

Policies during the COVID-19 crisis and health inequities in Rotterdam

Promoting better health for all people in times of crisis



CEPHIR

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CEPHIR is onze academische werkplaats Publieke Gezondheid voor de regio Rotterdam. Bij CEPHIR werkt de afdeling Maatschappelijke Gezondheidszorg van het Erasmus MC samen met gemeente Rotterdam en GGD-en en gemeentes uit de regio. Zij werken aan het onderbouwen van het beleid in de volksgezondheid. CEPHIR staat voor 'Centre for Effective Public Health In the larger Rotterdam area'. cephir@erasmusmc.nl www.cephir.nl



Summary

The COVID-19 crisis is a global pandemic impacting on all aspects of our lives. Lockdown and subsequent mitigation policies have been implemented to combat the crisis at national and local level. Beyond their direct effects on COVID-19 infections, these policies are expected to have large consequences in other domains of health. It is also expected that groups in the population will be impacted differently - resulting in health equity effects - but it remains unknown to which extent, for which health conditions, or which population groups. To address this knowledge gap we brought together COVID-19 policies and evidence available from existing literature. We aimed to identify possible health equity effects of lockdowns and subsequent mitigation policies. Despite uncertainties due to the unprecedented situation, existing knowledge is of importance to inform decision-making.

We scoped local, regional and national policy documents to identify all policy actions taken between March and October 2020 in the city of Rotterdam, the Netherlands. Policies were described in a policy inventory and grouped by the underlying topics. Each topic corresponded to a so-called equity question, which allowed us to move from the policy inventory into the literature search. Policymakers were consulted to check the policy inventory and grouping of policies. Four databases were searched to identify umbrella reviews that could answer the equity questions. If the evidence was insufficient, we also searched for systematic reviews that were published in the context of COVID-19. Equity effects (e.g. different effects by population subgroups) were extracted per equity question for subgroups defined according to characteristics of the PROGRESS-Plus framework: place of residence, race/ethnicity/culture/language, occupation, gender/sex, religion, education, socioeconomic status, social capital, age and disability. We also extracted information on average effects in the population and subgroup risk factors, that allow us to hypothesize how health effects could be unequally distributed. Results were narratively summarized. Policymakers were involved in outlining a dissemination strategy.

We identified 199 lockdown and mitigation policies introduced in the city of Rotterdam across many areas of policymaking: from work and income to education or social services. Ten equity questions were formulated, and seven were searched in literature reviews. The majority of evidence was found for the equity questions on decreased financial stability and job security, limited social contact, and staying or working at home. Evidence suggested that the risk of cardiovascular disease or depression might be differently distributed among individuals that experience work-related stress, social isolation and stress at work and at home, depending on their characteristics as age, gender/sex, socioeconomic status, occupation, and social capital. For the remainder of the equity questions, evidence in published literature was sparse.



This research has shown that lockdown and mitigation policies were introduced in all areas of policymaking. The policy response may have an impact on health inequities, also in the long-term. It is key to bring health into all policy areas and design policies to prevent and reduce health inequities. This strategy can be used to recover from the current crisis, but also to tackle other emerging public health challenges of our times.

Together with policymakers we outlined a dissemination strategy. In addition to the report, we developed an infographic and short clip available in [Dutch](#) and [English](#) to allow for a wide dissemination of the findings.

Our research into COVID-19 policies in Rotterdam

We scoped dozens of policies

implemented between March and October 2020, in the city of Rotterdam. We identified 199 policies and grouped them according to their possible consequences.



We looked into differences

and wanted to know if the health of specific groups of people was more impacted than others. We used the PROGRESS-plus framework to identify characteristics for which differences may occur.



Characteristics

- Place of residence
- Race/ethnicity/culture/language
- Occupation
- Gender/sex
- Age
- Religion
- Socioeconomic status (SES)
- Education
- Social capital

We searched for evidence

and selected literature reviews to understand how policies could have caused unintended harmful effects on health. This systematic approach – from policy to evidence – will help to tailor policies and promote better health among all people.



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Promoting better health for everyone in times of crisis All policies can make the difference

Policies in all domains can have an impact on health, but this impact is not the same for everyone. Some of the policies introduced during the COVID-19 crisis were likely to be harmful for health, while others were implemented to soften the negative harms. We found that lockdown policies might result in unequal effects on health for different groups of people.



Dozens of policies were created in Rotterdam during the COVID-19 crisis

The impact of COVID-19 policies

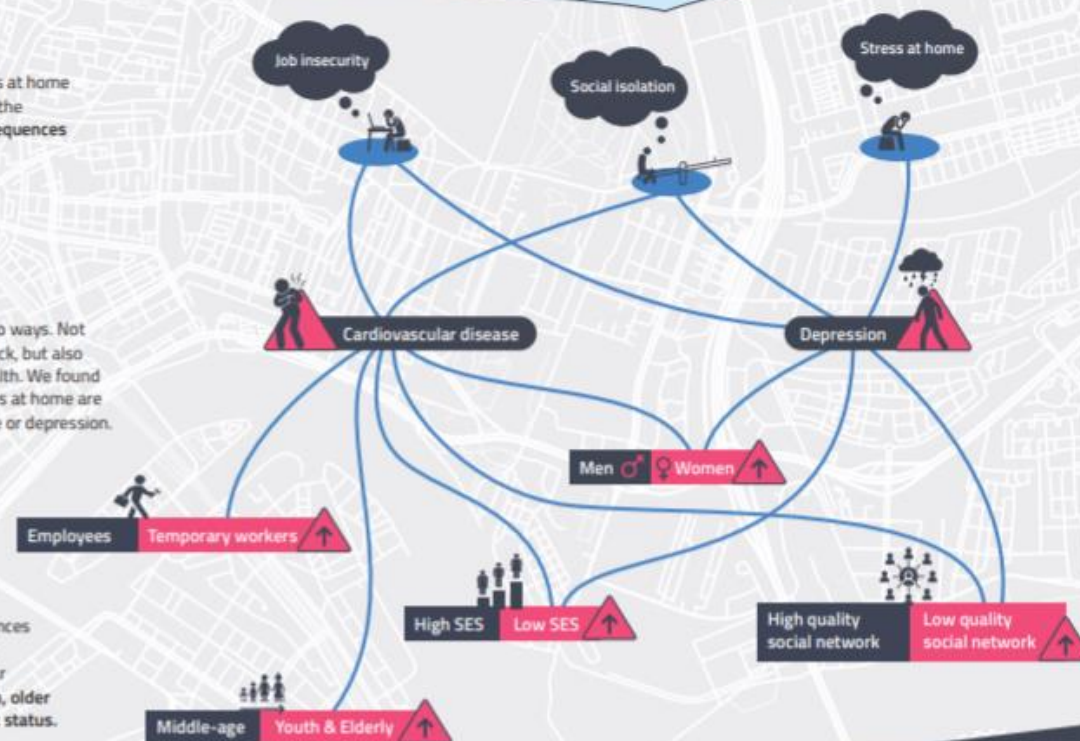
Lockdown policies have limited the number of visitors at home and closed down restaurants and schools to prevent the spread of the virus. This came with unintended consequences as social isolation and worrying about losing jobs.

Adverse effects on health

Health was affected during the COVID-19 crisis in two ways. Not only would an infection with the virus make people sick, but also lockdown policies had negative consequences on health. We found evidence that job insecurity, social isolation and stress at home are associated with higher risks of cardiovascular disease or depression.

Some people are at higher risk

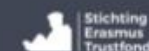
Some people will be more impacted by the consequences of policies than others, depending on several of their characteristics. For example, the risk of cardiovascular disease or depression may differ for men and women, older as compared to younger adults, or by socioeconomic status.



Design by The Online Scientist

Consider the health effects of all policies

The COVID-19 pandemic taught us that all policies have an impact on our health, in positive and negative ways, but not everyone is affected equally. To prevent unfair or avoidable differences, it is key to bring health into all policy areas and to design policies that take into account differences between groups. This strategy can be used to recover from the current crisis, but also to tackle other public health challenges of our times.



Ons onderzoek naar COVID-19 beleid in Rotterdam

We brachten tientallen beleidsmaatregelen in kaart

en vonden 199 beleidsmaatregelen in nationale en lokale documenten die tussen maart en oktober 2020 zijn ingevoerd in Rotterdam. Deze maatregelen hebben we ingedeeld naar mogelijke gevolgen.



We keken naar verschillen

om te kijken of COVID-19 beleid nadeliger uitpakte voor sommige groepen dan voor andere. We gebruikten het PROGRESS-plus raamwerk om kenmerken te identificeren waarvoor verschillen kunnen optreden.



Kenmerken

- | | |
|-----------------------------|---------------------------------|
| Woonplaats | Religie |
| Ras/etniciteit/cultuur/taal | Sociaaleconomische status (SES) |
| Beroep | Opleiding |
| Gender/seks | Sociaal kapitaal |
| Leeftijd | |

We zochten naar bewijs

en selecteerden literatuurstudies om te begrijpen hoe beleid onbedoeld heeft geleid tot schadelijke gevolgen voor de volksgezondheid. Deze systematische aanpak – van beleid naar bewijs – zal helpen dat beleid wordt gemaakt met als doel om een betere gezondheid te bevorderen voor iedereen.



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Het verbeteren van gezondheid in tijden van crisis: beleid kan het verschil maken

Elk beleid kan een impact hebben op de volksgezondheid, maar deze impact is niet altijd voor iedereen gelijk. Sommige beleidsmaatregelen die tijdens de COVID-19 crisis zijn ingevoerd zorgden mogelijk voor een verslechtering in gezondheid. Daartegenover staan beleidsmaatregelen die werden genomen om deze negatieve effecten te verminderen. Uit ons onderzoek blijkt dat het beleid tijdens de coronacrisis kan leiden tot gezondheidsverschillen tussen groepen mensen.

Huisvesting

Jongeren

Onderwijs

Inkomen

Tijdens de coronacrisis zijn er tientallen beleidsmaatregelen genomen in Rotterdam

De impact van het COVID-19 beleid

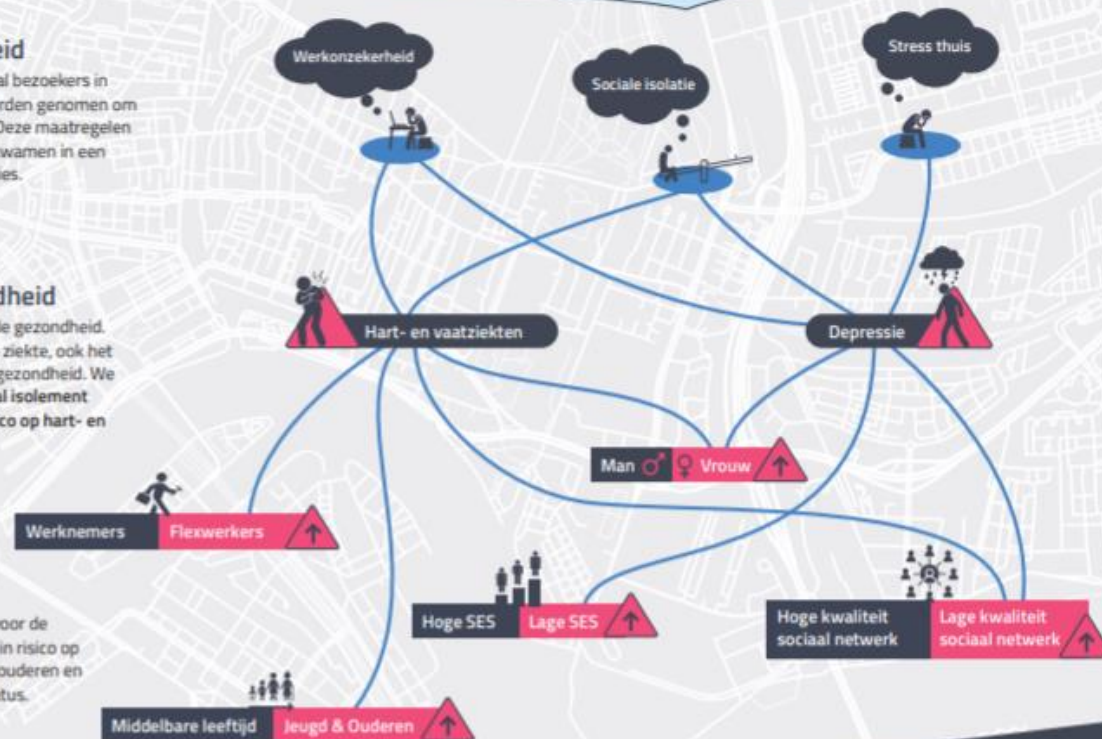
Lockdown-maatregelen, zoals het maximum aantal bezoekers in huis en het sluiten van restaurants en scholen, werden genomen om verdere verspreiding van het virus te voorkomen. Deze maatregelen hadden onbedoelde gevolgen. Sommige mensen kwamen in een sociaal isolement en hadden zorgen over baanverlies.

Nadelige effecten voor de gezondheid

De coronacrisis had op twee manieren impact op de gezondheid. Een infectie met het virus veroorzaakte niet alleen ziekte, ook het lockdown-beleid heeft mogelijk gevolgen voor de gezondheid. We vonden aanwijzingen dat werkonzekerheid, sociaal isolement en stress thuis geassocieerd is met een hoger risico op hart- en vaatziekten of depressie.

Sommigen lopen meer risico

De beleidsmaatregelen hebben grotere gevolgen voor de één dan voor de ander. Zo vonden we een verschil in risico op hart- en vaatziekten tussen mannen en vrouwen, ouderen en jongvolwassenen, en naar sociaaleconomische status.



Ontwerp: The Online Scientist

Overweeg gezondheid in alle beleidsdomeinen

De coronacrisis heeft ons geleerd dat alle beleidsmaatregelen een positieve dan wel negatieve impact hebben op onze gezondheid, maar dat niet iedereen in gelijke mate wordt getroffen. Om oneerlijke of vermijdbare verschillen te voorkomen is het essentieel om gezondheid te integreren in alle beleidsdomeinen en verschillen tussen groepen in acht te nemen. Deze strategie kan worden gebruikt om te herstellen van de huidige crisis, maar ook om andere uitdagingen waar we momenteel voor staan op het gebied van de volksgezondheid aan te pakken.

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Introduction

In March 2020, the city of Rotterdam, much like the rest of the world, was confronted with a major crisis: the rapid spread of the coronavirus 2019 (COVID-19) disease. First identified in Wuhan, China in December 2019, the WHO declared COVID-19 a pandemic on March 11, 2020. In response to the pandemic, governments worldwide adopted various policies aimed at reducing transmission of the virus. While history provides ample examples of epidemic control through the implementation of population-wide measures, the policy response to the COVID-19 crisis is unprecedented in both size and rigour. A notable characteristic of the COVID-19 policy response are a number of so-called “lockdown” measures, such as quarantine and social distancing guidelines, school- and workplace closures. While officially labelled a health crisis, measures to reduce the spread of the virus were taken across all policy domains. As such, policies designed to protect people from contracting the virus, have been shown to have large social and economic consequences.

The impact of these socioeconomic consequences, much like the impact of the disease itself, is not the same for everyone. Rather, it is dependent on the conditions in which people are born, grow, work, live, and age (1). These conditions, known as the social determinants of health, may increase susceptibility to harm or worsen health outcomes. When differences in health outcomes occur as a result of avoidable and unfair differences between different groups of people, we speak of health inequity (2). Throughout the course of the COVID-19 crisis, several researchers have called attention to the ways in which the pandemic contributes to the instigation or widening of such inequities. As the authors of the recently published book *The Unequal Pandemic: COVID-19 and Health Inequalities* (2021) conclude, the pandemic is unequal in three ways: not only has it killed unequally, but from a socioeconomic perspective, it has also been experienced unequally, and will impoverish unequally (3). To adequately address the adverse effects of the pandemic, it is thus imperative to understand the relationship between the COVID-19 policy response and health inequities.

While the socioeconomic impact of the crisis has been felt all across the Netherlands, the equity concerns of the pandemic are perhaps even more pressing in the city of Rotterdam. Before the pandemic, Rotterdam reported the highest percentage of low-income households in the country, and a risk of long-term poverty that was more than twice as high as the national average (4). Moreover, the city is characterized by a large migrant population, as well as an economy in which an ever-growing number of the working population generates an income from flexible jobs (5). As such, the impact of lockdown policies may be especially great among subgroups of the city’s population. Previous research into the impact of the COVID-19 crisis in Rotterdam confirmed that, within weeks of the

implementation of the first lockdown policies, the socioeconomic effects were already observable on an individual level; that citizens felt that the crisis had affected their livelihood; and that fear of unemployment was unequally distributed among the working population (6).

These findings paint an alarming picture of adverse socioeconomic effects of the pandemic, and underpin the importance of identifying which groups have been impacted disproportionately. The policies implemented during the crisis have both created as well as mitigated some of these adverse effects. Yet, previously published reports on the societal impact of the pandemic do not focus on specific policies, but rather discuss the overall impact of the pandemic on the population being studied. Moreover, while these reports highlight the importance of addressing the inequities that may arise as a result of the pandemic, they remain speculative about long-term consequences. Indeed, much of the published work on the COVID-19 crisis consists of opinion pieces and real-time analyses which mainly report on short-term outcomes and effects, or predictions for the future. While these insights are very valuable, more scientific evidence into potential long-term equity effects of the pandemic is needed. This research fills in two important gaps. Firstly, it takes a policy-centred approach, specifically focusing on the city of Rotterdam. Secondly, it follows a systematic approach to identify international evidence on inequities that may have arisen as a result of the policies implemented. This report brings these two aspects together.

1.1 The present study

Objective of the project

The Stichting Erasmus Trustfonds research project *Policies during the COVID-19 crisis and health inequities in Rotterdam* focused on the equity effects of policy interventions implemented during the first period of the COVID-19 crisis in the city of Rotterdam. The project had the objective of identifying, on the one hand, the equity harms that policies might have instigated or exacerbated, and the mitigation strategies that have the potential to counteract these inequities, on the other.

The research project was embedded in the Rotterdam academic centre CEPHIR – a collaboration between the city of Rotterdam, municipal health services and the Erasmus MC – and ran for a period of six months (January-July 2021). Conducted by a team of researchers at the department of Public Health at Erasmus MC, the project partly followed a published framework (7), the authors of which were consulted on various occasions on matters relating to methodology and data interpretation. Moreover, a pragmatic and policy-focused approach was created through consultation with local policy makers working in

different domains at the municipality of Rotterdam. The following report outlines the project's trajectory, methods, and key findings.

Outline of the project

This project is organized in three phases (Figure 1). In the first phase, we scoped local and national policy documents and created a policy inventory. In the second phase, policies in the inventory were grouped into equity questions. Equity questions can be conceptualized as the research questions that allow us to bring dozens of policies into a literature search. To operationalize this search we defined the exposures associated with each equity questions, that were used in the search string. In the third phase, we systematically searched several databases to learn about effects of exposures by subgroups defined according to the PROGRESS-plus domains. We started our literature search by studying umbrella reviews. For the equity questions where limited evidence was found based on these type of studies, we further scoped systematic reviews written in the context of COVID-19. Our results consist of three types of findings. First, we describe how certain PROGRESS-plus characteristics are risk factors to the exposures searched, posing individuals with these characteristics at higher risk of (average) outcomes of such exposures. Second, we report whether differential outcomes of exposures have been shown by PROGRESS-plus subgroups (equity effects)¹. Third, we list mitigation strategies suggested by literature to deal with the exposures studied. This report continues by providing a detailed description of the three project phases, describing the methods and results for each phase separately (section 2 – 4). After outlining the three phases, the report presents a joint discussion of the findings (section 5).

¹ Please note that the first and second type of findings aim at allowing the same conclusions, namely, what are the differential effects of policies on health for different subgroups? However, when the literature did not report these effects directly (equity effects) we extrapolate them from risk factors and average effects, which we consider a second-best type of evidence.

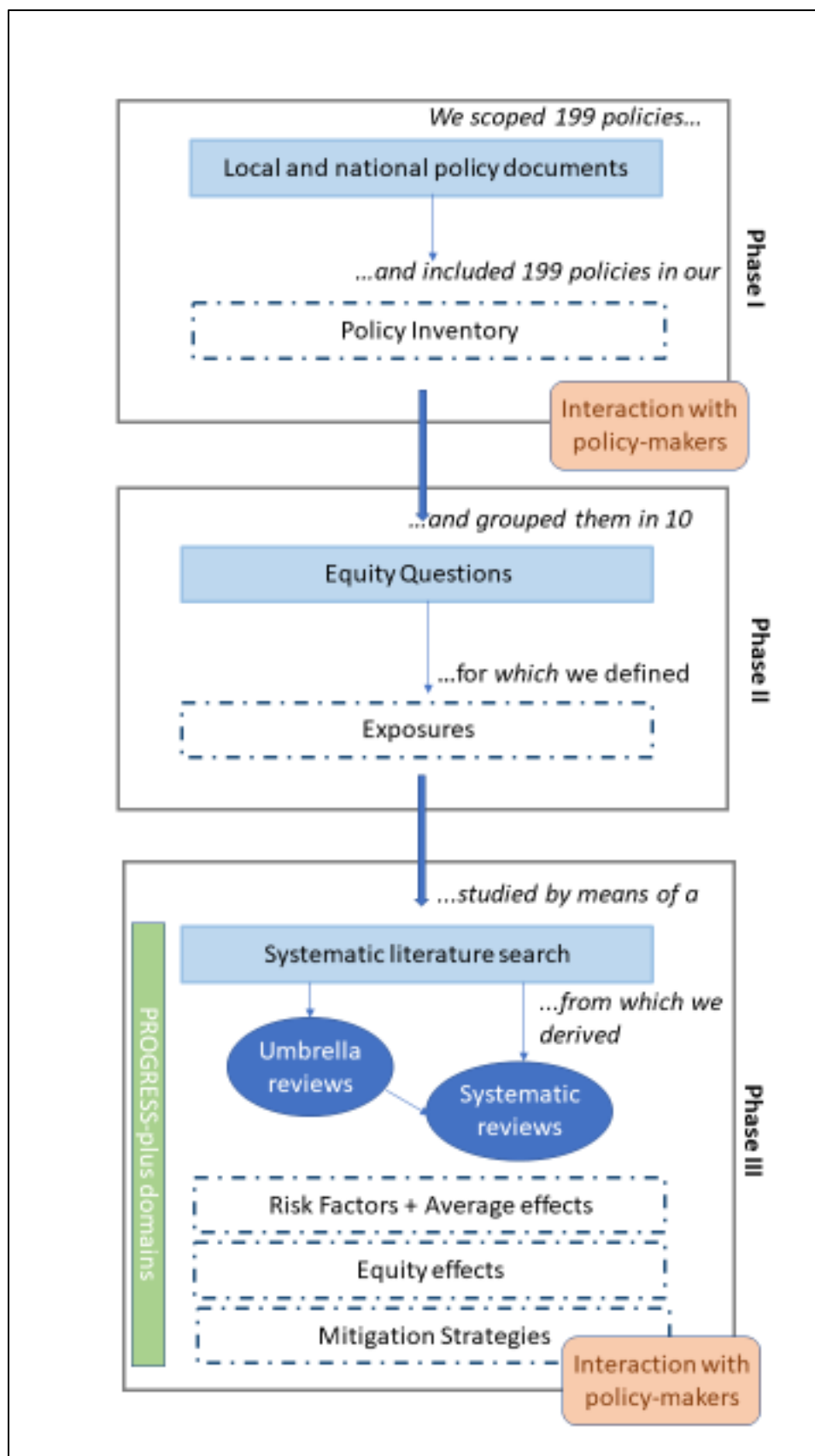


Figure 1. The three phases of this report

2. Phase I - Policy inventory

The first phase of this research project consisted of creating an inventory of policies implemented between March and November 2020 in the city of Rotterdam. The aim of the inventory was to create an overview of policy actions taken in the context of the COVID-19 crisis impacting on the Rotterdam citizens.

2.1 Methods

Policy definition and eligibility criteria

In this inventory, COVID-19 policies are defined as actions taken by governmental actors to address either the spread of COVID-19 or the consequences of situations arising as a result of the COVID-19 crisis. From this definition, it follows that policies were scoped if they were implemented by governmental actors as a direct or indirect response to the COVID-19 crisis. Policies were included if they were implemented by local or regional actors (that is, the municipality of Rotterdam and the Security Region Rotterdam-Rijnmond). In line with this location-specific focus, we scoped policies found in local and regional documents. In the local and regional documents we also identified policies centrally implemented by the national government that impacted Rotterdam. These national-level policies were scoped further in national documents and considered for inclusion. In accordance with certain particularities in legislation in the Netherlands, measures which could not be legally enforced and therefore officially classified as ‘urgent advices’ were included.

Policies which were implemented as a result of a collaboration between governmental and other institutional actors were included, for example NGOs or professional associations. We excluded policies that have no direct impact on the population (e.g., logistics, staffing, and ICT infrastructure), as well as policies relating specifically to animals (e.g., measures for animal asylums). International policies (e.g., travelling abroad) and measures taken by international entities such as the European Union were also excluded.

Information sources and policy identification

The inventory covered the period from March 2020 until November of the same year. To identify relevant policies, the council information database of the municipality of Rotterdam (‘Raadsinformatiesysteem Gemeente Rotterdam’) was searched. Policies were scoped by evaluating all documents coming from the Board of Mayor and Aldermen (the governing body within the municipality) addressed to the city council containing the term ‘COVID-19’ in their title. In addition, the COVID-19 Impression Reports published by the Security Region Rotterdam-Rijnmond were evaluated, as were the Emergency Ordinances (‘Noodverordeningen’) Rotterdam-Rijnmond. Additional information was obtained from national policy documents by searching the ‘Coronavirus timeline’ (published online by the

Dutch national government) and associated documents. National policies scoped included 1. Policies relating to the nationwide ‘emergency package of the economy’; 2. Policies directly related to processes or actions mentioned in local documents such as the specific organization of the education system during the crisis; and 3. Health and safety-related policies such as physical distancing measures, hygienic measures and quarantine regulations.

Data extraction

The inventory was created by one researcher (ESDJ) who independently extracted data according to a pre-specified format (see below). The inventory format was developed in consultation with two additional members of the research team (FJMM, FVL). Robustness of method was verified by one inventory reviewer (FJMM) who conducted the policy-scoping method outlined above based on random 15% samples of policy documents from the searched database. Policies to be excluded were discussed in two group meetings (ESDJ, FJMM, FVL) until agreement on inclusion and exclusion was reached.

The inventory followed a pre-specified format extracting the following information:

- a. Policy: a brief description of the policy.
- b. PROGRESS-plus domain: the domain where we hypothesised that equity effects might occur based on the policy description. Our domains correspond to the Cochrane PROGRESS-plus equity framework (8). This framework, used to identify characteristics that differentiate health opportunities and outcomes, includes the following categories: Place of residence; Race, ethnicity, culture, language; Occupation; Gender/sex; Religion; Education; Socioeconomic status; Social capital, and ‘plus’ categories relevant to the research being undertaken – for this study, the domains Age and Disability were included. See Table 1 for definitions of all domains.
- c. Date of implementation/communication: date when a measure was either implemented (if this date is specified), or communicated in official documentation.
- d. Policy progression: where relevant, the ‘lifespan’ of a policy – how long it was implemented for, whether it was renewed or loosened at some point etc.
- e. Level of implementation: the governing level at which a policy was implemented, whereby national refers to the national government, regional to the Security Region Rotterdam-Rijnmond and local to the municipality of Rotterdam.
- f. Target population: the group(s) at which the policy was aimed.
- g. Comments: an extra column for additional comments (where relevant).

2.2 Results

We reviewed 19 COVID-19 documents addressed to the city council, three COVID-19 Impression Reports from the Rotterdam-Rijnmond security region, and additionally consulted national documents where needed. This resulted in the inclusion of 199 policies. The full policy inventory is available upon request (Appendix A).

Table 1 PROGRESS-plus domains (adapted from Glover et al. and O'Neill et al. (7, 9))

Domain	Definition
Place of residence	Place of residence can refer to a type of dwelling, location of dwelling, or lack of dwelling (people who experience homelessness)
Race, ethnicity, culture, language	This domain refers to racial, ethnic, or cultural background (including language)
Occupation	Occupation may refer to status or type of employment
Gender/sex	This domain refers to biological and gender-based differences
Religion	Religion refers to religious affiliation (or lack thereof)
Education	Education may refer to level of education or educational settings
Socioeconomic status (SES)	SES refers to a measure of one's combined economic and social status
Social capital	Social capital refers to social relationships and networks
Age	While age itself is an unavoidable risk factor for many diseases, certain age groups can be impacted by avoidable differences such as access to services or technology, vulnerability to exploitation, and the impact of termination or suspension of services and activities
Disability	Disability refers to any condition of the body or mind that causes activity limitations or societal participation restrictions

**Policymaker interaction**

During the first phase of our research, we consulted with policymakers at the municipality of Rotterdam with the objective of ensuring all relevant policies were included in the inventory. To compose a varied group of policymakers, we consulted with members of our project's advisory board and contacts at the COVID-19 team at the municipal health service of Rotterdam-Rijnmond.

Eleven policymakers were included in our expert panel. They worked in the policy areas of Work & Income (1), Health and Safety (1), Youth (2), Corona Organisation (2), Education (2), Public Health (1), and the Social Domain (2). Meetings with these policymakers took the form of semi-structured interviews with clusters of three policymakers at most. These interactions had the objective of checking whether the policy inventory was complete. When new policies or materials were brought up by policymakers these were checked for inclusion.

3. Phase II – Equity Questions

In this second phase of the research, policies included in the inventory were grouped into so-called *equity questions*, created with the objective of informing our literature search (phase III of the project). These equity questions refer to the broader underlying topics that policies address, and can be conceptualized as the research questions from which the literature search strategy was built.

3.1 Methods

The policies identified in the inventory were grouped into ten equity questions. These equity questions were created as a way of organizing the 199 individual policies according to broader underlying themes for which a literature search could be conducted. It should be noted that these 199 policies are both ‘lockdown’ policies which have a limiting effect (e.g., closing schools) as well as ‘mitigation’ policies aimed at reducing potential adverse effects (e.g., organizing a summer school program).

Since it would not be efficient to search evidence of equity effects for 199 single policies, and since many policies are expected to have similar impacts (for instance, various policies were aimed at limiting social contact, and could therefore have the same set of consequences), the equity questions functioned as the building blocks of the literature search.

The equity questions were created through group meetings during which three researchers (ESDJ, FJMM, FVL) reviewed all the inventory and reached consensus about attribution of each policy to an equity question. The intuition behind this grouping was the type of exposure that the policy could cause or tackle (e.g., loneliness or job insecurity). For more information on exposures, see Table 2 below.

3.2 Results

The 199 policies were grouped into ten equity questions which are listed and explained below and summarized in Panel 1.

- **The equity effect of having decreased financial stability and work security**

With this question we aim at identifying the equity effects of policies impacting on the professional activities of individuals or businesses insofar as they have financial or employment-related consequences. Emphasis is placed, in the first instance, on the financial instability and employment insecurity or unemployment facing

individuals as a result of forced cancellation or suspension of activities in varying sectors such as retail, the catering industry, and the cultural sector. Following this, special attention is also given to measures taken to support individuals and businesses facing financial hardship, notably the policies that fall under the so-called national emergency package for the economy.

- **The equity effect of limiting meaningful activities, social participation, and social contact**

With this question we aim at identifying the equity effects of policies that impact on people's ability to engage in meaningful activities, participate socially and maintain an (active) social network. Measures relating to social isolation are included here. In addition, measures impacting on opportunities for social interaction and support, such as the suspension or modification of social, leisurely, and sports activities, and the carrying out of voluntary and civil activities, are included. Special attention is paid to subgroups experiencing (forced) social isolation as a result of their age or place of residence (e.g. elderly in nursing homes), and subgroups for whom specific measures and mitigation strategies have been implemented (e.g. children, youth).

- **The equity effect of changing the provision of social services**

With this question we aim at identifying the equity effects arising from policies that impact on the way social services are provided. Social services are understood here as any form of social care or social work provided or facilitated by professional actors such as the municipality or non-governmental organisations. This includes services aimed at supporting specific groups, which were forced to move from an in-person to a (primarily) online format, such as municipal counters or neighbourhood teams. This question also includes changes to processes through which (professional) forms of social support are impacted, for example efforts by institutions to help children and students who have gone 'off the radar' as a result of the suspension of physical education.

- **The equity effect of imposing physical distancing**

With this question we aim at identifying the equity effects of measures aimed at limiting the spread of the virus, such as physical distancing, hygiene etiquette, and the obligation to wear a face mask at specific locations. Included are specific measures targeting subgroups (e.g., window times at supermarkets for elderly).

- **The equity effect of having primary needs met (food, income, shelter)**

This question is concerned with the equity effects of policies that support the primary needs of food, income and shelter. This primarily includes policies related to shelters for homeless persons or asylum seekers, support to the food bank and other (acute) aid initiatives, and welfare assistance.

Note that this question differs from the question on financial stability and work security. That is, this question specifically concerns people who are already understood to be extremely vulnerable due to the circumstances they are in (such as asylum seekers, homeless people, people living in poverty), whereas financial (in)stability or job (in)security may relate to individuals across all levels of socioeconomic status.

- **The equity effect of cancelling or modifying the provision of educational activities**

With this question we aim at identifying the equity effects arising from policies that impact the usual provision of education, namely any suspension or cancellation of educational activities, or a shift to an online environment. These also include policies that impact the decision-making process in education, for example exam cancellations in primary and secondary education, and postponing the issuance of a binding negative study advice (in Dutch: BSA) in higher education. A large number of policies that fall under this question are decided on the national level. Policies related to special forms of education such as integration schooling and residential education (in youth care facilities or juvenile detention centres) are also included.

- **The equity effect of staying or working at home**

With this question we aim at identifying the equity effects arising from the physical act of staying or working at home. These effects are addressed, for instance, in policies relating to working remotely and going into quarantine. These policies have potential implications for (occupational) physical activity, and informal caring tasks, among others. Here, special attention goes to the difference between those who are able to work from home, and those who are not (because they work in vital sectors, for example).

Please note that effects of social isolation or loneliness are discussed in a different equity question.

- **The equity effect of providing information**

With this question we aim at identifying the equity effects of the provision of information by governmental actors, addressed either to the public or organizations. This concerns general information that is being communicated about the measures to control the spread of the virus (e.g., national communication campaigns, Corona Alert app), as well as targeted information for specific subgroups or sectors (e.g., translated leaflets). Special attention is paid to groups which may be understood as being more difficult to reach, for instance because of a language or literacy barrier.

- **The equity effect of changing health services provided by the local authorities**

With this question we aim at identifying the equity effects of changes to regular healthcare provision, specifically the health services that fall under the responsibility of governmental institutions, such as municipal health services (in Dutch: GGD). Examples include the setting up of a “crisis structure mental health care” (in Dutch: GGZ) and suspension of neonatal hearing screenings.

Note that, although extremely relevant in terms of equity, major changes in care delivered in hospitals or through other healthcare providers were not included in our policy inventory, given that these were neither a consequence of a policy nor addressed locally (that is, through interference of local governmental actors).

- **The equity effect of limiting the use of public transportation**

With this question we aim at identifying the equity effects arising from policies related to modes of transport, such as limiting the use of public transportation and issuing a free parking permits for caregivers.

Panel 1 Equity questions

The equity effect of having decreased financial stability and work security

The equity effect of limiting meaningful activities, social participation, and social contact

The equity effect of changing the provision of social services

The equity effect of imposing physical distancing

The equity effect of having primary needs met (food, income, shelter)

The equity effect of cancelling or modifying the provision of educational activities

The equity effect of staying or working at home

The equity effect of providing information*

The equity effect of changing health services provided by the local authorities*

The equity effect of limiting the use of public transportation*

** These policies were excluded from the literature review phase*

Selecting equity questions

Given the short time span of the project, aimed at timely inform policymakers on the major impacts of identified policies on the population of Rotterdam, we made a selection on the equity questions to be studied further. Seven equity questions were included in our literature review (see table 2). Exclusion of three equity questions was based on two reasons. First, the limited number of policies contributing to these equity questions. Second, the lower likelihood of capturing the information about the exposure in the literature search (section 4.1), given unprecedented and very specific type of measures implemented with during the COVID-19 pandemic. Detailed explanations for the exclusion of each equity question are provided in [appendix B](#).

Exposures within equity questions

To use equity questions to inform our literature review strategy, we defined exposures associated with each equity question. An exposure may be defined as a (harmful) state, measure or action that an individual experiences as a consequence of the policies being introduced. Table 2 shows the different exposures included in the search strategy.

Table 2 Exposures considered per equity question

Equity question	Exposure
The equity effect of having decreased financial stability and work security	<ul style="list-style-type: none"> - Financial security/insecurity - Employment/unemployment - Income - Job change
The equity effect of staying or working at home	<ul style="list-style-type: none"> - Working from home - Remote work - Telecommuting - Informal care - Physical activity
The equity effect of limiting meaningful activities, social participation, and social contact	<ul style="list-style-type: none"> - Meaningful activities - Social participation - Social contact - Social support - Social distancing - Social needs - Social behaviour - Loneliness
The equity effect of imposing physical distancing	Physical distancing
The equity effect of changing the provision of social services	<ul style="list-style-type: none"> - Social services - Social care - Social work - Psychosocial work
The equity effect of having primary needs met (food, income, shelter)	<ul style="list-style-type: none"> - Basic needs - Human needs - Food insecurity - Income insecurity - Homelessness - Housing
The equity effect of cancelling or modifying the provision of educational activities	<ul style="list-style-type: none"> - Education - School - Distance learning

The search string included a combination of medical subject headings (MeSH) terms and exploded terms depending on the database searched, allowing to retrieve all references indexed to that term, as well as all references indexed to any narrower term.

4. Phase 3 – Literature review

The primary objective of our literature search was to identify evidence of potential long-term effects as to complement the existing knowledge base, while also accounting for the unique situation the COVID-19 crisis presented. Although our ultimate outcomes of interest relate to health – both physical and psychological effects – we follow Glover et al. and additionally study group/social harms and opportunity costs (see Table 3) (7, 10). These type of effects are studied for their potential to (in)directly lead to differences in the distribution of health in the population.

Table 3 Definition of adverse effects (based on Glover et al. (7), adapted from Lorenc and Oliver (10))

Adverse effect	Definition
Physical health	Direct or indirect harms that accrue across all spheres of physical health
Psychological health	Direct or indirect harms that accrue across the range of mental health areas, including but not limited to depression, anxiety, stress, and psychosis
Group or social	Direct or indirect harms that accrue by targeting social interventions at particular groups or parts of society, thereby worsening the experience of subsets of people within a population
Opportunity cost	The loss of one or more option, course of action, or outcome that is incurred by selecting an alternative one

To achieve our objective of identifying evidence for potential long-term effects, we conducted a research strategy that focused on umbrella reviews. The rationale for this selection was twofold. First, we had to follow an approach that allowed us to generate and synthesize evidence within the limited timespan of our project. The WHO recommends the conduct of so-called ‘rapid reviews’ (a type of knowledge synthesis in which the steps of a regular systematic review are accelerated or streamlined) for producing evidence in such a shortened timeframe (11). Second, by focusing on umbrella reviews - which synthesize the available evidence of multiple systematic reviews - we aim to report findings that have been consolidated through the hierarchy of evidence.

Despite the systematic search, not all research questions were sufficiently answered by umbrella reviews. Therefore, we conducted a second search and extracted information that specifically focused on those equity questions for which little to no evidence was found in the first-stage search. For the second-stage search, we focused on systematic reviews published in the context of COVID-19.

4.1 Methods

Search strategy

The search strategy was created in consultation with the medical librarian from the Erasmus Medical Center Rotterdam. In order to cover medical but also education and social fields of research, various electronic databases were searched: EMBASE, ERIC, Sociological Abstracts, and Web of Science. The search strategy consisted of four parts:

1. a term that referred to the type of reviews (i.e., umbrella in first stage and systematic in second stage) AND
2. exposures (and synonyms, mesh terms thereof) as listed in Table 2 OR
3. terms defining equity or inequalities (e.g., differential effects) OR
4. terms defining equity domains using the PROGRESS-Plus framework (see above).

For the first stage of the review, we searched for any umbrella review published from inception until March 14, 2021. For the second stage of the review, we searched for any systematic review published between 2020 and May 21, 2021 and additionally included the term COVID-19 in their title or abstract. We only reviewed English abstracts. Both search strategies are presented in [appendix C](#).

Study selection and inclusion criteria

We sorted the identified records for each stage in separate Endnote files. Records were reviewed and screened by one researcher (ESDJ) in consultation with two additional researchers (FJMM, FVL). After screening titles and abstracts, one researcher (ESDJ) screened the full-text of articles considered for inclusion. Articles were included if all the four criteria below were met:

- covered the exposures within the scope of our equity questions (those defined in Table 2 or synonyms thereof), and presented information about adverse effects (those defined in Table 3) or mitigation strategies (e.g. interventions or programs targeted at the exposure of interest².)
- reported on high-income countries. Articles focusing on low- and middle income countries only were excluded;
- study design corresponded to umbrella (first search) or systematic (second search) review;

² Please note that we primarily scoped evidence on (inequitable) health outcomes related to our identified exposures. If included articles also reported on mitigation strategies for the same exposures, these were also included; for place-based interventions targeting health promotion that might have been disrupted by the pandemic, e.g., interventions in the school- or work environment aimed at tackling substance-use or improving sexual health, inclusion or exclusion was based on an abstract assessment of relevance, which was verified and agreed among two researchers.

- full-article was available in English.

Data extraction

For the studies included, one researcher (ESDJ) extracted data using a standardized data extraction form. A second reviewer (FJMM or FVL) verified the extracted data by way of a 20% sample. Any discrepancies were resolved after discussion.

Data extraction included:

- a. Publication details
 - (1) the first author's name
 - (2) publication year
 - (3) access information (URL or doi)
 - (4) study design
 - (5) inclusion criteria
 - (6) number of reviews included
 - (7) number of studies included
 - (8) quality assessment
- b. Equity question(s) addressed in the review;
- c. Exposure(s) retrieved;
- d. PROGRESS-plus domains (see Table 1.);
- e. Category of outcome: Physical (PH), Psychological (PS), Group/Social (GS), Opportunity Cost (OC) (see Table 3).
- f. Results related to exposures, presented according to our framework to identify equity effects (more details below)
 - risk factors (groups at higher risk of experiencing an exposure)
 - average effects (outcomes of the exposure that apply to the general population, or the entire population under study)
 - equity effects (outcomes of the exposure differentiated by group)
 - potential mitigation strategies on the exposures.

Tables with the extracted results are presented in [appendix D](#), per umbrella/systematic review. For each review, evidence is presented in three different tables, by the type of evidence found (risk factors, average effects, equity effects). Columns in each table classify the PROGRESS-plus domain, category of outcome and describe the study results, divided into a column of effects and a column of mitigation strategies.

Framework for identifying equity effects

For each exposure, we identified different types of results. Where available, we reported evidence on outcomes of an exposure differentiated by group, the so-called *equity effects*. However, when no evidence of equity effects was available, we reported evidence on

PROGRESS-plus domains which were identified as *risk factors* to an exposure, in combination with health outcomes identified as a consequence of this exposure for the general population, known as *average effects*. In this case, we inferred that differential outcomes would result from evidence that a particular exposure leads to certain health effect, combined with evidence of who is at higher risk of experiencing that same exposure. Findings obtained through this combination of information form a less robust type of evidence in comparison to evidence obtained directly from the literature on equity effects. Nevertheless, in the current context of limited knowledge, it holds significance for the purpose of our study.

4.2 Results

The first stage of the search on umbrella reviews yielded 429 results. After deduplication, 324 remained. After scanning title and abstract, 33 articles were included for a full-text review. Of these, one article was excluded for not being available in English, five were excluded because they were not umbrella reviews, and a further eight reviews were excluded because they could not provide information on exposures within the scope of our equity questions. The results of the remaining 19 articles were extracted and summarized. These included information mostly for four of the seven equity questions: the equity effect of having decreased financial stability and work security; the equity effect of limiting meaningful activities, social participation and social contact; the equity effect of imposing physical distancing; and the equity effect of staying/working at home.

For the second stage of the search, 356 references were identified, of which 13 systematic reviews were included for a full-text review after title and abstract screening. Results were extracted from eight of these systematic researches, that covered the three equity questions for which little evidence was previously retrieved: the equity effect of cancelling or modifying the provision of educational activities; the equity effect of changing the provision of social services; and the equity effect of having primary needs met (food, income, shelter). Figure 2 present the study selection for the output of literature searches on umbrella and systematic reviews.

The following sections present a narrative summary of the results per equity question. Each summary is structured as follows: a brief introduction of the exposures identified in the literature, followed by an overview of risk factors, average effects, equity effects, and mitigation strategies per exposure. For the equity questions for which the most evidence was identified, the most important results have also been summarized in a table, namely the equity effects, and average effects for which one or more risk factors are identified.

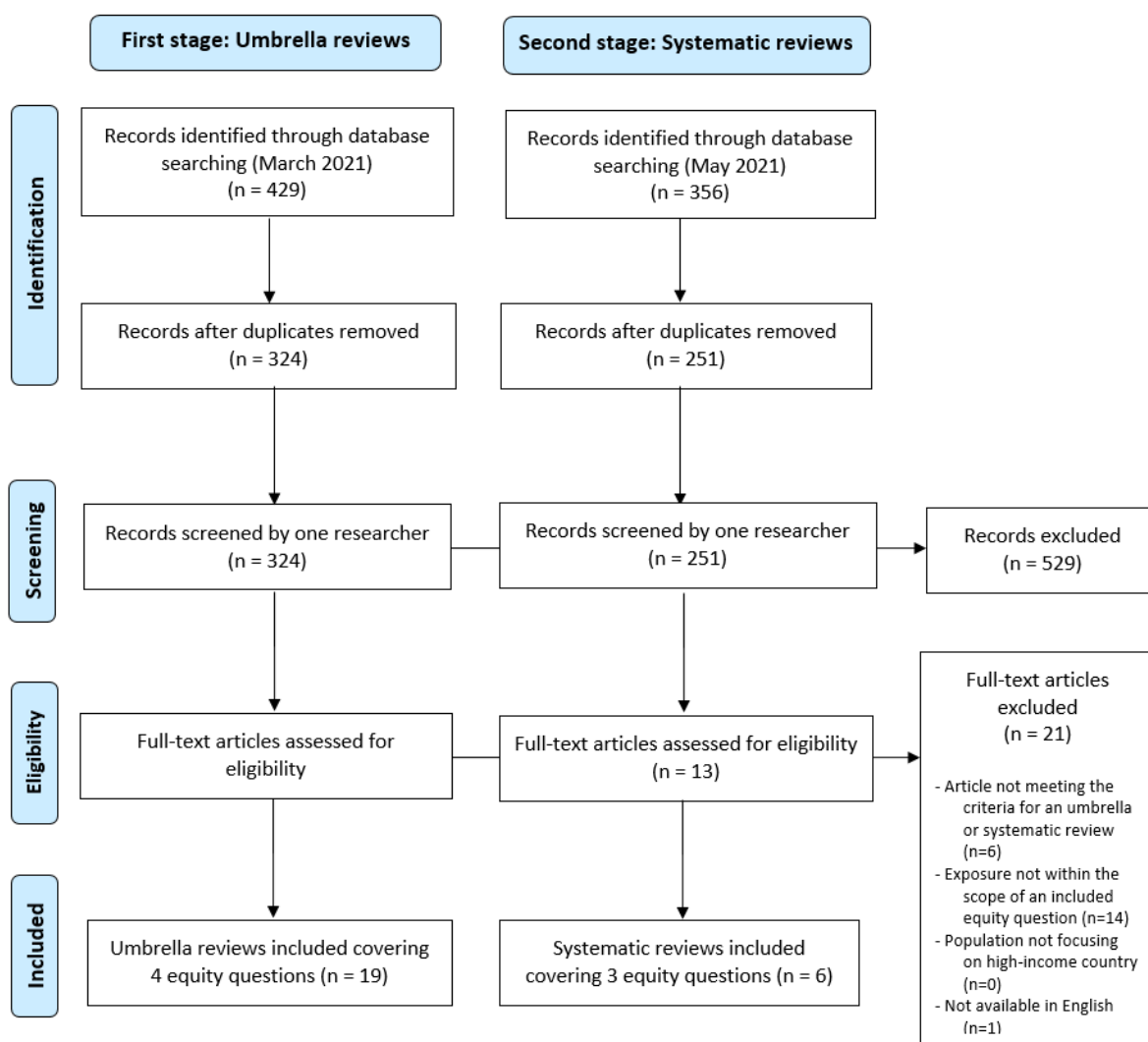


Figure 2: Flow diagram

4.2.1 Summary of results for equity questions only scoped in umbrella reviews

This section presents the findings from the first literature search for the four equity questions for which most evidence was found. As the evidence base for these questions was higher than for the remaining ones, information for these questions was not retrieved from the second literature search. After reviewing the evidence from the first search we identified that literature treated physical distancing primarily in a social context, probably due to the limited past situations in which physical distancing was imposed as during the COVID-19 pandemic. Therefore, the equity question on physical distancing was brought under the question regarding limiting social contact.

4.2.1.1. The equity effect of having decreased financial stability and work security

The COVID-19 crisis has impacted on the financial stability and work security of many, especially those working in sectors which have been forced to suspend or cancel their activities altogether. In our literature search, we identified two umbrella reviews which present evidence on the effects of the following exposures associated with decreased financial stability and work security: *precarious work, job insecurity, work-related stress* and *unemployment*. One review by Naik et al. reports on the effects of unemployment, precarious work and job insecurity on several health outcomes (12). A review by Fishta et al. focuses on the effects of work-related stress – including job insecurity – on cardiovascular disease (13). The authors measure work-related stress exposure according to demand control or job strain, and effort reward imbalance.

Risk factors

Findings from Naik et al. report that gender is a risk factor for precarious work and job insecurity, with women being more vulnerable to these exposures (12). Moreover, gender was also found to be a risk factor for work-related stress. Fishta et al. report that women are more likely to have low levels of control over their work and are more likely to hold high-strain jobs – thus being at higher risk of exposure to work-related stress (13). Besides gender, Fishta et al. found other risk factors for work-related stress to be socioeconomic status (social class acts as a modifier of the negative effects of work-related stress and cardiovascular disease), and occupation (high perceived stress is seen in specific professions such as nurses or teachers, as well as in specific groups of workers in precarious employment situations such as temporary or leased workers) (13). According to the authors, younger age is an important risk factor in relation to the length of exposure to work stress, since younger employees often perceive stressors as more uncontrollable (13).

Umbrella reviews scoped did not report on risk factors for unemployment.

Average effects

Work-related stress, including job insecurity, is identified as an important social determinant of cardiovascular diseases and mortality in the working-age population (13). Evidence shows that work-related stress has an impact on cardiovascular re-events (e.g., after myocardial ischemia) or on the prognosis of other cardiovascular diseases.

Evidence of the average effects of unemployment on health was reported in the umbrella review by Naik et al. (12). The authors found evidence for unemployment being related to several worse health outcomes including suicide – although further outcomes were not specified.

Equity effects

Regarding precarious work, job insecurity, and work-related stress, several equity effects were identified. Naik et al. found that precarious work creates gendered patterns of health inequalities (12). Furthermore, Fishta et al. reported that the association between job stress and increased risk of cardiovascular outcomes was consistent among men (13). Due to lack of studies that included women or conducted subgroup analysis, less consistent findings were found among women (13).

Besides the equity effects identified above, Naik et al. reported on several equity effects related to “economic crisis” (12). Although not traditionally understood as an exposure but rather as a macroeconomic factor, the authors’ definition of economic crisis includes aspects related to unemployment which are relevant to the COVID-19 crisis such as population level employment or Gross Domestic Product changes (12). As such, the equity effects related to economic crisis are reported here. The authors found that in the case of such a crisis, migrants were most likely to experience adverse outcomes related to higher exposure to infectious diseases and associated rises in mortality. Moreover, they report a possible widening of health inequalities as a result of alcohol-related harm, which may lead to unemployment and substance use among migrants. The authors found conflicting evidence of the differential impacts of age and gender on health inequities in the case of economic crisis, but conclude that income appears to be a key mediating factor (12).

Umbrella reviews scoped did not report on equity effects for the exposure unemployment.

Overview of differential outcomes

Table 4 provides an overview of the expected evidence for differential outcomes.

Table 4 Financial stability: overview of expected differential outcomes

Equity question	Decreased financial stability and work security		
Exposures	Work-related stress and job insecurity		
Domains	Age	SES	Occupation
Subgroups	Young employees	Low	Specific occupations (e.g. nurses, teachers) and precarious employment situations
Outcomes	Cardiovascular disease (re-events and prognosis)		
	Mortality		
	Poor health behaviours		

All conclusions have been deduced from the combination of information on risk factors and average effects.

Mitigation strategies

In terms of mitigation strategies for reducing work-related stress, Fishta et al. found limited evidence for the effectiveness of workplace interventions aimed at increasing decision-making latitude or limiting psychological demands (e.g., reducing time pressure) (13). The authors report that a reduction of the overall working time shows favorable changes in mediators relevant to the cardiovascular system, such as blood pressure. No strategies were listed for mitigating the adverse effects of precarious work.

Regarding strategies for addressing the adverse effects of unemployment, Naik et al. report that generous unemployment insurance mitigates the negative impacts of unemployment, and report on an active labor market program as a potential mitigator of the impact of unemployment on suicide (12).

4.2.1.2. The equity effect of limiting meaningful activities, social participation, social contact and physical distancing

As noted above, the identified literature for physical distancing treated it in a social context. As such, the two equity questions on limiting social contact and physical distancing have been merged and will be discussed as one in the following section.

Many lockdown measures taken to reduce the spread of COVID-19 have impacted on people's ability to engage in meaningful activities, participate socially and maintain an (active) social network. These social limitations may amplify the objective state of social isolation as well as increase the chance of people experiencing the subjective state of loneliness, particularly among certain subgroups. Moreover, limitations regarding social participation may also have an impact on a community- or network level, thus impacting on social networks/cohesion. Lastly, limiting social contact might have implications for the use of mobile technologies and social media.

In the literature, we identified nine umbrella reviews that evaluated the effects of the following exposures: *loneliness*, *social isolation* and *social networks/cohesion*, and *mobile technologies and social media*. Three reviews specifically focused on loneliness, two looked at the effects of loneliness as well as social isolation, and one identified the effects of loneliness, social isolation, and living alone - grouped together under the umbrella term *social connection*. In addition, we identified one umbrella review focusing on the effects of neighborhood community life (defined as the whole range of social relationships playing out in a particular geographical area), and one investigating social networks/cohesion. Lastly, one umbrella review zoomed in on the effects of mobile technologies and social media among adolescents.

Risk factors

Two umbrella reviews reported on risk factors for loneliness (14, 15), synthesizing evidence from 14 and 7 systematic reviews, respectively. Risk factors identified by Solmi et al. are age (youth and elderly are at higher risk of loneliness), social capital (quality of social network is more strongly correlated with loneliness), socioeconomic status (low socioeconomic status is associated with higher loneliness), and sex (female sex is associated with higher loneliness) (14). The review by Veronese et al. identified social capital as a risk factor for loneliness, indicating that difficulties in relation to social integration are likely to increase loneliness (15).

Arias de-la Torre et al. identified gender as a risk factor for intensive use of mobile technologies and social media among adolescents: according to the authors, special attention should go to young women (16).

No evidence on risk factors for social isolation or social networks/cohesion was reported in the umbrella reviews scoped.

Average effects

One umbrella review by Leigh-Hunt et al. presents strong evidence that both social isolation and loneliness are associated with increased all-cause mortality, and social isolation is also associated with cardiovascular disease and depression (17). Another review focusing on loneliness finds associations with a range of physical and mental health outcomes (14). Moreover, one review demonstrates that a lack of social connection leads to poorer health outcomes, both physical and mental (18).

One umbrella review by Ehsan et al. found consistent evidence that social networks/cohesion are linked to better health outcomes. For example, social networks/cohesion can be a protective factor against cardiovascular diseases, diabetes, and cancer, and it can also be positively linked to a range of mental health outcomes (19). The effects, however, vary according to subgroups and contexts (more details under equity effects). The same authors report that on average, higher levels of social participation and civic participation predict lower mortality rates (19). Another umbrella review by Pérez et al. found that social capital, just like social cohesion, social environment, community participation, and social support, has a positive effect on a range of physical and mental health outcomes including healthy weight, depression, physical activity, perceived health and healthy behaviors (20).

One umbrella review by Arias-de la Torre et al. reported a relationship between the use of mobile technologies and social media and the development of depressive symptoms among adolescents, due to excessive personal involvement and social comparison (16).

Equity effects

Three reviews found differential outcomes for the exposures loneliness and social isolation by age: social isolation and loneliness in children are associated with abuse and poorer developmental and educational outcomes (17), and loneliness is associated with a higher rate of suicide attempts among older people (14). Morina et al., moreover, found negative physical and mental health outcomes for loneliness, social isolation, and living alone in children and adolescents, as well as older adults (18). Further differential outcomes regarding these exposures were observed according to gender. Morina et al. reported an association between a lack of social connection and coronary heart disease, stroke and frailty in older male but not older female adults (18).

Ehsan et al. reported a more pronounced positive relationship between social networks/cohesion and positive health outcomes for low socioeconomic status and minority groups (19). This relationship can be conceptualized as a 'buffer effect', based on 'bonding social capital' – social resources that an individual can get through close networks or groups with similar socio-demographic characteristics. However, ineffective coping networks or increased health-risk behavior in support networks may cause negative variations in otherwise overall positive health outcomes related to social networks/cohesion. Another review by Pérez et al. reports that the positive effects of social capital, social cohesion, social environment, community participation and social support on physical and mental health outcomes were found particularly in older adults and children (20).

No relevant equity effects were identified regarding the exposure mobile technologies and social media among adolescents.

Overview of differential outcomes

Table 5 Social contact: overview of expected differential outcomes

Equity question	Limiting meaningful activities, social participation, social contact and physical distancing				
Exposures	Loneliness and social isolation			Social connection	
Domains	Age	SES	Social capital	Gender/sex	
Subgroups	Children Youth Elderly	Low	Low quality social network	Female	Older males*
Outcomes	All-cause mortality Depression Cardiovascular disease			Coronary heart disease* Stroke* Frailty*	

* Conclusions taken directly from equity effects identified in the literature. Other conclusions have been deduced from risk factors and average effects.

Mitigation strategies

In terms of mitigation strategies, social cognition interventions (targeting cognitive processes in social interaction) appear to be most effective in addressing loneliness for older persons, and potential was also found in e-interventions (21). According to one umbrella review by Chipps et al., internet-supported communication shows a significant reduction in loneliness, though this is mediated by self-efficacy and frequency of use (22). Moreover, as the evidence from the review by Jarvis et al. indicates, the digital divide – defined as the skills, capacity and access to digital technology – needs consideration in planning future interventions, especially for lower resource settings (e.g., low income or low education) (21). Additional consideration, the same authors argue, has to be paid to differences in gender, age, economic status, geographical location, cultural practices, and educational qualification of the users of digital technologies. Notwithstanding the challenges reported above, a recent umbrella review, conducted in the context of COVID-19, questions the effectiveness of technological interventions for reducing loneliness in older adults (15). This review found meditation, mindfulness, social cognitive training and social support to be statistically significant for reducing loneliness among the general population.

For mobile technologies and social media use among adolescents, Arias de-la Torre et al. found that, when adapted, mobile technologies and social media themselves could promote healthy behaviors, improve social support and become a point of help and information for adolescents at risk of depression (16).

Umbrella reviews scoped did no report on mitigation strategies for the exposure social networks/cohesion.

4.2.1.3 The equity effect of staying/working at home

One of the defining features of the lockdown was staying and working from home – the latter applying only to those people who could conduct their work remotely. In our search strategy, we included exposures directly related to this shift in working remotely, but also exposures which may indirectly relate to working and being at home: physical activity and informal care. In our first literature search, we identified six umbrella reviews that reported on the following exposures related to being or working at home (and, as a consequence, not at the office): *internal housing conditions, workplace social support, job control, control at home, and occupational physical activity*.

Risk factors

For the exposures internal housing conditions, job control and control at home and occupational physical activity, no risk factors were identified in the literature.

One umbrella review by Wagner et al. highlights social capital as a risk factor for workplace social support (23). Their review found evidence that problematic relationships at work can result in withdrawal behaviors, poor team performance, absenteeism and turnover intention.

Average Effects

No average effects were reported for the exposures internal housing conditions, workplace social support, and control at home.

In their umbrella review of job demand and control interventions, Williams-Whitt et al. found moderate evidence that increased job control (including changes in job demands and increased employee participation) reduces sick leave and absenteeism among workers (24). Moreover, they report that the overall level of evidence regarding the effects of increased job control on work performance is moderate and positive (24).

Regarding occupational physical activity, one review by Cillekens et al. reports that engaging in high levels of occupational physical activity showed beneficial health effects for stroke, coronary heart disease, multiple cancer outcomes, and mental health, when compared to engaging in low levels of occupational physical activity (25). In contrast, high levels of occupational physical activity showed unfavorable health outcomes regarding mental ill health, osteoarthritis and sleep duration and/or quality (25).

Equity effects

No equity effects were reported for the exposures internal housing conditions and workplace social support.

In one umbrella review on work-related stress, the authors found differential outcomes according to gender. They report evidence that the exposure low control at home predicts coronary heart disease among women but not among men (13). The combination of stress at home and at work predicts perceived symptoms of coronary heart disease among women (13).

In their umbrella review, Cillekens et al. report that high occupational physical activity was associated with higher risk of all-cause mortality in men as compared to low occupational physical activity (25). In contrast, a non-significant reduced risk in mortality was observed in women (25).

Overview of differential outcomes

Table 6 Working and staying at home: overview of expected differential outcomes

Equity question	Staying and working at home	
Exposures	Stress at home and work	Occupational physical activity
Domains	Gender/sex	
Subgroups	Women*	Men*
Outcomes	Coronary heart disease* Cardiovascular disease*	All-cause mortality*

* Conclusions taken directly from equity effects identified in the literature.

Mitigation strategies

Regarding the exposure internal housing conditions of low-income groups, Gibson et al. reports that there is strong evidence that improvements in warmth and energy efficiency have positive impacts on the health of low-income groups (26). This is the case particularly where the interventions are targeted at the elderly or people with existing health conditions (26).

For the exposure workplace social support, Wagner et al. found limited evidence that interventions intended to promote employee health and well-being had a positive effect on employee's mental health outcomes (23). They found strong evidence for the positive effects of providing work supervisors with mental health promotion education, and reported with moderate level of evidence that programs to improve the quality of supervisory practice positively affect worker injuries and illnesses (23).

Fishta et al. found evidence for a mitigation strategy regarding the observed gendered outcomes of low control at home in combination with work-related stress (13). As the authors report, using methods to examine psychosocial stress in women early in the onset of coronary heart disease is crucial (13).

Regarding job demand and control interventions, Williams-Whitt et al. found that organizationally focused systems approaches to reduce job stress have favorable impacts at both the individual and organizational level (24).

For the exposure occupational physical activity, no mitigation strategies were identified.

4.2.2. Summary of results for equity questions scoped in umbrella reviews and systematic reviews

The following sections present summaries for the three equity questions for which little evidence was found in the umbrella review search. As a result, we conducted an additional search for systematic reviews written in the context of COVID-19. For the question on educational activities, this second search yielded a substantial amount of new evidence. For the remaining two equity questions, the evidence base remained limited. The summaries below report findings from both searches.

4.2.2.1. The equity effect of cancelling or modifying the provision of educational activities

The COVID-19 crisis was accompanied by a closure of schools across all levels of education. Educational activities were either cancelled, suspended or moved to an online format. The effects of this modification of educational activities has impacted all students and educational staff, and a literature search was conducted to evaluate if the change to online education is likely to have caused differential outcomes.

In our first umbrella review literature search, no articles were identified that related specifically to school closures or drastic changes in the format on educational activities. Instead, the evidence found in this first literature search focused on exposures related to the physical school environment. Since COVID-19 caused a disruption to this physical school environment, we report on effects of 'indirect' exposures – *school-based interventions*, *school-based (health) services* and *physical school environment* – that are likely to have been disrupted. These exposures were discussed in three umbrella reviews (27-29). In our second search on systematic reviews specific for COVID-19, we identified five systematic reviews that report evidence related directly to the cancellation or modification of educational activities (30-34). The health effects as well as opportunity costs of the exposures *online distance education* and *school closures* are discussed below.

Since different types of evidence were found in the two searches, the results are separated in the summary below.

First literature search – Umbrella reviews

Risk factors

No evidence for risk factors was found in the identified literature.

Average effects

In their umbrella review on health promotion in the school environment, Shackleton et al. found a number of positive health outcomes associated with school-based health services, such as improvements in students' sexual health and, for girls, increased odds of using hormonal contraceptives and getting screened for sexually transmitted diseases (27). Moreover, the authors report several effects of the physical school environment: schools which are more successful in engaging students have lower rates of group fighting, as well as smoking, alcohol consumption, and drug use (27). Lower rates of student violence were associated with physical environments that were not disorderly, and schools with strong student participation and a sense of community had decreased levels of smoking (27). Regarding substance use, the authors report strong evidence of the positive effects of school ethos and the importance of social relationships and student engagement on substance use prevention (27). Changes to schools' physical environment, the authors note, may influence substance use within but not outside of schools (27).

Equity effects

One finding by Shackleton et al. concerned differential outcomes according to gender/sex (27). Female students at schools with school-based health centers were more likely to have used emergency contraception at last sex, while access to school-based health centers did not influence the receipt of reproductive health care for boys (27).

Mitigation strategies

One review by Macintyre et al. on socioeconomic inequalities and population-level interventions for adolescent health found that environmental intervention in schools – this concerns interventions delivered in the school setting – is more likely to address inequalities compared to education-based strategies (29).

Another review by Craike et al. on physical activity interventions, found that particularly those interventions that were school-based and multicomponent were likely to be effective in improving physical activity among children: the authors report evidence for the effectiveness of comprehensive interventions that included school policies, and government policies targeting children in school settings (28). Common elements of successful policy-focused interventions included enhancements to physical education, additional physical activity opportunities, school self-assessments, and education about physical activity (28).

Second literature search – Systematic reviews on COVID-19

Risk factors

For the exposure school closures, no risk factors were identified in the literature.

The review by Melissa Bond highlights the PROGRESS-plus domains socioeconomic status, disability, education, and age as risk factors for the exposure online distance education (30). As the author notes, the following subgroups are most likely to suffer the impacts of online distance education: students from lower income families, students with special needs, academically at-risk students, and primary-school aged students – the latter two requiring greater self-direction when learning remotely (30). In addition, Bond identifies poor internet connectivity, lack of internet quota to cover the whole family, and general technical issues as factors potentially impacting on the ability of students to participate in online distance education; these factors may be attributed to the domains socioeconomic status or place of residence (30).

Average effects

Regarding average effects of school closures, one systematic review by Chiesa et al. notes that children miss out on public policies taking place in schools, such as balanced and free food programs, guidance about personal hygiene, physical activity and citizenship initiatives (31). The authors also report evidence that school closures were associated with a loss in learning and education, though no further specificity was given.

Another review on online distance education by Abu Talib et al. reports evidence that the forced and rapid transition to online learning affected mental health among students in higher education (32). Many students experienced stress or anxieties related to the lockdown about financial stability and socializing that indirectly affected their performance. Moreover, the authors note how lack of face-to-face social interaction for extended periods of time can have a detrimental effect on mental health. According to one study, student engagement was sometimes lacking due to factors such as reliance on recorded lectures, a lack of motivation or interest, stress and boredom, as well as the distraction caused by using electronic devices (32). The authors also note the impact of online distance education on academic staff, who in some cases had to deal with an increased or even doubled workload. A similar finding was reported in the systematic review by Bond, which notes that, as a result of online distance education, teachers have been working extraordinarily long hours, which is associated with declined teacher well-being (30). Moreover, her review shows mixed results regarding online distance education for students: some students experience reduced anxiety and improved self-esteem as a result of less school-related stress, while others exhibit increased opposition, emotional outbursts and sleep issues, which all impacted on their learning (30).

Equity effects

Regarding equity effects of school closures, Chiesa et al. report a differential outcome related to occupation: school closures are associated with wider social impact and economic harm on working parents, health workers and other key workers being forced from work to care for children at home (31).

Furthermore, Abu Talib et al. note how socioeconomic status is a factor for differential effects related to the exposure of online education: there is a gap in student access to online distance education, which is usually related to family income (32). Transitioning to online learning, the authors argue, exacerbates differences between privileged and underprivileged students. Bond notes further differential effects related to socioeconomic status: parents in the lowest-income group spent slightly more time providing support than those in higher income group for primary school children; a number of studies reported that a large amount of students were spending less than two hours a day studying, with students from lower socio-economic backgrounds less likely to be completing and returning work (30). Moreover, Bond also reports differential effects by age: as primary school children were particularly in need of technical guidance, this placed further stress on family life (30). A review by Viner et al. highlights the importance of making exceptions to school closures for people in 'vital' occupations: according to the authors, healthcare workers experience substantial personal dilemmas in balancing work and family commitments, particularly relating to childcare needs if schools are closed and childcare services are unavailable (33).

Mitigation strategies

The identified systematic reviews discussed several mitigation strategies to address the adverse effects of school closures and online distance education. In their review, Abu Talib et al. argue that boosting and maintaining motivation of students may improve morale and help combat any lockdown-induced stress or anxiety (32). Moreover, the authors note that underequipped students have to be provided with the equipment necessary to partake in online activities, such as electronic devices and stable internet connection (32).

The review by Bond highlights the importance of addressing the so-called digital divide, with several studies recommending the provision of further funding for equipment and professional development for educational staff (30). Moreover, the author reports that widening funding to a variety of children's services, might enable these services to better work together and provide children with the best possible online distance education (30). Several studies included in Bond's review suggest that further funding should be made available by governments towards establishing online educational resources, to ease the burden on schools and teachers (30). Hereby, special attention should go to disadvantaged students, as several studies emphasized. Practical suggestions for schools for helping make online distance education more equitable included providing books with food deliveries to

students; having a printed pack with all learning materials delivered each week, as well as stationery, and providing social stories such as picture flashcards with explanations of what is happening, to help explain the pandemic situation to students with special needs (30).

Another mitigation strategy for addressing the adverse effects of online distance education discussed by Bond is for teachers to include opportunities for interaction in their educational program, both synchronously and asynchronously (30). Suggestions included daily video conferencing sessions with teachers, increased opportunities to have video calls with classmates, virtual gyms, and partnering students for virtual experiments (30). Asynchronous suggestions included using an official platform for sharing experiences and interaction amongst students and the teacher, such as Class Dojo or Google Classroom (30). Here, the author notes the importance of using technology that students (and parents) are already familiar with, such as social media channels, which can reduce anxiety and technology overload (30). Support in providing staff with training on how to teach via distance and online learning was identified as a key need, especially for teachers in rural and lower socioeconomic areas (30).

Evidence for the usefulness of social networking sites was also addressed in a review by Cavus et al., which found such sites to be useful and effective in supporting educational practices (34).

4.2.2.2. The equity effect of changing the provision of social services

During the COVID-19 crisis, several measures were implemented which resulted in a changed provision of social services, understood here as any form of social care or social work provided or facilitated by professional actors. This includes the discontinuation or moving online of services, as well as changes to the processes through which professional social support is delivered.

We found limited evidence related to this equity question. In our first search based on umbrella reviews, one umbrella review by Naik et al. was identified which reported on the exposures *welfare policies* and *welfare states*, which may be linked to the provision of social services (12). Another umbrella review by Winters et al. reported on the effectiveness of cross-sector service provision – a working together of independent, yet interconnected sectors in health and social services (35). No evidence for this question was found in our second search based on systematic reviews related to COVID-19.

Risk factors

Umbrella and systematic reviews scoped did not report on risk factors for exposures related to this equity question.

Average effects

In terms of average outcomes, the umbrella review on the macroeconomic determinants of health and health inequalities by Naik et al. found that welfare states are likely to be associated with positive health outcomes, though no specific outcomes were reported (12).

Equity effects

Regarding equity effects, the umbrella review by Naik et al. reports an inconsistent association between health inequalities outcomes and welfare states: one review found that welfare only has a weak association with health inequalities, while another found that welfare states are likely to be associated with reduced health inequalities (12).

Mitigation strategies

Naik et al. found evidence that generous welfare policies benefit all residents. Moreover, as their results indicate, greater health and social care spending is associated with better population health and reduced health inequalities (12).

In their umbrella review of cross-sector service provision, Winters et al. report evidence that such service provision leads to improvements in the accessibility of services to users; a more equitable distribution of services; improved experiences of staff and informal care givers; improved health status, quality of life or well-being experienced by people using services; and reductions in otherwise likely deteriorations in their health (35).

4.2.2.3. The equity effect of having primary needs met (food, income, shelter)

A number of measures taken as a consequence of the COVID-19 crisis related specifically to the primary needs of food, income, and shelter. For instance, specific measures were introduced relating to shelter for the homeless, as well as supporting measures for the Food Bank.

Of the umbrella reviews identified in the first search, only one reported evidence on effects related to primary needs, specifically regarding the exposure *housing foreclosure or unaffordable housing* (12). The second search on COVID-19 systematic reviews search yielded limited additional evidence for this equity question (36). The evidence found in both searches is discussed below.

Risk factors

Umbrella and systematic reviews scoped did not report on risk factors for exposures related to this equity question.

Average effects

For average outcomes, we identified one systematic review in our COVID-19 specific literature search which found that concerns about the ability to meet living expenses are related to poor mental health outcomes (36).

Equity effects

In their umbrella review on macroeconomic determinants of health and health inequalities, Naik et al. report evidence that housing foreclosure and unaffordable housing can affect low socioeconomic status areas, thus widening health inequalities (12). The impacted health condition was not reported.

Mitigation strategies

No mitigation strategies for this equity question were identified in either of the literature searches.

Policymaker interaction round two

After concluding our literature search, we had a second round of interaction with policymakers. During this collective meeting, we presented our first results and discussed our findings.

Furthermore, we asked for their inputs on outlining a dissemination strategy. They suggested materials that are visual. Therefore, we will disseminate our findings by means of a report, infographic and a short video. All materials will be shared with the policymakers that contributed to the project, as well as within the municipality of Rotterdam more broadly using the network of academic collaborative center CEPHIR.

5. Discussion

This study aimed to understand how the policy response to the first wave of the COVID-19 crisis in Rotterdam might have impacted on health equity. We scoped local, regional and national policy documents, resulting in a comprehensive inventory of 199 lockdown and mitigation policies. Policies were grouped according to common underlying topics, into ten equity questions. The breadth of the identified policies and the resulting equity questions demonstrated how the COVID-19 crisis affected all areas of policymaking. On the basis of our equity questions, we conducted a systematic literature search to identify equity effects linked to the equity questions. Based on our results, health inequalities can be expected due to decreased financial stability and job security, limited social contact, and staying or working at home; these were the equity questions for which we have identified most evidence. Part of our conclusions are extrapolated from information on risk factors for a certain exposure and average outcomes of that exposure, e.g. in the population as a whole. For the equity question on decreased financial stability and job security, umbrella reviews reported that persons with low socioeconomic status, young age, precarious employment, and specific occupations (such as nurses and teachers) are at higher risk of being exposed to work-related stress and job insecurity. Additionally, studies found that these exposures are associated with cardiovascular diseases and mortality. For the equity question on limited social contact, studies reported that persons with young and old age, low socioeconomic status and low social capital, and female sex were at higher risk to experience social isolation and loneliness. Social isolation and loneliness were linked to an increased risk in all-cause mortality, depression, and cardiovascular diseases. We have also found evidence directly reporting equity effects, for example on staying or working at home. It has been found that women are more likely to be at risk, given that low control at home and a combination of stress at work and at home was associated with cardiovascular disease among women, but not men. In the next paragraphs, we will reflect on the lessons learned from this project, its strengths and limitations, and future recommendations for research and practice.

5.1 Lessons learned

The policy response to the COVID-19 crisis, as it was analyzed in the context of this study, reveals a number of lessons regarding the relationship between policymaking and public health. First, our results indicate that policies in all areas, from work and income to education or the social domain, impact on people's health. It shows that health is not influenced solely by the efforts of the healthcare sector, but is also defined by social determinants. The response to the pandemic has demonstrated how all policies potentially have an effect on the social determinants of health, and therefore all policy areas should

consider the health implications of their decisions. This recommendation closely follows the WHO approach known as ‘health in all policies’ (37).

A second lesson to be learned from this crisis relates to how the policy response to the pandemic has been rapid, rigorous, and all-encompassing with measures being implemented across all areas of policymaking. A health crisis was tackled across all areas of policymaking. As such, COVID-19 has demonstrated that it is possible to act on a massive scale when it comes to solving such crises. This in turn raises the question of whether other emerging health crises, such as the high prevalence of obesity and smoking in the population, could similarly be addressed on a large scale and across all areas of policymaking. The COVID-19 crisis is unique in many ways and its context cannot simply be compared to that of other public health challenges, but the scale and rigor of its policy response give cause for hope that all-encompassing solutions to major crises are possible and even desirable.

This leads to a third lesson that is closely linked to the former. This study showed that the crisis that the COVID-19 pandemic presents us with, is much more than a health crisis alone. Some suggested to call the crisis a syndemic rather than a pandemic (38). The socioeconomic effects, and particularly the inequitable distribution of these effects, are just as much a health concern as the pandemic itself. Yet, it is easier to determine the direct effects of COVID-19 on a single infected person showcasing symptoms, than it is to determine whether someone’s cardiovascular disease or depression is caused by unemployment, stress-at-home, loneliness, or perhaps a combination of these factors that changed due to the COVID-19 crisis. But, as the pandemic has taught us, there might not be time nor adequate ways of determining exact cause-and-effect relationships; and perhaps this should also not prevent us from designing policy interventions. It has been suggested that we should not ask about a policy “does it solve the problem”, but rather “does it contribute (along with other factors) to a desirable outcome?” (39). This approach, in turn, requires rethinking the aim of policymaking, which shifts from finding ‘solutions’ or ‘cures’ to finding multiple interacting factors which might contribute to preventing the root causes of a problem. Such an approach would allow coping with the uncertainties and unpredictabilities which a crisis such as COVID-19 presents; crucially, it also forces us to consider the interconnectedness of all areas of policymaking and put this interconnectedness at the center of policy designing.

5.2 Strengths and limitations

Our study has several strengths. First of all, it reflects on the impact of the COVID-19 crisis as a complete flow from policies in all domains to health effects based on evidence from international academic literature. Our approach was comprehensive and systematic, with a

focus on higher-level evidence from umbrella and systematic reviews to safeguard robustness. Moreover, we took a multifaceted approach to health equity: whereas equity concerns are oftentimes articulated through indicators of socioeconomic status only, the PROGRESS-plus framework utilized in this study draws attention to other characteristics that might be impacted. Another strength of our study was its policy focus, which was complemented by several interactions with local policymakers. With this report, we were able to inform policy stakeholders in a short timeframe.

This study also has some limitations. Given the rapid nature of the project, decisions made when scoping the literature may have affected the evidence found. First, the amount of evidence found, as well as the strength of the evidence, differs between equity questions. From our first literature search on umbrella reviews, we primarily found evidence relating to the equity questions on decreased financial stability and work security, limited social contact, and staying or working at home. While umbrella reviews are becoming increasingly popular in the public health domain, the lack of umbrella reviews on topics such as poverty and education may reflect the sparse use of this type of reviews in the respective fields. Alternatively, it could be argued that these factors are considered as established risk factors, and therefore were not the focus of umbrella reviews. To address the lack of evidence for some questions, we performed an additional search aiming to identify systematic reviews published in light of the COVID-19 crisis. Even with this second approach, it is likely that we are missing insights provided by individual studies that were not brought together into reviews. Second, some of the exposures arising from the policies scoped were very specific to the COVID-19 crisis. One could argue that effects we have identified in the literature may differ from effects resulting from the current crisis. For example, caution is warranted when deriving conclusions from evidence that mainly builds on voluntary working from home, rather than the current situation when it was mandatory to work from home (40). Third, some exposures were uncommon before COVID-19, therefore the evidence may not have been available or summarized in systematic reviews, and have thus not been included in our study. This may explain why we had little evidence for the impact of changing the provision of social services. Lastly, given the rapid nature of this project, we did not take into consideration the doubling of evidence in certain reviews on the same topic and no formal quality assessment was conducted.

5.3 Future recommendations

Although policies scoped gave origin to ten equity questions, only seven of these were studied in the literature phase. The questions excluded should be further considered in other studies. First, we did not study the equity question on information provision, due to the large scope of this question. How information is communicated, received and complied with during a crisis likely applies to all policies. Communication has important implications

for equity (41): while it is possible to design policies which are egalitarian or equity-promoting in theory, these might still have unequal outcomes if the communication about these policies is not appropriately targeted to each subgroup being addressed. Secondly, evidence is warranted on access and provision of health services and possible equity effects. This should not only focus on the health services provided by governmental/local health authorities – as those targeted by the policies scoped in this report – but consider all the care provided within the health system. Thirdly, there are national policies related to topics such as specialized detention or immigration procedures that were mentioned in national documents and therefore not scoped in this study. Given that these policies specifically target certain groups of people, they might have particular consequences in terms of health inequities.

Furthermore, it should be noted that there are some PROGRESS-plus domains for which little to no evidence was found, such as race/ethnicity/culture/language and religion. This absence of evidence should not be taken as evidence on absence of potential equity effects for these groups, but rather as a lack of literature reviews focusing on these domains. The absence of information about these domains implies that extra efforts have to be made to locally monitor the efforts on the related subgroups.

This study has demonstrated how the COVID-19 crisis has instigated or exacerbated health inequities. These inequities, as we have seen, cannot be attributed to a single cause, but rather originate from a set of intersecting issues. We live in a world of increasingly complex health problems, also known as ‘wicked’ problems (42). These wicked problems do not lend themselves to simple solutions, whereby a linear process takes us from A to B. Instead, a key characteristic of these problems is that they have multiple causes and effects, and that a myriad of factors reinforce each other. Solutions, therefore, require an acknowledgement of this complexity, and should come from multiple sides as well. Several authors have emphasized the need for the operationalization of a so-called ‘complex systems approach’. In such an approach, complex public health problems are solved not through single interventions, but through a multitude of interventions targeting the interdependent elements within a connected whole (or ‘system’) which contribute to the problem (43).

With COVID-19, we have seen that it is possible to act on a health concern through all areas of policymaking. Could we combat other complex health problems such as smoking, mental disorders, or obesity with the same all-encompassing approach as COVID-19? We should treat health inequity as a ‘complex problem’, as something that goes beyond individual behavior, formal healthcare, or even prevention, and instead requires a collective approach which addresses the underlying causes of inequalities. As the recent report from the Dutch Council for Public Health and Society concludes, what we need is a breakthrough approach targeted at the complex inequalities behind unfair differences in health (44).

Future research should therefore focus on examining the interconnectedness between different causes and forms of inequality, whereby health should be a key concern. Crucially, such a 'complex systems' approach to health and inequalities should also focus on intersectionality – the cumulative effect of inequalities across different equity domains. Certain PROGRESS-plus domains may coincide in certain population groups, for example older age and low socioeconomic status, thereby also increasing risks in a cumulative way (7). It is important to take this intersectional approach for future research into unraveling inequalities in health.

As these results from our literature study show, measures taken across all policy areas may result in unequal health effects, underlining the findings from previous studies that the COVID-19 pandemic has exposed and amplified the underlying inequalities in society. It remains important that inequalities in society are monitored. Knowing what happened and where to act is of vital importance for preventing unequal health effects.

6. Conclusion

This research shows how the policy response to the COVID-19 crisis might impact on health inequities. In providing a response to the COVID-19 crisis, lockdown and mitigation policies were identified in all areas of policymaking, in the city of Rotterdam. Grouping policies by their underlying exposure is a useful approach to identify possible health effects from existing literature. We found that some of the exposures resulting from the COVID-19 policies may have health effects, whereby specific groups are at higher risk of experiencing adverse effects than others. The COVID-19 crisis was understood as a health crisis that needed to be tackled beyond the health domain, and through coordinated measures for all areas of society. Future policymaking on other contemporaneous public health challenges should address the social determinants of health with the same breadth of policymaking across all domains, but paying special attention to differential effects for different groups of people.

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