DEFINING AND CHARACTERIZING COVID-19

QUARANTINE HEISTANCY IN LANE COUNTY

by

MARLEE ODELL

A THESIS

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Approved: _____*Melissa Graboyes. PhD*_____
Primary Thesis Advisor

Contact tracing and subsequent quarantine of individuals exposed to COVID-19 has been a useful tool throughout the COVID-19 pandemic. While trying to implement such measures, however, it has become clear that some people are hesitant to agree to quarantine, for a variety of reasons. The term "hesitancy" appears in other areas of public health such as with vaccine hesitancy, however, it has not been defined for COVID-19 quarantine hesitancy. Arising from personal experience as a contact monitor (CM) for the University of Oregon Corona Corps, this thesis defines COVID-19 quarantine hesitancy and identifies the determinants behind a contact's hesitancy. Semi-structured, open-ended interviews were conducted with UO Corona Corps CMs about their experience with hesitant contacts. The interviews were thematically analyzed to reveal themes rooted in the firsthand experiences of CMs. This work suggests that COVID-19 quarantine hesitancy is when contacts display resistance while receiving or implementing COVID-19 quarantine guidelines. In addition, it suggests that there are multiple types of hesitancy and stages in the quarantine process in which hesitancy can arise. Thematic analysis also revealed three categories of COVID-19 quarantine hesitancy determinants: situational determinants, personal determinants, and quarantine

comprehension. The results from this thesis can help inform future use of quarantine, whether for COVID-19 and other diseases.

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Terms and Abbreviations

Term/Abbreviation	Definition
CDC	Center for Disease Control
CM	Contact Monitor
Contact	An individual who is exposed to a contagious disease.
Contact tracing	The process of identifying and notifying individuals exposed to a positive disease
COVID-19	Coronavirus Disease 2019
EVD	Ebola virus disease
Isolation	Separates sick people with a contagious disease from people who are not sick
LCPH	Lane County Public Health
OHA	Oregon Health Authority
Quarantine	Separates and restricts the movement of people who were exposed to a contagious disease to see if they become sick
UO	University of Oregon
WHO	World Health Organization

September, 17th, 2021:

During the last few minutes of my shift, I had an incoming call. It was a mother of a contact returning our call from earlier. I went through the identity confirmation questions, explained why we were calling, and began collecting her and her son's information. She seemed aware of the situation and the call was going smoothly. I started to discuss her son's quarantine dates and it turned out that he was already a few days into his quarantine. She asked why she hadn't been called sooner. I tried to explain the limitations to the flow of information and that sometimes there was a delay in when we found out about a case and their contacts. She went on to explain that she had been hearing about COVID-19 cases and outbreak at her son's school from other parents for a while before she was notified by the school or us. She explained how she had been struggling to figure out what to do. She wanted to have her kids stay home from school, but the school wouldn't excuse their absences. She started to get emotional and explained how frustrated she was at how the school outbreak was handled and felt the schools being open was reckless and endangering kids. She told me she didn't know who to hold responsible — the school, the governor, or us — but that someone was "dropping the ball."

She explained that she had been on the phone all day with the school and different Lane County Public Health departments trying to explain her concerns and fears but that everyone told her that they couldn't help her. I could hear her fear, pain, and upset of having her children in a dangerous situation and feeling it was out of her control and that no one was listening or helping her. Hearing her express her concerns and let out her frustration and fears, I too started to feel emotional. She was pinpointing some of the exact things I had felt throughout the pandemic; feeling an urgency and weight that wasn't being mirrored by others, and an overall feeling of fear and lack of safety. I wanted to address all her concerns and not be one more person on the phone who left her feeling helpless. I couldn't offer any solutions to her valid problems with the school situation. All I could do was tell her that I heard her and would pass on what she had said to my supervisors. I tried to tell her that I saw how she was doing everything in her power and that I saw how hard she was fighting for her kids, and I apologized that I couldn't do more for her. The call ended with her thanking me for listening and when I got off the phone, I passed on her concerns to the LCPH supervisor.

This thesis has grown out of my experience working as a contact monitor for the University of Oregon (UO) Corona Corps in collaboration with Lane County Public Health (LCPH). I investigated quarantine hesitancy among people exposed to COVID-19. The call recalled above was different from the types of calls I focus on in my thesis: the mother wasn't hesitant to quarantine her son in the slightest. However, I think it exemplifies how much pressure and responsibility the COVID-19 pandemic has placed

individuals. While public health takes a population-based approach and tries to promote health for all, this can unintentionally leave individuals feeling overly responsible and can overlook individual-level challenges. Many public health workers, our team included, have worked hard to minimize the enormous pressures put on the individual and I wanted my thesis to support this effort. One area where I saw this pressure was with individuals who were hesitant to quarantine. I wanted to understand how as public health workers we could better support these individuals. This motivated this thesis and discussions with fellow contact monitors in order to understand the roots of COVID-19 quarantine hesitancy.

CHAPTER 1: Introduction

Contact tracing and quarantine are public health tools commonly used to limit the spread of a disease. Contact tracing involves figuring out who an infected person exposed while they were contagious. These identified individuals, the contacts, are then asked to quarantine and stay home for the disease's incubation period (the maximum possible time it could take for someone exposed to contract the disease). Before COVID-19 vaccines were available, the main strategy for containing COVID-19 was to identify positive COVID-19 cases, have COVID-19 cases separate themselves from others, and to advise people exposed to COVID-19 cases to quarantine. Contact tracing and encouraging quarantine for exposed individuals have been key tools in limiting the spread of COVID-19 as they allow for a way to target COVID-19 before a new person is infected. Ideally, contact tracing and effective quarantine can break up the chain of transmission of COVID-19 so that fewer people are exposed and therefore fewer people are infected.

There is no question that being asked to complete quarantine and stay home is a significant and disruptive ask. Given this, understandably, some contacts resisted our recommendations and quarantine. Through my work as a contact monitor (CM) I observed a range of contact reactions to being asked to quarantine. These observations led me to want to understand what appeared to be COVID-19 quarantine hesitancy and evolved into this thesis and discussions with fellow CMs.

Building from personal experience as a CM with the UO Corona Corps, this thesis investigated COVID-19 quarantine hesitancy and asked the following questions:

1. What is COVID-19 quarantine hesitancy?

2. What are the factors behind COVID-19 quarantine hesitancy?

3. What are the barriers to quarantining?

The research questions and focus of this thesis were motivated by the variety of calls I experienced and the conversations I had with contacts. While most contacts I spoke to were willing and able to follow our recommendations, there were a number of difficult calls. Some contacts reacted with anger and frustration when asked to quarantine, some wanted to comply but were hindered by financial and external circumstances, and some struggled with confusing and differing recommendations. I quickly realized how each individual call was unique with differing reactions, conversations, and outcomes and began to wonder how this phenomenon could be translated into an overall theory of COVID-19 quarantine hesitancy. Over the course of the COVID-19 pandemic, we saw quarantine protocols evolve. They first evolved to include more individuals as the intensity of COVID-19 grew, and then to include fewer and fewer people until now in Lane County, quarantine is no longer recommended for the general public. Each stage was met with hesitancy by some folks and while COVID-19 quarantine use has slowed, quarantine will certainly be used in the future, whether for COVID-19 or another disease. Currently, there is limited literature on COVID-19 quarantine hesitancy and there is not an established definition. Understanding COVID-19 quarantine hesitancy is needed to support future uses of quarantine.

A combination of qualitative analysis of semi-structured interviews with Corona Corps CMs and ethnographic fieldnotes provided valuable conclusions about COVID-19 quarantine hesitancy. Based on 17 interviews conducted over 4 months with fellow

Corona Corps CMs I determined that COVID-19 quarantine hesitancy is when contacts display resistance while receiving or implementing COVID-19 quarantine guidelines. Analysis of CM responses also suggested that there was not one universal type of COVID-19 quarantine hesitancy and while there were two main categories — one based on individual preferences and beliefs, and one based on external, social circumstances — there was significant variation in how and why COVID-19 quarantine hesitancy arose.

Given the range of COVID-19 hesitancy determinants and presentations identified in this thesis, future quarantine guidelines should consider and prepare for such diversity. Public health officials created guidelines to ask COVID-19 contacts to quarantine to limit the further spread of COVID-19 in communities. Such guidelines requested individual sacrifices to protect a larger public's health. Protecting a population's health is an important goal, but the results of this thesis show that there are significant barriers to contacts being willing and able to help by quarantining. In this thesis I argue that the individual-level challenges contacts face when asked to quarantine, many of them beyond their control, can't be overlooked when trying to achieve population-level benefits. For quarantine to be effective public health officials must have guidelines and supports in place — whether it is financial support or clear guidelines with effective communication — that will set individual contacts up for success in quarantine. The results of this thesis and evaluation of COVID-19 quarantine hesitancy reflects on the relationship between public health and the individual and provides insights for future work.

Methods

Using a mixed methods approach, this thesis incorporated a qualitative and ethnographic approach to investigate COVID-19 quarantine hesitancy in Lane County. Seventeen semi-structured interviews were conducted with former and current Corona Corps contact monitors (CMs) from August 2021 to December 2021. The Corona Corps was formed in June 2020 by the University of Oregon to provide a student work force to support the contact tracing for the University of Oregon and Lane County communities. Through September 2021, Corona Corps CMs called contacts identified by Lane County Public Health to inform them of their exposure to COVID-19 and asked them to quarantine.

Interviews with the CMs were systematically coded and qualitatively analyzed to identify and validate meaningful themes. Systematic coding and robust analysis were important as there was a single coder on this project. This project was approved by the Institutional Review Board at the University of Oregon in July 2021.

Given my experience as a CM, the overall ethnographic approach used in this thesis allowed for contextualizing the results and a more insightful analysis. Ethnographic interludes were included throughout this thesis. Fieldnotes for these interludes were taken between June 2021 and October 2021. My experience as a CM also influenced my general approach to this thesis, including the development of my research and interview questions, my ability to lead the interviews, and effectively analyze my co-worker's reflections.

Permission from UO Corona Corps supervisors was obtained and former and current UO Corona Corps CMs were recruited via social media and email reach-outs.

Eligible participants were anyone who worked for the UO Corona Corps CM team, either in a lead or caller position. Participants were excluded if they were not a member between June 2020 and September 2021 when the Corona Corps called Lane County community members in addition to UO students. There were 17 individuals successfully recruited for interviews; 10 of whom were leads at some point during their employment, meaning they oversaw other CM work. Lead CMs provided unique insights as they had perspectives from both making calls themselves and from supporting and reviewing other CMs' work.

Recruited CMs were asked a series of 14 open-ended questions about their experience with hesitant contacts and their ideas about COVID-19 quarantine hesitancy (a copy of the interview tool is included in the Appendix 1). Question topics included describing memorable calls with hesitant contacts, defining COVID-19 quarantine hesitancy based on their experience, and discussion of the factors CM's perceived to be behind COVID-19 quarantine hesitancy. The interviews lasted on average 30 minutes and participants were compensated with $10 gift cards to either Trader Joe's, Chipotle, or Starbucks. The interview questions were developed based on literature on measuring vaccine hesitancy, my personal experience as a CM, and discussions with UO Corona Corps supervisors.[1] Interviews were conducted both in-person and over Zoom based on the participant's preference. The interviews were audio recorded with permission and

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[1] Noni E. MacDonald and SAGE Working Group on Vaccine Hesitancy, "Vaccine Hesitancy: Definition, Scope and Determinants," *Vaccine* 33, no. 34 (August 14, 2015): 4161–64, https://doi.org/10.1016/j.vaccine.2015.04.036; Heidi J. Larson et al., "Measuring Vaccine Hesitancy: The Development of a Survey Tool," *Vaccine*, WHO Recommendations Regarding Vaccine Hesitancy, 33, no. 34 (August 14, 2015): 4165–75, https://doi.org/10.1016/j.vaccine.2015.04.037; Gretchen J. Domek et al., "Measuring Vaccine Hesitancy: Field Testing the WHO SAGE Working Group on Vaccine Hesitancy Survey Tool in Guatemala," *Vaccine* 36, no. 35 (August 23, 2018): 5273–81, https://doi.org/10.1016/j.vaccine.2018.07.046.

later uploaded to and transcribed by Otter.ai, a transcription service allowed by the Institutional Review Board.

An inductive approach (pulling themes from the data, rather than applying a thematic construct to the data) was used to identify themes related to COVID-19 quarantine hesitancy. Interview transcripts were read, and key points and topics were identified and recorded as initial codes. This continued until there was a saturation of identified codes. Four out of the 17 transcripts were used in this stage. Codes were then organized and grouped until a draft codebook was established. The codes were then entered into Nvivo (a qualitative analysis software) and applied to each transcript. Quotes that stood out and seemed highly relevant were also identified. While transcripts were coded, memos were kept for each transcript on notable ideas and observations. The codes and coded transcript excerpts were then analyzed to provide a thematic conclusion. The main analysis focused on codes that fell under the top-level code "What is COVID-19 quarantine hesitancy" to form a definition and the top-level "What causes COVID-19 quarantine hesitancy" to understand determinants.

Literature Review

Currently, there is no literature discussing or defining COVID-19 quarantine hesitancy. Database searches provided no sources discussing quarantine hesitancy, both with and without "COVID-19" as a search term. However, there is related research discussing the importance of quarantine and the challenges of quarantine. The following sections summarizes such research and shows the need for focused research into COVID-19 quarantine hesitancy.

A body of public health studies have shown the efficacy of quarantine practices in relation to COVID-19. Recent published work has emphasized the benefit of quarantine practices for reducing the spread of COVID-19. One of the challenges of containing COVID-19 has been pre-symptomatic and asymptomatic transmission. Asymptomatic cases have a comparable viral load to symptomatic patients, and in patients who do develop symptoms the highest viral shedding (the period of highest transmissibility) is before symptoms appear.[2] Work with models and modeling data for the spread of COVID-19 have emphasized the importance of accounting for such pre-symptomatic and asymptomatic transmission in the approach to the pandemic.[3] Pre-symptomatic and asymptomatic COVID-19 cases are responsible for "more than 50% of the overall attack rate in COVID-19 outbreaks".[4] One of the goals of quarantine is to prevent these pre-symptomatic and asymptomatic cases from unknowingly spreading COVID-19 before they realize they have it.

Evaluating approaches to containing COVID-19 is difficult due to the precarious state of COVID-19 and how rapidly conditions change. In addition, most of the currently available research is based on modeling data which often involves making assumptions on parameters. With these limitations in mind, many researchers have concluded that implementation of quarantine for individuals exposed to COVID-19

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[2] Mackowiak and Sehdev, "The Origin of Quarantine."

[3] Rahul Subramanian, Qixin He, and Mercedes Pascual, "Quantifying Asymptomatic Infection and Transmission of COVID-19 in New York City Using Observed Cases, Serology, and Testing Capacity," *Proceedings of the National Academy of Sciences* 118, no. 9 (March 2, 2021): e2019716118, https://doi.org/10.1073/pnas.2019716118.

[4] Seyed M. Moghadas et al., "The Implications of Silent Transmission for the Control of COVID-19 Outbreaks," *Proceedings of the National Academy of Sciences of the United States of America* 117, no. 30 (July 28, 2020): 17513–15, https://doi.org/10.1073/pnas.2008373117.

reduces the spread.[5] To support the development of recommendations early in the pandemic, Nussbaumer-Streit et al. conducted a rapid review of publications to evaluate the effectiveness of quarantine with COVID-19 outbreaks. Based on 51 studies (including both observational and modelling studies with COVID-19, SASRS, and MERS) the authors concluded that quarantining exposed individuals reduces COVID-19 incidence and mortality and is effective when combined with other public health measures.[6] Other researchers and policy advisors have suggested the importance of having a multi-faceted approach to COVID-19, including the use of quarantine.[7,8] Overall, although the current literature is limited, the consensus is that quarantine has a clear role in the pandemic and is effective in reducing cases and deaths.

Although no source specifically focused on quarantine compliance, several sources discussed structural challenges and compliancy considerations with COVID-19 measures in general (such as social distancing, largescale lockdowns, and mask wearing). Several sources identified sociodemographic considerations as factors for lockdown compliance.[9] For example, some literature discussed challenges people living in low- and middle-income countries faced when trying to comply with measures such

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[5] Barbara Nussbaumer-Streit et al., "Quarantine Alone or in Combination with Other Public Health Measures to Control COVID-19: A Rapid Review," *The Cochrane Database of Systematic Reviews* 4 (April 8, 2020): CD013574, https://doi.org/10.1002/14651858.CD013574.

[6] Nussbaumer-Streit et al.

[7] Christina Silcox et al., "A National Decision Point: Effective Testing and Screening for COVID-19" (The Rockefeller Foundation & The Margolis Center for Health Policy, September 9, 2020), https://www.rockefellerfoundation.org/report/a-national-decision-point-effective-testing-and-screening-for-covid-19/.

[8] Nicholas C. Grassly et al., "Comparison of Molecular Testing Strategies for COVID-19 Control: A Mathematical Modelling Study," *The Lancet. Infectious Diseases* 20, no. 12 (December 2020): 1381–89, https://doi.org/10.1016/S1473-3099(20)30630-7.

[9] Bronwyné Jo'sean Coetzee and Ashraf Kagee, "Structural Barriers to Adhering to Health Behaviours in the Context of the COVID-19 Crisis: Considerations for Low- and Middle-Income Countries," *Global Public Health* 15, no. 8 (August 2, 2020): 1093–1102, https://doi.org/10.1080/17441692.2020.1779331.

as crowded living conditions and lacking running water and electricity.[10] Employment

and income issues were another emphasized factor with stay-at-home order compliance.

Investigation into stay-at-home orders in the United States and Brazil found that the

effectiveness of workplace closures was improved as socioeconomic development

increased. With this they found that offering resources such as stimulus packages

improved compliance with stay-at-home orders.[11] Many sources also identified a moral

obligation or ideology component in which compliance was dependent on whether

individuals thought the measures in question were important with one identifying fear

and concern for contracting COVID-19 as a behavior predictor.[12,13,14]

   While no source found in this literature review explicitly identified quarantine

hesitancy, there were a range of sources that described challenges with adherence to

quarantine; both in connection to COVID-19 and focused on other diseases. For

example, with the hopes of informing COVID-19 quarantine approaches, a rapid

evidence review investigated adherence to quarantine for other diseases. This review

found that quarantine adherence ranged from 0 to 92.8% and cited the following as the

main factors influencing adherence decisions: knowledge about the disease and

quarantine procedure, social norms, perceived benefits of the quarantine, perceived risk

[10] Coetzee and Kagee.

[11] Paul F. Testa et al., "Who Stays at Home? The Politics of Social Distancing in Brazil, Mexico, and the United States during the COVID-19 Pandemic," *Journal of Health Politics, Policy and Law* 46, no. 6 (December 1, 2021): 929–58, https://doi.org/10.1215/03616878-9349100.

[12] Amy Nivette et al., "Non-Compliance with COVID-19-Related Public Health Measures among Young Adults in Switzerland: Insights from a Longitudinal Cohort Study," *Social Science & Medicine* 268 (January 1, 2021): 113370, https://doi.org/10.1016/j.socscimed.2020.113370.

[13] Brouard, Vasilopoulos, and Becher, "Sociodemographic and Psychological Correlates of Compliance with the COVID-19 Public Health Measures in France."

[14] Craig A. Harper et al., "Functional Fear Predicts Public Health Compliance in the COVID-19 Pandemic," *International Journal of Mental Health and Addiction*, April 27, 2020, https://doi.org/10.1007/s11469-020-00281-5.

of the disease, and practical issues (such as supplies and financial consequences). The review ended by arguing that "when quarantine is deemed necessary, public health officials should take steps to minimise the risk of non-adherence by providing a timely, clear rationale for quarantine and information about protocols; emphasising social norms to encourage this altruistic behaviour; increasing the perceived benefit that engaging in quarantine will have on public health (in particular to those at heightened risk of the disease); and ensuring sufficient supplies are provided."[15] These factors could be logical factors for COVID-19 quarantine hesitancy. These findings suggest that there are a range of possible factors influencing COVID-19 quarantine hesitancy and led to the development of interview questions that would allow CMs to reflect on such factors. Many of the factors identified in the reviewed literature was supported by CMs reflections and were expanded upon with insights from the CMs.

There is growing research on COVID-19 and recommendations for limiting its spread, including quarantine. Quarantine has been an important tool for limiting COVID-19 spread however, it is not a straightforward expectation of all contacts. This thesis will build on the previous findings regarding the factors influencing COVID-19 measure adherence by adding a specific lens of COVID-19 quarantine. As there is no current literature around defining, understanding, or combating COVID-19 hesitancy specifically, this thesis will also attempt to fill these gaps by using first-hand accounts from contact monitors to build a definition and suggest targets for quarantine hesitancy interventions.

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[15] R. K. Webster et al., "How to Improve Adherence with Quarantine: Rapid Review of the Evidence," *Public Health* 182 (May 1, 2020): 163–69, https://doi.org/10.1016/j.puhe.2020.03.007.

CHAPTER 2: Background

Quarantine and Contact Tracing Basics

Over the course of the COVID-19 pandemic most people have likely heard public health terms such as isolation, quarantine, or contact tracing come up in everyday conversation. Although these and other public health terms have become a part of our everyday language, they are often misused by the general population. Two terms that people often mix up are quarantine and isolation. Isolation "separates sick people with a contagious disease from people who are not sick" while quarantine "separates and restricts the movement of people who were exposed to a contagious disease to see if they become sick."[16] Individuals who need to quarantine are identified through a process known as contact tracing. When someone is diagnosed with a disease of concern, anyone they came into close contact with while they are contagious will be identified as contacts. These contacts may be asked to quarantine depending on the disease and factors such as vaccination status and level of current spread of the disease. The quarantine period is often the duration of the incubation period, the maximum possible time it can take for someone to develop the disease after being exposed. However, it can also be shorter depending on infection trends. Isolation is used to prevent contagious individuals from further spreading the disease and quarantine ensures that if the exposed contact were to develop the disease, they would not come into contact with additional susceptible individuals while contagious. Ultimately, both

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[16] Center for Disease Control, "About Quarantine and Isolation | Quarantine | CDC," January 27, 2020, https://www.cdc.gov/quarantine/quarantineisolation.html.

isolation and quarantine are tools used to control the spread of a disease. Table 1

provides a summary of these two tools.

	Isolation	**Quarantine**
Definition	"Separates sick people with a contagious disease from people who are not sick"[17]	"Separates and restricts the movement of people who were exposed to a contagious disease to see if they become sick"[18]
Goal	Prevent contagious individuals from infecting others	Prevent potentially contagious individuals from infecting others.

Table 1. Summary of Isolation and Quarantine

Public health officials have used quarantine for a variety of health concerns such

as cholera, the plague, tuberculosis, ebola, SARS, and now COVID-19.[19] Quarantine

and what public health officials ask of exposed individuals can take a variety of forms.

This is not a new strategy, as there are references to techniques resembling quarantine

that go back thousands of years to the Bible. As of recent quarantine has been put to use

in the COVID-19 pandemic to limit the spread of COVID-19 and protect communities.

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[17] Center for Disease Control.

[18] Center for Disease Control.

[19] Donna Barbisch, Kristi L. Koenig, and Fuh-Yuan Shih, "Is There a Case for Quarantine? Perspectives from SARS to Ebola," *Disaster Medicine and Public Health Preparedness* 9, no. 5 (October 2015): 547–53, https://doi.org/10.1017/dmp.2015.38.

Quarantine and COVID-19

Like many other places, Lane County established an isolation and contact tracing program to confront COVID-19. This included case investigators speaking with COVID-19 cases to explain recommendations and figure out who their close contacts were. The contacts identified in these case investigations would then be entered into ARIAS, a database developed during the pandemic used by health departments throughout Oregon, and assigned to contact monitor teams. For most of the pandemic, Lane County Public Health (LCPH) had a CM team made up of LCPH employees and contracted with the UO Corona Corps for an additional CM team. Each day, LCPH liaisons would assign the Corona Corps a portion of the contacts to call, inform them of their exposure, and ask them to stay home and quarantine. The exact quarantine recommendations fluctuated with changing COVID-19 knowledge, the development of vaccines, the emergence of new variants, and the case levels in a community.

Even once the pandemic reached a point that officials recognized the need for quarantine measures and they were enacted, recommendations continued to change. Quarantine recommendations gradually built up to a two-week quarantine for every individual exposed. The recommendations continued to evolve, however, and overall became shorter over time. With growing knowledge and the introduction of vaccines the guidelines were also altered to include fewer people (such as only those not up to date on vaccines). While it is understandable that the recommendations would fluctuate throughout the pandemic as things rapidly changed and we learned more about COVID-19, these changing recommendations created potential for confusion. Not only did evolving recommendations create confusion but there were also differences in the

quarantine recommendations between local health departments and the federal level from the CDC. Generally, the CDC advised less intense guidelines, with Oregon and LCPH usually adapting them but sometimes after a delay. These complexities are important to keep in mind when assessing COVID-19 quarantine hesitancy as they can create barriers to contacts knowing what they should do when exposed.

At the start of the pandemic in March 2020, quarantine was essentially not utilized as the contagious properties were still being investigated and officials felt monitoring symptoms were sufficient. Early on, there was also no infrastructure to carry out full contact tracing and follow up procedures. Oregon Health Authority's (OHA) interim investigation guidelines stated that confirmed and suspected cases should isolate until 72 hours after fever and symptoms had resolved. Case investigation and contact tracing were performed to identify close contacts (defined at the time as being within 6 feet for 60 or more minutes or having direct contact with infectious secretions of a COVID-19 case), however unless a contact had symptoms, they were only asked to closely monitor themselves for symptoms for 14 days after exposure. If a contact became symptomatic, they were then asked to withdraw from their normal activities and enter isolation until 72 hours had passed since having a fever or other symptoms. It wasn't until May 2020 that quarantine was recommended for asymptomatic contacts. Non-healthcare workers identified as a close contact (which changed to being within 6 feet for 15 minutes or more in June 2020) were advised to quarantine for 14 days and to seek testing if symptoms developed.

At the end of 2020, essential workers were eligible for the first vaccines. As rollout of vaccines progressed, the quarantine recommendations were updated. Contacts

who were fully vaccinated (at this point two doses of Moderna or Pfizer or the single Johnson & Johnson dose was considered fully vaccinated) and were exposed at least two weeks after receiving their final dose were able to go about their normal activities without quarantine. Vaccinated individuals exposed to COVID-19 were still advised to monitor symptoms and get tested 5-7 days after their exposure.

In January 2022 the CDC updated their quarantine recommendations and OHA and LCPH followed suit shortly after the update. At this time, contacts not up to date on their COVID-19 vaccines were recommended to stay home and quarantine for 5 days with testing on day 5 followed by an additional 5 days of mask wearing. Up to date contacts were not advised to quarantine. Starting in January 2022, up to date was defined as receiving a COVID-19 booster, receiving the primary series of Pfizer or Moderna within the last 5 months, or receiving the primary Johnson & Johnson series within the last 2 months.

At the end of February 2022, the CDC updated their guidance to state, tribal, local and territorial (STLT) health departments saying that "universal case investigation and contact tracing are not recommended for COVID-19."[20] This recommendation was made while citing the high levels of infection and vaccine induced immunity, increasing use of at home tests, emerging variants with shorter incubation periods and more rapid transmission, among other factors. Of note, however, is that the CDC still recommends quarantine for those not up to date with their COVID-19 vaccines and states "STLT health departments should support public education to encourage people with COVID-

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[20] CDC, "Health Departments," Centers for Disease Control and Prevention, February 11, 2020, https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/prioritization.html.

19 to follow isolation guidance and inform close contacts about their potential exposure so close contacts can quarantine."[21] However, as of March 12th, 2022 OHA and LCPH are no longer recommending quarantine for the general public in any form for contacts of COVID-19. All contacts are advised to monitor for symptoms after their exposure and get tested, but regardless of vaccination status quarantine is not required.[22] The CDC has not changed its recommendations to the general public since January 2022 and is still recommending 5 days of quarantine for contacts not up to date with their vaccines. A detailed timeline of the various quarantine recommendations is provided in Figure 1.

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[21] CDC, "Health Departments," Centers for Disease Control and Prevention, February 28, 2022, https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/prioritization.html.
[22] Lane County Public Health, "Contact Tracing: Quarantine & Isolation Resources," Contact Tracing: Quarantine & Isolation Resources, accessed May 8, 2022, https://lanecounty.org/government/county_departments/health_and_human_services/public_health/2019_novel_coronavirus__c_o_v_i_d19/contact_tracing.

OHA/LCPH

CDC

DEC 2019
Cluster of patients in Wuhan, China begin to experience shortness of breath and fever

JAN 2020
Thesis ...thorities identify and isolate ...navirus, CDC establishes as ... first confirmed COVID-19 case in the US

FEB 2020
First presumptive COVID-19 case in Oregon

MAR 2020

All close contacts were recommended to **monitor their symptoms** for 14 days. High risk contacts were asked to quarantine but there were no restrictions for low-risk contacts.
There were no testing recommendations given.

MAY 2020

14 **day quarantine** recommended for all close contacts. Testing recommended for symptomatic contacts.

14 **day quarantine** period recommended for all close contacts. *
Testing recommendations unknown.

JULY 2020

14 **day quarantine** period recommended for all close contacts. *
Testing recommendations unknown.

DEC 2020

10-day quarantine option offered, but **14 day quarantine was encouraged.**
A 7-day quarantine was NOT offered.

14 **day quarantine** recommended, however, based on local circumstances contacts have the following options if asymptomatic:
1) Complete a **10-day quarantine** with no testing
2) Complete a **7 day quarantine** with having a negative test within 48 hours of last

JAN 2021
1st COVID-19 vaccine doses given
*If exposure occurred between doses or within 2 weeks of final dose, contact asked to quarantine

Unvaccinated contacts asked to quarantine (14 or 10 days, 14 still encouraged). Fully vaccinated contacts who were asymptomatic did not have to quarantine. Fully vaccinated contacts were asked to monitor their symptoms for 14 days and get tested 7 days after their exposure.
Fully Vaccinated = Two weeks post second dose of Moderna or Pfizer vaccine or two weeks after J&J vaccine

Unvaccinated contacts asked to quarantine (10 and 7 days still options).

APR 2021

All **unvaccinated contacts** asked to quarantine or 14 days.

JUNE 2021

OHA allows local public health authorities to adapt **10 or 7 day quarantine** with a negative test (7 day quarantine still not offered in Lane County).
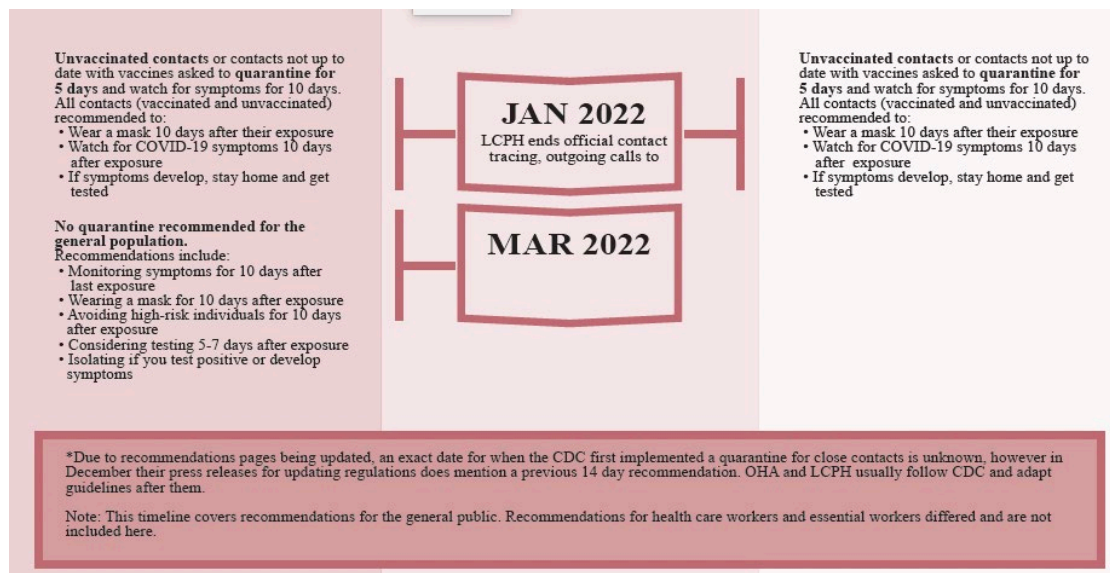
Figure 1. Quarantine Recommendations timeline

Recommendations from local and state health departments are often influenced by the CDC, however there can be differences between them. There was a high degree of consensus between the recommendations early in the pandemic until December 2020, when the CDC offered two different options, depending on "local circumstances."[23] Up until the change to a 5 day quarantine and 5 day masking recommendation, LCPH continued to recommend the full 14 day quarantine period. Corona Corps scripts included a section to explain to contacts that a 10 day quarantine was an option for them but CMs were instructed to emphasize that a full 14 day quarantine was the safest way to reduce the spread of COVID-19 and was strongly recommended by LCPH. However, if a contact brought up the 7 day option CMs were trained to tell them that a 7 day quarantine was not an option in Lane County. This is a clear point of conflict and could

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[23] Center for Disease Control, "COVID-19 and Your Health," Centers for Disease Control and Prevention, February 11, 2020, https://www.cdc.gov/coronavirus/2019-ncov/your-health/quarantine-isolation.html.

lead to confusion among contacts, care providers, and others consuming the

information, as two reputable public health agencies had different recommendations.

The differing recommendations made by various public health organizations and

sources was one theme brought up frequently in calls and was mentioned in interviews

with fellow CMs, for example:

> I remember this one case is a family household, continuous exposure
> type of case. So the other members of the family had to quarantine for
> [24] days instead of the normal like 14. And they were really shocked
> and in disbelief when I when I told them about that amount of time. And
> I think what compounded that was the fact that at their doctor's office,
> they were told something different. And also, at like a testing center they
> were also told something different. And I think maybe the information I
> gave them itself was shocking, but also the fact that it contradicted things
> that they had previously heard, made it even harder for them to accept.
> And so then I think this stems mostly like from confusion and frustration
> rather than like you know opposition to doing the things that I tell them
> to. -CM 16, CM for 9 months

Changing and differing recommendations was a salient barrier and will be discussed

further in the following chapter. This occurred on local, state, and federal level within

the US, but also between countries. In August of 2020 the WHO advised countries that

"all contacts of individuals with a confirmed or probable COVID-19 be quarantined in a

designated facility or at home for 14 days from their last exposure."[24] With this they

stated that "before implementing quarantine, countries should communicate why this

measure is needed and provide appropriate support to enable individuals to quarantine

safely."[25] Each country, based on individual conditions, resources, and understanding,

interpreted the need for quarantine differently. In the US, in a decentralized health care

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[24] World Health Organization, "Considerations for Quarantine of Contacts of COVID-19 Cases," June 25, 2021, https://www.who.int/publications-detail-redirect/WHO-2019-nCoV-IHR-Quarantine-2021.1.
[25] World Health Organization.

system, this interpretation trickled down to states and counties, and eventually to the individual contacts who had to decide if and how to quarantine and which set of guidelines to follow.

Not only did this aspect of the pandemic create confusion for community members dealing with COVID-19 exposures, but it also posed as a challenge to CMs. There were frequent new procedures and changes to existing recommendations. While this was a result of the nature of the pandemic and an expected characteristic of the work, it could lead to mistakes and burnout of workers. For instance, during an interview one CM had the following reflection:

> I think some of the challenges were, things were happening so quickly. There were a lot of changes throughout the pandemic, that it almost felt like we couldn't get like a steady balance like as soon as we started to feel comfortable with one certain quarantine and one certain isolation, a change would happen. And that's like most jobs. But I think what made this so confusing and like, complicated was because COVID-19 was such a new thing. No one really knew how to approach it. So, I think contact tracers, contacts, kind of the public, were just getting frustrated by all these changes. And we were kind of the ones who had to juggle it all. -CM 9, CM for 3 months, lead for 8 months

The differing and changing recommendations created frustration and confusion to some degree for everyone involved. For CMs and public health officials it made it challenging to communicate information and expectations. For contacts, it may have created a lack of trust and dissuaded people from quarantining. Seeing recommendations change constantly with a lack of consensus and clear answers understandably likely resulted in quarantine hesitancy.

Previous uses of quarantine and lessons learned

The COVID-19 pandemic has familiarized the public with the idea of quarantine procedures; however, quarantine has been used as a public health tool well before COVID-19. The first mention of restricting movement of people for health reasons is found in the Old Testament in Leviticus in which it states that people with Hansen's disease, commonly known as leprosy, must live outside the camp and separate themselves while they are sick.

> When anyone has a swelling or a rash or a shiny spot on their skin that may be a defiling skin disease, they must be brought to Aaron the priest or to one of his sons who is a priest. The priest is to examine the sore on the skin, and if the hair in the sore has turned white and the sore appears to be more than skin deep, it is a defiling skin disease. When the priest examines that person, he shall pronounce them ceremonially unclean. If the shiny spot on the skin is white but does not appear to be more than skin deep and the hair in it has not turned white, the priest is to isolate the affected person for seven days. On the seventh day the priest is to examine them, and if he sees that the sore is unchanged and has not spread in the skin, he is to isolate them for another seven days. On the seventh day the priest is to examine them again, and if the sore has faded and has not spread in the skin, the priest shall pronounce them clean; it is only a rash. They must wash their clothes, and they will be clean.[26]

While the term "quarantine" was not yet used, and the procedures sound more like an isolation, a separation of people who were already sick, it does suggest that thousands of years ago, separating healthy from afflicted individuals was a well-used strategy even prior to germ theory. However, given the lack of knowledge of germ theory or disease etiology of leprosy, these procedures created significant sigma for leprosy patients.[27]

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[26] "Bible Gateway Passage: Leviticus 13 - New International Version," Bible Gateway, accessed April 10, 2022, https://www.biblegateway.com/passage/?search=Leviticus%2013&version=NIV.

[27] Samson O. Olanisebe, "Laws of Tzara'at in Leviticus 13-14 and Medical Leprosy Compared," *Jewish Bible Quarterly* 42, no. 2 (April 1, 2014): 121–28.

The first outbreak of the bubonic plague in 541 CE (known as either the

Justinian Plague or the First Plague) provides another early form of quarantine. The

plague originated in Arabia and Pelusium and spread to Syria, Persia, Palestine and

reached Byzantine, the capital of Constantipole, in 542 CE. As the outbreak was killing

up to ten thousand people daily, the Roman emperor Justinian I set up procedures to

dispose of the bodies and established laws to restrict movement of people he thought to

be responsible for the spread — mainly non-Christian religious minorities.[28] This

discriminatory and arbitrary form of quarantine, however, had little effect on the

outbreak.[29]

The Black Death, or the Second Plague, and the attempts to contain it gives rise

to early quarantine terminology. First hitting Southern Europe in 1347 and spreading to

England, Germany, and Russia by 1350, the Black Death was estimated to have killed

40-60% of people in Europe, the Middle East, and North Africa. Around this time early

forms of the contagion theory "which promoted separation of healthy persons from

those who were sick" were forming and possibly influenced approaches. [30] Early

attempts to stop the spread included trying to clean the air through food and drink

inspections, regulating burials, and burning clothing suspected to be contaminated.

These interventions may have targeted secondary sources of infection, but as we now

know that the responsible vectors were fleas on rats, they had limited success.[31] More

extreme measures included that of Viscount Bernabo of Reggio, Italy who "declared

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[28] Kelly Drews, "A Brief History of Quarantine," *The Virginia Tech Undergraduate Historical Review* 2, no. 0 (May 1, 2013), https://doi.org/10.21061/vtuhr.v2i0.16.
[29] Drews.
[30] Philip A. Mackowiak and Paul S. Sehdev, "The Origin of Quarantine," *Clinical Infectious Diseases* 35, no. 9 (November 1, 2002): 1071–72, https://doi.org/10.1086/344062.
[31] Drews, "A Brief History of Quarantine."

that every person with plague be taken out of the city into the fields, there to die or to recover."[32] In the Mediterranean port of Ragusa (modern Dubrovnik, Croatia) the city's chief physician advised setting up a separate treatment cite outside the city for sick individuals.

Still experiencing only limited success, in 1377 a law was passed in Ragusa that established a trentino (derived from Italian word "trenta" meaning thirty), a 30 day separation period for people coming from plague endemic areas. Here the protocols enacted started to more directly relate to modern notions of quarantine. The new law prohibited visitation of quarantined individuals. If someone did try to visit someone in quarantine, there were fines and violators were also quarantined. Other areas took on similar laws and the quarantine period was later extended from 30 days to 40 days, invoking the term quarantino (derived from the Italian word "quaranta," meaning "forty"). The reasoning behind the expansion to 40 days is unclear. Some believe it was due to observations that the 30 days was still allowing for disease spread. Others believe it was influenced by the Christian practice of Lent (a 40 day observance). It is possible that the decision was influenced by "the Ancient Greek doctrine of "critical days" which held that contagious disease will develop within 40 days after exposure."[33]

During outbreaks of the plague in Italy, officials also established a quarantine in which infected individuals and their family were restricted to their homes, often with a guard stationed outside to ensure containment. An extreme example of this was in Milan where there were three homes that first contracted the plague and "all the

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[32] Mackowiak and Sehdev, "The Origin of Quarantine."
[33] Mackowiak and Sehdev.

occupants of the three houses concerned, dead or alive, sick or well, were walled up inside and left to perish."[34] In Venice, those infected with the plague were sent to a small island of Lazzaretto Vecchio. While there was little understanding of disease mechanics, these early examples show the foundational idea of separation of healthy individuals from sick individuals with parallel to modern quarantine and isolation protocols. As understanding of diseases has progressed, quarantine and isolation protocols have been refined into an effective public health tool. These examples also show that while sometimes quarantine may be necessary, in some situations there are elements of coercion and force. This thesis focuses on quarantine hesitancy in the US where people voluntarily commit to following public health guidelines, however, the characterization and identified factors might be different elsewhere where there are laws around quarantine and punishments for violations.

Quarantine Case Study: Smallpox

Efforts to contain smallpox provide an illustrative example of how quarantine has been used in the past and contains interesting parallels to the COVID-19 pandemic. Smallpox is an acute contagious disease that causes high fever, fatigue, severe back pain, and characteristic rashes and bumps. According to the WHO, "smallpox was fatal in up to 30% of cases".[35] Smallpox declared eradicated by the WHO in 1980, largely thanks to the development of smallpox vaccine.[36] Before and combined with the

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[34] Drews, "A Brief History of Quarantine."
[35] World Health Organization, "Smallpox," accessed April 28, 2022, https://www.who.int/health-topics/smallpox.
[36] World Health Organization.

development of the vaccine, health officials utilized quarantine and isolation procedures to limit the spread.

Muncie, Indiana provides an interesting example of quarantine in use during an outbreak of smallpox starting in April of 1893. The outbreak started with a young girl who had a mild case of smallpox and unfortunately attended school infecting other children. These first cases were misdiagnosed as cases grew between May and August. In August, the cases were correctly identified as smallpox. At this point there were now 14 cases among 6 different families. Doctors advised the city council to quarantine each infected household and restrict the families to their homes. The city council agreed and made the difficult assessment that limiting individual autonomy was worth protecting the larger community's health. These families were asked to stay home, signs reading "smallpox" were posted, and guards were stationed outside the homes. Food and supplies were delivered at a safe distance and those outside the infected district were kept from entering and encouraged to get vaccinated. These measures were also coupled with a requirement for those inside the infected district to get a smallpox vaccination; showing how as the situation progressed, officials repeatedly had to weigh individual freedoms against the public's health.

Health officials struggled convincing the community that it was indeed smallpox and that it posed a significant threat to the community. There were instances of violators with family members using rear home exists and having friends visit. Eventually, guards were given the authority to arrest violators, elevating again the coercive and authoritative aspects of their quarantine approach. Other physicians were brought in to confirm the smallpox cases and try to persuade the community. Consulting doctors

"advised the absolute quarantine of all infected and exposed persons and urged city leaders to establish a hospital or pest house for those already afflicted."[37] While the city physicians and the established committee on public safety agreed that it was needed, they decided not to open a separate hospital citing the fact that much of the community didn't believe there was smallpox in the community and removal of the infected would be "next to impossible."[38] The reluctance to mandate the forced movement of infected people from their homes to a hospital may have been influenced by riots that had recently happened in Montreal following attempts to require smallpox vaccinations and moving cases to isolation hospitals.[39]

As cases continued to spread, some outside the initial infected district, and with the death of one of the family's 16-year-old daughter community acceptance grew. In September, the State Board of Health declared a city quarantine with the following precautions:

1. No public meeting of any sort should be held. No exercises should be held at any church, lodge, opera house, ball ground, or any place (including school when it was to open) of like character.

2. The people generally should remain at their homes as much as possible. Congregations of persons on the streets should be avoided. The police were directed to see that no crowds collected on the street. Loitering or loafing would subject parties to arrest.

3. Special care should be taken to keep at a good distance from the infected houses. No communication should be had with persons infected or in danger of infection.

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[37] William G Eidson, "Confusion, Controversy, and Quarantine: The Muncie Smallpox Epidemic of 1893," n.d., 26.
[38] Eidson.
[39] Jonathan M. Berman, "When Antivaccine Sentiment Turned Violent: The Montréal Vaccine Riot of 1885," *CMAJ : Canadian Medical Association Journal* 193, no. 14 (April 6, 2021): E490–92, https://doi.org/10.1503/cmaj.202820.

4. Everybody should be vaccinated, whether vaccinated in the past few years or not.[40]

It is worth noting that this of the term quarantine does not seem in line with modern public health use as it is referring to precautions for everyone, and not just the separation of exposed contacts. Officials also decided to open a smallpox hospital and attempt to remove the infected cases. Initially the community was reluctant to comply. The Muncie city council passed an ordinance "to use all the necessary means, including force and breaking of doors if required, to compel removal of all persons having smallpox" and showing the government's growing willingness to use force and coercive approaches.[41] This was met with resistance including protests from the community and lawyers claiming such ordinance was unconstitutional. Given this, public officials ended up not issuing warrants necessary to use such force. Eventually most households were convinced to send their infected members to the hospital, however this also came with folks hiding the presence of smallpox in their homes, lying about vaccination status, and competing medical opinions (similar to anti-vaccination movements today). Community members had to decipher conflicting options between doctors who were advocating for smallpox control measures and those who thought they were extreme and un-necessary. Neighboring communities started to establish quarantine against Muncie residents and prevented entry without certification of good health or vaccination. In the case of the Board of Health of Randolf country, they declared that anyone who entered from Muncie would be quarantined for 10 days no matter their

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[40] Eidson, "Confusion, Controversy, and Quarantine: The Muncie Smallpox Epidemic of 1893."
[41] Eidson.

certificates. With time and improved community acceptance, cases started to fall and quarantine and other measures were lifted.

As the response to smallpox outbreaks show, quarantine is a public health tool that can be adapted to various health emergencies. It also shows the key role that communities play in the implementation of such interventions and their success. Through their degree of acknowledgement of the threat of smallpox and whether they decided to comply to regulations, individuals in the community influenced the impact of quarantine measures and the course of smallpox infection. In his paper Confusion, Controversy, and Quarantine: The Muncie Smallpox Epidemic of 1893, William Edison recounts much of this smallpox outbreak and states that "local citizens ignored sensible precautions and thus encouraged the spread of the malady".[42] I would argue however, that the outcome was also a reflection of how government and health authorities were able to support and educate the community and that the responsibility shouldn't solely be placed on the individuals. This example of quarantine and smallpox also illustrates how when quarantine and restrictive public health measures are implemented, governments and public health agencies must weigh limits on individual autonomy against the protection of a larger public's health. As the outbreaks progressed, health officials seemed increasingly willing to place limits on individuals as the threats to health grew. Questions of when and to what extent to limit individual autonomy must be addressed when quarantine is implemented, and in some situations, they are answered in harmful and problematic ways.

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[42] Eidson.

Quarantine has also been used more recently to address health threats such as Ebola virus disease (EVD). The questions raised above, however, did not disappeared and were present in the approach to EVD. In 2014 during outbreaks in West Africa there were military enforced mass quarantine of communities highly affected by EVD. These mass quarantines occurred in Guinea, Liberia, and Sierra Leone, where EVD rates were the highest. In Liberia, health officials attempted to contain EVD by targeting West Point, the country's largest slum, and implementing a 10 day quarantine. Barbed wires and scrap wood were used by military officials to create a barricade and the exit points were patrolled. These measures resulted in unrest and tragically resulted in the shooting of some residents, including a 15 year old boy.[43] While quarantine procedures might be well intended and are an important tool for public health there is a careful balance between protecting individual liberties and promoting the health of the public.

Quarantine is a valuable public health tool. Previous uses can both show the potential benefits of using quarantine techniques as well as the challenges and considerations that are involved. This thesis adds additional insights into such considerations. The conclusions of this thesis should be coupled with what we have learned from previous quarantine uses to maximize its benefit in future use.

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[43] Amber Hildebrandt · CBC News ·, "The Folly of Mass Quarantine, Especially for Diseases like Ebola | CBC News," CBC, August 25, 2014, https://www.cbc.ca/news/world/ebola-outbreak-why-liberia-s-quarantine-in-west-point-slum-will-fail-1.2744292.

CHAPTER 3: Results and Discussion

Interviews with contact monitors produced insightful reflections that led to a definition and characterization of COVID-19 quarantine hesitancy. CMs suggested that *COVID-19 quarantine hesitancy was when contacts displayed resistance while receiving or implementing COVID-19 quarantine guidelines*. Coupled with this definition are important considerations of how in the CMs' work there was not one universal type of COVID-19 quarantine hesitancy and it presented in a variety of ways. With this variation in presentation was also a range of determinants of hesitancy, including determinants specific to a contact's situation and social circumstances, personal determinants, and quarantine comprehension determinants. The results of this analysis help to establish COVID-19 quarantine hesitancy as a relevant concept and identify targets for future interventions.

What is COVID-19 Quarantine Hesitancy

All contact monitors were explicitly asked to define COVID-19 quarantine hesitancy based on their experience. This question was asked partway through the interview following related questions that asked CMs to reflect on memorable hesitant calls, the themes they noticed in hesitant calls, and strategies they used in difficult calls. CMs were familiar with the idea of hesitancy and able to describe and reflect on hesitant calls without further prompting. Questions were ordered so that CMs had a chance to think about hesitancy in their calls before providing a definition. All CMs had experience with hesitant calls and there were no suggestions that this phenomenon was not present in their work. COVID-19 quarantine hesitancy definitions from CMs that

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were prompted by explicit questioning as well as those unprompted during related discussions were used to build a definition. There were 56 excerpts in which CMs defined and described hesitancy. Based on analysis of these excerpts I propose that *COVID-19 quarantine hesitancy was when contacts displayed resistance while receiving or implementing COVID-19 quarantine guidelines.* There were two overarching types of this COVID-19 quarantine hesitancy: 1) an intrinsic, personal based hesitancy and 2) an external, situational based hesitancy.

This definition was a product of CMs reflecting on calls in which they were also a participant. While CMs were able to utilize their first-hand experience, being participant observers was one limitation of this study. This was also true of my overall analysis as it was impossible to remove the influence of my personal experience working with as a CM and with hesitant contacts. This lens should be considered with the results of this thesis.

Coming up with a concise and comprehensive definition for COVID-19 quarantine hesitancy was not an easy process for CMs. When asked to define COVID-19 quarantine hesitancy, 10 out of the 17 participants expressed difficulty such as prefacing their responses with "I don't know," mentioning it was a hard question, or feeling unsure as to whether their answer was sufficient. Given the examples CMs provided and their experience, this difficulty wasn't due to a lack of familiarity with the concept but rather due to its complexity. With my definition I attempted to capture this complexity and provide the subtleties that CMs communicated. The following sections break down each part of this definition with example quotes from contact monitors and discussion.

Resistance in reception and implementation of COVID-19 quarantine guidelines

The CMs' responses suggested that COVID-19 quarantine hesitancy was when a contact displayed resistance while receiving and/or implementing recommended quarantine guidelines. CM 1 verbalized this well when they were asked to define COVID-19 quarantine hesitancy:

> I think it's someone who's just not willing to like, listen, and is kind of set in their mindset of like, "quarantine is not helpful", or like, "I don't even need to do it because COVID is a hoax", that sort of thing…I think it kind of just rests on, like people who aren't willing to kind of change their mindset regarding the topic. - CM 1, CM for 9 months, lead for 3 months

CM 1 emphasized an unwillingness to listen to public health recommendations and made a distinction between contacts who had some flexibility in their mindset and those who did not. CM 16 focused more on the reaction of contacts but still emphasized the resistance towards public health official recommendations:

> I'd say…when there's a sizable discrepancy between how you want to execute your life with the way that public health officials are recommending you react to COVID…I kind of want to think about it in terms of like, anger, or reaction and towards what public health recommenders are recommending. -CM #16, CM for 10 months

CM 16 utilized the idea of a discrepancy between what contacts wanted to do and what CMs recommended them to do to form their definition. They also started to suggest some of the limitations of evaluating hesitancy, as they mentioned it wasn't possible to know whether what contacts share over the phone is an accurate representation of contacts' positions.

Many CMs expressed the difficulty of condensing COVID-19 quarantine hesitancy into a simple definition, as CM 14 explained below. However, a common trend was discussion of how public health recommendations were received by contacts:

> I feel like it's this resiliency to quarantine based on a multitude of factors and it can't really be boiled down to one thing. There's a mix of, you know, economic pressures, responsibilities and priorities that people want to do. But you know, quarantine basically stops that. - CM 14, CM for 5 months, lead for 12 months

Several CMs explained how despite the potential benefit of public health recommendations, the reality was that they were not always received and carried out by the public in the way public health officials intended or expected. The CMs associated this discrepancy with quarantine hesitancy.

With their discussion of how contacts respond to the recommendations from CMs and public health officials, many CMs pointed towards a tension that existed between the individual and public health work. In all public health work, there is a tension between unlimited autonomy for individuals and a limited autonomy in lieu of protecting a wider "public's" health. This was certainly at play when asking contacts to quarantine. Each contact had their own criteria for when they were willing to forego their autonomy, and quarantine, for benefit of others, and when they are not. This was a theme that reappeared throughout the analysis of both the definition and determinants. Every individual can potentially be hesitant to quarantine, and whether they were depended on their boundaries and the degree of influence of COVID-19 quarantine determinants.

Essentially, the first component of the proposed definition was an attempt to capture the CMs' discussion of the gap between public health work and the individuals

who were asked to make sacrifices to protect others. This portion of the proposed definition highlights one area in which public health may have faltered during the pandemic. Public health works to promote and protect the health and well-being on a community level, however, from what hesitant COVID-19 contact calls showed, the success of public health efforts also relied on individual "buy-in".

Situational vs personal-based COVID-19 quarantine hesitancy

When asked to define COVID-19 quarantine hesitancy, many CMs found it effective to break the concept into separate categories or types of hesitancy. These were a situational-based hesitancy, in which the drivers were outside of the control of the contacts, and a personal-based hesitancy in which the hesitancy arose mainly from personal beliefs and decisions. Below are some examples of these distinctions that CMs made:

> There's like one side where it is being fed by these like false facts and this like, whole polarized issue. But then on the other hand, there's the people who are unwilling because of their situational needs. And I definitely had more empathy towards the latter. Because, like, they were the type of unwillingness or hesitancy where they would comply if they had the ability to. But a lot of times, that's where like, you would see the most anger, because they're like, "I'm stuck in this situation. Like, fuck you." But, yeah, I think those are two really important sides to the COVID hesitancy or the quarantine hesitancy. - CM 7, CM for 4 months

Asking a contact to quarantine put contacts in a tough place. As CM 7 discussed, even if they wanted to quarantine, they might not have had the ability to. CMs discussed both an unwillingness arising from individual preferences as well as an unwillingness or inability arising from life circumstances — such as the need to go to work, having to care for dependents, and other pressing issues. Below CM 9 mentioned the multiple

types of hesitancy, and explained the different types of fear involved in quarantine

hesitancy:

> It's a hard one, because I think the hesitancy comes from so many
> places…there were so many viable and rational reasons that I could be
> compassionate about as to why people had the hesitancies that had
> nothing to do with ignorance that had nothing to do with political
> values… the two biggest categories I feel like stem from the hesitancy is
> either it comes from fear or it comes from like the kind of American
> individualism that that kind of indignation of not wanting to be told what
> to do - CM 9, CM for 3 months, lead for 8 months

CM 9 seemed to compare a hesitancy arising from fear and one arising from "American

individualism." With their first category of a fear-based hesitancy, they mentioned

resource and situational based fears aligning with other CMs who discussed a

situational based hesitancy. With the mention of "American individualism" CM 9

seemed to point to a second type of hesitancy that captured the priority many contacts

hd to protect their autonomy.

The commonality between CMs in dividing COVID-19 quarantine hesitancy

into different types suggested that there was not a single, universal description of that

quarantine hesitancy. There were differences in how exactly CMs divided up types of

hesitancy and some identified more than two categories, however, clearly there was

something more complex at hand than one type of hesitancy. This suggested a need for

understanding quarantine hesitancy as a multi-faceted concept so that more tailored

solutions can be implemented.

COVID-19 Quarantine Hesitancy Presentation and Determinants

      As was evident in the definitions provided by CMs and the described calls, there was clear variety in who was hesitant, when they were hesitant and in what way they were hesitant. Based on the responses given by CMs and my personal experience as a CM, I proposed that there was a general pathway that all contacts go through when deciding whether to follow public health guidance to quarantine. A contact could become hesitant at any point along, before, or after this pathway, though the focus of the interviews was based on experience with hesitancy during a current exposure. Figure 2 visualizes this pathway. A summary with a brief description of determinants, example quotes, and the organization of categoires is provided in Appendix 3.
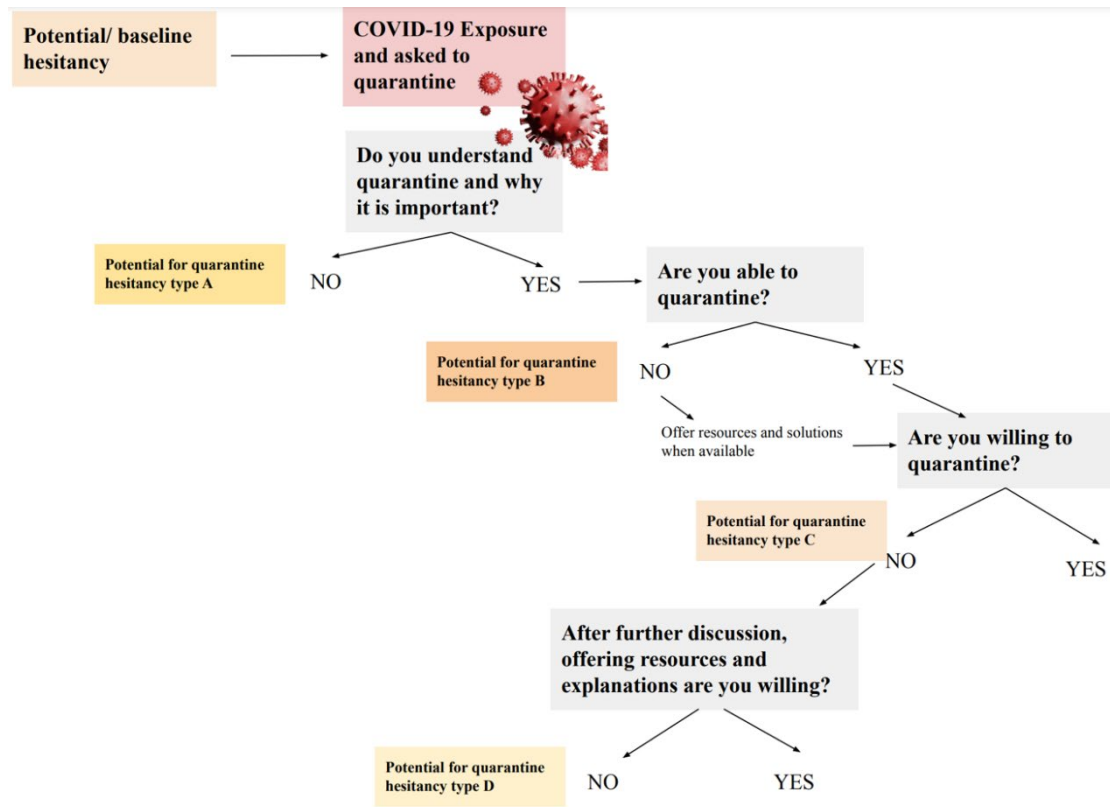
Figure 2. Visualization of quarantine decision pathway with types of hesitancy

This provided organization is meant to show the diversity of how COVID-19 quarantine hesitancy can present itself. All contacts had an individualized potential or baseline hesitancy, and it could present itself at any step between finding out about an exposure and deciding whether to quarantine. I've grouped together the types of potential hesitancy based on the key question or decision contacts struggled with. CMs provided their perspectives and interpretations of the reasons and factors behind hesitancy. Analysis of these reasons revealed three main groups of hesitancy determinants: quarantine comprehension, situational determinants, and personal

determinants. The following sections describe the various types of quarantine hesitancy described by CMs and discuss the specific determinants that were associated with the various types.

August 5th, 2021:

I was assigned to an older contact; I reviewed the ARIAS file and started the call. I introduced myself, confirmed his identify and explained why I was calling. After a few minutes he said that he was confused and was having a hard time following what I was saying. I started to notice that he spoke with a bit of a stutter and seemed to be getting a bit distressed. I tried to slow down quite a bit and explain things in as basic and clear terms as I could. Even though I tried different approaches to explaining his exposure and quarantine recommendations, I was still having trouble getting through to him. At one point in the call, he said, "you think differently than me" and stated how confused he was and that he didn't "know where to start" with our recommendations. Hearing how overwhelmed and stressed he was during the call and about his situation made me feel almost sick to my stomach. I hated that when he was in an already stressful situation, taking in a COVID-19 exposure, I was failing to support him and was adding to the stress. He seemed willing to comply with what we were asking, he was just confused. In the end I found out that he was fully vaccinated, and he didn't actually have to quarantine. As we were closing out the call, he apologized for being difficult and thanked me for my help. This broke my heart to hear, and I tried to express that he wasn't difficult at all. I felt bad I couldn't explain things better for him and left him feeling as though he did something wrong.

There is no question that quarantine and the related guidelines could be confusing for contacts to understand. CMs did their best to effectively communicate the guidelines and the reasons behind them, but understandably contacts could get confused during this process. This confusion was also compounded by factors such as misinformation, complicated quarantine situations or contradictions between public health institutions. Ultimately, uncertainty around quarantine recommendations was a potential source of hesitancy.

Type A:

The first type of hesitancy I identified, type A, was when contacts from the start didn't understand what was being asked of them or why it was important. This included both barriers to understanding such as outside misinformation and the confusing nature

of quarantine recommendations. Type A hesitancy captured the fact that if *what* was being asked and *why* it was being asked wasn't clear, understandably contacts may not have fully quarantined. Below is an example of a hesitant contact from CM 15 which I classified as type A:

> I think it was because he was receiving so much information. And it didn't add up. The contact received information from like the testing center, from his doctor from a different testing center, from the school. And so he had like four sets of information that were kind of similar but not the same. And then a case investigator at Lane County Public Health told them that that was all wrong and here's a new set of information. And so when we called him was very upset, because he didn't know what to do. - CM 15, CM for 12 months, lead for 1 month

As CM 15 described, if it wasn't clear to a contact what they were supposed to do it could be frustrating to try to figure out how to proceed. Equally important to knowing what to do was understanding why it was important:

> And then another [call] was more along the sides of I just don't understand why this is such an important deal. Like, why would you want me to quarantine if I'm just an individual, and I don't have the power to stop the entire pandemic with just myself quarantining. So they're very hesitant in that respect, as well, just like not understanding that even one person can make like a really huge difference in the transmission of the virus. -CM 6, CM for 8 months, lead for 5 months

If a contact didn't know what was being asked of them and why, it was likely that they wouldn't properly quarantine. CMs discussed how the level of quarantine comprehension contacts had was influenced by a variety of factors including confusing, differing and changing recommendations, misinformation, household exposures, fear, exposure awareness, education, COVID-19 fatigue and vaccines. In total, there were 140 excerpts that discussed quarantine comprehension determinants leading to hesitancy type A.

According to CMs, confusion resulting from the nature of the quarantine guidelines led to hesitancy. CMs discussed challenges including confusion around the guidelines changing as well as resulting from differences in recommendations (such as between local recommendations and the CDC, or from primary care providers). There were 14 CMs that discussed these challenges with 34 references. For example:

> People felt like what Lane County was giving out for a quarantine timeline was different than what Oregon was giving out, which was different than what their family members were experiencing in different states. So I feel like honestly, that's another thing that caused hesitancy was just the way that different counties, states, government officials, everybody who was discussing quarantine and was discussing the pandemic that kind of affected the way that people saw it and whether or not they thought that the full 14 days were necessary, in a way -CM 11, CM for 6 months

Educating the public is a key role of public health work. Based on the responses of the CMs, educating the public and communicating clear recommendations was particularly challenging with COVID-19. This was partly because public officials, scientists, government officials and everyone involved in responding to COVID-19 had to learn about COVID-19 while try to keep the public informed simultaneously. As discussed in the background chapter, there was also significant variation between the CDC and Oregon and changes throughout the whole pandemic, which understandably made it harder for contacts to comprehend. CMs discussed how the rollout of vaccines further complicated recommendations as there were new guidelines for quarantine depending on the vaccination status of contacts. Although vaccines were an important achievement during the pandemic, they also created a new set of guidelines had to be digested and interpreted by contacts.

Compounding this confusion around recommendations were complicated quarantine situations such as household exposures. When there was a positive COVID-19 case living in a household with other susceptible members, contacts had an extended quarantine period as they had to quarantine both through the case's isolation period and for a period after the last possible day of exposure. CMs explained how this was challenging to explain to contacts and they were often met with hesitancy:

> Some weird calls that were hesitant had to do with like, family situations in which kids were testing positive at different stages, and we were having to create those really long quarantine, like timelines for families. And I remember parents being very hesitant in the sense like, "how is it possible that my kid hasn't gotten it yet? Like, why did they have to stay at a school for 24 plus days?" Parents would even go as far as saying like, "Well, I hope my kid gets it, because then they wouldn't have to quarantine for that long of a time." -CM 11, CM for 6 months

Understanding quarantine was challenging enough without adding in the changing and extended quarantine timelines of household exposures. Keeping in mind that majority of COVID-19 contacts had no familiarity with disease mechanics, if contacts didn't understand why they were being asked to quarantine for such a long time they were likely to be hesitant.

Another intrinsic challenge of implementing quarantine and communicating information to contacts was that most of the details of a contact's exposure couldn't be shared due to privacy laws. This was a common challenge brought up in interviews with 16 different references among 10 CMs. Generally, the CMs felt that when a contact didn't know who exposed them the contact was more likely to be hesitant. As CMs were not able to provide this information, this was difficult to combat as CM 13 described below:

HIPAA doesn't allow us to, like, tell people …exactly when or who they were exposed to…You would definitely have less hesitancy if we were actually able to say, like, "this person exposed you," because in a lot of cases, like we would call people and they would be like, I don't know, like, "I know I'm not like I wasn't exposed, like nobody told me that. Why would I trust you?" - CM 13, CM for 2 months, lead for 6 months

In situations such as these, not having the context of an exposure could make it difficult for contacts to understand why they should quarantine. If contacts were not confident that they were exposed, in some cases they were harder to convince that it was necessary for them to quarantine.

CMs also reflected on how understanding of what "exposure" itself means could lead to hesitancy. CM 9 provided an example of a hesitant contact that demonstrates this factor well:

So I think an example like I really remember, it's because I spoke to her, I would say maybe two times a day, for a good like four days. She was a student who she was she spent 15 minutes in a room with her roommate who was unpacking her clothes, or something like that. And they were both masked, and she was just in there helping her unpack, and in her opinion, that was just not warranted, as like exposure. And so I think like, that's an example of people that like, really had a hard time with the semantics of what exposure meant. And we're very convinced that these like small actions they were making weren't… considered as exposure. So I think the biggest group of people that I experienced with were students who they were like, "but I just, you know, walked over to this person's room for a good five minutes, that shouldn't count."- CM 9 CM for 3 months, lead for 8 months

The influence of whether contacts understood what exposure meant and trusted the contact tracing process enough to accept an exposure notification from a stranger raised questions of the relationship between public health and the individual. Public health work is focused on community health, and it tries its best to support and inform the public. However, for public health interventions to succeed, there needs to be support

and cooperation from the individual. A vaccination campaign won't work if individuals don't think it is important to get vaccinated and aren't willing to do so, or an anti-malaria intervention using bed nets will fail if individuals don't use them. The same is true for quarantine. While the individual is a key player, it is the responsibility of public health institutions to educate and support individuals so that they can make informed decisions.

July 15th, 2021:

I received an incoming call from a contact who had completed an initial call with another CM a few days prior. During the first call he had requested to be connected with a case manager to try and get rent assistance. He called back in to ask if we knew when the case manager would call him as he hadn't heard anything yet. I saw in his file notes that the request was made and unfortunately beyond that I didn't have an answer for him. I told him that I would check in on the request and that someone should be calling him soon. He told me that he didn't know what to do and that he was a single father and had to go to work. I felt for him but all I could do was try to express my sympathy and that reassure him that his concerns were valid. I tried to assure him the case manager would call soon, but I knew with the degree of stress he was dealing with, my words could only do so much in the moment.

During initial calls, CMs had roughly 10 to 15 minutes to accomplish quite a bit. In addition to gathering contacts' information, informing them of their exposure, and explaining quarantine, the calls were an opportunity to learn about each individual's situation. These calls were the main means of connecting contacts to resources and support. Although the available resources fluctuated throughout the pandemic, in some cases LCPH was able to offer rent assistance, help applying for unemployment, liaison assistance with difficult employers, official letters to show employers and schools, and free COVID-19 testing among other resources. The calls to contacts were crucial windows into the contact's situations and were important for discovering and assisting with their individual challenges. Unfortunately, the resources offered were not always enough. There were some resources, such as rent and utilities assistance, that contacts had to qualify for to receive. The availability of these resources also fluctuated with funding allocations to LCPH and as the pandemic progressed, fewer resources were available. Despite these resources and attempts to support contacts, it was impossible to eliminate all challenges contacts faced when asked to quarantine.

Type B:

If a contact understood the situation, the next question was whether a contact was *able* to quarantine. If they were not able to quarantine this could result in hesitancies that I've grouped into type B. This type of hesitancy was when a contact might understand that they should quarantine but due to factors outside their control were unable to. CM 13 provided an example of this type of hesitancy:

> A lot of people would be hesitant to quarantine…because they have to go to work and they're like, "I can't afford to take time off work. Like I have to go"…And then another one in that same idea is like groceries. I remember having like a really hard call one time with a huge family. And they, they were like, "we have to get groceries, like, we're not going to have enough groceries to feed like my family, I'm going to the grocery store, like I don't know what to tell you." - CM 13, CM for 2 months, lead for 8 months

CMs discussed several situational factors that could lead to this type of hesitancy. Such factors included resources and finances, multiple exposures, household exposures, and exposure awareness.

The theme of resources and finances was mentioned in all 17 interviews at least once, with 53 individual references. These discussions included practical and logistical considerations that were involved in a contact's ability to quarantine. CMs brought up factors such as loss of income, challenges with employers, stress of paying bills, food and grocery supplies, job security, trying to apply for unemployment, and providing for others (such as family members, employees, or patients). For example:

> I had a call where the person wanted to quarantine but their employer didn't want them to. So coming across instances like that, where individuals wanted to quarantine but felt they couldn't in fear of losing their job. Those are really tricky… people who want to do what they

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think is right, but like, can't for fear of being unable to pay their bills or take care of their families. -CM 4, CM for 7 months, lead for 6 months

Ultimately, there were some demands in a contact's life, such as possibly losing their job, that took precedence over quarantine, even if they understood that they should quarantine. CM 9 provided another illustrative example of how some contacts' life circumstances created an inability to quarantine:

Whenever there was a breakout in like a health center, or like, like a retirement facility or something like that, where workers needed to choose between going home or continuing to take care of their people like that was a really difficult thing, where they're like, "we literally can't close our business down, like people rely on us. There's nothing we can do about that,"… that was a really, again, another very difficult thing to rationalize [with] them, because it totally made sense. So many people …were depending on them, and they didn't have the infrastructure or the staff or the resources to replace people, you know, whether it's because of just low staffing in general or like, because it's a highly skilled job, and they just don't have like all the people in the world to replace them. - CM 9 CM for 3 months, lead for 8 months

CMs explained that quarantine disrupted everyday life and created strain in crucial areas for contacts. It is understandable that some things, such as food and rent, were prioritized by contacts over staying home for the full quarantine period. Asking someone to quarantine was also asking them to possibly forgo income, navigate expectations with employers, and to possibly take on additional expenses such as paying for grocery delivery services. Sometimes hesitancy arose because individual survival and responsibility was prioritized over protecting others. When evaluating COVID-19 quarantine hesitancy and what we ask of contacts, public health officials and those responsible for allocating resources should consider the difficult position quarantine puts contacts in. Contacts shouldn't have to choose between meeting their

needs or caring for people dependent on them (whether children, elderly relatives, or patients) and complying helping to protect others with quarantine.

Clearly there was a social and situational component to COVID-19 quarantine hesitancy. As such situational factors intensified, they could shift a contact's willingness to quarantine. Child exposures were one theme brought up by CMs as they often created logistical and stressful situations for families. Child exposures were discussed by 11 CMs, 16 different times. Another example of an intense quarantine situation mentioned by CMs were household exposures. The extended quarantine could start to weigh on contacts and create an overwhelming situation:

> There was one specific person who was just in a family. They weren't vaccinated and random people kept testing positive. So they just like kept having quarantine for so long. And they were just like, at this point, I'm not going to do it anymore. Like, "I understood it at the beginning," but they had been in quarantine for like, a month and it was still like two more weeks and they were just like, "I'm not doing it." -CM 3, CM for 11 months

CM 3 provided an example of how household exposures could lead to hesitancy as they increased the burden of the ask of quarantine. This increase could lead to a burnout of sorts where contacts reached of breaking point of what they were able and willing to comply with. The situational determinants involved with type B hesitancy emphasized the importance of looking at the full picture of what quarantine involved. It was not always black and white, yes or no questions. When someone was deciding to quarantine, they were also deciding if they had the capacity to do it. For many people already in vulnerable situations they did not.

September 23rd, 2021:

I made a call to a household contact whose adult daughter tested positive. Early in the call she told me she was a police officer and she explained how during on her experience working in the field she didn't see people sick from COVID-19. She told me, "sorry I know it is just your job, but I think all of this is totally ridiculous" …"I deal with tweakers and homeless people and no one social distances and no one is sick." She also mentioned that her daughter, who had tested positive, was the only one in their household who was vaccinated which she found "interesting." Although this contact was willing to talk with me and go through the call, she made it clear she didn't agree with what I was telling her, and I got the impression she wasn't going to quarantine.

CMs experienced a range of responses and reactions from contacts when they called and asked them to quarantine. Understandably, emotions were heightened given the implications and stress of both being exposed to COVID-19 and being asked to put their life on hold. Many CMs reflected that there were also intense and varying opinions around COIVD-19 and quarantine. A contact's ideology and personal perspectives appeared to be another source of hesitancy.

Type C:

If a contact was able to quarantine, hesitancy was then based on whether a contact was *willing* to quarantine. I've grouped hesitancies resulting from initial preferences and contacts not wanting to quarantine into Type C. CM 6 described an example of a hesitant contact who would fit in this group:

> Sometimes they hang up and like, you never talk to them again. But this man just wanted to continue explaining, like, "what is the point of us quarantining, if it's not real?" …And he was stating, like all the other people who have had COVID, like, that's not real either. People who have symptoms, not real, they have some other illness. And he was like, "I understand that you want me to quarantine, but I'm not gonna do it." - CM 6, CM for 8 months, lead for 5 months

When CMs spoke a with contact on the phone, they would prepare for a range of reactions and responses. Some contacts had set opinions about COVID-19, quarantine, and what they were willing to do. From CMs responses there seemed to be a third group of determinants that mainly influenced whether or not a contact was willing to quarantine. These were personal determinants that included COVID-19 beliefs, autonomy, lack of care, inconvenience, politics, trust, exposure awareness, fear, COVID-19 fatigue, vaccines, and child exposures. This was a rather broad category of determinants that had 151 references.

Possibly to a greater degree than other public health issues, the COVID-19 pandemic has involved an array of personal beliefs, some quite intense, that influenced how a contact responded to being asked to quarantine. The role that COVID-19 beliefs had in quarantine hesitancy was frequently mentioned by CMs. There were 10 CMs who discussed COVID-19 beliefs with 21 references:

> Another probably would be like the lack of like the population of people who just don't want to believe that this is a problem and so they're hesitant I would say more like, completely unwilling to not be hesitant. But so definitely like that group of people who don't believe they should have to quarantine that it's against their personal autonomy. -CM 13, CM 2 months, lead for 8 months

While there were a multitude of factors behind COVID-19 quarantine hesitancy that were beyond the control of the contacts, there is no questions that a contact's personal beliefs influenced their response to exposures and degree of hesitancy to quarantine. Understandably, if someone didn't believe that COVID-19 was real or a serious threat they likely didn't quarantine. Often contacts formed their own beliefs and opinions to COVID-19 prior to their exposure and came into calls with a pre-set mindset.

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Child exposures were an area that several CMs identified as evoking passionate opinions and beliefs by parents. As was discussed previously with the situational determinants, child exposures could pose unique challenges. It seemed that in addition to the logistical and resource challenges of child exposures, parents also tended to have rather passionate opinions regarding quarantine for their child. The discussions from CMs suggested that issues around privacy were heightened and parents were more critical and questioned the recommendations more frequently. For example:

> Mothers tend to wonder why their child needs to quarantine and they become very hesitant to quarantine their child for the reasons of them wanting to make sure they get an education, then wanting to make sure that they socialize, and that they meet those developmental timelines, they have a big concern with that. And so they can be quite hesitant in saying, "if we have data showing that my child is not at as risk as others, then why would I want to run the risk of them not meeting those developmental timelines, if I could just leave them in school and just test them" -CM 6, CM for 8 months, lead for 5 months

This quote from CM 6 is a bit of a generalization, which was one limitation of these reflective interviews. There were also many parents who were more than willing to quarantine their children. The CMs discussed quarantine hesitancy and calls they remembered as well as they could but ultimately there were some generalizations that were made to convey their ideas. Many brought up the concerning trend that parents often didn't see quarantine as something that was necessary for their children. In their responses several CMs provided examples of parents of exposed children assuming their child was fine and not wanting to quarantine them. In general, with child exposures everything seemed slightly intensified. Personal opinions about what to do were stronger, privacy concerns were more prevalent, and understandably parents seemed more critical of what was being asked. The themes and dynamics associated

with child exposures that CMs discussed showed how every contact had a different criterion for being willing to quarantine and certain factors could enhance or detract from willingness to quarantine, leading to type C hesitancy.

Another factor many CMs mentioned that fit into the personal based determinants of type C hesitancy was politics. Politics was mentioned as a factor involved in hesitancy by 9 CMs, 22 different times.

> When you combine politics with public health, I feel like that's when the conversations tended to get a little heavier. And where people had just different differing ideals and different views about the situation at hand, and the way it was being dealt with, even like some people just didn't support public health, they didn't think it was a necessary initiative, they thought that people should be responsible for their own well being. – CM 11, CM for 14 months, lead for 1 month

Many CMs described how politics seemed to infiltrate their work and influenced contact's reception of quarantine recommendations. From the CMs' perspectives, political stances influenced how contacts perceived COVID-19 exposures and the validity of quarantine and the public health interventions. Many CMs expressed frustration at the presence of politics in the work as they felt that public health and fighting COVID-19 shouldn't have been political:

> People that were very political, about their like reasons for not wanting to listen to us and to quarantine and associating public health and government as something that was like against the Trump Organization, which was very interesting, considering we technically are the Trump administration, like we were technically under the Trump administration, as government employees too. So like, we weren't at odds with the administration or with the government in general, but like a lot of people felt, I remember like we were politically against them, because we even recognize the existence of COVID in the first place. So I feel like a lot of the time like, there were people who just couldn't rationalize with because they felt that anything that was coming out of my mouth was political, politically motivated, rather than, you know, motivated by public health. And so I think that's another trend like that COVID was a lot of people that were hesitant, had political reasons for being hesitant

and political reasons for not trusting me. -CM 9 CM for 3 months, lead
for 8 months

As CM 9 pointed out, although public health work shouldn't be political, it is often

influenced by politics and the COVID-19 pandemic has shown an extreme influence of

politics. Unfortunately, COVID-19 seemed to develop into a political issue with

responses and beliefs around COVID-19 being correlated with specific political

leanings. Although everyone made their own decision of whether to quarantine, based

on CM responses, their decision making was influenced by their political leaning.

COVID-19 fatigue was another idea brought up by several CMs that may have

influenced COVID-19 quarantine hesitancy. The term "COVID-19 fatigue," now

widely used publicly, was proposed by CM 12. It refers to the trend that throughout the

pandemic, the longer COVID-19 impacted people's lives and longer they were asked to

adjust their lives COVID-19 the less willing they were to comply to COVID-19

precautions, in this case quarantine. COVID-19 fatigue mentioned in 8 interviews with

9 references:

> People were just tired of dealing with COVID. My mom always likes to
> call it COVID fatigue. So I think that's a good word for that. I think a lot
> of people were hesitant because they were pretty much tired of COVID
> but at the same time too, there were like a decent amount of people that
> were hesitant because they didn't really understand like what certain
> things meant. And they also didn't really understand initially why we
> were giving them different guidelines than what the CDC was giving
> people. Because…I live in California now in California still follows the
> 10 day quarantine if you're exposed. And I know Oregon doesn't do that.
> So kind of like, I think just kind of misinformation …made it a little bit
> more easy for them to be hesitant to it, because it was just like a lot of
> different things are being spread around. And also like they are just tired
> of like constantly hearing about it and people talking to you about it. And
> now there's some random person telling you what to do on the phone.

None of that's fun. So like, I think mainly, those two things were reasons why people were hesitant. -CM 12, CM for 7 months

The point of the pandemic and the degree to which "COVID-19 fatigue" impacted an individual appeared to be a determinant of quarantine hesitancy. This fit in the personal determinants category, as how much of an effect COVID-19 fatigue had on an varied between individuals. The more of an impact COVID-19 fatigue and the other factors discussed here had on an individual the more likely they were to present as type C hesitancy and be unwilling to quarantine.

Type D:

When adverse opinions toward quarantine came up, CMs did their best to listen to the contact and work through their concerns. Sometimes this worked and contacts were convinced to quarantine, however, sometimes they still were not willing to quarantine which would be type D hesitancy. For example:

> I had one call last winter where it was a family like a mother and son and a dad. And they were really concerned about the dad completing the full quarantine as it was an in house exposure… the dad was uncomfortable or didn't feel like he'd be able to finish the entire quarantine. So he was kind of combative, and trying to shorten it, or just made me feel really pressured to like, come up with an alternative way to help him in that situation. But, you know, just slowly breaking it down…trying to explain why it's important to quarantine the entire time and provide different resources. But when they don't really listen, or it doesn't seem like they're hearing you it can be really hard to navigate that. - CM 4, CM for 7 months, lead for 6 months

All the determinants discussed previously influenced this type of hesitancy. Depending on the intensity of the various determinants — whether a resource determinant such as loss of wages, or a personal determinant such as thinking COVID-19 wasn't real — a

contact who was initially hesitant sometimes was able to overcome their hesitancy with supports and further discussion with CMs. However, when the determinants were more intense, discussion with CMs or offered supports were not enough to overcome the hesitancy leading to type D.

This construct of COVID-19 quarantine hesitancy and the discussion of the range of determinants was intended to present the range of possible hesitancies. There was also combinations and overlaps between the types of hesitancies and determinants. There were connections between determinants such as contact's life circumstances influencing their willingness to quarantine or how much of barrier there was to understanding their particular quarantine situation. CMs emphasized the variation of hesitancy and there was likely variation beyond what the CMs were able to observe as their perspectives were limited to what contacts reveled during calls.

One of the interview questions asked about common themes CMs noticed in the reasons contacts gave for being hesitant, a follow up probe question to this was whether they noticed any trends along gender, age, class, race or ethnicity or any similar demographics. I was not able to find much similarity in the responses to these questions and there was a range of answers indicating there was variety in who was hesitant. Some CMs explicitly stated that there were not any observable trends they could think of and they felt they had dealt with hesitancy in all types of people and along all demographics. This goes to show that no one is immune to hesitancy and with the right combination of circumstances and personal ideations anyone could be hesitant in some form. The interviews clearly showed that the factors and determinants behind contact's answers to these three key questions were complicated and diverse. Given the

individuality of quarantine hesitancy presentation, it is important that future solutions that are responsive to such diversity that can be adapted to circumstances of individual hesitancies.

Conducting interviews with CMs provided a definition and a construct for the types of hesitancies and specific determinants, however, using this group as participants did come with some limitations that should be kept in mind with the results of this thesis. The perspectives from CMs were based on what they saw during their initial calls with contacts, and not what happened over a contact's quarantine period. For example, there could have been situations where a contact presented as compliant during the call with the CM but later — either because they held a different opinion from what they presented or because their situation evolved — the reality of their quarantine hesitancy may have been different. This study was also limited to the CMs' experience and while this was a useful perspective and CMs were able to reflect on their calls a whole and comment on patterns, the lived experiences of contacts asked to quarantine and their perspectives on hesitancy may have differed. Future work should investigate COVID-19 quarantine hesitancy with former contacts to test the definition and determinants developed here. This study also may have been influenced by recall and participant observer bias. When CMs were asked to recall hesitant calls and reflect on their work, it is likely that they remembered and commented on the more extreme instances of hesitancy. The more extreme cases were likely easier to remember and of more interest to CMs. Additionally, as CMs were participants themselves in the calls, their own beliefs and expectations may have both influenced how the call was handled and their memories of the calls. All the CMs, myself included, had a degree of bias as

we all had the goal of encouraging contacts to quarantine. In our work we were trained to prepare for push back and challenging calls. This may have made CMs more sensitive to situations they were prepped for or expected and may have influenced my analysis. Ultimately, the interviews with CMs provided useful and meaningful information, however, further investigation with contacts themselves, CMs from multiple teams, and other participants would strengthen the conclusions of this thesis.

CHAPTER 4: Conclusions and Recommendations

Every CM interviewed had experience with contacts who showed COVID-19 quarantine hesitancy. It is likely that throughout the pandemic, this quarantine hesitancy furthered the spread of COVID-19. Although COVID-19 quarantine protocols are winding down, there will continue to be infectious diseases that require quarantine. It is therefore important to understand COVID-19 quarantine hesitancy and the responsible determinants.

This thesis and the insights of from the Corona Corps showed the complexity of COVID-19 quarantine hesitancy and the subtilties that require a thoughtful approach. While the CMs described difficult and tolling calls, they still had a positive outlook on the contact tracing work and saw the difference we made in the community. They also saw room for improvement. The areas they identified as being responsible — such as financial constraints, confusing recommendations, or personal ideologies — should be starting points for future solutions. Targeting one aspect, however, isn't enough. Multi-faceted approaches should be implemented and combined with compassion and openness. The strategies described by the CMs provided a perspective that should be adapted to effectively connect with and support hesitant contacts:

> I always tried to be a good listener to start and reassure them that I wasn't trying to like mandate anything, I wasn't trying to force them into anything. The information I was sharing with them, was based off guidelines that were supposed to protect their health and the community's health… my goal was how can I slow down the conversation, make sure they feel like they're being heard, provide them with the resources, we had to help them if possible? And then reassure them that if they chose to quarantine, they were … doing what was good for them and the community. And hopefully, in the end, they would feel like, like they did the right thing. -CM 11, CM for 14 months, lead for 1 month

COVID-19 quarantine hesitancy arose from very real and valid challenges. In my opinion, given the degree of sacrifice quarantine involved, quarantine hesitancy shouldn't have been something surprising and should have been expected and planned for. Future uses of quarantine need to continue to emphasize listening to the struggles and concerns of contacts, as the Corona Corps CMs did and should be equipped with infrastructure to address fixable barriers. Analysis of CM interviews showed COVID-19 quarantine hesitancy was complex and contacts became hesitant in different ways and for different reasons. During calls CMs tried to be as individualized as possible and this approach should be preserved in future work:

> I think it was really important to like, use the script as a resource, but being able to, like gauge the conversation and kind of go at your own pace, and like, bring up the things that you think are vital to like this specific person … that was something that I really utilized. Or it was just like, trying to make it as individualized as possible. -CM 7, CM for 4 months

Effective public health requires a collaborative relationship between recommenders and those making sacrifices for the good of those around them. Quarantine is no exception. While it can be an overwhelming and challenging ask, it doesn't have to be. Each contact being asked to quarantine deserves to have their individual challenges listened to and addressed in a way that reflects their unique situation.

Appendix 1: Contact Monitor Interview Questions

1) How long have you been working as a contact monitor (if applicable, how long were you a CM, and how long have you been a lead?)

2) Can you tell me a little bit about why you choose to do this job?

3) What has been the best part about this job for you?

4) Can you tell me a bit about the challenges of this job? What has been the most difficult part for you?

5) Could you give me a rough estimate of the percentages of calls you make where the contact ends up being hesitant in some way?

   Probe: For example, someone questioning or pushing back against any of the quarantine recommendations. Or if someone indicates they will straight up not quarantine. Or maybe they are frustrated or concerned about having to stay home. Any calls along those lines.

6) Are there any memorable calls with hesitant contacts that you could describe to me?

7) When you speak with a hesitant contact, what strategies do you use to encourage them to quarantine?

8) Do you notice any common themes in the reasons contacts give for being hesitant?

Probe: Did you notice any trends along gender, age, class, race/ethnicity?

9) Based on your experience as a contact monitor, what factors do you think create quarantine hesitancy among contacts?

10) Based on your experience, how would you define COVID-19 quarantine hesitancy?

11) Thinking back on your time with the Corona Corps, if you had to describe a timeline of quarantine hesitancy throughout the pandemic what would it look like? For example, when has it been highest, have the reasons behind it fluctuated?

12) One goal of my project is to both clearly define what makes up "COVID-19 quarantine hesitancy" and to develop a tool or framework to measure COVID-19 quarantine hesitancy in a community. Do you have any ideas of how you would go about measuring COVID-19 quarantine hesitancy?

13) Do you think COVID-19 quarantine hesitancy impacts the work of the Corona Corps and Lane County Public Health in fighting the pandemic? Why or why not?

14) Is there anything else you want to share about your work as a contact monitor or your thoughts on COVID-19 quarantine hesitancy?

Appendix 2: Summary of COVID-19 Hesitancy Determinants Codes

Category 1: Situational Determinants

Code	Description	Example datum	Explanation of inclusion in Category
Resources and Finances	Discussions of resource-based needs such as groceries, medications, etc, and financial-based needs such as loss of income, rent, and utilities. Applies to issues that might take precedence over completing quarantine.	"Being out of two weeks of work is like pretty financial costly to a lot of families"	Captured influences of key external factors that influenced contact's ability to quarantine. Showed that a contact's individual situation in terms of what resources they have available and their financial situation influence hesitancy.
Multiple Exposures	Discussions of contacts being exposed to COVID-19 and being asked to quarantine multiple times.	"There was like an exhaustion, where a lot of the hesitancy came from like "I quarantined two months ago, Do I really have to do it again?""	The number of exposures a contact had seemed to be a situational characteristic that led to hesitancy in some contacts.
Household Exposures	Discussions of exposure situations where contacts are living with a positive case and have an extended quarantine period.	"Because if they have like an extended period of quarantine the family or like, if the parent has to go back to work, they're like really hesitant on continuingly doing the full like 24 day quarantine instead of the 14 day quarantine."	Captures how complex exposure situations can intensify quarantine for contacts and leads to hesitancy.
Child Exposures	Discussions of situations with children are exposed to COVID-19. Includes discussion of the challenges it creates for parents and families as well as connected opinions.	"we had like a lot of child exposures, like, classes and stuff, it went up again, because parents, I think it was just like an inconvenient situation for them. They were sending their kids to camps and all that, because they couldn't take care of them."	This was a bit of a complicated code mentioned often by CMs. Fits in this category in reference to the complexities child exposures creates in terms of parents might have to take time off work and figure out the logistics.
Exposure Awareness	Discussions of the varying degrees of awareness contacts have of who and how they were exposed. Also refers	" I feel like when we're kind of coming to them saying like this happened and we can't give you any information. That's a big	The form of exposure and whether or not contact was aware created varying situations for contacts

to how well contacts understood what exposure meant.	factor of them being hesitant like if they know about their exposure, it's probably more likely that they'll listen."	and influenced hesitancy. Fits in situational determinants that is outside the control of a contact.

Category 2: Quarantine Comprehension			
Code	**Description**	**Example datum**	**Explanation of inclusion in Category**
Misinformation	Discussion of contacts having inaccurate or differing information. Includes mentions of varying sources such as social media, political sources, care providers or general awareness.	"I would say a lot of the hesitancy was more prominent with people who, what, like were not expecting this call, like, at all, or like had like misinformation about whether, like what is considered a contact"	Misinformation and information can contradict what CMs tell contacts and leads to confusion. Receiving inaccurate information can make it harder for contacts to know what they are supposed to do and can lead to hesitancy.
Confusion/ Changing & Differing recommendations	Discussion of how quarantine recommendations were confusing for contacts to interpret. Includes discussion of how recommendations changed throughout the pandemic and differed between sources.	"The contact received information from like the testing center, from his doctor from a different testing center, from the school. And so he had like four sets of information that were kind of similar but not the same"	When the quarantine guidelines were not clear or there were discrepancies between available recommendations, it was harder for contacts to know what they should do.
Household Exposures	Discussions of exposure situations where contacts are living with a positive case and have an extended quarantine period.	"Because people are like, "Oh, I'm in the same room. I'm in the same house as them, but I'm not the same room. Why do I have to quarantine longer?" or that was a big thing that cause hesitancy like a big, big, big thing was "I'm not going to quarantine for 24 days. I'm not in the same room as them. I shouldn't quarantine for 24 days."	Given the complicated quarantine timelines in household exposures, CMs mentioned increased confusion with household exposures. Contacts both struggled to know what to do in household exposure situations and why the recommendations were longer.
Exposure Awareness	Discussions of the varying degrees of awareness contacts have of who and how they were exposed. Also refers	"People that like, really had a hard time with the semantics of what exposure meant. And we're very convinced that	Fits in this category in terms of understanding what exposure means and understanding the criteria for

	to how well contacts understood what exposure meant.	these like small actions they were making weren't, they would not weren't being considered as exposure"	
Education	Refers to public and individual education regarding COVID-19. Includes discussion of previous understanding of COVID-19 and quarantine as well as education that occurs during CM calls	"I just feel like there was a better way that we could go about kind of sharing information about public health to the public"	The degree and accuracy of education around COVID-19 contacts had influenced their understanding and hesitancy.
COVID-19 Fatigue	Applies to discussion of how contact's perception of quarantine and COVID-19 throughout the pandemic and how for some, willingness to comply declined	"And then there was like an exhaustion, where a lot of the hesitancy came from like "I quarantined two months ago, Do I really have to do it again?" Or whatever it was. And it was like, "how am I not immune to COVID yet,""	Fits in this category in terms of whether contacts understood why they should quarantine. Some CMs discussed how as the pandemic progressed, contacts progressively had a harder time seeing the impacts of public health measures.
Vaccines	Refers to any discussion of how the rollout of vaccines influenced COVID-19 quarantine hesitancy.	"I think also like the vaccine thing, say somebody's got only had one dose, like that hesitancy was a huge thing, because of the misinformation or misunderstanding of how a vaccine works and stuff like that."	CMs discussed how, especially early on implications of vaccines such as vaccination status, changing guidelines created additional confusion for contacts.

Category 3: Personal Determinants

Code	Description	Example datum	Explanation of inclusion in Category
Autonomy	Discussion of the contacts to making their own decisions in terms of quarantine. Includes both discussion of contacts evoking their autonomy and CMs trying to emphasize the important role each individual contact plays.	"so definitely like that group of people who don't believe they should have to quarantine that it's against their personal autonomy"	This code incorporates how both contacts consider the impact of quarantine on their personal autonomy and how the degree to which contacts feel as though quarantine is their own decision influences hesitancy.

COVID-19 Beliefs	Discussion of contact's beliefs and opinions around COVID-19. Includes beliefs about whether COVID-19 is real and or serious as well as opinions about how it should be handled.	"I've had a couple instances where people are just outright not even hesitant, just like completely against it, where they're explaining like that it's a hoax that their family members positive tests wasn't real and therefore, they shouldn't have to quarantine."	Contact's personal ideology and beliefs around COVID-19, which were often influenced how they responded to COVID-19 exposure and quarantine.
Child Exposures	Discussions of situations with children are exposed to COVID-19. Includes discussion of the challenges it creates for parents and families as well as connected opinions.	"And so they can be quite hesitant in saying, "well, if my child is in, if we have data showing that my child is not at as risk as others, then why would I want to run the risk of them not meeting those developmental timelines,"	Experts coded to child exposures in this category apply to how CMs described intensified opinions around their child's exposure — such as privacy issues or necessity.
Lack of Care	Refers to the lack of urgency/seriousness contacts apply to COVID-19 and quarantine. Captures instances of contacts not thinking quarantine is a necessary or useful measure.	"They don't care about their exposure in general and just being like, slightly passive aggressive, kind of like laughing about the work that we do"	Incorporates how individual's perspective on the necessity of quarantine and the whether they see a threat in COVID-19 influences hesitancy.
Inconvenience	Discussions of how contacts viewed quarantine as an inconvenience and an interruption in their lives.	"And so for a lot of people, there's, you know, just this backlash, because realistically, like if you have other responsibilities and priorities, like it's a major hindrance."	Captures the role of how the perceived inconvenience compares to the value of quarantine influences hesitancy.
Trust	Applies to any discussion of the role trust has in influencing quarantine compliance. Includes discussion of trust between contacts and CMs, between the community and government, trust of recommendations and science, ect.	"they would be like, I don't know, like, "I know I'm not like I wasn't exposed, like nobody told me that. Why would I trust you?"	Captures how an individual's trust in the components involved in the quarantine protocols influence protocol.
Exposure Awareness	Discussions of the varying degrees of	"I mean, sometimes people just felt like they	Fits in this category in terms of how each

	awareness contacts have of who and how they were exposed. Also refers to how well contacts understood what exposure meant.	didn't have to, like they were convinced that they weren't actually close contact and like, nothing you say, really matters because I wasn't exposed anyways"	individual had varying levels of acceptance of their exposure notification. Some contacts needed all the details to quarantine, others were satisfied with the general exposure notice.
Fear	Applies to discussions of how fear among contacts influenced quarantine hesitancy. Range of applications including how fear of COVID-19 might decrease hesitancy as well as how fear of the quarantine process increases hesitancy.	" I feel like in the beginning, people might be more likely to quarantine because they were like, kind of scared of it in the beginning,"	Captures of personal emotions and assessments of the COVID-19 and quarantine situations influenced hesitancy.
COVID-19 Fatigue	Applies to discussion of how contact's perception of quarantine and COVID-19 throughout the pandemic and how for some, willingness to comply declined	"Everyone was aware of the overarching circumstances. I think as time lingered as, as we got over the new years, people were, you know, kind of getting tired of pandemic, they were kind of tired of having to quarantine, that's when this hesitancy kind of started."	This code fits in this category as the degree to which COVID-19 fatigue impacted contacts varied between individuals and was often influenced by their preset perspectives.
Vaccines	Refers to any discussion of how the rollout of vaccines influenced COVID-19 quarantine hesitancy.	"once vaccines are rolled out and everything, definitely more people who were frustrated that they had to quarantine even though they are vaccinated and showing symptoms."	Fits into this category as it captures individual reactions to the COVID-19 vaccines and associated implications for quarantine.
Politics	Includes any discussion of the role of politics in quarantine hesitancy. Includes political influences on personal beliefs and reactions to COVID-19 and being asked to quarantine	"So even in like certain areas of Lane County, you'll have people who have different political values than people in Eugene and so I think that definitely influences how you choose to see quarantine and COVID and everything."	Captures how politics is a downstream factor in how an individual construct's their belief system around COVID-19 and how they respond to being asked to quarantine.

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