Literature screening report

Topic: Non-pharamaceutical interventions to control COVID-19

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Content

Preamble

A large number of scientific publications become available on a daily basis, reflecting the rapid development of knowledge and progress of science on COVID-19 related issues. Leading authorities should base decisions or policies on this knowledge; hence they need to master the actual state of this knowledge. Due to the large number of publications shared daily, decision makers heavily depend on accurate summaries of these publications, in the different public health domains. Therefore, the authors of this report were mandated by the Swiss School of Public Health plus (SSPH+), on request of the Federal Office of Public Health (FOPH), to inform the FOPH on recent findings from the literature.

Literature screening report: Non-pharamaceutical interventions to control COVID-19 *Non-pharamaceutical interventions to control COVID-19 – 10.02.2021. Authors: Sonja Merten and Kristen Jafflin*

Background

In response to a request by the Federal Office of Public Health we provide an overview of the current state of knowledge at the international level as regards the effectiveness of non-pharmaceutical measures to control COVID-19.

Questions addressed

Question 1: Which non-pharmaceutical measures have the greatest effect or effectivetheness in combating pandemic?
Question 2: Related to this, in which locations or settings is there the greatest (or least) risk of transmission of SARS-CoV-2?
Question 3: Sub question: Which psychological or social effects / side effects of the measures are known?

Methodology

We conducted a review of the literature on the effectiveness of non-pharmaceutical measures to control COVID-19, with a focus on measures implemented also in Switzerland. In a first step we reviewed the Cochrane Special Collection, «Coronavirus (COVID-19): infection control and prevention measures» for recent Cochrane reviews related to the above subjects. This was followed by a search of the LitCovid database subsections 'Transmission' and 'Prevention' and a broader PubMed search. The PubMed search strings used included the MeSH terms covid-19 or sars-cov-2 in combination with various terms for different non-pharmaceutical interventions. These terms were identified from a taxonomy and glossary by the World Health Organization listing non-pharmaceutical interventions that may be implemented to limit the spread of COVID-19. Measures reviewed included:

- **Individual measures**, such as hand hygiene, wearing a mask, using other personal protective equipment.
- **Surveillance and response measures**, including active and passive case detection and isolation, tracing and quarantining contacts, and implementing quarantine.
- **Social and physical distancing measures**.
- **Measures targeting offices, businesses, institutions and operations**:
- Adaptations, such as home office, mask requirements, technical barriers,
- Closure of non-essential businesses.
- **Gatherings, businesses and services:**
- Restricting private gatherings at home and in public, restricting mass gatherings, restricted opening hours for shops/services**,**
- **Domestic and international travel.**

Current Swiss measures that are not easily classified according to this schema include restrictions on singing and restrictions on sports including ski resorts. Environmental measures such as cleaning and

disinfecting surfaces, improving air ventilation or increasing room humidification were not included in the search as these measures are not part of regulations directed at the general public in Switzerland; similarly, measures targeting special populations such as pregnant women were not included in the search.
In addition we conducted a second search on the **mental health and psychosocial impacts of COVID-19** and related measures. The body of literature on this topic is however vast and warrants an own search. Several projects are currently trying to curate the emerging literature on mental health and Covid-19 (e.g. MHCOVID Project).

Using different search strings we searched PubMed, PsychInfo, the NIH and PMC Europe collections of Covid-19 resources, Evidence-AID, Epistemonikos, for peer-reviewed publications and pre-prints. In addition we searched the websites of selected governmental and non-governmental organizations. Websites included were:

- Bundesgesundheitsministerium (Deutschland) https://www.bundesgesundheitsministerium.de/coronavirus.html
- Robert Koch Institut (Deutschland) https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/nCoV.html
- Government website, France https://www.gouvernement.fr/info-coronavirus
- INSERM (France) https://www.inserm.fr/information-en-sante/dossiers-information/coronavirus-sars-cov-et-mers-cov
- Institut Pasteur https://www.pasteur.fr/fr/sars-cov-2-covid-19-institut-pasteur
- CDC website
- WHO.INT and WHO EURO website
- ECDC website

We identified a rapid review on the effectiveness of NPI conducted by the Robert Koch Institute in September 2020 [1], which covers the literature available until end of July 2020. Therefore, we included only literature that was published later in our review.

Two reviewers screened about 1500 search hits and retained 49 systematic reviews, analyses of large multi-country databases, and data-informed modelling studies for inclusion in this rapid review. Due to the narrow time frame we are likely to have missed some publications, however, as we had to limit our search to a selection of databases. In addition, three documents were retained from the grey literature search.
The articles were then summarized in a table and indexed by topic. The findings are presented in a narrative summary answering to the three research questions.

Results and Findings

Question 1: Which non-pharmaceutical measures have the greatest effect or effectivetheness in combating pandemic?

1.1 Individual measures

Summary: Face masks, physical distancing and use of protective eye wear were all shown to reduce risk of contracting or transmitting SARS-COV-2/COVID-19

Results: Several recent systematic reviews and meta-analyses were published, which focused on individual measures to prevent SARS-Covid-2 infection, primarily the use of face masks, as well as physical distancing and hand hygiene. We identified 9 recent systematic reviews looking and individual-level NPIs, including wearing of face masks and other personal protective equipment (PPE) [2-10], hand washing, and physical distancing, 6 of which included meta-analyses [2-4,6,7,11]. They find decreased relative risk or adjusted odds ratios (aOR) of contracting COVID-19 associated with mask wearing [4-7,10], physical distancing and use of eye protection [6]. When ranked, all three NPIs provided similar levels of protection (aOR of contracting COVID-19 between 0.15 and 0.22), although the quality of the evidence base is highest for physical distancing [6]. Three studies examined the efficacy of different types of face masks (cloth vs. medical masks) and found either no evidence of the protectiveness of cloth masks [8] or that cloth masks were not as effective as surgical masks [9,12]. One review summarized the evidence of mask use by children, showing that evidence is still limited [13].

1.2 Community measures

Summary: Early and more stringent measures and gradual reopening are associated with better health outcomes. Multiple studies find cancelling small gatherings and closing educational institutions to be among the most effective measures, with other effective measures being border restrictions, increasing availability of PPE, restricting individual movement, national lockdowns, offering income support and debt/contract relief, and closing non-essential businesses like restaurants, bars and night clubs.

We identified 30 studies related to community-level NPI, including 14 systematic reviews, 10 original studies, and 6 modelling studies. Multiple studies, including both comparative studies and modelling, found that the timing of imposing and lifting restrictions had an important impact on outcomes, with early onset of stricter restrictions and gradual reopening associated with better outcomes than later or heterogeneous implementation of restrictions and abrupt re-openings [14-18]. Similarly, studies found better outcomes with cumulative measures (e.g., social distancing, masking and quarantine) than single measures [19] and stricter measures had greater impact than less strict measures [20]. Studies ranking the effectiveness of different NPI, as measured by their effect on R0 as an indicator to measure the transmission of SARS-CoV-2 found that the most effective interventions were: cancelling small gatherings, closing educational institutions, border restrictions, increasing availability of PPE, restricting individual movement, and national lockdowns [21]; closures of non-essential businesses like bars, restaurants and night clubs; school and university closures, limiting gathering sizes to 10 people or less [22], and school closures, internal movement restrictions, work closures, income support and

debt/contract relief, and limiting gathering size to 10 people of less [23]. A study limited to OECD countries found that the limitation of gatherings had the greatest effect on average daily growth rate of SARS-CoV-2 cases, followed by mask wearing, school closures, and workplace closures [24]. One original study found school closure to be the only effective intervention, especially if combined with contract tracing [25], while a systematic review found school closures being ineffective to very effective with studies being at risk of confounding and collinearity from other non-pharmacological interventions implemented close to school closures [26]. One modelling study showed that it took 1-3 weeks for the effect of the implementation of an NPI to be seen on community R_0, and longer to see the effect of reopening measures [27].

Question 2: Related to this, in which locations or settings is there the greatest (or least) risk of transmission of SARS-CoV-2?

Summary: Existing evidence does not allow us to rank settings by their transmission risk. However, evidence suggests that transmission levels in schools and health care settings are low, particularly with protection measures in place, whereas household transmission is higher. Studies have found high levels of transmission in various settings, including meetings, a chalet, in choirs, while eating, traveling and at religious events.

We reviewed the literature on SARS-COV-2 transmission in schools. While some studies found that school closures were among the most effective measures at controlling COVID-19 transmission [21-23,25], studies of transmission in school settings generally find relatively low levels of transmission, particularly among children [28,29] and haven't found increased transmission associated with school re-openings with protective measures in place in the fall [30].

In addition, we reviewed two studies systematically reviewing the literature on transmission in different settings, either through studies examining the secondary attack rate (SAR) associated with different settings [31] or with a review of observed clusters in different settings [32]. Numerous studies document clusters of SAR in households or healthcare settings, finding a "pooled household SAR of 18.1% (95%CI: 15.7%-20.6%)" and "pooled healthcare SAR was 0.7% (95% CI: 0.4%, 1.0%)". Within households, transmission was more likely to occur if the index case was symptomatic. It was further found that close contacts who were adults were more likely to develop COVID-19 than close contacts who were children, and that spouses had a higher risk of infection than other household contacts. [31] There were too few studies in other settings to estimate pooled SAR, but the review notes that studies find high SAR at a meeting, in a chalet and at choirs, and relatively high SARs while eating and traveling and at a religious event [31]. The review of observed clusters similarly finds clusters associated with non-household gatherings, public transportation, shopping malls, conferences, among tourists, at religious organizations and among workers [32]. Neither study reviewed studies of transmission at sporting events, but similar clusters have been associated with such events [33].

Question 3: Sub question: Which psychological or social effects / side effects of the measures are known?

3.1. Prevalence of mental health problems

Summary: Prevalence of many mental health problems are at least 3-4 times higher during the COVID-19 pandemic, including anxiety, depression, post-traumatic stress disorder, psychological stress, and insomnia. Groups at heightened risk of mental health problems include healthcare workers, people with chronic illnesses, survivors of COVID-19, younger people, and pregnant women.

We reviewed ten systematic reviews and meta-analyses that examined the prevalence of psychological outcomes in the general population during the pandemic or lockdown periods. Multiple meta-analyses calculated pooled prevalence of major psychological outcomes during the COVID-19 outbreak or during major disease outbreaks including COVID-19. They found pooled prevalence of PTSD ranging from 18% to 33% [34-38], of anxiety from 15% to 25% [34-36,38-41], of depression from 16% to 31% [34-36,38,39,41], of psychological distress from 13% to 41% [35,41], and of insomnia from 24% to 38% [36,41]. These levels are several times higher than baseline levels in the general population. Certain sub-groups were at increased risk of experiencing negative mental health outcomes, including survivors of COVID-19 infections [37,41], healthcare workers [37-39], people with chronic illness [38,41], women [39,40] and younger people [40]. In Switzerland, persons with previous mental health issues, young people and persons over 65 years old were more likely to experience stress and other mental health symptoms [42]. In addition, we reviewed four studies focusing on the mental health of pregnant women [43-46]. All found a higher prevalence of psychological problems, including depression, anxiety, psychological distress and insomnia. Two studies included meta-analyses of studies comparing psychological outcomes for pregnant women during COVID-19 with outcomes in control groups (pregnant women pre-COVID or in areas unaffected by the pandemic). One found higher odds of experiencing both anxiety and depression (odds ratio = 2.15 and 1.95 respectively) [45], and the other found that anxiety levels were significantly higher than prior to the pandemic, but the prevalence of depression, while higher, was not significantly so [44].

3.2 Psychological or social effects/side effects of *quarantine, isolation or lockdown* measures

Summary: Isolation, quarantine and lockdown measures can have numerous social and psychological consequences. Experiencing isolation and quarantine, particularly for longer durations, increases odds of experiencing anxiety and depression, and mass lockdowns have are also associated with increased levels of anxiety and depression.

Results: Three systematic reviews or meta-analyses examined the social or psychological consequences of quarantine, isolation or lockdown measures on affected individuals. The first [47] systematically reviewed the literature on past pandemics to identify potential social consequences of mass quarantine, identifying seven: (1) psychological distress, (2) heightened communication inequalities, (3) food insecurity, (4) economic challenges, (5) diminished access to health care, (6) disruptive education, and (7) gender inequity and violence. They emphasized how mass quarantine has particularly severe negative consequences for marginalized groups, including people of lower socio-economic status and migrant groups. Two meta-analyses examined the effect of quarantine, isolation or lockdown on individuals through examining either case-control studies [48] or longitudinal and natural experiment studies [49]. The first found higher odds of depressive or anxiety disorders (odds ratio of 2.8 and 2.7, respectively) among individuals experiencing quarantine or isolation, and

the second found a small but significant negative effect of lockdowns on depression and anxiety, but no significant effect on positive psychological functioning or loneliness.

3.3 Psychological or social effects/side effects on children and young people

Summary: Children and young people were negatively affected by isolation, leading to an increase in symptoms of depression, anxiety, posttraumatic stress, insomnia, and signs of hopelessness and low interest or pleasure in activities. In youth with Autism Spectrum Disorder (ASD) or Attention Deficit with Hyperactivity Disorder (ADHD), symptoms increased.

Results from two systematic reviews [50,51] and a cohort study [52] illustrate that isolation, as it is the case during school closure, can be a risk factor for deterioration in mental health, including depressive and anxiety symptoms, among children and young people. The reported prevalence of depression in young people in the studies included in one of the systematic reviews ranged from 22.6% to 43.7% and from 18.9% to 37.4% for anxiety symptoms [50]. Other symptoms included distress, fear, post-traumatic stress, insomnia, an increase in severity of ASD, and of ADHD symptoms. In addition, an increase in frustration, irritability, hopelessness, a low interest or pleasure in activities, a reduction in outdoor activities, extensive mobile phone use, and excessive use of social media were described [51,52].

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