For a structured response to the psychosocial consequences of the restrictive measures imposed by the global COVID-19 health pandemic: The MAVIPAN longitudinal prospective cohort study protocol

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THE MAVIPAN RESEARCH COLLABORATION

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The COVID-19 pandemic and the isolation measures taken to control it have caused important disruptions in economies and labour markets, changed the way we work and socialize, forced schools to close and healthcare and social services to reorganize in order to redirect resources on the pandemic response. This unprecedented crisis forces individuals to make considerable efforts to adapt and can have serious psychological and social consequences that are likely to persist once the pandemic has been contained and restrictive measures lifted. These impacts will
be significant for vulnerable individuals and will most likely exacerbate existing social and
gender health and social inequalities. This crisis also puts a toll on the capacity of our healthcare
and social services structures to provide timely and adequate care. In order to minimize these
consequences, there is an urgent need for high-quality, real-time information on the psychosocial
impacts of the pandemic. The MAVIPAN (Ma vie et la pandémie/My life with the
pandemic) study aims to document how individuals, families, healthcare workers,
and health organisations that provide services are affected by the pandemic and how they adapt.

Methods

The MAVIPAN study is a 5-year longitudinal prospective cohort study that was launched on
April 29th, 2020 in the province of Quebec which, at that time, was the epicenter of the pandemic
in Canada. Quantitative data is collected through online questionnaires approximately 5 times a
year depending on the pandemic evolution. Questionnaires include measures of health, social,
behavioral and individual determinants as well as psychosocial impacts. Qualitative data will be
collected with individual and group interviews that seek to deepen our understanding of coping
strategies.

Discussion

The MAVIPAN study will support the healthcare and social services system response
by providing the evidence base needed to identify those who are most affected by the pandemic
and by guiding public health authorities’ decision making regarding intervention and resource
allocation to mitigate these impacts. It is also a unique opportunity to advance our knowledge on
coping mechanisms and adjustment strategies.

Trial registration: NCT04575571 (retrospectively registered)

KEYWORDS
COVID-19, Pandemics, Mental Health, Psychological Adaptation, Health Personnel, Longitudinal Studies

BACKGROUND

The health crisis imposed by COVID-19 is forcing major worldwide social reorganization that will have profound consequences on our society [1]. Affected countries have been attempting to contain the spread of the virus by requiring extraordinary isolation efforts from their populations [2, 3]. One-third of the world’s population (~3 billion individuals) has, is or will again experience some kind of isolation measures, causing an unprecedented and rapidly evolving psychosocial crisis [4-7]. While biomedical research is relentlessly pursuing its efforts to understand the impact of the disease on infected individuals and to develop new treatments and vaccines, its psychosocial consequences that could permanently affect our wellbeing, the state of our health system, and our society cannot be ignored [7-10].

Failure to address psychosocial and health issues will prolong the impact of the pandemic for years to come. The psychosocial consequences of this health crisis will spare no one, particularly vulnerable individuals, and will persist long after restriction measures are lifted and the pandemic is over [7, 9, 11, 12]. The combination of professional changes, the state of being “at risk”, the possible loss of employment, the resulting economic difficulties, changes in couple and family dynamics, school closures and the reduction of services in health and social services network may all have an impact on the adjustment and development of individuals of all ages [13-17]. This impact will be significant for individuals facing unique contexts or challenges (e.g., older adults, individuals living with a disability, individuals with a chronic or mental health condition, underprivileged families) and will most likely exacerbate existing social, racial and gender inequalities in health and human development [18-25].
The scale of the current COVID-19 mobilization has destabilized several aspects of our health and social services structures. Services are being suspended, others are being maintained or intensified, and new intervention strategies are rapidly being adopted to adjust to containment measures or risk of virus transmission [26, 27]. Service interruptions, amongst others, have an impact on the physical and mental health and subsequent development of already vulnerable individuals [28]. Health and social services workers are experiencing major changes in their practice during this crisis [9, 29]. Many of these workers bear constant witness to the human toll of the pandemic and, all too often, become part of it [9, 30, 31]. This occurs in a context where these workers are subject to the same measures as the rest of the population, thus placing greater demands on their ability to adapt [30, 32, 33]. It is crucial to document practice changes and adjustments of these individuals, who must remain available for their family, colleagues and the population.

Recovering from the pandemic will require a social and economic response that is just as important as the current efforts to minimize the spread of infection [1, 34]. There is an urgent need for information on the evolution of the psychosocial dimensions of health and coping strategies used by our population and our health and social services structures. By comprehensively documenting such information, stakeholders will be in a better position to make timely informed decisions and implement strategies to minimize the expected consequences of the crisis on our mental health and well-being.

The MAVIPAN (*Ma vie et la pandémie*) cohort was developed in response to these individual and collective needs. It was born out of an unprecedented collective effort between the 4 research centers of the Quebec Integrated University Health & Social Services Center and their province-wide academic, governmental, institutional and community partners.
METHODS

Aims

Overall, MAVIPAN aims to accelerate the availability of high-quality, real-time evidence within health and social services structures to address, support and minimize ongoing and future, direct and indirect, psychosocial consequences of the COVID-19 pandemic. Working toward that goal, through constantly evolving research questions responsive to the pandemic evolution and knowledge users (KUs) needs, we will document, monitor, and evaluate the following:

(i) Individual and family adjustment and mitigation strategies, especially for those considered vulnerable and in high-risk contexts (e.g., What are the psychosocial and professional characteristics of the most vulnerable participants? What are the characteristics of those who seem to be coping well and who may have even improved during confinement? How are families coping over time?);

(ii) Healthcare, social services and frontline worker adjustment and mitigation strategies (e.g., What is the role of coping and adaptive strategies on the wellbeing and psychological health of our workers? Are there specific sectors of activity or levels of responsibility that are more vulnerable to adjustment issues? What are the predictive factors of burnout amongst healthcare workers?);

(iii) The organization of service structures (e.g., What are the mental health and social service needs non-related to COVID-19 that are not covered or poorly covered by current services? How have some services reorganized to provide appropriate levels of care and minimize barriers to care delivery?) and
(iv) The social and economic response (e.g., What are the economic, social and community-based initiatives that have contributed to mental health wellness? What health or social services should be prioritized upon another confinement?).

We have established strategic research priorities under key themes to address our objectives. We have identified Health inequities and mental health as cross-cutting themes across our objectives. Additional key themes have emerged from sources most likely to increase vulnerability during this health crisis: social environment and health, chronic diseases and disabilities, and frontline, health and social workers. Together, these strategic research priorities will be used as an evolving roadmap to assess the level and extent to which we are addressing our research objectives in a way that meets the needs of KUs and state of current knowledge.

**Conceptual Underpinnings**

The proposed approach draws from discussions with and lessons learned from KUs and field experts, literature reviews on the psychosocial impacts of disasters, quarantine, and long-term inequalities resulting from crises, and considerations of the strongest study design with the least risk of bias, while considering the complexities of the current and evolving pandemic situation.

MAVIPAN is grounded into the (i) Integrated Knowledge Translation (iKT) approach that actively involves KUs throughout the entire research process and its governance to enhance the relevance and uptake of results, [35] and the complementary (ii) SPOR Patient Engagement Framework to foster a climate in which researchers and KUs understand the value of patient involvement [36]. The design, measures, and analyses are further informed by the (i) Model of Psychosocial Impact of Natural Disasters that specifically addresses coping mechanisms and mitigation strategies during traumatic events, [37] and the (ii) Dahlgren and Whitehead's Model of the Social Determinants of Health that identifies the environmental, social, and individual
spheres of influence that hinder or enhance the health of individuals and create inequities between populations [38]. We will add to this model by considering structural and political determinants of health, which are emerging in the critical race literature [39-41].

**Study Design**

MAVIPAN is a mixed-methods based, prospective, observational, longitudinal cohort where participants will be followed over a 5-yr period [42]. We will collect quantitative and qualitative data at time of recruitment and then according to the 4 expected phases of the pandemic evolution: the impact phase we are experiencing, the turning point phase when the crisis is brought under control, the recovery phase, and the post crisis following a new "normal", accounting for additional infection waves and major events (e.g., vaccines) (Figure 1). The longitudinal aspect of the cohort sets itself apart. The collection of information related to the same individual at multiple points throughout the evolution of the crisis allows for a unique understanding and insights into mechanisms at play, temporal relationships with key crisis events, and the persistent or transient nature of the psychosocial impacts, and can inform when and how to intervene [43, 44]. The use of mixed methods is well-suited for this proposal and adds to its significance [45]. Quantitative data measure indicators, determinants, and impacts (short, mid and long term). Qualitative data build a reflexive approach into the determinants, and will be central to exploring and identifying unexpected impacts and adaptation strategies experienced by participants.

**Participants**

MAVIPAN is open to any individual aged 14 and over who understands French or English across the Province of Quebec, the epicentre of Canada’s COVID-19 epidemic [46]. Within this province, we have been and will continue to reach individuals in urban, suburban and rural areas
where different numbers of COVID-19 cases (from no cases to hotspots) are found. We are particularly invested in recruiting vulnerable populations (e.g., older adults, individuals living with a disability or a chronic/mental health condition, minorities, child protection families, individuals living in institutional settings) and populations that have become vulnerable because of the COVID-19 context (e.g., healthcare and social services workers, adolescents and young adults, caregivers).

**Recruitment**

We continue to systematically recruit across the province, through our website [47], lead media, social media and networks (e.g., Twitter, Facebook), and mass diffusion across healthcare establishments, universities and large networks. We are supported by regional Public Health Directions from healthcare establishments across the province. We have established and continue to seek collaborations with urban and rural cities (e.g., City Halls) who promote MAVIPAN through their networks. We developed a recruitment plan tailored to our vulnerable populations, that includes collaborations with (i) key clinical departments and programs (e.g., COVID-19 clinic) and communication offices within healthcare establishments across the province to directly reach patients and clients, (ii) community-based organizations and (iii) provincial thematic networks or associations.

**Retention Plan**

We recognize the challenge of loss to follow-up in prospective cohorts [43, 44, 48]. We have developed a retention plan that includes, but is not limited to: study branding and publicity, incentives (e.g., annual gift certificates), personalized email messages, intermittent lay language summary of findings disseminated to participants, and an individualized study page to keep participants informed and engaged [49-51].
Quantitative Data Collection

We collect quantitative data through online questionnaires using the REDCap electronic data acquisition platform that is maintained by Université Laval Collaborative platform for large-scale and sustainable data collection Pulsar [52]. Registration, consent and questionnaires can be completed on different digital devices, in French or English. We also provide support for people who do not have access to the Internet or to a computer, have limited digital literacy, or have a disability (e.g., manual-gestural language, research assistant).

Participants can register at any point over the course of the study and complete a thorough baseline questionnaire (30-45 min). Additional questionnaires, up to 4 per year, will be tailored to key events in the crisis evolution (e.g., second wave) and change in restrictive measures (e.g., closing of schools). These include a brief (15 min), standardized follow-up questionnaire which we intend to administer at least twice a year and ad hoc questionnaires (<30 min) aligned with key events (e.g., vaccine). A notice and then one reminder is sent to participants when a new questionnaire becomes available. Participants are given a week to complete questionnaires (i.e. they can start filling a questionnaire, stop at any time and come back to their saved questionnaire). Questionnaires have been and will continue to be developed and pilot tested with key experts and KUs, using brief (instead of exhaustive) validated measures when available.

Measures

We selected well-validated measures based upon our theoretical models, Public Health recommendations, expert consensus, and KUs’ inputs [35, 37, 53]. We document health, social, behavioral and individual determinants and psychosocial impacts of the pandemic for baseline and follow-up questionnaires (Figure 2) [54-70]. We further added specific measures and indicators for vulnerable populations, such as disease management, changes in life circumstances
attributable to the pandemic, or caregiver burden. Participants have the opportunity to fill in
open-ended questions addressing current or expected challenges, helpful innovations, hopeful
moments, and additional topics they would want to see addressed in future questionnaires.

**Linkage**

At registration, we ask participants if they agree to be contacted for additional research
opportunities. This allows us to add ancillary protocols (e.g., interviews with subsets of
participants) in response to the pandemic evolution, our findings, and the needs of KUs, thus
substantially improving the quality and relevance of the information that is gathered.
Furthermore, this allows for opportunities to link MAVIPAN with provincial, national and
international COVID-19 related initiatives, thus fostering dynamic, multidisciplinary
collaborations leading to increased impact.

**Qualitative data collection**

Each ancillary qualitative protocol will be unique yet (i) will share common elements of their
interview guide (e.g., mitigation strategies, impact of the pandemic) and (ii) rely on best practices
for the conduct of its activities [71, 72]. We will conduct semi-structured interviews and focus
groups mainly through securitized online medium (e.g., Zoom, Microsoft Teams) for the time
being and will adapt as the restrictive measures are lifted. Length and number of participants will
be tailored to each research question. Additional approaches (e.g., observations) could be added if
relevant.

**Ethics**

We have worked and continue to work in close collaboration with our Research Ethics
Committee, who has been instrumental in designing this “living” cohort. We have set templates
and procedures in place allowing for an agile process and rapid response (e.g., within days) to
new questionnaires and ancillary protocols being submitted. All study procedures have been
approved by the respective Research Ethics Committee of all participating institutions.

**Data management**

We recognize that longitudinal studies require an appropriate data infrastructure that is
sufficiently robust to withstand the test of time [43, 44, 48]. MAVIPAN operates using the
REDCap system, a HIPAA compliant secure data entry system, housed within Université Laval’s
Pulsar infrastructure. Data management is under the shared responsibility between the research
team and Pulsar’s highly qualified personal. This setting ensures the highest of standards (i.e.
standardized data collection procedure, secured data storage, quality control, daily back-up
system) in a sustainable infrastructure that guaranties housing of the data for years to come.

**Sample Size**

We propose a cost-effective, time sensitive, non-probabilistic purposive sampling paired with
online sampling and a snowballing technique without size restriction. Based of recruitment rate
so far (2,800 participants in the first 5 months of the study), we expect to recruit 5,000
participants by the end of 2021 and 7,500 participants by the end of the study. We recognize bias
and limitations associated with this approach (e.g., sampling error, self-selection, lack of
representation of population) [48]. We have included key sociodemographic questions that will
enable us to compare and weight data to provincial and national standards. We have used similar
validated questions as key institutions such as Statistics Canada to further ensure comparability of
our findings.

**Analysis**
We will pursue analysis under a mixed-method umbrella, with both sequential and simultaneous analysis of quantitative and qualitative data, to strengthen the breadth and depth in our capacity to answer our research questions [71]. Findings from the quantitative analysis will inform phases of qualitative data collection and hypotheses derived from qualitative analysis will inform subsequent quantitative component. Triangulation will be used to corroborate our findings and help explain paradoxes or inconsistencies emerging within the qualitative or the quantitative analysis.

Statistical analyses will involve both cross-sectional and longitudinal methods and will be of two-folds. First, in a cross-sectional fashion, we provide constant, descriptive information for KUs, enabling them to understand the characteristics of those individuals who are faring well and not so well during the present crisis [73]. In doing so, we help KUs identify high-risk individuals and families as a function of different sociodemographic characteristics (e.g., sociodemographic, occupational) as they relate to mental health problems, social and health behaviors, identified needs and the use of health and social services (i.e. health inequalities). These analyses will help identify populations that may be easily targeted for immediate health services or intervention to improve the state of our service structures.

Then, we will conduct analyses that will help us identify empirically-derived groups in adjustment as a function of time or other variables (i.e. identify individual differences in risk with the added benefits of multiple measures of adjustment). We will conduct generalized linear mixed models that will allow us to make associations between events that unfold and characterize the current crisis and individual adjustment across time, informing resilience trajectories, coping and adaptation mechanisms as well as cumulative burden experienced by subgroups of the population [74]. In-depth analyses of the factors contributing to the health and well-being (or lack
of) of these subgroups will further inform on the mechanism underlying the aggravation of health inequalities.

Lastly, we will develop analytical strategies tailored to each research question. These strategies will likely include range of methods appropriate for cross-sectional, longitudinal, linked data and causal modelling when relevant, adjusting for missing data where necessary. We will account for sex and gender-based analysis and use an intersectionality approach to explain potential comparisons with emerging key factors (sex, age, and race) in outcomes of COVID-19. We perform analysis using SAS (version 9.2) or R (version 4.0.1) software package.

Our overall qualitative approach will rely on thematic analysis (although other approaches, such as a narrative approach to qualitative inquiry whereby accounts of experience are explored from the life perspective, could be added if relevant) [71, 75]. Audio or video recorded interviews will be transcribed in verbatim, de-identified, and verified against actual recordings by team members. We will audio or video record focus groups, which will be complemented by the moderator and an observer observational notes. We will follow best practices for data management and organisation, coding, and analysis, using the most relevant software (NVivo, QDA Miner or Noldus Observer) [71, 75].

Furthermore, throughout the study, we will conduct cross-comparisons between the ancillary protocols (including a meta-analysis of all qualitative results), which will contribute to a conceptual framework on the health impact and adaptation strategies during a world-wide pandemic.

**Transparency of Research & Data Sharing**

Transparency of MAVIPAN will be evident in the clarity and completeness of datasets, codebooks and supporting documentation, many already available [47]. The substantial
investments necessary to build these large studies and the unprecedented nature of this health

crisis argue for optimal utilization of MAVIPAN. Data produced as a result of this study will be

shared in line with the Canadian Institute of Health Research joint statement on sharing research
data and findings relevant to this coronavirus outbreak. Resulting publications will be open

access.

Researchers and collaborators will be able to submit research questions and obtain access to data

sets. Questions being investigated will be posted on our website to avoid redundancy and

promote collaboration within the research community, healthcare institutions, public health

agencies, government officials and community organizations.

**Governance**

Large longitudinal cohort studies are demanding and require sound and sustainable infrastructure

and governance. We have set in place an equitable, inclusive and sustainable Governance Plan

that fully includes citizens, patients, other KUs, experts, and representatives from participating

research centers, health establishments, and organizations across the Province.

We have established (i) a Steering Committee (quarterly meetings) that provides strategic

leadership, including research question priorities, milestones and national and international

collaborations, facilitate research and knowledge translation activities, (ii) an Executive

Committee (monthly meetings) that reviews requests for collaboration and submission of

research questions (i.e. alignment with research priorities and feasibility), progress and

challenges of ongoing work, approval of publications to be submitted, and scholarship process for

graduate students, and (iii) a Lead Research Team (bi-weekly meetings) that will handle the day-
to-day operations of MAVIPAN.

**Study Status**
MAVIPAN was developed and launched within six weeks of the first confinement in March 2020. It was designed with the aim to be flexible and adapt according to the pandemic evolution and resolution and its associated restrictive measures in the upcoming 5 years. The study is currently opened for enrollment.

**Knowledge translation plans**

We have a well-defined iKT approach where KUs are involved throughout the research process and contribute to just-in-time diffusion and dissemination of research progress and outputs. We are providing, on an as-needed basis, following the crisis evolution, personalized (i.e. as a function of region or clientele) updates to KUs. Our KUs and collaborators are helping build community partnerships and assisting us with translation and dissemination of findings. Our bilingual website [47] and those of our collaborators will be an important tool for communicating our findings to other populations, stakeholders and research groups in Quebec, Canada and internationally. We will have plain language summaries posted on the website. Moreover, as the launch of the cohort drew media attention, we will build upon this interest, disseminating findings through news media and social networks. Furthermore, each of the research centres and healthcare institutions involved engages actively in KT towards practitioners and professionals, stakeholders and administrators, service users and other sectors of the population. Each of these platforms will be leveraged to ensure that pertinent information is constantly transmitted.

**DISCUSSION**

**Anticipated Outcomes and Impact**

The COVID-19 health crisis has caused an unprecedented scientific collaboration. Worldwide, scientists of different countries and background have come together, rapidly sharing the most recent and relevant information about the pandemic. MAVIPAN takes part in this international
scientific collaboration. As the epicentre of the pandemic in Canada, the province of Quebec is now a unique living laboratory to measure, understand and act on the impact of public health measures on population’s health and well-being. Results produced with MAVIPAN add new, unique and most relevant information to other governments and population in Canada, North America and worldwide to adjust the public health response in the next months and years. As other important waves of virus outbreaks are expected to take place, the MAVIPAN experience is central to improve the public health response.

MAVIPAN has the potential to be a critical component of the response to COVID-19 as it can initiate new rapid response to unmet needs. It can support institutions in the mental health and social services network and inform the evidence base underpinning the deployment and organization of services in times of crisis and in the recovery period. MAVIPAN’s unique infrastructure will increase the potential for data collection to be harmonized, shared and integrated across COVID-19 related initiatives. It will promote an agile, multidisciplinary and collaborative approach to research and address challenging and important COVID-19 research questions in a concerted and high-impact manner. Findings from MAVIPAN will improve our understanding of the psychosocial impacts, the coping mechanisms and adaptive strategies that have emerged from the restrictive measures of this unprecedented pandemic.

**Limitations, anticipated problems and solutions**

A major source of potential bias in cohort studies is due to losses to follow-up [44]. Cohort members may migrate or refuse to continue to participate in the study. We have put a sound and proven-effective retention plan in place. Open registration throughout the study compensates, to some extent, for loss to follow-up. We will also assess the seriousness of the bias in the measures of effect of exposure and outcome that this may case in incorporating this issue in our analysis.
plans. We have overcome issues of variations in data collection that sometime occurs in multi-
centered studies. All quantitative data collection is done through a unique platform and we have
established a common template for all qualitative activities. The collaboration with Pulsar ensures
that issues of management of such a large database (i.e. cost) are minimized and sustainability of
the database secured.

**CONCLUSION**

Launched in April 2020 across the Province of Quebec (Canada), MAVIPAN documents health,
mental health, social, behavioral, environmental and individual determinants and psychosocial
impacts of the pandemic. It is a unique initiative that will contribute in the upcoming months and
years to a coherent and integrated mitigation strategies response from health, mental health and
social services workers, researchers, public health authorities, policymakers, and the healthcare
system, within and across jurisdictions in Canada.

**DECLARATIONS**

**Ethics Approval**

This study is approved by the Ethics Committee of the Primary Care and Population Health
Research Sector of the CIUSSS de la Capitale-Nationale (Reference number: 2021-2043).

**Competing Interests**

The authors declare that they have no competing interests.

**Funding**

Funding for this study comes from discretionary funds from the four Research Centers of the
Quebec Integrated University Health and Social Services Center (Vitam: Centre de recherche en
santé durable, Centre de recherche universitaire sur les jeunes et les familles (CRUJeF), Centre interdisciplinaire de recherche en réadaptation et intégration sociale (CIRRIS), Centre de recherche CERVO).

Author’s contribution

The following authors conceived the study, co-wrote the first draft, and made critical revisions to the manuscript: (AL, MB, PB, JPD, YDK, CM, GT, CM, FR). The following authors participated to the design of the study and made critical revisions to the manuscript: (CC, DCV, NC, ED, RF, MHG, MI, LL, MM, CM, MCO, MAR, MCSJ, CS). The following authors contributed to the design of the study and provided revisions of the manuscripts (AB, MP, MPG, DL, MEL, HW, PA, GR, AV, MHM, MG, ESH, AG, EG, DN, JT, GD, MCS, SBB, NB, MFD, PM, LV). All authors approved the final version of this manuscript.

Acknowledgements

MAVIPAN Research Collaborative would like to acknowledge the following research team members for their time and implication in this research: Léa Langlois, Frédéric Cantin, Josiane Lettre and Geneviève Picher. We would also like to acknowledge the ongoing support and collaboration of the PULSAR team, including Laurence Dionne-Bibaud, Audrey St-Laurent, Marie-Andrée Lévesque and Carole Artault, the CIUSSS-CN Ethics committee, the CIUSSS de la Capitale-Nationale, the CISSS Chaudière-Appalaches, CISSS Bas-Saint-Laurent, CISSS Côte-Nord, and all our partners in the project. For the complete list, please go to www.mapivan.ca . Finally, we would like to give special thanks to all citizens and participants who give us feedback and support in the MAVIPAN project.
REFERENCES

1. Holmes EA, O'Connor RC, Perry VH, Tracey I, Wessely S, Arseneault L, Ballard C, Christensen H, Cohen Silver R, Everall I et al: Multidisciplinary Research Priorities for the Covid-19 Pandemic: A Call for Action for Mental Health Science. Lancet Psychiatry 2020, 7(6):547-560.

2. Gostin LO, Wiley LF: Governmental Public Health Powers During the Covid-19 Pandemic: Stay-at-Home Orders, Business Closures, and Travel Restrictions. JAMA 2020, 323(21):2137-2138.

3. Usher K, Bhullar N, Jackson D: Life in the Pandemic: Social Isolation and Mental Health. J Clin Nurs 2020, 29(15-16):2756-2757.

4. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, Rubin GJ: The Psychological Impact of Quarantine and How to Reduce It: Rapid Review of the Evidence. Lancet 2020, 395(10227):912-920.

5. Hossain MM, Sultana A, Purohit N: Mental Health Outcomes of Quarantine and Isolation for Infection Prevention: A Systematic Umbrella Review of the Global Evidence. Epidemiol Health 2020:e2020038.
6. Röhr S, Müller F, Jung F, Apfelbacher C, Seidler A, Riedel-Heller SG: Psychosocial Impact of Quarantine Measures During Serious Coronavirus Outbreaks: A Rapid Review. Psychiatr Prax 2020, 47(4):179-189.

7. Dubey S, Biswas P, Ghosh R, Chatterjee S, Dubey MJ, Chatterjee S, Lahiri D, Lavie CJ: Psychosocial Impact of Covid-19. Diabetes Metab Syndr 2020, 14(5):779-788.

8. Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, Agha M, Agha R: The Socio-Economic Implications of the Coronavirus and Covid-19 Pandemic: A Review. Int J Surg 2020, 78:185-193.

9. Otu A, Charles CH, Yaya S: Mental Health and Psychosocial Well-Being During the Covid-19 Pandemic: The Invisible Elephant in the Room. Int J Ment Health Syst 2020, 14:38.

10. Rubin GJ, Wessely S: The Psychological Effects of Quarantining a City. BMJ 2020, 368:m313.

11. Liu JJ, Bao Y, Huang X, Shi J, Lu L: Mental Health Considerations for Children Quarantined Because of Covid-19. Lancet Child Adolesc Health 2020, 4(5):347-349.

12. Moser DA, Glaus J, Frangou S, Schechter DS: Years of Life Lost Due to the Psychosocial Consequences of Covid-19 Mitigation Strategies Based on Swiss Data. Eur Psychiatry 2020, 63(1):e58.

13. Brand JE: The Far-Reaching Impact of Job Loss and Unemployment. Annual Review of Sociology 2015, 41:359-375.

14. Buzzi C, Tucci M, Ciprandi R, Brambilla I, Caimmi S, Ciprandi G, Marseglia GL: The Psycho-Social Effects of Covid-19 on Italian Adolescents' Attitudes and Behaviors. Ital J Pediatr 2020, 46(1):69.
Lavner JA, Clark MA: Workload and Marital Satisfaction over Time: Testing Lagged Spillover and Crossover Effects During the Newlywed Years. Journal of Vocational Behavior 2017, 101:67-76.

Nichol KL, Baken L, Nelson A: Relation between Influenza Vaccination and Outpatient Visits, Hospitalization, and Mortality in Elderly Persons with Chronic Lung Disease. Annals of Internal Medicine 1999, 130(5):397-403.

Tanoue Y, Nomura S, Yoneoka D, Kawashima T, Eguchi A, Shi S, Harada N, Miyata H: Mental Health of Family, Friends, and Co-Workers of Covid-19 Patients in Japan. Psychiatry Res 2020, 291:113067.

Banks J, Karjalainen H, Propper C: Recessions and Health: The Long-Term Health Consequences of Responses to Coronavirus. Fiscal Studies 2020, 41(2):337-344.

Charil A, Laplante DP, Vaillancourt C, King S: Prenatal Stress and Brain Development. Brain Research Reviews 2010, 65(1):56-79.

Desjardins T, Leadbeater BJ: Changes in Parental Emotional Support and Psychological Control in Early Adulthood: Direct and Indirect Associations with Educational and Occupational Adjustment. Emerging Adulthood 2017, 5(3):177-190.

Fitzpatrick KM, Harris C, Drawve G: Fear of Covid-19 and the Mental Health Consequences in America. Psychol Trauma 2020, 2(S1):S17-S21.

Guilcher SJT, Craven BC, Bassett-Gunter RL, Cimino SR, Hitzig SL: An Examination of Objective Social Disconnectedness and Perceived Social Isolation among Persons with Spinal Cord Injury/Dysfunction: A Descriptive Cross-Sectional Study Disability and Rehabilitation 2019.
23. Holt-Lunstad J, Smith TB, Baker M, Harris T, Stephenson D: Loneliness and Social Isolation as Risk Factors for Mortality. Perspectives on Psychological Science 2015, 10(2):227-237.

24. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y: A Nationwide Survey of Psychological Distress among Chinese People in the Covid-19 Epidemic: Implications and Policy Recommendations. Gen Psychiatr 2020, 33(2):e100213.

25. Lebrasseur A, Fortin-Bédard N, Lettre J, Bussières E-L, Best K, Boucher N, Hotton M, Beaulieu-Bonneau S, Mercier C, Lamontagne M-É et al: Impact of Covid-19 on People with Physical Disabilities: A Rapid Review. Disability and Health Journal (Accepted).

26. Ripp J, Peccoralo L, Charney D: Attending to the Emotional Well-Being of the Health Care Workforce in a New York City Health System During the Covid-19 Pandemic. Acad Med 2020.

27. Shanafelt T, Ripp J, Trockel M: Understanding and Addressing Sources of Anxiety among Health Care Professionals During the Covid-19 Pandemic. JAMA 2020, 323(21):2133-2134.

28. Tarabulsy GM, Rousseau M, Lacerte D, Chateauneuf D, Vaillancourt A: Hausse Des Signalements À La Protection De La Jeunesse : Un Examen des Causes Possibles à la Grandeur du Québec. Rapport déposé au Ministère de la santé et des services sociaux.; 2020.

29. Vassos M, Nankervis K, Skerry T, Lante K: Can the Job Demand-Control-(Support) Model Predict Disability Support Worker Burnout and Work Engagement? Journal of Intellectual & Developmental Disability 2017, 44(2):139-149.

30. Fukuti P, Uchôa CLM, Mazzoco MF, Corchs F, Kamitsuji CS, Rossi L, Rios IC, Lancman S, Bonfa E, Barros-Filho TEP et al: How Institutions Can Protect the Mental...
Health and Psychosocial Well-Being of Their Healthcare Workers in the Current Covid-19 Pandemic. Clinics 2020, 75:e1963.

31. Zerbini G, Ebibgo A, Reicherts P, Kunz M, Messman H: Psychosocial Burden of Healthcare Professionals in Times of Covid-19 - A Survey Conducted at the University Hospital Augsburg. Ger Med Sci 2020, 18:Doc05.

32. Fawaz M, Samaha A: The Psychosocial Effects of Being Quarantined Following Exposure to Covid-19: A Qualitative Study of Lebanese Health Care Workers. Int J Soc Psychiatry 2020:20764020932202.

33. Saleem M, Dastgeer S, Durrani AK, Saad AA, Manzoor Z, Hussain HN: Self-Control Mediates the Relationship between Psychosocial Strengths and Perceived Severity of Covid-19 among Frontline Healthcare Professionals of Pakistan: A Single Center Experience. Pak J Med Sci 2020, 36(Covid19-s4):S62-S66.

34. Harris C, Carson G, Baillie JK, Horby P, Nair H: An Evidence-Based Framework for Priority Clinical Research Questions for Covid-19. J Glob Health 2020, 10(1):011001.

35. Canadian Institutes of Health Research: Guide to Knowledge Translation Planning at Cihr: Integrated and End-of-Grant Approaches. Ottawa, ON; 2012.

36. Research CiOHI: Strategy for Patient-Oriented Research: Patient Engagement Framework. Ottawa, ON; 2012.

37. Bell PA, Greene TC, Fisher JD, Baum A: Environmental Psychology: Harcourt College Publishers; 2001.

38. Dahlgren G, Whitehead M: Policies and Strategies to Promote Social Equity in Health. Background Document to Who-Strategy Paper for Europe; 1991.

39. Dawes DE: The Future of Health Equity in America: Addressing the Legal and Political Determinants of Health. The Journal of Law, Medicine & Ethics 2018, 46(4):838-840.
40. Dawes DE: Health Inequities: A Look at the Political Determinants of Health During the Covid-19 Pandemic. American Journal of Health Studies 2020, 35(2):77-82.

41. Mishori R: The Social Determinants of Health? Time to Focus on the Political Determinants of Health! Medical Care 2019, 57(7):491-493.

42. Baron M, Blouin P, LeBlanc A, et al.: Document méthodologique – Informations générales. Retrieved from www.mavipan.ca. 2020

43. Caruana EJ, Roman M, Hernández-Sánchez J, Solli P: Longitudinal Studies. Journal of thoracic disease 2015, 7(11):E537.

44. van Weel C: Longitudinal Research and Data Collection in Primary Care. The Annals of Family Medicine 2005, 3(Suppl1):S46-S51.

45. Creswell JW, Fetters MD, Ivankova NV: Designing a Mixed Methods Study in Primary Care. The Annals of Family Medicine 2004, 2(1):7-12.

46. Government of Canada: Coronavirus Disease (Covid-19): Outbreak Update. https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection.html. Accessed 04 November 2020.

47. The MAVIPAN study website. www.mavipan.ca. Accessed 06 November 2020.

48. Frippiat D, Marquis N: Web Surveys in the Social Sciences: An Overview. Population 2010, 65(2):285-311.

49. Robinson KA, Dinglas VD, Sukrithan V, Yalamanchilli R, Mendez-Tellez PA, Dennison-Himmelfarb C, Needham DM: Updated Systematic Review Identifies Substantial Number of Retention Strategies: Using More Strategies Retains More Study Participants. Journal of Clinical Epidemiology 2015, 68(12):1481-1487.
50. Sánchez-Fernández J, Muñoz-Leiva F, Montoro-Ríos FJ: Improving Retention Rate and Response Quality in Web-Based Surveys. Computers in Human Behavior 2012, 28(2):507-514.

51. Teague S, Youssef GJ, Macdonald JA, Sciberras E, Shatte A, Fuller-Tyszkiewicz M, Greenwood C, McIntosh J, Olsson CA, Hutchinson D: Retention Strategies in Longitudinal Cohort Studies: A Systematic Review and Meta-Analysis. BMC Medical Research Methodology 2018, 18(1):151.

52. PULSAR. www.pulsar.ca. Accessed 06 November 2020.

53. Canuel M, Gosselin P, Duhoux A, Brunet A, Lesage A: Boîte À Outils Pour La Surveillance Post-Sinistre Des Impacts Sur La Santé Mentale : Changements Climatiques (Toolkit for the Monitoring of Mental Health Post-Disasters). Montreal: Institut national de santé publique du Québec; 2019.

54. Abidin RR: Parenting Stress Index: Professional Manual., 3rd edn. Odessa, FL: Psychological Assessment Resources, Inc.; 1995.

55. Baillargeon J, Dubois G, Marineau R: Traduction Française De L’ Échelle D’ajustement Dyadique. Canadian Journal of Behavioural Science 1986, 18(1):25-34.

56. Caron J: A Validation of the Social Provisions Scale: The Sps-10 Items. Santé mentale au Québec 2013, 38(1):297-318.

57. Carver C: You Want to Measure Coping but Your Protocol’s Too Long: Consider the Brief Cope. International Journal of Behavioral Medicine 1997, 4(1):92-100.

58. Clement ME, Gagne M, Chamberland C: French Adaptation and Validation of the Parent-Child Conflict Tactics Scales (Pc-Cts). European Review of Applied Psychology 2018, 68(3):141-149.
592 59. Cutrona C, Russell D: The Provision of Social Support and Adaptation to Stress. Advance
593 in Personal Relationships 1987, 1:37-67.
594 60. De Grâce G-R, Joshi P, Pelletier R: L’échelle De Solitude De L’université Laval (Ésul):
595 Validation Canadienne-Française Du UCLA Loneliness Scale. Canadian Journal of
596 Behavioural Science 1993, 25(1):12-27.
597 61. Derogatis LR: Symptom Checklist-90-R: Administration, Scoring & Procedure Manual
598 for the Revised Version of the Scl-90. Minneapolis, MN: National Computer System;
599 1994.
600 62. Dumka LE, Stoerzinger HD, Jackson KM, Roosa MW: Examination of the Cross-Cultural
601 and Cross-Language Equivalence of the Parenting Self-Agency Measure. Family
602 Relations 1996, 45(2):216-222.
603 63. Grässel E, Adabbo R: Perceived Burden of Informal Caregivers of a Chronically Ill Older
604 Family Member: Burden in the Context of the Transactional Stress Model of Lazarus and
605 Folkman. GeroPsych: The Journal of Gerontopsychology and Geriatric Psychiatry 2011,
606 24(3):143-154.
607 64. Hughes ME, Waite LJ, Hawkley LC, Cacioppo JT: A Short Scale for Measuring
608 Loneliness in Large Surveys: Results from Two Population-Based Studies. Research on
609 Aging 2004, 26(6):655-672.
610 65. Lovibond SH, Lovibond PF: Manual for the Depression Anxiety Stress Scales, 2nd edn.
611 Sydney: Psychology Foundation of Australia; 1995.
612 66. Morin CM: Insomnia: Psychological Assessment and Management. New York: Guilford
613 Press; 1993.
614 67. Rushton PJ, Chrisjohn RD, Fekken. GC: The Altruistic Personality and the Self-Report
615 Altruism Scale. Personality and Individual Differences 1981, 2(4):293-302.
68. Spanier GB: Measuring Dyadic Adjustment: New Scales for Assessing the Quality of Marriage and Similar Dyads. Journal of Marriage and Family 1976, 38(1):15-28.

69. Straus MA, Hamby SL, Finkelhor D, Moore DW, Runyan D: Identification of Child Maltreatment with the Parent-Child Conflict Tactics Scales: Development and Psychometric Data for a National Sample of American Parents. Child Abuse & Neglect 1998, 22(4):249-270.

70. Tennant R, Hiller L, Fishwick R, Platt S, Joseph S, Weich S, Parkinson J, Secker J, Stewart-Brown S: The Warwick-Edinburgh Mental Well-Being Scale (WEMWBS): Development and Uk Validation. Health and Quality of Life Outcomes 2007, 5(1):63.

71. Creswell JW: Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th edn: SAGE Publications; 2014.

72. Tong A, Sainsbury P, Craig J: Consolidated Criteria for Reporting Qualitative Research (Coreq): A 32-Item Checklist for Interviews and Focus Groups. International Journal for Quality in Health Care 2007, 19(6):349-357.

73. Judd CM, McClelland GH, Ryan CS: Data Analysis: A Model Comparison Approach to Regression, Anova, and Beyond: Routledge; 2017.

74. Gad AM, El Kholy RB: Generalized Linear Mixed Models for Longitudinal Data. International Journal of Probability and Statistics 2012, 1(3):41-47.

75. Patton MQ: Qualitative Research and Evaluation Methods, 3rd edn: Thousand Oaks: SAGE Publications; 2002.
| Baseline Questionnaire | continuous |
|------------------------|------------|
| Follow-up questionnaires and Ad hoc questionnaires |           |
| Ancillary qualitative data collection |           |

COVID-19 cases

1st wave

Study launch April 2020

2nd wave

Potential additional waves

Potential vaccine immunization

Y0 Y1 Y2 Y3 Y4 Y5
### HEALTH DETERMINANTS

**Health antecedents**
- Perceived physical health
- Perceived mental health
- Satisfaction with life
- Physical chronic illness diagnoses
- Mental health disorders and diagnoses
- Disabilities
- Anthropometric measurements
- Advance care planning

**COVID-19 exposure**
- Exposure to COVID-19
- COVID-19 diagnosis

### INDIVIDUAL DETERMINANTS

**Demographic, social and economic indicators**
- Age and gender
- Socio-economic status
- Household composition
- Dependents
- Immigration status
- Employment status (essential worker, teleworking)
- Loved one in nursing home
- Dwelling characteristics

**Geographic indicators**
- Region
- Rural, peri-urban or urban area
- Neighborhood (for urban areas)

### SOCIAL AND BEHAVIORAL DETERMINANTS

**Social and behavioral indicators**
- Social support
- Altruistic behavior
- Coping strategies
- Physical and leisure activities

### PSYCHOSOCIAL IMPACT

**Psychosocial impact indicators**
- Perceived physical health
- Perceived mental health
- Satisfaction with life
- Wellbeing
- Sleep quality
- Stress, depression and anxiety symptoms
- Loneliness
- Hostility
- Food, tobacco and drug consumption
- Fears about seeking health or social care services
- Testimonies: lived experiences

### Specific indicators for vulnerable populations

- **Young people 14 - 17**
  - Relationships in foster home or youth centre

- **Families**
  - Couple and ex-partner relationships
  - Children’s behavior
  - Behavior towards children

- **People suffering from chronic illnesses**
  - Medication observance/adherence
  - Ability to get one’s prescribed medication

- **People suffering from mental health disorders**
  - Medication observance/adherence
  - Ability to get one’s prescribed medication

- **People with disabilities**
  - Impact of the quality of the living environment
  - Lifestyle habits

- **Natural caregivers**
  - Role and relationship with person being cared for
  - Lived experience of lockdown (carers of children)

- **Healthcare and social services system stakeholders**
  - Working conditions, fatigue
  - Job perception
  - Concerns, needs, factors for wellbeing

*Highlighted indicators are measured at both baseline and follow-up*