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## Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

**Appendix S1** Situation in Japan in January to April 2020.

**Appendix S2** Methods.

**Appendix S3** Descriptive statistics of the mental health variables.

**Figure S1** Logistic regression results for the prevalence of depression symptoms (nine-item Patient Health Questionnaire score > =10).

**Figure S2** Logistic regression results for the prevalence of anxiety symptoms (7-item Generalized Anxiety Disorder Scale score > =10).

**Table S1** Descriptive statistics of the sample stratified by the mental health variables.

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# Forced social isolation due to COVID-19 and consequent mental health problems: Lessons from *hikikomori*

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The COVID-19 pandemic has forced a worldwide lockdown with huge numbers of citizens confined to their homes,[1] often resulting in social isolation, which may lead to mental health problems. One of the best examples of consequences of severe social isolation is the condition known as *hikikomori* – a form of severe social withdrawal that was originally described in Japan in the late 20th century and has more recently been found worldwide.[2–4] In the 2010 guideline on *hikikomori* by the Japanese Ministry of Health, Labour, and Welfare, the definition of *hikikomori* was described as an avoidance of social participation, which in principle has continued under the condition of being housebound for a period of more than 6 months.[5]

There are similarities and differences between *hikikomori* and COVID-19-related social isolation. Just recently, we developed a draft set of international *hikikomori* criteria, which defines the severity as mild, moderate, or severe depending on whether the person leaves home up to 3 days a week, one or fewer days per week, or rarely leaves a single room.[6] Individuals experiencing COVID-19-related social isolation may be measured using the same scale; however, it should be recognized that individuals with *hikikomori* avoid social situations voluntarily, while COVID-19-related social isolation may be enforced by government restrictions and/or due to an individual's fears of infection.

In the past two decades, numerous studies have investigated the psychological impact of quarantine (i.e., forced social isolation) due to epidemics, such as SARS and MERS, revealing that the experience of quarantine is associated with higher prevalence of stress-related mental disturbances, such as anxiety, depression, and especially avoidance behaviors.[7] Similarly, based on our clinical experiences, traumatic events, such as economic, social, or political crisis, can cause even previously healthy people to avoid social contact and enter a *hikikomori* state with psychiatric conditions.[3] Thus, we herein hypothesize that COVID-19-induced social isolation and the consequent economic crisis may be risk factors for *hikikomori* in the post-pandemic world.

At onset, individuals with *hikikomori* tend not to suffer and are satisfied because they have escaped real-world stresses. However, longer lasting social isolation gradually increases loneliness, which is a crucial risk factor for mental disturbances, including anxiety, depression, and addiction disorders.[3] Prolonged home confinement may lead to domestic discord, domestic violence, and in extreme cases even homicide.[2] If COVID-19-induced social isolation were to last more than several months, similar *hikikomori*-related problems might occur much more frequently among the huge numbers of individuals who are forced to stay at home. In fact, COVID-19-related family violence and homicides have already emerged.

The Internet and its related social media platforms are believed to be useful tools to combat social isolation and physical distance. However, there is little evidence about the effectiveness of substituting direct contact among people by communication via the Internet. In addition, it is highly probable that there are pathogenetic links between life in a society relying on Internet communication, social isolation, and mental health problems, including Internet addiction,[8] and that therefore social isolation and the reliance on the simple virtual tools widely used during the current crisis elevate the risk of Internet addiction and other disturbances of mental health. It is possible that the introduction of 'face-to-face'-like communication systems with innovative technologies, such as virtual reality and humanoid robotics, would prevent or reduce COVID-19-induced mental health problems.

Even though no statistical data exist, there are anecdotal examples of people in Japan and perhaps elsewhere who fear that their COVID-19-positive status might become known in their community and this makes them hesitate to take a polymerase chain reaction test – a behavior similar to that of individuals with *hikikomori* and their family members, who avoid contact with psychiatrists in order to avoid being given a psychiatric diagnosis. In Japan and some Asian countries, both fears are probably deeply rooted in traditional-culture-based shame (*haji*) and social ostracism (*murahachibu*), which have, during past epidemics and economic crises, often led those sick or financially ruined to commit suicide.[3, 9] Recent reports of COVID-19-related suicides might support this hypothesis.[9] Action against COVID-19 must therefore include a component addressing the prevention of stigmatization of the disease to avoid covert spread of the disease and other consequences of stigma related to the disease, such as depression and suicide.

Generally, *hikikomori* support programs are designed to change avoidance behaviors of persons with *hikikomori*.[5] We have recently developed a family-based educational program to reduce the stigma toward psychiatric disorders and the risk of family violence, suicide, and other mental disturbances due to *hikikomori*, using lectures and role-play sessions.[10] This program is based on the Mental Health First Aid, which aids

in the detection of early signs of mental health problems before onset, and the Community Reinforcement and Family Training that was originally developed for family members of individuals with addiction disorders.[10] We believe that these *hikikomori* support programs especially using online educational systems might be useful in the effort to make social isolation more tolerable and prevent its negative consequences.

COVID-19 may be changing global society in fundamental ways, hastening the online revolution as virtual spaces and environments supersede traditional boundaries, such as the urban and rural. To overcome this current chaos, psychiatric specialists along with experts from a wide-ranging number of fields, such as psychology, engineering, sociology, and politics, must take action to provide for the new reality of global mental health.

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## Disclosure statement

All authors declare that they have no conflicts of interest.

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# Forensic psychiatry in the time of coronavirus: The Italian security residences put to the test in a public health emergency

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The COVID-19 emergency has significantly affected the functioning of almost all activities in Italy.[1] Health-care services have been heavily involved. Even those not on the frontline dealing with the outbreak have had to immediately change their operational procedures.[2, 3] Hospitals have been largely adapted to the reception of COVID-positive patients and local residential facilities have set up barriers both to the entry of new patients and to outside visitors. Many patients returned home where isolation could be guaranteed. Even in prisons, visits by external staff were suspended and procedures for inmates' release, when legally possible, were accelerated. With the definitive closure of forensic psychiatric hospitals in Italy, security residences (REMS) have been established in all regions.[4] REMS are territorial psychiatric rehabilitative health facilities for offenders who are mentally incapacitated and considered to be highly dangerous to society; each REMS can accommodate 20 patients. Most of the offenders are treated in the ordinary psychiatric residential facilities, which in our region treat 2500 patients, with about 10% of them offenders.[5]

With the start of the COVID-19 Phase 1, characterized by the total lockdown of the population, an operational procedure adapted from the guidelines laid down at the national level by the National Health Authority[6] was prepared in Piedmont specifically for the two local REMS. The application of these regulations has led to various modifications, some of which are particularly significant. First of all, inclusion in REMS was limited to people already in prison or people who were difficult to control in the community during lockdown. The waiting list[7] to enter the REMS was, therefore, blocked and court orders were temporarily put on hold, particularly where clinical and safety monitoring were guaranteed in the patients' current placements. Swab-positive COVID patients have been managed in isolation within REMS if they are asymptomatic or paucisymptomatic and are directed to hospitals if they present more severe symptoms. The REMS that had positive cases among their patients had to be divided into two zones – COVID and COVID-free zones, respectively – with separate routes of entry. Comprehensive use of appropriate personal protective equipment was also initiated.

The facilities have been equipped to allow video contact with relatives and, in the case of REMS, also with lawyers and magistrates; all physical contact with people from the outside has been suspended.

Group-level activities have been reorganized, also in a participatory way with the help of patients; team meetings and all activities involving the simultaneous presence of several people have also been regulated. Only activities involving a limited number of patients together have been maintained if physical distancing and the use of surgical masks is guaranteed in large and well-ventilated spaces, or, when possible, outdoors.

Activities outside the perimeter of the facility, even if authorized by the Judicial Authority, have been limited to situations deemed essential by the facility manager, based on the patient's condition, excluding individuals under health surveillance (i.e., those placed in isolation after testing positive for COVID-19).

Patients have been actively supported in complying with prevention regulations, actively promoting distancing from other patients and staff, as well the use of the surgical masks and frequent hand-washing.