



## Coronavirus pandemic: Establishing effective rules for autumn and winter

### Executive summary

The daily number of new SARS-CoV-2 infections in Germany has been increasing again since July. This trend is even more pronounced in other European countries (e.g. France, Spain, the Netherlands, Austria) or in Israel, where in some cases the numbers already exceed those from the end of March 2020. In order to stop the pandemic from again becoming difficult to control also in Germany, it is essential for the responsible actors on the federal and state level to agree on national, effective, and standardised rules for preventive measures and to ensure that these measures are implemented and complied with more consistently than has been the case to date.

Furthermore, the challenge of keeping the pandemic under control will increase as temperatures fall, group activities take place indoors, autumn and winter holidays approach, and social activities increase during Advent and at Christmas. The onset of the cold and flu season will place greater demands on the health system, with the added difficulty of distinguishing infections with SARS-CoV-2 from other illnesses with similar symptoms. Even optimistic predictions do not envision sufficient quantities of an effective vaccine being available before spring 2021, the widespread distribution of which would then have to follow on a step-by-step basis which has yet to be determined. To date, the effectiveness of medicinal therapies has also been limited.

The aim of preventive measures should be to maintain public and economic life to the greatest degree possible in the coming months. With regard to all policy decisions which need to be taken, it will be even more important than before to clarify and weigh up their economic, social, and psychological effects, as well as the effects on the health system, to communicate the issues clearly and on the basis of sound arguments, and to address the limits of existing knowledge about the pandemic and uncertainties regarding its likely development.

Against this backdrop, the German National Academy of Sciences Leopoldina recommends:

#### **1. Consistent compliance with protective measures:**

Complying with the well-known protective measures, particularly those concerning physical distance, hygiene, and the wearing of a mask, as well as regular exchange of air (if applicable, aided by a high-performance air filter system) in enclosed spaces, remain the most important, effective, straightforward, and economical means of keeping the pandemic under control. Concerning a possible deterioration of the situation in autumn and winter, uniform rules and escalation levels ought to be defined nationally, with protective measures taking effect in line with regional infection rates. These need to be regularly re-assessed and adjusted as required. Key is the obligation to wear a mask covering the mouth and nose in all indoor spaces, if minimum distance and frequent exchange of air are not guaranteed. This is particularly important in light of many asymptomatic persons who are nevertheless infectious. With respect to all protective measures, it is important to do more to uphold the rights of affected persons, for example in care homes, and to give due consideration to their social needs.

## **2. Rapid, targeted testing, reduced quarantine and isolation periods:**

The following steps remain key to controlling the rate of infection: 1. targeted testing depending on the respective risk of infection; 2. establishing test strategies which prioritise groups requiring heightened protection; 3. digitisation strategies which reduce the time between testing and notification of the test result; 4. the availability of validated, time-saving test procedures which are independent of laboratories and thus decentralised, in order to, among other things, differentiate more quickly between a SARS-CoV-2 infection and illnesses such as influenza with similar symptoms. Rapid antigen tests could, despite lower specificity and sensitivity than PCR testing, provide evidence of infectiousness. Access, use, and the consequences of a positive test result should be regulated by decree, particularly with respect to the implementation of the reporting obligation. Easily accessible, comprehensible, and reliable procedures for testing, notification of results, and interpretation are important.

In order to reduce the negative impact on individuals, family members, and the economy and society, the isolation period following the onset of symptoms could, in the case of a positive test result, be reduced to around one week. Laboratory tests can be used to estimate the current infectiousness. Similarly, the quarantine period for persons who have been exposed to a high risk of infection (Category I contacts, for example following contact with a person proven to be infected or a stay in a high-risk area) could, according to recent assessments, be reduced from 14 to 10 days.

## **3. Facilitating responsible behaviour:**

Over the coming months, successfully controlling the pandemic will depend on implementing the well-known protective measures more consistently than has been the case up to now. To facilitate this, citizens require easy and barrier-free access to knowledge which is tailored to specific groups, motivation, and the possibility to behave accordingly, as well as clear rules. Greater attention must be given to the particular needs of young adults. Ideally, the rules of behaviour should become second nature. Clearly visible, motivating, and relevant reminders of the rules in public spaces, as well as people who are seen as role models in society practising such behaviour, are also important factors. Transparently communicating the basis, procedures, and goals of policies is equally important and motivating.

## **4. Alleviating social and psychological effects:**

Psychological problems have increased during the pandemic, with potentially long-term consequences for the health of many people. The structures and possibilities for appropriate assistance are thus more important than ever, in particular significantly greater provision of psychotherapeutic or psychiatric treatment and counselling to both prevent and respond to problems. One important preventive strategy is promoting exercise as a way of building up resilience.

## Starting point

In recent months, the German National Academy of Sciences Leopoldina has published a number of ad-hoc statements containing recommendations on possibilities for intervention and strategies relevant to health, on medical care and patient-oriented research, as well on a crisis-resistant education system.<sup>1</sup> Building on the preceding statements, the present 6th ad-hoc statement examines necessary strategies for successfully controlling the pandemic during the autumn and winter.

Since late July, the number of registered infections with SARS-CoV-2 has again been rising in many German regions. This trend is even more pronounced in other European countries (e.g. France, Spain, the Netherlands, Austria) or in Israel, where in some cases the numbers already exceed those from the end of March 2020 (Fig. 1). Current knowledge suggests that the primary reasons for this are increasing (international) mobility and people socialising more in larger groups. At the same time, the arrival of autumn brings a series of challenges which will make controlling the rate of infection and dealing with the pandemic more difficult. These include falling temperatures, group activities taking place indoors, the upcoming autumn and winter holidays, and more social activities during Advent and at Christmas. Furthermore, the onset of the cold and flu season involves the added difficulty of distinguishing infections with SARS-CoV-2 from other illnesses with similar symptoms.

Predictions regarding the development of the pandemic remain highly uncertain. Even optimistic predictions do not envision large quantities of an effective vaccine being available before spring 2021<sup>2</sup>, the widespread distribution of which would then have to follow on a step-by-step basis which has yet to be determined. To date, the effectiveness of medicinal therapies in treating COVID-19 patients has also been limited.

In recent months, important insights have been gained, particularly regarding the ways in which SARS-CoV-2 is transmitted. While infection from contact with contaminated surfaces seems to play a minor role, and infection via droplets remains a key factor, greater focus is also now being placed on transmission via aerosols in poorly ventilated spaces which are full of people.<sup>3,4</sup>

In order to stop the pandemic from again becoming difficult to control, also in Germany, it is essential for the responsible actors on the federal and state level to agree on national, effective, and uniform rules for preventive measures and to ensure that these measures are implemented and complied with more consistently than has been the case to date.

Individual behaviour is a key factor in controlling the pandemic, including in colder seasons. In addition to communicating current knowledge about the virus, it is important to find ways of increasing acceptance of existing protective and hygiene regulations and ensuring compliance.

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<sup>1</sup> The statements are available at: <https://www.leopoldina.org/en/press-1/news/ad-hoc-statement-coronavirus-pandemic/>.

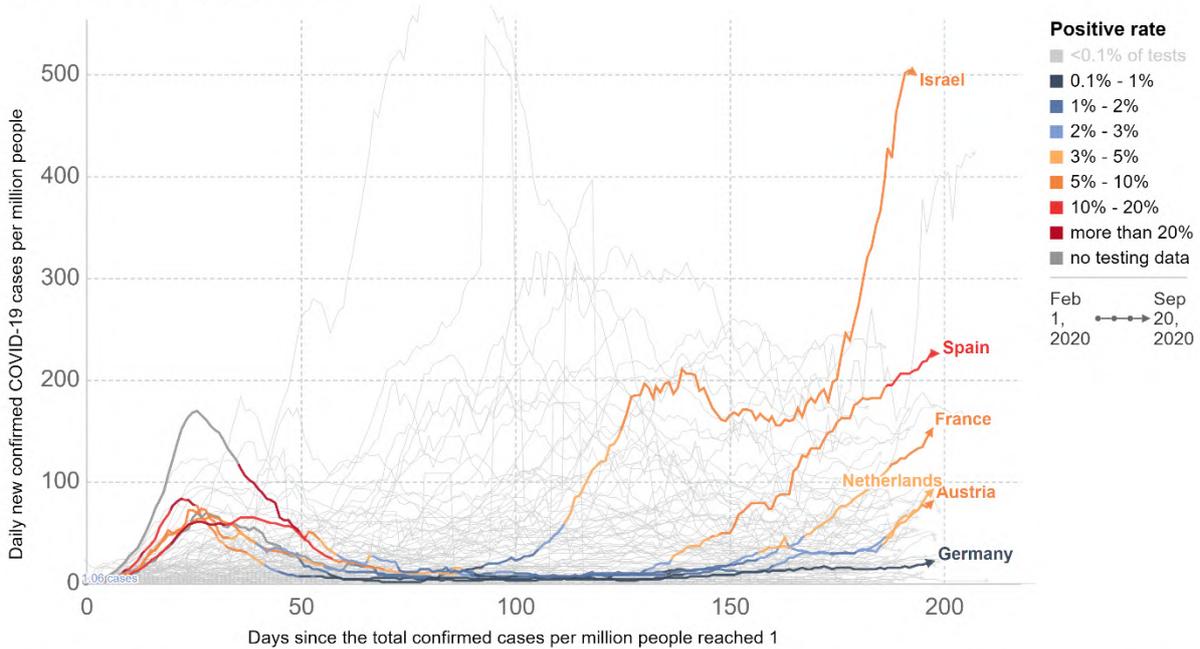
<sup>2</sup> See [https://www.vfa.de/de/arsneimittel-forschung/woran-wir-forschen/impfstoffe-zum-schutz-vor-coronavirus-2019-ncov \(Version: 17/09/2020\)](https://www.vfa.de/de/arsneimittel-forschung/woran-wir-forschen/impfstoffe-zum-schutz-vor-coronavirus-2019-ncov (Version: 17/09/2020))

<sup>3</sup> See Robert Koch Institute (2020)

<sup>4</sup> van Doremalen et al. (2020)

# Daily new confirmed COVID-19 cases per million people

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases; the main reason for that is limited testing.



Source: European CDC – Situation Update Worldwide – Last updated 20 September, 10:34 (London time), Official data collated by Our World in Data  
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**Fig. 1:** Number of daily new infections (per million inhabitants) and proportion of persons who tested positive in Germany, France, Spain, Austria, the Netherlands, and Israel (period from 1 February 2020 to 20 September 2020, taken from <https://ourworldindata.org/coronavirus> on 20 September 2020).

Even if the number of new infections is likely to rise in the coming months, the goal must remain to keep public and economic life functioning and to prevent the closure of educational institutions.<sup>5</sup> Concerning persons who depend on specific institutions, such as those living in care homes, it is important in the next few months to consider not only their physical health, but also to uphold their rights and give due consideration to their social needs. In addition, supportive measures should be available to sectors of the population which are particularly burdened by the current situation, such as single parents, people with mental illness, or people with little formal education.

## 1 | Consistent compliance with protective measures

Complying with the well-known protective measures, particularly those concerning physical distance, hygiene and the wearing of a mask, as well as regular exchange of air (if applicable, aided by a high-performance air filter system) in enclosed spaces, remain the most important, effective, straightforward, and economical means of keeping the pandemic under control. These protective measures can reduce the risk of infection (see Box 1).

<sup>5</sup> For more on education, see the statement (in German): Coronavirus-Pandemie: Für ein krisenresistentes Bildungssystem <https://www.leopoldina.org/publikationen/detailansicht/publication/coronavirus-pandemie-fuer-ein-krisenresistentes-bildungssystem-2020/>

**Box 1: Airborne transmission of SARS-CoV-2**

Virions with a diameter of approx. 0.15 µm are generally spread as part of larger particles in the air in the form of droplets (standard definition: > 5 µm) and aerosols (standard definition: < 5 µm). It is assumed that the larger droplets generally fall to the ground in a radius of approx. 1–2 m, while aerosols spread through the entirety of enclosed indoor spaces and remain longer in the air due to normal air movements. However, the boundaries between droplets and aerosols are not strictly defined. There are hardly any known instances of SARS-CoV-2 transmission in the case of contact outdoors with appropriate physical distancing. It can therefore be assumed that regular exchange of air, if applicable using high-efficiency particulate air (HEPA) filters, significantly reduces the risk of an infection in enclosed spaces.<sup>6</sup> However, the science is still uncertain regarding the significance of aerosols in infections.<sup>7</sup> In hospital rooms of infected persons, infectious viruses in aerosols have been detected at a distance of more than 2 m.<sup>8</sup> The viruses become fully inactive within several hours in the air.<sup>9</sup> It is not fully clear how many infectious virus particles need to be inhaled for a serious infection to occur.

Even if not all the facts are known, a correctly worn mask covering the mouth and nose<sup>10</sup> in combination with frequent exchange of air reduces the risk of virus transmission: Calculations show<sup>11</sup> that regular shock ventilation can reduce the risk of infection by around 50%, while wearing a mask in addition can make infection five to ten times less likely.

Based on current knowledge, large gatherings of people at which the necessary physical distance, the wearing of a mask, and an appropriate exchange of air cannot be guaranteed, should still not take place. In particular, group activities in enclosed spaces which lead to heightened transmission via droplets and aerosols, such as sport, singing, or speaking at volume, should either not take place or only with special protective measures.

Concerning a possible deterioration of the situation in autumn and winter, uniform rules and escalation levels ought to be defined nationally, with protective measures taking effect in line with regional infection rates, and all subject to regular reassessment and revision as required.

## 2 | Rapid, targeted testing, reduced quarantine and isolation periods

Targeted testing for an acute infection with SARS-CoV-2 and the targeted, preventive quarantining of persons from an infection cluster remain key to tackling the coronavirus pandemic. Easily accessible, comprehensible, and reliable procedures for testing, notification of results, and interpretation are important aspects of this process. Further digitisation of data records, and a fully accessible, rapid notification of results and their consequences are vitally important. In light of anticipated shortages of PCR tests – in part due to globally limited test reagents and materials – the conditions and regulations for the use of validated, rapid, and cost-effective antigen tests should be established as soon as possible (see Box 2). To date, such tests have largely not been permitted in Germany. Article 24 of Germany's Protection against Infection Act (IfSG) currently allows only doctors to diagnose one of the illnesses (which include Covid-19) mentioned in Article 6 IfSG. Permitting rapid antigen tests as a

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<sup>6</sup> See statement (in German) by the Indoor Air Hygiene Commission (IRK) at the Federal Environment Agency (2020). <https://www.umweltbundesamt.de/dokument/stellungnahme-kommission-innenraumlufthygiene-zu> (Version: 17/09/2020)

<sup>7</sup> Klompas et al. (2020)

<sup>8</sup> Lednicky et al. (2020)

<sup>9</sup> van Doremalen et al. (2020)

<sup>10</sup> Drewnick et al. (2020)

<sup>11</sup> Lelieveld et al. (2020)

means of primarily identifying infectious people could significantly relieve the burden on doctors, even though the sensitivity and specificity of such tests is considerably lower than that of PCR tests. Access to and use of such tests (in pharmacies and doctors' practices) as well as the consequences of a positive test result need to be clearly regulated by decree. This includes the implementation of the obligation to report the result.

The aim must be to further reduce the time between test and result and, in particular, to record infectiousness, as the need for isolation measures is based on this. On average, it takes two days for the virus to be detectable following infection, and five days for the first symptoms to appear. As a rule, the infectious phase begins two to three days before symptoms appear and ends roughly seven days later.

This means that, in the case of a positive result, the mandatory isolation period could be reduced to about one week. To estimate the remaining level of infectiousness, PCR/virus load criteria can be used. Similarly, the quarantine period for persons who have been exposed to a high risk of infection (Category I contacts, for example following contact with a person proven to be infected or a stay in a high-risk area) could, according to recent estimates, be reduced from 14 to 10 days. Both approaches can reduce the negative impact on individuals and family members, as well as on the economy and society.

Testing should be prioritised among groups and living situations in which infection can spread more easily and widely, for example in care homes and community facilities. Easily accessible testing and advice should be available to people whose work involves high risk of exposure to the virus.

#### **Box 2: Available testing systems for SARS-CoV-2**

**1.** As a rule, **PCR tests** detect the RNA of viruses in a swab from the mouth, nose or throat via a biochemical reaction (RT-PCR) in a laboratory which takes about two-and-a-half to five hours. Tests from various manufacturers with various target genes are used, the analytic and clinical validity of all of them has been established. The detection of virus RNA via RT-PCR is evidence of an infection in the person who has tested positive. All the tests used exclude the possibility of RNA specific to SARS-CoV-2 being confused with RNA of other viruses (including other coronaviruses) or with RNA belonging to the body. The rate of false positive tests in diagnostic RT-PCR testing is considerably lower than indicated by the purely technical specificity data concerning individual RT-PCR tests, as initially positive tests are subject to an additional test to confirm the result. This may involve testing for additional target genes, repeated testing of the same sample or an additional patient sample, differential testing for other pathogens compatible with the symptoms, as well as the diagnostic use of additional laboratory parameters, especially antibody results. Alternatives to RT-PCR testing (e.g. RT-LAMP) have been developed and are on the way to being granted approval. However, it is not expected that alternative laboratory-based test formats will lead to faster or more efficient laboratory diagnosis, as the actual challenges in the laboratory are rooted in the logistics surrounding samples, in pre-analysis, and in validating and communicating results. Using different molecular testing methods will not change any of this.

**2. Antibody tests** generally detect antibodies in the blood binding to SARS-CoV-2. In the case of these tests, too, the logistical, pre- and post-analysis necessities considerably exceed the time required for the actual testing procedure in the laboratory. Immune cells (T cells) can also, without detectable antibodies, play a decisive role in combating infection.<sup>12</sup> Due to the sensitivity and limited life span of immune cells, there are no routine laboratory tests for them. A positive antibody test for SARS-CoV-2 provides fundamental evidence that infection was present. As both the antibody response which is detected and the T-cell response

<sup>12</sup> Stringhini et al. (2020)

which is not detected by the test arise in the case of infection, a positive antibody test also implies immunity. This fact is not undermined by individual reports of a second infection occurring several months after the first. In rare cases, cross-reactivity with antibodies for other coronaviruses which might cause, for example, cold-like symptoms and diarrhoea, can cause a positive test result in antibody tests without, however, meaning there is cross-immunity to SARS-CoV-2. To date, antibody tests have played a minor role in the fight against the pandemic.

**3. Rapid antigen tests:** The tests identify specific proteins of the virus, and display the result in a manner comparable to home pregnancy tests. Over the next few weeks, products from various manufacturers will be available for use. Approval for these tests generally includes European CE quality certification, though this does not mean they are approved for home- or self-testing. For regulatory reasons, only healthcare professionals are allowed to use the tests. Major requirements have to be met before these tests are approved for home use. However, use outside the laboratory offers considerable advantages, enabling new kinds of diagnosis and improved contact in areas where there have been major restrictions (for example, visiting care homes and attending events). According to current information, such tests are cheaper than PCR testing. The tests' sensitivity is considerably lower than that of PCR, but seems sufficient to identify persons who are currently infectious. For the sake of specificity and ensuring reliable diagnoses, positive results from rapid antigen tests should be confirmed (or corrected) by a subsequent PCR test.

### 3 | Facilitating responsible behaviour

The population's willingness to follow recommended and sensible rules of behaviour depends partly on appropriate communication which is attuned to a fluctuating situation. It is necessary to: 1. communicate the reasons for policy decisions and the uncertainty which such decisions involve; 2. reveal the procedures and criteria which form the basis of the essential considerations in the decision-making process; and 3. reflect on the possible economic and social effects of both decisions taken and of alternative courses of action/behaviour, in particular not taking any measures at all.

To make it easier for citizens to continue to comply with protective measures – and to do so more consistently than has been the case thus far – they need knowledge, motivation, and the possibility to behave accordingly<sup>13,14</sup>, as well as clear rules. The rules of behaviour should become second nature. To make such habits automatic, clear “if...then” rules<sup>15</sup> (e.g. about when to wash hands or ventilate) and an appropriate setup of the environment<sup>16</sup> are necessary, for example by providing free masks to cover the nose and mouth in the workplace. Clearly visible, motivating, and relevant reminders of the rules in public spaces, as well as role models setting a positive example by clearly practising such behaviour, are also important factors. Failure to comply with the obligation to wear a mask over the nose and mouth must be fined everywhere, in order to emphasise the importance of such rules. A current study shows that only 77% of people surveyed will wear a mask if it is a mere “recommendation”, while 97% will comply if it is obligatory.<sup>17</sup> Avoiding infecting others either intentionally or through negligence corresponds to the legal obligation not to injure third parties, rather than being, as is often claimed in the public debate, merely a question of ethical solidarity.

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<sup>13</sup> Michie et al. (2014)

<sup>14</sup> Webb & Sheeran (2006)

<sup>15</sup> Rothman et al. (2015)

<sup>16</sup> Norman (2013)

<sup>17</sup> A majority of people in both high-risk and non-high-risk groups considered such an obligation fairer than a voluntary recommendation. (Betsch, Korn, Sprengel, et al., 2020).

At the same time, greater attention must be given to the particular needs of adolescents and young adults. This phase of life is typically characterised by leaving the parental home and moving in new, frequently changing groups while preparing for professional life and dating.<sup>18</sup> Behavioural recommendations should be developed which allow young people to experience this phase of life in a responsible manner in the context of the pandemic. This requires, among other things, targeted educational campaigns on media which this group uses, if possible involving influential role models and influencers.

Knowledge, motivation, and trust are important requirements for behaviour, which is why transparent and comprehensible communication about the risk of infection and possible consequences are key. This includes communicating key figures and the reference values for such figures in a clear way, while admitting to uncertainties concerning interpretation, and explaining the possible effects of preventive measures. Another aspect is the way in which communication is framed. For example, the term “recovered” is often used in the media, which suggests a return to full health. However, there is growing evidence that even mild cases of infection can lead to longer lasting effects on health.<sup>19</sup> The term “recovered” should therefore be used with caution and with reference to the uncertainty surrounding possible longer-term consequences.

Information concerning health and the consequences of testing must be fully accessible and tailored to the needs of various groups in a diverse society. Various forms of communication (social media, print media, radio and television, posters, video clips, etc.) should be used. Infographics and animation can show the links between particular kinds of everyday behaviour and the associated risks.<sup>20</sup> In addition, emphasis should be placed on overarching values such as the protection of persons in vulnerable groups<sup>21</sup>, appealing to a sense of community (e.g. with demonstrations of solidarity among neighbours) and altruism (behaviour which helps others while providing no benefit to oneself), but also pointing out the universal interest in having a functioning education system, economy, and societal institutions. It is also important to boost self-efficacy, in particular by drawing attention to previous successes caused by changes in behaviour.

Furthermore, the appeal to the public to comply with behavioural rules which help to tackle the pandemic should be reinforced by pointing out that the overwhelming majority of the population is complying.<sup>22</sup> If the media focuses on deviations from these behavioural rules, it risks a boomerang effect, with people thinking that the majority do not stick to the rules anyway and so non-compliance is the norm.<sup>23</sup> It cannot be over-emphasised that the few essential rules (physical distance, masks, hygiene, ventilation) are both relatively easy to adopt and effective.

## 4 | Alleviating social and psychological effects

Psychological problems have increased during the pandemic, with potentially long-term consequences for the health of many people. In addition, the negative socio-economic effects of the crisis (unemployment, bankruptcies, etc.) will become even clearer in the coming months, which will further heighten the psychological burden on the population. Decision-makers in politics, legislation,

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<sup>18</sup> Among young people, in particular, social support and acceptance by peer groups is key to identity development and a sense of well-being (Chu et al., 2010).

<sup>19</sup> See Marshall (2020).

<sup>20</sup> Betsch, Korn, Felgendreff, et al. (2020)

<sup>21</sup> Ryan & Deci (2000)

<sup>22</sup> Tuncgenc et al. (2020)

<sup>23</sup> Schultz et al. (2007)

and administration should make extra effort to show that they are very aware of the risks and harmful effects – which sometimes lie in the future and are often not immediately visible – arising from attempts to tackle the pandemic (and not just from the pandemic itself) and that they give them due consideration. In order to maintain mental and physical well-being in the coming winter months, supportive structures are more vital than ever, as well as significantly greater provision of psychotherapeutic or psychiatric treatment and counselling to both prevent and respond to problems.<sup>24</sup> One important preventive strategy is promoting exercise as a way of building up resilience. More attention should also be given to the psychosocial burden of quarantining and isolating, and appropriate support, such as telephone hotlines or online therapy, should be available.<sup>25</sup>

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<sup>24</sup> Vinkers et al. (2020)

<sup>25</sup> Brooks et al. (2020)

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## Further reading

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