RESEARCH

What Long-Term Care Interventions and Policy Measures Have Been Studied During the Covid-19 Pandemic? Findings from a Rapid Mapping Review of the Scientific Evidence Published During 2020

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Context: Throughout the Covid-19 pandemic, long-term care researchers have aimed to generate evidence rapidly to inform the pandemic response. It is unclear which areas were prioritised during this period of rapid evidence generation.

Objectives: We aimed to map the international scientific evidence on interventions and policy measures to mitigate the impacts of the Covid-19 pandemic on people who use and provide long-term care.

Methods: We conducted a pragmatic, rapid mapping review of international evidence to identify the range of interventions, policies, and measures in long-term care studied during the Covid-19 pandemic and published throughout 2020. Studies were primarily identified from two academic databases (MEDLINE; Web of Science).

Findings: We included 137 studies from 22 countries, mostly focusing on the United States, Europe, and Canada. Half of the studies focused on preventing or controlling Covid-19 infections. Other common types of interventions were measures to treat Covid-19 or improve access to general healthcare and studies of possible targets for policies and interventions, such as care home ownership. Only 13 studies covered home-based or community-based care.

Limitations: This was a pragmatic review that aimed to map key areas of research in long-term care during the pandemic, rather than a systematic review of all available studies.

Implications: During the first year of the Covid-19 pandemic, a substantial body of evidence on interventions to mitigate impacts of the pandemic in the long-term care sector emerged. However, reflecting the context and speed with which they were carried out, most studies did not apply an analytical lens and instead provided descriptive findings only. There were very few studies on home-based or community-based care settings. As countries assess the lessons that can be learnt from the pandemic and improve the preparedness of their long-term care systems for future pandemics and other shocks, it will be important to consider the importance of facilitating rapid generation of more robust evidence.

Introduction

The Covid-19 pandemic has taken a disproportionate toll on people using long-term care, particularly people living in care homes. While typically accounting for less than 1% of the population, residents of long-term care facilities represented 41% of all Covid-19 related deaths in 22 high-income countries (Comas-Herrera *et al.*, 2021).

The concentration of deaths among people using long-term care has led to a flurry of measures to prevent infections or manage the consequences of the disease in institutional and home-based settings, going beyond existing infection prevention and control (IPC) protocols. While some measures reflected high-level policy changes at the country level, others were implemented pragmatically by care providers ahead of official guidance (Comas-Herrera *et al.*, 2020; Langins *et al.*, 2020; Rajan, Comas-Herrera and Mckee, 2020). Researchers made efforts to rapidly assess the effectiveness of some of these measures and generate timely evidence to inform the pandemic response. This involved adapting and re-orienting existing studies, as well as responding to new research funding calls. Given the rapid nature of the development of this new area of research, it can be expected that some measures were studied more frequently than others, leading to an uneven evidence landscape for measures intended to mitigate the consequences of the pandemic in long-term care.

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We therefore aimed to map the evidence published during the first year of the pandemic in relation to interventions and policy measures to mitigate the impacts of Covid-19 on people who use and provide long-term care. We adopted a pragmatic approach that allowed us to rapidly identify emerging evidence, rather than one that aimed to exhaustively document all long-term care focused studies. We also summarised key findings on the effects of identified interventions and policy measures.

Methods

We conducted a pragmatic, rapid mapping review of international evidence to identify the range of interventions, policies, and measures in long-term care studied during the Covid-19 pandemic. Relevant measures were defined broadly as any action that could be taken by those organising and delivering care to mitigate the impact of Covid-19 on people using and providing long-term care. Pragmatic review methods have been loosely defined as "recognising the different purposes of a review and ways of applying systematic methods to undertake a review of the literature" (Noble and Smith, 2018, p. 39), including search strategies focused on specific journals and methods for reviewing large bodies of evidence, incorporating mapping methods into systematic reviews (Sagliocca *et al.*, 2013; Lewis *et al.*, 2019). We use the term *pragmatic* to describe this mapping review, because it builds on a previously conducted systematic review on a related topic (Salcher-Konrad *et al.*, 2020). Specifically, we applied a flexible approach to searching the literature and reviewed previously retrieved records against a new set of inclusion criteria, as described below.

Search strategy

The search strategy builds on highly sensitive database searches that were previously developed to identify international studies on Covid-19 and long-term care published until July 2020 (Salcher-Konrad *et al.*, 2020; WHO, 2020). Weekly database searches were conducted for seven databases (MEDLINE; Embase; CINAHL Plus; Web of Science; Global Health; WHO COVID-19 Research Database; medRxiv) from April through July 31, 2020. From August 1 through December 31, 2020, database searches were restricted to MEDLINE (via PubMed) and Web of Science, due to significant overlap between these two databases and the remaining ones. We combined the terms "Covid-19" and "long-term care" and their variants and relevant subject headings. Search terms did not include any specific outcomes or interventions. As an example, we provide the search syntax for MEDLINE in the appendix (Table A1).

To complement these searches and identify potentially relevant studies, we also searched for systematic reviews of Covid-19 and long-term care in Google Scholar and MEDLINE but did not identify any.

Inclusion criteria and selection process

All records were screened by a reviewer and records that were either clearly not relevant for Covid-19 in long-term care populations (e.g., studies in animals or cells, stud-

ies of previous infectious disease outbreaks, or studies of Covid-19 in non-long term care populations) or did not constitute an original report (e.g., opinion pieces or review articles clearly labelled as such) were discarded. For the remaining records, full texts were obtained, and each study was independently assessed for relevance by two reviewers separately. Disagreements on the application of the inclusion criteria were resolved through discussion on a record-by-record basis.

We included reports that met the following inclusion criteria:

- Provides original data about any intervention or measure that was implemented in response to the Covid-19 pandemic in a long-term care population, or original data on possible targets for such measures.
- Reports on adults (aged 18 years or older) using (service users) or providing (service providers) long-term care services. "Long-term care" means all health, personal, and community care services for people with long-term care needs, including care provided in institutional settings (including all non-acute residential and nursing facilities that house people with some form of long-term care need) and care provided in the homes of people with long-term care needs or in the community (including unpaid care, home-based care services, day-care centres, and other community-based care services).
- Reports on any intervention or measure that aims to either prevent Covid-19 outbreaks in long-term care settings or manage the disease and its impact on users and providers of long-term care services once an outbreak has occurred. We also included studies that empirically assess possible targets for policy interventions, including, but not limited to, staffing levels at long-term care facilities, the qualification levels of staff, and environmental factors such as ventilation systems and spacing. We did not include studies only assessing the association of Covid-19 outcomes with non-policy amenable characteristics, such as the age or ethnicity of long-term care users or staff.
- Reports on any outcome related to the impact of Covid-19 on long-term care, including the prevention of Covid-19 related deaths, prevention of Covid-19 cases, and prevention of other detrimental outcomes, such as hospitalisations or intensive care unit admissions. We also included other outcomes, such as mental health and overall wellbeing of long-term care users and providers, adequate care provision for service users with Covid-19, adequate end-of-life care, and other unintended outcomes related to IPC and other public health measures in long-term care settings.

Mapping of interventions

From each included report, we extracted some basic characteristics, including date and location of the study, the population for which the intervention was intended, a brief description of the intervention, and results as reported by the study authors.

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We categorised the identified measures to analyse which types were more commonly employed and in what setting. We adapted an existing, pragmatic taxonomy of Covid-19 measures for long-term care that was initially developed by the LTCcovid.org collaboration to categorise ongoing research projects and early policy responses to the pandemic (also used in Yu and Comas-Herrera, 2021).

Most of the studies identified only provided a narrative account of the interventions, and relatively few used a control group or other comparative analytical approaches. We highlight the findings of the latter group of studies, which allowed for the quantification of the effect of the interventions studied. Findings of these studies were extracted and summarised narratively in **Tables 2–5**.

Results

We screened 11,715 references and reviewed 850 full texts to arrive at our set of 137 included studies (**Figure 1**). A list of all included studies and their main characteristics is provided in the appendix (Table A2). Included studies were conducted in 22 countries. Most studies were from the United States (n = 58; or 42%). There were 11 studies from the United Kingdom. Only 4 studies were from low- and middle-income countries (2 studies from China and 1 each from Brazil and Cuba). **Figure 2** shows the geographical distribution of the studies.

There was a strong focus on institutional care, with 95% of studies focusing on this setting. Only 8% of studies looked at care provided in the homes of people with long-term care needs, and 1% were conducted in community settings (some studies investigated more than one type of care).

All included studies were observational, and the majority were descriptive; 46% were outbreak reports or case studies of measures taken in individual care homes or organisations; 19% were case studies at national or regional level; the remaining studies were analytical quantitative studies using individual participant level data (9%), institutional-level data (22%), or ecological studies using regional-level data (5%).

Prevention/control of Covid-19 infections

Of the 137 included studies, 50% (n = 69) reported on interventions for preventing or controlling Covid-19 infections, most of which were focused on institutional care settings (**Table 1**). The majority were descriptive studies of multifaceted outbreak responses, ranging from outbreak reports of individual care homes to case studies at a national level.

The most common interventions (n = 45) were testing approaches, which varied between care homes. Basic testing was limited to screening symptomatic cases (Balestrini *et al.*, 2020; Callaghan *et al.*, 2020; Tarteret *et al.*, 2020), thus missing asymptomatic cases. In one case, this was extended to testing close contacts and other high-risk groups in response to contact tracing (Park *et al.*, 2020). A more thorough approach involved repeat universal testing (**Table 2**) (Bakaev, Retalic and Chen, 2020; Lipsitz *et al.*, 2020; Louie, Scott, *et al.*, 2020b; Louie, Stoltey, *et al.*, 2020a; Ly *et al.*, 2020; McBee *et al.*, 2020; Montoya *et al.*, 2020; Österdahl *et al.*, 2020; Psevdos *et al.*, 2020; Rudolph *et al.*, 2020; Sanchez *et al.*, 2020; Blackburn *et al.*, 2020; Shea *et al.*, 2020; Shih, Wang and Chao, 2020; Shimotsu *et al.*, 2020; Tan and Chua, 2020; Telford *et al.*, 2020; Veronese *et al.*, 2020; White *et al.*, 2020; Blasco *et al.*, 2020; Borras-Bermejo *et al.*, 2020; Collison *et al.*, 2020; Eckardt *et al.*, 2020; Escobar *et al.*, 2020; Guery *et al.*, 2020; Heudorf *et al.*, 2020; Birgand *et al.*, 2021). Repeat testing was sometimes undertaken until there were either no new cases or until everyone in the care home tested negative (Blain *et al.*, 2020; Dora *et al.*, 2020; Munanga, 2020; Shrader *et al.*, 2020; Sohn *et al.*, 2020).
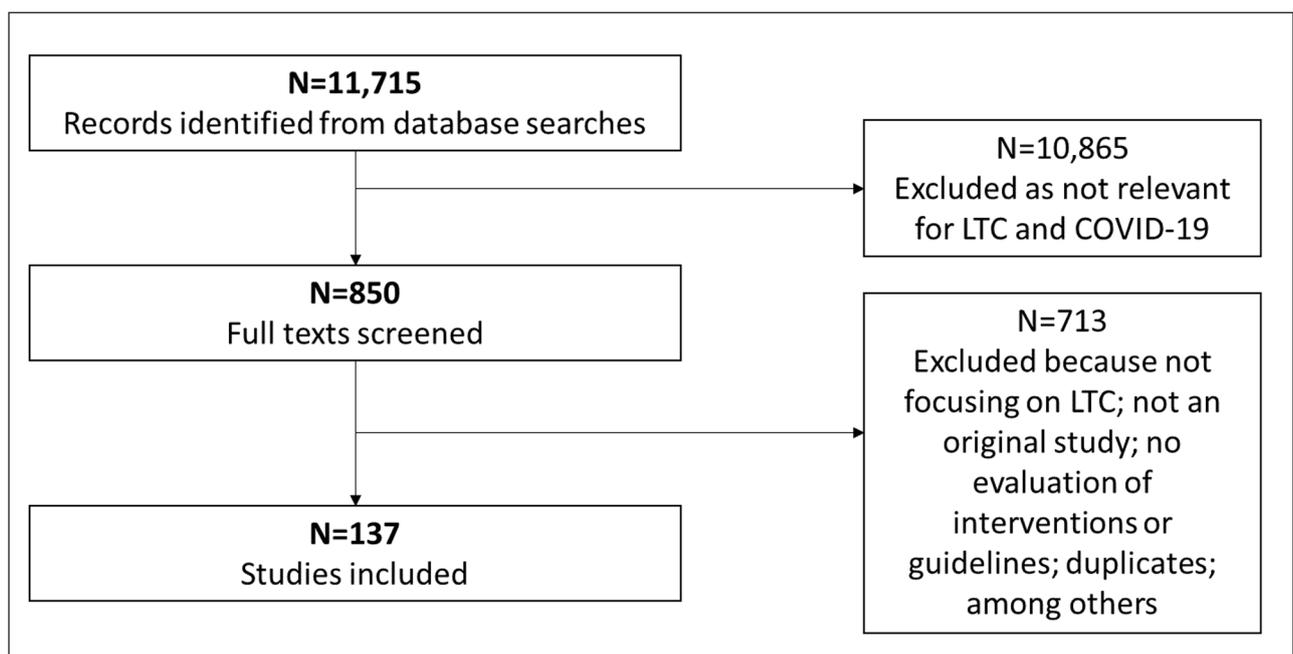

Figure 1: Flow chart of inclusion and exclusion decisions.

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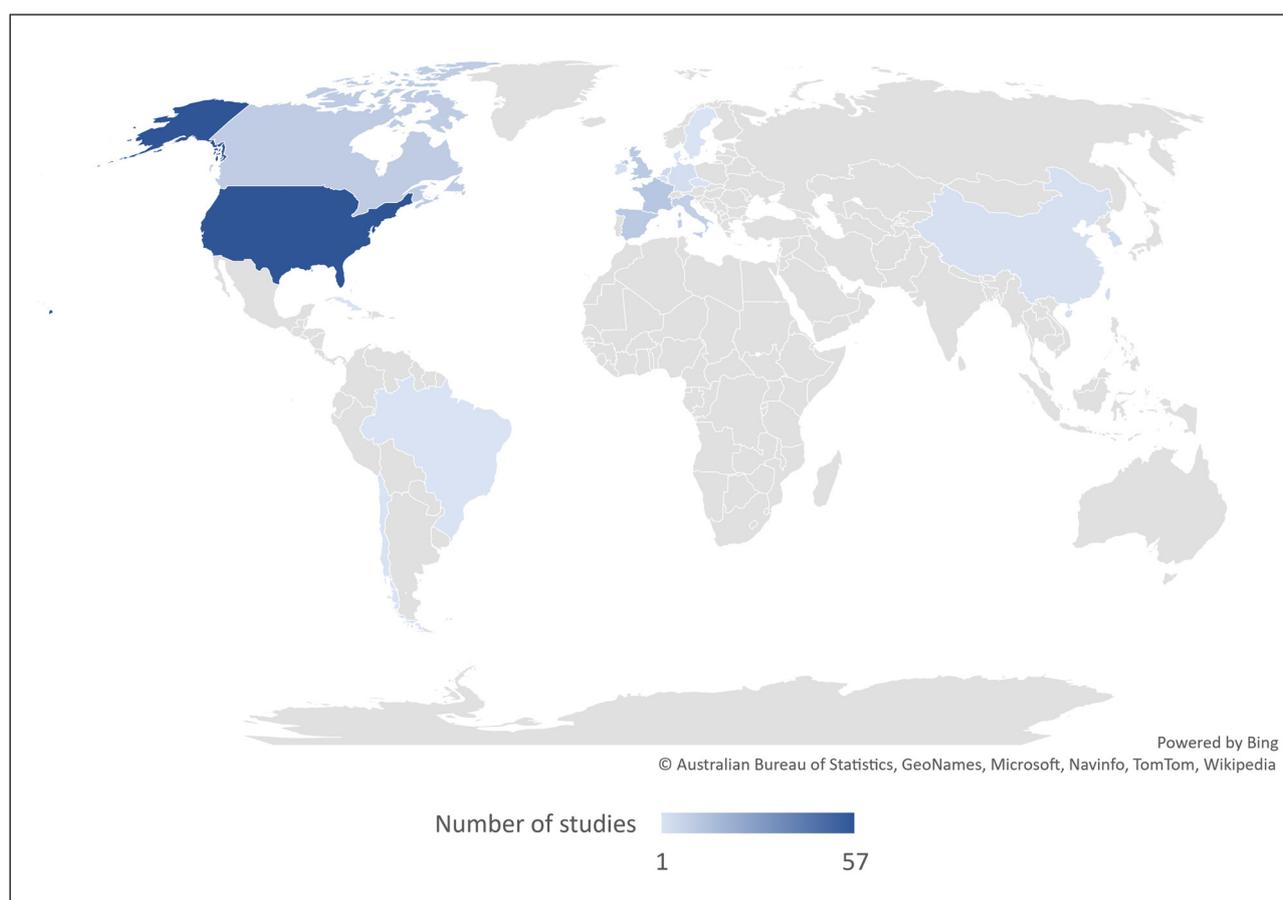
Figure 2: Geographical distribution of 137 studies reporting on long-term care interventions and policy measures published during the first year of the Covid-19 pandemic.

Table 1: Frequency of different types of long-term care interventions and measures studied during the Covid-19 pandemic*.

Intervention/measure type	Number of studies (n = 137)	% of all included studies	Institutional	Home-based	Community-based
Preventing/controlling Covid-19 infections	69	50%	66	4	1
Measures to treat Covid-19/improve access to general healthcare	26	19%	23	2	1
Possible targets for policies and interventions	24	18%	24	0	0
Policy and governance	15	11%	15	2	0
Measures to compensate for isolation policies	11	8%	11	1	0
Measures to improve care coordination/governance	9	7%	9	1	0
End-of-life care and advanced care planning	6	4%	6	1	0
Measures to support staff and unpaid carers	4	3%	2	2	0
Adaptation of existing interventions	2	1%	1	1	0
Interventions to improve quality of care	2	1%	2	0	0
Measures to support care provider organisations	0	0%	0	0	0

* Note that the same study could contribute to several categories of interventions.

Pooled testing was used as a means to preserve resources when there were no current cases (Cabrera *et al.*, 2020; Tan and Chua, 2020). Antibody detection was used in conjunction with testing for diagnosing those with a low viral load (Buntinx *et al.*, 2020). In addition to testing, lung ultra-sonography was used to track the progression of disease and make clinical assessments (**Table 2**) (Dini *et al.*, 2020; Nouvenne *et al.*, 2020; Veronese *et al.*, 2020).

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Table 2: Selected examples from the included studies relating to preventing or controlling Covid-19 infections.

Authors	Study overview and findings
Telford *et al.* (2020)	In Georgia, the United States, 15 long-term care facilities (LTCFs) performed facility wide testing in response to identified cases, and 13 LTCFs performed it as a preventative strategy. The LTCFs who conducted testing as a preventative strategy had significantly fewer cases upon testing and follow-up testing.
Dini *et al.* (2020)	In Italy, lung ultrasonography was utilised to measure the presence of lung damage in those with a history of Covid-19 symptoms. This was able to predict infection with a sensitivity of 79% and specificity of 57%, which was especially useful for detecting false negatives from RT-PCR testing.
Belmin *et al.* (2020)	In France, staff were voluntarily confined in care homes for periods of a week or longer whilst working. In the care homes where this was practiced, only 6% (n = 1) had cases, compared to 48% in the remaining 9,513 care homes in France.

Cohorting and isolation were commonly used to limit the spread of disease (n = 24). Isolation was undertaken to prevent infected residents from leaving their rooms (Bakaev, Retalic and Chen, 2020; Balestrini *et al.*, 2020; Lee, Son and Peck, 2020; McBee *et al.*, 2020; Munanga, 2020; Shea *et al.*, 2020; Shimotsu *et al.*, 2020; Voeten *et al.*, 2020), which sometimes included those who had been exposed (Callaghan *et al.*, 2020; Heudorf *et al.*, 2020; McBee *et al.*, 2020). Some facilities isolated new admissions before they were allowed to integrate (Callaghan *et al.*, 2020; Tan and Chua, 2020). Cohorting enabled the spatial separation of infected residents from the rest of the care home (Borras-Bermejo *et al.*, 2020; Eckardt *et al.*, 2020; Gonzalez de Villaumbrosia *et al.*, 2020; Louie, Stoltey, *et al.*, 2020a; Montoya *et al.*, 2020; Tan and Seetharaman, 2020). Separation was sometimes done in special facilities (Dora *et al.*, 2020; Escobar *et al.*, 2020a; Espasandin-Duarte, Cinza-Sanjurjo and Portela-Romero, 2020; Heras *et al.*, 2020; Psevdos *et al.*, 2020; Shih, Wang and Chao, 2020; Shrader *et al.*, 2020; Sohn *et al.*, 2020). In one case, separate cohorts were created for those who had been exposed (Collison *et al.*, 2020). Selected groups of staff were sometimes cohorted with these specific groups (Dora *et al.*, 2020; Montoya *et al.*, 2020; Sohn *et al.*, 2020; Voeten *et al.*, 2020).

Several measures aiming to reduce the risk of infection from staff were studied (n = 24). Symptom and temperature screening before shifts enabled symptomatic staff to be identified, although this was unable to detect asymptomatic staff (Bakaev, Retalic and Chen, 2020; Borras-Bermejo *et al.*, 2020; Shimotsu *et al.*, 2020; Sohn *et al.*, 2020; Tan and Seetharaman, 2020; Eckardt *et al.*, 2020; Escobar *et al.*, 2020; Louie, Stoltey, *et al.*, 2020a; Mills, Buccola, *et al.*, 2020b; Munanga, 2020; Park *et al.*, 2020; Psevdos *et al.*, 2020; Shea *et al.*, 2020). In one case, staff movement was limited by assigning caregivers to one resident (Balestrini *et al.*, 2020). In some cases, staff were isolated on site or in hotels to reduce the risk of infection transmission (**Table 2**) (Belmin *et al.*, 2020; Kim, 2020; Lee, Son and Peck, 2020; Mills, Sender, Lichtefeld, *et al.*, 2020a; Tan and Chua, 2020). In one case, a care home allowed asymptomatic staff to work, providing care for infected residents only (Louie, Stoltey, *et al.*, 2020a).

IPC protocols that were implemented early on in response to the pandemic included measures such as social distancing, use of personal protective equipment (PPE), enhanced hygiene, closure of communal areas, and restriction of activities in care homes (n = 22). In addition, visitors were banned or severely restricted (n = 17). IPC protocols were often implemented through training interventions (n = 15). Adherence to IPC was also monitored for some sites (Dolveck *et al.*, 2020; Escobar *et al.*, 2020b; Louie, Stoltey, *et al.*, 2020a; Mills, S. Sender, *et al.*, 2020a; Park *et al.*, 2020).

In some cases, action committees were convened to produce outbreak preparedness plans, which were disseminated to infection control teams on the ground (Mills, Buccola, *et al.*, 2020b; Mills, Sender, Lichtefeld, *et al.*, 2020a). These committees enabled coordination between hospitals and care homes, including managing patient flow, and also helped care providers acquire PPE.

Measures to treat Covid-19/improve access to general healthcare

There were 26 studies that reported on measures to treat Covid-19 or improve access to general healthcare for people living in care homes or other care facilities. Of these, 12 observational studies focused on pharmaceutical interventions. No randomised controlled trials of pharmaceuticals were identified. We identified cohort studies of angiotensin converting enzyme inhibitors, angiotensin receptor blockers, and statins (De Spiegeleer *et al.*, 2020); antithrombotics (Brouns *et al.*, 2020), vitamin D3 (Annweiler *et al.*, 2020); itolizumab (Díaz *et al.*, 2020); metformin (Lally *et al.*, 2021); and hydroxychloroquine and azithromycin (Ly *et al.*, 2020; Shrader *et al.*, 2020). Uncontrolled studies reported on doxycycline (Ahmad *et al.*, 2020; Alam *et al.*, 2020) and inosine pranobex (Beran *et al.*, 2020).

Non-pharmaceutical interventions included the creation of contingency plans to maintain access to general healthcare (in both institutional and home-based care) (Archbald-Pannone *et al.*, 2020; Benaque *et al.*, 2020; Chen *et al.*, 2020; Christ, 2020b; Harris *et al.*, 2020; Siu *et al.*, 2020). Telemedicine by videocall or telephone was used to reduce in person consultations and was reported to increase the resilience and wellbeing of residents (Echeverria *et al.*, 2020; Eckardt *et al.*, 2020; Lai *et al.*, 2020; Renzi *et al.*, 2020; Shrader *et al.*, 2020). There was one study that recognised the need for simple technology so that it was accessible (Ickert *et al.*, 2020). In two studies, task forces were deployed to identify those in need of care

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in facilities where access to healthcare was limited due to high infection rates (Diamantis *et al.*, 2020; Eckardt *et al.*, 2020).

Possible targets for policies and interventions

There were 24 studies that analysed possible targets for interventions, including ownership structures, quality of services, and staffing policies. Most were institution-level cohort studies, which analysed associations between care home characteristics, and infection and mortality rates. The majority were conducted in the United States (n = 15). Some studies found that private ownership was associated with more infections and higher mortality, which was often related to a lack of PPE (Braun *et al.*, 2020; He, Li and Fang, 2020; McGarry, Grabowski and Barnett, 2020; Stall *et al.*, 2020). In some studies, high nursing home quality ratings were associated with fewer infections and lower mortality (Bui *et al.*, 2020; Chatterjee *et al.*, 2020; He, Li and Fang, 2020; Li *et al.*, 2020; McGarry, Grabowski and Barnett, 2020; Sugg *et al.*, 2021). However, other studies found that ratings were not independently associated with Covid-19 outcomes and that the presence of a Covid-19 case or death in a care home was instead associated with the care home being part of a chain (Abrams *et al.*, 2020; Bowblis and Applebaum, 2020; Dean, Venkataramani and Kimmel, 2020). High staffing levels were found to be associated with fewer infections and lower mortality, which was suspected to reflect the need for sufficient staff to implement IPC and cohort patients (Figueroa *et al.*, 2020; Harrington *et al.*, 2020; McGarry, Grabowski and Barnett, 2020; Sugg *et al.*, 2021). Although in some cases high staffing levels increased the probability of infection in care homes, this was associated with a decreased chance of outbreaks and lower mortality (Dutey-Magni *et al.*, 2020; Gorges and Konetzka, 2020; Li *et al.*, 2020). In one case, the presence of a healthcare union had a protective effect (**Table 3**) (Dean, Venkataramani and Kimmel, 2020). Resource availability was important, with PPE shortages being associated with more infections and higher mortality (Bowblis and Applebaum, 2020; Brainard *et al.*, 2020; Christ, 2020a; Figueroa *et al.*, 2020; McGarry, Grabowski and Barnett, 2020). In Canada, crowding in care homes was associated with larger and deadlier outbreaks (**Table 3**) (Brown *et al.*, 2020). In the United Kingdom, higher mortality was linked to residents being transferred back to care homes from hospital (Burton *et al.*, 2020). There was one study that found that the number of agency staff working at a care home was important (Office for National Statistics, 2020), with staff working in multiple care homes being more likely to be infected (**Table 3**) (Ladhani *et al.*, 2020).

Policy and governance

Fifteen studies reported on policy and governance, with the majority of these being descriptive regional and national case studies. The regulation and oversight of social care services was analysed, which highlighted that the number of available beds and the maximum occupancy of nursing homes were associated with the number of infections and mortality (Buja *et al.*, 2020; Liotta *et al.*, 2020; Romero-Ortuño and Kennelly, 2020; Rothgang *et al.*, 2020). Covid-19-specific measures varied between countries, with strict IPC policies and more robust responses leading to fewer infections and deaths (Liu *et al.*, 2020; Sepulveda, Stall and Sinha, 2020; Siu *et al.*, 2020; Villalobos Dintrans, Browne and Madero-Cabib, 2020), although implementation was dependent on resources (Miller *et al.*, 2020; Rolland *et al.*, 2020; Rothgang *et al.*, 2020). Within Canada there were uneven responses that led to regional

Table 3: Selected examples from the included studies relating to possible targets for policies and interventions.

Authors	Study overview and findings
Dean, Venkataramani and Kimmel (2020)	In New York, the United States, a study analysed the relationship between the presence of healthcare unions, and infection and mortality rates. The presence of a healthcare union in 246 care homes was associated with a 30% decrease in Covid-19 related mortality, when compared to 109 care homes where there were no healthcare unions.
Brown *et al.* (2020)	In Ontario, Canada, a crowding index was generated for 618 care homes, which considered the size of a facility, the proportion of 1/2/4- bed rooms, and the number of residents per bathroom. A high crowding index did not affect the introduction of Covid-19 to care homes, but it did increase the rate of spread of infection once it was introduced.
Ladhani *et al.* (2020)	In London, the United Kingdom, testing was carried out on 254 staff who worked between six care homes. Staff working in a single care home (n = 227) had a positivity rate of 17%, whereas staff who worked across multiple care homes (n = 27) had a positivity rate of 52%.

Table 4: A selected example from the included studies relating to policy and governance.

Authors	Study overview and findings
Liu *et al.* (2020)	Covid-19 infection and mortality rates in care homes were lower in the Canadian province of British Columbia (BC) compared to Ontario. The different pandemic experiences of the two provinces were contrasted with pre-pandemic levels of regulation and oversight of social care services. Care homes in BC had higher funding per resident and more comprehensive inspections. The pandemic response was faster and more wide reaching in BC.

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differences (**Table 4**) (Liu *et al.*, 2020). Studies from Hong Kong and Taiwan highlighted local preparedness following the experiences of the SARS epidemic (Chow, 2020; Lum *et al.*, 2020; Yang and Huang, 2020). This included convening central command centres, which utilised strict emergency response plans to effectively manage the pandemic and protect nursing homes.

Data and information and communication technology

Data and information and communication technology were the focus of 25 studies. Care home residents were sometimes supplied with technology (Gallo Marin *et al.*, 2020; McArthur *et al.*, 2021), with preferences varying between telephone calls and video calls (**Table 5**) (Sacco *et al.*, 2020). This enabled them to maintain social contact (Archbald-Pannone *et al.*, 2020), either with families (Shrader *et al.*, 2020; Van der Roest *et al.*, 2020; Wammes *et al.*, 2020) or dedicated volunteers (Office *et al.*, 2020; van Dyck *et al.*, 2020). In one case, this extended to facilitating the real time monitoring and remote treatment of residents (Echeverria *et al.*, 2020).

Electronic health record data enabled efficient admission of residents, allowing the history of patients to be tracked (Bernabeu-Wittel *et al.*, 2020). Electronic health records also facilitated the development of a model to track the real time geographical spread of infection in addition to the trajectories of outbreaks within facilities (Caspi *et al.*, 2020). Other models utilised machine learning trained on outcome data to generate risk indexes at a patient and facility level (**Table 5**) (Stow *et al.*, 2020; Sun *et al.*, 2020).

Home-based care and community-based care

There were few studies that focused on home-based care and community-based care (n = 13). Some of these studies reported on the use of telemedicine to replace face-to-face consultations (Benaque *et al.*, 2020; Goodman-Casanova, 2020), with video calls associated with greater improvements in resilience and wellbeing than telephone calls (**Table 6**) (Lai *et al.*, 2020). Additionally, technology was used for cognitive stimulation and to aid social connectedness (Goodman-Casanova, 2020; Villalobos Dintrans, Browne and Madero-Cabib, 2020), which had a positive impact on users (**Table 6**) (Office *et al.*, 2020). Some studies focused on multifaceted interventions (Benaque *et al.*, 2020; Chen *et al.*, 2020; Huang *et al.*, 2020; Lum *et al.*, 2020; Mills, Buccola, *et al.*, 2020b; Mills, Sender, Reynolds, *et al.*, 2020c; Shea *et al.*, 2020), including enhanced IPC, strict safety protocols, and selectively carrying out home visits to those with the highest need (**Table 6**) (Khatri *et al.*, 2020). In some cases, studies focused on educating home-care users (Chen *et al.*, 2020; Goodman-Casanova, 2020), and supporting nurses through training and psychological interventions (Benaque *et al.*, 2020; Khatri *et al.*, 2020; Shea *et al.*, 2020). Some studies reported that day centres were closed and activities and clubs cancelled (Benaque *et al.*, 2020; Villalobos Dintrans, Browne and Madero-Cabib, 2020), with home-based services limited to delivering meals, maintaining nursing care, and administering medicines (Khatri *et al.*, 2020; Shea *et al.*, 2020). Other studies reported on temperature and symptom screening for nurses and home-care users (Koeberle *et al.*, 2020; Lum *et al.*, 2020; Shea *et al.*, 2020), which was

Table 5: Selected examples from the included studies relating to data and information and communication technology.

Authors	Study overview and findings
Sacco *et al.* (2020)	In Angers, France, 132 residents in care homes and geriatric acute care units were surveyed to understand their preference between telephone calls and video calls. They were able to complete telephone calls more independently than videocalls, and tended to use them more often, although satisfaction tended to be higher when video calls were undertaken.
Sun *et al.* (2020)	In the United States a model was trained on Covid-19 outcomes reported in 1,146 care homes. This model generated a risk index associated with the likelihood of Covid-19 infection in a care home. This was then validated by outcomes separate from the original sample, which demonstrated moderate predictive power and strong association with outcomes.

Table 6: Selected examples from the included studies relating to home-based care and community-based care.

Authors	Study overview and findings
Lai *et al.* (2020)	In Hong Kong, 60 home-care recipients and their carers were surveyed to understand changes in general cognitive functions, symptoms of dementia, and their quality of life, in response to using video calls instead of telephone calls to carry out telemedicine. This was associated with improved resilience and wellbeing, partly because it could capture the important social elements intrinsic to face-to-face interactions.
Office *et al.* (2020)	In the United States, 14 students made 25 telephone calls as part of an outreach programme to older adults who were at risk of social isolation. These conversations focused on sources of support and personal topics. This programme had a positive impact on both the students and the receivers of the calls.
Khatri *et al.* (2020)	In Singapore, a home hospice service initiated a multifaceted response including enhanced IPC, substantial safety and communication training for staff, reduced size of home hospice teams, and pre-visit triage so that visits could be selectively carried out for those with the highest need. There were no infections among staff members.

tracked using custom applications (Mills, Buccola, *et al.*, 2020b; Mills, Sender, Reynolds *et al.*, 2020c).

Evidence gaps

Evidence gaps were identified relating to studies that focused on home-based care (n = 11) and community-based care (n = 2). Additional evidence from these settings may yet emerge, because over 30 ongoing and planned research projects relating to these settings have been identified (Yu and Comas-Herrera, 2021). Due to the timing of the vaccination approvals and roll-outs, studies on the roll-out and effectiveness of vaccinations in social care settings were largely missing until the end of 2020, and consequently they do not feature in this review. A large majority of the studies focused on the United States, Europe, and Canada, with most of the others focusing on countries in East Asia. We did not find published studies assessing psychological or rehabilitation interventions to mitigate the impacts of the pandemic, especially isolation. Additionally, we found no studies reporting on measures to support care provider organisations. There were a few studies that described environmental or building interventions (n = 3), mainly focusing on natural and mechanical ventilation, but which did not empirically assess their effectiveness. We found little evidence on measures to support staff and unpaid carers (n = 4), which was mainly focused on improving mental wellbeing. There were few studies reporting on interventions to improve quality of care (n = 2), end-of-life care and advanced care planning (n = 6), and adaptations to existing interventions (n = 2).

Discussion

Our rapid review of long-term care focused interventions studied during the Covid-19 pandemic and published during 2020 found that, in the first year of the pandemic, the state of evidence was poor overall, reflecting both the time it takes to generate evidence and for it to be published, and the crisis context in which most of this research was carried out. Despite identifying 137 studies reporting on a variety of different types of interventions, most studies did not apply an analytical lens and instead provided descriptive findings only. The availability of evidence was particularly poor in relation to care provided outside congregate settings, with only 11 studies covering home-based care and 2 covering community-based care. This suggests that the evidence available to decision-makers and those developing guidance documents was very limited.

The long-term care measures studied during the first year of the pandemic tended to focus on the prevention or management of infections in institutional care settings. There was a heavy emphasis on outbreak management and testing strategies. Other measures that may be key to preventing infections were less well studied, for example physical characteristics of care homes and, particularly, building ventilation.

Most of the studies we identified focused on IPC and reported on a bundle of measures adopted as part of an outbreak response, which means that it is not clear to what extent a single measure would have contributed to better or worse outcomes. The use of multifaceted packages to reduce the risk of outbreaks is in line with the findings of a systematic review of guidelines for long-term care organisations during the pandemic (National Collaborating Centre for Methods and Tools, 2021). That review also found existing evidence on the effectiveness of these measures to be of very low certainty.

Some of the measures adopted, particularly banning visitors and isolating infected people, have the potential to impact severely on the wellbeing of people using and providing long-term care (Low *et al.*, 2021).

Our review identified an important evidence gap in relation to non-institutional care, despite growing evidence that people using care at home and unpaid carers have been severely affected by the pandemic (Lorenz-Dant and Comas-Herrera, 2021).

Most studies we identified were descriptive reports of outbreaks and the responses of individual nursing homes or care organisations, reflecting the speed and crisis context in which these interventions were implemented and written up to share learnings. While descriptive case studies can provide valuable evidence in the face of a rapidly evolving pandemic, more robust studies will be needed to inform the future planning of long-term care. We expect that more studies exploiting natural variation in how measures were implemented will be published. Such studies, providing a counterfactual, will allow researchers and policy makers to better gauge which measures were successful in preventing infections and more severe outcomes and which were not. An international database of studies of Covid-19 in the long-term care sector has identified at least 14 trials or other evaluations that will contribute to increasing the quality of available evidence.

The findings from this mapping show that only low-quality evidence on measures to prevent and mitigate Covid-19 in the long-term care sector was available to guide decisions on how to respond to the pandemic in the long-term care sector during 2020. While, particularly at the beginning of the pandemic, this was inevitable due to the presence of a novel virus, there may be scope for researchers, research funders, governments, and publishers to learn lessons from the scientific response to the pandemic in relation to long-term care and to consider the role of research in future pandemics or other major emergencies. This may involve assessing the degree to which the existing research infrastructure was able to support, or not, the rapid generation of evidence to assist decision-making during the pandemic and identifying opportunities to both strengthen the long-term care evidence base and have better "research preparedness" for future events.

Comparatively, the health sector was able to respond more rapidly to the pandemic, partly enabled by existing mechanisms for global research coordination during public health emergencies, such as the Global Research Collaboration for Infectious Disease Preparedness (GloPID-R) and WHO Research and Development Blueprint (Naci *et al.*, 2020). Existing research capacity

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and infrastructure allowed the rapid implementation of large scale trials of Covid-19 treatments in routine care settings, such as the RECOVERY trial which capitalised on the opportunities offered by linked routine data in the United Kingdom. There have been examples of similar capacity being developed in the context of long-term care, such as the VIVALDI study in the United Kingdom (Krutikov *et al.*, 2021). However, the lack of precedent meant that this was slower to be developed and shorter in reach than corresponding initiatives in the health care sector. The findings of our mapping review support the need to build up research capacity in the social care sector through developing partnerships between research and routine care settings, especially in home-based and community-based care settings, including infrastructures for data collection, standardisation, and distribution.

Our review also indicates a possible geographical imbalance in research capacity. Only four studies were identified from low- and middle-income countries. Histories of uneven development and unequal exchange mean that there is a continued dependency on the Global North, which makes the Global South vulnerable to disrupted funding streams caused by emergencies such as the Covid-19 pandemic (Reidpath and Allotey, 2020). Furthermore, few global health funders allocate resources to research capacity development, reinforcing this dependency (Adegnika *et al.*, 2021). There is a need to enable the Global South to develop robust research and implementation capacity, independent of the Global North.

Limitations

This review was pragmatic, rather than systematic. We focused on mapping which types of interventions were studied during the pandemic but did not attempt to systematically synthesise findings on the effectiveness of these. Other reviews have systematically synthesised available evidence on the effects of specific interventions or other factors that could explain variations in outcomes (Kruse *et al.*, 2021; National Collaborating Centre for Methods and Tools, 2021).

The pragmatic nature of the review also meant that we only searched two databases from August through December 2020. It is therefore possible that we have missed published studies of long-term care interventions during the pandemic. However, this was compatible with the aim of our review, which was to map the evidence base in terms of key areas of research focus, rather than to exhaustively list every published study. Furthermore, we compared search results for these two databases with results from a wider set of seven databases of peer-reviewed articles that were searched up until the end of July 2020 and did not find reduced sensitivity when only searching MEDLINE and Web of Science.

We focused on English databases only and the findings of this mapping review may therefore not be representative of the global literature on long-term care interventions during the pandemic. Furthermore, the classifications that we used to define types of care reflect care systems that are present in the Global North (de Carvalho, Schmid and Fischer, 2021). These were instrumental in developing our search strategy, enabling us to identify relevant search terms. Representation of the structure of long-term care provided in the Global South would enable a more inclusive search strategy.

Due to the high death toll among care home residents during the early phase of the pandemic, we were initially more primed to identify interventions aimed at preventing infections and mitigating their consequences, that is, managing outbreaks. It is therefore possible that we missed some studies of interventions focusing on the psycho-social impact of the pandemic early on.

Conclusion

This review aimed to map the range of interventions, policies, and measures in long-term care studied during the Covid-19 pandemic and published throughout 2020. We identified 137 studies, the majority of which were descriptive case studies from high income countries, covering multiple infection control measures adopted in care homes. By the end of 2020 there was very little evidence available on measures for home-based or community-based settings.

Decision makers in long-term care had very limited scientific evidence on the measures to respond to the pandemic at their disposal during 2020. The rapidly evolving pandemic appears to have hampered gold-standard approaches to generate and synthesize evidence in long-term care. This is in contrast to the health care sector, which was able to rapidly implement large-scale trials in routine care settings to assess the effectiveness of different treatments. As countries assess the lessons that can be learnt from the pandemic and improve the preparedness of their long-term care systems for future pandemics and other shocks, it will be important to consider the importance of facilitating rapid generation of more robust evidence.

Additional File

The additional file for this article can be found as follows:

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Competing Interests

The authors has no competing interests to declare.

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