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Mascot Magic or Sporting Spectacle: An Interrupted Time Series Analysis with Social Listening Tools to Assess the Effect of "Butterbear" Mania and the 2024 European Football Championship on the Mental Well-being of Thai Residents

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Abstract

Mental health is a major public health issue in Thailand. In June and July 2024, a commercial mascot called "Butterbear" and the Euro-2024 football tournament were trending on social media. This study assessed gender, age, and geographic-specific exposure to these trends and their association with mental well-being in Thailand. We applied an interrupted time series analysis to compare mental well-being across gender, age, and region. Data from the Mental Health Check-in, from January 2020–July 2024, were used to estimate the levels of stress and depression, and the risk of suicide. Google Trends and social media analytics provided engagement data. Seasonal autoregressive integrated moving average models with exogenous regressors incorporating socioeconomic indicators were used. Totally, 5,499,170 responses were recorded, with stress, depression, and suicide risk levels at 7.8%, 5.2%, and 9.1%, respectively. "Butterbear" and "Euro-2024" were searched 631,414 and 1,975,759 times, respectively. Significant female engagement for "Butterbear" and male engagement for "Euro-2024" in the 18–34-year age group were observed. Improvements in mental well-being were found among females in Bangkok aged 18–34 years in terms of stress (−18.0%), depression (−22.8%), and suicide risk (−18.0%) compared to predicted levels. Males and females outside Bangkok, had smaller differences, with changes in stress levels ranging from −4.2% to 5.7%. The study's trends suggest a mental health relationship with these global events, influenced by media marketing. Leveraging popular phenomena such as Butterbear and global sporting events such as Euro-2024 can enhance mental well-being and could be utilized as part of health promotion campaigns.

Keywords: mental health, marketing, social listening tools, interrupted time series analysis, social media consumption

Introduction

Mental health problems have become increasingly prevalent in Thailand, particularly among those in early to middle adulthood who face a range of socioeconomic pressures.[1,2] In 2020, Thailand had 13,000 outpatient mental health visits per 100,000 population with 0.94 psychiatrists per 100,000 population.[3]

Rapid socio-economic changes and educational pressures can exacerbate mental health, making those in their early to middle adulthood particularly vulnerable.

Additionally, various forms of social events and digital entertainment, including sports tournaments, and entertainment videos via online resources and social media, have a profound impact on an individual's mental health, either as a source of stress relief as a "therapeutic effect of entertainment" or as a trigger for mental health issues. Therapeutic effects of entertainment have been described as a coping strategy to deal with stress, for example, entertainment videos for stress coping among undergraduate students, or the use of animal mascots to help soldiers combat or adjust to the stress associated with their military duties. The effect of the media could produce positive emotions toward their psychological well-being.[4–6]

Social media has become a major platform allowing individuals to follow social events and digital entertainment. It provides a valuable source of data for understanding population-level entertainment exposure via social listening tools. Social media usage in Thailand is pervasive, particularly among adolescents and young to middle-aged adults. Social media platforms such as Facebook, TikTok, Instagram, and X (formerly twitter) are integral to the daily lives of many Thais with 49.0, 44.3, 18.7, and 14.6 million users, respectively.[7] These platforms provide a space for social interaction and entertainment dissemination.

Butterbear, a cuddly mascot created by the owner of a popular Thai bakery located in Bangkok, was introduced in December 2023 and went viral through social media in June 2024.[8] Her character is designed to exude warmth, comfort, friendliness, politeness, accessibility, and happiness. People on social media interact with Butterbear not as a mascot with someone inside, but as if she was a little girl, an internet idol with a personality.[8] Many say that Butterbear helps alleviate stress and enhance emotional well-being.[9] From 1 Jun 2024 to 10 Jul 2024, Butterbear was engaged more than 82 million times, with three million views on YouTube for her first music video within two weeks.[10,11]

Major sporting tournaments have the potential to impact population-level mental health, either positively through increased community engagement and emotional involvement or negatively through heightened anxiety, disappointment, and gambling.[12,13] The 2024 European Football Championship (Euro-2024), a globally-watched sporting event, began in June 2024 at the same time as Butterbear fever was becoming a global phenomenon. These global events can have significant mental health implications in Thailand, fostering community spirit and enhancing social bonds through shared experiences. However, it also poses challenges, particularly for vulnerable young adults, who may face increased stress and feelings of isolation.[14,15]

During June 2024 and July 2024, "Butterbear" and "Euro-2024" were the top monthly searched and mentioned keywords in Thailand), prompting discussions on their emotional impact on the Thai population.[16] However, the influence of social media engagement with Butterbear and Euro-2024 on mental well-being has not been thoroughly examined. This study aimed to utilize social listening tools to analyze the online entertainment target audience, assessing the gender, age, and geographic-specific exposure of Butterbear and Euro-2024, and to evaluate their relationships on short-term mental well-being in Thailand.

Methods

Study Design

This was an interrupted time series (ITSA) study.

Data Collection and Descriptive Analysis

Mental well-being data were extracted from the Mental Health Check-in (MHCI), a voluntary preliminary online mental health assessment and screening tool for mental health problems under the responsibilities of the Department of Mental Health, Ministry of Public Health, Thailand. The MHCI is accessible to all individuals nationwide. Individuals can choose to participate anonymously, allowing for widespread engagement. This approach enables the collection of mental health data across various demographics and regions. The online assessment includes measures of stress (5 four-frequency-choices questions: ST-5), severity of depression (9 four-frequency-choices questions: 9Q), and suicide risk (8 yes-no questions: 8Q). These measures were tested for validity and reliability and are standard measures for use in stress and suicidal risk assessments.[17,18] Aggregated data on number of responses, high stress (ST-5 ≥5), suicide risk (8Q ≥1), and severe depression (9Q ≥7) were collected for the period between 1 Jan 2020 and 15 Jul 2024.[19] Data were stratified by gender, age group, and geographic region (Bangkok metropolitan or others). Monthly percentages of stress, depression, and suicide risk were calculated.

To measure the magnitude of engagement, daily search data on Google and YouTube, covering 1 Jan 2024 to 15 Jul 2024, were obtained from Google Trends with Google Trends Supercharged Chrome extension.[20] Keywords used included "Butterbear" and "หมีเนย" (Butterbear in Thai) for Butterbear and "Euro-2024" and "ยูโร 2024" (Euro-2024 in Thai) for Euro-2024. Searches were summarized weekly and visualized to identify patterns and trends over time.

Bi-weekly engagement data, including the number and percentage of messages, were extracted from social media analytics provided by Wisesight Trend, an open-

source real-time social media monitoring platform.[21] Social media included Facebook, TikTok, Instagram, X (formerly Twitter), and YouTube. The entertainment media were categorized into nine categories by Wisesight Trend, namely restaurant (which Butterbear was classified), sport (which Euro-2024 was classified), actor/actress, gaming and e-sport, V-tuber, variety, film and literature, beauty and fashion, and cooking and chef. Gender and age-specific distributions were also analyzed to understand the demographic reach of Butterbear and Euro-2024.

Monthly key socioeconomic indicators, including unemployment rate and household debt, were extracted from the labor force survey report, National Statistical Office, and Society and Bank of Thailand.[22–24]

Interrupted Time Series Analysis

ITS analysis is a quasi-experimental design that assesses the effect of an intervention by analyzing data collected at multiple time points before and during the intervention.[25] In this study, ITS analysis was used to assess the impact of Butterbear and Euro-2024 on mental well-being indicators. We first identified the intervention period based on search trends from the descriptive analysis. The beginning of the intervention period was identified by the time that cumulative searches reached 5% of total searches and onward. Secondly, time series components were identified by visualization and component decompositioning of the monthly percentage of stress, depression, and suicide risk. Due to appearances of trends and seasonality, seasonal autoregressive integrated moving average with exogenous regressor (SARIMAX) models were selected, incorporating socioeconomic indicators as exogenous variables to address socioeconomic confounders. Different parameters were fit to the data. For model validation, data during the pre-intervention period were split into a training set and a testing set (last six months), and the best model was selected based on the mean absolute error (MAE) and mean absolute percentage error (MAPE) criterion during the six-month testing phase. MAE measures the average magnitude of errors between predicted and actual values, without considering their direction, by calculating the average absolute differences between them. MAPE expresses this accuracy as a percentage by calculating the average absolute percentage difference between predicted and actual values.[26] The selected model was used to perform the ITS analysis on the mental health indicators, together with monthly key socioeconomic indicators. Changes in monthly percentages of stress, depression, and suicide risk between observed data (as-is) and predicted data (pre-intervention trend continued) during intervention periods (until August 2024) were calculated. The analysis was stratified by subpopulation based on social listening data (gender, age group, and geographic region). Mean estimates of predicted data with 95% prediction interval (PI) were calculated.

Ethics

Ethics approval was not required for this work as it is part of the routine mission of the Intelligence and Non-communicable Diseases Unit at the Division of Epidemiology. This study did not collect individual data.

Results

Descriptive Analysis

From 1 Jan 2020 to 15 Jul 2024, there were totally 5,499,170 responses in the MHCI. High stress levels were reported in 7.8% of responses, suicide risk in 5.2%, and severe depression in 9.1%. Most responses were female (62.5%) and 6.9% were from Bangkok.

Between 1 Jan and 15 Jul 2024, Butterbear was searched 631,414 times (32.5% Google Search, 67.5% YouTube), while Euro-2024 garnered 1,975,759 searches (49.6% Google Search, 50.4% YouTube). As shown in Figure 1, most searches (96.3%) occurred between 1 Jun 2024 and 15 Jul 2024.

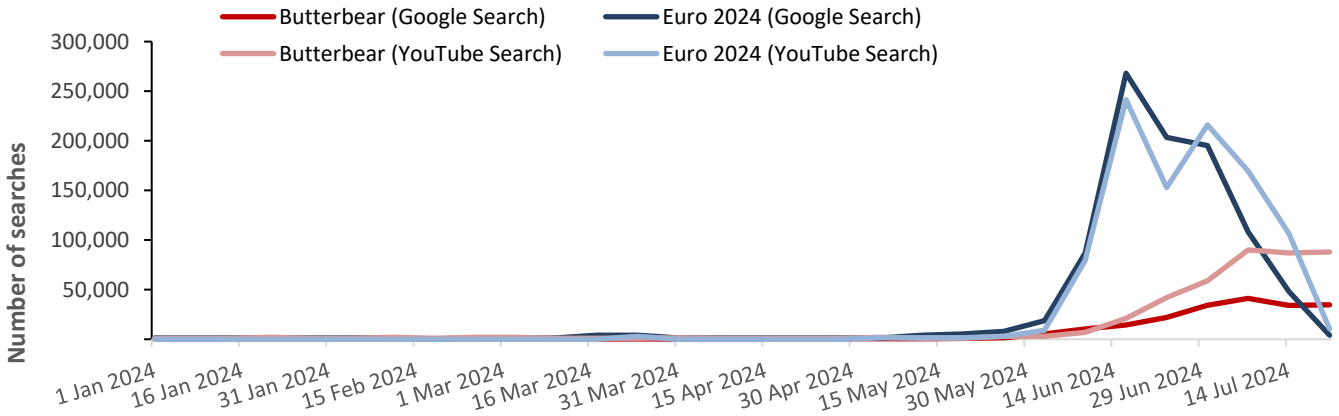


Figure 1. Number of Butterbear and Euro-2024 keyword searches between 1 Jan 2024 and 15 Jul 2024 stratified by platform (Google Search and YouTube)

For hashtags mentioned on social media, Butterbear and Euro-2024 significantly outpaced other entertainment categories, with 31.6% and 29.9% of the total entertainment hashtags, respectively. This positioned Butterbear and Euro-2024 as the top two entertainment topics during that timeframe. Butterbear accounted for 82.0% of the overall restaurant hashtag, and Euro-2024 comprised 75.2% of the overall sport hashtag. Both showed a consistent upward trend, with Butterbear's hashtag rising from 2,151 to 8,209 and Euro-2024's from 3,154 to 5,795 from early June to early July. Figure 2 shows that 50,193 messages mentioned Butterbear and 130,148 mentioned Euro-2024. For Butterbear, the 25–34 age group accounted for 49.1% of messages, with 79.3% female representation, and the 18–24 age group made up 37.9% of messages, with 66.8% females. For Euro-2024, the 18–24 age group accounted for 45.3% of messages, with 81.8% male representation, and the 25–34 age group made up 34.6% of messages, with 80.5% males (Table 1).

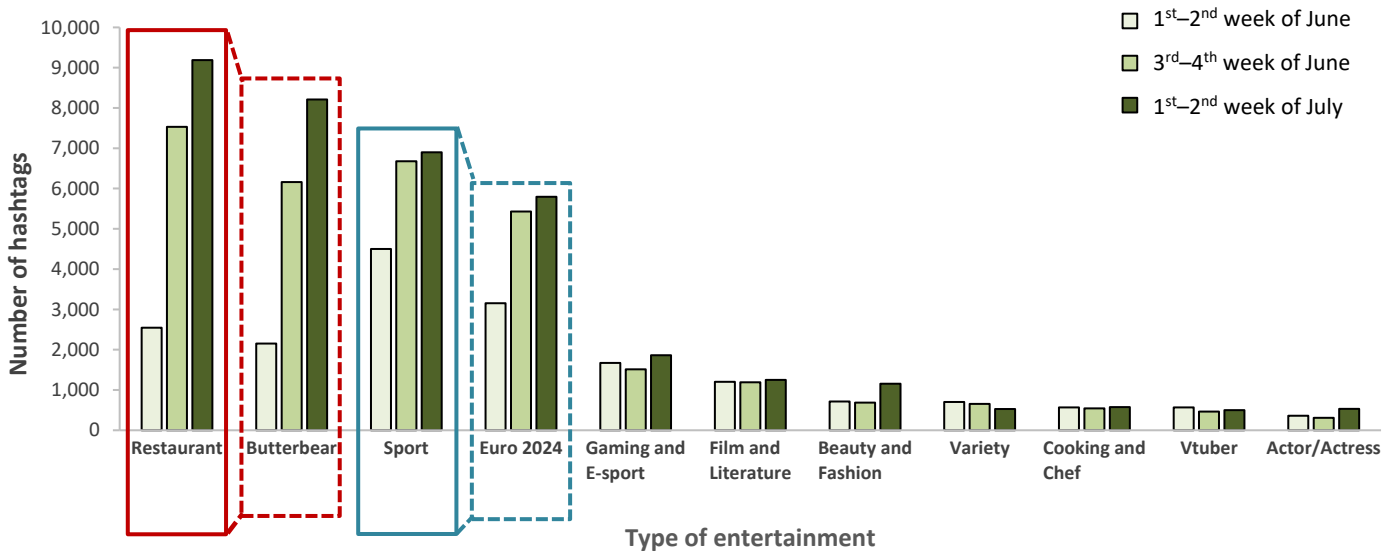


Figure 2. Number of Butterbear and Euro-2024 messages mentioned between 1 Jan 2024 and 15 Jul 2024 compared with other types of entertainment

Table 1. Number and percentage of messages mentioning Butterbear and Euro-2024 on social media by age group and gender between 1 Jun 2024 and 15 Jul 2024

Age group (years)	Butterbear			Euro-2024		
	Total n (%)	Females n (%)	Males n (%)	Total n (%)	Females n (%)	Males n (%)
<18	3,046 (6.1)	1,354 (44.4)	1,692 (55.6)	10,157 (7.8)	2,576 (25.4)	7,581 (74.6)
18–24	19,039 (37.9)	12,707 (66.8)	6,332 (33.3)	58,939 (45.3)	10,748 (18.1)	48,191 (81.9)
25–34	24,647 (49.1)	19,557 (79.3)	5,090 (20.7)	45,025 (34.6)	8,796 (19.6)	36,229 (80.4)
35–44	2,534 (5.0)	1,448 (57.1)	1,086 (42.9)	10,959 (8.4)	1,309 (12.0)	9,650 (88.0)
≥45	944 (1.9)	363 (38.5)	581 (61.5)	5,068 (3.9)	655 (12.9)	4,413 (87.1)
Total	**50,193 (100)**	**35,429 (70.6)**	**14,764 (29.4)**	**130,148 (100)**	**24,084 (18.5)**	**106,064 (81.5)**

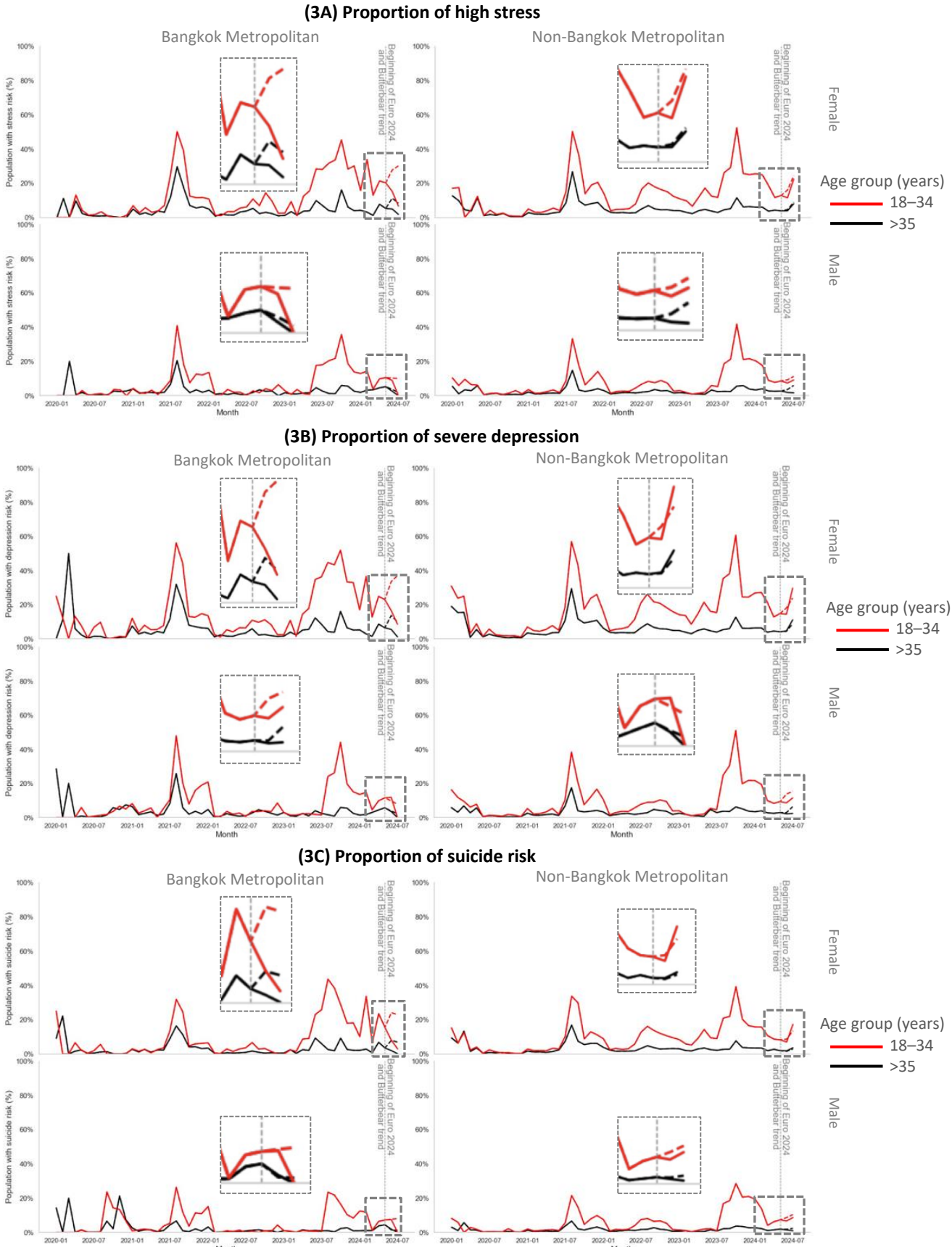
Interrupted Time Series Analysis

From the aforementioned searching trends, 1 Jun 2024 and 15 Jul 2024 were identified to be the intervention period. The analysis revealed high MAPE in the "under 18 years" age group, with an average 724.1%, leading to its exclusion due to low model accuracy. For ages 18–34, the overall average MAPE was 65.0%, and for ages over 35, it was 61.9%. Overall, except for respondents under 18 years of age, the average MAPE increased to 63.5% (Table 2). The model parameters, coefficients, standard errors, and *p*-values are illustrated in Supplementary Table 1.

Table 2. Mean absolute error (MAE) and mean absolute percentage Error (MAPE) of SARIMAX model for predicting monthly percentage of high stress, severe depression, and suicide risk during model validation phase (December 2023–May 2024) stratified by age group, gender, and region

Age group (years)	Gender	Region	MAE	MAPE (%)
Under 18 years old	Female	Bangkok Metropolitan	36.27	1,077.1
		Non-Bangkok Metropolitan	9.33	311.0
	Male	Bangkok Metropolitan	20.23	700.7
		Non-Bangkok Metropolitan	30.66	807.6
	Overall	Overall	24.12	724.1
18–34 years old	Female	Bangkok Metropolitan	10.89	73.3
		Non-Bangkok Metropolitan	3.47	23.4
	Male	Bangkok Metropolitan	3.24	54.8
		Non-Bangkok Metropolitan	8.11	108.6
	Overall	Overall	6.43	65.0
Over 35 years old	Female	Bangkok Metropolitan	1.66	76.5
		Non-Bangkok Metropolitan	1.17	37.1
	Male	Bangkok Metropolitan	1.90	115.4
		Non-Bangkok Metropolitan	0.43	18.8
	Overall	Overall	1.29	61.9
Overall	Females	Overall	10.47	266.4
	Males	Overall	10.76	301.0
	Overall	Bangkok Metropolitan	12.37	349.6
		Non-Bangkok Metropolitan	8.86	217.8
		Overall	10.61	283.7
Overall except for respondents under 18 years of age	Females	Overall	4.30	55.6
	Males	Overall	3.42	74.4
	Overall	Bangkok Metropolitan	4.42	80.0
		Non-Bangkok Metropolitan	3.30	47.0
		Overall	3.86	63.5

The ITS analysis, depicted in Figure 3, evaluates the impact of Butterbear and Euro-2024 on mental well-being indicators, adjusted for key socioeconomic variables. The analysis covered three indicators: stress (Figure 3A), severe depression (Figure 3B), and suicide risk (Figure 3C) across different regions and genders. High stress levels, severe depression, and suicide risk showed higher proportions in the 18–34 age group compared to the 35 and older age group, with noticeable peaks during June and August 2021 and 2023. Between June and July 2024, however, the proportion decreased in all subgroups in Bangkok, while it increased in females outside Bangkok. In contrast, marked predicted spikes were observed among females, but not in males, during the same period.



Vertical dashed line illustrates the starting point of the intervention period.

Figure 3. Interrupted time series analysis illustrated the impact of Butterbear and Euro-2024 on mental well-being indicators after adjusting for key socioeconomic indicators by (3A) proportion of high stress, (3B) proportion of severe depression, and (3C) proportion of suicide risk

Further examination revealed significant differences between observed and predicted mental well-being proportions between June and July 2024. For females aged 18–34 in Bangkok, the observed proportion for high stress was 10.9% versus a predicted proportion of 28.9% (95% PI 3.9%, 53.9%), resulting in a difference of –18.0% (95% PI –43.0%, 7.0%). The difference for severe depression was –22.8% (–50.9%, 5.4%), and –18.0% (–33.0%, –3.0%) for suicide risk. For females aged 35 and older in Bangkok, the observed differences were smaller: –6.4% (–23.9%, 3.4%) for stress, –8.5% (–32.5%, 3.3%) for depression, and –6.4% (–17.0%, 1.0%) for suicide risk. In contrast, females aged 18–34 outside Bangkok had much smaller discrepancies: –3.3% (–24.4%, 16.9%) for stress, 1.1% (–25.8%, 22.0%) for depression, and 1.0% (–14.5%, 12.1%) for suicide risk. For males aged 18–34 in Bangkok, the difference for stress was –5.7% (–20.8%, 4.4%), –2.9% (–23.2%, 5.9%) for depression, and –4.2% (–15.3%, 3.7%) for suicide risk. These variations highlighted regional and demographic disparities in observed and predicted mental well-being trends, particularly among young females in Bangkok, where observed rates were significantly lower than expected. (Table 3)

Table 3. Differences between observed and predicted monthly percentage of high stress with 95% prediction interval (PI), severe depression and suicide risk from SARIMA model between June and July 2024 stratified by age group, gender and region

Mental well-being	Age group (years)	Gender	Region	Mean observed proportion (%)	Mean predicted proportion (95% PI)	Different from predicted (%)
High stress	18–34	Female	Bangkok Metropolitan	10.92	28.91 (3.88, 53.93)	-17.99 (-43.01, 7.04)
			Non-Bangkok Metropolitan	16.90	20.16 (0.00, 41.26)	-3.26 (-24.36, 16.90)
		Male	Bangkok Metropolitan	4.42	10.15 (0.00, 25.20)	-5.73 (-20.78, 4.42)
			Non-Bangkok Metropolitan	8.22	10.22 (0.00, 26.11)	-2.00 (-17.89, 8.22)
	≥35	Female	Bangkok Metropolitan	3.37	9.79 (0.00, 27.26)	-6.42 (-23.89, 3.37)
			Non-Bangkok Metropolitan	5.93	6.75 (0.00, 14.24)	-0.82 (-8.31, 5.93)
		Male	Bangkok Metropolitan	1.26	2.69 (0.00, 34.92)	-1.43 (-33.66, 1.26)
			Non-Bangkok Metropolitan	1.72	4.76 (0.26, 9.27)	-3.04 (-7.55, 1.46)
Severe depression	18–34	Female	Bangkok Metropolitan	12.54	35.30 (7.10, 63.49)	-22.76 (-50.95, 5.44)
			Non-Bangkok Metropolitan	22.04	20.99 (0.00, 47.81)	1.05 (-25.77, 22.04)
		Male	Bangkok Metropolitan	5.90	8.76 (0.00, 29.05)	-2.86 (-23.15, 5.90)
			Non-Bangkok Metropolitan	10.04	14.54 (0.00, 33.77)	-4.50 (-23.73, 10.04)
	≥35	Female	Bangkok Metropolitan	3.33	11.78 (0.00, 35.79)	-8.45 (-32.46, 3.33)
			Non-Bangkok Metropolitan	7.87	6.58 (0.00, 16.55)	1.29 (-8.68, 7.87)
		Male	Bangkok Metropolitan	1.73	3.04 (0.00, 36.48)	-1.31 (-34.75, 1.73)
			Non-Bangkok Metropolitan	2.29	4.60 (0.00, 10.11)	-2.31 (-7.82, 2.29)
Suicide risk	18–34					
		Female	Bangkok Metropolitan	5.48	23.52 (8.52, 38.52)	-18.04 (-33.04, -3.04)
			Non-Bangkok Metropolitan	12.13	11.10 (0.00, 26.64)	1.03 (-14.51, 12.13)
		Male	Bangkok Metropolitan	3.69	7.86 (0.00, 19.01)	-4.17 (-15.32, 3.69)
			Non-Bangkok Metropolitan	7.64	9.51 (0.00, 21.59)	-1.87 (-13.95, 7.64)
	≥35	Female	Bangkok Metropolitan	1.04	7.41 (0.00, 18.06)	-6.37 (-17.02, 1.04)
			Non-Bangkok Metropolitan	2.72	2.21 (0.00, 9.31)	0.51 (-6.59, 2.72)
		Male	Bangkok Metropolitan	0.90	1.30 (0.00, 32.73)	-0.40 (-31.83, 0.90)
			Non-Bangkok Metropolitan	1.16	2.04 (0.00, 5.21)	-0.88 (-4.05, 1.16)

Discussion

The findings from this study underscore the importance of considering demographic and geographic factors when assessing the mental health impacts of social events. Notably, the significant engagement with Butterbear and Euro-2024 among young adults reflects a broader trend of digital and social media influence on mental health.

The analysis of the Mental Health Check-in data from January 2020 to July 2024 revealed significant findings, with high stress levels reported in 7.8% of responses, severe depression in 9.1%, and suicide risk in 5.2%. Gender-specific trends showed higher levels of mental health issues among females. These findings are consistent with other studies, such as the Global Burden of Disease study, which also highlighted higher rates of mental health disorders among younger

adults and females.[3,27] The consistency with other research indicates that the patterns observed in this study are reflective of broader global trends, possibly due to shared socioeconomic and cultural factors influencing mental health.

The Butterbear phenomenon and Euro-2024 had significant engagement in search trends, with millions of searches, and their hashtags dominated the entertainment and sports categories on social media. The gender-specific trends, with Butterbear engaging more females and Euro-2024 engaging more males, align with general patterns in media consumption where females tend to engage more with entertainment content and males with sports content.[28] Comparatively, studies on media events and mental health, such as those on the FIFA World Cup, have shown similar trends where major events significantly influence social media activity and further public mental health.[29] This similarity suggests that large-scale digital entertainment universally captures public attention and can affect mental health through heightened media exposure and social engagement.

The greater impact on mental well-being for females compared to males can be attributed to differences in emotional engagement, regardless of age group and region. Males might engage with Euro-2024 in a way that is less emotionally charged, for example, heightened anxiety, disappointment, and gambling, than females' engagement with Butterbear, leading to a less pronounced impact on their mental health.[12,13] Additionally, females may be more susceptible to the emotional and social content associated with Butterbear, leading to a more significant impact on their mental well-being.[28] The age-specific trends, with young adults (18–34-year-olds) being more affected, align with findings from other studies that indicate younger people are more vulnerable to the mental health effects of social media and major events due to their higher levels of engagement and emotional investment.[14,15,30]

For geographical consideration, females in the Bangkok metropolitan area experienced a higher impact compared to those outside Bangkok. Urban areas such as Bangkok typically have higher media exposure and more intense social pressures, which can exacerbate baseline mental health issues.[31] Rural and suburban areas might have less intense media coverage and different social environments, mitigating the effects of these events on mental well-being.[32] These trends align with other findings, suggesting that the mental health impact of global events is a global phenomenon influenced by media consumption patterns and social dynamics.

Mascots have been used by several countries, including the United States of America, Taiwan, and Japan, to promote disease prevention and health promotion.[33–35] Our findings suggest critical policy and practical implications, particularly the need for tailored mental health support services for different demographic groups. Leveraging popular cultural phenomena like Butterbear and Euro-2024 could enhance mental health and other health promotion campaigns, such as disease prevention and control. For example, Butterbear could promote mental health interventions related to females aged 18–34 who have depression.[36] Additionally, the differences in impact across age, gender, and region suggest that a one-size-fits-all approach to social media promotion for public health policy may not be effective. Instead, tailored strategies that consider media exposure, social context, and individual engagement are crucial for mitigating the mental health effects of major social events.

Limitations

This study's limitations include reliance on self-reported data, mostly during critical periods, which may introduce overestimation of mental health risks from reporting biases, as similar studies have noted that such data can be affected by stigma and reporting biases.[37] Moreover, the trending of search terms can be performed multiple times by the same individual. Second, focusing on only two social events may overlook other influential factors, though these two events contributed to more than two-thirds of entertainment engagement during that period, with models already adjusted for several key social indicators mentioned above. Third, the impacts of global phenomena/events are influenced by a complex interplay of media exposure, social context, and individual engagement. Therefore, the interpretation of individual relationships should be done with caution to avoid the "ecological fallacy". Addressing these limitations in future research by incorporating diverse data sources and robust methodologies will enhance the accuracy and reliability of findings.

Recommendations

To maximize the public health benefits of global phenomena and events, public health campaigns should incorporate them into health promotion strategies for mental health and disease prevention. By linking health messages with well-recognized characters or events, campaigns can enhance their appeal and effectiveness, particularly for specific audiences who are more engaged with these trends. Additionally, campaigns should be tailored to reflect the distinct social and media landscapes of both urban

and rural settings, improving their relevance and effectiveness across different demographics. Future research should investigate these dynamics, particularly individual effects, further to support the development of more targeted, evidence-based health promotion campaigns that address mental health needs during significant national and global events.

Conclusion

In conclusion, engagement with Butterbear and Euro-2024 among young adults was significantly correlated with improved mental well-being. Our findings align with other research demonstrating that major events can have a profound influence on mental health via media consumption patterns and social dynamics. Future research should explore these factors and develop targeted interventions to support the mental health of vulnerable populations during significant events.

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Conflicts of Interests

The author declares that there are no conflicts of interest.

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