Who complies with coronavirus disease 2019 precautions and who does not?

Róbert Urbán\textsuperscript{a}, Orsolya Király\textsuperscript{a}, and Zsolt Demetrovics\textsuperscript{b,c}

\textbf{Purpose of review}  
Severe acute respiratory syndrome (SARS)–coronavirus disease 2019 (COVID-19) virus imposes a higher risk of complications and mortality among people with mental disorders. Until widely available vaccines, adherence to preventive behaviours remains the most crucial tool to prevent SARS/COVID-19 virus transmission. Our review focuses on the determinants of adherence behaviours.

\textbf{Recent findings}  
Adherence behaviours include the use of a face mask and protective gloves, personal hygienic behaviours (handwashing or using hand sanitiser), and keeping physical distance and avoiding social gatherings. In almost all studies, males and younger people show less adherence. Risk perception and health beliefs (especially perceived severity of COVID-19 related conditions) can explain the sex and age differences in adherence. Studies covering the impact of mental disorders on adherence are surprisingly missing, with the exception of smoking.

\textbf{Summary}  
Engaging men and young people in adopting preventive behaviours is crucial in protecting the whole community and specific vulnerable populations. There is a lack of studies investigating preventive behaviours among people living with mental disorders and addiction problems. Furthermore, descriptive and intervention studies are needed to understand and improve the adherence of this population to preventive behaviours.

\textbf{Keywords}  
adherence, face mask use, personal hygienic behaviours, physical distancing, preventive behaviours

The pandemic of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), represents the most rapidly spreading infectious disease since the influenza pandemic of 1918–1919. Responding effectively to the COVID-19 pandemic requires responses from a medical perspective (i.e., implementing adequate treatment, vaccination, etc.), and it necessitates people worldwide changing their individual behaviours in response to the public health imperative of infection control. Consequently, social and behavioural sciences play central roles in coping with the challenges caused by the current COVID-19 pandemic and future pandemics \cite{1,2}. To understand these mechanisms, we reviewed the literature on preventive behaviours from the onset of the COVID-19 pandemic to March 2021.

Possible routes of transmission include close contacts between people, contracting the virus through surface spread (via fomites), contracting it via large droplets (through coughing and sneezing), and airborne (aerosol) transmission, especially in enclosed spaces \cite{3}. Importantly, the transmission of SARS-CoV-2 is possible from infected people who are asymptomatic \cite{4}. Preventive measures, therefore, need to be applied irrespective of apparent symptoms. Until now, only one study has shown that vaccination can dramatically decrease viral transmission \cite{5}; therefore, adherence to preventive behaviours remains the most important tool to keep infectivity measured by the reproduction number low \cite{6}. A key goal is to decrease this number $<1.0$ through coordinated prevention efforts,
Living with a mental disorder

Previous studies have highlighted the increased risk of SARS-CoV-2 infection and fatality among people vulnerable to the burden of the current situation. The issue is whether and how this can be achieved in a sustained way.

There are specific populations who are more vulnerable to the burden of the current situation. Previous studies have highlighted the increased risk of SARS-CoV-2 infection and fatality among people living with a mental disorder [8]. Furthermore, one study from Italy [9] has reported increased odds of SARS-CoV-2 infection in older (≥65 years) people with dementia, psychosis, and anxiety. Younger patients (<65 years) with dementia and anxiety also showed an increased risk of infection. There is also an increased risk of SARS-CoV-2 infection in patients with a recently diagnosed substance use disorder [10].

Furthermore, accumulating data about the higher risk of SARS-CoV-2 infection is paired with the alarming data that fatality due to SARS-CoV-2 infection is increased among patients with a variety of mental disorders. Adherence to preventive behaviours is one of the most important ways to protect individuals and society against spreading severe acute respiratory syndrome (SARS)-coronavirus disease 2019 (COVID-19).

People with mental and behavioural disorders have a higher risk of COVID-19 infection and mortality; therefore, their protection is essential.

Currently, there is a lack of data on adherence to preventive behaviours among people with mental health and substance use disorders. There is a pressing need for research in these populations at increased risk of developing COVID-19 disease.

Males and younger people have lower adherence to preventive behaviours; therefore, they may increase the risk to acquire and transmit the virus to other members of society.

Specific communication strategies should correct risk perception for these groups and emphasise the severity of COVID-19 related conditions.

Adherence to preventive behaviours is one of the most important ways to protect individuals and society against spreading severe acute respiratory syndrome (SARS)-coronavirus disease 2019 (COVID-19).

People with mental and behavioural disorders have a higher risk of COVID-19 infection and mortality; therefore, their protection is essential.

Currently, there is a lack of data on adherence to preventive behaviours among people with mental health and substance use disorders. There is a pressing need for research in these populations at increased risk of developing COVID-19 disease.

Males and younger people have lower adherence to preventive behaviours; therefore, they may increase the risk to acquire and transmit the virus to other members of society.

Specific communication strategies should correct risk perception for these groups and emphasise the severity of COVID-19 related conditions.

Which require the engagement of members of the community and their adherence to these preventive approaches. Adherence to preventive behaviours is expected to reduce the spread of infection and provide an opportunity for the healthcare system to build up appropriate resources to treat severe cases [7]. The issue is whether and how this can be achieved in a sustained way.

There are specific populations who are more vulnerable to the burden of the current situation. Previous studies have highlighted the increased risk of SARS-CoV-2 infection and fatality among people living with a mental disorder [8]. Furthermore, one study from Italy [9] has reported increased odds of SARS-CoV-2 infection in older (≥65 years) people with dementia, psychosis, and anxiety. Younger patients (<65 years) with dementia and anxiety also showed an increased risk of infection. There is also an increased risk of SARS-CoV-2 infection in patients with a recently diagnosed substance use disorder [10].

Furthermore, accumulating data about the higher risk of SARS-CoV-2 infection is paired with the alarming data that fatality due to SARS-CoV-2 infection is increased among patients with a variety of mental disorders. For example, in a study from Italy, higher odds of fatality of SARS-CoV-2 infection were also associated with dementia, psychosis, and anxiety. The risk of infection was comparable or even higher than the risk of other chronic conditions such as heart disease and diabetes. Another study from the USA demonstrated that the risk of mortality is increased in patients with schizophrenia spectrum disorder, even after controlling for age and other chronic medical conditions [11]. Patients with a schizophrenia spectrum disorder had a 2.7-fold higher odds of mortality, which was found to be higher than diabetes, heart failure, or hypertension. These alarming data should direct our attention to the crucial importance of the prevention of SARS-CoV-2 infection among patients with mental disorders. Until the vaccination of patients with mental disorders, the prevention of viral transmission is the most important tool to protect all vulnerable populations. Therefore, a high degree of adherence to preventive behaviours is required from patients, caregivers and the wider social environment.

**ADHERENCE TO PREVENTIVE BEHAVIOURS**

Prevention of transmission of SARS-CoV-2 requires behavioural change that dramatically alters human interactions, which is challenging and stressful for all of us, and especially for patients with mental disorders. Most countries facing the COVID-19 epidemic have implemented public health interventions and legislation to decrease the frequency of close personal contact by spatial distancing measures [12] and promoting physical or chemical barriers to virus transmission through wearing face masks and gloves, and handwashing, respectively. We can learn from experiences with influenza viruses. For example, a meta-analysis of studies investigating interventions to prevent influenza provided evidence of the benefit of multiple preventive behaviours [13]. For example, hand washing in combination with face mask use significantly reduces influenza virus transmission [13]. Countries, however, differ in which protective measures they require. For example, the recommendation regarding wearing a face mask varies across countries [14,15]. The degree of adherence necessary for effective prevention across populations is still not known, but we assume that consistent – daily or almost daily – use of preventive behaviours can significantly decrease the rate of viral transmission. However, preventive behaviours are complex, and estimating adherence to them can be challenging.

Preventive behaviours may be grouped into three different clusters: the use of a face mask and protective gloves, personal hygiene behaviours (handwashing or using hand sanitiser), and keeping physical distance and avoiding social gatherings. Each preventive behaviour is so complex that performing it appropriately requires knowledge, skills, and motivation [16]. Wearing a face mask and protective gloves can be regarded as an effective way of protection, as previous
experience with influenza prevention emphasised the use of face masks with hand hygienic measures [13]. Surprisingly, at the beginning of the pandemic, the WHO did not yet suggest these important tools (WHO, 2020). Recent evidence supports the idea that a face mask can protect from the transmission of viral RNA [17]. Although face mask use has become an important way of preventing viral transmission, according to direct observational studies, the proportion of face mask users among observed participants was only 41.2% in the United States [18], 45.6% in Iran [19], and 66.5–73.6% in Poland [20**]. Furthermore, a relatively low proportion of individuals used the mask correctly (approximately 60% in Poland and 75.6% in Iran).

Before the COVID pandemic, relatively few studies investigated personal hygienic behaviours; some reported low adherence to hand-washing behaviour among college students after using the toilet [21,22]. A relatively low compliance rate to hand hygiene guidelines was also observed among healthcare workers [23]. The COVID pandemic has somewhat increased hand hygiene performance in acute care hospitals [24], but less is known about personal hygienic behaviours in communities.

Physical distancing is an even more complex behaviour and it has far more consequences to people’s well-being. It aims to prevent exposure to high-risk situations such as closed spaces with poor ventilation, crowded places, and close-contact settings [25]. Community-level physical distancing, or lockdowns, are able to decrease SARS-CoV-2 related mortality; however, the effect is moderated by the local situation [26**]. Using mobile technology, physical distancing can be measured on an ecological level; however, it is difficult to draw conclusions regarding individual behaviours. Analysing mobility data has revealed a large socioeconomic disparity in the adherence [27] to physical distancing. In regions with higher proportions of essential workers and a higher population density, the adaptation to physical distancing is less intense [28]. In cross-sectional self-report surveys [27,29,30], some degree of nonadherence to physical distancing was prevalent; however, the majority of these studies used convenience samples, which makes it difficult to quantify and generalise the results to the general population and may also suffer from social desirability bias.

**FACTORS INFLUENCING ADHERENCE TO PREVENTIVE BEHAVIOURS**

**Sex**

Almost all observational and questionnaire-based studies from different countries documented that the adherence to all three clusters of preventive behaviours is lower among men [31**,32]. Males tend to use face masks less frequently and less appropriately [18,19,20]**, they are less likely to wash their hands [22,33], and they are more likely to transgress the rules of physical distancing and self-isolating [27]. Beside these adherence behaviours, men perceive a lower risk than women across countries [34**]. However, culture and social hierarchy may also moderate the impact of sex on preventive behaviours. For example, a study in India reported an opposite pattern of sex difference [35]. The lower adherence to prevention and the lower perceived risk may contribute to the lower life expectancies in general and the higher mortality rate due to COVID-related complications among males. The sex difference concerning preventive behaviours, self-care, perceived immunity, or the perceived vulnerability to complications are possible explanations; nevertheless, we need further research on the gendered meaning of preventive behaviours that would explain the lower rate of preventive behaviours among men [36].

**Age**

The younger population without any symptoms of infection may contribute to viral transmission in communities [25]. Being of a younger age is an important predictor of nonadherence to preventive behaviours [32,37**]. Frequent communication regarding the SARS-CoV-2 virus stressed the fact that COVID-19 mainly threatens the older population, which can lead to a false safety message to younger people [38], considering that despite the lower risks, 1% of hospitalisations due to COVID-19 in China were among those aged 20–29 years, and 3% from the age group of 30–39 years old [39]. Based on nine relevant health indicators, approximately one-third of young people are medically vulnerable to severe COVID-19 illness, at least in the United States [40]. Current smoking status dramatically increases medical vulnerability.

As for risk perception, their perceived lower vulnerability and the stage of brain development of adolescents and young adults predispose them to take more risks to gain social and emotional stimulation (such as social gatherings) and underestimate the long-term consequences of their behaviour [41]. Health communication to this age group should specifically consider increased attention to emotionally toned stimuli and lower sensitivity to negative consequences.

**Cognitive factors: risk perception, health beliefs, self-efficacy**

Risk perception and health beliefs may explain different adherence levels to preventive behaviours
Substance use

After a screening of the relevant research, we could not identify any study focusing on how substance use impacts adherence behaviours, except smoking. Although smokers are more likely to develop symptomatic COVID-19 [46**], it is still unclear whether smoking increases hospitalisation and mortality from COVID-19 infection [47**,48,49]. Nevertheless, the assumed increased risk due to smoking is present in COVID-related communication; therefore, it may influence smokers’ preventive behaviours. On the contrary, one study found that current smokers reported lower adherence than never smokers, even though they are more worried about becoming seriously ill from COVID-19 [50**]. We can assume that both the physical and social contexts of substance use, predisposing personality characteristics (impulsivity, low self-control, delinquency) and the marginalisation of these groups may make substance users less adherent to preventive behaviours, while preventive behaviours and isolation, on the other hand, may increase problematic substance use, making the users more vulnerable to COVID-19 infection.

Lockdown

The most effective nonpharmacological interventions to mitigate the spread of SARS-CoV-2 include curfews, lockdowns, and closing places where people gather for a longer period of time [51**]. These interventions force people to perform preventive behaviours, mainly physical distancing. Although most people adhere to these restrictions, some people can transgress them as well. Apart from the clear benefits of lockdowns and similar interventions, they also have high costs that should be considered as a limitation. First, such interventions cannot be held for too long without risking economic and political instability [52]. Second, lockdowns, curfews, and closing venues may increase the sense of loneliness and isolation and heighten the risk of mental health problems, especially in the adult and young population [53–55]. Additionally, problematic alcohol and substance use [56**], as well as behaviour addictions, for example, gaming disorder [57] or the problematic use of the internet or pornography [58], may also increase. The negative impacts of lockdown hit even harder those people who suffer from mental or addictive disorders [59] or those who live in economic hardship [60]. Therefore, instead of prolonging this intervention type, we need to find ways to increase adherence to other preventive behaviours in communities.

CONCLUSION

Understanding adherence to public health recommendations will help decrease the likelihood of SARS-CoV-2 transmission and potentially the severity of the COVID-19 illness. Everyone, irrespective of their particular risk of these infections, can contribute to the health of the community as a whole. Developing ways of engaging men and young people in adopting preventive behaviours and emphasising the severity of the illness is vital for the optimal prevention of SARS-CoV-2 transmission now and in the future. Besides the description of the situation about adherence to preventive behaviours, we also need to focus on how to improve individuals’ preventive behaviours with the help of behaviour science [61] and the capacities of families and communities to mitigate the negative adverse effects of preventive interventions, such as the increased risk of substance use and problematic behavioural addictions [62*].

There is a lack of data on adherence to preventive behaviours among people with mental health and substance use disorders. There is a pressing need for research to understand these vulnerable populations’ determinants of adherence behaviour and specific needs to improve their self-care and adherence to public health recommendations.

Although biotechnological development of testing and vaccination is necessary, human behaviour within its globalised ecological context is still the cornerstone of preventing infectious diseases. Understanding the predictors of hygienic and adherence behaviours in the current COVID epidemic can inform us how to establish effective prevention programs in future outbreaks. Further research is necessary to explore the specific needs of people living with mental, behavioural or addictive disorders [42]; these factors are also important because they are amenable to change with interventions. Risk perception and health beliefs include perceived susceptibility to and perceived severity of the infection and its consequences and perceived self-efficacy regarding preventive action. Being female, having a direct COVID-related experience, and prosociality had positive impacts, whereas an individualistic worldview had a negative impact on perceived risk across ten countries [34**]. Interestingly, the predictive power of perceived vulnerability varied across nations. In contrast, the perceived severity of the COVID-19 illness and the perceived self-efficacy regarding preventive behaviours predicted the rate of adherence behaviours in various countries [32,43–45].
disorders to support their adherence behaviours in current and future pandemics.

Acknowledgements
This study was supported by the Hungarian National Research, Development and Innovation Office (KKP126835; ELTE Thematic Excellence Programme 2020, TKP2020-IFA-05). Orsolya Király was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences and by the ÚNKP-20-5S National Excellence Program of the Ministry for Innovation and Technology from the source of the National Research, Development and Innovation Fund.

Financial support and sponsorship
None.

Conflicts of interest
There are no conflicts of interest.

REFERENCES AND RECOMMENDED READING
Papers of particular interest, published within the annual period of review, have been highlighted as:
• of special interest
• of outstanding interest

1. Bavel Jv, Baicker K, Boggio PS, et al. Using social and behavioural science to support COVID-19 pandemic response. Nat Hum Behav 2020; 4:460–471. This review paper highlights the previous research in social and behavioural sciences that are relevant in understanding responses to COVID-19 and direct researchers' attention toward the important gaps.

2. West R, Michie S, Rubin GJ, Amol R. Applying principles of behaviour change to reduce SARS-CoV-2 transmission. Nat Hum Behav 2020; 4:451–459. This review paper provides a valuable behavioural framework (capability-opportunity-motivation-behaviour model) for planning behavioural interventions for changing preventive behaviours.

3. Zheng J. SARS-CoV-2: an emerging coronavirus that causes a global threat. Int J Biol Sci 2020; 16:1678–1685.

4. Rothe C, Schunk M, SPreth H, et al. Transmission of 2019-nCoV infection from an asymptomatic contact in Germany. N Engl J Med 2020; 382:970–977.

5. Petter E, Mor O, Zuckerman N, et al. Real-world evidence for lower viral load of individuals who have been vaccinated by BNT162b2. Lancet 2021; 397:1197–1200. This study presents the effect of the social distancing measures on the spread of COVID-19 in ten highly infected countries. The results showed that the effectiveness of these measures varied largely between the participatory countries.

6. Galasso V, Pons V, Profeta P, et al. Factors associated with adherence to self-isolation and lockdown measures in the UK: a cross-sectional survey. Public Health 2020; 187:41–52.

7. Garner R, Benetix JF, Knaer J, Bansal S. Socioeconomic disparities in social distancing during the COVID-19 pandemic in the United States: observational study. J Med Internet Res 2021; 23:e24591. doi: 10.2196/24591.2021-01-22.

8. Coriau A, Moran C, Campbell T, Geller AC. Barriers and facilitators of adherence to social distancing recommendations during COVID-19 among a large international sample of adults. PLoS One 2020; 15:e0239795. doi: 10.1371/journal.pone.0239795.

9. Hills S, Eraso Y. Factors associated with nonadherence to social distancing rules during the COVID-19 pandemic: a logistic regression analysis. BMC Public Health 2021; 21:352.

10. Fang F, Gu X, Sun P, et al. Factors associated with increased COVID-19 related mortality risk. In this study, mood disorder and anxiety disorder diagnosis were not associated with increased COVID-19 related mortality risk.

11. Nemani K, Li C, Olsson M, et al. Association of psychiatric disorders with mortality among patients with COVID-19. JAMA Psychiatry 2021; 78:380–386. This well designed cohort study highlighted the increased risk of COVID-related mortality among schizophrenia patients after controlling for confounding variables. In this study, mood disorder and anxiety disorder diagnosis were not associated with increased COVID-19 related mortality risk.

12. Abdell H, McQueen D. The COVID-19 pandemic calls for spatial distancing and social closeness: not for social distancing! Int J Public Health 2020; 65:231–1231.

13. Wong VY, Cowling BJ, Aisio AE. Hand hygiene and risk of influenza virus infections in the community: a systematic review and meta-analysis. Epidemiol Infect 2014; 142:922–932.

14. Cheng KK, Lam TH, Leung CC. Wearing face masks in the community during the COVID-19 pandemic: altruism and solidarity. Lancet 2020; doi:10.1016/S0140-6736(20)30918-1. [Epub ahead of print]

15. Feng S, Shen C, Xia N, et al. Rational use of face masks in the COVID-19 pandemic. Lancet Respir Med 2020; 8:434–436.

16. DiMatteo MR. Variations in patients’ adherence to medical recommendations: a quantitative review of 50 years of research. Med Care 2004; 42:200–209.

17. Leung NML, Chu DKW, Shyu EYC, et al. Respiratory virus shedding in exhaled breath and efficacy of face masks. Nat Med 2020; 26:676–680.

18. Arp NL, Nguyen TH, Linick EJ, et al. Use of face coverings in public during the COVID-19 pandemic: an observational study. 2020. doi: 10.1101/2020.06.09.20126946.

19. Rahimi Z, Shirali GA, Araban M, et al. Mask use among pedestrians during the Covid-19 pandemic in Southwest Iran: an observational study on 1,440 people. BMC Public Health 2021; 21:133.

20. Ganczak M, Pasek O, Duda - Duma L, et al. Use of masks in public places in Poland during SARS-CoV-2 epidemic: a covert observational study. BMC Public Health 2021; 21:393.

21. Moore LD, Robbins G, Quinn J, Arbogast JW. The impact of COVID-19 on adherence to social distancing recommendations during COVID-19 among college students. Am J Infect Control 2020; 38:361–368.

22. Mariwah S, Hampshire K, Kasim A. Impact of gender and physical environment on the handwashing behaviour of university students in Ghana: impact of gender and environment on hygiene behaviour. Trop Med Int Health 2012; 17:447–454.

23. Erasmus V, Daha TJ, Brug H, et al. Systematic review of studies on compliance with hand hygiene guidelines in hospital care. Infect Control Hosp Epidemiol 2010; 31:283–294.

24. Moore LD, Robbins G, Quinn J, Arbogast JW. The impact of COVID-19 on hand hygiene performance in hospitals. Am J Infect Control 2020; 49:30–33.

25. Furuse Y, Sando E, Tsuchiya N, et al. Clusters of coronavirus disease in communities. Japan, January–April 2020. Emerg Infect Dis 2020; 16:2176–2179.

26. Thu TPB, Ngoc PNH, Hai NM, Tuan LA. Effect of the social distancing measures on the spread of COVID-19 in 10 highly infected countries. Sci Total Environ 2020; 742:140430. doi:10.1016/j.scitotenv.2020.140430. This study presents the effect of the social distancing measures on the spread of COVID-19 in ten highly infected countries (U.S., Spain, Italy, U.K., France, Germany, Russia, Turkey, Iran, and China). The results showed that the effectiveness of these measures varied largely between the participatory countries.

27. Amid P, Amelit R, Lambert H, et al. Factors associated with adherence to self-isolation and lockdown measures in the UK: a cross-sectional survey. Public Health 2020; 187:41–52.

28. Garnier R, Benetix JF, Knaer J, Bansal S. Socioeconomic disparities in social distancing during the COVID-19 pandemic in the United States: observational study. J Med Internet Res 2021; 23:e24591. doi: 10.2196/24591.2021-01-22.

29. Coriau A, Moran C, Campbell T, Geller AC. Barriers and facilitators of adherence to social distancing recommendations during COVID-19 among a large international sample of adults. PLoS One 2020; 15:e0239795. doi: 10.1371/journal.pone.0239795.

30. Hills S, Eraso Y. Factors associated with nonadherence to social distancing rules during the COVID-19 pandemic: a logistic regression analysis. BMC Public Health 2021; 21:352.

31. Galasso V, Pons V, Proleta P, et al. Gender differences in COVID-19 attitudes and behavior: panel evidence from eight countries. Proc Natl Acad Sci USA 2020; 117:27268–27291.

32. This survey conducted in eight countries (Australia, Austria, France, Germany, Italy, New Zealand, U.K., U.S.) shows that women are more likely to agree and comply with restraining measures, which may explain the substantial gender differences in mortality. This evidence has important implications for public health policies and communication on COVID-19, in which gender differences should be considered.

33. Twoan B, Pak B, Mcklsoi A, et al. Nonadherence to preventative behaviours during the COVID-19 epidemic: findings from a community study 2021. doi: 10.21203/rs.3.rs-209275/v1.
Addictive disorders

33. Suen LKP, So ZYY, Yeung SKW, et al. Epidemiological investigation on hand hygiene knowledge and behaviour: a cross-sectional study on gender dis-parity. BMC Public Health 2019; 19:401.
34. Dryhurst S, Schneider CR, Kerr J, et al. Risk perceptions of COVID-19 among the world. J Risk Res 2020; 23:994–1006. This study presents the first assessment of public risk perception of COVID-19 worldwide using national samples in ten countries across Europe, America, and Asia. Pooled across countries, personal experience with the virus, individualistic and prosocial values, hearing about the virus from friends and family, trust in government, science and medical professionals, personal knowledge of government- ment strategy, and personal and collective efficacy were all significant predictors of risk perception.
35. Pinchoff J, Santhy K, White C, et al. Gender specific differences in COVID- 19 knowledge, behavior and health effects among adolescents and young adults in Uttar Pradesh and Bihar, India. PLoS One 2020; 15:e0244053. doi: 10.1371/journal.pone.0244053.
36. Addis ME, Mahalik JR, Men, masculinity, and the contexts of help seeking. Am Psychol 2003; 58:6–14.
37. Haischer MH, Bellfluss R, Hart MR, et al. Who is wearing a mask? Gender-, age-, and location-related differences during the COVID-19 pandemic. PLoS One 2020; 15:e0240785. doi: 10.1371/journal.pone.0240785.
This observational study examined shoppers’ mask-wearing behaviour in the U.S. and showed that gender, age, and location factor play a crucial role in compliance. More specifically, older individuals, females and those living in urban or suburban areas were more likely to wear masks. Mask mandates also increased mask-wearing compliance.
38. Kluge HH. Statement – older people are at highest risk from COVID-19, but all must act to prevent community spread 2020; https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/statements/statement-older-people-are-at-highest-risk-from-covid-19, but-all-must-act-to-prevent-community-spread.
39. Ruan S. Likelihood of survival of coronavirus disease 2019. Lancet Infect Dis 2020; 20:630–631.
40. Adams SH, Park MJ, Schaub JP, et al. Medical vulnerability of young adults to severe COVID-19 illness—data from the national health interview survey. J Adolesc Health 2020; 67:362–368.
41. Casey BJ, Jones RM, Hare TA. The Adolescent Brain. Ann N Y Acad Sci 2000; 1124:111–126.
42. Glanz K, Bishop DB. The role of behavioral science theory in development and implementation of public health interventions. Annu Rev Public Health 2010; 31:39–418.
43. Irigoyn-Camacho ME, Velazquez-Alva MC, Zepeda-Zepeda MA, et al. Effect of income level and perception of susceptibility and severity of COVID-19 on stay-at-home preventive behavior in a group of older adults in Mexico City. Int J Environ Res Public Health 2020; 17:7418. doi: 10.3390/ijerph170207418.
44. Jose R, Narendran M, Bindu A, et al. Public perception and preparedness for the pandemic COVID-19: a health belief model approach. Clin Epidemiol Glob Health 2021; 9:41–46.
45. Kim S, Kim S. Analysis of the impact of health beliefs and resource factors on preventive behaviors against the COVID-19 pandemic. Int J Environ Res Public Health 2020; 17:8666. doi: 10.3390/ijerph17128666.
46. Hopkinson NS, Rossi N, El-Sayed_Moustafa J, et al. Current smoking and COVID- 19 risk: results from a population symptom app in over 2.4 million people. Thorax 2021; doi: 10.1136/thoraxjnl-2020-216422. [Online ahead of print]
This study investigated current smoking and COVID-19 risk using data from a population symptom app in over 2.4 million people during the first wave of the pandemic, suggesting that people who smoke are at an increased risk of developing symptomatic COVID-19.
47. Simons D, Shahab L, Brown J, Perski O. The association of smoking status with SARS-CoV-2 infection, hospitalisation, and mortality in COVID-19: a living rapid evidence review with Bayesian meta-analyses (version 7). Addiction 2020; doi: 10.1111/add.15276. [Online ahead of print]
This review of observational and experimental studies up to 25 August 2020 estimated the association of smoking status with infection rates, hospitalisation, disease severity and mortality from COVID-19 disease. Compared with never smokers, current smokers appear to be at an increased risk of infection. In contrast, former smokers appear to be at increased risk of hospitalisation, increased disease severity and mortality from COVID-19. However, causality is uncertain, and data for current smokers were also inconclusive.
48. Farsalinos K, Barbouni A, Poulas K, et al. Current smoking, former smoking, and adverse outcome among hospitalised COVID-19 patients: a systematic review and meta-analysis. Ther Adv Chronic Dis 2020; 11:204062332095076.
49. Aiqahanti JS, Oyelade T, Aishah AM, et al. Prevalence, severity and mortality associated with COPD and smoking in patients with COVID-19: a rapid systematic review and meta-analysis. PLoS One 2020; 15:e0233147. doi: 10.1371/journal.pone.0233147.
50. Jackson SE, Brown J, Shahab L, et al. COVID-19, smoking and inequalities: a study of 53 002 adults in the U.K. Tob Control 2020; doi: 10.1136/tobaccocontrol-2020-055933. [Online ahead of print]
A cross-sectional online survey study of adults in the U.K. examines associations between smoking and COVID-19 relevant outcomes. Results suggest that current smoking was independently associated with self-reported confirmed COVID-19 infection. Smokers reported lower adherence to guidelines despite being more worried than nonsmokers about catching or becoming seriously ill from COVID-19.
51. Haug N, Geyhefer L, Londea A, et al. Ranking the effectiveness of worldwide COVID-19 government interventions. Nat Hum Behav 2020; 4: 1303–1312. This study quantifies the impact of nonpharmaceutical interventions (NPIs) implemented in 79 territories on the effective reproduction number of COVID-19. Results indicate that a suitable combination of NPIs is necessary to curb the spread of the virus. Using country-specific what-if scenarios, the study assesses how the effectiveness of NPIs depends on the local context, opening the way for forecasting the effectiveness of future interventions.
52. Tasell CA. Economic, social and political issues raised by the COVID-19 pandemic. Econ Anal Policy 2020; 68:17–28.
53. Charles NE, Strong SJ, Burns LC, et al. Increased mood disorder symptoms, perceived stress, and alcohol use among college students during the COVID-19 pandemic. Psychiatry Res 2021; 296:113706. doi: 10.1016/j.psychres.2021.113706.
54. Guessoum SB, Lachal J, Rudack R, et al. Adolescent psychiatric disorders during the COVID-19 pandemic and lockdown. Psychiatry Res 2020; 291:113264. doi: 10.1016/j.psychres.2020.113264.
55. Singh S, Roy D, Sinha K, et al. Impact of COVID-19 and lockdown on mental health of children and adolescents: a narrative review with recommendations. Psychiatry Res 2020; 293:113429. doi: 10.1016/j.psychres.2020.113429.
56. Pollard MS, Tucker JS, Green HD. Changes in alcohol use and consequences during the COVID-19 pandemic in the U.S. JAMA Netw Open 2020; 3:e2022942.
This survey collected data from a nationally representative, probability-sampled panel of U.S. adults. It examined individual-level changes in alcohol use and its consequences, as well as demographic disparities, from before to during the COVID-19 pandemic. Results suggest an increase in the frequency of alcohol use and heavy drinking and increased alcohol-related problems for women.
57. King DL, Delfabbro PH, Bilieux J, Potenza MN. Problematic online gaming and the COVID-19 pandemic. J Behav Addict 2020; 9:184–186.
58. Mestre-Bach G, Blycker GR, Potenza MN. Pornography use in the setting of the COVID-19 pandemic. J Behav Addict 2020; 9:181–183.
59. Marsden J, Darke S, Hall W, et al. Mitigating and learning from the impact of COVID-19 infection on addictive disorders. Addiction 2020; 115:1007–1010.
60. Wittenwein D, Velthorst E. Economic hardship and mental health complaints during COVID-19. Proc Natl Acad Sci USA 2020; 117:27277–27284.
61. Borell C, Michie S, Reichel S, et al. Harnessing behavioural science in public health campaigns to maintain ‘social distancing’ in response to the COVID-19 pandemic: key principles. J Epidemiol Community Health 2020; 74:617–619.
62. Kiraly O, Potenza MN, Stein DJ, et al. Preventing problematic internet use during the COVID-19 pandemic: consensus guidance. Compr Psychiatry 2020; 100:152180. doi: 10.1016/j.comppsych.2020.152180. This theoretical paper presents some practical recommendations proposed by a large international group of experts for preventing problematic internet use during the COVID-19 pandemic.