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Letter to the editor

Geographical distance to the epicenter of Covid-19 predicts the burnout of the working population: Ripple effect or typhoon eye effect?

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ABSTRACTS

Covid-19 originated in Wuhan and rippled across China. We investigate how the geographical distance of working adults to the epicenter of Wuhan predicts their burnout - emotional, physical and mental exhaustion due to excessive and prolonged stress. Preliminary results of a survey of 308 working adults in 53 cities showed working adults' distance to the epicenter of Wuhan had an inverted U-shaped relationship with their burnout. Such results help to identify regions where people may need more psychiatric assistance, with direct implications for healthcare practitioners and policymakers.

Dear Editor

Covid-19 emerged in Wuhan in December 2019. Wuhan, a metropolis with over 11 million people, is a key transport hub in central China. The movement of people helped the new coronavirus to steadily sweep across China by the end of January 2020. By February 2020, almost all people in China had their lives and work disrupted (Zhang et al., 2020), running the risk of burnout – emotional, physical and mental exhaustion due to excessive and prolonged stress of being overwhelmed, emotionally drained, and incapable of meeting constant demands (Maslach and Leiter, 2016). Who may be most susceptible to burnout during this crisis?

Research has suggested the impact of a crisis spreads out in a circle and declines gradually over geographical distance, known as the ripple effect (Slovic, 1987). However, evidence from the field often found the opposite – the level of anxiety and concern was lower for residents who were nearer to the risk center, as in the case of SARS (Shi et al., 2003). Such an effect is termed a typhoon eye effect, as the epicenter of a typhoon is relatively calm.

The theories of the "ripple effect" and the "psychological typhoon eye effect" offer opposite predictions, and we aim to examine these opposing predictions by analyzing the relationship between working adults' distance to the epicenter of Covid-19 and their burnout. Burnout is typically associated with cardiovascular problems, headaches, chronic fatigue, gastrointestinal disorders, muscle tension, hypertension, cold/flu episodes, and sleep disturbances, and burnout in the working population predicts job dissatisfaction, negative impacts on their colleagues, lower productivity and impaired quality of work, low organizational commitment, absenteeism, and turnover (Maslach and Leiter, 2016).

As the world now is weathering the storm of Covid-19 pandemic, this study helps psychotherapists and healthcare policymakers to identify those in more susceptible areas to prioritize assistance during the Covid-19 outbreak.

The outbreak of Covid-19 began in late 2019 at Wuhan, and Covid-19 came into the public eye on January 20, 2020 when the Chinese premier publicly urged decisive and effective efforts to prevent and control the virus. Two days later, on January 22, China decided to shut down Wuhan, stopping all modes of transport by the morning of the next day. However, on the night of January 22, about 300,000 people left Wuhan by train alone. About 70% of the them left Wuhan for other locations within the same province; 14% went to the neighboring provinces, and the rest travelled further (Kinetz, 2020). The virus spread across China. We conducted a survey as in Zhang et al., 2020 on February 20–21, 2020 of working adults at locations that vary in their travel distance from Wuhan. We reached 410 adults, and 308 of them answered the survey, with a response rate of 75.1%. All respondents agreed to participate in the study, which was approved by the ethics committee at Tongji University (#20200211).

The participants provided their socio-demographic characteristics, such as gender, age, education, job status (worked at office, worked from home, or suspended working), and their location at the time of the survey. Using their locations, we calculated each participant's distance to Wuhan. We assessed burnout over the previous month using the 5-item Chinese version of Maslach Burnout Inventory-General Survey (MBI-GS). We used Stata 16 for OLS regression analysis to analyze the relationship between the distance to the Covid-19 epicenter and burnout.

The regression analysis uncovers an inverted U-shaped relationship between working adults' distance to the Covid-19 epicenter and their burnout ($\beta = -0.275$, $p = 0.036$) (see Table 1). The inflection point of the inverted U-shaped relationship lies at 1020 km from the epicenter. Such an inverted U-shaped relationship suggests both a ripple effect and a typhoon eye effect took place, where the typhoon eye effect dominated close to the epicenter and the ripple effect dominated further away.

Unlike prior studies that examined either the ripple effect or typhoon eye effect from the epicenter of a crisis, we found an inverted U-shaped relationship, suggesting the two effects are both in play. Our results suggest psychiatrists and public health policymakers need to be careful using either theory alone in identifying and screening people at mental health risk from the Covid-10 pandemic based on geographical

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Table 1
Working adults' burnout by their distance to the Covid-19 epicenter.

	Burnout		
	Coefficient	SE	95% CI
Covariates			
Gender	−0.053	0.075	[−0.009, 1.130]
Age	−0.007	0.004	[−0.016, 0.007]
Education	0.090*	0.031	[0.028, 0.151]
Worked at office (reference group)			
Worked from home	0.046	0.090	[−0.133, 0.225]
Stopped working	0.048	0.102	[−0.154, 0.250]
Independent Variable			
Distance to the epicenter	0.561	0.289	[−0.008, 1.130]
Quadratic Effect			
Distance to the epicenter squared	−0.275*	0.131	[−0.532, −0.018]

$N = 308$.
* $p < 0.05$.

distance from the epicenter alone.

We note our limitations that offer opportunities for future research. The inverse U-shaped relationship that we found was limited to predicting burnout, a psychological syndrome under prolonged social stressors, and it is interesting to examine how the distance to the epicenter predicts other mental health outcomes. The inverse U-shaped relationship is also limited to China, which had one clear epicenter in Wuhan, where Covid-19 originated. China is also a geographically large country, in which the epicenter of Wuhan happens to be centrally located. Hence, the ripple effect and the typhoon eye effect may play out differently in other countries with multiple epicenters of Covid-19, such as Washington State and New York State in the US, and with distinct geographical features. Nonetheless, our results point to the need for further studies to determine how the two effects may dominate each other in other Covid-19 infected areas to enable better identification of those who are in greater need of mental health care.

CRediT authorship contribution statement

Stephen X. Zhang: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing, Supervision. **Hao Huang:** Validation, Visualization, Writing - original draft, Writing - review & editing. **Feng Wei:** Investigation, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.112998.

References

Zhang, S.X., Wang, Y., Rauch, A., Wei, F., 2020. Health, distress and life satisfaction of people in China one month into the COVID-19 outbreak. Psychiatry Res. 288, 112958. https://www.sciencedirect.com/science/article/pii/S0165178120306521 doi:2020.03.13.20034496.

Kinetz E, 2020. Where did they go? Millions fled Wuhan, China, before coronavirus lockdown. https://globalnews.ca/news/6527152/coronavirus-lockdown-wuhan/ (accessed 29 March 2020).

Maslach, C., Leiter, M.P., 2016. Understanding the burnout experience: recent research and its implications for psychiatry. World Psychiatry 15 (2), 103–111. https://doi.org/10.1002/wps.20311.

Shi, K., Chen, X.F., Hu, W.P., et al., 2003. A follow up study on the risk cognitive characteristics of SARS among Beijing residents. Popul. Res. 27 (4), 42–46. http://kns.cnki.net/kcms/detail/detail.aspx?FileName=RKYZ200304009&DbName=CJFQ2003.

Slovic, P., 1987. Perception of risk. Science 236 (4799), 280–285. https://doi.org/10.1126/science.3563507.

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