

Review

The Impact of the COVID-19 Pandemic on the Prevalence and Severity of Internet Addiction: Current and Future Public Health Challenges

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ABSTRACT

The coronavirus disease-2019 (COVID-19) pandemic altered the lifestyle of a substantial number of individuals who were compelled to undergo quarantine in their residences. Consequently, they relied heavily on the Internet for studying, online teaching, official meetings, communication, entertainment, conferences, and work. There is a possibility that the pandemic has led to a greater inclination towards internet addiction compared to both pre-pandemic and post-pandemic periods. Internet addiction is a behavioral disorder characterized by excessive and compulsive internet use that interferes with daily life activities. The prevalence of internet addiction has been a concern for several years, with an increasing number of people spending considerable amounts of time online. Several studies provide evidence that the occurrence of internet addiction varies significantly across countries and cultures, with certain regions demonstrating higher rates than others. This review reveals a substantial surge in the prevalence of internet addiction during the COVID-19 pandemic. The most notable discovery is that internet addiction has undergone an almost threefold increase during the COVID-19 pandemic when compared to its occurrence in the previous decade. During the COVID-19 pandemic, Nigeria had the highest recorded prevalence rate of internet addiction, reaching 88.1%. In contrast, Turkey had the lowest observed rate of internet addiction at 4.8%. Accordingly, we stress the importance of enhancing our awareness to recognize internet addiction as a novel global syndrome arising from progressively complex public health and psychosocial circumstances.

Keywords

COVID-19; Pandemic; Internet addiction; Public Health; Nigeria.

BACKGROUND

Over the past few years, there has been a significant rise in internet usage, raising considerable concerns about the potential dangers associated with excessive internet use and the development of Internet addiction.¹ When a newly discovered coronavirus, originally named 2019-nCoV and now known as severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) (Coronavirus disease-2019 (COVID-19)), was first identified in Wuhan, Hubei Province, China, it initially spread rapidly within China and

to various other countries.^{2,3} In December 2019, the first reported COVID-19 outbreak occurred and aroused global attention, leading to COVID-19 restrictions, further emphasizing their importance. The global number of internet users witnessed a substantial surge, skyrocketing from 738 million in 2000 to 4.9 billion in 2021.¹ This increase amounts to a staggering growth of over 567% within a span of only two decades. Internet addiction has been extensively investigated on a global scale, encompassing various characteristics that have the potential to negatively impact social,

psychological, and functional aspects.⁴ Additionally, other variables have been widely explored, such as depression, sleeping patterns, body weight, aggressiveness, and other addictive substances.⁴ Furthermore, the general population has experienced relatively high rates of anxiety symptoms (ranging from 6.33-50.9%), depression symptoms (ranging from 14.6-48.3%), and post-traumatic stress disorder symptoms (ranging from 7-53.8%) during this global health crisis.^{3,5,6}

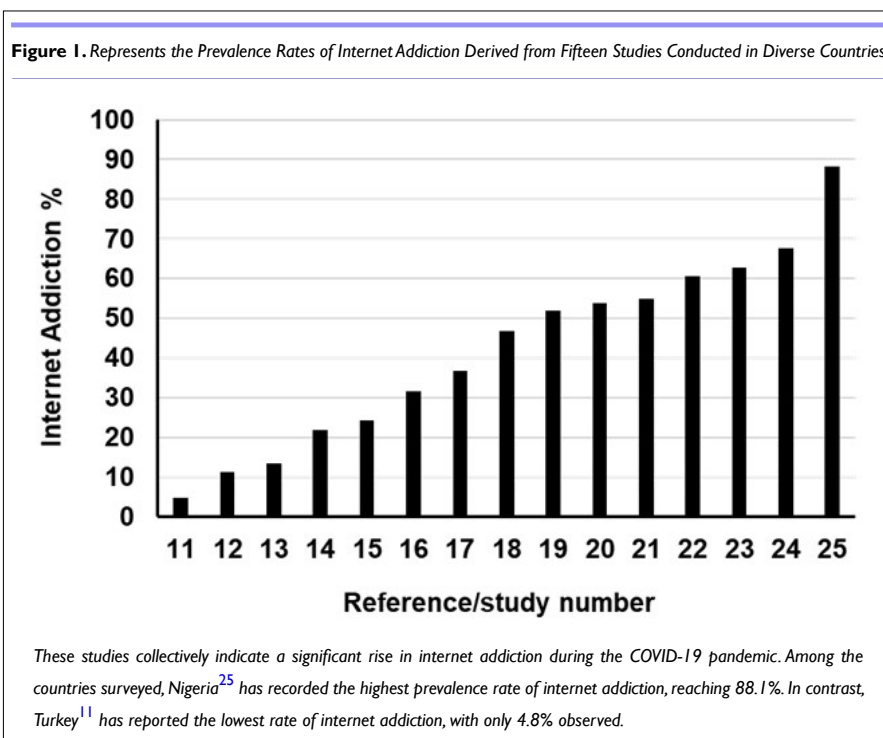
In 2018, the concept of “*death by digital distraction*”, which refers to the extreme consequence of excessive personal technology use, emerged on the internet through a concerning publication by the U.S. Naval Institute.⁷ Digital technology is clearly highlighted as a powerful “new drug”, referring to national statistics suggesting that 78% of Americans between 18 and 24-years of age use social media, online dating, video games, online pornography, and other personal digital technology multiple times a day, often to an extent that raises grounds for concern.⁸ Furthermore, digital addicts exhibit a wide range of behavioral symptoms, including eating disorders and withdrawal from outdoor and social activities.⁹ It is important to consider the evidence that suggests dysfunctional melatonin and vitamin D metabolism in these individuals when de-

veloping treatment approaches.⁹ The conclusions drawn provide a comprehensive understanding of digital addiction, highlighting the significance of sleep deficit as one of the key contributing factors.⁹

The global number of smartphone users is expected to experience a steady rise from 2023-2028, with an overall increase of 910.3 million users, which is a 17.33% increase.¹⁰ Following five consecutive years of growth, it is estimated that the smartphone user base will reach a new peak of 6.2 billion users in 2028.¹⁰ It is worth mentioning that the number of smartphone users has consistently been on the rise in recent years. Smartphone users are limited to internet users of any age using a smartphone.¹⁰

METHODS

In this literature review, we used the results of the 15 different studies¹¹⁻²⁵ that have been conducted worldwide overall from the published articles at PubMed and Google Scholar as mean references. These studies collectively examined the effects of COVID-19 on Internet addiction, as demonstrated in Table 1 and Figure 1. To compare the prevalence of Internet addiction before and after the COVID-19 pandemic, we utilized the *t*-test statistical method.



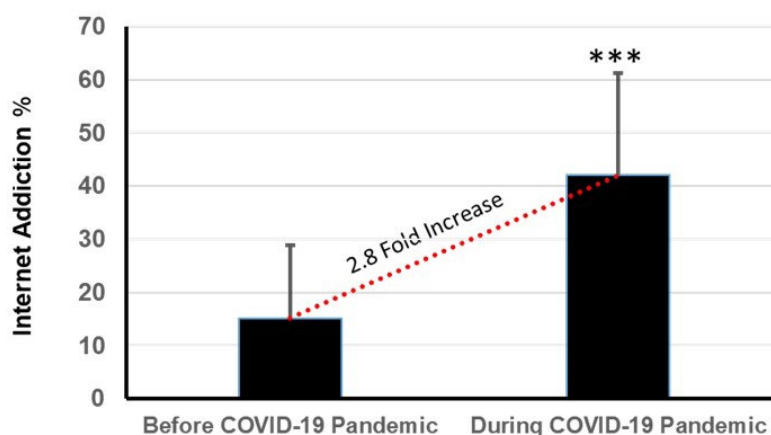
DISCUSSION

A review of literature published between 2000 and 2009 on Medline and PubMed focusing on “Internet addiction” in the United States and Europe showed that the prevalence rates of Internet addiction range from 1.5-8.2%, which is not COVID-19-related, although the specific diagnostic criteria and assessment questionnaires varied across countries.²⁶ Throughout the previous decade, the prevalence of Internet addiction worldwide exhibited substantial variation, ranging from 1.6% in Europe to 44% in India, with an average of 15%.^{27,28} However, based on the current review, which

includes 15 studies conducted globally, the average prevalence of Internet addiction during the COVID-19 pandemic ranged from 4.8% in Turkey to 88.1% in Nigeria, with an overall average of 42%. Using the *t*-test statistical methodology, we observed a substantial increase in the average rate of Internet addiction from 15% before the COVID-19 pandemic²⁷ to 42% during the COVID-19 pandemic, representing a 2.8-fold increase, as shown in Figure 2. Cross-sectional studies conducted on patient samples demonstrate a significant comorbidity between Internet addiction and psychiatric disorders, especially affective disorders (such as depression),

Table 1. The Results and Conclusions from Fifteen Different Studies Conducted Across Various Regions Worldwide that Provide Insights into the Rates and Prevalence of Internet Addiction

Author Name	Duration	Country/Countries	# of Participants	Age	Results	Conclusions
Ozturk et al ¹¹	2020-2021 academic year	Turkey	1572	13 to 16-years	4.8% of adolescents had limited internet addiction symptoms. However, 20.7% were suffered from psychosocial problems	Internet addiction and psychosocial problems were associated with several sociodemographic factors
Lee et al ¹²	14-18 May 2021	South Korea	1155	20-years or older	11.17% were at risk of Internet addiction	Addictive Internet use was significantly associated with psychological distress during the COVID-19 pandemic
Kumar et al ¹³		India	475	16 to 21-years	13.4% of recruited students had severe internet addiction	Females were highly addicted than males
Rouleau et al ¹⁴	February 2021 to May 2022	Canada	247	12 to 17-years	15.4% of those who were hospitalized and 6.5% of the community group exhibited problematic use of social media	Adolescent inpatients should be screened for problematic use of social media
Lin ¹⁵	March 2 through 27 March 2020	Taiwan	1060	14.66±0.86-years	24.4% of the population had Internet addiction	The prevalence rate of Internet addiction was high among junior high school students during the COVID-19 outbreak
Alheneidi et al ¹⁶	April 15 to May 7, 2020	Kuwait, Saudi Arabia	593	18-years and over	31.5% spent eight hours or more online daily	Problematic internet use was associated with loneliness and the predictors of loneliness
Li et al ¹⁷	March 24 to April 30, 2020	China	20472	15-years or above	The Internet addiction was 36.7%	The COVID-19 pandemic adversely impacted Internet use and increased the prevalence and severity of Internet addiction
Sun et al ¹⁸	24-31 March 2020	China	6416	28.23±9.23-years	46.8% of the subjects reported increased dependence on internet use, and 16.6% had longer hours of internet use	COVID-19 pandemic implicated in addictive behaviors in China
Siste et al ¹⁹	April 28 to June 1 st 2020	Indonesia	4737	31.84±7.73-years	Online duration increased by 52% compared to before the pandemic.	A high point prevalence of internet addiction and identified several preventable factors predictive of IA during home-quarantine
Zhang et al ²⁰	July 2020	China	999	17.01±0.77-years	53.9% spent above 6 hours online daily bases	Internet addiction was an important cause of adolescents' aggressive behavior during the COVID-19 pandemic
Khubchandani et al ²¹	May 2021	United States	1305	18-years or older	Probable addiction or risk of addiction (41%), and definite or severe addiction (14%).	An increase in internet addiction among U.S. adults during the COVID-19 pandemic
Schoultz et al ²²	October/ November 2020	Norway, USA, UK, and Australia	2368	18-years or over	60.5% have been addicted to social media	Social media also led to negative impact on public perceptions, including mistrust and confusion.
Priego-Parra et al ²³	March 23 to April 21 2020	Urban areas, México	561	30.7±10.6-years	62.7% of the population had some degree of internet addiction	Excessive internet use and exposure to misinformation are linked to higher levels of anxiety and depression.
Tahir et al ²⁴	June and July 2020	Dominican Republic, Egypt, Guyana, India, Mexico, Pakistan, and Sudan	2749	15 to 44-years	67.6% were addicted to Internet and 73.5% suffered from poor sleep quality	Internet Addiction was a significant predictor of low-quality sleep, accounting for 13.2% of the variability in poor sleep quality
Onukwuli et al ²⁵	July and August 2021	Nigeria	1000	14 to 19-years	The prevalence of internet addiction was 88.1% (24.9% had mild, 59.6% had moderate, while 3.6% had severe addiction)	During the COVID-19 pandemic era, there was a high incidence of internet addiction among adolescents, with addiction being more likely among males

Figure 2. Illustrates the Average Rates of Internet Addiction before and during the COVID-19 Pandemic

The data collected before the pandemic originated from 12 different studies conducted by Duong et al²⁷. In contrast, the data collected during the COVID-19 Pandemic was sourced from 15 different studies as presented in Table 1. By employing the t-test statistical methodology, we found that the average rate of internet addiction before the COVID-19 Pandemic was 15%, while during the COVID-19 Pandemic, it surged significantly to 42% ($***p<0.001$) which is 2.8 fold increase.

anxiety disorders (including generalized anxiety disorder and social anxiety disorder), and attention deficit hyperactivity disorder (ADHD).²⁶ Various factors are found to be predictive of the severity of internet use, including personality traits, parenting and familial factors, alcohol use, and social anxiety.²⁶ There was a significant positive correlation between Internet addiction and aggressive behavior, and anxiety, but not depression, mediated the effect of Internet addiction on aggressive behavior.²⁰ Furthermore, the public health model recognizes addiction as an outcome of interactions between individuals, digital media, and the environment.²⁹ These circumstances further emphasize our awareness towards recognizing a new global syndrome, Internet addiction, driven by increasingly challenging public health and psychosocial conditions.¹⁰

The COVID-19 pandemic posed substantial challenges to the current state of public health, despite advances in medicine. The lack of a strong medical infrastructure to restrict the virus's spread, as well as the initial lack of a quick vaccination, led to the virus's global spread.³⁰ Consequently, quarantine measures were put in place, but unfortunately, a concurrent 2.8-fold increase in Internet addiction compared to pre-pandemic levels was also observed (Figure 2). Looking ahead, the future of public health will be influenced by various factors, including scientific and technological advancements and the development of medical systems capable of effectively managing pandemics.³¹ Additionally, policy decisions, global cooperation, and societal changes will play crucial roles in shaping public health outcomes.³² Addressing these challenges and seizing opportunities will necessitate collaboration between governments, international organizations, healthcare professionals, and communities worldwide.

CONCLUSION

During the COVID-19 pandemic era, there has been a significant increase in Internet addiction on a global scale. This Internet ad-

diction is significantly associated with psychosocial problems and is severely affected by diverse sociodemographic factors that vary across regions and countries. Moreover, it has significant mental health consequences, including anxiety, depression, loneliness, aggressiveness, and sleep disturbances. The detrimental effects of Internet addiction on public health necessitate the development and provision of evidence-based services tailored to the specific problem type and severity experienced by each individual.

RECOMMENDATIONS

To effectively prevent and treat Internet addiction, which is recognized as a novel global syndrome and has severely impacted public health worldwide, it is essential to adopt a comprehensive approach that prioritizes the well-being of the younger generation. Importantly, urgent attention is needed to implement educational measures and new public health strategies that can protect and support young adults, youths, and adolescents, with the aim of preventing any additional harm and improving public health.

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CONFLICTS OF INTEREST

The authors declare that this review article was conducted without any commercial or financial associations that could be seen as a potential conflict of interest.

REFERENCES

1. Ayub S, Jain L, Parnia S, et al. Treatment modalities for inter-

- net addiction in children and adolescents: A systematic review of randomized controlled trials (RCTs). *J Clin Med.* 2023; 12(9): 3345. doi: [10.3390/jcm12093345](https://doi.org/10.3390/jcm12093345)
2. Kirtipal N, Bharadwaj S, Kang SG. From SARS to SARS-CoV-2, insights on structure, pathogenicity and immunity aspects of pandemic human coronaviruses. *Infect Genet Evol.* 2020; 85: 104502. doi: [10.1016/j.meegid.2020.104502](https://doi.org/10.1016/j.meegid.2020.104502)
3. Bao Y, Sun Y, Meng S, Shi J, Lu L. 2019-nCoV epidemic: Address mental health care to empower society. *Lancet.* 2020; 395(10224): e37-e38. doi: [10.1016/S0140-6736\(20\)30309-3](https://doi.org/10.1016/S0140-6736(20)30309-3)
4. Marin MG, Nuñez X, de Almeida RMM. Internet addiction and attention in adolescents: A systematic review. *Cyberpsychol Behav Soc Netw.* 2021; 24(4): 237-249. doi: [10.1089/cyber.2019.0698](https://doi.org/10.1089/cyber.2019.0698)
5. Shi L, Lu ZA, Que JY, et al. Prevalence of and risk factors associated with mental health symptoms among the general population in China during the coronavirus disease 2019 pandemic. *JAMA Netw Open.* 2020; 3(7): e2014053. doi: [10.1001/jamanetworkopen.2020.14053](https://doi.org/10.1001/jamanetworkopen.2020.14053)
6. Liu JJ, Bao Y, Huang X, Shi J, Lu L. Mental health considerations for children quarantined because of COVID-19. *Lancet Child Adolesc Health.* 2020; 4(5): 347-349. doi: [10.1016/S2352-4642\(20\)30096-1](https://doi.org/10.1016/S2352-4642(20)30096-1)
7. Ryan P. Technology: The new addiction. Paper presented at: US Naval Institute Publications; September 2018; 144: e387. MD, USA. Website. <https://www.usni.org/magazines/proceedings/2018/september/technology-new-addiction>. Accessed June 3, 2022.
8. Smith A, Anderson M. Social Media Use in 2018. 2018. Website. <https://policycommons.net/artifacts/617452/social-media-use-in-2018/1598263/>. Accessed July 9, 2023.
9. Dresch-Langley B, Hutt A. Digital addiction and sleep. *Int J Environ Res Public Health.* 2022; 19(11): 6910. doi: [10.3390/ijerph19116910](https://doi.org/10.3390/ijerph19116910)
10. Degenhard J. Number of smartphone users worldwide 2013 to 2028. 2023. Website. <https://www.statista.com/forecasts/1143723/smartphone-users-in-the-world>. Published June 1, 2023. Accessed July 9, 2023.
11. Ozturk FO, Ayaz-Alkaya S. Internet addiction and psychosocial problems among adolescents during the COVID-19 pandemic: A cross-sectional study. *Arch Psychiatr Nurs.* 2021; 35(6): 595-601. doi: [10.1016/j.apnu.2021.08.007](https://doi.org/10.1016/j.apnu.2021.08.007)
12. Lee JJ, Shin SH. Associations between Fear of COVID-19, depression, and Internet addiction in South Korean Adults. *Healthcare (Basel).* 2022; 10(5): 861. doi: [10.3390/healthcare10050861](https://doi.org/10.3390/healthcare10050861)
13. Kumar G, Dash P, Jnaneswar A, Suresan V, Jha K, Ghosal S. Impact of Internet addiction during COVID-19 on anxiety and sleep quality among college students of Bhubaneswar city. *J Educ Health Promot.* 2022; 11: 156. doi: [10.4103/jehp.jehp_396_21](https://doi.org/10.4103/jehp.jehp_396_21)
14. Rouleau RD, Beauregard C, Beaudry V. A rise in social media use in adolescents during the COVID-19 pandemic: The French validation of the Bergen Social Media Addiction Scale in a Canadian cohort. *BMC Psychol.* 2023; 11: 92. doi: [10.1186/s40359-023-01141-2](https://doi.org/10.1186/s40359-023-01141-2)
15. Lin MP. Prevalence of Internet addiction during the COVID-19 outbreak and its risk factors among junior high school students in Taiwan. *Int J Environ Res Public Health.* 2020; 17(22): 8547. doi: [10.3390/ijerph17228547](https://doi.org/10.3390/ijerph17228547)
16. Alheneidi H, AlSumait L, AlSumait D, Smith AP. Loneliness and problematic internet use during COVID-19 lock-down. *Behav Sci (Basel).* 2021; 11(1): 5. doi: [10.3390/bs11010005](https://doi.org/10.3390/bs11010005)
17. Li YY, Sun Y, Meng SQ, et al. Internet addiction increases in the general population during COVID-19: Evidence from China. *Am J Addict.* 2021; 30(4): 389-397. doi: [10.1111/ajad.13156](https://doi.org/10.1111/ajad.13156)
18. Sun Y, Li Y, Bao Y, et al. Brief report: Increased addictive internet and substance use behavior during the COVID-19 pandemic in China. *Am J Addict.* 2020; 29(4): 268-270. doi: [10.1111/ajad.13066](https://doi.org/10.1111/ajad.13066)
19. Siste K, Hanafi E, Sen LT, et al. The impact of physical distancing and associated factors towards Internet addiction among adults in Indonesia during COVID-19 pandemic: A nationwide web-based study. *Front Psychiatry.* 2020; 11: 580977. doi: [10.3389/fpsy.2020.580977](https://doi.org/10.3389/fpsy.2020.580977)
20. Zhang Y, Hou Z, Wu S, Li X, Hao M, Wu X. The relationship between Internet addiction and aggressive behavior among adolescents during the COVID-19 pandemic: Anxiety as a mediator. *Acta Psychol (Amst).* 2022; 227: 103612. doi: [10.1016/j.actpsy.2022.103612](https://doi.org/10.1016/j.actpsy.2022.103612)
21. Khubchandani J, Sharma S, Price JH. COVID-19 pandemic and the burden of Internet addiction in the United States. *Psychiatry Int.* 2021; 2(4): 402-409. doi: [10.3390/psychiatryint2040031](https://doi.org/10.3390/psychiatryint2040031)
22. Schoultz M, Lamph G, Thygesen H, et al. Perceptions of social media challenges and benefits during the Covid-19 pandemic: Qualitative findings from a cross sectional international survey. *PLOS Glob Public Health.* 2023; 3(1): e0001463. doi: [10.1371/journal.pgph.0001463](https://doi.org/10.1371/journal.pgph.0001463)
23. Priego-Parra BA, Triana-Romero A, Pinto-Gálvez SM, et al. Anxiety, depression, attitudes, and Internet addiction during the initial phase of the 2019 coronavirus disease (COVID-19) epidemic: A cross-sectional study in México. *MedRxiv.* 2020; 1-27. doi: [10.1101/2020.05.10.20095844](https://doi.org/10.1101/2020.05.10.20095844)

24. Tahir MJ, Malik NI, Ullah I, et al. Internet addiction and sleep quality among medical students during the COVID-19 pandemic: A multinational cross-sectional survey. *PLoS One*. 2021; 16(11): e0259594. doi: [10.1371/journal.pone.0259594](https://doi.org/10.1371/journal.pone.0259594)
25. Onukwuli VO, Onyinye EN, Udigwe IB, Umeh UM, Enebe JT, Umerah AT. Internet addiction during the COVID-19 pandemic among adolescents in southeast Nigeria and implications for adolescent care in the post-pandemic era: A cross-sectional study. *SAGE Open Med*. 2023; 11: 20503121231152763. doi: [10.1177/20503121231152763](https://doi.org/10.1177/20503121231152763)
26. Weinstein A, Lejoyeux M. Internet addiction or excessive internet use. *Am J Drug Alcohol Abuse*. 2010; 36(5): 277-283. doi: [10.3109/00952990.2010.491880](https://doi.org/10.3109/00952990.2010.491880)
27. Duong XL, Liaw SY, Augustin JPM. How has Internet addiction been tracked over the last decade? A literature review and 3C paradigm for future research. *Int J Prev Med*. 2020; 11: 175. doi: [10.4103/ijpvm.IJPVM_212_20](https://doi.org/10.4103/ijpvm.IJPVM_212_20)
28. Poli R. Internet addiction update: Diagnostic criteria, assessment and prevalence. *Neuropsychiatry*. 2017; 7(1): 4-8.
29. Chung S, Lee HK. Public health approach to problems related to excessive and addictive use of the internet and digital media. *Curr Addict Rep*. 2023; 10(1): 69-76. doi: [10.1007/s40429-022-00458-z](https://doi.org/10.1007/s40429-022-00458-z)
30. Boehm E, Kronig I, Neher RA, Eckerle I, Vetter P, Kaiser L. Geneva Centre for Emerging Viral Diseases. Novel SARS-CoV-2 variants: The pandemics within the pandemic. *Clin Microbiol Infect*. 2021; 27(8): 1109-1117. doi: [10.1016/j.cmi.2021.05.022](https://doi.org/10.1016/j.cmi.2021.05.022)
31. Thoradeniya T, Jayasinghe S. COVID-19 and future pandemics: A global systems approach and relevance to SDGs. *Global Health*. 2021; 17(1): 59. doi: [10.1186/s12992-021-00711-6](https://doi.org/10.1186/s12992-021-00711-6)
32. Zhao F, Bali S, Kovacevic R, Weintraub J. A three-layer system to win the war against COVID-19 and invest in health systems of the future. *BMJ Glob Health*. 2021; 6(12): e007365. doi: [10.1136/bmjgh-2021-007365](https://doi.org/10.1136/bmjgh-2021-007365)