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7-22-2023

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#### **Recommended Citation**

Farokhnia Hamedani, Moez; Javidi, Giti; and Sheybani, Ehsan, "Understanding Cyberbullying Dynamics in the COVID Vaccination Era" (2023). *IRAIS 2023 Proceedings*. 9. https://aisel.aisnet.org/irais2023/9

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**Annual Conference on Information Systems** 

### Understanding Cyberbullying Dynamics in the COVID Vaccination Era

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During the COVID-19 vaccination era, the rise of cyberbullying has introduced new dimensions to the already complex landscape of vaccine-related discussions and debates (Barlett et al. 2021). As the global population eagerly seeks vaccination as a means to combat the pandemic, online platforms have become fertile breeding grounds for misinformation, polarized opinions, and deliberate attacks (Karmakar and Das 2021). Unfortunately, individuals who express divergent views on vaccination have become prime targets of online harassment, facing a barrage of hate messages, threats, and public shaming(Kee et al. 2022). This insidious form of cyberbullying not only erodes the possibility of meaningful and constructive dialogue but also poses a significant threat to public health by stifling open conversations about vaccines and their potential benefits.

Moreover, cyberbullying during the COVID vaccination era has extended its reach to target individuals based on their vaccination status. This divisive aspect of cyberbullying further exacerbates the already charged atmosphere surrounding vaccinations. Those who have chosen to receive the vaccine may find themselves subjected to unwarranted criticism, ridicule, or even marginalization from those who hold opposing viewpoints. Such acts of cyberbullying contribute to an environment characterized by fear, shame, and exclusion, hindering society's collective efforts to promote vaccination uptake and achieve herd immunity.

To comprehensively address the issue of cyberbullying during the COVID vaccination era, it is crucial to delve into the underlying factors that drive this surge of online hostility. A multitude of elements come into play, such as deeply ingrained beliefs, fear-driven narratives, political affiliations, and concerns surrounding personal freedoms. These factors collectively contribute to the escalating animosity and hostility observed across various online platforms. One significant factor that amplifies cyberbullying is vaccine hesitancy and refusal, which has led to the division of communities. Those who have made the choice to be vaccinated often find themselves subjected to unwarranted criticism and ridicule from individuals who hold opposing views. This form of cyberbullying not only fosters a hostile environment but also generates feelings of fear, shame, and exclusion. Consequently, these negative dynamics hinder efforts to promote vaccination and impede progress towards achieving herd immunity.

The surge in cyberbullying during the COVID vaccination period can be attributed to a range of interconnected factors. Political standpoints, religious beliefs, race, gender, and differing viewpoints about vaccination contribute to the polarization and intensity of online conflicts. Individuals with strong political affiliations may engage in cyberbullying as a means to assert their opinions or discredit those with opposing views. Similarly, religious beliefs and cultural backgrounds can serve as catalysts for cyberbullying when they intersect with discussions

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surrounding vaccines. Furthermore, disparities based on race and gender can exacerbate the targeting of individuals, further deepening the divide and escalating the intensity of cyberbullying incidents. In this research paper, our objective is to delve into the various dimensions in which both pro-vaxxers and anti-vaxxers have become targets of cyberbullying. To accomplish this, we have meticulously gathered a substantial dataset from Twitter, comprising tweets specifically associated with vaccination during the COVID vaccine rollout in the United States.

By analyzing this extensive dataset collect on Twitter from the beginning of official vaccination on December 2020 for 10 month, we aim to uncover the patterns and trends of cyberbullying directed towards individuals expressing pro-vaccine or anti-vaccine sentiments. Our investigation focuses on identifying the key aspects on which these individuals are targeted, shedding light on the factors that drive online harassment within the vaccination discourse. Utilizing a meticulous blend of manual labeling techniques and state-of-the-art automated classification algorithms, our study delves into a comprehensive analysis of the distribution of cyberbullying topics within the collected tweets. The combination of manual labeling and automated classification enables us to achieve a robust and comprehensive understanding of the distribution of cyberbullying within the collected Twitter dataset. This hybrid approach allows us to capture both the intricate details discovered through manual inspection and the efficiency and scalability provided by automated algorithms. It is worth noting that the mere purpose of this work is to investigate the dynamic of the cyberbullying patterns through a descriptive approach with no intention of establishing causality.

Through our preliminary analysis, intriguing patterns have emerged, shedding light on the evolving dynamics of cyberbullying during the COVID vaccination era. Our findings indicate that individuals have been subjected to varying patterns of targeting by other users, highlighting the complex nature of online harassment. Initially, the majority of instances of cyberbullying were triggered by passionate vaccination advocacy or opposition. These fervent exchanges often revolved around expressing one's stance on vaccines and engaging in heated debates. However, as time progressed, we observed a concerning shift in the patterns of cyberbullying, suggesting a deeper and more pervasive issue at play.

Furthermore, our research findings reveal a notable trend: the majority of cyberbullying instances are initiated by individuals expressing pro-vaccine views. This observation underscores the significance of understanding the role that differing perspectives play in online harassment during the COVID vaccination era. One crucial dimension on which users are often targeted is their political orientation. The polarization of society along political lines has seeped into the vaccination discourse, becoming a prominent catalyst for cyberbullying. Disagreements over vaccine policies, mandates, and government actions have intensified the online hostility, with individuals facing harassment based on their political beliefs. In addition to political orientations, race and gender also emerge as significant dimensions of cyberbullying. Marginalized communities, characterized by racial or ethnic identities, may encounter cyberbullying that reflects deep-seated biases and discrimination. Similarly, gender-related

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cyberbullying can manifest in various forms, including misogynistic or sexist remarks targeting individuals based on their gender identity.

By illuminating the various dimensions of cyberbullying during the COVID vaccination era, our study endeavors to contribute valuable insights into the underlying factors and intricate dynamics of this pervasive issue. Through a comprehensive examination of the nature and extent of cyberbullying, we aim to foster a deeper understanding that can inform the development of effective interventions and support systems. Understanding the multifaceted nature of cyberbullying is crucial for devising targeted strategies to address this problem. By uncovering the specific factors that contribute to cyberbullying during the COVID vaccination era, such as the impact of misinformation, the influence of polarizing narratives, and the interplay of personal beliefs, we can identify key areas for intervention and prevention.

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