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Why were COVID-19 infections lower than expected amongst people who are homeless in London, UK in 2020? Exploring community perspectives and the multiple pathways of health inequalities in pandemics

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ABSTRACT

High rates of COVID-19 infections and deaths amongst people who are homeless in London, UK were feared. Rates however stayed much lower than expected throughout 2020; an experience that compares to other settings globally. This study sought a community level perspective to explore this rate of infections, and through this explore relationships between COVID-19 and existing health inequalities. Analyses are reported from ongoing qualitative studies on COVID-19 and homeless health service evaluation in London, UK. Repeated in-depth telephone interviews were implemented with people experiencing homelessness in London (n=17; 32 interviews in total) as well as street outreach workers, nurses and hostel staff (n=10) from September 2020 to early 2021. Thematic analysis generated three themes to explore peoples' experiences of, and perspectives on, low infections: people experiencing homelessness following, creating and breaking social distancing and hygiene measures; social distancing in the form of social exclusion as a long-running feature of life; and a narrative of 'street immunity' resulting from harsh living conditions. Further study is needed to understand how these factors combine to prevent COVID-19 and how they relate to different experiences of homelessness. This community perspective can ensure that emerging narratives of COVID-19 prevention success don't ignore longer running causes of homelessness and reinforce stigmatising notions of people who are homeless as lacking agency. Our findings aid theorisation of how health inequalities shape pandemic progression: severe exclusion may substantially delay epidemics in some communities, although with considerable other non-COVID-19 impacts.

1. Introduction

In March 2020 there were concerns that COVID-19 infections and deaths would be high amongst people experiencing homelessness in the UK (Hamilton, 2020; Kirby, 2020) and globally (Tsai & Wilson, 2020). This potential COVID-19 vulnerability was linked to pre-existing health inequalities for people experiencing homelessness and exclusion. Such pre-COVID-19 health inequalities in the UK were severe. People who are homeless experience high rates of poor lung health, blood borne viruses as well as injury and poisoning (Robert W. Aldridge et al., 2018; R. W. Aldridge et al., 2017; Lewer et al., 2019; Rogans-Watson, Shulman, Lewer, Armstrong, & Hudson, 2020). Such inequalities then overlap with potential limits on capacity to socially distance and maintain hygiene owing to poverty, long-running hardship and limited or lack of shelter and facilities (Hamilton, 2020).

Across the population the UK experienced a 'first wave' of COVID-19 in the spring and early summer of 2020, with a 'second wave' with a second peak of infections in the general population in January and February 2021. Data from COVID-19 testing in London within homeless accommodation facilities and amongst rough sleepers suggests that infections remained relatively low throughout wave 1 and the rest of 2020, and then rose substantially in early 2021 in the second wave. A peer led COVID-19 outreach based testing service targeting people who are homeless in settings in London completed 5823 tests from April 1, 2020

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to February 10, 2021; in April 2020 there were 10 infections identified in homeless hostels, and then over 90 infections in homeless hostels in January 2021 (Hayward & Story, 2021). Positive tests amongst those reporting symptoms were 3–4 times higher in wave 2 as compared to wave 1 (Hayward & Story, 2021). In addition, up to June 2020, 16 people experiencing homelessness had died in England and Wales of COVID-19, with homelessness understood as having 'no fixed abode', whether rough-sleeping, in a hostel or shelter, or emergency accommodation (ONS, 2020). This compares to an estimated population of those homeless of 46,565 (Lewer et al., 2020). Statistics on COVID-19 infections and deaths are partial owing to challenges of definition and COVID-19 testing access. However, there is wide consensus across policy makers that infections and deaths were though lower than feared in 2020 (Teixeira, 2020), with these figures rising in a second wave in early 2021.

The UK experience of initially relatively low COVID-19 infections amongst people experiencing homelessness is matched by reports from Dublin, Ireland (O'Carroll, Duffin, & Collins, 2021), Poland (Wilczek, 2020), and Denmark (Lenskjold & Dalsted, 2020). Other settings, including Boston and San Francisco, USA, however had severe localised COVID-19 outbreaks in 2020 (Baggett, Keyes, Sporn, & Gaeta, 2020; Imbert et al., 2020). Other analyses in the USA have shown local trends of lower infections amongst people who are homeless and unsheltered (i.e. rough sleeping) than those in shelters (Yoon et al., 2020). High COVID-19 exposure has also been reported amongst people who are homeless in Paris, France, although two thirds of those people did not report symptoms (Roederer et al., 2021).

Understanding why there were lower rates of infection than feared amongst some people experiencing homelessness in 2020 is crucial to aid future pandemic planning. Low infections amongst people who are homeless in the 'first wave' in the UK have been principally linked to specific emergency measures targeting people who are homeless: most notably, a nationwide '*everyone in*' emergency housing intervention (Teixeira, 2020). With government funding, local authorities and charities rapidly housed many people rough sleeping or using communal night shelters in hotels or other temporary accommodation. This '*everyone in*' policy led to 33,000 people being housed up to November 2020 (NAO, 2021). In London alone 1700 people were housed in hotels (GLA, 2021). '*Everyone in*' was part of a sector wide response, including a coordinated strategy to assess, triage and cohort people (Story & Hayward, 2020) linked to infection control measures in hostels, such as closing communal areas, encouraging physical distancing and wearing of masks (Beale, 2020). The introduction and implementation of measures, such as mask wearing for example, varied across settings and time, with hostels taking different approaches depending on their clients. These specific measures targeting people who are homeless were in addition to the general 'lockdown' for the rest of the UK which lasted from March until June 2020, which involved limits on travel, leaving home and maintaining social distancing; the UK didn't introduce requirements for masks until July 2020 and this only in some public settings. Modelling suggests the combination of '*everyone in*' and hostel level measures prevented over 20,000 infections and 266 deaths from COVID-19 amongst people experiencing homelessness (Lewer et al., 2020). The importance of 'everyone in' for preventing COVID-19 infections is also supported by infections rising amongst people who are homeless in early 2021 as the UK experienced a 'second wave' and as the 'everyone in' programme was discontinued (Hayward & Story, 2021).

Whilst the central role for 'everyone in' and hostel level measures in preventing COVID-19 infections in the first wave in the UK is well demonstrated there is a need to explore what additional factors shaped COVID-19 prevention and pandemic progression in London, UK. Such an effort can help disentangle the role of different interventions and how this relates to specific contexts (O'Carroll et al., 2021). Study of '*everyone in*' hotels in the UK suggests many housed in them found these positive, and are potentially supportive of long-term health, although there are reports of people excluded owing to drug use (Lavelle & Hattenstone, 2020; Neale, 2020, 2021). Other experiences to those in '*everyone in*' have though been less examined, resulting in limited understanding of how COVID-19 was experienced within hostels, other shared accommodation, essential services and for those who continued rough-sleeping (Parkes et al., 2021).

Exploring these additional perspectives on how COVID-19 risk is experienced and managed is essential for how it can reveal additional sources and strategies for infection prevention that may have contributed to lower than expected infections. Crucially, there is a need to engage with individual and community level factors and interventions to understand the varying impacts of COVID-19 on people who are homeless across settings. In response, this report explores community perspectives on why COVID-19 infections remained lower than feared amongst people who are homeless in London, UK through 2020 and the first wave of the pandemic.

2. Material and methods

The analysis builds on two qualitative studies. Principally, data are drawn from the *After the Lockdown study*, which is qualitatively exploring experiences of COVID-19 during 2020 and 2021 amongst people experiencing homelessness as well as the perspectives of community outreach and other service delivery stakeholders in London, UK. This ongoing study is grounded in long-standing community-academic partnerships in London and led by a research team including people with lived experience of homelessness.

Repeated in-depth interviews were implemented with a purposive sample of people experiencing homelessness and with people working in outreach and hostel settings. From September 2020 respondents were recruited who had experience of homelessness during 2020 and the first wave of COVID-19; understanding homelessness as rough sleeping, using hostels or within temporary accommodation. A focus was on recruiting people not involved in '*everyone in*' hotels to allow exploration of perspectives not yet engaged with. Recruitment also sought a purposive range of ages and genders. A target was 10 respondents participating in 'key informant' interviews designed to elicit in-depth insight into their own and also community experiences. Interviews were repeated to gain depth of insight, understand change over time and to build rapport given the challenging circumstances of interviews. Recruitment happened through a COVID-19 telephone welfare service for people experiencing homelessness run by Groundswell, linked to MB, and through other service delivery and research networks of the team. Many respondents were then either familiar with the organisations involved or with particular individuals, which could have shaped responses in interviews. Outreach and hostel staff were also recruited through existing research networks.

Semi-structured interviews explored topics identified a priori – e.g. health care access, testing, ability to socially distance – and then integrated emerging themes. In initial interviews the question of 'why have infections been lower than expected?' emerged for how respondents had a range of explanations beyond dominant policy narratives. Through discussion this question was identified as important, and in later interviews we continued to ask about experiences of COVID-19 infection and how respondents thought this had been avoided, for themselves and for others.

Interviews were done by AG, SB and PA over the telephone, owing to social distancing measures (Annand et al., 2021); mobile phone access is common amongst people who are homeless, albeit with limits for the most excluded, and with challenges on duration of access to a phone and the same number. Triangulation across accounts between people who are homeless and stakeholders working in services was an effort to respond to these limits. Interviews with hostel, outreach and community organisation staff therefore sought to understand the system context and experiences of rough sleeping that were harder to explore directly owing to challenges of phone access and contact with services.

Our analysis also includes data from a separate *Homeless Health Peer Advocacy* evaluation that began before COVID-19. This study is a mixed-

methods investigation including qualitative study of a peer advocacy service amongst people who are homeless, implemented by Groundswell. In interviews by AG and PA since March 2020 COVID-19 was frequently explored due to its centrality to health experiences and use of the peer advocacy service. Where these interviews explored participants' own experiences of COVID-19 prevention or views on low infections amongst the homeless community they were integrated with this analysis. Notably, these data had less exploration of COVID-19 and so accounts had less depth, reflecting the aims of the study.

An inductive and deductive approach to thematic analysis was used (Green & Thorogood, 2014). As data were collected, memos were written and emerging themes discussed. Deductively, accounts were critically explored to understand the role for community agency (Friedman et al., 2007). Inductively, explanations from participants to explain low rates of infections were identified. Emerging themes were explored in repeated interviews, including reflecting with participants on the nascent analysis. Later, transcribed data were coded, with constant comparison used to refine themes. Coding of the data was led by [anonymised] using Nvivo 12, with checks on coding by [anonymised]. Draft manuscripts were discussed by the team and shared with some interview respondents to check analysis and interpretation.

The After the Lockdown study was approved by King's College London ethics committee (HR-19/20-20112) and the Homeless Health Peer Advocacy evaluation by Dulwich Research ethics committee (IRAS project ID 271312). All names used are pseudonyms to ensure anonymity.

3. Theory

This exploration of why infections were low amongst people who are homeless was framed by literatures identifying a role for community action and mobilisation in disease prevention and epidemic responses for stigmatised and marginalised populations (Cornish, Priego-Hernandez, Campbell, Mburu, & McLean, 2014; Friedman et al., 2007). Friedman et al. (2007) explored how 'micro-scale' organisation by people who use drugs prevented or limited the spread of HIV epidemics in places like New York, Rotterdam and Buenos Aires; such 'indigenous harm reduction' practices demonstrate the active agency that people bring to their own health, despite severe stigma and exclusion (ibid.). Relatedly, the organic emergence of models of 'secondary syringe exchange' whereby people provide needles and syringes for other people who use drugs has been found to be highly effective at reaching highly marginalised groups (Murphy, Kelley, & Lune, 2004). Community mobilisation to harness the agency of marginalised groups is also increasingly seen as essential for designing and delivering effective interventions (Cornish et al., 2014). An effort to explore agency amidst experiences of stigma and marginalisation was in turn framed by how these experiences are socially produced and reflect particular governing norms and balances of power (Link & Phelan, 2001; Tyler, 2020), with those social conditions of exclusion in turn generating health risk and structural violence (Rhodes et al., 2012).

A concern with experiences of stigmatised and marginalised groups of people is essential to understanding broader dynamics of inequalities in health. A feature of the COVID-19 pandemic was the rapid emergence of inequalities across contexts in rates of COVID-19 infection and death linked to pre-existing inequalities structured by class, race and ethnicity (Marmot, Allen, Goldblatt, Herd, & Morrison, 2020). Specific theoretical attention has focused on the development of COVID-19 inequalities in the USA and development of *fundamental cause* and *stages of disease* theory (Clouston, Nataleb, & Link, 2020). These theories in combination suggest that epidemics initially impact across all socio-economic groups, and then inequalities emerge as an epidemic progresses, shaped by existing structural inequalities (ibid); the outcome is that groups with lower socio-economic status face the biggest burden of disease, whilst those with higher socio-economic status are able to deploy resources to protect themselves. Analysis here sought to understand how experiences of exclusion like homelessness relate to this developing theory of health inequalities and emerging epidemics.

4. Results

Across both studies 17 people experiencing homelessness were interviewed (5 women, 12 men), a total of 32 times, and 10 people working in outreach, hostels or homeless health service delivery (see Table 1). Respondents lived variously in large hostels, small hostels, housing of multiple occupancy with shared facilities, or temporary accommodation. Three people had been in '*everyone in*' hotels briefly in early 2020 and 2 people had slept rough during 2020. All respondents from the After the Lockdown study were aged 40 or over, and 5 of 7 from the Homeless Health Peer Advocacy evaluation, with maximum ages of 60+ (we use general age categories to ensure anonymity of participants). The sample of people homeless interviewed differs from the range of experiences included within 'core homelessness', which includes rough sleeping, where approximately 60% of people are aged under 45 (S. Fitzpatrick et al., 2021). However, the sample does though closely resemble experiences of people in hostels; a recent survey in a London hostel reported a mean age of 55 (Rogans-Watson et al., 2020).

4.1. Experiences of COVID-19

5 respondents thought they may have had COVID-19, although none of these were confirmed by a test, with experiences ranging in how they related to timelines of the pandemic and common symptoms. Accounts like Jane's indicate COVID-19 infection is quite likely: *"On 18 March [2020] I woke up and I thought I was getting either the flu or the cold, I had aches and pains all over my body, temperature and sneezing and so I just … I didn't know that it was COVID, I hardly knew anything about COVID at that time"*. Leon's timeline of infection suggests it is less likely: *"back in January when I'm pretty sure I did get it, it was before it become big you know … I woke up one morning with just a continuous cough you know so I was coughing every … you know more than what I normally would with the COPD"*. For Chris the description of symptoms suggest explanations other than COVID-19 are possible: *"I was wiped out for four days, basically just bread and water in my room. The reception down here knew it, but I didn't have, at the time I didn't have the cough and the temperature."*

Respondents also reported they knew of few or no infections amongst others. Of interviewees who were homeless, one knew of someone who had died of COVID-19, and another said that "*many homeless people caught it but I don't have their numbe*r" (Helen), but did not elaborate. Others though reported numbers of infections were low in their hostels, or that they did not know of anyone who had had COVID-19. There was though widespread agreement by stakeholders that infections had been lower than expected amongst people experiencing homelessness, and this went against predictions: "*my team leader was quite honest with us, it's like 'we should be expecting a lot of our clients to die'* "and yet: "*I've still not come across a client who's had Corona virus funnily enough*" (S5, outreach worker). This was a 'surprise' and a question outreach and hostel staff were themselves discussing:

> *myself and other members of my team were also, I wouldn't say shocked but not, surprised, yeah, surprised by the fact that there were low levels of numbers of our client group, the ones that we knew who were either exposed or had the virus, or who kind of succumbed to the virus and passed away, we had very low numbers.* (S9, outreach worker)

Respondents had a range of experiences of COVID-19 testing: of having tested, tried and not succeeded, or not tried. Some reported or anticipated difficulties in access, owing to limits to internet access and information, or the distance to travel. Others reported few or no barriers, whether in having tested or if they needed it, linked to processes such as accessing tests alongside addressing other health issues, or how hostels had arranged testing (although not regularly): "*We got tested at the*

Table 1
Summary of respondents from the [anonymised] study and [anonymised] evaluation.

After the Lockdown study		
Participants with experience of homelessness		
Pseudonym	Gender, age, ethnicity and nationality	Homelessness experience during 2020
Eva	Woman, 50s, Eastern European	Temporary accommodation. Had to move during 2020.
Ian	Man, 50s, White British	Brief period of living in a hostel through lockdown 1 then in a shared house through private rental market
Dave	Man, 40s, White British	Shared temporary accommodation (private bedroom, shared kitchen and bathroom).
Henry	Man, 50s, East Asian	Large hostel (private bedroom, shared bathrooms and dining facilities)
Raj	Man, 40s, South Asian	Hostel (private bedroom and bathroom, shared kitchen). Room given during first lockdown.
Peter	Man, did not report – estimate 60s, white British	Hostel prior to COVID, then in a hotel for three months in the first wave, and then back in same hostel.
Jane	Woman, 50s, White British	In a hotel for several months, then into a hostel (private bedroom and shower, shared kitchen), finally in housing of multiple occupancy (private bedroom and bathroom, shared kitchen).
Helen	Woman, 50s, Black British	Self contained flat in temporary accommodation.
Jim	Man, 60s, White British	Semi-independent shared accommodation (private room, shared bathroom and kitchen).
Leon	Man, 40s, White British	COVID hotel briefly, and also rough sleeping at the same time; at time of interview, in a hostel.
Outreach workers and hostel staff		
	Gender	Role
S1	Woman	Outreach worker, working mainly with people rough sleeping
S2	Man	Outreach worker, working mainly with people rough sleeping
S3	Man	Outreach worker, linked to day centre role
S4	Woman	Charity volunteer, running food bank/ meals service
S5	Man	Outreach worker, working mainly with people rough sleeping
S6	Man	Outreach worker, working mainly with people rough sleeping
S7	Woman	Hostel worker
Homeless Health Peer Advocacy Evaluation		
Participants with experience of homelessness where experiences of COVID-19 were gathered		
Jackie	Woman, Not reported – estimated 20s or 30s	Hostel. Unspecified on kitchens and shared spaces
Samuel	Man, 50s, White British	Hostel, with private room and shared bathroom and communal eating facilities.
Chris	Man, 60s, White British	Hostel. No detail shared on length of stay or facilities relating to COVID risk.
Shaun	Man, 40s, White British	Hostel. No detail shared on facilities relating to COVID risk.
Noah	Man, 30s, White Polish	Large hostel. Shared kitchen and bathrooms.
Angus	Man, 50s, White British	Rough sleeping through first period of 2020, then in temporary private rented accommodation.
Bernadette	Woman, 50s, White british	Hostel.
Outreach nurses and hostel staff		
	Gender	Role
S8	Woman	Specialist outreach nurse
S9	Woman	Specialist outreach nurse
S10	Woman	Hostel manager

beginning just to see if we had it, the whole building got swabbed and that, and everyone was alright" (Jackie).

A core part of the UK COVID-19 response was the introduction of a smart phone application, run by the *National Health Service*, that would enable contact tracing, by alerting people when they had been near people with COVID-19. None of our respondents reported using it, and when it was discussed people either did not know about it, did not understand it, their phone would not support the app, or they did not trust the technology. An outlier is of people collectively agreeing to not use the government endorsed 'app':

> we count as one household [hostel of approx. 50] and of course they're all going in and out and stuff, and all it needs is one of them to actually have had a contact, not to actually have had COVID but to actually had a contact with someone with COVID, that means all of us would actually have to [quarantine], so all of us made a collective decision that none of us are going to get the NHS app, that way, you know, we, that way, no app, no problems. (Chris)

An effort to avoid the NHS app and so quarantine could then extend to avoiding testing, as widely reported in the UK, especially for those on low incomes (Tapper, 2021).

In summary, the experiences of COVID-19 infection reported to us conforms to the statistics described in the introduction, of infections and deaths within the community being low or lower than expected. A theme of there being potentially lower than expected infections is though complicated by potential challenges or limits in COVID-19 testing access and uptake.

4.2. Community experiences and perspectives of COVID-19 prevention and management

Analysis of accounts to explore why infections had been lower than expected produced three themes: following, creating and breaking the rules; social distancing or social exclusion; and street immunity.

4.2.1. Following, creating and breaking the rules

Common across the data were accounts of people carefully adhering to official guidance on social distancing and hygiene:

> I just do it my way, I keep meself to meself, I stay in me room, I go out to cook something or I go out and have a shower, that's probably the furthest I go, if not then it'll be outside in the garden to empty the bin, as soon as I've emptied the bin and whatever it's straight back in, hands washed, sanitised because germs, bacteria, spreads everywhere … like OCD. (Dave)

Other respondents also described washing their hands often, staying in their rooms to keep distance from other residents, or at least staying indoors. Managing distance in a hostel could though be challenging: *"if I go along the corridor and I see a person coming the opposite direction I'll either stop or I move on quickly to get away"* (Henry).

There were more isolated accounts of people describing what seemed to be their own creative steps to control hygiene and social distancing: *"you just have to really keep in your own little corner and I just stay in my room. And what I've started doing was, I started making sure all the banisters and all the door handles [in the hostel] have been disinfected every night." (Jackie)*. Such efforts by residents to support disinfection measures were also listed in widely available guidance to hostels, which could have influenced Jackie's initiative (Beale, 2020). Other strategies included using shared kitchens late at night to avoid other residents and sourcing free facemasks from hospitals.

Narratives of determined efforts to manage COVID-19 risk could reflect a desirability bias, whether owing to past contact with the

research team, or through knowledge of the public health and medical school grounding of some of the research team. Some accounts displayed both public and more private accounts. Dave, as above, first says "*I've always kept me distance, I've always wore me mask and stuff like that and I've always washed me hands*", but later "*it's very hard as well because you just slip out of that cycle … fist bump whatever, hug whatever, but you didn't realise until after you've done it*"; an initial assurance giving way to a more complex account shaped by context. Bias may also be displayed when complaining of others who did not follow rules, and so demonstrating one's own separation from these behaviours: *"the guy next door to me, the guy above me and all that cause they're just like … well they basically lost the plot, they're not getting the message"* (Jim). An alternative interpretation of such complaints is of different understandings of what is appropriate social distancing. Others directly described breaking rules, and so indicating any desirability bias was not universal. *"I know some close, some friends who are not infected, I feel they're not infected and then I stay close to them" (*Raj).

There were accounts from within hostels of people not wearing masks or bringing in visitors despite bans. Not following rules – self-reported, and by others – was often linked to drug and alcohol use: *"the majority of people in here [hostel] don't wear them [masks], as I said, they drink you know."* (Peter). Here breaking the rules is described as coming from necessity: "*if they have an addiction to alcohol they can't just say 'well I'm just not going to drink anymore' it doesn't work like that"* (S7, hostel worker) and "*I mean if there's three or four of you and you're sharing a bottle of cider you're not going to be sat 2 m apart.*" (Leon). Leon, who had lived in an '*everyone in*' hotel briefly, continued to meet-up and drink with his friends daily, an experience described by an outreach worker: "*this [COVID] is the least of their worries*" and "*a lot of drugs are there … and it's easy for them to beg with you know a high foot traffic from commuters to get the drugs, so we see encampments of clients who you know, I wouldn't say are socially distancing, they're sharing needles, they're sharing tents you know so there's no social distancing there.*" (S5, outreach worker). Whilst data here principally focused on breaking the rules from necessity and that mainly linked to drugs and alcohol, there were also reports of breaking the rules grounded in other logics, of either misunderstanding guidance or of considering it not applying to them: "*some people or my friends like wouldn't see me for a long time they come and hug me and they said they don't care about virus"* (Raj).

Following, creating and breaking rules came in the context of various efforts to change hostel environments to aid social distancing: "*no visitors allowed in this building for the last six months, and from September it was when we go out just wear a mask, and you can't make any contact even in the corridor, and you just get the food and go straight up to your room and eat in your room" (Henry)*. Hostel staff also described efforts to source face masks for residents, and change staff rotas and work routines to minimise social contact (Story & Hayward, 2020).

4.2.2. Social distancing or social exclusion

Social distancing for some was also described as a long-running feature of their lives in terms of having little social contact, pre-dating COVID-19, and so helping them to prevent COVID-19. As Jim describes: "*I'm pretty good at keeping my own company. Well you see I've had osteoporosis for the last … years so … but a lot of the time I was bed ridden anyway so that's been going on for years, so I'm pretty much used to self-isolating anyway"*. For Jane mental ill-health has generated her long-standing isolation: *"I tend to just keep in my room and actually that's mainly to do with my OCD rather than the COVID itself*"; generally Jane described themselves as a 'loner', even if they would go to day centres to be around people before the pandemic. Such direct descriptions of COVID-19 prevention borne of social exclusion were rare from our respondents who were homeless, but it was more common for long-running limits on social networks to figure in peoples' accounts and so hint at how this social exclusion may be a factor. Of the 12 respondents who described their social networks, half indicated they were in contact with some friends and/or family, and the other half described social isolation: being a 'solo person', not having any good friends, and losing friends from being homeless, and these experiences originating before the COVID-19 pandemic.

Several stakeholders offered the same theory as that described by Jim and Jane: "*I think there's that natural social isolation that being homeless has given this client group*" (S2, outreach worker), with people having "*social bubbles*" that *"are really, really tiny*" and *"that's kind of what we've related it to [low infections], the kind of social exclusion side of things"* (S10, hostel worker). Others elaborated on this theory:

> they're quite a socially isolated group anyway, and they're probably just not in situations where they're being exposed to COVID-19, potentially, would be more my theory. You know, they're not, they weren't getting on trains to commute to work, or sitting in an office, or going to big family parties around at someone's house (S8, outreach nurse)

Further, people who are homeless are "probably mixing with themselves" and not in other areas of public life. These limited social networks were related to situations of drug and alcohol use: "*you know people share needles, they will share their drugs, they will share their alcohol, but I think that people stick within the same circles from what I understand, like people know each other but you'd usually quite often find the same group of people together*" and from this limiting of social contact to other people with the same experience we might explain lower than expected infections (S1, outreach worker). Social, economic and spatial isolation then potentially act to reduce COVID-19 risk through enabling a particular form and experience of social distancing.

4.2.3. Street immunity

Another explanation offered for low infections, overlapping with the above, was of COVID-19 prevention borne from peoples' experiences of homelessness and how this may have impacted on their immune systems. This was related to people in hotels or hostels, but also those rough sleeping. As Leon says: *"for some reason it's not affecting us and I don't know whether it's … if we just naturally have antibodies against it"*). A specific mechanism was suggested by Jackie:

> I was actually quite surprised nobody in here got it [COVID-19], but then I think, the thing is, we've been exposed to so many elements and so like living on the streets and stuff, maybe our immune system is a little bit stronger.

This idea was echoed by stakeholders with views such as this: *"one sort of lay person's view is that you know these guys have been exposed to so much shit in their life they're probably quite robust, they find it … they've probably got immune systems that have seen it all you know"* (S2, outreach worker). Whilst strengthened immune systems resulting from long-running exposure to pathogens figured in some accounts – and such co-infection has been hypothesised to protect against COVID-19 amongst people experiencing homelessness (Maguire, 2020) and similar explanations offered for children (Ng et al., 2020) – for others it was a mechanism of 'resilience' from being 'in the open air' (S3, outreach worker). Here then an overlap to the theme above of social isolation, with time in the open air itself potentially protective (S1, outreach worker), and so exclusion from settings where there might be risk of air borne transmission (Greenhalgh et al., 2021).

A direct reading of these accounts indicating immunity or protection from rough sleeping needs caution, partly for the plausibility of any biological mechanism, and also for how a potential 'street immunity' allows for a desirable identity of vitality – a resource not commonly available to people experiencing homelessness. Notions of people as 'immune', 'robust' and 'resilient' could instead account for a normalisation of pain given contexts of stigma and limited health care access (Harris, 2020). Such an interpretation arose from an interview with a hostel worker after we speculated on an emerging theory of 'street immunity' resulting from exposure to pathogens. After their initial response

– "*It is something I've considered*" – they segued in to a related line of argument:

> S7 - you see some of the people that are coming in and you know when they end up going to get health checks and you're like 'how has this person not ended up in hospital before they came here, how were they not found on the streets dead?' and it turns out that they've had an illness going on for years … and they're isolated and they're not accessing these services and they're carrying on and it's always amazed me … and you just don't understand how they've managed to survive that long, and I do wonder if perhaps that has had an impact on their immune systems and their ability to you know be able to fight these things as it were in a way and ... you know.
>
> Int: I think also kind of interesting, what you're saying is, it's almost like it might be immunity or it might just be people just basically can … are used to withstanding an enormous amount of pain.
>
> S7 - An enormous amount of pain yeah. (S7, hostel worker)

Rather than an active immune system, it might instead be an experience of being 'numb' (S7, hostel worker) given so much suffering and limited access to health care. The suffering from mild to moderate COVID-19 may for some be indistinguishable from other ongoing pain, and not form part of processes of care access, and so further echo an overarching theme of social exclusion as shaping experiences of COVID-19.

5. Discussion

This exploration of community experiences and perspectives has identified three themes to describe processes that may explain the lower than expected rates of COVID-19 amongst people who are homeless: following, creating and breaking rules, as well as social exclusion and street immunity. The analysis suggests a range of sometimes contradictory themes that point to factors that could both help explain lower than expected COVID-19 infections in terms of limited testing access and uptake, but also in how COVID-19 infections were prevented. We discuss these themes and raise questions for future exploration.

The potentially important role for people experiencing homelessness in following and initiating COVID-19 restrictions follows insights from past pandemics where affected and marginalised communities have initiated locally relevant responses (Friedman et al., 2007). This theme in the data is reminder of the agency of communities facing severe stigma and marginalisation. In distinction from the theory that framed our exploration of this topic (Friedman et al., 2007), we heard reports of expression of agency amongst those we interviewed, but not indications of community or network organisation; i.e. data did not indicate coordinated efforts to involve others in particular preventative actions or spread certain messages such as with the early stages of the HIV epidemic and drug use messaging. Such differences could reflect the rapid emergence of the pandemic, the limits on social mobility undermining capacities for social organisation, as well as long-running limits on the resources and capacities by which groups of people who are homeless may take self-directed action. The actions described to us do though emphasise the role for community engagement (Kinsman & Funk, 2020) in coproducing pandemic responses. Investigation is needed to understand how this agency can be best enabled, and in particular how community action can enable structural interventions (Sweat & O'Reilly, 2013). Specific exploration is needed of the role of community agency in realising the potential of structural level hostel and hotel level measures, and then what the effects are of any fatigue over time in diminishing adherence to necessary measures. Further study, and recognition of the role for this agency, is important to counter discourses of people experiencing homelessness as 'risk' to the rest of society (Selsky, 2020) and further highlight the agency and active role for people experiencing homelessness in protecting their own health and that of others.

The themes of social exclusion and street immunity could be interpreted as suggesting that longer-running exclusion from care could limit testing uptake, and so explain lower than expected infections as a consequence of them not being detected. The experience of structural violence, and the widely reported exclusion from health care that many face (Elwell-Sutton, Fok, Albanese, Mathie, & Holland, 2017), has been previously described as leading to a normalisation of pain and corresponding absence of care-seeking (Harris, 2020). This phenomena – narrated as 'street immunity' - could help explain experiences from France where of people who were homeless surveyed and who tested seropositive for COVID-19, two thirds did not report symptoms (2021). Social exclusion and a corresponding absence of caring social support networks could also undermine capacities for accessing COVID-19 testing and treatment, given the increasing recognition of the role of social capital in pandemic responses (Oronce & Tsugawa, 2021).

The themes of social exclusion and 'street immunity' could also though suggest long-running exclusion and structural violence (Rhodes et al., 2012) may have, perversely, contributed to preventing infections. The patterns of economic, social and spatial isolation in the UK that can result from particular experiences of prevailing stigma; limited, punitive or underfunded services; criminalised drug use, and a distorted housing system (Gallent, 2019; Harris, 2020; Johnsen, Cloke, & May 2005; Loopstra et al., 2016; Moran & Atheron, 2019; Thompson, Guise, Edgar, Solley, & Burrows, 2020). In combination, these processes may have generated living conditions and experiences that limited exposure to COVID-19. Additionally, the narrative of 'street immunity' would reflect how these conditions may have challenged immune systems to generate a response to COVID-19. Caution is needed in hypothesising specific immunological effect. However, the mechanisms described could help explain lower rates of infection amongst those homeless and unsheltered, as reported by Yoon et al. (2020), whether through enhanced immunity in response to exposure to pathogens, or the role of being in the open air.

Identifying a potential role for social exclusion in COVID-19 prevention or in undermining testing access needs further scrutiny. If social exclusion is found to generate COVID-19 this would pose challenging questions for public health. Not least for how any prevention effect being grounded in such harsh experiences comes at significant risk for other health challenges (Yoon et al., 2020) and severe indirect effects of COVID-19 are then more likely (Bambra, Riordan, Ford, & Matthews, 2020). Future analysis should explore these different experiences of homelessness, structural violence and COVID-19 and relate them further to their specific contexts and histories, such as particular long-running dynamics of housing in Ireland (O'Sullivan, 2020) or income generating strategies amidst specific drug markets in the USA (Bourgois, 1998). Variation in COVID-19 epidemiology across settings internationally should also include comparative analyses of the structural conditions and histories involved in creating particular experiences of exclusion (Hopper, 2003; Wacquant, 2008). Recognising the potential role for long-running social exclusion in preventing COVID-19 must be the basis for ensuring future protection derives from different sources: of being housed and included in society.

Recognising the potential role for agency, social exclusion and street immunity in limiting COVID-19 amongst people who are homeless provides novel insights for international debates seeking to understand the contributions of different interventions for people experiencing exclusion (O'Carroll et al., 2021). As above, the '*everyone in*' housing interventions along with the hostel level interventions in the UK have been prominent in explanations of low infections (GLA, 2021; NAO, 2021); the importance of '*everyone in*' underlined by how this scheme was not given more funding in early 2021 whilst the UK experienced a severe second wave of the pandemic, including with reported rises in infections amongst people experiencing homelessness (Hayward & Story, 2021). The analysis here is an important adjunct to recognition of '*everyone in*' and the hostel level measures, through showing how this must be considered alongside other factors, and how they may combine. Such combined effects could include '*everyone in*' being partially enabled through processes described here;

that hotels reduced numbers of those most vulnerable in some hostels, with community agency and social exclusion then acting to reinforce prevention in hostels; and – for people continuing to sleep rough – that their own agency, social exclusion and possible 'street immunity' may have been more influential. As above, ongoing analysis needs to explore more the variation according to different experiences of homelessness (O'Sullivan, 2020; Yoon et al., 2020).

Studying the complexity of causality of COVID-19 prevention in the UK, as elsewhere, is essential to respond to a particular danger of a narrative of COVID-19 prevention success overly focused on single interventions to the neglect of long-running structural dynamics. Whilst '*everyone in*' and hostel level measures were radical and remarkable and with large impact, a narrow focus on provision of hotel rooms risks depoliticising homelessness (Elwood & Lawson, 2017) by ignoring the long-running factors in the UK homelessness crisis (Fitzpatrick, Bramley, & Johnsen, 2012; Gallent, 2019) that an exploration of social exclusion and 'street immunity' bring to the fore. Indeed, any congratulations offered to the current UK government for '*everyone in*' comes in the context of recent and rapid rises in homelessness that can be linked to specific government policy changes (BMA, 2019; Loopstra et al., 2016), and continuing inaction on the fundamental causes of the UK housing crisis (Gallent, 2019). Such depoliticization of homelessness is evident in similar debates, where housing first - an intervention approach centred on provision of housing with support and without conditions – is increasingly being promoted across the policy sector, but in ways that ignore the complexities of this intervention and that also serve interests seeking to forestall action on the housing supply and costs (Pleace, 2021). Uncritical reflection on low COVID-19 infections and the role of emergency interventions – as we are arguably now seeing with housing first - could then distract from action on the long-term challenges of housing, health and welfare policies and their role in inequalities.

Findings of social exclusion potentially limiting COVID-19 suggest further dynamics through which COVID-19 and socio-economic status combine. As described in the introduction, the theory of fundamental causes and stages of disease theory suggests lower socio-economic status is linked to the emergence of COVID-19 inequalities after an initial period of higher infections amongst those of higher socio-economic status, as people of lower socio-economic status are unable to access or deploy resources or protective strategies, and these experiences building on long-running ill-health (Clouston et al., 2020). The findings here can help develop this theory. Whilst emergency housing interventions have shaped the pandemic dynamics for some groups in the UK, for others extreme social exclusion, as well as 'street immunity' and contexts for it, may be more dominant. Extremes of low socio-economic status – being unhoused and impoverished, as well as marginalised by drug use – could provide various routes of protection, and so may prevent or create further delays, perhaps lengthy, in the emergence of COVID-19 inequalities. However, whilst inequalities in COVID-19 infections and deaths may not emerge at the start of the pandemic, it is likely that inequalities in the indirect effects of COVID-19, and in particular the effects of lock-down policies could be far higher for these especially excluded groups. Further analysis is needed to disaggregate different experiences of low socio-economic status, and how these relate to direct and indirect inequalities relating to COVID-19. Recognising these multiple dynamics of health inequalities and COVID-19, and other infectious disease pandemics, could help in planning the timing and sequencing of interventions. Specifically, if extremes of socio-economic exclusion do lead to delays in COVID-19 inequalities it suggests the need for COVID-19 support to be sustained well beyond an initial emergency period and any wave of infections amongst the general population; further, any support measures should also priorities protecting against indirect effects of COVID-19, through for example ensuring access to money and income.

The qualitative design and social distancing for data collection necessitate caution in interpreting and generalising findings. The sample is also not representative of all experiences of homelessness. However, the repeated interviews and triangulation from different sources allowed insight into a little explored set of experiences. Further study to establish the role of the factors suggested is essential.

6. Conclusions

In conclusion, this analysis provides theories that should be tested further for their contribution to COVID-19 epidemiological understanding and the role of pre-existing health inequalities. Lower than feared COVID-19 infections amongst people who are homeless could be explained by how community agency, social exclusion and processes of 'street immunity' interacted with emergency housing interventions. While social exclusion and 'street immunity' may have given some protection against COVID-19, the entrenched health and social inequalities involved should still be addressed. Understanding how these factors, in combination with emergency housing, contributed to the reduced transmission of COVID-19 will increase our understanding of the epidemiology of the virus to inform public health interventions.

Contributions

AG, MC, MB, MC, PA, SR, LP - study conceptualisation; AG, SB, MC, PA - data collection; AG, SB and PA - data curation; AG, PA and PH - formal analysis; AG, MC, MB, MC, PA, SR, LP, PH - analysis discussion; AG – writing original draft; MC, MB, MC, PA, SR, LP, PH - writing, review and editing.

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Ethics statement

The After the Lockdown study was approved by King's College London's ethics committee (HR-19/20–20112) and the Homeless Health Peer Advocacy evaluation by Dulwich Research Ethics Committee (IRAS project ID 271312). All participants gave informed consent. All names used in the manuscript are pseudonyms.

Declaration of competing interest

None.

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