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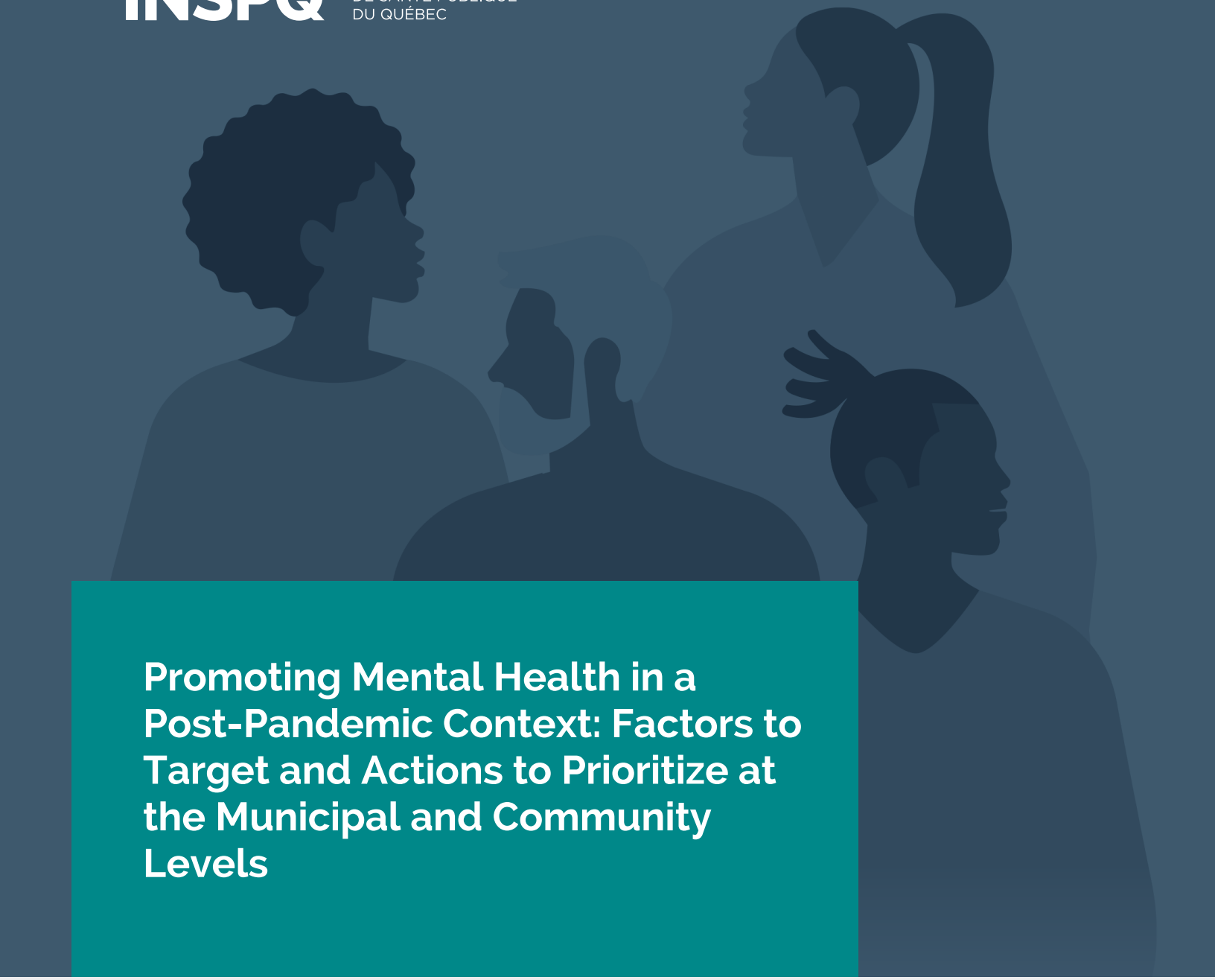

Promoting Mental Health in a Post-Pandemic Context: Factors to Target and Actions to Prioritize at the Municipal and Community Levels

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KNOWLEDGE SYNTHESIS

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FOREWORD

The Quebec government's Programme national de santé publique (PNSP) 2015–2025 aims to support actions adapted to vulnerable populations in addition to supporting the development of healthy public policies. The combination of these objectives also contributes to reducing the social inequalities in health present in the Quebec population.

This publication from the Institut national de santé publique du Québec is aligned with measure 2.10 of the PNSP: support for initiatives that promote the development and strengthening of communities' capacities to act on their living conditions and environments. It is the focus of a mandate that is part of the annual planning of the framework agreement with the Ministère de la Santé et des Services sociaux. In addition to this alignment, it is also consistent with the objectives of Direction 2 on the development of healthy and safe communities and territories in the Politique gouvernementale de prévention en santé.

This publication is intended primarily for public health department stakeholders with a view to supporting municipal environments.

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ABBREVIATIONS AND ACRONYMS

AMSTAR	A MeaSurement Tool to Assess systematic Reviews
INSPQ	Institut national de santé publique du Québec
MMAT	Mixed Methods Appraisal Tool
PHAC	Public Health Agency of Canada
WHO	World Health Organization

KEY MESSAGES

The INSPQ was mandated by the Direction générale de la santé publique of the Ministère de la Santé et des Services sociaux to produce a knowledge synthesis of the scientific literature in order to 1) identify, in literature reviews, the factors associated with mental health in the context of a pandemic or a disaster, factors upon which municipalities can take action; and 2) identify actions at the municipal or community level that influence these factors and help promote mental health in the aftermath of a disaster.

The reviews analyzed show a strong convergence on several factors associated with mental health status, including those related to the social environment: social support, taking pro-social actions (e.g., offering support to friends or neighbours during lockdown), social isolation and feelings of loneliness, or restricting contact and periods of confinement. The same is true for factors related to the socioeconomic status of individuals, including income, education, and job insecurity following a disaster. However, only a few reviews focus on the characteristics of the physical environment.

The studies reviewed that present actions at the municipal or community level have the objective of strengthening community resilience while supporting individuals in developing their adaptive capacity and improving their well-being. The majority identify mental health as an asset to be maintained or strengthened. However, none of the studies have robust evaluations of the effects of interventions on mental health; rather, they present observations or formative assessments. These, as well as several characteristics common to the studies, make it possible to identify organizational approaches: having an explicit concern for mental health and putting together a dedicated team; the importance of intersectoral work that includes citizens and local actors in an equal dynamic; ensuring coherence of interventions around the goal of recovery, in particular by adopting a logic model and building on community strengths. Other studies offer examples of direct interventions to the population, including implementing actions that are sensitive to lived realities and promote participation.

Finally, a few observations and courses of action emerge from this synthesis:

- Mental health must be an explicit part of the response and of the preparedness planning response for disasters. It is therefore important to approach it from the perspective of health promotion, which helps foster mental health as well as prevent its deterioration.
- Several factors in the sphere of social interactions are recognized for their influence on mental health in the context of a disaster. Thus, it is important to foster social support and positive social relationships by building on participatory approaches, forming intersectoral mental health teams that include citizens and different groups in the community, while ensuring an equal dynamic among collaborators.

- Targeting neighbourhoods that are particularly affected by a disaster may better address mental health needs. It is crucial to provide a safe physical environment and green spaces that are accessible to all.
- An equity-based approach can guide municipalities in implementing actions to facilitate recovery. Thus, it is important to know the status of populations by having data not only on symptoms of mental disorders, but also on positive mental health and the factors that protect and weaken groups during disasters. Interventions should then be linked to these factors in a strength-based, equity-focused approach to recovery.

SUMMARY

Major and sudden changes, caused by disasters such as the COVID-19 pandemic, create economic and social burdens for affected communities and influence the physical and mental health of the people within them. Many experts agree that is important to incorporate a focus on mental health in the response to and preparation for disasters, while being sensitive to differential impacts, in order to achieve greater equity. The focus then must be not only on support for individuals, but also on actions that create environments conducive to mental health and well-being for all, while taking social inequalities into account.

Municipalities are recognized as a key player in creating physical, sociocultural, economic, and political environments that support physical and mental health. They are well positioned to participate in the deployment of actions to promote mental health in times of crisis, during recovery, but also in preparation for disasters.

It is in this context that the INSPQ was mandated by the Direction générale de la santé publique of the ministère de la Santé et des Services sociaux to produce a knowledge synthesis of the scientific literature in order to 1) identify, in literature reviews, the factors associated with mental health in the context of a pandemic or a disasters , factors upon which municipalities can take action; and 2) identify actions at the municipal or community level that influence these factors and allow for the promotion of mental health in the aftermath of a disaster.

Following a systematized process, 28 documents were selected and analyzed: 15 reviews responding to Objective 1, the majority of which were of good quality and for which it was possible to conclude that the data were reliable; and 13 primary studies responding to Objective 2, of which only two met all the criteria for quality.

FACTORS ASSOCIATED WITH MENTAL HEALTH IN THE CONTEXT OF DISASTERS

Of the 15 reviews on factors associated with mental health, eight focus solely on the COVID-19 pandemic, four relate to the COVID-19 pandemic or other pandemics, and three relate to other disasters. They deal more with factors related to the deterioration of mental health or symptoms of mental disorders than with factors that contribute to improving mental health.

- Social environment: social support, taking pro-social action, social isolation and feelings of loneliness, or restriction of contact and periods of lockdown are a set of factors that influence mental health and are widely reported in the reviews. Overall, when positive, they are protective of mental health status and when negative, they are associated with the deterioration of mental health and the emergence of symptoms of mental disorders.

- Physical environment: some reviews note that living near an epicentre of COVID-19 infection or in a highly affected city or neighbourhood (high prevalence of cases) is associated with more symptoms of mental disorders. However, there appears to be no consensus on the association between living in an urban or rural area and mental health during disasters.
- Sociodemographic characteristics: women, young adults, individuals with physical or mental health conditions having a history before the disasters, and individuals from minority groups are the groups most often identified as likely to experience symptoms of anxiety, depression, post-traumatic stress, psychological distress, and more stress during and after different pandemics and disasters.
- Socioeconomic characteristics: there is a strong convergence among the reviews analyzed that households reporting low income or impacts of the pandemic on their income (e.g., job insecurity) as well as people with low levels of education are at greater risk of experiencing symptoms of common mental disorders following disasters.
- Behaviours and lifestyle habits: physical activity can be associated with fewer symptoms of common mental disorders while time spent accessing information about the disaster can be associated with symptoms of anxiety, post-traumatic stress, and stress.

MUNICIPAL OR COMMUNITY-BASED MENTAL HEALTH PROMOTION INITIATIVES

The thirteen studies reviewed have the goal of building community resilience while supporting individuals in developing their adaptive capacity and improving their well-being. The majority of them identify mental health as an asset to be preserved or strengthened.

- Eight of the studies reviewed present approaches to responding or planning to respond to a disaster that focus on the psychosocial dimensions of recovery for one or more communities. Various organizational aspects and associated resources emerge:
  - An explicit concern for mental health in the response and planning of responses to disasters at the community level is a pivotal part and can be achieved through 1) the formation of a dedicated mental health team working from a perspective of recovery and 2) knowledge of the communities and of their specific mental health issues;
  - The alignment of various interventions around a goal of recovery is important and can be achieved through 1) the use of a logic or conceptual model and 2) building on community assets;
  - Intersectoral teamwork is always present in the approaches reviewed and can be facilitated by 1) ensuring the involvement of local actors and 2) aiming for an equal dynamic among collaborators.

- Five other studies reviewed focused on direct community interventions aimed at the population, or at changing the physical environment to encourage psychosocial recovery.
  - Three studies, of different designs, show examples of community-based interventions to encourage recovery and reduction of negative emotions and build on the active engagement of participants: reminiscence therapy combined with physical activity sessions reduced loneliness among seniors during the COVID-19 pandemic; traditional dance workshops after a major earthquake allowed participants to experience several benefits (enriched daily life, better mood, improved self-esteem, socialization, mutual support); participants in art workshops (thematic group meetings, then music and collage) established after an earthquake, report that these workshops helped transform traumatic experiences by giving them a collective meaning.
  - Two other studies presented characteristics of the physical environment (presence of organizations that provide services, presence of urban green spaces in the neighbourhood) and their relationship to mental health. With the exception of safety-based organizations (police stations and fire stations), which may be associated with more acute stress, functional limitations, and psychological distress, the first study did not show significant associations between the presence of organizations near residences (e.g., hospitals, community or religious organizations, family services) and mental health, following the 2013 Boston Marathon bombings. In the second study, users of urban green spaces expressed that these spaces are favoured for physical activity and relaxation during the COVID-19 lockdowns. They expressed positive feelings such as comfort, tranquility, and better stress management. Participants also mentioned that contact with nature helped them cope with stress.

CORRESPONDENCE BETWEEN THE FACTORS IDENTIFIED AND THOSE TARGETED BY THE INTERVENTIONS STUDIED

There is an imperfect match between the factors identified and those targeted (explicitly or not) by the interventions. Factors related to the social environment are the most invested, while those related to socioeconomic characteristics do not seem to be the target of identified interventions.

OBSERVATIONS AND COURSES OF ACTION

Linking organizational and direct interventions to factors associated with mental health during disasters, however imperfectly, allows for the establishment of targets and courses of action to support mental health at the municipal or community level during disasters.

- Mental health must be an explicit part of the disaster preparedness planning. It must be approached from a perspective of health promotion, which makes it possible both to foster mental health for all and to prevent its deterioration and the emergence of mental disorders.

- Several factors pertaining to the social environment, and particularly to the sphere of social interaction, are known to influence mental health in the context of disasters. Accordingly, it is important to foster social support and positive social relationships through participatory approaches, to support the development of intersectoral mental health teams that include citizens and different groups in the community, and to ensure an equal dynamic among collaborators.
- Targeting neighbourhoods that are particularly affected by an extreme event may better address mental health needs. Accordingly, it is important to be concerned with a safe physical environment that addresses protective factors for mental health and well-being and to provide accessible green spaces.
- An equity-based approach can guide municipalities in implementing actions to facilitate recovery. Thus, it is important to know the status of populations by having data not only on symptoms of mental disorders, but also on positive mental health and the factors that protect and weaken groups during disasters. Interventions can then be linked to these factors in a strength-based, equity-focused approach to recovery.

1 INTRODUCTION

Major and sudden changes in communities affect how they function. When these are triggered by extreme events, which are also called "disasters" in the scientific literature, they cause an economic and social burden for the affected communities and influence directly and indirectly the physical and mental health of the people in them. They are of different natures, such as natural or technological disasters or pandemics of infectious diseases like COVID-19.

Throughout this pandemic, the disease, the measures taken to curb its spread, and its pervasive presence in the media have caused stress and turmoil, disrupting family, social, and professional life. These personal and social upheavals are experiences that influence fluctuations in mental health, symptoms of mental disorders, and individual and community well-being, both in the short term at the onset of a disaster and in the long term during the recovery period (1, 2). These upheavals have led various jurisdictions to consider what measures can be put in place to mitigate their consequences and to promote recovery. Municipalities have various levers of action that can contribute to the quality of life and the physical and mental health of their citizens. As such, they are well placed to help deploy initiatives that promote mental health in times of crisis and in the aftermath of these upheavals.

It is in this context that the INSPQ was mandated to produce a knowledge synthesis from the scientific literature on inspiring, effective, or promising municipal actions aimed at mitigating the impacts of the pandemic on mental health in a post-pandemic context. The focus is on mental health promotion initiatives that can help restore the ability of individuals and communities to function after this pandemic and in preparation for other major events.

DEFINITIONS

Disasters

Disasters are defined as a sudden and severe disruption of the functioning of a community or society. This disruption can occur at any level (sudden or not, extensive or not, frequent or rare) and is the result of a hazardous event. The latter, interacting with exposure conditions, vulnerabilities, and capacities of populations, results in one or more of the following: human, material, economic, and environmental losses and impacts (3).

Mental health

Mental health is defined as a state of well-being in which a person can realize his or her potential, cope with life's normal challenges, carry out productive work, and contribute to his or her community (4). It is thus described in positive terms rather than in terms of the presence or absence of a mental disorder (5). Because mental health is often associated with mental disorders, it is sometimes referred to as positive mental health or emotional, psychological, and social well-being (1, 6).

Mental health fluctuates from optimal (or flourishing) to minimal (or languishing), whether or not one has a diagnosed mental disorder or associated symptoms (7, 8). It is measured by the presence of positive emotions and satisfaction with life, as well as psychological functioning (e.g., the ability to express one's ideas, manage day-to-day responsibilities, maintain positive relationships based on trust, and have a sense of purpose) and social functioning (e.g., a sense of belonging to a group and being able to contribute to it, that society allows us to fulfill our potential, and that the functioning of society is meaningful) (6, 9). Good mental health is an essential element of a healthy life and a successful society. It is therefore important to create conditions to promote and preserve it in addition to the interventions traditionally known to prevent its deterioration and to support people with symptoms of mental disorders (10).

Recovery

Recovery in the field of public health is aligned with a civil security approach to managing risks related to emergencies and disasters that advocates action on social, economic, physical, or environmental conditions and also includes the stages of prevention/mitigation, protection/preparedness, and response/intervention (11, 12). The WHO suggests that recovery in a public health context should be an opportunity to address a range of factors, including the reduction of social inequalities and the strengthening of citizen participation and local capacity, which will increase the resilience of communities to potential crises (13).

The effects of the pandemic on mental health

A number of international studies and literature reviews show a deterioration in the quality of mental health from the onset of the pandemic: a decrease in the level of emotional well-being and psychosocial functioning, an increase in the level of psychological distress, and an increase in the presence of symptoms of anxiety, depression, or post-traumatic stress (14–18).

In the Canadian population, population-based survey data indicate that in the fall of 2021, nearly 30% of Canadians aged 12 years and older considered their mental health to be significantly worse than before the pandemic (19). It is also observed that fewer Canadians aged 18 and older report high levels of self-rated mental health or a strong sense of community belonging in 2020 than in 2019, and life satisfaction was significantly lower in 2020 than in 2019 (20). With respect to the presence of mental health symptoms, Canadian data show that the prevalence of major depressive disorder among those 18 years and older was higher in the first year of the pandemic than in previous survey cycles (21).

Some studies, in Canada and elsewhere in the world, show that manifestations of deteriorating mental health status and the onset of common mental disorders may have increased early in the pandemic, in 2020, which would be a normal response to disasters. Mental health status tended to return to normal during the following months for the majority of the population (14, 17, 22, 23). Furthermore, several studies, based on other extreme events, suggest that the effects of the COVID-19 pandemic on mental health status may be more long-term (14, 17, 22), particularly among certain groups, such as those who have been financially affected (17).

Indeed, some groups may have more difficulty returning to their pre-pandemic mental health status. This includes those who had pre-existing mental health symptoms, those experiencing negative impacts of COVID-19 (e.g., loss of employment or income, feelings of loneliness, death of loved ones), or those already affected by social inequalities in health (20, 23–26). On this last point, many authors have highlighted the differentiated consequences of the COVID-19 pandemic (27–29). Indeed, certain populations are already accumulating risk factors that may further expose them to the consequences of this crisis, e.g., through job insecurity, inadequate housing conditions, or poorer access to digital tools, and these factors contribute to creating differences in physical and mental health (28-30).

Addressing the mental health impacts of disasters

Faced with the present or potential consequences of the COVID-19 pandemic on mental health, several experts support the importance of incorporating priority attention to mental health in the response to disasters (31–33), while being sensitive to differential impacts, in order to achieve greater equity (27, 34). Interventions that target strengths and promote mental health improve the health of populations with an eye towards equity, as they simultaneously promote improved mental health and the prevention or reduction of mental disorders (35). Indeed, both

mental health and many common mental disorders are influenced by environmental, social, and individual determinants that often overlap and operate similarly throughout the life trajectory (36). The focus then must be not only on support for individuals, but also on actions that create environments conducive to mental health and well-being for all, while taking social inequalities into account. Consequently, in addition to specialized psychiatric services and frontline mental health services, it is important to integrate a concern for mental health and psychosocial needs into interventions offered by all sectors of society (e.g., food security, protection of children and victimized people, support for people who are grieving) (1, 2, 28)[1].

Municipalities[2] are living environments and represent a political body of proximity in contact with populations. Several framework documents or structuring initiatives in Quebec (40–42) and elsewhere (43–47) have long recognized them as essential actors who hold various levers of action for creating physical, sociocultural, economic, and political environments that are conducive to physical and mental health. For example, they can intervene directly in the public space or develop inclusive sociocultural, sports, and leisure planning. They can develop social development policies or programs that promote equitable access to quality housing. They can also facilitate social participation. As a result, municipalities have a role to play in promoting mental health in the wake of extreme events. They have been allies in the deployment of many local and regional initiatives aimed at recovery and also at mitigating the disparities accentuated by the pandemic (48).

Objectives of the synthesis and target audience

The specific objectives of this knowledge synthesis are:

1) To identify factors in literature reviews associated with mental health in the context of a pandemic or extreme event upon which municipalities can act;
2) To identify actions at the municipal or community level that influence these factors and promote mental health following a disaster.

The findings from this synthesis will contribute to the knowledge of public health practitioners and their partners about municipal levers and municipal or community-level actions that are useful for mental health promotion. They will also facilitate the development, continuation,

[1] For more information, see the INSPQ's work on actions to promote mental health and well-being in the context of COVID-19: https://www.inspq.qc.ca/en/publications/3016 (37) https://www.inspq.qc.ca/publications/3109-memoire-consultations-effets-pandemie-sante-mentale-covid19 (in French only) (38)

[2] In the present publication, as with other work carried out by the INSPQ, municipal environments refer to all municipal organizations (local municipalities, boroughs, regional county municipalities, agglomerations, and metropolitan communities) (39).

enhancement, and sharing of inspiring actions or even regional mental health promotion programming with municipal partners. This document is intended primarily for public health departments that support municipal settings.

The second section of this paper discusses the research and analysis methodology employed. Results are presented in the third section, for each of the above objectives, and then for the correspondence between them. The fourth section is devoted to presenting observations and courses of action.

2 METHODOLOGY

In order to meet the objectives, a knowledge synthesis of the scientific literature that incorporates characteristics of a systematized method (49) was undertaken.

Bibliographic research

Bibliographic research was carried out with the support of an INSPQ librarian. The search strategy, described in Table 3 of Appendix 1, combines keywords and descriptors related to these concepts:

- For the first objective: 1) mental health; 2) disaster; 3) associated factors; 4) literature review.
- For the second objective: 1) mental health; 2) disaster; 3) recovery; 4) municipal/community response.

The search was launched in eight scientific literature databases on August 24, 2021. The Medline, Psychology & Behavioral Science Collection, SocIndex, Health Policy Reference Center, Political Science Complete, Public Affairs Index, and Environment Complete databases were searched via the EBSCO platform. The PsycInfo database was queried via the OVID platform. The search was limited to articles in English and French.

Given the timeline for completing this synthesis, the grey literature was not explored.

Selection of included studies

The selection of included studies followed certain steps of a systematic review methodology: the eligibility criteria of the studies were developed by the two authors (Caroline Braën-Boucher [CBB] and Marie-Claude Roberge [MCR]) prior to the bibliographic research. Full double-blind selection was not followed, but a selection validation process was used. Of the references from the first selection, roughly 50 were independently evaluated by title and abstract by the two reviewers to reach a common understanding of the eligibility criteria, and then the remaining references were evaluated by a single reviewer. Following the selection by title and abstract, the full papers were evaluated according to the eligibility criteria. The second reviewer intervened when there was uncertainty about the inclusion of certain references.

Eligibility criteria for studies (PECOS-PICOS) (50, 51)

- **P**opulation: general population of all ages (children, adults, teenagers, seniors, disadvantaged populations, pregnant women, families, First Nations, etc.)/exclusion: specific populations with mental disorders, specific patient populations (in need of care), health care workers.
- **E**xposure: sudden disasters that disrupt the functioning of society or groups (pandemic, epidemic, natural disaster), lockdowns/exclusion: economic crisis, event that is not transferable or generalizable to the municipal setting (e.g., event that results in out-of-border

migration), event that occurred in non-comparable countries (e.g., Ebola outbreak, armed conflicts).

- **I**ntervention: recovery, healing, mental health promotion interventions after a disaster at the municipal or community level; organizational interventions (policies, programs, plans, bylaws) that target the integration of mental health; direct interventions at the population level, targeting the well-being of a community or population groups or modifying the physical environment (hereafter, direct interventions)/exclusion: clinical interventions aimed at self-care or aimed at the reduction of mental disorders; policies or actions at the national level.
- **C**omparator: all (studies without comparator allowed).
- **O**utcome: positive mental health, well-being, recovery, resilience, wellness, reduction of stress or other manifestations of unhappiness, factors associated with mental health during disasters (e.g., social support, employment status)/exclusion: treatment for mental disorders.
- **S**tudy design:
  - Objective 1: Literature reviews (systematic or not)/exclusion: primary studies, protocols.
  - Objective 2: Evaluative studies of effects or implementation as well as descriptive studies of direct interventions at the municipal or community level, literature reviews (systematic or non-systematic)/exclusion: research protocol, report of general recommendations (not in the context of a specific disaster), advocacy, expert opinion, summaries, commentaries.

Additional inclusion criteria:

- Publications since 2009; peer-reviewed publications.

Additional exclusion criteria:

- Literature reviews with no research methodology.

Data extraction

A data extraction form was developed for each of the objectives of the synthesis.

Each data extraction form includes the following items to be extracted: 1) study identification; 2) population; 3) context of the studies (disaster involved); 4) aspect of mental health addressed.

For the first objective, the data retrieved also addressed: 5) factors associated with mental health; 6) characteristics of the primary studies included in the reviews; 7) results; 8) limitations; and 9) authors' conclusions.

Data extracted specifically for the second objective also included: 5) characteristics of the interventions: description, objectives, components, approaches, initiators, and collaborators; 6) factors associated with mental health affected by the interventions (explicitly or not); 7) results

and interpretation (if evaluated); 8) limitations; and 9) authors' conclusions. An author performed the data extraction (CBB). A second author was called upon to validate extractions when necessary (MCR).

Evaluation of study quality

The assessment of risk of bias and methodological quality of the reviews included in Objective 1 was conducted by an author using AMSTAR (A MeaSurement Tool to Assess systematic Reviews). The AMSTAR tool, consisting of 11 items, has been shown to be valid and reliable (52, 53). The adaptation suggestions of Burda and colleagues (54) were considered and items two and five were adapted for this synthesis. Item 2 ("Was there duplicate study selection and data extraction?") was considered to be met if the authors of the reviews conducted the selection of the primary studies in a double-blind manner and a method of validation by a second reviewer was used for the extraction. Item 5 ("Was a list of studies [included and excluded] provided?") was considered met when review authors clearly named the primary studies included. Reviews with a score of 1 to 3 were rated as low quality, those with a score of 4 to 7 as medium quality, and those with a score of 8 to 11 as good quality (55).

With respect to assessing the risk of bias and methodological quality of intervention studies, the Mixed Methods Appraisal Tool (MMAT) (56) was used. This tool is adaptable to different study designs and has been shown to be reliable (interclass correlation coefficient of 0.72–0.94) (57).

Data synthesis and analysis

For each objective, a narrative synthesis was conducted. The Public Health Agency of Canada's (PHAC) Positive Mental Health Surveillance Indicator Framework, based on the ecological model (58), was used for data analysis.

For the first objective, several documents on municipal power and jurisdiction and on healthy environments guided the identification of factors that municipalities can influence (59–61). Municipal actions are governed by the Municipal Powers Act, which gives municipalities the autonomy and flexibility to act on a wide range of factors. Consequently, while they cannot directly address certain risk factors, such as age, they can provide inclusive recreational programs that take this into account. Nevertheless, certain factors, particularly individual or relational factors (e.g., fear of going to the emergency room, context of separation) associated with mental health that call for a clinical response were not retained. Finally, the selected factors were grouped according to the levels of the ecological model.

The studies collected in relation to the second objective were grouped according to whether they evaluated or described 1) organizational interventions (municipal plans and programs or those originating from other jurisdictions, but which involve the municipality or are aimed at communities); 2) direct interventions, i.e., those aimed at the general population or at groups identified as being in a vulnerable situation, or those aimed at changing the physical

environment. Next, each group of interventions was subjected to a thematic content analysis, i.e., a vertical analysis to draw out the main characteristics of each intervention and a horizontal analysis to highlight the points of convergence between them.

Finally, the PHAC framework was used to explore correspondences between factors associated with mental health (Objective 1) that are targeted (explicitly or not) by the identified actions (Objective 2). The correspondences are also presented in table form (Table 2).

3 RESULTS

The bibliographic search of the scientific literature resulted in 1,250 references, of which 1,190 (duplicates removed) were evaluated by title and abstract. Following this first stage of selection, 97 full-text articles were screened against the eligibility criteria. This second selection stage resulted in 28 documents being identified. The study selection flow diagram is presented in Figure 1 in Appendix 1. The documents selected are:

- Fifteen literature reviews to address Objective 1: Factors associated with mental health in the context of pandemics or disasters that municipalities can influence (COVID-19 [62–69]; COVID-19 or other pandemics [70–73]; other disasters [74–76]). The characteristics of the included reviews are detailed in Table 4 in Appendix 2.
- Thirteen primary studies to address Objective 2: to identify municipal or community-based actions that promote mental health in the post-pandemic context (organizational interventions [77–84]; direct interventions [85–89]). The characteristics of these primary studies are detailed in Table 6 in Appendix 3.

Based on the assessment of methodological quality with the AMSTAR tool, nine reviews are rated as good quality, three as medium quality, and three as low quality. The results are presented in Table 5 in Appendix 2.

With respect to the methodological quality of the primary studies, the assessment with the MMAT shows that seven studies (7/13) did not respond positively to the preliminary questions, so, according to the tool's recommendations, the quality assessment could not be continued. For the remaining studies, four studies met one or two (out of four or five) of the quality criteria. Two studies met all items (4/4). The results are presented in Table 7 in Appendix 3.

This knowledge synthesis of the scientific literature presents the results in the order of the objectives.

3.1 Factors associated with mental health in the context of extreme events

Of the fifteen reviews included, ten are systematic reviews, two are scoping reviews, and three are narrative reviews. Eight focus on the COVID-19 pandemic, four focus on the COVID-19 pandemic or other pandemics, and three reviews focus on other disasters (the 2011 earthquake and tsunami in Japan and various disasters). Although all of these reviews focus on factors associated with mental health, the measures of mental health most often refer to the presence of symptoms associated with common mental disorders (e.g., depression, anxiety) or deteriorating mental health (e.g., difficulty functioning, negative emotions).

3.1.1 Factors related to the living environment

Social environment

One of the most frequently mentioned factors in the included reviews related to the social environment is social support. The latter is indeed named in several reviews as a protective factor for mental health and the emergence of symptoms of mental disorders (62, 64, 69). Indeed, among those reporting more social support, fewer symptoms were noted: among young adults (64), adults (69), and pregnant and postpartum women (62, 66) during the COVID-19 pandemic, and among young adults during other disasters (76).

In addition, Marques de Miranda and colleagues, point out that teenagers performing pro-social actions (e.g., supporting friends or neighbours during a quarantine), show fewer symptoms of depression during the COVID-19 pandemic (67). Two reviews related to the pandemic also report that maintaining contacts, even virtually (young adults) (64), or having a large social network (adults) (69), are associated with fewer symptoms of common disorders and prevent deterioration in mental health.

Less social support is named as a factor associated with more symptoms, including post-traumatic stress in the general population (2011 earthquake and tsunami in Japan) (74), psychological distress in young adults (various disasters) (76), and anxiety in pregnant and postpartum women (COVID-19) (62). The reviews also note associations from studies of different pandemics between low social capital (quantity and quality of contacts) and symptoms of anxiety (72) or between few positive family and neighbourhood relationships and symptoms of depression (73).

Social isolation (66), a feeling of loneliness (69), and restricted social contact or periods of lockdown (64, 68, 70, 71, 73) (lockdown of more than 10 days [70, 73] or more than 3 months [68]) were also identified as factors associated with more symptoms of mental disorders and worsening mental health status during different pandemics for all populations studied.

Two reviews also noted positive aspects to the confinement environment related to individual well-being. Parents have reported that this context has brought family members closer together (71), and that their children are calmer and express positive feelings about family time (68).

Physical environment

Five reviews examining the link between place of residence (urban or rural, no specific definition) and the risk of reporting symptoms of mental illness have reached different conclusions. Two of these, which include multiple primary studies (10 primary studies), find mixed results (65, 69). The last three reviews are based on a smaller number of primary studies (one to two studies). Two of them found that children, teenagers, and parents from rural areas were more likely to have mental health problems than their peers from urban areas (67, 71), while the third review

found the opposite in children (64). Thus, reviews of urban-rural risk differences do not converge.

Several reviews, however, converge on the fact that residing near or in a city or neighbourhood heavily affected by the COVID-19 pandemic (e.g., higher case prevalence, epicentre such as Wuhan) is associated with more symptoms of mental disorders in adults (65, 72) as well as in children, teenagers, and their parents (67, 68, 71).

3.1.2 Individual-related factors

Sociodemographic characteristics

The individual-related factors for which the reviews converge are, first of all, sex and age. Several reviews note that women (adults, teenagers, and girls) were more likely than men to experience symptoms of anxiety, depression, post-traumatic stress, psychological distress, and more stress during and after various pandemics and disasters (65, 67–69, 71, 76).

In terms of age, young adults may be the group most at risk. In this regard, two general population reviews of the COVID-19 pandemic note that young adults were more likely to report symptoms of common mental disorders (65, 69). A third review examining the COVID-19 pandemic, where the study population was pregnant and postpartum women, noted that it was the younger women who were also more likely to report such symptoms (66). Finally, two other reviews focusing specifically on youth during the pandemic, mention that being an older teenager (compared to younger teenagers and children) is a risk factor for the presence of symptoms of depression (67, 68).

In the reviews of other disasters, the age-related results differ somewhat. A review specific to young adults aged 18–34 years exposed to other disasters (76), reported that it was the older adults in this age range who were at greater risk of reporting symptoms of common mental disorders. In a second review, the authors note instead that it was people aged 60 years and older who were at greater risk of such symptoms (depression and stress) during previous respiratory virus pandemics (H1N1, H7N9, SARS, MERS) (72).

Other population groups are also identified by the included reviews as likely to have been at greater risk for symptoms of common mental disorders during disasters. First, people with physical or mental health conditions prior to the disaster had an increased risk of reporting symptoms during the various events studied, for several age groups: the general population (65, 69, 73), children and teenagers (67), and young adults (76). However, Ahmad and colleagues argue instead that studies are contradictory for pregnant and postpartum women who had symptoms of mental disorders before the COVID-19 pandemic, with respect to this association during the COVID-19 pandemic (62).

Next, Gibson and colleagues note that several studies show an association between being a member of a minority group and symptoms of common mental disorders during the COVID-19 pandemic. People who did not identify as White as well as those who identified as non-binary, transgender, as a member of a sexual or gender minority, or as MSM[3] were indeed more likely to report symptoms of common mental disorders (65).

Socioeconomic characteristics

The characteristics of the socioeconomic status of individuals or families constitute a set of factors associated with mental health on which the included reviews strongly converge. First, it is noted that individuals with low family income are more likely to have reported symptoms of anxiety, depression, post-traumatic stress, and stress, in the general population and during all disasters studied (62, 65, 69, 73, 74). In addition, two reviews report the results of a single study among young adults during the COVID-19 pandemic, showing that stable family income is associated with less anxiety (64, 65).

The impact of pandemics (COVID-19 or others) on finances (e.g., loss of income, financial strain) is also noted as a factor associated with more symptoms of common mental disorders or as a source of stress in reviews of non-specific populations (72, 73), families (71), children and teenagers (67), and young adults (64).

Precarious employment status (e.g., unemployed or job loss) is generally identified by reviews as a factor associated with anxiety, depression, and post-traumatic stress symptoms (65, 69, 74). Note, however, a nuance reported by two reviews regarding pregnant women who, in turn, were more likely to report anxiety and symptoms of depression if they were employed full-time, indicated as a source of stress, during the COVID-19 pandemic (65, 66). However, still among pregnant and postpartum women, Ahmad and colleagues did not find a significant correlation between employment status and symptoms of depression in the perinatal context (62).

Most reviews report that people with lower levels of education were more likely to experience symptoms of anxiety, depression, post-traumatic stress disorder, psychological distress, and stress during the different disasters studied, for the general population and among young adults (69, 72, 73, 76). Two other reviews found associations between higher levels of education and anxiety and symptoms of depression during the COVID-19 pandemic in the general population (65) and in pregnant and postpartum women (66).

[3] Men who have sex with men.

Lifestyle habits

In relation to lifestyle habits, three reviews identify physical activity as a protective factor associated with fewer symptoms of common mental disorders or behavioural problems: fewer symptoms of anxiety or depression and less stress in young adults (64), fewer symptoms of anxiety and depression in pregnant or postpartum women (66), and less hyperactivity and distraction in children and teenagers (68).

The reviews distinguish a second behaviour associated with the presence of common symptoms of mental illness, namely, seeking information about pandemics or other disasters. One review notes that getting information about COVID-19 via mass media or social media is associated with more symptoms of depression in young adults (64). On time spent viewing information, four reviews note that too much time (without specifying duration) spent viewing information is associated with more symptoms of anxiety, post-traumatic stress, and stress in all populations (64, 68, 69, 74). However, they also note that too little time spent accessing information is also associated with these symptoms (64, 69). On perception of what is being looked at, it is noted that children and teenagers who expressed satisfaction with the information viewed on COVID-19 were less likely to report symptoms of anxiety, depression, and post-traumatic stress (67). Among teenagers, considering oneself knowledgeable about COVID-19 may also be a protective factor for symptoms (71).

The following table (Table 1) provides a summary of the factors identified.

Table 1 Factors associated with mental health during disasters identified in the reviews, grouped by category and their influence (+ or -)

Categories of factors	Factors identified in the reviews and their influence
Living environments – Social environment	**Social interactions** (+) Social support (62, 64, 66, 69, 76) (+) Social network (64, 69) (+) Pro-social actions (67) (+) Positive relationships in the neighbourhood (73) (+) Bonding, positive feelings in a context of lockdowns (68, 71) (-) Low social support (62, 74, 76) (-) Low social capital (72) (-) Isolation/feeling of loneliness (66, 69) (-) Little social contact during confinement (64, 68, 70, 71, 73) (-) Duration of confinement (+10 days) (70, 73) (+3 months) (68)
Living environments – Physical environment	**Spatial variations** (-) Residence near a neighbourhood/city heavily affected by an epidemic (65, 67, 68, 71, 72)
Individuals – Eco-sociodemographic characteristics	**Sociodemographics** (-) Women (65, 67, 69, 71, 76) (-) Age young adults (18–34) (62, 65, 69, 76) (-) Age (teenagers more at risk compared to children) (67, 68) (-) Seniors (over 60, other pandemics/epidemics) (72) (-) Pre-existing physical or mental conditions (65, 67, 69, 73, 76) (-) Ethnicity (people who do not identify as White) (65) (-) People who identify as non-binary, transgender, as a member of a sexual or gender minority, or as MSM (65)
	Socioeconomics (-) Low family income (62, 64, 65, 69, 73, 74) (-) Impacts of the pandemic on finances (loss of income, financial constraints) (64, 67, 71–73) (-) Employment status (unemployed, lost job, migrant worker) (65, 69, 74) (-) Education level (69, 72, 73, 76) (not associated [65, 66)])
Individuals – Lifestyle habits	**Physical activity** (+) Physical activity (+150 minutes/week for pregnant and postpartum women, physical activity 1–2 x/week for children) (64, 66, 68)
	Viewing information (+) Satisfaction with information viewed about COVID-19 (67) (+) Considers oneself well informed about COVID-19 (71) (-) Viewing information via mass media and social media (64) (-) Viewing information about the pandemic (perceived as too much or not enough) (64, 68, 69, 74)

3.2 Municipal or community-based mental health promotion following a disaster

The second objective of this knowledge synthesis is to identify actions at the municipal or community level (direct or organizational interventions) that influence factors associated with mental health and promote it in a post-disaster context. Bibliographic research identified 13 studies. Eight studies presented organizational interventions (77–84) that may or may not include descriptions of direct population-based interventions. These studies outline organizational approaches to responding to or planning for the response to a disaster, and focus on the psychosocial dimensions of recovery in one or more communities. Five other studies specifically described or evaluated interventions directly to the population or in the physical environment to encourage psychosocial recovery (85–89) (key features in Table 6 in Appendix 3).

All of these studies consider mental health as a component of psychosocial recovery. The majority identify mental health as an asset to be maintained or strengthened. They have the goal of building community resilience while supporting individuals in developing their adaptive capacity and improving their well-being. Specifically, the studies emphasize the importance of contributing to the creation of social ties and citizen participation (77–82, 84, 88, 89), improving well-being (87), psychological, social, and spiritual well-being, and reducing feelings of loneliness (88). In other studies, the authors aim for overall recovery or psychosocial well-being (84, 85, 89). Two of the studies report instead that the interventions implemented are aimed at reducing symptoms of mental disorders, particularly symptoms of depression and anxiety (83, 84).

The next section will first present the studies included in connection with organizational actions, followed by those involving direct interventions.

3.2.1 Organizational interventions to mitigate the mental health impacts of disaster

Most studies provide detailed descriptions of organizational approaches and sometimes formative assessments of these approaches, such as lessons learned or best practices for actualizing these approaches. These assessments are more process-oriented and do not include an evaluation of the effectiveness of mental health interventions. The studies also differ according to the events concerned, the study designs, the proposed actions, etc. In this section, the organizational aspects and the associated means, which have been identified from the approaches outlined in the studies, are presented.

First organizational aspect: an express concern for mental health

The first organizational aspect common to the studies identified is that mental health is an express concern in community-based disaster management. Indeed, in all studies, the authors conclude that mental health is a key issue in recovery and insist that it must be specifically included in the response to and preparedness planning for disasters (77–84). For example, the program proposed by Bosman and colleagues after explosions in a neighbourhood in Enschede in the Netherlands brings together several actions to promote mental health. These actions are explicitly described by the authors as supporting the autonomy of the affected populations and as being essential to the return to overall functioning of these populations (77).

Means in which this concern for mental health can be explicitly integrated are named by the authors or are common to many of the approaches found in the studies reviewed:

1) Forming a team dedicated to mental health from the perspective of recovery

The formation of a team (a cell or a cluster) explicitly dedicated to mental health appears to be a central component for including mental health in community-level responses to and preparedness planning for disasters (77–84). According to the studies reviewed, the initiative to form teams emerges from various jurisdictions, including the health and social services sector, the public health sector, the mental health care and services sector, and the university research community. For example, after Hurricane Sandy in New York City, a university health centre initiates an intersectoral team in a neighbourhood with local health centres and major faith-based organizations to develop a set of psychosocial recovery interventions (e.g., training in psychological first aid for citizens) (80). Similarly, the Los Angeles County Community Disaster Resilience Initiative established working groups based on targeted neighbourhoods to identify priorities for building community resilience (84). The REACH NOLA program is based on a cross-sector community and academic team working to expand access to mental health resources in post-Katrina New Orleans (83).

2) Have knowledge of communities and their specific mental health issues

Explicitly incorporating a mental health focus into disaster management would, according to studies, benefit from a good understanding of the specific mental health issues in a community. Several authors stress the importance of collecting data on mental health status and the specific characteristics that make certain groups vulnerable or resistant to disasters (78, 82). The way of collecting data is variable. For example, some authors suggest integrating quantitative indicators when available, or collecting qualitative content directly from the communities (77,78), via local actors in the dedicated teams. The availability of mental health data would allow, for example, the quantification of arguments presented to decision-makers (78, 82), the targeting of populations or subgroups with factors that make them vulnerable to disasters (82), and the development of planning that is sensitive to these subgroups and to the real mental health issues experienced by communities.

Second organizational aspect: diverse but coherent interventions

The second organizational aspect identified in the reviews concerns the coherence of interventions around a recovery objective. Indeed, in the included studies, a core objective related to mental health is developed, and then a variety of interventions are linked to it. This means that various interventions are deployed by the dedicated teams and are always part of a broader framework of psychosocial recovery. The authors' stated objectives include reorganizing community life (77), strengthening community resilience (77, 80, 81), or well-being (79). The many mental health promotion actions that are deployed within this framework are diverse and touch on more specific sub-objectives (e.g., memorial arrangements in the physical environment [77, 78], newsletters about positive examples of reconstruction [77]), but they are intended to be coherent with a broader objective. There are two ways to actualize this coherence:

1) Use a conceptual model

Several authors argue for the importance of using a conceptual model to support approaches and situate the various actions within a coherent whole (78, 80, 82, 84). These various models visually translate the functioning of the community, presenting, for example, the different factors to be considered in order to foster community resilience, the cycles of preparedness planning to the responses themselves (78, 82), or the organization of the different actors and the intended impacts (80). This type of model would make the process and its arguments visually understandable to collaborators and decision-makers (78). A model can also bring into view the components of planning over time (82) as well as the logic that links direct interventions to broader goals (78, 80, 82, 83).

2) Build on community assets

The studies reviewed show that building on assets, drawing on existing community skills, or on networks that have already been formed, can be the anchor for coherence between the various interventions and could facilitate the achievement of a common goal of recovery (77, 78, 81). These considerations should also be balanced with a recognition of the needs of communities, which external services are called upon to meet (78).

For instance, we note the importance of supporting existing partnership structures with community organizations (77, 79) and also of supporting them individually as they respond to specific community needs (77, 78). Also, building on community skills can be done through positive communication strategies, such as sharing success stories (e.g., of people who rebuilt their homes after a fire) via local media (77). Psychological first aid training for citizens or an intervention that connects isolated people are other examples of actions identified that build on community skills (80, 82–84). Taken together, these diverse actions support a broader goal of recovery.

Third organizational aspect: the need to work in intersectoral teams

The third organizational aspect that emerges from the included studies is that mental health or recovery teams are necessarily intersectoral. This character is indeed present in the studies reviewed (77–84). The teams usually include health actors (social services, physical or mental health care and services, public health) who will engage in a partnership with other sectors, including municipalities or other local authorities to represent the communities. The intersectoral quality of the teams presented in the studies may be achieved by the following means:

1) Ensure the involvement of local actors

The authors of all the studies included in this section point out the importance of emphasizing the role of local actors in intersectoral teams (77–84). Local actors may be represented by community organizations (these are always among the collaborators in the studies), citizens, local leaders, community workers, community facilitators from, for example, municipal or religious institutions (77–84) and may represent the voices of different groups that make up a community (78, 81). The authors note the importance of involving these actors early on when planning responses to disasters (79, 84). While the involvement of local actors can take different forms, some authors propose that these people play a key role. For example, this could involve social workers who play a pivotal or coordinating role in the various actions deployed (77, 83).

The reasons given in the studies for the importance of this involvement of local actors are varied. One of the reasons given is that such involvement would provide a good understanding of the needs of the communities in which they work and identify the mental health issues that concern them (78, 79). Including such actors would also allow for the development of shared definitions of mental health issues (e.g., What do we mean when we talk about social cohesion?) (80, 82, 84).

2) Aim for an equal dynamic among collaborators

Several authors note the importance of fostering joint decisions and equal relationships between different intersectoral collaborators (78–80), making sure that citizens' concerns and interests are prioritized. One suggestion is to give greater weight to citizens, especially when the interests of other political or economic players are at stake (78). Others also suggest directly including people from targeted groups in decision-making and planning (e.g., immigrant populations, teenagers and children) (77, 79).

An equal approach would encourage the active participation of people from the communities targeted by the actions, for example, groups from the neighbourhoods most affected by the event (77, 81, 82). Moreover, this approach would make it possible to develop a relationship of trust between these communities and the authorities, one that was perhaps previously fragile or that has deteriorated as a result of disasters (81, 84). It should be noted that some authors

suggest that the physical presence of representatives from different health authorities (public health or mental health) may encourage this sense of trust and the perception that these authorities are sensitive to what is being experienced by the community (77, 81).

3.2.2 Direct interventions to mitigate the mental health impacts of disasters

Five studies are presented in this section. First, three studies describe community-based interventions that have been carried out with populations particularly affected by disasters (85, 88, 89). These studies all differ in design and quality and involve a range of populations and disasters. Two interventions specifically target seniors, the first during the COVID-19 pandemic in a Chinese town (88) and the second after an earthquake in rural Chile in 2010 (85). The third intervention addresses women in a Tibetan community following an earthquake in rural China (89). Two interventions were examined for effects on mental health and its factors (88, 89) and the other was assessed for appreciation of the intervention (researchers' observations of participant satisfaction and impressions) (85).

Two other studies present characteristics of the physical environment (presence of organizations that provide services, presence of urban green spaces in the neighbourhood) and their relationship to mental health (86, 87). The study by Jose and colleagues investigated the association between the presence of different types of organizations in the vicinity of the residence and symptoms of mental health deterioration (86). The study took place in the wake of the Boston Marathon bombings in 2013. Mayen Huerta and Cafagna's study is a qualitative study on the use of urban green spaces and participants' sense of well-being, in different urban areas of Mexico City during a lockdown in September–October 2020 (87).

The three community interventions are presented first, followed by those related to the physical environment.

Community interventions

The authors of the three studies emphasize that their approaches are based on a capacity-building or empowerment approach that is adapted to local realities (e.g., cultural context). Espinoza and his colleagues frame their intervention in a participatory action research project and combine meetings and discussions followed by creative workshops (85). The second intervention proposed by Ren and colleagues combines reminiscence therapy and physical activity (tai chi) (88), both in a group setting, while the final intervention uses a psychosocial empowerment model to develop workshops around a local dance practised by the women (89). In all three studies, the social workers and researchers encouraged the participants to determine the form that the creative workshops would take (85), to take charge of the organization of the meetings and their continuation (89), and to base them on local cultural practices (85, 88, 89).

In the three community interventions, group meetings are organized first, followed by creative workshops or physical activity. Interventions by Ren and colleagues and Espinoza and colleagues initially set up meetings centred on a reminiscence therapy approach (88), or discussions about themes evoked by the participants, whether or not related to the common disaster, but with a view to recovery (85). Following these sharing sessions, a second component is deployed, either creative music and art workshops (85) or physical activity sessions (practising tai chi) (88). The study by Sim and colleagues proposes the practice of a particular dance to groups of women, a cultural practice specific to this community (89).

Effects of community interventions on mental health

The study by Ren and colleagues, involving seniors during the COVID-19 pandemic, measures the effect of the intervention (reminiscence therapy and physical activity) on feelings of loneliness, emotional resilience, and spiritual well-being (88). The authors compare the participant group (n = 60) with a control group (n = 61). The control group receives instruction on lifestyle habits, mental health, prevention and symptoms related to feelings of loneliness, and tools to improve their well-being. Following the intervention, the authors report a decrease in feelings of loneliness and an increase in psychological resilience and spiritual well-being in both groups, but significantly more so in the group that received the intervention. However, the authors note important limitations to their study, namely that the measurement times, only one month following the intervention, do not allow for an evaluation of the medium- and long-term effects of the intervention (88). In addition, the data-collection method and measurement times are not clearly established.

Sim and colleagues conducted a qualitative analysis using a Success Case Method (90) with participants in the dance workshops (n = 14), which were first offered by a social worker and then taken over by the groups of women (89). The intervention was carried out after a major earthquake. Participants first completed a questionnaire about their psychosocial conditions (psychological: enriched daily life, mood and self-confidence; social: social interactions and mutual help), and then those with the highest scores were invited to participate in in-depth interviews, again about their psychosocial conditions. During the interviews, respondents reported psychological benefits (enriched daily life, better mood and self-confidence) and benefits related to their social interactions (especially more positive interactions with their neighbours) and accept more mutual help. The limitations of this study include the small sample size (89) and the fact that the results only include participants who perceived the intervention to be beneficial.

The third study, also carried out after an earthquake, does not include an assessment (85). However, the authors present their observations as well as comments from participants. They argue that the art therapy proposed by their intervention (thematic group meeting followed by music and collage) helps transform traumatic experiences by giving them a collective meaning.

The authors also report that individuals expressed that their daily lives were also enriched, allowing for a sense of purpose or "feeling alive, rather than sitting at home and thinking about the past" (85).

Intervention in the physical environment

The study by Jose and colleagues investigates the influence of the presence of different types of organizations in the vicinity of the residence (safety-based organizations [police, firefighters], health-based organizations [hospitals], religious, educational, family and child-related organizations, and community-based organizations) on symptoms of acute stress, post-traumatic stress, functional impairment, and psychological distress among residents of Boston after the 2013 marathon bombings (n = 788), and New York City for comparison (n = 901) (86).

This study shows that the presence of organizations is not associated with mental health, except for safety-based organizations (police and fire stations), which are associated with more acute stress, functional impairment, and psychological distress among Bostonians when located one-half to one mile (800 m to 1.6 km) away. The authors speculate that these results may suggest that residents of Boston who reside at a greater distance from safety-based organizations, and those who are close to health-based organizations, reported fewer symptoms of deteriorating mental health. The authors invite us to consider these results when we need to expand certain services or plan the implementation of other services to support the population in the context of a crisis (86).

Analysis of qualitative interviews conducted in Mayen Huerta and Cafagna's study during a COVID-19 lockdown highlights the connection users make between urban green spaces and their well-being (87). Users express that green spaces are for them preferable for physical activity and relaxation during lockdowns, that they evoke positive feelings of comfort, tranquility, and better stress management. Participants also expressed that being in contact with nature (even seeing trees from their residence) helps them cope with stress. Qualitative analyses also allowed the authors to find that people who did not visit urban green spaces (sometimes due to a perceived lack of access) expressed more stress and anxiety. A majority of women from poorer neighbourhoods with fewer green spaces expressed this (87).

3.3 Correspondence between the factors identified and those targeted by the interventions studied

An imperfect match exists between the results of the two objectives, i.e., between the factors influencing mental health in the context of disasters (Objective 1) and the factors targeted (explicitly or not) by the interventions (Objective 2). Certain categories of factors are strongly represented in the interventions, notably those related to the social environment and more particularly to social interactions. Other factors are present in the interventions, but to a lesser extent. This is the case for those related to the physical environment. In contrast, some factors do not appear to be the target of the interventions or target them indirectly. These include factors related to socioeconomic characteristics. Table 2 below illustrates these connections.

It is possible that organizational interventions have targeted factors other than those identified in the studies. The matches that could be identified depend on the level of detail provided in the studies. Also, the context of the COVID-19 pandemic is still recent and it is quite possible that many of the interventions deployed have not yet been evaluated in the scientific literature. Similarly, a review of the grey literature would surely suggest initiatives in this direction.

Table 2 Factors associated with mental health targeted by interventions during extreme events[4]

	Categories of factors identified in the synthesis						
Interventions at the municipal or community level	Social interactions	Spatial variations	Urban design	Sociodemographics	Socioeconomics	Physical activity	Accessing information
Organizational interventions (e.g., support for community-based organizations and their networks, sponsorship of isolated individuals, psychological first-aid training *[a]*; targeting more heavily affected neighbourhoods, presence of vulnerable groups in a targeted neighbourhood *[c]*; creation of gathering places *[d]*; support/collaboration with immigration organizations *[f]*; monthly periodical, dissemination of positive rebuilding images, Photovoice, dissemination of survey results to the population first *[h]*)							
Bosman et al., 2013 (77)	■	■		■			■
Généreux et al., 2018 (78)	■		■				■
Lalani and Drolet, 2019 (79)	■						
McCabe et al., 2014 (80)	■						
Scigliano et al., 2019 (81)	■	■			■		
Slemp et al., 2020 (82)	■						
Springgate et al., 2011 (83)	■						
Wells et al., 2013 (84)	■				■		
Direct community interventions (e.g., group discussions, group reminiscence therapy, and group physical activity intervention) *(b)*; presence of organizations in the neighbourhood, use of green space during lockdown *(e)*; intervention aimed directly at groups of women and seniors *(f)*; targeting highly disadvantaged areas *(c)*; group practice of tai chi or dance *(g)*.							
Espinoza et al., 2016 (85)	■				■		
Ren et al., 2021 (88)	■			■		■	
Sim et al., 2019 (89)	■			■		■	
Direct interventions on the physical environment							
Jose et al., 2018 (86)			■				
Mayen Huerta and Cafagna, 2021 (87)			■				

(a) Bosman et al., 2013; Généreux et al., 2018; Lalani et Drolet, 2019; McCabe et al., 2014; Scigliano et al., 2019; Slemp et al., 2020; Spinggate et al., 2011; Wells et al., 2013.

(b) Espinoza et al., 2016; Ren et al., 2021; Sim et al., 2019.

(c) Espinoza et al., 2016; Scigliano et al., 2019; Wells et al., 2013.

(d) Généreux et al., 2018.

(e) Jose et al., 2018; Mayen Huerta et Cafagna, 2021.

(f) Bosman et al., 2013; Ren et al., 2021; Sim et al., 2019.

(g) Ren et al., 2021; Sim et al., 2019.

(h) Bosman et al., 2013; Généreux et al., 2018.

[4] Studies presenting organizational interventions do not necessarily document the single and multiple interventions deployed within their framework. This does not allow us to be exhaustive in matching them to the mental health factors identified.

4 OBSERVATIONS AND COURSES OF ACTION

This synthesis of the scientific literature identifies factors associated with mental health that municipalities can influence in the context of disasters, and then identifies studies of municipal or community-based actions that influence these factors and help promote mental health.

The reviews identified are mostly of good quality (nine of them have an AMSTAR score between 8 and 11 [55]) and it can be concluded that the data from this literature are reliable. In addition, there is strong convergence among the reviews on several factors identified. It should also be noted that, although the reviews claim to target factors associated with mental health, they focus more on factors associated with the deterioration of mental health or the presence of symptoms of mental disorders (preventive approach) than those associated with the improvement or preservation of mental health.

In terms of interventions, the studies suggest an approach to mental health promotion rather than prevention. The latter studies include few evaluations, which is also consistent with the findings of other studies and expert opinions (91, 92). In addition, their quality is generally low: more than half of the studies did not meet two basic criteria for further MMAT evaluation (56).

It would be unfounded to propose a precise and effective way to act on mental health in the context of disasters on the basis of all the material identified. However, the convergence observed between certain characteristics presented in the studies and the fact that the results identified are consistent with what is known about mental health promotion in and outside of the context of extreme disasters (3, 44, 45, 93, 94) allows us to draw some conclusions. It also allows for the identification of targets and courses of action at the municipal or community level to promote mental health in post-COVID-19 recovery.

4.1 The importance of a population mental health promotion perspective

The first observation regarding the results of the synthesis is that, on the one hand, the literature on factors associated with mental health in the context of disasters is based mainly on factors associated with symptoms of mental disorders, despite the fact that the authors claim to focus on mental health. The angle of approach in the identified literature seems to be more concerned with the deterioration of mental health. On the other hand, the literature on interventions is based more on a mental health promotion approach, focusing on improving mental health and its protective factors, and building on the potential of communities to strengthen mental health, both at the individual and community level. Despite the distinction between these approaches, it is important to remember that mental health and many common mental disorders share a number of underlying factors. Thus, it appears useful to develop interventions that promote mental health, since they have the capacity to both promote it and prevent its deterioration (35).

From a recovery perspective, the literature shows us that mental health must be an explicit part of preparedness planning for disasters. Moreover, the WHO, in its updated action plan on mental health (95), recommends integrating mental health into public health emergency preparedness planning (96). Planning actions to reduce the symptoms of mental disorders that occur in response to a disaster is recommended, as well as upstream actions that build the capacity of communities to deal with future similar events (95, 96). The strengthening and consolidation of capacities to face other events can be supported by mental health promotion initiatives, upstream of the problems, through support of the communities' socio-environmental factors, with a view to equity. Municipalities are well placed to do this in an informed way, as they know their citizens and have the responsibility to represent them. If they have a better understanding of mental health issues arising from disasters, they are also better representatives of their population. In particular, they can contribute to the consolidation and strengthening of capacities by offering spaces and opportunities for citizen participation (e.g., supporting community projects, collective and unifying events [97]).

Course of action:

- Ensure that community recovery plans explicitly incorporate mental health, from a health promotion perspective that both promotes mental health for all and prevents its deterioration and the emergence of mental disorders.

4.2 The social environment: a preferred target for action

The synthesis of factors associated with mental health in the context of disasters identified the importance of several factors that fall within the social environment, including the sphere of social relationships (or the social network) (62, 64, 66–74, 76). This is also an important issue in the context of the pandemic, where social distancing has been a means of mitigation. Social relations are mainly targeted by the actions identified, both in terms of organizational interventions and direct interventions. In particular, these aim to strengthen social ties (e.g., existing social network structures, strengthening relationships in the neighbourhood) (77, 89), break isolation (78, 85, 88, 89), or encourage social contact (85, 88, 89). These various actions, which aim to consolidate or increase the social network of individuals and communities (e.g., via the networks of community organizations and churches), therefore act on factors that promote social support and are a privileged field for intervention.

Social support (and its corollaries such as one's social network [98]) is widely recognized as an essential resource for coping with times of increased stress (99), and generally within communities to promote mental health (100, 101). Social support is conducive to mental health, both informally and individually (e.g., positive and supportive relationships in the neighbourhood) and formally and structurally (e.g., through organized institutions, such as churches or community organizations) (99, 102). The interventions identified address both

aspects, by promoting the expansion of individuals' social networks (group interventions that provide opportunities to socialize) or by supporting the work of community organizations and their networks (e.g., the presence of community organizations in all studies of organizational actions).

Moreover, social support is a key ingredient of community resilience (37), which is essential during disasters. A recent study highlights a mechanism, following several mass traumas, that links community resilience to a decrease in post-traumatic stress and symptoms of depression. The authors note that individual resilience mediates this mechanism (103). For community resilience to help reduce symptoms, related resources must be in place for individuals (e.g., social participation, social support, positive social relationships, sense of belonging, capacity building, etc.) to generate their individual resilience (103).

The studies identified in this report indicate that the intersectoral nature of interventions can foster capacity building, particularly if it involves citizens in an equal dynamic (78–80, 89). Although joint decision-making, recognition of competencies and support for a shared vision of the issues encourage, in principle, an equal dynamic and greater equity, the literature also highlights certain pitfalls in maintaining these principles when they are operationalized (104, 105). To counter this pitfall, studies suggest ways to facilitate equal relationships between collaborators. Among other things, we note the importance of being equipped to understand the different forms of power at stake, as well as the elements that limit the power of communities and hinder the equal dynamic (e.g., limits of a structural, systemic, or financial nature) (104, 105). Such tools would make it possible, for instance, to specify the political or economic interests that are at stake and that must be balanced with citizens' interests (78). In addition, participatory and community-based governance models could be adopted by municipalities to ensure community decision-making (48). Municipalities can prioritize public consultations, for example, and ensure their continuity during disasters (48).

The effect of interventions on mental health is not evaluated in the identified studies and should clearly be the subject of future research. More robust study designs, such as randomized trials, are difficult to apply to the type of interventions identified (92). Moreover, this field of complex interventions requires appropriate analysis tools, which also aim to examine the processes (106, 107). Certain tools and methods could be preferred, for example, realistic evaluations of contexts and mechanisms of action (when-why-how) (107), or analyses of intersectoral interventions that link actions to transitory outcomes (108). Continued efforts to identify barriers to equal dynamics, establish the ingredients for mental health, and analyze intersectoral processes can lead to mental health outcomes.

Courses of action:

- Promote social support and positive social relationships through participatory and inclusive approaches;
- Support operationalizations by dedicated mental health teams that work in an intersectoral manner and include citizens;
- Ensure that the ingredients for mental health are present, such as the involvement of different groups in the community and an equal dynamic among collaborators.

4.3 The physical environment: a target for action

Residing in a neighbourhood or location more heavily or directly affected by a disaster appears to be proportionately associated with mental health and is a risk factor in studies. In the reviews included in relation to factors associated with mental health in the context of disasters, living in a neighbourhood with a high prevalence of cases or in a city considered to be an epicentre of this epidemic (e.g., Wuhan) are factors associated with the presence of various symptoms of mental disorders (65, 67, 68, 71, 72). Targeting neighbourhoods that are particularly affected by the impacts of a disaster could help mitigate this increased risk. Some of the interventions identified work in this way (81, 84, 85) by targeting neighbourhoods that are more heavily affected or where it is known, for example, that a group is particularly vulnerable (e.g., a high proportion of single seniors residing in a neighbourhood to be targeted). It is essential here to remember the importance of collecting and relaying data on local issues and characteristics that make communities vulnerable (78, 82).

It is surprising that other factors related to the physical environment are not present in the identified reviews (e.g., the presence of green space, population density, housing conditions). These are likely to be studied more in relation to infection rates (109, 110), or are not specific to mental health (111, 112). Also, the built environment is cited as a factor that can mitigate the impacts of the COVID-19 pandemic or health measures (113), but its link to physical activity seems to be the one that is referred to, given that physical activity is a protective factor for mental health. In the context of the COVID-19 pandemic, it seems important to integrate mental health effects into studies on the influence of the physical environment.

Among the interventions identified, Mayen Huerta's raises a previously identified point (113) regarding the use of green spaces, but also the quantity and satisfaction with them in neighbourhoods (greenery visible from the residence [87]), which may promote well-being (114–117). Various recommendations have also been made in relation to the physical environment and are the responsibility of municipalities, such as promoting pedestrian streets or shared streets that could be green spaces conducive to well-being and active transportation (118). Mayen Huerta's study also highlights the importance of access to green space, particularly for underserved populations (113, 119, 120).

Other elements, from the studies identified but also from the literature on environments conducive to health (61), make it possible to underline the importance of having a concern for a physical environment that can be beneficial to well-being. For example, the importance of offering interventions in places that are safe (79), the importance of the physical presence of health authorities in public spaces (81), or the development of memorial or temporary sites for the reappropriation of public spaces affected by a disaster (121). These examples of interventions are actions that involve or can be driven by municipalities. On the other hand, the physical environment is an area in which municipalities play a predominant role.

Courses of action:

- Have a concern for a safe and welcoming physical environment that takes protective factors for mental health and well-being into account;
- Provide green spaces that are accessible to all.

4.4 Addressing social inequalities in mental health

In addition to the mental health impacts of the COVID-19 pandemic on populations, this crisis has underscored the mental health inequities that affect certain population groups. This is what leads several authors to describe the pandemic as a syndemic, i.e., a phenomenon in which the interaction of social, environmental, and economic conditions with the disease produces inequalities for certain groups (27, 122–124). Factors associated with mental health in times of disasters highlight precisely which characteristics may make different groups vulnerable. In particular, the included reviews note that women, young adults, non-Whites, people identifying with LGBTQIA+ groups, and people with pre-existing physical and mental conditions were at greater risk for symptoms of common mental disorders and deteriorating mental health status during disasters. This is also true for those with low family income, migrant workers, those experiencing financial impacts during the crisis (e.g., job loss, job insecurity), or with lower levels of education. It should be noted here that the intersection of these factors represents an increased risk and also that several of them can be explained by a precarious financial situation (e.g., young adults experience more job insecurity) (65). However, the interventions identified do not specifically target these factors.

Socioeconomic characteristics emerge as risk factors for mental health in the context of disasters, and this finding is consistent across the included reviews. It should also be noted that certain organizational and direct interventions are sometimes aimed at communities in neighbourhoods or regions with a higher level of deprivation, which may represent a way of targeting groups made vulnerable by a disaster (81, 84, 85). However, the interventions in this synthesis do not directly target economic conditions. In the context of the COVID-19 pandemic, a Quebec study shows that young adults were among the groups most heavily affected by job loss (125). There is also evidence that employment interventions help to promote mental health

in this population (126). Investing in local economic development (60) or employment assistance programs (127) could thus be incorporated into strategies to improve the well-being of young adults. Municipalities can also contribute to the economic stability of individuals and families by enabling access to housing (e.g., 30% of income dedicated to housing, prevention of evictions) (128).

The importance of collecting data is paramount to understanding the characteristics that weaken particularly affected population groups and social inequalities in mental health. It is equally important to be aware of characteristics that represent assets for coping with adversity (78, 82). These data will also allow for the appropriate targeting of groups and the development of, or access to, interventions that are most appropriate and aligned with their needs and strengths.

Courses of action:

- Collect data on the mental health status of populations that goes beyond indicators of debilitating mental disorders to include indicators of positive mental health, the strengths that enable people to cope with adversity;
- Use the data collected and knowledge of the mental health status of populations and its factors to identify interventions that are best aligned with community needs and strengths.

4.5 Limitations

This knowledge synthesis highlights the factors associated with mental health in the context of disasters, and then attempts to link a series of actions at the municipal and community levels that could help mitigate mental health impacts. Organizational and direct population/physical environment interventions address some categories of factors, while other categories could be further strenghtened. This work highlights the challenges that intervention research and interventions themselves face. The synthesis also has several limitations related to the included studies and the synthesis approach itself.

Limitations of the studies identified

- The literature on factors associated with mental health in the context of disasters is heterogeneous (definitions and indicators of mental health status and its factors);
- The measures of these indicators are often poorly defined or not at all defined;
- Studies of actions to mitigate the impacts of extreme events on mental health include limited assessments of mental health or well-being;
- Intervention studies are highly heterogeneous (quality, design).

Limitations of the knowledge synthesis

- This knowledge synthesis focuses solely on the scientific literature. However, the grey literature offers many examples of community- or municipal-level interventions. The synthesis cannot purport to have covered these initiatives;
- Few interventions implemented in the context of the COVID-19 pandemic were identified. Since this event is recent and ongoing, interventions in this context may not yet have been the subject of published scientific articles. This makes it difficult to grasp all of the initiatives that are still in development or that have been published very recently;
- Few factors associated with the physical environment emerged from the included reviews (e.g., housing conditions).

5 CONCLUSION

This scientific knowledge synthesis was conducted to support post-pandemic psychosocial recovery and preparedness for potential disasters at the municipal level. Specifically, the objective was to identify factors that influence mental health in the context of a pandemic or disaster and that are within the reach of municipal or community action. It also aimed to identify actions at the municipal or community level that influence these factors and promote mental health following a disaster.

Based on the studies identified, it can be concluded that the data from the factor reviews are reliable. Although the reviews have limitations, they show strong convergence and many are of good quality. However, it is not possible to comment on the effectiveness of interventions in directly improving mental health or psychosocial recovery. However, studies that present organizational actions do identify common organizational aspects that could allow mental health to be explicitly incorporated into responses to and preparedness planning for disasters. The other interventions, while not demonstrating strong evidence of mental health effects because the studies have significant limitations, provide examples of community-based recovery interventions that may be inspirational.

In fact, this knowledge synthesis based on the scientific literature makes it possible to inspire courses of action related to the conditions that put population groups at greater risk of experiencing the consequences of the pandemic on their mental health status, as well as organizational practices and direct interventions that can lead to recovery. In light of the data and their intersections, it seems that the social environment is a privileged field of action, when it promotes positive social relationships, participation, and social support. Municipalities are well suited to support areas of social support such as sports and recreation programs (where young adults may be particularly targeted), as well as cultural and artistic programs. Intersectoral approaches that involve local actors in an equal dynamic between collaborators also seem necessary for recovery and preparation for possible extreme events.

The proximity of municipalities to communities and their pivotal role at the heart of local action make them particularly well placed to foster intersectoral action. They can provide leadership or coordination of the various interventions deployed, ensuring their coherence and a common vision among collaborators. Although the present knowledge synthesis does not allow for a detailed discussion of aspects of the physical environment, it remains that its layout is another field of action favoured by municipalities and that its development from a mental health promotion perspective must be pursued.

Finally, an equity-based approach can guide municipalities in deploying programs to encourage recovery. They have an advantage in that they have knowledge of their population, its specific needs, and the particular characteristics that may put certain groups at risk or protect them.

They also are well positioned for action on the social determinants of mental health, which have the potential to foster increased mental health while contributing to the reduction of mental disorders and poor mental health.

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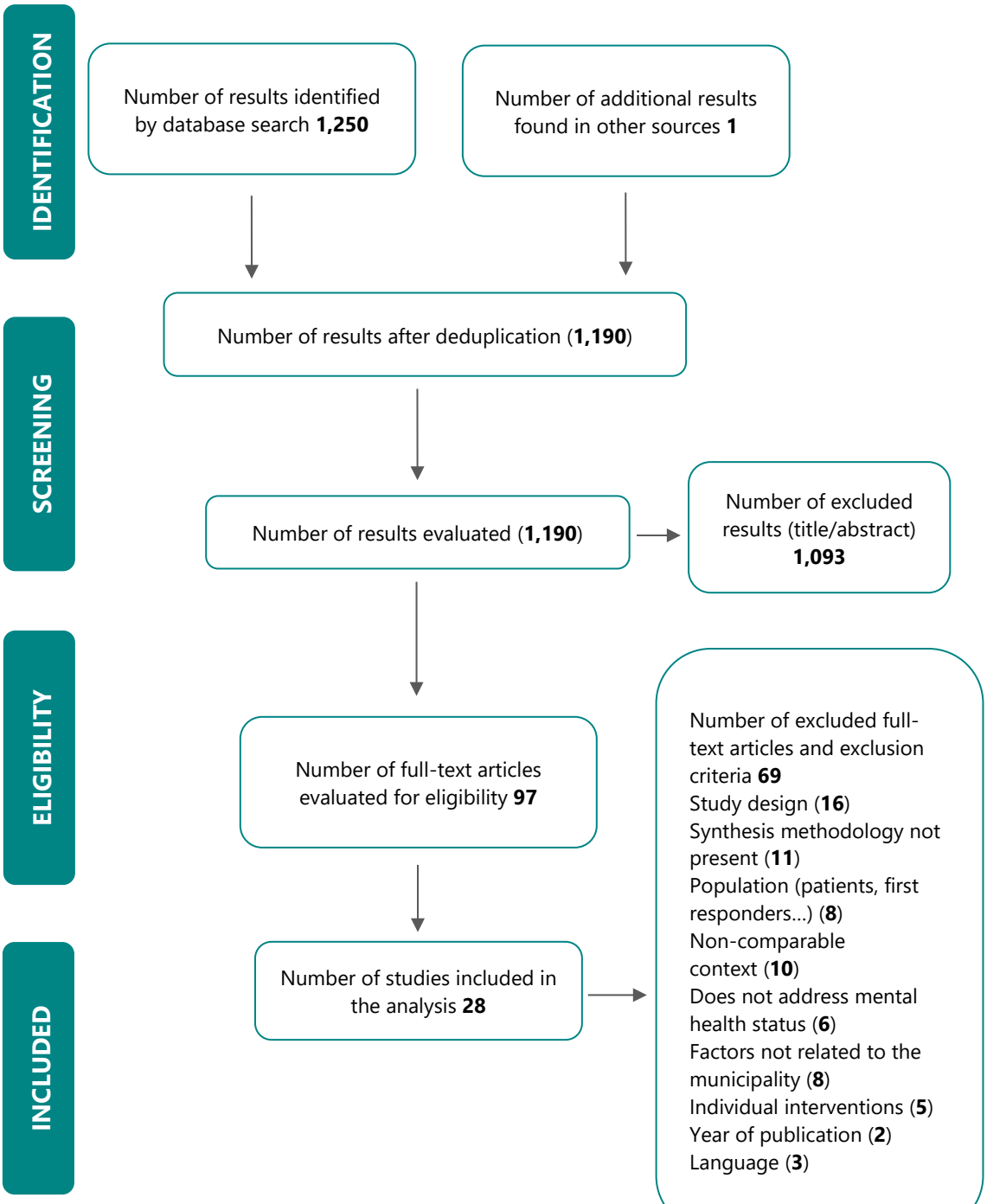
APPENDIX 1 METHODOLOGICAL DETAILS

Table 3 Research strategy for OVID

Accessed on August 24, 2021

#	Query
1	(((mental OR emotional OR psychological) adj3 (health OR wellbeing OR "well-being" OR wellness OR "well-ness" OR distress or stress)) OR flourish*).ti,ab. or "mental health"/
2	(((disease* or virus or viral or flu or influenza) adj2 outbreak*) or epidemic* or pandemic* or (economic adj1 (depression or recession)) or ((health or sanitar* or socio-economic* or socioeconomic* or economic*) adj1 (crisis or crises)) or ((health or sanitar*) adj3 emergenc*) or disaster or flood* or fire* or wildfire* or tornado* or storm* or hurricane* or earthquake* or "ground collapse" or landslide* or "environmental hazard").ti,ab. or epidemics/ or pandemics/ or "disease outbreaks"/ or "economic recession"/ or Disasters/
3	(Recovery OR healing OR "post-pandemic" OR "traumatic event*" or resilience or attenuat*).ti,ab. or "Resilience, Psychological"/or "mental health recovery"/
4	(((urban OR rural OR suburban OR metropolitan OR city OR cities OR "community intervention*" OR Neighbourhood OR neighborhood OR "local governance" OR "local government" or area) and (activit* OR campaign* OR "head start*" OR initiative* OR intervention* OR polic* OR practice* OR program* OR promotion* OR service* OR strateg*)) or (environment* adj1 design) OR (health* adj1 (city OR cities OR place*)) OR ("land use" adj1 (design* OR plan* OR polic*)) OR "recreational facilit*" OR "leisure zone*" OR (green adj1 (space* or structure*)) OR playground* OR play-ground* OR park OR parks OR ((built OR man-made OR manmade OR physical OR design* OR healthy OR healthier) adj1 (environment* OR surrounding* OR infrastructure* OR facilit* OR surrounding* OR form)) OR (environment* adj (attribute* OR design* OR feature*)) OR biodiversity).ti,ab. or "rural areas"/ or "suburban areas"/ or "urban areas"/ or "local government"/ or "residence charcateristics"/
5	1 and 2 and 3 and 4
6	((risk* or predictor* or factor* or cause* OR circumstance* OR context* OR environmen* or inequalit* or equit* or inequit* or socio-economic* or (unmet adj2 need*) or income or socioeconomics or geographic or exclusion or poverty or vulnerability or marginaliz* or vulnerable or (social adj2 exclusion*) or gradient or determinant or residence or location or ethnicity or (immigration adj2 status)) AND ((mental OR emotional OR psychological) adj3 (health OR wellbeing OR "well-being" OR wellness OR "well-ness" OR distress or stress))).ti. or (((risk* or predictor* or factor* or cause* OR circumstance* OR context* OR environmen*) adj3 ((mental OR emotional OR psychological) adj3 (health OR wellbeing OR "well-being" OR wellness OR "well-ness" OR distress))) OR ((inequalit* or equit* or inequit* or socio-economic* or (unmet adj2 need*) or income or socioeconomics or geographic or exclusion or poverty or vulnerability or marginaliz* or vulnerable or (social adj2 exclusion*) or gradient or determinant or residence or location or ethnicity or (immigration adj2 status)) AND ((mental OR emotional OR psychological) adj3 (health OR wellbeing OR "well-being" OR wellness OR "well-ness" OR distress or stress)))).ab.
7	(((systematic OR state-of-the-art OR scoping OR literature OR umbrella) ADJ (review* OR overview* OR assessment*)) OR "review* of reviews" OR meta-analy* OR metaanaly* OR ((systematic OR evidence) ADJ1 assess*) OR "research evidence" OR metasynthe* OR meta-synthe*).tw. OR exp Review Literature as Topic/ OR exp Review/ OR Meta-Analysis as Topic/ OR Meta-Analysis/ OR "systematic review"/
8	2 and 6 and 7
9	5 or 8

Figure 1 Study flow diagram



Translated and adapted from the *PRISMA 2009 Flow Diagram*

APPENDIX 2 CHARACTERISTICS, METHODOLOGICAL QUALITY, AND RISK OF BIAS OF LITERATURE REVIEWS

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of disasters (Objective 1)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic						
Ahmad & Vismara (2021) (62)						
Rapid review	Pregnant women during the first wave of COVID-19	17	China Canada Turkey Argentina Iran Qatar Spain Italy Pakistan Japan	Longitudinal (1) case control (1) cross-sectional (13) prospective (2)	Pre-existing mental disorders + mental disorder symptoms (MD) Low family income + MD Social support and physical activity – symptoms of anxiety and depression (AD)	Medium (7/11)
Chaabane et al. (2021) (63)						
Rapid review	Children and teenagers (kindergarten, elementary, middle, and high school)	10 (1 relevant)	Italy	Not specified	School closure and quarantine + A and solitude (from one study)	Medium (7/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic						
Cielo et al. (2021) (64)						
Rapid narrative review	Young adults (ages 18–30)	15	Italy (3) China (2) Malaysia (2) Bangladesh (2) Pakistan (1) France (1) Ethiopia (1) Spain (1) Saudi Arabia (1) Nigeria (1)	cross-sectional (12) longitudinal (2)	Urban (vs. rural) residence + AD (from a single study) Accessing pandemic information via mass media or social media+ D (from a single study) Consultation (not enough or too much) of information about COVID-19, financial insecurity, food insecurity, having a loved one with COVID-19 + stress (from one study) Social support and activities – MD or stress Stable family income – MD (from a single study) Physical activity – A, stress (from a single study) and D	Low (3/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic						
Gibson et al. (2021) (65)						
Rapid narrative review	Disadvanta-ged population groups based on factors of inequality as defined by the Public Health Agency of Canada (PHAC)	117	Majority of studies China (47) and USA (14) Various countries	cross-sectional (112), cohort (4), case control (1)	Women + MD Young adults (<35 years old), people who are unemployed or have lost their jobs, people living or working in cities or areas most affected by COVID-19 + MD Low level of education + MD (majority of studies) Lower family income + MD Stability of income – MD Place of residence (urban/rural) = mixed results MD Pre-existing psychological or physical health problems + MD Migrant workers (from a single study) and people who do not identify as White (Black, Indigenous, Asian, Hispanic, minority ethnic groups) + MD Non-binary, transgender, sexual minorities, and MSM + MD	Good (8/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic						
Iyengar et al. (2021) (66)						
Systematic review	Pregnant and postpartum women	81	Various countries in Europe, Asia, the Middle East, Africa, and the Americas	Majority cross-sectional longitudinal (8) retrospective (2) quasi-experimental (1)	Socioeconomic factors (young maternal age, high number of hours worked, full-time employment status, high job stress, and low income/financial strain) + AD Lower level of education + MD (majority of studies) High level of education + A (certain studies) Low social support and social isolation (quarantine) and feelings of loneliness + MD Increased social support – MD Little physical activity + MD	Good (9/11)
Marques de Miranda et al. (2020) (67)						
Narrative review	Children (ages 6–15) and teenagers (ages 12–21)	51	Not specified	Not specified	Older teenagers (//children) + D /Mixed results for A Place of residence: Metropolitan regions – AD Reside in an area highly affected by the pandemic + A (from a single study) Pre-existing MD conditions + A Teenagers with financial constraints in the family + D (from a single study) Family support and pro-social actions – D (teenagers) Knowledge of or satisfaction with information about COVID-19 – AD and post-traumatic stress disorder (PTSD)	Low (2/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic						
Panchal et al. (2021) (68)						
Systematic review	Children and teenagers under 19 years of age	61	Various countries in Europe (35), Asia (22), Australia (1), North America (1), South America (1), more than one country (1)	cross-sectional (45) longitudinal (16)	Teenagers (//children) and girls (//boys) + AD during lockdowns Reside in an area with a high incidence of COVID-19 + AD More time to access information about the pandemic + AD (from a single study) Duration of confinement > 3 months, + emotional symptoms, hyperactivity-inattention and problem behaviours (children) (from a single study) Play and physical activity – hyperactivity-inattention (children) (from a single study) During lockdown, children are calmer (feeling of safety and well-being) (qualitative study)	Good (10/11)
Rodríguez-Fernández et al. (2021) (69)						
Systematic review	General population (adult)	26 (low-quality studies excluded)	China (6) Spain (3), Germany (2), the UK (2), Saudi Arabia (1), Brazil (1), India (1), South Korea (1), Pakistan (1), Jordan (1), Italy (1), Vietnam (1), Turkey (1), Bangladesh (1), USA (1)	cross-sectional (24) longitudinal (2)	Sociodemographic variables (women, young adults, students, divorced or widowed, low income, low education, feelings of loneliness, pre-existing psychiatric illness, poor perceived health) + AD and PTSD Unemployed, lack of psychological support, long periods of social distancing + D Spiritual well-being – D Perceived lack of information related to the pandemic + PTSD and stress Good perceived health, high family income, broad social network, and social support – A	Good (10/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic, other pandemics and epidemics						
Chau et al. (2021) (70)						
Systematic review	Patients with SARS, health care workers, and the general public in the five key regions of the epidemic	35 (19 relevant)	Mainland China, Hong Kong, Canada, Taiwan, and Singapore	Majority cross-sectional longitudinal (2)	Women + A Duration of lockdown > 10 days + D	Good (11/11)
Fong & Iarocci (2020) (71)						
Systematic review	Children (0–18 years) or their parents	17	China (6) Australia (3) USA (2) India (1) Turkey (1) Japan (1) Argentina (1) Netherlands (1) Canada (1)	Quantitative (11) mixed (2) qualitative (4)	Teenagers (12–18 years) (//children), girls + AD Place of residence in a rural area + D (from one study) Reside near or in an epicentre + D (from a single study) (Parents) periods of lockdown + PTSD (from a study) (Children) Awareness of COVID-19, consider themselves informed about COVID-19 – MD (from one study)	Good (8/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
COVID-19 pandemic, other pandemics and epidemics						
Luo et al. (2020) (72)						
Systematic review	Affected people, health care workers, students, shut-ins, and the general population	56 (30 relevant)	Hong Kong (31) China (21) Taiwan (10) Singapore (9) South Korea (9) Canada (8)	Majority cross-sectional	Low social capital, someone affected who is close to the person, and women + A (each factor from a single study) Reside near a hospital + A Reside near or in an epicentre of an epidemic + PTSD Low education (from a study), older people (from a study), and women + PTSD People > 60 years old and those with income loss during epidemics + D (each factor from a single study)	Medium (6/11)
Muehlschlegel et al. (2021) (73)						
Systematic review	General population (unspecified)	40	China USA South Korea Canada India Austria Hong Kong Taiwan Sierra Leone Italy Vietnam UK	Cross-sectional (20) longitudinal (10) qualitative (4) cohort studies (2) mixed (2) case study (1) case control (1)	In the month following a lockdown, people who reported poor relationships with family or in the neighbourhood (from a single study), impacts of lockdown on their finances or low income, low education, and women + AD and PTSD Medium-term, duration of lockdown more than 10 days, low family income (from a single study) + D and PTSD Pre-existing MD, food insecurity, financial constraints, and lack of spaces to socialize (each factor from a single study) + A Long term (6 months following a lockdown), income reduction + MD	Good (8/11)

Table 4 Characteristics of literature reviews on factors associated with mental health in the context of extreme events (Objective 1) (cont'd)

Type of review	Population	Nb of primary studies	Countries (primary studies)	Design (primary studies)	Factors associated with mental health or mental disorders	Quality (AMSTAR)
Authors (year)						
Other disasters						
Ando et al. (2018) (74)						
Systematic review	Residents of Japan, from areas affected by the disaster	42	Japan	Cross-sectional (31) longitudinal (10) randomized study (1)	Unemployed, low income, pre-existing health condition, women, and people who watch TV news longer + AD and PTSD (each factor is from a single study)	Good (8/11)
Mao & Agyapong (2021) (75)						
Narrative review	Not specified	21	Not specified	Not specified	Reported results are not clearly derived from the included studies	Low (2/11)
O'Donohue et al. (2021) (76)						
Scoping review	Young adults (18–34 years old)	91	USA (55) developed countries (72) New Zealand Australia China Haiti Pakistan Italy Peru Sri Lanka Japan Philippines Indonesia Iceland Armenia South Korea		Following the disaster: women + AD, PTSD, psychological distress, and sadness Men + feeling of hopelessness and externalizing anger Young adults (18–34 years) + psychological distress, hopelessness, stress (each factor from a single study), and PTSD Low level of education + psychological distress, hopelessness, and + PTSD (each disorder indicator from a single study) Pre-existing MD + psychological distress, stress, AD, and PTSD Little social support + psychological distress	Good (9/11)

Table 5 Assessing the methodological quality and risk of bias of literature reviews (AMSTAR)

	1. Was an "a priori" design provided?	2. Was there duplicate study selection and data extraction?	3. Was a comprehensive literature search performed?	4. Was the status of publication (i.e., grey literature) used as an inclusion criterion?	5. Was a list of studies (included and excluded) provided?	6. Were the characteristics of the included studies provided?	7. Was the scientific quality of the included studies assessed and documented?	8. Was the scientific quality of the included studies used appropriately in formulating conclusions?	9. Were the methods used to combine the findings of studies appropriate?	10. Was the likelihood of publication bias assessed?	11. Was the conflict of interest stated?	Total
COVID-19 pandemic												
Ahmad et al. (2021) (62)	1	1	1	0	1	1	0	0	1	0	1	7
Chaabane et al. (2021) (63)	1	1	0	1	1	1	1	0	0	0	1	7
Cielo et al. (2021) (64)	0	0	0	0	1	0	0	0	1	0	1	3
Gibson et al. (2021) (65)	1	1	1	0	1	1	1	1	1	0	0	8
Iyengar et al. (2021) (66)	1	1	1	0	1	1	1	1	1	0	1	9
Marques de Miranda et al. (2020) (67)	0	0	1	0	0	0	0	0	0	0	1	2
Panchal et al. (2021) (68)	1	1	1	1	1	1	1	1	1	0	1	10
Rodríguez-Fernández et al. (2021) (69)	1	1	1	1	1	1	1	1	1	0	1	10
COVID-19 pandemic, other pandemics and epidemics												
Chau et al. (2021) (70)	1	1	1	1	1	1	1	1	1	1	1	11
Fong et al. (2020) (71)	1	1	1	0	1	1	1	1	0	0	1	8
Luo et al. (2020) (72)	1	1	1	0	0	0	1	1	0	0	1	6
Muehlschlegel et al. (2021) (73)	1	1	1	0	1	1	1	1	0	0	1	8
Other extreme events												
Ando et al. (2018) (74)	1	1	1	0	1	1	1	0	1	0	1	8
Mao & Agyapong (2021) (75)	0	0	0	0	1	0	0	0	0	0	1	2
O'Donohue et al. (2021) (76)	1	0	1	1	1	1	1	1	1	0	1	9

APPENDIX 3 CHARACTERISTICS AND METHODOLOGICAL QUALITY OF INCLUDED STUDIES RELATED TO MUNICIPAL OR COMMUNITY-BASED ACTIONS

Table 6 Characteristics of studies related to municipal or community-based actions

Objective/Design	Population targeted by the intervention	Extreme event(s)	Mental health aspect(s) of recovery/measure(s)	Action(s) or intervention(s)/role of the municipality	Assessment (e.g., evaluation, lessons learned)/ conducted with…
Authors (year)/Country					
Organizational actions					
Bosman et al. (2013)/Netherlands (77)					
To review the work of Mediant (regional mental health centre), which has taken a central position in the recovery/descriptive study	Residents of affected neighbourhoods	Explosions in Enschede (fireworks disaster) (Netherlands), 2000	Emotional resilience, autonomy/unmeasured	Multiple interventions/colla-boration, support through existing services to victims, communities. Neighbourhood visits City social workers Communication	Description of the approach (theoretical and practical)/researchers of the Mediant centre
Généreux et al. (2018)/Canada (78)					
To describe community strategies implemented to improve community resilience and identify lessons learned and ways to improve the long-term public health response to disaster/descriptive case study	Adults living in Lac-Mégantic	Lac-Mégantic train tragedy, July 2013	Community resilience, adaptability/unmeasured	Multiple interventions/colla-boration, presence at the collective reflection meeting, collaboration in several initiatives	Lessons learned, authors report results of cohort studies in the area, in subsequent years/local public health actors and researchers (assessments, lessons learned), area residents (cohort)

Table 6 Characteristics of studies related to municipal or community-based actions (cont'd)

Objective/Design	Population targeted by the intervention	Extreme event(s)	Mental health aspect(s) of recovery/ measure(s)	Action(s) or intervention(s)/role of the municipality	Assessment (e.g., evaluation, lessons learned)/ conducted with…
Authors (year)/Country					
Organizational actions					
Lalani & Drolet (2019)/Canada (Alberta) (79)					
Describe the integration of mental health into the response to a disaster (Alberta Resilient Communities Research Project), discuss promising practices for promoting wellness and resiliency in rural communities after a disaster event/qualitative study	Children and teenagers	Flooding in Alberta, 2013	Resilience/ unmeasured	Multiple interventions/not clearly stated Multiple community collaborators (social workers, community agencies, schools)	Barriers to use of mental health resources, identification of promising practices/37 community stakeholders (e.g., social workers, teachers, mental health therapists, etc.)
McCabe et al. (2014)/USA (80)					
Describe organizational approaches and validation of interventions in mental health response planning during a public health emergency/descriptive study	Leaders and members of community and religious organizations	Hurricane Sandy, New York, 2012	Community resilience/ unmeasured Psychological first aid (PFA)/PFA Knowledge, Skills, and Attitudes Survey Form, Disaster Mental Health Knowledge Test, PFA Training Follow-up Questionnaire	Psychological first aid training, mental health emergency response planning exercises/no explicit role	Assessment of learning and attitudes in PFA, ability to develop planning/participants in training Appreciation of the approaches/representatives from different sectors involved in the project (academic, community, religious, etc.)

Table 6 Characteristics of studies related to municipal or community-based actions (cont'd)

Objective/Design	Population targeted by the intervention	Extreme event(s)	Mental health aspect(s) of recovery/ measure(s)	Action(s) or intervention(s)/role of the municipality	Assessment (e.g., evaluation, lessons learned)/ conducted with…
Authors (year)/Country					
Organizational actions					
Scigliano et al. (2019)/USA (81)					
Describe the Sandy Recovery and Resiliency program, a program that builds resilience, coping skills, and social-emotional competencies in a community-based approach with underserved populations. Share knowledge gained from this experience/case study	Populations identified as vulnerable in the face of Hurricane Sandy, underserved by mental health services	Hurricane Sandy, New York, 2012	Community resilience, coping skills, and social-emotional skills/unmeasured	Multiple interventions/not clearly stated Collaborator (e.g., libraries as a place for activities and gatherings)	Evaluation of the approach from retrospective internal reporting data/Children's Health Fund (program initiator)
Slemp et al. (2020)/USA (82)					
Describe how a New York City public health agency used the COPEWELL program for community resilience building after Hurricane Sandy in New York City/case study	COPEWELL is aimed at communities affected by a disaster	Hurricane Sandy, New York, 2012	Community resilience/ unmeasured	Multiple interventions/instigator of the intersectoral working group (New York City Department of Health and Mental Hygiene, Office of Emergency Preparedness and Response)	Evaluation of the use and benefits of using COPEWELL (observations and telephone interviews)/workgroup members

Table 6 Characteristics of studies related to municipal or community-based actions (cont'd)

Objective/Design	Population targeted by the intervention	Extreme event(s)	Mental health aspect(s) of recovery/ measure(s)	Action(s) or intervention(s)/role of the municipality	Assessment (e.g., evaluation, lessons learned)/ conducted with…
Authors (year)/Country					
Organizational actions					
Springgate et al. (2011)/USA (83)					
Description of REACH NOLA mental health training program for community workers, description of approach, description of one community worker's experience with this program/descriptive study	Wide range of stakeholder organizations (community workers, NGOs, churches)	Hurricanes Katrina and Rita, New Orleans, 2005	Stress, symptoms of anxiety and depression, post-traumatic stress disorder/ unmeasured	Psychological first aid training (awareness, education, screening, referral, peer support)/not clearly stated	Questionnaires on community mental health needs and interest in training for community agencies/community workers and supervisors of community organizations Appreciation of the training and work done with the community/community worker
Wells et al. (2013)/USA (84)					
Description of the application of a community resilience model in participatory research, Los Angeles and New Orleans/case study	Disaster-affected and underserved communities	Hurricane Katrina, New Orleans, 2005	Community resilience, depression/ unmeasured	Collaborative development of psychological first aid training for community organizations, efforts to address the stigma of depression/project collaborator	Process evaluation, lessons learned/researchers and collaborators (including Los Angeles County Department of Public Health)

Table 6 Characteristics of studies related to municipal or community-based actions (cont'd)

Objective/Design	Population targeted by the intervention	Extreme event(s)	Mental health aspect(s) of recovery/measure(s)	Action(s) or intervention(s)/role of the municipality	Assessment (e.g., evaluation, lessons learned)/ conducted with…
Authors (year)/Country					
Interventions					
Espinoza et al. (2016)/Chile (85)					
Description of psychosocial interventions targeting older women after an earthquake in rural Chile/qualitative study	Seniors 15 to 20 workshop participants	Earthquake and tsunami, Chile, 2010	Recovery (psychosocial) from trauma, sense of belonging/researchers' observations in workshops	Group meetings and music and art workshops/community intervention (no explicit role)	Observations at workshops/researchers
Jose et al. (2018)/USA (86)					
Examine how the presence of organizations (different types) is associated with residents' mental health status following the Boston bombings/cross-sectional study	Residents of affected area (Boston N = 788) Comparator (New York N = 901)	Boston Marathon bombing, April 15, 2013	Psychological distress, acute stress, PTSD, fears and worries about the future, functional limitations/BSI-18, SASRQ, PC-PTSD, SF-36*, Future Fears and Worries Tool (not validated)	Presence of different types of organizations in the vicinity of the residence (safety-based [police, fire], health-based services [hospitals], religious, educational, family and children's organizations, and community-based organizations)/not stated (implicit, urban design)	Associations between the presence of organizations and mental health status/residents of Boston and New York
Mayen Huerta & Cafagna (2021)/Australia (87)					
Explore factors affecting users' use of urban green spaces; analyze the relationship between the use of urban green spaces and user well-being/qualitative study	Adult residents of Mexico City (16 participants, ages 22–58 [11 women, 5 men])	COVID-19 pandemic lockdown, Mexico City, 2020	Well-being/qualitative interviews on the role that the use of urban green spaces may have played in the sense of well-being	Use of urban green spaces during lockdown/not stated (implicit, urban design)	Sense of well-being associated with the use of green spaces/users of green spaces, residents of different neighbourhoods in Mexico City

Table 6 Characteristics of studies related to municipal or community-based actions (cont'd)

Objective/Design	Population targeted by the intervention	Extreme event(s)	Mental health aspect(s) of recovery/ measure(s)	Action(s) or intervention(s)/role of the municipality	Assessment (e.g., evaluation, lessons learned)/ conducted with…
Authors (year)/Country					
Interventions					
Ren et al. (2021)/China (88)					
Measure the effect of a community-based physical activity and reminiscence therapy intervention in older adults on spiritual well-being, psychological resilience, and loneliness/intervention study (quasi-experimental) with control group	Seniors aged 60–80 years; intervention group n = 60, control group n = 61; 45% female	COVID-19 pandemic, 2019	Emotional resilience, spiritual well-being, feelings of loneliness/BRS, SIWB*, ULS Loneliness Scale	Reminiscence therapy and physical activity (tai chi) group/community intervention (no explicit role)	Validated questionnaires/intervention participants and control group
Sim et al. (2019) /China (89)					
Observe the effects of a community-based intervention that focuses on psychosocial capacity building, is culturally sensitive, and has the potential to improve the well-being of women in rural Tibetan communities after an earthquake/qualitative study	Women from Zhanjiang village in China (n = 14 in survey, n = 4 qualitative interviews)	Earthquake in Sichuan, 2008	Psychosocial well-being, resilience, capacity building, distress/qualitative interviews	Dance workshops (local practices) (first offered by a social worker, then taken over by the women's groups)/creation of a centre dedicated to the practice of dance	Survey and then qualitative interviews with top-scoring individuals/intervention participants

* *BSI-18: Brief Symptom Inventory; SASRQ: Stanford Acute Stress Reaction Questionnaire; PC-PSTD: Primary Care PTSD Screen; SF-36: Short-Form Health Survey (SF-36); BRS: Brief Resilience Scale; SIWB: Spirituality Index of Well-Being*

Table 7 Methodological quality assessment of municipal and community-based action studies (MMAT)

Study categories	Methodological quality criteria	Yes	No	Do not know
Authors (year)				
Bosman et al. (2013) (77)				
Screening questions (for all types)	S1. Are there clear research questions?		X	
	S2. Do the collected data allow to address the research questions?		X	
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
Espinoza et al. (2016) (85)				
Screening questions (for all types)	S1. Are there clear research questions?		X	
	S2. Do the collected data allow to address the research questions?		X	
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
Généreux et al. (2018) (78)				
Screening questions (for all types)	S1. Are there clear research questions?		X	
	S2. Do the collected data allow to address the research questions?			X
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
Jose et al. (2018) (86)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?	X		
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?	X		
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	X		
	3.3. Are there complete outcome data?	X		
	3.4. Are the confounders accounted for in the design and analysis?	X		
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?	X		

Table 7 Methodological quality assessment of municipal and community-based action studies (MMAT) (cont'd)

Study categories	Methodological quality criteria	Yes	No	Do not know
Authors (year)				
Lalani & Drolet (2019) (79)				
Screening questions (for all types)	S1. Are there clear research questions?		X	
	S2. Do the collected data allow to address the research questions?			X
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
Mayen Huerta & Cafagna (2021) (87)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?	X		
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
1. Qualitative studies	1.1. Is the qualitative approach appropriate to answer the research question?	X		
	1.2. Are the qualitative data collection methods adequate to address the research question?	X		
	1.3. Are the findings adequately derived from the data?	X		
	1.4. Is the interpretation of results sufficiently substantiated by data?	X		
McCabe et al. (2014) (80)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?	X		
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed method design to address the research question?	X		
	5.2. Are the different components of the study effectively integrated to answer the research question?	X		
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?			X
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?		X	
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?		X	

Table 7 Methodological quality assessment of municipal and community-based action studies (MMAT) (cont'd)

Study categories	Methodological quality criteria	Yes	No	Do not know
Authors (year)				
Ren et al. (2020) (88)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?	X		
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?			X
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	X		
	3.3. Are there complete outcome data?	X		
	3.4. Are the confounders accounted for in the design and analysis?		X	
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?		X	
Scigliano et al. (2019) (81)				
Screening questions (for all types)	S1. Are there clear research questions?		X	
	S2. Do the collected data allow to address the research questions?		X	
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
Sim et al. (2019) (89)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?	X		
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
1. Qualitative studies	1.1. Is the qualitative approach appropriate to answer the research question?			X
	1.2. Are the qualitative data collection methods adequate to address the research question?			X
	1.3. Are the findings adequately derived from the data?	X		
	1.4. Is the interpretation of results sufficiently substantiated by data?		X	

Table 7 Methodological quality assessment of municipal and community-based action studies (MMAT) (cont'd)

Study categories	Methodological quality criteria	Yes	No	Do not know
Authors (year)				
Slemp et al. (2020) (82)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?	X		
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
1. Qualitative studies	1.1. Is the qualitative approach appropriate to answer the research question?	X		
	1.2. Are the qualitative data collection methods adequate to address the research question?			X
	1.3. Are the findings adequately derived from the data?		X	
	1.4. Is the interpretation of results sufficiently substantiated by data?		X	
Springgate et al. (2011) (83)				
Screening questions (for all types)	S1. Are there clear research questions?		X	
	S2. Do the collected data allow to address the research questions?		X	
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			
Wells et al. (2013) (84)				
Screening questions (for all types)	S1. Are there clear research questions?	X		
	S2. Do the collected data allow to address the research questions?		X	
	Further appraisal may not be feasible or appropriate when the answer is 'No' or 'Can't tell' to one or both screening questions.			

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