



Dynamic reciprocal relationships between traditional media reports, social media postings, and youth suicide in Taiwan between 2012 and 2021

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ABSTRACT

Rising social media use over the past decade has been linked with increasing suicide rates among young people. Previous studies that assessed the impact of social media on suicide have typically focused on single social media platforms, such as Twitter, and assumed unidirectional associations, where social media posts leads to suicide. Our study focused on the past decade (2012–2021) which has witnessed a rapid increase of social media platforms and use. Poisson and negative binomial auto-regression models were employed to examine the dynamic reciprocity between social media, traditional media and youth suicides in Taiwan. Increased volume in suicide-related social media posts positively correlated with increased youth suicide rates ($\beta = 2.53 \times 10^{-5}$, 95% CI = $(0.83 \times 10^{-5}, 4.24 \times 10^{-5})$, $P < 0.01$), but increased rates of youth suicide was not related to an increase in suicide-related social media posts. Suicide-related posts on social media triggered reporting of suicide-related news on traditional media platforms ($\beta = 3.35 \times 10^{-2}$, 95% CI = $(2.51 \times 10^{-2}, 4.19 \times 10^{-2})$, $P < 0.001$), whilst traditional media reports of suicide led to increased suicide-related social media posts ($\beta = 6.13 \times 10^{-1}$, 95% CI = $(4.58 \times 10^{-1}, 7.68 \times 10^{-1})$; $P < 0.001$). However, suicide-related reports on traditional media platforms did not directly lead to an increase in youth suicide rates. Our findings highlight challenges for suicide prevention strategies in the 21st Century, in dealing with the increasing prominence of social media over traditional media. As social media is more difficult to regulate than traditional media, suicide prevention efforts must adapt to this new landscape by developing innovative strategies that address the unique risks and opportunities presented by social media.

1. Introduction

The World Health Organization (WHO) reported that in 2019, suicide was the fourth-leading global cause of death among young people (World Health Organization, 2021). It has been estimated that over 150,000 young people aged 10–24 years have died by suicide each year, representing approximately 19% of all suicide deaths worldwide (World

Health Organization, 2018). It is a significant public health concern that over the past decade, suicide rates in young people have significantly increased across several high-income countries (Chen et al., 2021; Padmanathan et al., 2020; Yang & Yip, 2021). As this appears to coincide with the significant increase in use of social media by young people over the same time period, researchers have increasingly focused on investigating the link between suicide-related social media posts and the

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prevalence in young people, of suicidal ideation, planning, attempts and events (Keles et al., 2020; Marchant et al., 2017; Memon et al., 2018; Nesi et al., 2021; Sedgwick et al., 2019). However, perhaps suicide is a relatively rare event compared to suicidal ideation and attempts, there has been limited research conducted into the association between suicide-related social media posts and youth suicide deaths.

The majority of research in this area has reported a positive association between suicide-related social media posts and suicide events (Jashinsky et al., 2014; Ueda et al., 2017; Won et al., 2013). Won et al. found a significant association between suicide-related weblog entries and suicide numbers during 2008 and 2010 in South Korea (Won et al., 2013). A US state-level study by Jashinsky et al. reported that suicide-related Twitter conversations were associated with suicide rates (Jashinsky et al., 2014). Ueda et al. examined 26 celebrity suicides during 2010 and 2014 in Japan. They found that the volume of Twitter posts about these events was associated with spikes in subsequent suicide events; whereas the intensity of reporting in traditional media showed no such association (Ueda et al., 2017). However Sinyor et al.'s study from Ontario Canada was an exception, as no association was found between suicide-related posts on Twitter and suicide incidence during 2015 and 2016 (Sinyor et al., 2021). However, all these studies had limitations. Firstly, they tended to focus on a single social media platform, such as Twitter, despite the fact that social media is an increasingly-diverse landscape comprising multiple channels of expression. Second, most studies typically utilized a wide time window (e.g. weekly data), without differentiating between temporal sequences between social media posts and subsequent suicide incidence (Jashinsky et al., 2014; Sinyor et al., 2021; Won et al., 2013). Such a wide time window hinders researchers' opportunities to establish causal directionality between social media and suicide. Both social media use and suicide events might occur within the same time window, rendering it difficult to determine which event came first. For instance, did a rise in social media posts about suicide lead to increased suicide events, or did an increase in youth suicides result in greater volumes of social media posts? We propose that utilizing daily count data would better support an examination of dynamic reciprocity, and temporal sequencing, between social media and suicide incidence. Third, researchers have generally assumed that the causal direction is one way, from social media to suicide (Jashinsky et al., 2014; Sinyor et al., 2021; Won et al., 2013). Reverse causation (i.e. youth suicide triggering media discussions) has not been considered, and furthermore, there has been little investigation of the relationship between traditional media, social media, and suicide. While social media has become increasingly adopted over the past decade (particularly by young people), traditional media continues to play a significant role and serves certain functions better. According to the Taiwan Internet Report 2020; Taiwan Network Information Center, 2022), 79.0% of young population (ages 12–24) engages with web-based traditional media contents and 95.6% regularly use social media platforms. Furthermore, traditional media, in general, is regarded as more credible and trustworthy than social media (Johnson & Kaye, 2015). As traditional media is better equipped to host in-depth reporting and analysis of news events (Johnson & Kaye, 2015). The Japanese study by Ueda et al., in 2017 was one of the few to examine the relative importance of social and traditional media on suicide events, finding no association on traditional media and suicide (Ueda et al., 2017). However, these researchers did not explore the direction of interactions between traditional media, social media and suicide. Given that there is sound evidence of the influence of traditional media on suicide rates (Chen, Chen, & Yip, 2011; Niederkrotenthaler et al., 2020), it is important now, in the face of increasing social media use by young people, to investigate if, and how, social and traditional media, and youth suicide, are connected.

This paper reports findings from our research into the associations between traditional and social media, and suicide by young Taiwanese people aged 15–24 years, during the decade 2012–2021. Taiwan was an ideal location for this research. Not only has it experienced an alarming

74% increase in youth suicide between 2010 (5.5 per 100,000 population) and 2021 (9.6 per 100,000 population) (Ministry of Health and Welfare, 2022), but, according to a recent survey, over 99% of Taiwanese people aged 18–29 years are regular internet users (Taiwan Network Information Center, 2022). Our research differed from earlier studies in several ways. For instance, we used daily count data, we did not assume one-way directionality, and rather than just focusing on a single social media platform, we examined a miscellany of social media channels (Facebook, Instagram, TikTok, Twitter). We hypothesized that the influence of social media on youth suicide would surpass that of traditional media, driven not only by the higher proportion of youths using social media regularly (95.6% vs. 79.0%), but also by the significantly heightened propensity for self-presentation/expression and interpersonal transactions (Valkenburg & Peter, 2011, 2013; Valkenburg et al., 2016) inherent in the social media landscape. In addition, Taiwan enacted the Suicide Prevention Act in 2019, which stipulates that media organizations are prohibited from publishing detailed descriptions of suicide scenes and methods. Failure to comply with this regulation can attract a maximum fine of one million New Taiwan dollars (approximately 33,500 USD) (Laws & Regulations Database of The Republic of China (Taiwan), 2019). The Act only holds authority over traditional media outlets; it lacks jurisdiction over personal communications exchanged on social media platforms. It should be noted that our study did not directly measure individuals' media consumption behaviors, which encompass a spectrum of individual characteristics and how people interact with and consume various types of media. Valkenburg & Peter proposed a differential susceptibility to media effects model (Valkenburg & Peter, 2013; Valkenburg et al., 2016), this model posits that individuals exhibit varying levels of susceptibility to the influence of media messages due to three key factors: predisposition, developmental, and social. Predisposition factors include individual characteristics such as personality traits, temperament, and personal experiences. Developmental factors encompass differences related to age groups and stages of cognitive development. Social factors are shaped by cultural norms, peer influences, and societal context. These three sets of factors collectively influence how individuals engage with and respond to various forms of media. While our analysis doesn't delve deeply into individual media consumption behaviors, understanding the framework of differential susceptibility helps understand the multifaceted nature of media effects. Our study aims to illuminate the specific dynamics between media postings and youth suicides, all the while acknowledging the intricate interplay between media exposure and individual traits and psychosocial circumstances. It is implied that these media postings could serve as an indirect indicator of latent media consumption behaviors. Fig. 1 presents our underpinning theoretical models.

2. Methods

2.1. Data

Suicide data for the years 2012–2021 were extracted from Taiwan's National cause-of-death mortality data files. The ICD-10 codes used to identify suicide deaths were X60-X84 (Intentional self-harm), and we retrieved daily counts of suicide deaths for individuals aged under 25 years.

Media data were retrieved from the media tracking tool OpView, developed by eLand Cloud Services, the largest social media analytic company in Taiwan (eLAND, 2023a). OpView has systematically collected online big data since 2012. It carries out semantic analysis on Mandarin Chinese and mines text content related to a diverse range of subject topics. OpView covers over 90% of social media platforms used in Taiwan (such as Instagram, Facebook, TikTok, Twitter, Plurk, YouTube, ptt, Dcard), and the data mining process delves into approximately six billion Chinese keywords per day (eLAND, 2023b). In addition, data on news websites operated by professional media

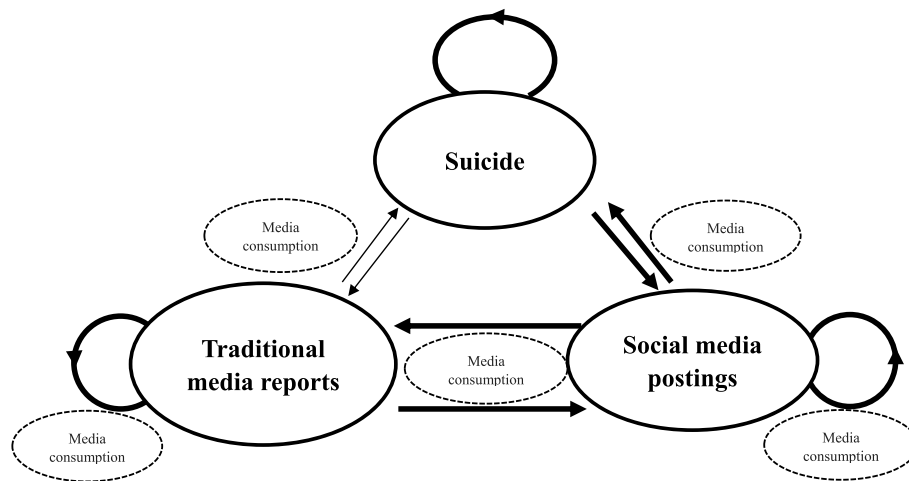


Fig. 1. Theoretical Model for the Reciprocal Interactions between Traditional Media, Social Media and Youth Suicide
 Note: media consumption is a latent variable which was not measured directly.

organizations (such as United Daily and Apple Daily) were collected (defined as traditional media platforms in this study). We used a series of Chinese keywords (38 terms) to capture daily suicide-related social media posts and traditional media reports. These keywords were developed from our previous qualitative and quantitative studies on media content and suicide in Taiwan (Chen et al., 2010, 2011b, 2012a, 2012b, 2013, 2014, 2016). The list of keywords used, and the detailed searching methods, are presented in Appendix 1.

Data on control covariates between 2012 and 2021, namely monthly unemployment and divorce rates, were retrieved from Department of Statistics (National Statistics R.O.C. (Taiwan), 2023).

2.2. Analytic strategies

We first presented the mean and range of daily data for three variables we assessed: traditional media reports, social media postings, and youth suicide counts. Additionally, we provided a line chart that longitudinally plotted these three variables. A figure with fitted intensity of these three variables was also illustrated.

We then tested whether the distributions of the three variables followed a Poisson distribution, if not, a negative binomial auto-regression model was fitted instead. It turned out that number of youth suicide counts followed a Poisson distribution, whereas over-dispersion was observed for traditional media reports and social media postings. Hence, we fitted negative binomial regression models for these two outcome variables. We performed Poisson and negative binomial auto-regression models to assess the endogenous and exogenous effects of past events on the intensity of current events, after controlling for covariates (unemployment rate and divorce). We assumed that conditional on relevant covariates, the daily counts of youth suicides (N_t^s)

followed Poisson distributions, while the daily counts of suicide reports in traditional media platforms (N_t^t) and daily numbers of social media suicide posts/reports (N_t^n) followed negative binomial distributions. Our analysis aimed to assess the dynamic reciprocity between youth suicides, traditional news platforms and social media platforms. Each variable was assumed to be affected by endogenous effects (self-excitation) and exogenous effects (effects from two other variables) in the preceding days. For example, daily counts of youth suicide were assumed to be affected by recent youth suicides (in the last few days) (i.e. self-excitation effect) as well as the intensity of suicide reports on traditional media platforms, and posts/discussions of suicides on social media platforms (i.e. exogenous effects from traditional media and social media), occurring in the same time period. The local polynomial intensity estimator (Chen, 2011, 2022; Chen, Yip, & Lam, 2011) was used to estimate the intensities (i.e. average daily counts) of the three variables shown in Fig. 1. The respective daily mean numbers of events of these three variables were calculated using the following formulas:

$$\begin{aligned} \mu_t^s &= \nu^s + \alpha_1^s \times div_t + \alpha_2^s \times unemp_t + \beta^{s,s} \times \frac{1}{L^s} \sum_{j=1}^{L^s} N_{t-j}^s + \beta^{s,t} \times \frac{1}{L^s} \sum_{j=1}^{L^s} N_{t-j}^t \\ &+ \beta^{s,n} \times \frac{1}{L^s} \sum_{j=1}^{L^s} N_{t-j}^n \\ \mu_t^t &= \nu^t + \alpha_1^t \times div_t + \alpha_2^t \times unemp_t + \beta^{t,s} \times \frac{1}{L^t} \sum_{j=1}^{L^t} N_{t-j}^s + \beta^{t,t} \times \frac{1}{L^t} \sum_{j=1}^{L^t} N_{t-j}^t \\ &+ \beta^{t,n} \times \frac{1}{L^t} \sum_{j=1}^{L^t} N_{t-j}^n \end{aligned}$$

Table 1

The averages of daily counts of youth suicide, number of items on traditional media and social media, during 2012 and 2021.

Year	Youth suicide Average daily N (range)	Traditional media Average daily N (range)	Social media Average daily N (range)
2012	0.55 (0, 3)	153.66 (12, 803)	777.33 (233, 3487)
2013	0.47 (0, 4)	200.67 (10, 638)	996.43 (61,9095)
2014	0.45 (0, 3)	446.56 (66, 2314)	1495.54 (424, 9292)
2015	0.52 (0, 4)	936.97 (222, 22755)	2404.55 (874, 43340)
2016	0.59 (0, 4)	1008.81 (146, 5792)	3304.30 (887, 16577)
2017	0.54 (0, 3)	1589.19 (221, 14565)	4803.95 (985, 25868)
2018	0.60 (0, 3)	1242.23 (279, 17144)	4462.76 (1025, 48469)
2019	0.73 (0, 4)	1321.35 (508, 5664)	5815.70 (1714, 40615)
2020	0.71 (0, 4)	1328.22 (373, 21955)	6192.08 (2270, 95768)
2021	0.72 (0, 5)	1052.50 (495, 7006)	5797.78 (2055, 35459)

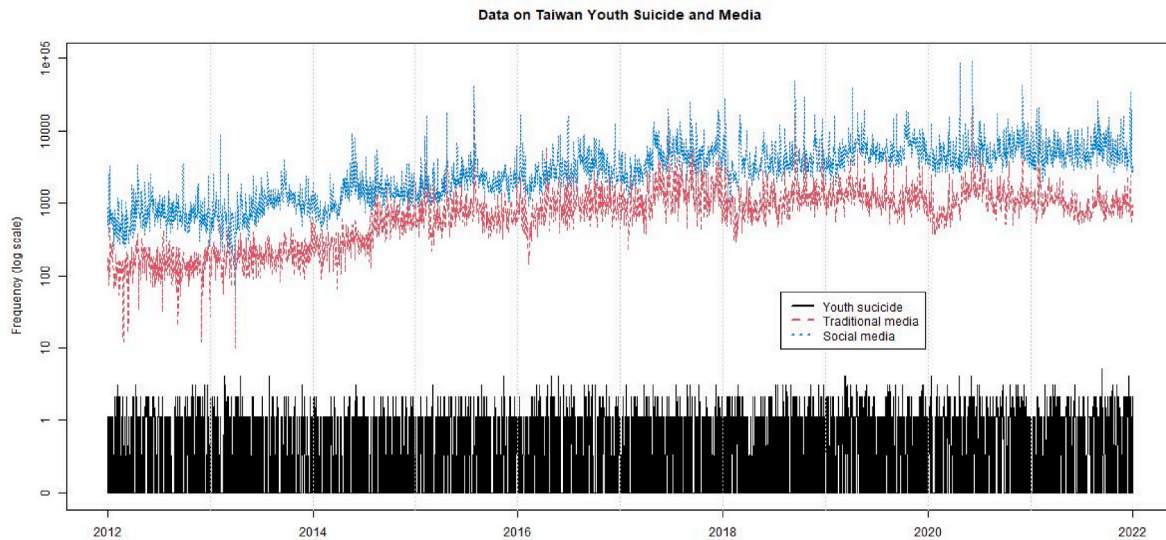


Fig. 2. The daily number of traditional media reports, social media postings and youth suicides in Taiwan, 2012–2021

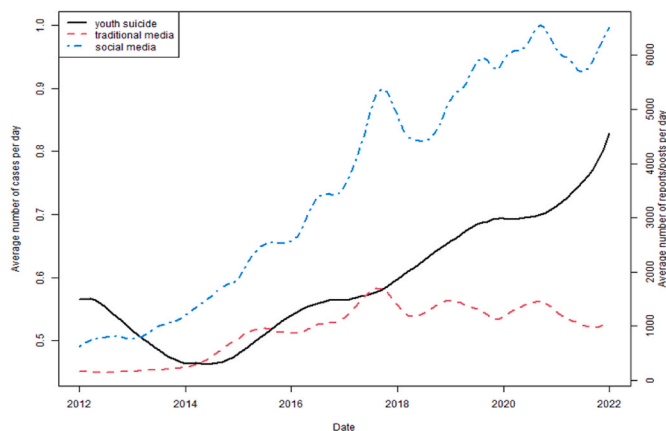


Fig. 3. Fitted intensities (daily counts) on youth suicide, suicide-related items reported in traditional media and social media platforms.

$$\mu_i^n = \nu^n + \alpha_1^n \times div_i + \alpha_2^n \times unemp_i + \beta^{n,s} \times \frac{1}{L^n} \sum_{j=1}^{L^n} N_{i-j}^s + \beta^{n,t} \times \frac{1}{L^n} \sum_{j=1}^{L^n} N_{i-j}^t + \beta^{n,n} \times \frac{1}{L^n} \sum_{j=1}^{L^n} N_{i-j}^n$$

where $\nu^{s/t/n}$ denotes the intercept, $\alpha_1^{s/t/n}$ and $\alpha_2^{s/t/n}$ denote the regression coefficients for divorce rate and unemployment rate respectively, and $\beta^{s/t/n,s/t/n}$ denotes the regression coefficients for endogenous variables. The lag parameters $L^{s/t/n}$ are nuisance parameters that were selected by

Table 2

Estimates for the Poisson and Negative Binominal Auto-regression model on the triangular relationship between traditional media, social media and youth suicide in Taiwan, 2012–2021

Outcomes	Predictors		
	Youth suicide estimate (95% CI)	Traditional media estimate (95% CI)	Social media estimate (95% CI)
Youth suicide	1.47×10^{-1} (0.65×10^{-1} , 2.29×10^{-1})***	-3.43×10^{-5} (-9.98×10^{-5} ; 3.11×10^{-5})	2.53×10^{-5} (0.83×10^{-5} , 4.24×10^{-5})**
Traditional media	-3.27 (-10.06, 3.51)	7.86×10^{-1} (7.46×10^{-1} , 8.26×10^{-1})***	3.35×10^{-2} (2.51×10^{-2} , 4.19×10^{-2})***
Social media	3.94 (-30.4, 38.3)	6.13×10^{-1} (4.58×10^{-1} , 7.68×10^{-1})***	8.31×10^{-1} (7.88×10^{-1} , 8.75×10^{-1})***

P < 0.01 *P < 0.001.

All models controlled for monthly unemployment rates and divorce rates.

95% CI: 95% Confidence Interval.

the Akaike Information Criterion (AIC). These were as follows: $L^s = 7$, $L^t = 1$, $L^n = 1$. Evidence of dynamic reciprocity or lack thereof (see Fig. 1) was estimated from these Poisson or negative binomial autoregressive models. The model fitting was done using R (R Core Team, 2022).

3. Results

The average daily counts, number of postings on traditional and social media, and youth suicide, by year, are presented in Table 1. Throughout the entire observation period, the mean for daily youth suicide counts, daily traditional media reports, and daily social media postings were 0.587 (range 0–5), 927.9 (range 10–22755), and 3604.9 (range 61–95768), respectively. After 2014, there was a rapid increase not only in the number of postings on traditional media and social media online platforms, but also in the number of youth suicides. Fig. 2 presents a line chart for daily youth suicide counts and suicide-related items on traditional and social media platforms, between 2012 and 2021. Fig. 3 presents the fitted intensity of the three variables during the study period.

The output of the Poisson and negative binomial auto-regression models suggested that when control covariates (unemployment and divorce rates) were taken into account, there were significant self-excitation effects in all three variables (Table 2). In other words, an increase in youth suicides led to further youth suicides ($P < 0.001$), and the publication of suicide-related content in one media platform (either traditional or social) stimulated further suicide content on that same platform ($P < 0.001$).

As shown in Table 2, youth suicide was not related to an increase in

suicide related posts on both traditional and social media platforms (traditional media $\beta = -3.27$, 95% CI= (-10.06, 3.51); $P = 0.34$; social media $\beta = 3.94$, 95% CI= (-30.40, 38.30); $P = 0.82$). Suicide-related reports in traditional media platforms were not associated with subsequent increases in youth suicide but were positively related to suicide-related posts on social media platforms ($\beta = 6.13 \times 10^{-1}$, 95% CI = (4.58×10^{-1} , 7.68×10^{-1}); $P < 0.001$). However, increases in social media posts were positively associated with a subsequent increase in youth suicide ($\beta = 2.53 \times 10^{-5}$, 95% CI= (0.83×10^{-5} , 4.24×10^{-5}), $P < 0.01$) and reports of suicide-related news in traditional media platforms ($\beta = 3.35 \times 10^{-2}$, 95% CI= (2.51×10^{-2} , 4.19×10^{-2}), $P < 0.001$) (Table 2). The dynamic, reciprocal and triangular relationships between youth suicide, and traditional and social media use, are presented graphically in Fig. 4. An increase in youth suicide counts was not associated with a significant increase in social media posts; but social media posts triggered an increase in youth suicide. However, suicides reported in traditional media platforms did not appear to trigger an increase in youth suicide; youth suicide did not stimulate suicide reports in traditional media platforms. Significant mutual influences between traditional media and social media platforms were observed.

Extra analyses were performed to assess the impact of different social media platforms on youth suicide risk. We categorized social media platforms as YouTube, Facebook, discussion forums (including Dcard and other discussion forums), and other social media sites. The results indicate that suicide-related content presented on each of the social media platforms was positively associated with youth suicide, although the impact of discussion forums did not reach statistical significance (Appendix II).

4. Discussion

Our findings provide evidence on the impact of social media suicide-related posts on rising youth suicide rates. The connection between youth suicides and media reports did not display a reciprocal pattern. Instead, it manifested as a one-way relationship from social media to suicide. A bi-directional relationship was observed between traditional and social media platforms, whereby suicide reports in each platform could potentially stimulate the reporting of suicide in the other. While suicide reports in traditional media platforms contributed to an increase in social media suicide-related posts, traditional media platforms did not appear to exert a direct impact on youth suicide rates. These findings highlight the urgent need for targeted interventions and policies that

address the potential harm that social media can do to youth mental health and suicide.

Social media use has previously been implicated as an important contributing factor to the rise in youth suicide rates in Taiwan (Chang et al., 2023; Chen et al., 2021). These studies identified a number of ways in which social media use may contribute to an increased risk of suicide, such as glamorizing and promoting suicide and suicidal behaviors, disseminating suicide-related content, exposing social media users to new methods of suicide, and providing an instantaneous vehicle for cyber-bullying/cyber-victimization (Biernesser et al., 2020; John et al., 2018; Nesi et al., 2021; Sedgwick et al., 2019). Our study findings corroborate those of existing literature, and contribute further evidence to the association between social media and youth suicide.

In line with findings from Japan (Ueda et al., 2017), we provided evidence of the impact of social media on suicide events in Taiwan, although the intensity of suicide reporting in traditional media platforms appeared to have no direct impact on suicide rates. Our findings however, are at odds with those of earlier Taiwanese studies conducted in the early 2000s, which showed an association between newspaper suicide reports and subsequent increases in suicide events (Chen et al., 2011b, 2013; Yip et al., 2013). We propose factors that might account for the rising significance of social media on youth suicide, relative to traditional media. First of all, social media platforms offer an immense amount of content, as evidenced by the data presented in Table 1, with a greater volume of suicide-related items compared to those published on traditional media platforms. Second, the algorithmic nature of social media platforms can lead to the amplification of certain types of content. As described by the differential susceptibility to media effects model, individuals may respond differently to media content based on predispositions, developmental factors, and social influences (Valkenburg & Peter, 2013; Valkenburg et al., 2016). For instance, certain youth may be more susceptible to the amplification of harmful content due to their predispositions or social environments. In addition, the anonymity and lack of face-to-face interaction on social media can make it easier for individuals to express suicidal thoughts and intentions, which may not have been as readily apparent in traditional media. In contrast to traditional media, social media platforms demonstrate a heightened capacity to foster a sense of community among vulnerable youths which may exacerbate suicidal ideation and behaviors (Intahomphoo, 2018; Nesi et al., 2018). These dynamics underscore the need for an in-depth understanding of the rising significance of social media in influencing youth suicide, considering the varying susceptibilities of individuals,

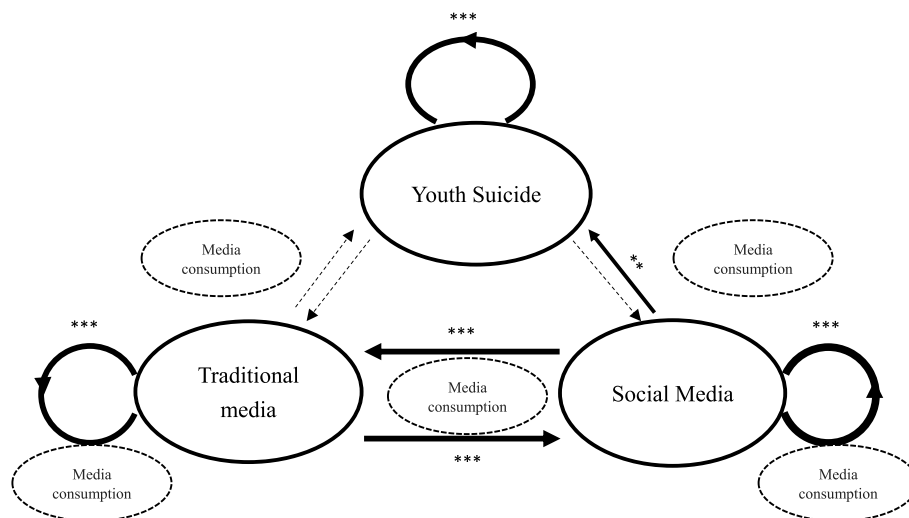


Fig. 4. Relationships between traditional media platforms, social media platforms and youth suicide in Taiwan, 2012-2021

Note: dashed lines indicate no statistically significant associations detected, solid lines with an asterisk indicate positive statistically significant associations ** $P < 0.01$ *** $P < 0.001$.

influenced by the unique features of these platforms, and how these susceptibilities contribute to their interaction with suicide-related content.

The enactment of the Suicide Prevention Act in 2019 might also have deterred suicide reporting in traditional media platforms. We assessed the intervention effect by adding an interaction term to the model (data not shown); however, the term was not significant. With this in mind, we believe that the process of passing a law is typically not a one-time event that could be captured by a single starting point. Instead, it is a complex and multi-stage process involving various steps, stakeholders, and considerations. Public input, amendments, communications, and revisions must have been underway before the law was actually passed. The Act lacks jurisdiction over personal communications exchanged on social media platforms, despite the reach of social media being much wider than traditional media. Our evidence of the prominence of social media over traditional media in influencing youth suicide, underscores the difficulty of effectively monitoring and controlling content on social media channels.

We did not observe an increase in coverage and discussion of suicide in both traditional and social media platforms following the rise of youth suicide rates. Previous studies have indicated that premature death, especially among young people, can spark intense conversations in the media, and youth suicide is often considered as newsworthy (Pirkis et al., 2007). In our current analysis, the association between youth suicides and media reports did not appear to be reciprocal; rather, it exhibited a direction from social media to suicide. The strength of our research lies in its comprehensive analysis of a range of media channels and the use of daily count data to examine the complex interplay between youth suicide and the intensity of suicide reporting across media channels. This approach differs from earlier studies that interrogated only one media platform, using wide time windows (Jashinsky et al., 2014; Sinyor et al., 2021; Won et al., 2013). This approach was unable to capture the nuanced and dynamic nature of these relationships. However, we also acknowledge several limitations when interpreting our results. Firstly, our analysis only considered the daily count data of media reports and suicide incidence. We did not examine the specific content of these reports. Therefore, factors related to media influences, such as glamorization of suicide or dissemination of new suicide methods, were not assessed. Second, as mentioned in the introduction, we did not measure media consumption behaviors directly, the media use variable measured in the current paper only considered media postings. Third, we grouped posts concerning suicidal ideation, attempts, and suicides without making distinctions. We also did not differentiate between posts that were self-referencing and those that referenced others. The risk associated with these posts in relation to suicide might vary. Fourth, we only controlled for unemployment rates and divorce rates, we were not able to include an exhaustive list of variables that might be related to youth suicide and media reports. Furthermore, we acknowledge that social and traditional media may have positive effects on mental health, but our analysis did not account for this. Lastly, we were unable to tell whether young people who died by suicide were influenced by the media. Hence, we were unable to confidently assert that suicide-related social media posts would result in actual suicide events.

5. Conclusions

Our empirical findings offer evidence for the influence of suicide-related posts on social media and the increasing rates of youth suicide. We also found that the media landscape has increased and evolved over time, in that the influence of traditional media has diminished, and the importance of social media has increased. The growing influence of social media poses significant challenges to public health suicide prevention efforts, and these challenges are expected to continue into the future. Policy actions should focus on implementing strict penalties for harmful content creators, mandating social media platforms to promote

warnings and sources of help, and developing comprehensive regulations for these platforms. It is difficult for any policy regulation to keep pace with the rapid changes occurring to language, content and technology around social media development and delivery. The current regulatory landscape could be described as fragmented, time delayed and inadequate, making it imperative to establish more effective and comprehensive regulations for social media sites to help prevent suicide in young people (Perakslis & Quintana, 2023).

Author contributions

YYC: acquired the data, conceived the study and drafted the manuscript.

FC: conducted the statistical analysis, wrote up method section, composed tables and figures, critically revised the manuscript.

KCCW: study design, data interpretation and manuscript revision.

THL: data acquisition, data interpretation.

YCC: data interpretation and manuscript revision.

PSFY: conceived the study and critically revised the manuscript.

Author statement

All the authors have read and approved of the contents of the submitted manuscript. They all agree to be listed as coauthors and have accepted the order of authorship. This manuscript has not been published previously and is not under consideration for publication elsewhere.

Ethical statement

The study was approved by the Research Ethics Committee of the Taipei City Hospital (No: TCHIRB-11012016).

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Role of the funding source

The funders had no role in design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Declaration of competing interest

None declared.

Data availability

The authors do not have permission to share data.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssmph.2023.101543>.

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