The Effect of the Covid-19 Pandemic on News Consumption: An Interrupted Time Series Analysis spanning Three Asian Countries

Keywords: network analysis, time series analysis, news consumption, COVID-19, audience studies

Extended Abstract

The outbreak of COVID-19 pandemic in early 2020 has had a profound impact on global news consumption patterns. The pandemic has created an environment of uncertainty and instability, raising questions about how it may have changed how people consume news worldwide. A long line of research argues that during times of anxiety and instability, individuals excessively seek out news to get diverse perspectives on events (Kay, 1954; Shabahang, Aruguete, & Shim, 2021). However, whether the compulsive need for information translates to the diversification of media diets remains unknown. There is reason to believe that in such conditions, individuals may gravitate towards well-known legacy news outlets due to their perceived reliability and trustworthiness, thereby making the news consumption landscape less fragmented and more centralized. In this study, we sought to address this empirical question in the context of three large Asia countries in the wake of the COVID-19 pandemic. Using digital trace data of news browsing behaviour spanning nearly three years, and sophisticated computational techniques borrowed from time series analysis and network science, we examined the effects of the COVID-19 pandemic on online news consumption patterns in India, Indonesia, and Malaysia. This analysis, therefore, speaks to the news consumption habits of over 1.7 billion people, representing over 20% of the global population as well as more than 20% of the global internet user base, and offers unprecedented evidence of the evolution of the news media ecosystems in these countries during the pandemic.

The longitudinal data we use for this study integrates web tracking behavior as well as desktop-browsing behavior of representative nationwide audience panels from November 2018 to September 2021 (Total N = 109,000) that is aggregated for each month and then deduplicated. The list of media outlets was determined by considering whether they reached a minimum threshold of 1% of the total online audience in their respective countries, and further refined after consulting with local experts from each country. This resulted in 281 outlets for India, 63 outlets for Malaysia and 59 outlets for Indonesia. We then categorized each news outlet into one of three groups: legacy, digital-born, and social media, separately for each country. Using January 2020 - the start of the pandemic as the point of intervention, we examined the monthly audience share (MAS) and average time spent (ATS) for each outlet category to assess how macro-level news consumption patterns had changed before and after. We used Interrupted Time Series (ITS) models to test for immediate and sustained effects (Schaffer, Dobbins & Pearson, 2021) of the pandemic on these measures. We also constructed monthly co-exposure networks (Grinberg et al. 2019; Mukerjee, Majo-Vazquez & Gonzalez-Bailon, 2018) (with media outlets as nodes connected by weighted edges that captured the monthly shared audience) and conducted similar ITS analysis on monthly network metrics to understand the overall impact of the pandemic on news consumption. The goal was to understand how the overall news consumption landscape was impacted by the

public awareness of the pandemic, as would be evidenced by meaningful changes in the properties of the monthly networks.

Our analysis found significant effects of the pandemic on news consumption patterns but the effects varied by country (see Tables 1 and 2). Some of the key findings are highlighted here. In India, we identified a significant immediate decrease but then a sustained increase in ATS for digital-born media outlets, indicating that Indian online users spent significantly less time on digital-born outlets following the outbreak, which eventually normalized to pre-pandemic levels. In parallel, there was a significant drop in ATS for social media indicating that Indian news consumers were spending less time on those platforms in the immediate aftermath of the pandemic. We also found a significant and sustained increase in the edge density of monthly co-exposure networks in India, suggesting that following the pandemic, news consumption in India became less fragmented (Yang et al., 2021). Interestingly, the overall degree centralization of the monthly networks witnessed a sustained decrease implying that even though the network density increased, the news consumption landscape did not become significantly more centralized for India. For Malaysia, on the other hand, the findings were different: Malaysian news consumers recorded a significant immediate increase in ATS as well as a significant sustained increase in MAS for social media platforms, indicating that they visited social media platforms more and also spent more time on them following the pandemic. In Indonesia, news consumers recorded a significant immediate decrease in ATS for legacy outlets.

These findings reveal profound yet differential structural changes in news consumption patterns in diverse Asian contexts following the COVID-19 pandemic. The immediate decrease in time spent on social media and digital-born outlets suggests that Indian news consumers may have sought out more credible sources of information in response to the pandemic. The findings from Malaysia and Indonesia serve as a useful foil, cautioning us to contextualize our results, and not generalize them to countries where they may not be applicable. The stark differences between the patterns we find in India on the one hand and Malaysia and Indonesia on the other, indicate the potential influence of powerful contextual factors, that could have moderated the public's engagement with news during the pandemic. The potential contextual factors will be further analyzed as we develop the paper.

References

Kay, H. (1954). Toward an understanding of news-reading behavior. *Journalism Quarterly, 31*(1), 15-32.

Shabahang, R., Aruguete, M. S., & Shim, H. (2021). Online news addiction: Future anxiety, fear of missing out on news, and interpersonal trust contribute to excessive online news consumption. Online Journal of Communication and Media Technologies, 11(2), e202105.

Grinberg, N., Joseph, K., Friedland, L., Swire-Thompson, B., & Lazer, D. (2019). Fake news on Twitter during the 2016 US presidential election. Science, 363(6425), 374-378.

Mukerjee, S., Majó-Vázquez, S., & González-Bailón, S. (2018). Networks of audience overlap in the consumption of digital news. Journal of Communication, 68(1), 26-50.

Yang, T., Majó-Vázquez, S., Nielsen, R. K., & González-Bailón, S. (2020). Exposure to news grows less fragmented with an increase in mobile access. Proceedings of the National Academy of Sciences, 117(46), 28678-28683.

Schaffer, A. L., Dobbins, T. A., & Pearson, S. A. (2021). Interrupted time series analysis using autoregressive integrated moving average (ARIMA) models: a guide for evaluating large-scale health interventions. BMC medical research methodology, 21(1), 1-12.

Table 1: Average Time Spent (ATS) and Monthly Audience Share (MAS): post-intervention effects (using January 2020 as the intervention)

Country	Media Type	ATS		MAS	
		D (immediate)	P (sustained)	D (immediate)	P (sustained)
Indonesia	Legacy	-0.65*	-0.01	0.21	0.18
	Digital-born	-0.18	-0.04	-0.32	0.27
	Social	0.74	-1.23	0.12	0.14
Malaysia	Legacy	1.08	-0.15	0.92	0.06
	Digital-born	0.45	0.02	1.13*	-0.19**
	Social	18.5**	-1.4	0.68	0.48***
India	Legacy	0.24	0.1	0.02	-0.05
	Digital-born	-0.37*	0.14***	0.06	-0.01
	Social	-1.18***	-4.68	-1.41	-1.73

P-values: * < 0.5 ** < 0.01 *** < 0.001

Table 2: Monthly network parameters: post-intervention effects (using January 2020 as the intervention)

Country	Network params	D (immediate effect)	P (sustained effect)
Indonesia	Transitivity	-0.003	~0
	Edge density	-0.011	0.0003
	Modularity	0.0013	0.0001
	Centralization	0.0046	0.0004
Malaysia	Transitivity	0.0022	-0.0037
	Edge density	0.0362	-0.0015
	Modularity	-0.0038	~0
	Centralization	-0.017	0.0051
India	Transitivity	-0.0004	0.0002
	Edge density	-0.0047	0.011***
	Modularity	-0.0015	-0.0001
	Centralization	-0.016	-0.0085

P-values: * < 0.5 ** < 0.01 *** < 0.001