Emerging Evidence on COVID-19

Evidence Brief on Adherence to Isolation and Quarantine Recommendations During COVID-19

Introduction

What is the evidence on the proportion of people that adhere to isolation and quarantine for COVID-19 and what drivers and barriers determine adherence?

Public health measures to control the spread of COVID-19 infections have included both isolation of people diagnosed with COVID-19 and quarantine of close contacts of cases and incoming travellers. Current Public Health Agency of Canada guidance recommends a mandatory 14 day quarantine for travellers entering Canada, suspect cases and/or known contact(s) of a confirmed COVID-19 case (1).

In a related evidence brief on quarantine strategies, December 2020 (available upon <u>request</u>), modeling studies show the benefits of quarantine in reducing transmission relies heavily on high adherence (2-4). This evidence review identifies and summarizes published and pre-published evidence on drivers and barriers, such as sociodemographic characteristics, knowledge and attitudes associated with adherence to COVID-19 isolation and quarantine recommendations. Studies up to January 15, 2021 were included.

Key Points

- A total of nine studies were identified, including seven observational studies reporting on COVID-19 infection isolation and/or quarantine adherence (Table 1), one study on intent to adhere to the recommendations (Table 2) and one rapid review summarising literature on factors associated with adherence to quarantine pre-COVID-19 (Table 3).

- Studies were from Europe (n=4), Asia (n=3) and the Middle East (n=1). The rapid review included three studies from Canada conducted during SARS.

- Adherence to COVID-19 isolation and quarantine were reported in four studies and ranged from 75% in a study from South Korea to 25% in a study from the UK (5, 6, 8, 10).

- Drivers of adherence to isolation and quarantine recommendations included increased quarantine and self-isolation adherence among adults of female gender, higher levels of education, being married or co-inhabiting with others and employment as a healthcare worker. Adherence by age group was variable from study to study.

- Individuals self-reporting symptoms, those with a confirmed COVID-19 test and those who received a COVID-19 diagnosis (suspect or confirmed) from a healthcare provider were more likely to comply

with isolation instructions compared with people told to quarantine due to their contacts with other COVID-19 cases and those who were not feeling ill themselves.

- Barriers to adherence were: lack of support from someone outside of the household, which is consistent with reported reasons for violation such as shopping for essential items and medication, and work demands. Support outside of the home was a driver of adherence during the SARS outbreak summarized in the rapid review (9).

- Higher perceptions of COVID-19 infection risk, infection transmission and confidence in effectiveness of isolation and quarantine were linked to improved adherence. These findings are consistent with the rapid review on adherence to quarantine due to other infections (9).

- Monetary compensation for lost wages, trust in public health regulations and worry about infection was linked to increased intent to adhere to quarantine. However, stricter sanctions, higher fines and penalties for violators of quarantine did not impact the degree of adherence with COVID-19 quarantine in a South Korean cohort.

- A study of quarantined children reported that increased adherence was attributed to female gender, older age of child, fewer children within the household, primary caregivers that were female and younger, as well as clear communications of quarantine instructions.

Overview of the Evidence

Nine articles were included in this review. There were seven published studies and one pre-print on adherence to isolation and quarantine during COVID-19, and one rapid review on adherence to quarantine for non-COVID-19 infections.

There were a number of limitations to the evidence. Most studies were conducted in Europe or Asia, therefore, the findings may not be reflective of the Canadian situation. Adherence is difficult to objectively measure and in most studies it was based on self-reports. This can lead to selection and social desirability biases. Some studies included efforts to adjust for selection bias and ensure representativeness of the study findings through random sampling, weighting of data to match the national populations and reporting adjusted effect estimates. However, not all of the studies reported efforts to adjust for selection biases.

The definitions of isolation and quarantine were not consistent across studies; the majority of studies did not distinguish between isolation and quarantine. This meant the identified barriers and drivers influencing isolation and quarantine adherence were often combined. Most studies examined a long list of potential risk factors that they may not have had appropriate power to include in an analysis without overfitting the regression model or they performed multiple comparisons where statistical adjustments such as a Bonferroni correction were needed. Such adjustments were not adopted by all included studies and may have led to spurious results. Carefully planned and executed analyses are needed to avoid this bias.

Important knowledge gaps within the available literature include the lack of Canadian data that consider local public health and infection transmission contexts. Data on the impact of multiple lockdowns and local infection prevalence are also lacking. Research in Canada, objective measures of adherence (over self-report) and measures of adherence over time would improve this body of research.

CONTENTS

COVID-19 ISOLATION AND QUARANTINE ADHERENCE

Seven studies that consider factors linked to quarantine and isolation adherence, are summarized in Table 1.

- Four cross-sectional surveys evaluated sociodemographics, knowledge and attitudes as drivers or barriers to adherence to isolation and quarantine of adults (n=3) and children (n=1) (7, 10-12).

- Adherence drivers included female gender, higher levels of education, being married or co-inhabiting with others, fewer children within a household and employment as a healthcare worker.

- Two longitudinal trend analysis studies with multiple survey cycles in Norway examined self-reported adherence to isolation and quarantine recommendations. One study found age to have an impact on quarantine adherence, while the other found gender, age and level of education to have a small impact on adherence (5, 6).

- Across studies individuals who had a positive test result or were diagnosed by a health care provider, those who perceived the infection to be more serious, or had received healthcare guidance on isolation were more likely to adhere to isolation and quarantine (5-7, 11, 12)

- The analysis of a South Korean cohort finds increased penalties for individuals who violated quarantine did not lead to better adherence (8).

Table 1: Studies Reporting on COVID-19 Isolation and Quarantine Adherence (n=7)

STUDY	METHOD	KEY OUTCOMES
Adults		
Ryu 2020 (8) Population-based Cohort South Korea Mar-Jun 2020	Public health data on the quarantined population (14 day quarantine) and quarantine violations was analysed via Poisson regression to measure the impact 1-strike out sanctions implemented April 5, 2020 with increased penalties (e.g. imprisonment, fines, deportation or electronic bracelets) for violators. Korean public health was "monitoring" quarantined individuals, but details are not provided.	High stake penalties, the "1-strike out" sanction, was not a driver of adherence as it did not have a significant effect (p=0.99) on the daily violation rate, among Koreans or foreigners. A median 36,561 (range, 8335-59,918) individuals were quarantined per day during the study period. Overall, adherence levels were high. The median number of daily violations was 6 (0-13), and the median rate of violation was 1.6/10,000 (0.0-8.0) quarantined individuals.
Carlsen (2020) (5) *Preprint* Longitudinal trend Study Norway Aug-Oct 2020	Participants from two prospective cohorts participated in a sub-study and submitted data every 14 days ~85000 responses per survey cycle) on illness, COVID-19 testing and quarantine. In the summer, testing became more accessible and the public health recommendation was to get tested if symptoms occurred and that confirmed or suspected cases should quarantine. This study analyzes self-reported adherence to isolation and quarantine from survey responders between Aug - Oct 2020. Response rates ranged from 55%-83%, across cohorts and survey cycles.	Illness was reported by 8.6-13% of people surveyed, 12%, 13% and 10% over the 4 survey cycles, 35-45% of men and 40% -45% women of respondents reported being tested in the past 14 days due to illness; and 4-5% of respondents reported being quarantined or isolated. Adherence to quarantine was higher in women. Among those that received a positive test result 79% were men and 91% women; suspect or confirmed diagnosis from a physician 65% men and 72% women; tested for SARS-CoV-2 53% of men and 59% of women; or reported illness in the last 14 days 26% men and 33% women. Norwegian county of residence, gender, older age and higher level of education were reported to have a small effect on increased odds of quarantine and self-isolation adherence.

		Adherence to recommendations for testing and quarantine was lower than expected in Norway despite high trust in government.
Steens (2020) (6) Longitudinal trend study Norway Apr – Jun 2020 (Multiple survey cycles)	An online survey was conducted among a representative sample (n=1400, 7% response rate) of adults to measure self-reported adherence to isolation and quarantine repeated every 3-6 weeks for 4 cycles. Response rates for cycle 2-4 ranged from 74% to 86%. The analysis was weighted by age and sex for representativeness. Isolation is required in Norway only for those with confirmed or probable COVID-19. Note: Participants were considered to have adhered to isolation/quarantine if they reported doing so for at least one day. This study also recruited additional people in each wave from their balanced internet population sample to try to balance dropouts which may bias the results.	1704 participants provided 4525 responses over the 4-cycle survey and the analysis was weighted to the national population. Participants reported 25% (95% CI 23-27) had received a quarantine request within 7 days of the survey and of these people 42% (37-48) adhered to quarantine. Adherence was higher for people with symptoms (75%, 95% CI 63-79) compared to those without (28%, 95% CI 23-34). 65% (60-70) of participants reported to have not adhered to a quarantine request. Adherence was highest among the 18-29 age group (72%; 95% CI 58-83), compared to those aged 30 or older. Reported adherence to quarantine/isolation declined over time, from 66% in April to 33% - 38% in May and June samples. Waning of adherence was particularly high in older age groups. In Norway, fines can be issued for violation of quarantine, but there is no active follow-up of cases. The authors suggest drivers were risk perception, knowledge, social norms and having symptoms; barriers were adverse financial consequences from adherence.
Carlucci (2020) (11) Cross-sectional Study Italy Mar 2020	Online survey of 3964 quarantined Italian adults, sampled at week 3 of national lockdown, on adherence to quarantine due to a COVID-19 infection. Sociodemographic, preventative behaviours including adherence to quarantine and risk perception factors were evaluated	Sociodemographic variables associated with higher adherence to quarantine: women (p<0.001), higher education (0.007), married/cohabitating (p<0.001), healthcare workers (p<0.001). Age: 50-59 (p<0.001) had higher adherence than 30-39, which was higher than 18-29

	in the survey and analyzed by analysis of variance.	(p<0.01). Notably those over 60 were less likely to adhere to quarantine.
		Regional variation, higher adherence in southern Italy (p<0.01).
		Lower adherence was noted for single people, students.
		Higher risk perception and anxiety levels were associated with higher adherence to quarantine. Reasons for compliance included reducing spread (79.8%), transmission (75.7%), trust in government (40.2%).
		Reasons for going out during quarantine were: 23.9% receiving medical treatments or going to the pharmacy, 9.7% for essential necessities (e.g. groceries), 8.5% work demands, 5% to walk domestic animals and 1% assisting families.
Smith (2020) (7) Cross-sectional study UK May 2020	An online survey included 2240 adults from an established representative population sample. Quota sampling was used to ensure representativeness. The survey investigated factors associated with adherence to self-isolation and lockdown measures. Logistic regression was conducted with a Bonferroni correction to the results with p<0.001. Adjusted for gender, age, having a child in the household, being extremely clinically vulnerable, employment status, education, deprivation, social grade, rural or urban, living alone, marital status and region.	75.1% of the 217 individuals reporting symptoms in self or household reported having left their home at least once (i.e. not complying with self-isolation or quarantine) in the previous 24 hours. Adjusted analysis for not having left self-isolation or quarantine in the previous 24 hours included: - Females (OR_{adj} 0.32 (95% CI 0.14-0.76) - Report of symptoms in self OR_{adj} 0.23 (95% CI 0.09–0.61) - Increased worry of COVID OR_{adj} 0.61 (95% CI 0.37–0.98) - Received help from someone outside the household OR_{adj} 0.30 (95% CI 0.09-0.96) - Perception of high infection contraction risk OR_{adj} 0.40 (95% CI 0.16-0.99) - A sense of community with neighbours OR_{adj} 1.52 (95% CI 1.03-2.24)

		Perceptions of COVID-19 influenced higher adherence if responders thought they had COVID-19, were self isolating, possessed good knowledge of prevention, were worried about COVID-19 and had intentions to follow government advice.
Xu (2020) (10) Cross-sectional survey China Feb 2020	2956 community dwellers in China (≥16 years of age) completed a voluntary survey on compliance with mitigation measures which included home quarantine defined as leaving home <1 time over 3 days. The data was analysed via chi-square and logistic regression employing Bonferroni correction.	75.6% of respondents reported being compliant to home quarantine. Compliance with home quarantine was lower in men (OR =0.61 (0.51–0.73)). The age 31-40 group (OR=0.71 (0.54–0.93)) and 41–50 age group (OR=0.67 (0.46–0.97)) was found to be less compliant with home quarantine when compare to individuals less than or 20 years of age. No other indicators for compliance were identified within the study data.
Children and Adolescents		
Lou (2020) (12) Cross-sectional Study China Feb 2020	This study followed up on quarantine adherence 8 days after the children presented to a fever clinic (n=495). Data was collected by phone interviews. Multivariate logistic regression including gender and age of patients, gender and age of caregivers, education level of caregivers, place of residence, number of children in the family and whether a nurse explained the quarantine measures were taken as the independent variables.	Odds of quarantine compliance increased with female gender of the child and caregiver, higher age of children OR 0.25 (95% CI 0.19-0.32) and the explanation of quarantine measures by nurses OR 2.13 (95% CI 1.33-3.41). Children with elderly caregivers were OR 2.46 (95% CI 1.37-4.42) times more likely to report poor compliance, when compared to children with young adult caregivers.

COVID-19 ISOLATION AND QUARANTINE ADHERENCE INTENTION

- One survey conducted in Israel assessed the intention to adhere to COVID-19 quarantine in relation to the presence and absence of compensation for lost wages. Intention to comply with quarantine varied from 57% to 71% between February and March 2020 when wage compensation was not assumed. When monetary compensation was offered, intention increased to over 95% suggesting a lack of wages was a significant barrier to adherence to quarantine recommendations.

Table 2: Studies Reporting on COVID-19 Isolation and Quarantine Adherence Intention (n=1)

STUDY	METHOD	KEY OUTCOMES
Bodas 2020 (13) Cross-sectional Study Israel Feb-Mar 2020	Surveyed the intent to comply with medical official requested two-week self-quarantine. One question assumed compensation for lost wages by the state, and another question assumed no such compensation. The survey was administered in February (563 responders) and in March (511 responders). After pooling the two study samples, univariate and multivariate regression analyses identified factors associated with intention to comply with quarantine. Response rate of 25% for both time points.	When monetary compensation was assumed, 94% of respondents (in February) and 95.5% of responders (in March) reported they would comply with self-quarantine. When monetary compensation was NOT assumed, quarantine adherence was 57%, (in February) and 71.4% (in March). Assuming no monetary compensation, significant associations with the intent to adhere to quarantine in the multivariate analysis were: age OR_{adj} 1.01 (95% CI 1.01-1.03), religion OR_{adj} 0.48 (95% CI 0.33-0.70), worry over COVID-19 OR_{adj} 1.26 (95% CI 1.10-1.47) and trust in health regulations OR_{adj} 1.26 (95% CI 1.10-1.44).

PRE-COVID-19 RAPID REVIEW OF ISOLATION AND QUARANTINE ADHERENCE

- The review summarizes evidence from 14 studies that consider quarantine adherence following SARS, H1N1, Ebola and Mumps outbreaks, including three Canadian studies on quarantine adherence conducted during the SARS outbreak.

- The review highlights that perceived risk of disease and benefit of quarantine, but not knowledge of the disease were important drivers of adherence.

- Similarly cultural norm and societal acceptance of quarantine were important, this includes trust in government.

- Mainly Canadian research from SARS highlights that reasons for breaking quarantine include fear of lost wages and work, and the need to seek supplies or medical attention. These findings are consistent with other studies included in this evidence brief.

Table 3: Rapid Review of Factors Impacting Isolation and Quarantine Adherence during pre-COVID-19 Outbreaks (n=1)

STUDY	METHOD	KEY OUTCOMES
Webster 2020 (9) Rapid review Jan 2020	A rapid review of factors associated with adherence to quarantine during infectious disease outbreaks described in 14 studies. The infections were H1N1 (swine flu), Ebola, SARS and Mumps.	Adherence rates ranged from 0-92.8% and were conducted in healthcare workers, school staff, residents of cities, parents and individuals testing positive for infection. The quarantine periods were variable. Making quarantine mandatory or enforced by law increased adherence. Culture and societal norms are important, examples from the Ebola outbreaks show improved adherence when the head of a household favoured quarantine. In contrast, adherence was reduced when caretaking of the sick was of high cultural priority. Whereas studies from SARS show high adherence to quarantine when there was societal pressure or laws to do so. Drivers of adherence were: perceived high risk of disease, quarantine or isolation protocol and benefit of quarantine; however perceived knowledge of the disease was not. The studies in Canada during SARS highlight work and fear of lost wages as major drivers of non-adherence as well as the need to get supplies or seek medical attention. There was mixed evidence on length of quarantine and adherence.

		Trust in government was associated with adherence to quarantine.

Methods:

A daily scan of the literature (published and pre-published) related to COVID-19 is conducted by the Emerging Science Group, PHAC; and has been ongoing since the beginning of the outbreak. The literature is retrieved from Pubmed, Scopus, BioRxiv, MedRxiv, ArXiv, SSRN, Research Square and cross-referenced with the WHO COVID-19 literature list, and COVID-19 information centers run by Lancet, BMJ, Elsevier and Wiley. A search to retrieve relevant literature for this evidence summary was conducted in the Refworks database. Targeted keyword searching is conducted within these databases to identify relevant citations on COVID-19 and SARS-CoV-2. The search algorithms used (isolation OR quarantine) AND (compliance OR adherence). 53 citations were screened for relevance and data was extracted from relevant articles into the review. This review contains research related to isolation and quarantine adherence published up to January 15, 2021.

Prepared by: Chatura Prematunge and Kaitlin Young. Emerging Science Group, PHAC.
phac.evidence-donnees.probantes.aspc@canada.ca

References:

1. Public Health Agency of Canada. For travellers without symptoms of COVID-19 returning to Canada [Internet].

2. Russell WA, Buckeridge DL. Effectiveness of quarantine and testing to prevent COVID-19 transmission from arriving travelers. medRxiv. 2020:2020.11.02.20224568. DOI:10.1101/2020.11.02.20224568

3. Ashcroft P, Lehtinen S, Bonhoeffer S. Quantifying the impact of quarantine duration on COVID-19 transmission. medRxiv. 2020:2020.09.24.20201061. DOI:10.1101/2020.09.24.20201061

4. Agusto FB, Erovenko IV, Fulk A, Abu-Saymeh Q, Daniel Romero-Alvarez D, Ponce J, Sindi S, Ortega O, Saint Onge JM, Peterson AT. To isolate or not to isolate: The impact of changing behavior on COVID-19 transmission. medRxiv. 2020:2020.08.30.20184804. DOI:10.1101/2020.08.30.20184804

5. Carlsen EØ, Caspersen IH, Trogstad L, Gjessing H, Magnus P. Public adherence to governmental recommendations regarding quarantine and testing for COVID-19 in two norwegian cohorts. medRxiv. 2020:2020.12.18.20248405. DOI:10.1101/2020.12.18.20248405

6. Steens A, Freiesleben de Blasio B, Veneti L, Gimma A, Edmunds WJ, Van Zandvoort K, Jarvis CI, Forland F, Robberstad B. 32945254; poor self-reported adherence to COVID-19-related quarantine/isolation requests,

norway, april to july 2020. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin. 2020;25(37) DOI:10.2807/1560-7917.ES.2020.25.37.2001607

7. Smith LE, Amlôt R, Lambert H, Oliver I, Robin C, Yardley L, Rubin GJ. Factors associated with adherence to self-isolation and lockdown measures in the UK: A cross-sectional survey. Public Health. 2020 Sep 5;187:41-52. DOI:10.1016/j.puhe.2020.07.024

8. Ryu S, Hwang Y, Yoon H, Chun BC. Self-quarantine non-compliance during the COVID-19 pandemic in south korea. Disaster Med Public Health Prep. 2020 Oct 12:1-11. DOI:10.1017/dmp.2020.374

9. Webster RK, Brooks SK, Smith LE, Woodland L, Wessely S, Rubin GJ. How to improve adherence with quarantine: Rapid review of the evidence. Public Health. 2020 05/01;182:163-9.

DOI:https://doi.org/10.1016/j.puhe.2020.03.007

10. Xu X, Chew KA, Xu X, Wu Z, Xiao X, Yang Q. Demographic and social correlates and indicators for behavioural compliance with personal protection among chinese community-dwellers during COVID-19: A cross-sectional study. BMJ Open. 2021 Jan 6;11(1):e041453,2020-041453. DOI:10.1136/bmjopen-2020-041453

11. Carlucci L, D'ambrosio I, Balsamo M. Demographic and attitudinal factors of adherence to quarantine guidelines during covid-19: The italian model. Frontiers in Psychology. 2020;11

DOI:10.3389/fpsyg.2020.559288

12. Lou Q, Su DQ, Wang SQ, Gao E, Li LQ, Zhuo ZQ. Home quarantine compliance is low in children with fever during COVID-19 epidemic. World Journal of Clinical Cases. 2020;8(16):3465-73.

DOI:10.12998/wjcc.v8.i16.3465

13. Bodas M, Peleg K. Self-isolation compliance in the COVID-19 era influenced by compensation: Findings from A recent survey in israel. Health Aff (Millwood). 2020 Apr 9:101377hlthaff202000382.

DOI:10.1377/hlthaff.2020.00382