mortality rates (PMRs) for suicide.

Results. Over the two years, the crude suicide rate was 30.0 per 100 000 among the general population and 30.5 among workers. Workers with no unemployment spells in the past five years had a significantly lower SMR (0.44; 0.42–0.46), while those with four or more unemployment spells had a significantly higher SMR (3.13; 2.92–3.35) than the general population. These findings were consistent across all sex and age groups. Additionally, workers with four or more unemployment spells had a significantly higher PMR than the general population.

Conclusion. The impact of unemployment on suicide mortality intensifies as the number of unemployment spells increases. These results underscore the necessity for additional social and psychological support along with economic assistance for individuals facing recurrent unemployment.

Introduction

Suicide is a leading cause of death worldwide, with more than 700 000 people committing suicide in 2019, accounting for 1.3% of all deaths in 2019 (World Health Organization [WHO], 2021). Approximately 58% of suicides occur among individuals aged under 50 years, posing a significant global public health problem with implications for the working population (WHO, 2021). Specifically, the suicide rate in South Korea is exceptionally high at 24.1 per 100 000 population, while the average suicide rate among the Organization for Economic Co-operation and Development (OECD) countries is 11.0 (OECD, 2023).

The causes of suicide are multifaceted, involving psychiatric, biological, social, environmental, and demographic factors (Farooq, Tunmore, Wajid Ali, & Ayub, 2021; Turecki & Brent, 2016). Among them, unemployment is an important social factor. Several studies, including one conducted in South Korea, have reported an association between unemployment and suicide (Blakely, Collings, & Atkinson, 2003; Nordt, Warnke, Seifritz, & Kawohl, 2015; Yoon, Jung, Choi, & Kang, 2019).

Studies have suggested that the association between unemployment and suicide stems from mutual risk factors, such as mental illnesses (Milner, Page, & LaMontagne, 2014; Mortensen, Agerbo, Erikson, Qin, & Westergaard-Nielsen, 2000). However, there is also evidence suggesting that unemployment causes suicide. A recent study conducted in Australia used 13 years of data and found that the association between unemployment and suicide is causal (Skinner, Osgood, Occhipinti, Song, & Hickie, 2023). According to studies, unemployment can lead to suicide through various pathways, such as impaired mental health, increased psychological distress (Daly & Delaney, 2013; Paul & Moser, 2009; Yoo et al., 2016; Yoon, Kim, Park, & Kim, 2017), financial stress, which is also related to mental illnesses (Ridley, Rao, Schilbach, & Patel, 2020), and social isolation (Pohlan, 2019).

However, it is also possible that the impact of unemployment accumulates over time. A previous study found that the number of unemployment spells is related to decreased quality of life and satisfaction, showing that unemployment has a scarring effect (Mousteri, Daly, & Delaney, 2018). Similarly, another study reported that adults experiencing fluctuations between different employment statuses are more prone to suicidal thoughts than consistently unstably employed or unemployed individuals (Kim, Ki, Choi, & Song, 2019). Studies have also shown a cumulative effect of unemployment on mental health and acute myocardial infarction (Dupre, George, Liu, & Peterson, 2012; Strandh, Winefield, Nilsson, & Hammarström, 2014).

Based on the existing evidence, it is plausible to hypothesize that the risk of suicide attributable to unemployment increases as the number of unemployment spells increases. However, to the best of our knowledge, research remains scant on the impact of the number of unemployment spells on suicide. Therefore, this study investigates how unemployment experiences affect suicide mortality and whether the effect varies based on the number of unemployment spells using two years of nationwide data from a country with one of the highest suicide rates.

Material and methods

Data source

We utilized data from Statistics Korea (the National Statistical Office of South Korea) and the Korean Employment Information Service (KEIS) for the years 2018 and 2019. Initially, we collected information on the number of deaths by cause, along with mid-year population figures categorized by sex and age (grouped into five-year intervals) from Statistics Korea. Subsequently, we obtained data on the total number of workers for each year, categorized by employment and unemployment history, from KEIS. Finally, we merged the datasets from both institutions to gather information about the employment history and cause of death of individuals who died during this period and had a record of employment.

Definition of a worker and the number of unemployment spells

We defined a 'worker' as anyone with an employment history in each calendar year of 2018 or 2019. We used workers' employment records to determine the number of unemployment spells that occurred over the past five years. For the total worker population, we analyzed employment records from the preceding five calendar years (from 1 January 2014 to 31 December 2018, for the 2018 dataset; from 1 January 2015 to 31 December 2019, for the 2019 dataset). For workers who died during this period, we analyzed employment records from the five years leading up to their date of death. The number of unemployment spells was categorized as zero, one, two, three, and four or more in the past five years. The analysis was limited to workers aged 25–64 years – generally considered the working population in Korea – and five years of employment history was evaluated.

Cause of death

Statistics Korea provides information on the causes of death based on the 8th revision of the Korean Classification of Diseases, which is aligned with the 10th revision of the International Classification of Diseases. For this study, the focus was on suicides, categorized

as intentional self-harm under the external cause of morbidity and mortality. To distinguish suicides from other external causes, the category was split into two: suicide (X60–X84) and external causes other than suicide (U12 and V01–Y89, except for X60–X84). We also identified four other leading causes of death that accounted for more than 5% of the total deaths: neoplasms (C00–D48), diseases of the circulatory system (I00–I99), diseases of the digestive system (K00–K92), and symptoms and signs not classified elsewhere (R00–R99). All remaining causes were grouped as 'others combined.'

Statistical analysis

We calculated crude mortality rates per 100 000 people for the general population, total workers, and workers stratified by the number of unemployment spells. To assess the impact of unemployment on mortality, indirect standardization was employed, using the general population as the reference group to compute standardized mortality ratios (SMRs) and 95% confidence intervals (CIs) according to the number of unemployment spells. Proportionate mortality ratios (PMRs) and 95% CIs were also calculated according to the number of unemployment spells, using the distribution of mortality in the general population as the reference. Furthermore, stratified analyses were conducted by sex and age group (25–44 and 45–64 years) for SMR and PMR analyses to explore potential differences in mortality rates among the subgroups. All statistical analyses were performed using the SAS software package version 9.4 (SAS Institute, Cary, NC, USA).

Ethics statement

The study was carried out in accordance with the principles of the latest revision of the Declaration of Helsinki. All study procedures were approved by the Institutional Review Board of Ajou University Hospital (AJOU-IRB-EXP-2021-149, AJOU-IRB-EXP-2022-180). Informed consent was waived because the data we obtained were not individual level.

Results

In Korea, an average of 65 256 deaths occurred annually from 2018 to 2019 among the general population aged 25–64 years (10 973 workers). Neoplasm was the leading cause of death for the general population (35.3%) and workers (28.7%). However, suicide was more common among workers (21.6%) than among the general population, where it was the third most common cause of death (14.2%). Diseases of the circulatory system were the second most common cause of death in the general population (14.4%) and third most common cause among workers (18.1%). The proportion of suicide increased with the number of unemployment spells, with proportions of 19.6% and 25.4% in workers with no unemployment spells and four or more unemployment spells, respectively. The distribution of leading causes of death is presented in [Table 1](#).

[Table 2](#) presents the total number of individuals in the general population and workers based on sex, age, number of unemployment spells, and suicide mortality rates per 100 000 people. The general population and workers had similar suicide mortality rates (30.0 and 30.5, respectively). Men had a higher suicide mortality rate than women in both groups. In the general population, the older age group (45–64) had a higher suicide mortality rate (33.3) than the younger age group (25–44; 26.3). However,

Table 1. Distribution of leading causes of death among individuals aged 25–64 years in the general population and workers, 2018–2019

	Workers													
	General population		Total		Zero		One		Two		Three		Four or more	
	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)	N	(%)
Total	65 256	(100.0)	10 973	(100.0)	3201	(100.0)	3290	(100.0)	1826	(100.0)	1079	(100.0)	1579	(100.0)
Neoplasm	23 028	(35.3)	3150	(28.7)	876	(27.4)	1101	(33.5)	519	(28.4)	291	(26.9)	364	(23.1)
Disease of the circulatory system	9382	(14.4)	1983	(18.1)	685	(21.4)	543	(16.5)	311	(17.0)	182	(16.9)	262	(16.6)
Disease of the digestive system	4941	(7.6)	528	(4.8)	97	(3.0)	162	(4.9)	98	(5.4)	58	(5.4)	114	(7.2)
Symptoms and signs, NEC	4235	(6.5)	649	(5.9)	194	(6.0)	169	(5.1)	112	(6.1)	72	(6.6)	104	(6.6)
Suicide	9283	(14.2)	2365	(21.6)	628	(19.6)	656	(19.9)	421	(23.0)	261	(24.2)	401	(25.4)
External causes other than suicide	5328	(8.2)	1507	(13.7)	535	(16.7)	413	(12.6)	220	(12.1)	142	(13.1)	198	(12.5)
Others combined	9061	(13.9)	793	(7.2)	188	(5.9)	247	(7.5)	146	(8.0)	74	(6.9)	138	(8.7)

Abbreviation: NEC, not elsewhere classified. All numbers are the averages of 2018 and 2019. The totals may not correspond to the sum of separate figures owing to approximation.

younger workers had a higher suicide mortality rate (34.1) than older workers. The suicide mortality rate increased gradually with the increase in the number of unemployment spells – the lowest rate was observed in the group with no unemployment spells (15.4) and the highest in the group with four or more unemployment spells (96.9). Stratified analyses by sex and age group showed similar results, demonstrating a consistent pattern wherein the crude suicide mortality rate increased with the increase in the number of unemployment spells across both sexes and age groups (online Supplementary Table).

Table 3 presents the results of comparing SMRs for suicide among workers aged 25–64 years and the general population based on the number of unemployment spells. Among total workers, the group with no unemployment spells displayed a significantly lower SMR than the general population (SMR: 0.44, 95% CI 0.42–0.46), whereas all other groups exhibited significantly higher SMRs – the highest SMR was observed in the group with four or more unemployment spells (3.13; 2.92–3.35). These findings were consistent across all subgroup analyses. While men exhibited a crude mortality rate exceeding that of women by more than 2-fold, the SMRs according to the number of unemployment spells remained similar across both sexes. However, the SMRs among younger workers in all categories were higher compared to those of older workers. In addition, it is noteworthy that the SMRs for suicide among men and younger workers significantly increased with each increment of unemployment spell, accompanied by distinct confidence intervals.

Table 4 presents the results of comparing PMRs among workers aged 25–64 years and the general population based on the number of unemployment spells. All worker groups exhibited significantly higher PMRs than the general population. As the number of unemployment spells increased, PMRs also increased – the highest rate was observed in the group with four or more unemployment spells (1.39; 1.30–1.49). These results were generally consistent across the stratified analyses. However, female workers with four or more unemployment spells displayed a higher PMR (1.68; 1.45–1.93) than male workers (1.32; 1.22–1.43), and older workers with four or more unemployment spells showed a higher PMR (1.47; 1.32–1.63) than younger workers (1.33; 1.21–1.46).

Discussion

This study investigated the association between the number of unemployment spells and suicide mortality. Utilizing nationally representative data, we obtained mortality data for the entire workforce and compared them with the overall Korean population. The overall suicide mortality rate among workers was similar to that among the general population. However, suicide mortality rates were higher among younger workers than among older workers. We also observed a trend of increasing crude mortality rates, SMRs, and PMRs for suicide as the number of unemployment spells increased, even after stratification by sex and age, suggesting a dose-response effect of unemployment on suicide mortality. Specifically, each instance of unemployment spell, regardless of the previous number of spells, led to a significant increase in SMRs among men and younger workers.

In this study, the suicide mortality rate among men was more than twice the rate among women, which is consistent with the previous finding that the risk of suicide is generally higher among men than among women (Hawton, 2000). However, our finding that the suicide mortality rate was higher among young

Table 2. Demographic characteristics and crude mortality rates for suicide among the general population and workers aged 25–64 years, 2018–2019

	General population			Workers		
	N	Death	Rate per 100 000	N	Death	Rate per 100 000
Total	30 950 355	9283	30.0	7 761 107	2365	30.5
Sex						
Male	15 722 133	6760	43.0	4 633 778	1840	39.7
Female	15 228 222	2523	16.6	3 127 330	526	16.8
Age						
25–44	14 482 938	3807	26.3	3 516 012	1199	34.1
45–64	16 467 417	5476	33.3	4 245 096	1166	27.5
Number of unemployment spells						
Zero				4 080 614	628	15.4
One				1 864 972	656	35.1
Two				936 524	421	44.9
Three				465 579	261	56.1
Four or more				413 418	401	96.9

All numbers are the averages of 2018 and 2019. The totals may not correspond to the sum of separate figures owing to approximation.

workers than among young general population or older workers is inconsistent with previous findings. Generally, individuals with jobs tend to have lower suicide rates than those who are unemployed (Blakely *et al.*, 2003; Yur'yev, Värnik, Värnik, Sisask, & Leppik, 2012), and suicide rates typically tend to increase with age (Cheong *et al.*, 2012; Statistics Korea, 2022). Although it is unclear, work-related risk factors for mental health, such as excessive workload, emotional labor, and job insecurity, may have a stronger impact on young workers, as they tend to experience more psychological distress due to less control and less stable positions at work (Hybels, Blazer, Eagle, & Proeschold-Bell, 2022).

We found that the suicide mortality rate was higher among individuals who experienced just one unemployment spell than among the general population. Notably, the suicide rate increased as the number of unemployment spells increased. These

observations suggest that distress associated with unemployment may accumulate over time and intensify the risk of suicide. Our SMR analyses, standardized by sex and age group, consistently supported these results. Compared to the suicide rate among cancer patients in South Korea, which is reported to be twice as high as that of the general population (Ahn *et al.*, 2010), the suicide mortality rate among workers with four or more unemployment spells, which is more than three times higher, suggests that repeated experiences of unemployment are profoundly distressing and traumatizing. Stratified analyses by sex and age also produced similar results, indicating that the cumulative experience of unemployment is a vulnerability for suicide across all demographic groups.

The mechanisms contributing to a higher risk of suicide among the unemployed than the employed include the direct stress of unemployment, loss of work-related identity and

Table 3. Standardized mortality ratios (SMRs) for suicide among workers aged 25–64 years compared to the general population according to the number of unemployment spells in the past five years, 2018–2019

	Stratified by sex						Stratified by age group			
	Total		Male		Female		25–44		45–64	
	SMR	(95% CI)	SMR	(95% CI)	SMR	(95% CI)	SMR	(95% CI)	SMR	(95% CI)
General population	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Number of unemployment spells										
Zero	0.44	(0.42–0.46)	0.45	(0.42–0.47)	0.41	(0.35–0.46)	0.59	(0.54–0.64)	0.36	(0.34–0.39)
One	1.09	(1.03–1.15)	1.06	(1.00–1.13)	1.17	(1.05–1.31)	1.19	(1.10–1.29)	1.00	(0.93–1.08)
Two	1.44	(1.34–1.54)	1.42	(1.31–1.53)	1.52	(1.32–1.72)	1.56	(1.42–1.71)	1.32	(1.19–1.46)
Three	1.82	(1.67–1.98)	1.86	(1.68–2.05)	1.71	(1.43–2.03)	2.07	(1.84–2.31)	1.57	(1.38–1.79)
Four or more	3.13	(2.92–3.35)	3.16	(2.91–3.42)	3.04	(2.63–3.49)	3.70	(3.36–4.05)	2.64	(2.37–2.92)

Table 4. Proportionate mortality ratios (PMRs) for suicide among workers aged 25–64 years compared to the general population according to the number of unemployment spells in the past five years, 2018–2019

	Stratified by sex						Stratified by age group			
	Total		Male		Female		25–44		45–64	
	PMR	(95% CI)	PMR	(95% CI)	PMR	(95% CI)	PMR	(95% CI)	PMR	(95% CI)
General population	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)	1.00	(Reference)
Number of unemployment spells										
Zero	1.06	(1.01–1.12)	1.06	(1.00–1.12)	1.09	(0.95–1.25)	0.91	(0.84–0.99)	1.23	(1.14–1.33)
One	1.15	(1.09–1.22)	1.11	(1.04–1.18)	1.33	(1.19–1.48)	1.07	(0.99–1.16)	1.24	(1.15–1.34)
Two	1.27	(1.19–1.36)	1.20	(1.10–1.29)	1.55	(1.35–1.76)	1.19	(1.09–1.31)	1.37	(1.24–1.51)
Three	1.27	(1.16–1.38)	1.23	(1.11–1.35)	1.43	(1.19–1.69)	1.22	(1.08–1.36)	1.35	(1.18–1.53)
Four or more	1.39	(1.30–1.49)	1.32	(1.22–1.43)	1.68	(1.45–1.93)	1.33	(1.21–1.46)	1.47	(1.32–1.63)

relationships, and financial strain (Wanberg, 2012). Increased mental stress has also been objectively reported in studies that have shown an increase in cortisol levels after unemployment (Maier et al., 2006). In other words, the impact of unemployment goes beyond just losing the job; it involves losing the value of work and job rewards (Kalleberg, 1977). This, in turn, leads to damaged self-esteem, a loss of motivation, and depression, all contributing to an increase in suicidal tendencies.

Additional hypotheses explaining the rise in suicide mortality rates associated with an increased number of unemployment spells include the ‘scarring effect’, where early unemployment can result in negative long-term outcomes, and the ‘discouraged worker effect’, wherein learned helplessness, lack of self-esteem, and fear of rejection contribute to a reluctance to actively finding and returning to work. Past experiences of unemployment can have long-lasting effects, diminishing the well-being of individuals in the workforce (Clark, Georgellis, & Sanfey, 2001). According to human capital theory, experiencing repeated unemployment diminishes future labor skills, placing individuals at a disadvantage in the job market (Becker, 2009; Manzoni & Mooi-Reci, 2020). Even if they manage to secure employment, they are more likely to be limited to low-status, low-paying jobs, perpetuating a cycle of precarious employment (Gangl, 2006). This detrimental feedback loop leads to workers developing a sense of failure, resulting in a tenfold increase in suicidal ideation (Korea Suicide Prevention Center, 2020).

In contrast, workers without unemployment spells showed a significantly lower suicide mortality rate than the general population. This is a natural consequence of having a secure income and can be explained by the healthy worker effect – people with good mental health are more likely to stay employed (Li & Sung, 1999). Additionally, work itself may have a positive effect on an individual’s mental health, for example, through a sense of accomplishment (Satuf et al., 2018).

The higher PMR in workers than in the general population suggests that they are an important group in terms of their relative contribution to suicide. The proportion of suicides among all causes of death in workers was approximately 1.5 times higher than that in the general population, while the proportions of cancer or chronic diseases, which often lead individuals to stop working due to reduced work capacity or the need for treatment, were comparatively lower. Nevertheless, PMRs for suicide

demonstrated an increase as the number of unemployment spells increased, adding support to the finding that the cumulative stress associated with unemployment heightens the risk of suicide. Among workers with four or more unemployment spells, suicide surpassed cancer as the primary cause of death. Therefore, this group requires enhanced care and vigilant monitoring.

While our primary focus was on elucidating the mechanism through which unemployment experiences impact suicide mortality rates via the deterioration of mental health, it is also well-known that mental health influences both employment status and suicide mortality concurrently (Chiu et al., 2023; Dobson, Vigod, Mustard, & Smith, 2021; Hakulinen et al., 2020; Milner et al., 2014). Although mental disorders can directly contribute to suicide, there are suggested pathways through which mental disorders impact the risk of suicide via change in employment, which may result in economic difficulty. Individuals with mental health issues are often marginalized from the employment market, leading to an increased risk of unemployment. Even if they manage to maintain employment, their incomes are more likely to be declined (Hakulinen et al., 2020; Hynek, Hollander, Liefbroer, Hauge, & Straiton, 2022; Olesen, Butterworth, Leach, Kelaher, & Pirkis, 2013). Several potential causes contribute to their unemployment. Among these, disability stands out as a significant factor. However, it is important to recognize that stigma and discrimination, which are also direct causes of suicide, also play pivotal roles in the unemployment experienced by individuals with mental health issues (Campbell et al., 2022; Sharac, Mccrone, Clement, & Thornicroft, 2010; Thornicroft et al., 2016).

In light of the findings from existing literature, it is plausible to interpret the result of our study as indicating that individuals with pre-existing mental health problems, who are already at a high risk for suicide, experienced recurrent unemployment due to their health condition. Conversely, the assumption that repeated unemployment may impact workers’ mental health, thereby increasing the risk of suicide, as hypothesized study, is also plausible. To overcome this limitation, previous studies examining the causal relationship between employment status and suicide utilized longitudinal study designs that ascertain temporal relationships or controlled mental health-related factors (Milner et al., 2014; Skinner et al., 2023). However, it is important to note that our study was a cross-sectional study. Furthermore, although we collected individual data on age, sex, employment history, and

suicide deaths, we were unable to obtain personal characteristics known to influence suicide mortality, such as substance abuse, socioeconomic condition, and personal histories of mental and physical illnesses. As a consequence, our study's limitations prevented the establishment of a causal relationship between unemployment and suicide mortality, therefore, caution is needed when interpreting the results. Given that utilizing the number of unemployment spells as a risk factor for suicide is, to the authors' knowledge, a novel approach, there is a necessity for future research to employ longitudinal designs and include a broader array of personal characteristics to establish causal relationships, even though there is growing evidence suggesting that unemployment itself act as a causal factor in suicide.

There are some other limitations in this study. First, certain workers who are not covered by employment insurance, such as government employees and private school faculty members, were not included in this study. However, as of 2019, more than 90% of workers were covered by employment insurance (Korean Statistical Information Service [KOSIS], 2023), implying that this study is representative of the entire Korean workforce. Also, we were unable to determine whether unemployment was voluntary or involuntary since the cause of employment termination could not be identified in the employment insurance data. Future studies should include information on unemployment benefits as these are exclusively provided to individuals who have lost their jobs involuntarily.

Despite these limitations, this study's strengths lie in being the first study that used credible large-scale data to explore the relationship between the number of unemployment spells and suicide mortality in the context of Korea. To increase the reliability of our results and provide an objective understanding of suicide mortality among Korean workers, we used data on the causes of death from Statistics Korea. This dataset adheres to international cause-of-death classification standards, enhancing the credibility of our findings.

Effective suicide prevention requires the identification of vulnerable groups and targeted policy support. Along with precarious employment and prolonged unemployment, which are known occupational risk factors for suicide, we suggest that a high number of unemployment spells can also be a risk factor. Therefore, individuals who face repeated unemployment require not only economic support, such as unemployment benefits but also social and psychological support. This study is timely as it has implications for protecting workers' mental health amid the economic downturn and deteriorating labor market conditions triggered by the coronavirus disease pandemic. Furthermore, unemployment stress has a detrimental impact on not only mental but also physical health. Therefore, further research is necessary to investigate the impacts of the number of unemployment spells on other causes of death, as well as to examine the effects of unemployment duration on suicide rates and/or mental health outcomes. Understanding these relationships can help devise comprehensive strategies to protect and support the well-being of workers and address the complex challenges associated with unemployment and suicide prevention.

Supplementary material. The supplementary material for this article can be found at <https://doi.org/10.1017/S0033291724000965>

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Competing interests. The authors declare none.

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Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Data availability statement. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

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