Contributing factors and mitigation strategies for enduring COVID-19 prevalence

Report 2 – Barriers and facilitators to local strategies

Prepared for
The PROTECT COVID-19 National Core Study on transmission and environment

PROTECT-05 (2022)
National Core Study Report

Prepared 2022

First published 2022

The PROTECT COVID-19 National Core Study on transmission and environment is a UK-wide research programme improving our understanding of how SARS-CoV-2 (the virus that causes COVID-19) is transmitted from person to person, and how this varies in different settings and environments. This improved understanding is enabling more effective measures to reduce transmission – saving lives and getting society back towards 'normal'.

This report examines the mitigation strategies implemented by Directors of Public Health across England during the course of the pandemic. UK local authorities that experience sustained high levels of COVID-19 are termed areas of enduring prevalence (AEP) according to UK Scientific Advisory Group for Emergencies (SAGE) in 2021. Semi-structured interviews with 19 Directors of Public Health across England were conducted. Nine of the 19 interviews were in areas identified as areas of enduring prevalence by UKHSA (formerly Public Health England) and ten were included as comparison areas that had not experienced enduring prevalence up until the time of data collection.

The researchers found no major differences in strategies used by Directors of Public Health between the areas of high enduring prevalence and other local authorities. Other than differences in structural indicators such as levels of deprivation, there were no major differences between areas of enduring prevalence and comparison areas in barriers and facilitators of COVID-19 control. A number of barriers to reducing COVID-19 transmission were identified, along with a broad range of local and national mitigation strategies. Differences in implemented mitigation strategies do not appear to explain the differences in prevalence between areas. More research is needed to understand the effectiveness of mitigation strategies.

This report and the research it describes were funded by the PROTECT COVID-19 National Core Study on transmission and environment, which is managed by the Health and Safety Executive (HSE) on behalf of HM Government. Its contents, including any opinions and/or conclusions expressed, are those of the authors alone and do not necessarily reflect UK Government or HSE policy.

Acknowledgements

We would like to thank all the individuals and organisations who were involved in the research, especially the Directors of Public Health who took part in the interviews, Professor Richard Amlot (UK Health Security Agency) and Dr Atiya Kamal (Birmingham City University) for editing the reports, and Vicky Turner and Helen Kreissl for providing administrative support with the research.

Contributing factors and mitigation strategies for enduring COVID-19 prevalence

Report 2 – Barriers and facilitators to local strategies used to control COVID-19 transmission

Dr. Angelique Hartwig[1], Professor Sheena Johnson[1,2], Catherine Lewis[3,] Dr. Anna Coleman[2], Dr. Nicola Gartland[2], Janet Ubido[2], Dr. Amit Gaokar[4], Professor Chris Armitage[5], Professor David Fishwick[3,6], Professor Arpana Verma[2,] Professor Martie van Tongeren[2,3].

[1] Alliance Manchester Business School, University of Manchester
[2] Centre for Occupational and Environmental Health and Thomas Ashton Institute, School of Health Sciences, University of Manchester
[3] Division of Population Health, Health Services Research & Primary Care
[4] Rochdale Borough Council
[5]Division of Psychology and Mental Health, University of Manchester
[6] Health and Safety Executive (HSE)

Abstract

Background

Variations in enduring prevalence of COVID-19 have been identified, and several local UK authority areas have experienced sustained high levels of the virus. This report (Report 2) examines the mitigation strategies implemented by Directors of Public Health across England during the course of the pandemic. A companion report (Report 1) examines key drivers of prevalence, and variations between local authority areas.

Methods

Semi-structured interviews with 19 Directors of Public Health across England were conducted between July and November 2021. Nine of the 19 interviews were in areas identified as areas of enduring prevalence by Public Health England (PHE; Gov.uk, 2021; SAGE, 2021) and ten were included as comparison areas that had not experienced enduring prevalence up until the time of data collection. Directors of Public Health were asked about barriers to reducing transmission as well as the effectiveness of local and national mitigation strategies.

Results

Directors of Public Health and their teams implemented a variety of mitigation strategies over the course of the pandemic including local contact tracing, testing and vaccination efforts, isolation support, communication campaigns, engagement with communities, business, and education. However, we found no major differences in strategies used by Directors of Public Health between the areas of high enduring prevalence and other local authorities. Other than differences in structural indicators such as levels of deprivation, which are discussed in more detail in Report 1, there were no major differences between areas of enduring prevalence and comparison areas in barriers and facilitators of COVID-19 control.

Conclusion

A number of barriers to reducing COVID-19 transmission were identified, along with a broad range of local and national mitigation strategies. Differences in implemented mitigation strategies do not appear to explain the differences in prevalence between areas. Participants asserted that more research is needed to understand the effectiveness of mitigation strategies.

Executive summary

Introduction

UK local authorities that experience sustained high levels of COVID-19 are termed areas of enduring prevalence (AEP) according to the UK Scientific Advisory Group for Emergencies (SAGE, 2021). This research aimed to gain expert views and insight into what factors contributed to enduring prevalence of COVID-19 infections and what local level strategies were effective in preventing or reducing transmission rates in areas that saw consistently high prevalence of COVID-19 infections across local authorities in England. The research explored how the local response was facilitated or hindered by local level factors as well as national strategies or guidance.

Report 1 described the key differences between the AEP and comparison group local authorities in terms of indicators such as housing and employment. This report (Report 2) explores which national and local level barriers have been responsible for the enduring prevalence of COVID-19 infection in certain geographic areas, what local and national level strategies, policies and guidance have been effective in reducing transmission, and identifies future research priorities that support continual improvement in local practice and decision-making relating to COVID-19.

Methods

Semi-structured interviews were conducted with 19 Directors of Public Health (DsPH) across England in areas of enduring prevalence and of lower prevalence. Local authorities have been anonymised for the purpose of this report. DsPH in nine areas of the 11 local authorities identified as areas of enduring prevalence (AEP) (Gov.uk, 2021; SAGE, 2021) agreed to take part in the research along with DsPH in ten comparison areas (CA). CA were selected according to recommendations by Public Health England (PHE) and the Association of DsPH (ADPH). For two AEP, statistical neighbours with low prevalence were identified and these were also included as CA. Statistical neighbours are defined as those that are similar in terms of levels of deprivation, whether urban or rural, and on populations of young, old, and ethnic minorities (PHE, 2019).

All the interviews were around an hour in length and included 15 questions. The interview schedule was devised based on existing literature and in collaboration with the project steering group (details on inside front cover), PHE and the ADPH. The interviews were conducted online via Zoom or TEAMS by two researchers who were experienced in qualitative research methods, between June and November 2021. The interviews were coded using NVivo, with a coding framework that was guided by the literature review, and by the research questions and the topics that were raised by the participants during the interviews.

Results

Participants discussed local level barriers to reducing transmission including residents' hesitancy to get tested, vaccinated or to self-isolate. Participants identified a number of reasons for this, including competing priorities such as financial barriers or conflict with other responsibilities. Other barriers to reducing transmission that were identified at the point of data collection included restrictions around data sharing and delays in accessing data, as well as changes and inconsistencies in national messaging. Participants implemented a variety of mitigation strategies over the course of the pandemic including local contact tracing, testing and vaccination efforts, isolation support, communication campaigns, engagement with business and education, and community engagement. They discussed working closely with local partners including clinical commissioning groups and primary care networks, and with regional networks including PHE, to facilitate a system wide approach to

transmission control. Participants also discussed the impact of national strategies including local and national lockdowns and the vaccination programme. However, as interventions were implemented at pace, evaluation of strategies was sometimes limited.

There were no major differences between AEP and CA in barriers and facilitators of COVID-19 control. Most of the DsPH across areas of varying prevalence discussed using the local and national level facilitators, as well as the impact of the local and national level barriers.

Conclusion

A number of barriers to reducing COVID-19 transmission were identified, including people's hesitancy to get tested, vaccinated or to self-isolate, delays in access to data, as well as structural barriers including the impacts of deprivation. Apart from differences in structural barriers, which are discussed in Report 1, no major differences in barriers were identified between the AEP and CA. Participants also discussed a broad range of local and national mitigation strategies, including local contact tracing, communication campaigns, community engagement and provision of accessible vaccination sites, as well as national mitigation strategies including the vaccination programme, and the importance of alignment between local and national strategies. Differences in implemented mitigation strategies do not appear to explain the differences in prevalence between areas. Participants asserted that more research is needed to understand the effectiveness of mitigation strategies.

Recommendations

As part of the interviews, the DsPH were asked what future research would be of benefit for them to facilitate an effective local response in the future. Many of them wished to see a better evidence base for local interventions and associated messaging which could be used to shape future interventions. Also, there was consensus that more research was needed to understand more deeply community needs, attitudes, and beliefs with regards to COVID-19 to tailor future messaging and mitigation efforts. Finally, the long-term impact of the pandemic was of interest to the respondents, including impact on individual health, visibility of enduring health inequalities, as well as the wider system for recovery.
Based on feedback from respondents and the analysis of data, a number of recommendations were developed, to build long-term resources to prevent / combat future pandemics or health crises. DsPH experiences of the pandemic provide an important opportunity to reflect on effective strategies for a local response. Better alignment of national and local responses may be needed to create consistency and build a system wide approach to reducing transmission. Improving the partnership between national and local leaders may help in ensuring that strategies are effective, tailored to local demands and more trusted by the public. Recommendations include:

Utilising local existing intelligence and infrastructure for local outbreak management.

Given the heterogeneity of local authorities and communities, the DsPH advocated building a local knowledge base and infrastructure that can be used for local outbreak management. The flexibility to locally adapt strategies was deemed important for effective transmission control.

Building on partnerships/networks established during the pandemic.

The local and regional partnerships established over the course of the pandemic were key to shaping the local response and should be widened to build support networks for emerging public health concerns or threats.

Addressing modifiable risk factors for the enduring prevalence of COVID-19

Consider actions that can be taken to tackle modifiable risk factors for the enduring prevalence of COVID-19, such as addressing differences in people's capabilities, opportunities, motivations and behaviours in response to vaccination and government

guideline engagement in the short term. In the longer term, issues to address include house occupancy, nature of work and housing standards.

Providing long-term investment in public health.

Local interventions to reduce transmission would have not been possible without funding which the public health team could allocate to outbreak control. However, many DsPH raised concerns about the uncertainty around future funding and expressed that long-term investment is needed to further build and preserve their capabilities to locally manage future health crises.

Evaluation of intervention effectiveness.

More formal evaluations of evolving packages of interventions over time may be helpful to build a knowledge base of effective interventions and to inform future strategies. Evaluating interventions across different local authorities may also highlight some of the contextual factors shaping the success of local strategies.

Preserving and improving data access.

Access to granular local level data was important for developing appropriate local interventions. At the time of data collection there were some gaps in the available data that some DsPH would like to see closed (e.g., more detailed data on vaccination status). In addition, changes to data sharing agreements were feared by some respondents to threaten future capabilities to organise local outbreak control strategies. Thus, preserving and extending the current data access level would help to further build resources for a local response.

Building and improving ‘soft’ intelligence.

The importance of ‘soft’ information gained from community engagement with community champions, etc. was highlighted. Building / improving the infrastructures and processes for this within with Local Authorities will support the understanding of influences on transmission rate trends and be an important part of future pandemic preparedness/resilience.

Contents

This work was supported by funding from the PROTECT COVID-19 National Core Study on transmission and environment, managed by the Health and Safety Executive on behalf of HM Government,

1. Main Report

List of abbreviations

ADPH:	Association of Directors of Public Health,	**LAs:**	Local authorities
AEP:	Association of Directors of Public Health,	**PHE:**	Public Health England
CA:	Comparison area	**SAGE:**	Scientific Advisory Group for Emergencies
COMF:	Contain Outbreak Management Fund	**UKHSA:**	UK Health Security Agency
DsPH:	Directors of Public Health		

2. Introduction

Aims

This research aimed to gain expert views and insight into what factors contributed to enduring prevalence of COVID-19 infections and what local level strategies were effective in preventing or reducing transmission rates in areas that saw consistently high prevalence of COVID-19 infections across local authorities in England. We gathered views from Directors of Public Health (DsPH) who could share their knowledge and experience at the local authority level to discuss potential reasons for enduring prevalence in particular regions, and strategies for reducing rates of COVID-19 at a local level. The research explored how the local response was facilitated or hindered by local level factors as well as national strategies or guidance. Report 1describes the key differences between the AEP and comparison group local authorities in terms of indicators such as housing and employment. This report (Report 2) focusses on exploring the following aims:

(1) which national and local level barriers contributed to the enduring prevalence of COVID-19 infection in certain geographic areas;

(2) which local and national level strategies, policies and guidance have been effective in reducing transmission;

(3) what are future research priorities that support continual improvement in local practice and decision-making relating to COVID-19.

Literature

In April 2021, SAGE published a report to summarise the best available evidence at the time regarding areas of enduring prevalence (SAGE, 2021). This report set out to look at risk factors linked to enduring increased SARS-CoV-2 prevalence in England and to identify new at-risk areas, rates of change in existing areas of enduring prevalence and assess how effective interventions might be developed. It was suggested that research at a granular level would inform the development of interventions, which might include workplace interventions and financial support for self-isolation. The importance of local experience and interventions was heavily stressed in this SAGE report.

Bambara et al. (2020) suggest that historically, pandemics have been experienced unequally with higher rates of infection and mortality among the most disadvantaged communities especially in more socially unequal countries. Emerging evidence from a variety of countries suggests that these inequalities are being mirrored by the COVID-19 pandemic. According to the authors, both historically and now, these inequalities have emerged through the 'syndemic' nature of COVID-19, in that it interacts with and exacerbates existing social inequalities in chronic disease and the social determinants of health. Factors highlighted include existing chronic disease, ethnicity, housing, work conditions and access to healthcare, which together produce unequal experiences of the pandemic between communities.

National and local government bodies have recognised these factors relating to individual risk, and suggested that structural issues linked to age, gender, ethnicity, occupation and geography have exacerbated impacts of COVID-19 on certain communities (Local Government Association, 2021a; Public Health England, 2020). Other issues include differences in people's capabilities, opportunities, motivations and behaviours. Armitage et al (2021) pointed out that some groups, such as people from ethnic minority backgrounds, men and younger people may need additional support to adhere to guidelines (Armitage et al, 2021).

Vaccination rates affect local transmission, and vaccination status has been shown to effect household transmission (Singanayagam et al., 2021). Monitoring of vaccine roll out has been done in near-real time in the OpenSAFELY project (The OpenSAFELY Collaborative et al., 2021), which aimed to describe trends and variation in coverage by geographic area and between key clinical and demographic patient groups. The research has shown substantial divergence in vaccination by ethnicity and across rankings of deprivation, and the authors concluded that reasons for variation in vaccination coverage between groups and regions were complex.

The Government's autumn/winter plan for COVID-19 (Cabinet Office, 2021) recognised the emergence of areas of enduring transmission, and outlined a range of measures to facilitate the management of enduring transmission at a local level:

- The Contain Outbreak Management Fund (COMF) was designed to help local authorities tackle enduring transmission, by supporting 'testing, non-financial support for self-isolation, support to particular groups, communications and engagement, compliance and enforcement'. This fund will finish by the end of March 2022;
- A new financial support package to tackle this issue. Initially, this has been enacted in 5 locations. This will be further rolled out to other areas following this pilot scheme;
- Availability of regional UKHSA Health Protection Teams, which include experts in communicable disease control, epidemiology, outbreak management. These teams are placed to provide local DsPH with specialised public health advice to inform local responses;
- Targeted community testing, which provides local delivery of asymptomatic testing to disproportionately impacted and under-served groups. Decisions on the targeting determined by local priorities.

The UK Health Security Agency (UKHSA) also issued guidance for areas of enduring transmission, and highlighted contributory factors which could be tackled including access to testing and vaccines, support for workplaces, and public health workforce capacity (UK Health Security Agency, 2021). This guidance emphasised the need for local approaches, stating that local insight was needed in order to develop culturally appropriate action to support residents from groups who had been disproportionately affected by the pandemic. The need for local approaches to engage communities in managing transmission, not just in areas of enduring prevalence, has also been stated by SAGE. They recommended the

development of a Community Champions scheme to provide support tailored to the needs of the community and the resources available (SAGE, 2020).
There are many examples of good practice by local authorities to counteract the problems of enduring prevalence, such as councils undertaking work to address the challenges brought by COVID-19, pooling of resources in the local government sector, and responding to new problems with innovative solutions, as well as recovery and renewal. The Local Government Association (LGA) has published case studies of good council practice that include behavioural, vaccination, testing strategies, and local test and trace (Local Government Association, 2021b). Research from The King's Fund has also explored the roles of DsPH during the pandemic, and how they have been instrumental in the local public health response (The King's Fund, 2021).

Background

Areas of Enduring Prevalence (AEP)

- The England map in Figure 1 shows the number of days in the 12 months since 1st March 2020 that each local authority has spent in the epidemic phase. The epidemic phase is characterised by a greater mean number of daily cases, higher variability, and a stronger correlation between case numbers across consecutive days. A local authority is assumed to be in the epidemic phase if the probability of epidemic exceeds 0.75 (Gov.uk, 2021)

- The local authorities selected for this study, as AEP, are those with the highest number of days spent in the epidemic phase for 12 months from 1/3/20.

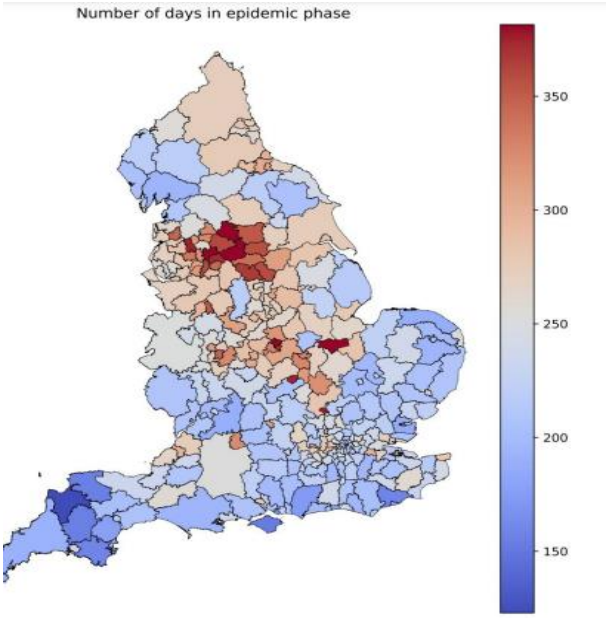


Figure 1: Areas of enduring prevalence (Gov.uk, 2021; SAGE, 2021).

3. Methods

Semi-structured interviews were conducted with 18 DsPH and one senior local authority leader in areas of enduring prevalence and of lower prevalence across England, as outlined above. Local authorities have been anonymised for the purpose of this report. DsPH in the 11 local authorities identified as areas of enduring prevalence (AEP) (Gov.uk, 2021; SAGE, 2021) were invited to take part in the research and nine agreed to take part. DsPH in ten CA also agreed to take part in the research. CA were selected according to recommendations by Public Health England (PHE) and the Association of DsPH (ADPH). For two AEP, statistical neighbours with low prevalence were identified and these were also included as CA. Statistical neighbours are defined as those that are similar in terms of levels of deprivation, whether urban or rural, and on populations of young, old, and ethnic minorities (PHE, 2019).

As shown in Figure 2 below 19 English local authorities were included in the research. This included six local authorities in the North West, three in Yorkshire and Humber, four in the East Midlands, two in London, three in the South East and one in the South West (see Appendix 1b for codes used for local authorities).

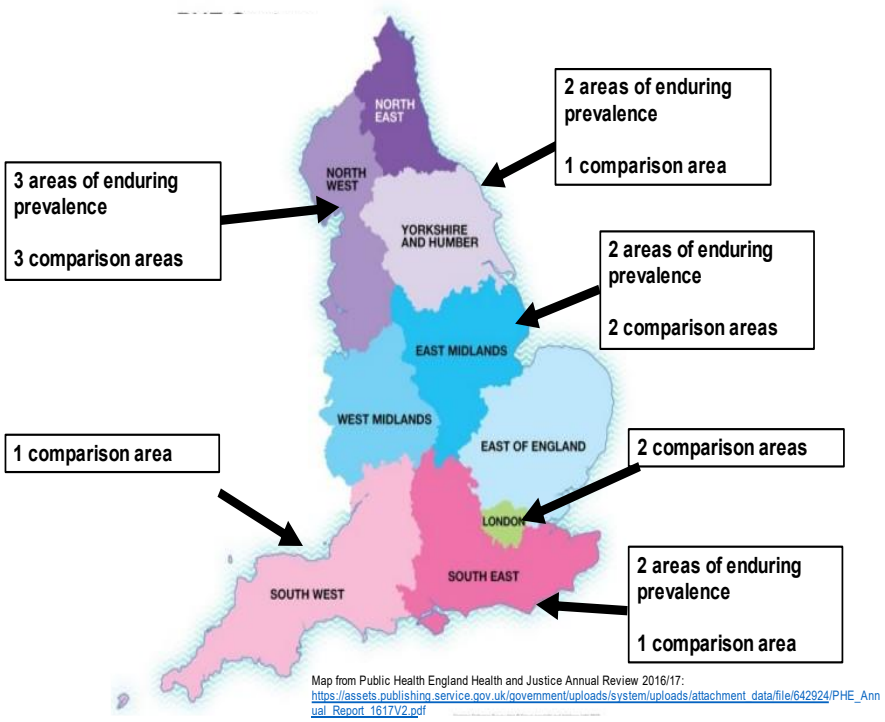


Figure 2 – Local authorities included in the research

All the interviews were around an hour in length and included 15 questions, including questions about local mitigation measures and barriers to reducing prevalence rates locally. The interview schedule was devised based on existing literature and in collaboration with the project steering group (details on inside front cover), Public Health England (PHE) and the Association of DsPH (ADPH). The interviews were conducted online via Zoom or TEAMS by two researchers who were experienced in qualitative research methods (AH and CL) between June and November 2021. The interviews were thematically analysed using an iterative coding process (Braun and Clarke, 2006). The interviews were coded using NVivo, with a coding framework that was guided by the research questions and the topics that were raised by the participants during the interviews. The codes were iteratively adapted and

restructured throughout the initial coding stage and as a result of discussions between the researchers.

To begin with, all transcripts were coded using the initial coding framework. All DsPH were asked to provide their opinion on barriers and strategies to control COVID-19 transmission locally and the initial analysis provided a broad picture of the themes that were discussed across all included local authorities. Using the codes that were generated in the initial coding phase as a framework, a comparison of similarities and differences within AEP and CA was conducted, using tabulations and counting of instances discussed by DsPH with regards to effective strategies to locally manage COVID-19 prevalence rates and the main barriers in doing so. However, no significant differences in mitigation strategies were identified across areas of varying prevalence. Therefore, this report presents a broad picture of the strategies that were employed across all included local authorities. It explores how the local response to the pandemic was facilitated or hindered by local level factors as well as national strategies or guidance.

4. Results

This section provides an overview of factors that participants identified as key drivers of enduring prevalence, and the strategies that they employed to reduce transmission rates in their local authorities as well as the facilitators and barriers to their local response. As discussed in the methods section above, other than differences in structural barriers such as variation in levels of deprivation, which are discussed in Report 1, no major differences in barriers to COVID-19 control were identified between areas of varying prevalence. Most of the DsPH across areas of varying prevalence discussed the impact of the local and national level barriers described below. Most of the DsPH also discussed using the local and national level facilitators described below. In addition, as interventions were implemented at pace, evaluation of the impact of mitigation strategies was sometimes limited. Therefore, the findings in this report, Report 2, will be presented in the form of the main themes across all included areas.

Overview of contributing factors for enduring prevalence

All DsPH were asked what they thought were contributing factors for enduring prevalence before discussing local level mitigation strategies. They mentioned various factors associated with higher, prolonged prevalence rates in different local authorities, including deprivation levels, population density, overcrowded housing, demographics (e.g., ethnicity, age), work-related factors (e.g., nature of work, type of employment) and vaccination rates. See Report 1 for detailed analysis of drivers of enduring prevalence.

Barriers to reducing transmission

Local level barriers to reducing transmission

Communication barriers

The DsPH mentioned barriers associated with designing effective communications for their communities. People may not be able to understand or may misinterpret guidance put out by local authorities. For instance, participants discussed the need to tailor messages for people with different levels of health literacy and language barriers in diverse communities. The various changes to rules and guidance -one participant said that there had been 280 changes to guidance within a year by July 2021- may have also exacerbated the issue of

consistent, clear messaging. Further, participants discussed the difficulty of designing unambiguous messages as there was a risk of "misuse of information" to support conspiratorial or racist views.

> "There is a low level of health literacy, generally, in some of those populations, associated with general levels of education. So, we had to make sure that messages were really clear, you know, you couldn't leave any kind of ambiguity." (P8, AEP)

> "You feel a huge responsibility on what you share because of the people that will misuse that information, when people fail to appreciate that it's the systemic inequalities that exist in society that have put us into this position and that have made these communities experience significant impact of COVID-19" (P2, AEP)

Some participants also discussed the issue of stigmatisation of certain population groups which have been blamed for high transmission rates. This made tailored interventions and communications directed towards specific communities very challenging and required careful consideration to circumvent additional stigmatisation.

Psychological and structural barriers to get tested, to self-isolate or vaccinate

People's hesitancy to get tested, vaccinated or to self-isolate were mentioned as common barriers to reducing transmission locally. As mentioned earlier in the report, further information about differences in barriers between AEP and CA is provided in Report 1. DsPH discussed differences in motivation for testing/self-isolation versus vaccination. The hesitancy to get tested or to self-isolate was often described as being the result of competing priorities such as financial barriers (i.e., income loss during self-isolation period), caring responsibilities or impact on social life, along with the impact of social norms and cultural or faith beliefs. Some participants also discussed the role of lacking trust in the system and national government as potential drivers for lower compliance with guidance.

> "In XX you have a, you know, three score and ten and that's your lot… life expectancy is markedly lower than the rest of the county. And actually, they're quite happy with that, that's their lot, they live life fast, and if it's their time, it's their time… they're grandparents in their 50s, they squeeze what we would, you know, consider to be and 80, 90-year lifestyle into 70 years and they're quite happy with that." (P5, AEP)

> "But I do think it's issues with testing, issues with, you know, people who are in more high risk situations, in terms of their housing, their work place, just their ability to self-isolate, whether that's financial, whether it's because they've got all the commitments that they just can't get out of. Whatever we think, it's difficult for them." (P16, CA)

> "They don't feel the state works for them, they don't engage with functions of the state, they don't vote in the same numbers and so on. They don't see the elected members doing what they need and, I think you know, there's a disconnect, which you can understand." (P1, CA)

Other barriers to testing included inaccessibility of testing sites, issues around registering test results and limitations of lateral flow tests. Some DsPH reported directing their efforts and communication to promoting PCR testing for symptomatic people as this proved to be more effective in identifying positive cases and providing people with appropriate support.

> "I still direct most people in most circumstances through to a PCR test because it is more accurate. I know we've got capacity for them, and I think they are more likely, if they struggle to take the test, to get the support they need to do it appropriately. The

> community testing has never taken off in the county. People are loathe to be undertaking two tests a week, lateral flow test.“ (P11, CA)

Vaccination uptake was often discussed by participants to be lower in younger population and specific population groups. Reasons for hesitancy to get vaccinated, according to DsPH, included attitudes towards vaccination, concerns about side-effects (e.g., fertility) or inaccessibility of vaccination sites. For example, some participants argued political motives or mistrust towards government being behind the vaccination hesitancy in young populations, and in certain ethnic and more deprived groups, whilst vaccination inequalities in certain ethnic groups was also often attributed to variances in deprivation levels. Vaccination inequalities in deprived areas was also described as being a common pattern with other types of vaccines.

> “there’s an ethnic divide, and deprivation gradients, so different ethnicities are more or less likely to take up vaccination and there’s a deprivation issue. So, more deprived populations less likely to be vaccinated, but as deprivation decreases, what we’re seeing in [local authority] is that that ethnicity gap disappears. So, the low uptake in black and black British groups or in Asian groups disappears as deprivation reduces. So, it’s a function of deprivation and ethnicity, rather than ethnicity per se.” (P1, CA)

> “Vaccination is the place, almost more than transmission, in [local authority] where we’ve seen the cultural impact, and when we’ve looked into vaccination hesitancy what we can see is that there are quite strong cultural variances between different ethnicities, and it’s been really important for us to really tailor our response to try and address the barriers and concerns in each of the groups rather than having a single approach as some other areas will have been able to do.” (P10, CA)

> “Yeah, that’s the other big one, in terms of national policy conflicting with local. So, we’ve actually had a really good vaccine delivery programme in XX, through the primary care networks. And some of the messaging coming around the national vaccination sites, confused the population. So, we had a national vaccination site over the border…that did quite a lot of vaccines for XX. But it wasn’t that accessible for some of our poorer communities and those without cars. But they were getting the messages from the national site before they got the messages from the GP practice.“ (P3, CA)

Data & IT

The restrictions around data sharing and delays in accessing data in the early stages of the pandemic were often described by participants as a key barrier to their local level transmission control. Data sharing restrictions (e.g., NHS data not shared with DsPH) meant that case numbers and data on demographics or location could not be accessed until summer 2020. Data access was perceived as crucial for understanding local transmission patterns and for tailoring messaging or interventions for specific locations and community groups within local authorities.

> “The reason we were pushing it, is we were not getting the level of detail of data that would allow us to do our job, so it was a very important point. And I was making the point very publicly that if this was any other infectious disease, I’d have access to that data immediately.” (P16, CA)

> “It was data sharing that’s been the problem, rather than the systems and processes, if you like, ‘because I think that had we been able to get to the data, the systems and processes were there to support whatever action needed to be taken. It was getting the data that was the problem.” (P2, AEP)

Some participants reported that there are still some data access restrictions related to, among others, vaccination status of cases, hospitalised patients, or students which would be useful to gain a complete picture of prevalence rates in local authorities as well as for tailoring local level mitigation efforts to slow the spread of COVID-19. For example, information on vaccination status is needed for efficient contact tracing and provision of support for unvaccinated identified contacts. Also, information on correlations between vaccination and hospitalisation could be used for messaging to encourage people to get vaccinated.

> "That would have been really powerful if I'd been able to communicate very early when hospital admissions started to go up. That this percentage of people were vaccinated or unvaccinated, this percentage of people were these age groups, 'cause it was a younger demographic and, you know, most people were unvaccinated or not fully vaccinated. […] it not only puts me at professional risk of not being able to take the right actions to mitigate the risk in the community, but it also misses an opportunity to communicate, I think, very powerfully with people who still haven't been vaccinated in our communities." (AEP M2)

The test and trace system was criticised by some of the DsPH for its lack of sophistication and limited scientific evidence (e.g., the introduction of daily contact testing in school). Many participants emphasised the uncertainty around the effectiveness of mitigation measures and lack of evidence for causation.

> "So we haven't evaluated, so they're just in the throes of an acute response, there's just no time or energy to do detailed evaluations. So we genuinely don't know what's been most or least effective, and actually it probably…the answer is that there's no single thing that has been most or least effective in terms of local strategies. It's that, kind of, Swiss cheese model where there's a whole bunch of protective interventions that are needed, there's no single thing that has done the trick, and then if the collective of all of them together that have then blunted what could have been much worse." (P8, AEP)

Community transmission control

In community transmission of COVID-19, a person may be infected by the virus, but as they have not knowingly been in recent contact with other confirmed cases or been overseas recently, the authorities are unable to trace the source of the infection. Many DsPH reported seeing high levels of community transmission in their local authorities, which have driven prevalence rates. Community transmission was described as very difficult to control at the local level due to issues around surge testing based on demographics, isolating people in large and complex households, people socialising outside of workplaces or education as well as travel in or out of local authorities. For example, the definition of a household with a fixed number of people living in one property did not account for different family structures (e.g., childcare requirements) that rely on mixing between different homes.

> "we've done a really good job of working with workplaces, to minimise spread in the workplace. But that community transmission, as I say, outside of workplaces and in the social contact, in the travel to and from work, was clearly an issue for quite a while." (P3, CA)

> "I was just going to…and within that, some of it was about concepts and definitions of a household as well, so particularly in the BME community, a household may be more than one house in the same street with sort of caring responsibilities going across, so that didn't tally up with some of the guidance as well and the ways we were being asked to contain outbreaks. But actually the same could be said for some of our other

> more deprived communities as well where there were real household networks, again childcare, not accessing traditional forms of childcare but using extended family, blended families. So slightly different scenarios, but I think a challenge for us was around what's your definition of a household and how that interacts with the guidance on managing household cases." (P18, AEP)

Some participants also found conducting surge testing for certain demographics who move in and out of local authorities to be very challenging. For example, there were instances of some communities with closer links to other communities outside of their local authority (e.g., sporting connections).

> "The demographic has been the issue, so it's…and predominantly at the moment it is young adults, so the unvaccinated or partially vaccinated adults and teens. They are spread right across the borough, so you can't do the kind of surge testing in a very, sort of, limited way." (P7, CA)

Systematic inequalities and deprivation

Systematic inequalities and deprivation levels in local authorities have not only played a crucial part in driving prevalence rates but have also hindered DsPH efforts to reduce transmission locally. Deprivation was mentioned by most of the DsPH. Participants primarily discussed financial barriers that prevented many people from being able to afford protective measures (e.g. face masks) or to follow testing and self-isolation guidance. Families with low income and precarious jobs struggle to cope financially with long self-isolation periods and may also be more likely to live in poorer housing conditions which makes it more difficult to self-isolate from the rest of the household. Thus, local level interventions to reduce transmission rates were limited by structural, systematic inequalities which were difficult to resolve with local level resources and in the short term. Despite having some capacity to provide additional financial and welfare support for residents, DsPH reported that these measures have not been sufficient to provide adequate financial security for communities in deprived areas.

> "you've got to provide better support to people who work in production and manufacturing, because their circumstances just aren't the same as others. And they're you know disproportionately disadvantaged because of that and that's why you will not see people be as compliant, it's not 'cause they don't want to be, it's because they cannot afford to be." (P8, AEP)

National level barriers to reducing transmission

Centralised, "one size fits all" outbreak response

The DsPH discussed the centralised national approach to managing COVID-19 as one of the key barriers to effective transmission reduction at a local level. Any local deviations of transmission rates from the national level created difficulties for DsPH to adequately manage transmission in their local authority. For example, the self-isolation guidance was not always feasible for some communities, in particular for people living in overcrowded, or poor housing, with caring responsibilities or who cannot financially afford to isolate. Another example was the tier system (activated in Autumn 2020, Gov.UK 2020) which placed certain local authorities in local lockdowns without consulting local expertise on its feasibility. In some of the more deprived areas, workers were less able to take advantage of the furlough scheme:

> "….lower skilled and lower waged work, and probably higher proportion of sort of zero hours work. We had lower numbers of people who were on furlough. So we had quite a lot went onto furlough initially, but a lot came back off, as the manufacturing and processing continued to work, or developed its COVID-19 safe working and came back. So yeah, left, I guess, more people in the workplace than on furlough, or working from home, which was obviously an issue for the borough." (P3, CA)

Some participants talked about the need for flexibility in response to COVID-19 which would allow them to draw on local knowledge to react to prevalence changes, to adapt interventions at the local level as needed, and to provide tailored support for communities.

The vaccination programme was also discussed by some DsPH as being not flexible enough to match local increased risk (e.g. prioritising vaccination in areas of enduring prevalence). Another issue the participants raised was the transparency and timing of guidance which was not always deemed appropriate given local circumstances (e.g., locally higher prevalence rates) and not communicated to DsPH and other local stakeholders in a timely manner.

> "I think the national approach has been a bit one size fits all, and that's not worked particularly well for us, it's meant we've had to a lot of extra work to tailor things locally. So, I mentioned earlier, for instance, about, you know, the term household not being particularly meaningful to some communities. And you know, I think there was some of the early guidance on, you know, how to self-isolate within your own household, you know, it talked about staying in your bedroom and using a separate bathroom, and that doesn't apply when you've got a multigenerational family living in a terraced house." (P6, AEP)

> "An imperfect system which is predicated on, you know, you say national supply chains, or national, you know, parameters, some of that's important. But if you can devolve as much of that in terms of resources, down to a local system and through, you know, the tried and tested emergency planning and response system …….. I think that needs resources attaching to it." (P7, CA)

Some DsPH discussed the limited effectiveness of nationally organised transmission control measures that hindered their local COVID-19 response and that there was often a delay between announcements and the necessary associated guidance.

> "Timeliness has been important. The decisions and the updates given at national briefings were never done with the guidance, the regs, all at the same time. You waited after an announcement, for guidance, which means you had a nightmare period of managing millions of questions, without knowing any of the answers. That's really difficult to deal with locally." (P2, AEP)

Disparities between national and local messages

Many participants expressed the view that multiple changes and inconsistencies in national messaging created challenges for their locally organised communication. Participants stressed that they were sympathetic to the fact that the government was faced with an unprecedented task to organise a national COVID-19 response and that it needed time to evolve. However, some DsPH felt that national guidance was sometimes contradictory and put out without consulting them which was deemed unconstructive in encouraging people to comply.

> "Nobody told me they were publishing that guidance. Nobody consulted me on that guidance. And it was, if you could try not to travel. So, it wasn't telling people what to do, but it was also saying, you should think about it, you know? All hell broke loose and we all said, who's published this guidance? Nobody really knew, and the general view was it was probably good advice, which might be true, because it's not bad

advice, but it undermines the local relationships that you've got, because you're not aware of what's coming out, and you are left to pick up the pieces." (P2, AEP)

"The national strategies are, and I'm sure lots of directors of public health people will tell you, it wasn't really…it wasn't very clear, it was very mixed messages. It was really difficult sometimes to get the messages locally because nationally I think it was very much politically driven. But it wasn't…it really made our work/life difficult for us." (P9, CA)

Overview of local mitigation strategies

This research aimed to explore what local mitigation strategies were used to overcome barriers to reducing transmission in local authorities and what facilitated a local COVID-19 response.

Broader structural response to the pandemic

The DsPH discussed taking a lead in local outbreak control by restructuring and reprioritising their pre-pandemic teams at the beginning of the pandemic and created a shared infection prevention and control strategy for their local authorities. This included close cooperation with local partners (e.g., clinical commissioning groups, social care, primary care) and regional networks (DsPH regional meetings, PHE) which facilitated a system wide approach to transmission control. The participants discussed a variety of effective mitigation strategies they implemented over the course of the pandemic including local contact tracing, local testing and vaccination efforts, isolation support, communication campaigns, engagement with business and education, and community engagement (see Table 1 for overview of strategies). Most DsPH made use of most strategies but tailored them as deemed appropriate for local demands. In the next section, the barriers, and facilitators to mitigating transmission rates in local authorities are explored in more depth.

Table 1: Overview of local level mitigation strategies from all areas studied

Local COVID-19 response strategies	**Examples**
Local coordination of outbreak control	Reorganisation of public health team; deploying of new staff with local knowledge; regular meetings and forums
Communication campaigns	Messaging via local and social media, webinars, community meetings; weekly press releases on data; direct messages to residents; translating materials into a range of languages appropriate to the population; promoting social cohesion
Community engagement	Contact by phone, door-to-door knocking, virtual forums; engagement through community champions/ leaders, faith groups, youth councils, unions or employers
Engagement with business, education and social care settings	Co-production of response; support of test and trace and risk assessment; organising engagement events;
Isolation support	Tailored engagement with vulnerable groups; welfare support (food delivery, medication); additional financial support for self-isolation
Local contact tracing	Local contact tracing team using local phone number for tracing; Follow-up with phone calls and text messages to encourage self-isolation
Shared infection prevention and control function	Collaboration with other DsPH, regional partners, NHS, social care & police; local resilience forums
Testing	Symptomatic PCR testing; Surge testing in hotspots, Supply of test kits
Vaccination	Accessible vaccination sites and mobile vaccination vans; Setting up vaccination sites at work, community centres or religious sites; drawing on community champions to understand vaccination hesitancy

Facilitators to reducing transmission

Local level facilitators

Local COVID-19 response

All DsPH discussed the importance of organising a COVID-19 response at the local level, allowing local control of virus transmission and provision of tailored support for residents in the local authority. For example, the introduction of a locally organised test and trace system was described as an effective approach, in terms of a higher proportion of residents being engaged with the service, to control community transmission while simultaneously offering appropriate welfare support for residents where required. Some participants described an effective local level response to COVID-19 as a system-wide, multi-agent approach to infection prevention and control which requires close cooperation with health and social services.

> "I think one of the really key things has been working as a system. So, working with NHS partners, working with local authority partners, working with anyone, police.

> Anyone around the table who played a useful part, basically, in the COVID-19 response and working together." (P7, CA)

> "We fundamentally turned the whole of the local authority into a COVID-19 response unit. […] the only way that we could actually achieve that, was to be able to use the person resource to do it. So, we pulled people from our sports services, we pulled people from our customer services across the organisation, to do some of that ground response, to do that follow up in terms of contact tracing, to create, you know, funds were put in place for us to say, well this is the day job." (P5, AEP)

Access to data

Access to local data, both in terms of the existence of data and participants' ability to access the data, was seen by most participants as critical to an effective local virus transmission control. This includes developing granular data at the local level which gives detailed information of transmission rates according to locations (e.g., wards, postcodes) and population characteristics (e.g., age band, occupation). Also, some participants found the "soft intelligence" (e.g., cultural differences, attitudes) from knowing local communities important in gaining an understanding of influences on transmission rate trends. It provided some additional explanatory value and nuance to objective data. Data from a range of sources were often used to direct efforts to control the spread in areas of high prevalence and to tailor messaging and interventions.

> "we know exactly where we've got high and low uptake of testing, high and low uptake of case rates, you know, engagement with contact tracing, vaccination. We've got a really rich picture now which we didn't have at all this time last year and yeah, that's enabled us to target our community engagement, things like where we do vaccination pop ups where we've put additional testing in place. […] the level of granularity we've been able to get down to has been useful. 'Cause we have sometimes, you know, gone for almost targeting specific streets where we we've seen either hotspots in cases or, you know, we've been able to do that with vaccination uptake as well, kind of, go down to actual street level." (P6, AEP)

> "the formal data that actually, I don't think any of that really gave us what we needed, it's been the soft intelligence, the local knowledge, and the engagement that we've done, as I said, with all of the different sectors and population groups that actually given us the insights that we needed to bend the trends." (P8, AEP)

Communication, engagement and access

Many DsPH emphasised the crucial role of consistent, continuous communication in conveying health messages and guidance to the public. Participants often described the aim of messages was primarily to communicate COVID-19-related guidance, but also to debunk any concerns around testing or vaccination and to promote social cohesion among residents within the local authority. Most respondents engaged with local and social media and identified key individuals in the community, including those in educational, business or religious settings, to help send out information locally.

> "I think it's probably impossible to say what's been most or least effective in terms of the levels of interventions. The things that I think have made most difference are a fairly strong and consistent approach to comms" (P4, AEP)

One of the key facilitators of an effective local COVID-19 response that all DsPH discussed was the close engagement with communities, which allowed them to better understand their

communities' needs and concerns. Direct feedback from communities often fed into the tailored interventions used over the course of the pandemic.

> "And I mean, some of the best stuff, we did, was actually with some of the community groups really listening to what was coming out of the communities. What myths they were seeing, what was circulating on their social media feeds, and those kinds of things. And doing some of that myth busting." (P3, CA)

> "So we would be giving messages, but equally they'd be giving us messages, and that meant that we were able to tailor our responses in a way that really meant that we had a community focus. It was a real coproduction. And that came from us starting that as a principle of this is all of us in it together. So this was not us just giving them information, it started as a two way relationship and really developed into a very mature relationship." (P10, CA)

Many participants described using various routes of engagement (e.g. phone, door-knocking, social media, organised meetings with local community groups, schools and businesses) to encourage compliance with COVID-19-related guidance, testing and vaccination uptake. Participants discussed a range of initiatives to make testing or vaccination easier and more convenient for local communities, including providing local vaccination sites in a range of locations such as supermarkets, religious settings and workplaces:

> "So, part of our strategy was to put vaccination clinics in some of the factories, because the theory being, somebody's come to work, and you've got a bit of a captive audience there. And we got loads of people that way, because they wouldn't have gone, they wouldn't have made an appointment, but they were at work, and we were sticking it in their arm while they were having their morning break, and that worked.… "We put loads of pops ups, drop ins…we did it in mosques, we did it in supermarkets, we did it in community centres and workplaces… having to book it via the national system, was only ever going to work for a certain group of the population really." (P2, AEP)

> "So what we have encouraged our businesses as we came out of lockdown on July 18th…We encouraged our local businesses to give staff time off to go and get themselves vaccinated. We had a clinic in the town hall so we arranged…so obviously they're not big enough workplaces for people to go, but what we did ask the employers to just give them time off during working time. They said they're really tired after work they couldn't really go. So we did that." (P9, CA)

About half the participants discussed using behavioural science to help inform these initiatives, although most participants talked about relying on national or regional behavioural science resources, with only a minority being able to access resources at a local level.

Using a local phone number for contact tracing and having community staff going door-to-door to engage with people were often described as being more effective strategies than more distal methods of engagement (e.g., national contact tracing). Some DsPH were able to build on existing trusting relations with communities to implement interventions and reach vulnerable groups (e.g., homeless people). Many participants described working with key people in the community, such as community champions, faith and community leaders, who could act as a gateway to different population groups. Local leaders' knowledge of their community also helped DsPH to gain better understanding of what COVID-19-related interventions may or may not work in certain communities.

> "Part of that work was very much again working directly with those communities. So as part of that we established a community leaders forum which was really a two-way forum. So one, it was about us being able to give information to community leaders

> that they could then pass back into their communities, but we also used it as an insight forum as well which allowed us to understand the challenges as to why people may not necessarily be complying with the rules or guidelines, and then how we can tailor the help and support to support them to comply.“ (P11, CA)
>
> “But I think my main messages are that this has demonstrated the importance of working with our communities, really listening and coproducing with our communities. It's shown what we can really achieve across a system when we have a common goal, and we remove all of the barriers that don’t really exist but we think exist between us. It’s shown I think how local authorities should be trusted, that they can be, both with money and with delivering outcomes but being allowed to derive for themselves the right way of doing stuff, and the importance of timely and properly engaged national guidance.” (P10, CA)

In addition, some participants reported that new relationships and new ways of working had been established between public health teams and community and voluntary groups and organisations during the pandemic. When health professionals had gained the trust of members of these communities they could then work together to improve health outcomes for members of those communities, who would be more likely to seek support with issues such as smoking cessation or healthcare in pregnancy, or to register with a GP:

> “We actually worked with the NHS CCG with that…That was really good because we had over XX Roma communities immunised and they’re now coming back for their second vaccine here. Even though they don’t…not all of them live in the borough…I think it’s the trust. So now what has happened is because they have got a trusted professional, they now want to ask about other health issues…smoking, pregnancy, all of those other things, that’s why we’re linking with the CCG, to make sure they’re registered with a GP and get other healthcare.” (P9, CA)

Many DsPH highlighted that there was not one single approach to effective transmission control but rather a multitude of interventions which were tailored to specific community needs. Thus, using existing local knowledge and building trust with local communities was key to co-produce effective strategies for transmission control. The engagement was often described as being most effective when they empowered communities to take responsibility for the COVID-19-response and lead their own initiatives. Some community groups were also mentioned as being very pro-active in self-organising support for their residents.

> “I think again my real emphasis here is what’s been happening at a local level, because I think you’ve got the national policy that then feeds down regionally and is then dealt with at local level, but I think the real thing for XX has very much been around how we have understood our data, understood our populations and then used that to tailor how we engage with our populations to make sure that we’re getting the right information to the right people in the right way at the right time.” (P12, CA)
>
> “There’s been multiple approaches, but it all comes down to, in my view, making sure things are convenient, easy to understand, consistent and accessible, but also how you get the communities themselves to help you to get the message out, because I can stand up and say a million things every week in the media briefing that I do, but that will only resonate with a small proportion of the population I suspect.” (P2, AEP)

DsPH discussed the importance of working in partnership with different local stakeholders to facilitate an effective COVID-19-response and control transmission rates. The close cooperation with partners in public health, business, education, health and social care was described as important in organising an effective regional and local response during the pandemic. Trusting partnerships helped DsPH to coordinate the testing and vaccination programme and to control virus transmission more effectively within high-risk settings such

as schools or care homes. Participants discussed working in partnership with local employers to provide tailored support that was appropriate to the size and nature of the business and, as mentioned above.

There was also a strong sense of cross-regional learning and support between DsPH from different areas. Many participants engaged regularly with other DsPH and PHE as part of the regional public health network to share local knowledge and practices that have been effective in reducing transmission rates.

> "that was a codesigned, coproduced system with all ten boroughs, with the partnerships, we had police involved, we had police, fire service, all of the acute trusts are involved in it as well, and PHE." (P7, CA)

> "It's a very much a sort of, small medium enterprise type economy. Which has its pluses and minuses, it's minuses from a COVID perspective, obviously, they don't have big occy health type .. roles But that's actually given us the opportunity through our business engagement team and through our environmental health officers, to get out there and engage with them in a really positive way around COVID…with most of our small businesses it's been a really positive engagement …a very, sort of, flexible collegiate response and they responded really well to that. So, I think, you know, in a sense we've had more control over businesses than, perhaps you know, some of our neighbours have had, just through those, kind of, pre-existing strong relationships." (P9, CA)

> "I suppose one of the fundamental things is the excellent relationships that we have with our neighbouring authorities across the south west but also with Public Health England, and I think that established relationship has been really fundamental in learning what other people have been doing that does and doesn't work properly." (P10, CA)

National Level facilitators

Coordinated national and local strategy

Some DsPH acknowledged the necessity of a national level COVID-19 response for managing transmission locally as this helped to reduce transmission rates across the country through testing and lockdown measures and can yield more coherent guidance. The national strategies for test and trace, financial support for isolation and the national vaccination programme were seen as important in facilitating local management of transmission control and welfare support. However, many participants commented on the misalignment between national and local response which has hindered the effective consolidation of national and local strategies, which has been illustrated in the 'National level barriers' section above.

> "I think where we've been given the flexibility to adapt some of the national policy, that's where it's been most effective. So, for instance, where we have been able to do the contact tracing ourselves, and had the resource to do that, we've got a better response, you know for instance, from people calling with a local number. And having people, you know, where we can…we've got people who can make calls and are multilingual." (P6, AEP)

> "What you need, in a country like England which is diverse in terms of geography and traditions, its infrastructure. You need far more devolution and what you need is a national framework and there will be some things that are better done at a national level. But much of it needs, in terms of power and resources to make decisions, needs to be devolved down into the local system." (P16, CA)

National lockdown measures

Participants discussed the effectiveness of national lockdown measures in rapidly reducing transmission rates which the prevalence data has supported. However, there were varying views on what level of lockdown was most effective, with the tier system (activated in Autumn 2020, Gov.UK 2020) being seen as having not had the desired effect on transmission rate change as anticipated.

> "It was almost…, you needed to get into Tier Three to have an impact. And that did work, so I think there was something about, you know, what was the tiering process trying to achieve. And then you just got local authorities, some wanted to go up a tier, because they wanted to stop things. Some wanted to stay down, because they wanted to keep stuff open. And what you saw really, was just it spread region to region. So I think the national lockdown was much more effective in that way." (P3, CA)

Vaccination programme

Even though there were very mixed views on the effectiveness of the national testing programme which began in December 2020, the vaccination programme was described as a success by many participants, due to its high take up in many areas, and serving as an effective national approach to protecting the public from the virus transmission and helping in reducing transmission rates in local authorities. Nevertheless, some respondents were critical of the timing and prioritisation of age groups of the vaccination programme. For example, areas of enduring prevalence with younger populations were not prioritised for vaccination and were affected by prolonged high transmission rates. An examination of the data showed that AEP overall had lower vaccination rates than the CA (see Appendix 1 and Report 1).

5. Discussion

This research aimed to identify local mitigation strategies to address enduring prevalence rates across different local authorities as well as to explore key facilitators and barriers to the local COVID-19 response. To this end, 19 interviews with DsPH and other public health leads from areas of low and high enduring prevalence were conducted. The included local authorities were chosen to represent different levels of prevalence and to explore what strategies have been effective in reducing acute and prolonged prevalence.
There were no major differences between AEP and CA in barriers and facilitators of COVID-19 control. Most of the DsPH across areas of varying prevalence discussed using the local and national level facilitators, as well as the impact of the local and national level barriers. The fact that there were no meaningful differences between high and low areas of prevalence [in facilitators and barriers] indicates other factors (e.g. structural) are likely to contribute to the difference in enduring prevalence rates. The following section discusses the findings according to the main research questions and provides an overview of future research priorities and recommendations.

1) **National facilitators:** What national level strategies, policies and guidance have been effective in reducing transmission?

The national mitigation measures (e.g., national lockdown; vaccination programme) were important to control the spread of COVID-19 across different regions and provided an important framework for local decision making.

2) **National barriers:** What national level barriers have hindered the reduction of COVID-19 infection rates?

The local response was greatly influenced by the national strategies and guidance. Key national barriers to reducing transmissions at the local level included the centralisation of COVID-19 response and misalignment between national and local messaging. The centralisation of measures such as vaccination and test and trace meant that many DsPH felt a lack of inclusion in the decision-making and flexibility to locally apply measures which often created disparities between local and national strategies. Moreover, improvements of timing and sophistication of national mitigation measures were said to be needed in order to best facilitate a local response.

The tier system placed certain local authorities in local lockdowns without consulting local expertise on its feasibility. Some participants talked about the need for flexibility in response to COVID-19 which allows to draw on local knowledge to react to prevalence changes, The findings suggest that an integrated, system wide COVID-19 response is needed which creates better alignment between local and national strategies. A national approach is important in supporting local efforts to reducing virus transmission. However, local public health teams require flexibility in tailoring their interventions to meet local demands.

3) **Local barriers:** What local level barriers have hindered the reduction of COVID-19 infection rates?

The fact that there were no meaningful differences between high and low areas of prevalence in facilitators and barriers indicates other factors (e.g., structural) are likely to contribute to the difference in AEP rates. DsPH discussed several barriers to their efforts to reduce transmission rates in their local authorities. These include barriers at the local level, such as systematic inequalities, limited community transmission control, data access restrictions as well as testing and vaccination hesitancy. The systematic inequalities and deprivation levels within or between local authorities were frequently discussed as the main barriers to reducing transmission. People's motivation to get tested and isolate may vary greatly depending on their job security, nature of employment and financial circumstances. In addition, vaccination hesitancy was also of greater concern in deprived areas and in communities that showed more mistrust in government. This is in line with historical evidence for unequal effects of infection and mortality in more disadvantaged communities (Bambara et al., 2020). The current pandemic has exacerbated social inequalities in chronic disease and social determinants of health. The DsPH agreed that it is crucial to understand that individuals' decisions to not comply with guidance is heavily influenced by the wider socio-economic context and constraints. In addition, public health interventions to detect positive cases and stop community spread was limited by data restrictions and challenges around testing administration and reliability.

Both, the UKHSA (2021) and SAGE (2020) highlighted the importance of local approaches to provide tailored support for those being disproportionately affected by COVID-19. The findings also highlight the need for adequate resources at the local level, including staffing, data access, and financial resources to implement mitigation measures and provide welfare support. This was particularly true for areas of high enduring prevalence which were faced with prolonged phased of high transmission rates. The uncertainty around future funding to provide long-term investment in public health was also highlighted in the King's Fund report (2021) and by the Local Government Association, which noted that there will be no real-terms increase in public health funding for 2022/23 (Local Government Association, 2022). Some DsPH also voiced concerns over the future of data sharing agreements in post-pandemic times and expressed that preservation of current access to funding and data may be crucial.

4) **Local facilitators:** What local level strategies, policies and guidance have been effective in reducing transmission?

Overall, the DsPH employed various local strategies to reduce transmission, including testing, contact tracing, vaccination, targeted communication approaches and tailored community engagement. Public health teams often underwent substantial structural changes to facilitate a coordinated local response. Many of these strategies were in line with good practice examples published by the Local Government Association (2021a). The strategies to reduce transmission were facilitated by a localised, tailored response, good partnerships with local and regional stakeholders, good data access, consistent messaging, and engagement with local communities.

The findings highlighted the key role DsPH played in shaping the local COVID-19 response and engaging with local communities. This is in line with the King's Fund report (2021) on DsPH experiences during the pandemic which emphasised their critical role in organising a strong public health response to COVID-19. A recent government publication 'Covid 19 Response - Living with Covid', outlines a greater role for local public health teams (HM Government, 2022). However, it is crucial this is supported by additional resourcing for local public health teams (BMA, 2022).

The strategies for reducing transmission were similar across local authorities in AEP and in the CA, since many DsPH followed national guidance on transmission control measures and shared their experiences of public health response strategies with other public health teams to facilitate mutual learning over the course of the pandemic. Nevertheless, the DsPH highlighted the importance of adapting guidance and tailoring their interventions locally to meet local demands (e.g., more surge testing in certain businesses or educational settings) and the needs of their community (e.g., engaging with ethnic groups that could benefit from higher vaccine uptake). DsPH local response heavily relied on building trusting relations with stakeholders and communities to encourage rather than enforce compliance with guidance. Strong engagement with local stakeholders and community groups was crucial in order to understand people's barriers to following guidance and implement appropriate interventions to address these. These findings align well with those of Lewis et al. (2021) on the contact tracing approach in Cheshire Merseyside which explored barriers and facilitators to engagement with contact tracing. The authors highlighted the importance of building relationships and using local knowledge in organising local contact tracing.

Respondents largely agreed that it was very difficult to determine the effectiveness of strategies for reducing transmission rates and results are primarily based on limited available data and anecdotal evidence. Due to the complexity of transmission risk, there was no single strategy to effectively reduce transmission rates but an array of measures that were needed. However, the differences in success of reducing transmission rates across local authorities were often discussed to be the result of existing structural differences and existing inequalities rather than the nature of interventions. Local level strategies were generally more focussed on controlling transmission (e.g., via testing, contract tracing, vaccinating) and may not have been able to address or overcome larger, systematic inequalities and deprivation. For instance, there were insufficient financial resources to compensate for financial barriers to self-isolation or to resolve poor housing conditions. This has meant that some of these wider socio-economic factors, such as deprivation or nature of work, were not only associated with high, prolonged transmission rates but also created barriers for DsPH to reduce transmission locally.

6. Conclusion

A number of barriers to reducing COVID-19 transmission were identified, as well as a broad range of local and national mitigation strategies. Barriers to reducing transmission included residents' hesitancy to get tested, vaccinated or to self-isolate, along with restrictions around data sharing and delays in accessing data, and as changes and inconsistencies in national messaging. Mitigation strategies included local contact tracing, testing and vaccination efforts, isolation support, communication campaigns, engagement with communities, business, and education. Other than differences in structural indicators such as levels of deprivation, there were no major differences between AEP and CA in barriers and facilitators of COVID-19 control.

Participants emphasised the importance of investment in public health, and of building on partnerships established during the pandemic and on 'soft' intelligence gained from community engagement. They emphasised the importance of preserving and improving access to data and asserted that more research is needed to understand the effectiveness of mitigation strategies.

7. Recommendations

Future research

As part of the interviews, the DsPH were asked what future research would be of benefit for them to facilitate effective future local response (see Table 2). Many of them wished to see a better evidence base for local interventions and messaging which can be used to shape future interventions. Also, there was consensus that more research was needed to understand more deeply community needs, attitudes, and beliefs with regards to COVID-19 to tailor future messaging and mitigation efforts. Finally, the long-term impact of the pandemic was of interest to the respondents, including impact on individual health as well as the wider system for recovery.

Table *2.* Future research priorities

Future research priorities	Examples
Developing the evidence base for effective interventions and communication strategies	• Research to understand barriers which can inform interventions and to support people to prioritise their health • Understanding most effective strategies to increase vaccine uptake • A short survey to ascertain what training / expertise / advice the DsPH received in relation to behavioural science to help them roll out interventions during the pandemic.
Community based deep dive qualitative study of attitudes and beliefs relating to COVID-19 vaccination and testing to inform future strategy.	• Developing approaches to engage those who are perceived to be disconnected from the state. • Developing approaches that will include consideration of the needs of those in high volume occupancy to developing a set of local

	community-based guidance with the assistance of local faith and community leaders that can be rolled out nationally across multiple languages and cultures.
Longitudinal work on the long-term impacts of the pandemic and how areas recover	• Understanding impact on other health outcomes (physical and mental health) • Understanding impact on healthcare system • Understanding impact on employment

Based on feedback from respondents and the analysis of data, we developed a number of recommendations to build long-term resources for future pandemics or health crises. DsPH experiences of the pandemic provide an important opportunity to reflect on effective strategy for a local response and to facilitate mutual learning:

- Integration of national and local response
  Ways to better align national and local response should be considered in order to create consistency and build a system wide approach to reducing transmission. Improving the partnership between national and local leaders may help ensure that strategies are effective, tailored to local demands and more trusted by the public.

- Utilising local existing intelligence and infrastructure for local outbreak management
  Given the heterogeneity of local authorities and communities, the DsPH advocated building a local knowledge base and infrastructure that can be used for local outbreak management. The flexibility to locally adapt strategies was deemed important for an effective transmission control.

- Building on partnerships/networks established during the pandemic
  The local and regional partnerships established over the course of the pandemic were key to shaping the local response and should be widened to build support networks for emerging public health concerns or threats in order that they are ready to activate at short notice.

- Addressing modifiable risk factors for the enduring prevalence of COVID-19
  Consider actions that can be taken to tackle modifiable risk factors for the enduring prevalence of COVID-19, such as addressing differences in people's capabilities, opportunities, motivations and behaviours in response to vaccination and government guideline engagement in the short term. In the longer term, issues to address include house occupancy, nature of work and housing standards.

- Providing long-term investment in public health
  Local interventions to reduce transmission would not have been possible without funding which the public health team allocated to outbreak control. However, many DsPH raised concerns about the uncertainty around future funding and expressed that long-term investment is needed to further build and preserve their capabilities to locally manage future health crises.

- Evaluation of intervention effectiveness
  More formal evaluations of current or previous COVID-19 interventions may be helpful to build a knowledge base of effective interventions and to inform future strategies. Evaluating interventions across different local authorities may also highlight some of the contextual factors shaping the success of local strategies.

- Preserving and improving data access
  Access to granular local level data was important for developing appropriate local interventions. There are still some gaps in the available data that some DsPH would like to see closed (e.g., more detailed data on vaccination status). In addition, changes to data sharing agreements were feared by some respondents to threaten future capabilities to organise local outbreak control strategies. Thus, preserving and extending the current data access level would help to further build resources for a local response.

- Building and improving ‘soft’ intelligence
  The importance of ‘soft’ information gained from community engagement with community champions, etc. was highlighted. Building / improving the infrastructures and processes for this within local authorities will support the understanding of influences on transmission rate trends and be an important part of future pandemic preparedness/resilience.

Summary of Reports 1 and 2

Introduction

UK local authorities that experience sustained high levels of COVID-19 infection are termed areas of enduring prevalence (AEP) according to UK Scientific Advisory Group for Emergencies (SAGE) in 2021. AEP are those with the highest number of days spent in the epidemic phase between 1/3/20 and 28/2/21. The epidemic phase is characterised by a greater mean number of daily cases, higher variability, and a stronger correlation between case numbers across consecutive days. A local authority is assumed to be in the epidemic phase if the probability of epidemic exceeds 0.75 (Gov.uk, 2021). This research aimed to gain expert views and insight into the factors that contributed to enduring prevalence of COVID-19 infections and what local level strategies were implemented and perceived as effective in preventing or reducing transmission rates in areas that saw consistently high prevalence of COVID-19 infections across local authorities in England. The research explored how the local response was facilitated or hindered by local level factors as well as national strategies or guidance.

This Report (2) explored which potential national and local level barriers could be responsible for the enduring prevalence of COVID-19 infection in certain geographic areas, and which local and national level strategies, policies and guidance have been effective in helping reducing transmission. Report 1 (Lewis et al, 2022) described the key differences between the AEP and comparison area (CA) local authorities in terms of indicators including deprivation levels, housing and employment. Both reports identified future research priorities that support continual improvement in local practice and decision-making relating to COVID-19.

Methods

This was a mixed methods study, involving qualitative interviews and the collection and analysis of data on a range of indicators. DsPH in the eleven local authorities identified by SAGE as areas of enduring prevalence (AEP) (Gov.uk, 2021; SAGE, 2021) were invited to take part in the research, and nine of these agreed. A set of comparison areas (CA) were selected, according to recommendations by Directors of Public Health (DsPH), the Association of Directors of Public Health (ADPH) and Public Health England (PHE). For two AEP, statistical neighbours with low prevalence were identified and these were also included as CAs. Statistical neighbours are defined as those that are similar in terms of levels of deprivation, whether urban or rural, and on populations of young, old, and ethnic minorities (PHE, 2019). DsPH in ten CA agreed to take part in the research. Local authorities were anonymised for the purpose of this report.

Indicators were collected for all participating local authority areas, to allow further investigation of some of the themes that emerged from the DsPH interviews, and from the literature review. Indicator data included overcrowding, occupation and employment status. Indicators were gathered from readily available data sources at the Office for Health Improvement and Disparities (formerly Public Health England fingertips) and NOMIS (Official Labour Market Statistics, ONS).

Semi-structured interviews were conducted with 19 DsPH across England in areas of enduring prevalence and areas with lower prevalence. All interviews were around an hour in length and covered 15 questions, including local mitigation measures and barriers to reducing prevalence rates locally. The interview schedule was devised based on existing literature and in collaboration with the project steering group (details on inside front page), Public Health England (PHE) and the Association of DsPH (ADPH). Interviews were conducted online via Zoom or TEAMS between June and November 2021 by two researchers experienced in qualitative research methods. Interviews were professionally transcribed and thematically analysed using an iterative coding process (Braun and Clarke,

2006). The interviews were coded using NVivo and a coding framework guided by the research questions and the topics raised by the participants during the interviews. Codes were iteratively adapted and restructured throughout the initial coding stage and as a result of discussions between the researchers throughout the coding process.

All transcripts were coded using the developed coding framework. The initial analysis provided a broad picture of the themes that were discussed by the DsPHs. Using these codes as a framework, a comparison of similarities and differences between and within AEP and CA was then conducted, followed by a 1:1 comparison of AEP and CA which are statistical neighbours.

Results

The indicators collected showed that there were higher levels of deprivation in AEP than CA. The proportion of people aged over 16 from ethnic minority groups is higher, although not significantly higher, in the AEP than in CA and the national average. The percentage of people in overcrowded housing tends to be higher in the AEP than in CA, except for the London local authorities.

The AEP tend to have higher proportions of people working in manufacturing, wholesale and retail and in education, than the CA. The percentage of people in employment is significantly lower in AEP than in CA, and the proportion working in lower skilled occupation groups is significantly higher in the AEP than the CA. The proportion of the population with a second covid vaccination is generally much lower in AEP. Data on booster uptake was not available at the time of writing.

In the interviews, participants identified various factors associated with enduring prevalence, including high deprivation levels, overcrowded housing, and low vaccination rates. Deprivation and employment were often jointly discussed as creating major barriers for people to financially afford to self-isolate or to work remotely. Not receiving sick pay, working on zero hours contracts or in insecure employment were thought to be associated with inability to self-isolate. There were strong similarities in the drivers of enduring prevalence described by the DsPH in AEP and CA. All participants asserted that there were differences in these factors between different wards or geographical areas within their local authority, and between different groups, including people from different age groups and ethnic backgrounds. Participants in the AEP were however more likely to discuss the impact of structural factors such as the impact of lack of sick pay or work insecurity, and of overcrowded housing.

Other than the structural differences between local authorities discussed above, such as levels of deprivation, there were no major differences identified between AEP and CA in barriers and facilitators of COVID-19 control. Therefore, in this Report (2) these findings were presented for local authorities overall across varying levels of prevalence.

Participants discussed local level barriers to reducing transmission including residents' hesitancy to get tested, vaccinated or to self-isolate. Participants identified a number of reasons for this, including competing priorities such as financial barriers or conflict with other responsibilities. Other barriers to reducing transmission that were identified by DsPHs at the point of data collection included restrictions around data sharing and delays in accessing data, as well as changes and inconsistencies in national messaging. Participants implemented a variety of mitigation strategies over the course of the pandemic including local contact tracing, testing and vaccination efforts, isolation support, communication campaigns, engagement with business and education, and community engagement. They discussed working closely with local partners including clinical commissioning groups and primary care networks, and with regional networks including PHE, to facilitate a system wide approach to transmission control. Participants also discussed the impact of national strategies including

local and national lockdowns and the vaccination programme. However, as interventions were implemented at pace, evaluation of strategies was sometimes limited.

Conclusion

The research suggests that existing health inequalities influence the wider picture of prevalence rates of COVID-19. Structural factors including deprivation, employment, and housing, converging with demographic factors including ethnicity and age, and vaccination rates, are key drivers of prevalence, and there are key differences in these drivers both within local authorities, and to a lesser extent, between AEP and CA. Further research is needed, ideally at ward/SOA level, on how these factors combine to predict transmission and how this varies between different areas, and on the relative importance of each of these factors.

A number of barriers to reducing COVID-19 transmission were identified, including people's hesitancy to get tested, or to self-isolate often related to financial circumstances, to get vaccinated, delays in access to data, as well as structural barriers including the impacts of deprivation. Apart from differences in structural barriers, no major differences in barriers were identified between the AEP and CA. Differences in implemented mitigation strategies do not appear to explain the differences in prevalence between areas. Participants asserted that more research is needed to understand the effectiveness of mitigation strategies.

Recommendations

A number of recommendations were made, based on the interviews and discussions with the steering group. This report recommended that further research was needed on how multiple factors interact in predicting enduring prevalence and which are the most important factors. This might include research on the views and experiences of employers and key health and social care actors, including Directors of Adult Social Care, community and voluntary organisations, along with other 'seldom heard' groups. Analysis of the indicators should be conducted at a ward/super-output area (SOA) level for AEP and CA, to allow more detailed comparisons between areas of varying prevalence. Further assessment of the role of mass movements of individuals into and out of areas of high prevalence should be conducted.

As part of the interviews, the DsPH were asked what research would be of benefit for them to facilitate an effective local response in the future. Many of them wished to see a better evidence base for local interventions and associated messaging which could be used to shape future interventions. Also, there was consensus that more research was needed to understand more deeply community needs, attitudes, and beliefs with regards to COVID-19 to tailor future messaging and mitigation efforts. Finally, the long-term impact of the pandemic was of interest to the respondents, including effects on individual health, visibility of enduring health inequalities, and the wider system for recovery.

Based on feedback from respondents and the analysis of data, a number of recommendations were developed, to build long-term resources to prevent / combat future pandemics or health crises. DsPH experiences of the pandemic provide an important opportunity to reflect on effective strategies for a local response. Better alignment of national and local responses may be needed to create consistency and build a system wide approach to reducing transmission. Improving the partnerships between national and local leaders may help in ensuring that strategies are effective, tailored to local demands and more trusted by the public.

In the shorter term, actions should be taken to tackle modifiable risk factors for the enduring prevalence of COVID-19, such as addressing differences in people's capabilities, opportunities, motivations and behaviours in response to vaccination and engagement with

government guidelines (Michie et al, 2011). In the longer term, issues to address include house occupancy, housing standards, nature of work, and tackling structural inequalities.

References

Armitage, C. J., Keyworth, C., Leather, J. Z., Byrne-Davis, L., & Epton, T. (2021). Identifying targets for interventions to support public adherence to government instructions to reduce transmission of SARS-CoV-2. BMC Public Health, 21(1), 1-6. https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-10574-6

Bambara, C., Riordan, R., Ford, J., & Matthews, F. (2020). The COVID-19 pandemic and health inequalities. *Journal of Epidemiology and Community Health, 74*(11), 964. doi:10.1136/jech-2020-214401

BMA (2022) BMA briefing: Living with COVID-19 response. British Medical Association. https://www.bma.org.uk/advice-and-support/covid-19/what-the-bma-is-doing/bma-briefing-living-with-covid-19-response

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101.

Cabinet Office (2021) COVID-19 Response: Autumn and Winter Plan 2021. https://www.gov.uk/government/publications/COVID-19-response-autumn-and-winter-plan-2021

Gov.UK (2020) COVID-19 Winter Plan: The government's plan for managing COVID-19 through the winter. https://www.gov.uk/government/publications/COVID-19-winter-plan

Gov.uk (2021) Defining “enduring prevalence” SPI-M spatial variation subgroup 21st April 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984083/S1213_Defining_enduring_prevalence.pdf

HM Government (2022) COVID-19 RESPONSE: LIVING WITH COVID-19. COVID-19 Response - Living with COVID-19.docx (publishing.service.gov.uk)

Kings Fund (2021). *Directors of public health and the COVID-19 pandemic: ‘A year like no other’*. Retrieved from https://www.kingsfund.org.uk/publications/directors-public-health-COVID-19-pandemic

Lewis, C., Ubido, J., Jones, L. (2021). *Evaluating Cheshire and Merseyside’s Integrated Approach to Contact Tracing.* April 2021. https://www.champspublichealth.com/wp-content/uploads/2021/06/CHAMPS-Track-and-Trace-Report-FINAL-1.pdf.

Lewis C, Hartwig A, Johnson S, Coleman A, Gartland N, Ubido J, Gaokar A, Armitage C, Fishwick D, Verma A, van Tongeren M. (2022). Contributing factors and mitigation strategies for enduring COVID-19 prevalence. Report 1 – Drivers and regional variations. Prepared for The PROTECT COVID-19 National Core Study on transmission and environment. PROTECT-04 (2022) National Core Study Report.

Local Government Association (2021a) A perfect storm - health inequalities and the impact of COVID-19. https://www.local.gov.uk/perfect-storm-health-inequalities-and-impact-COVID-19

Local Government Association (2021b) COVID-19: good council practice. https://www.local.gov.uk/our-support/coronavirus-council-information-and-support/COVID-19-good-council-practice

Local Government Association (2022) LGA statement on the public health settlement. https://www.local.gov.uk/about/news/lga-statement-public-health-settlement#:~:text=Public%20health%2007%20Feb%202022%20Commenting%20on%20the,the%20Local%20Government%20Association%E2%80%99s%20Community%20Wellbeing%20Board%2C%20said%3A

Michie, S., Van Stralen, M. M., & West, R. (2011). The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implementation science, 6(1), 1-12. https://pubmed.ncbi.nlm.nih.gov/21513547/

Public Health England (2019) Right Care. Where to look data pack. Public Health England and NHS Right Care cfv-where-to-look-sept-19-NHS-Heywood-Middleton-and-Rochdale-CCG-WTL-20190912.pdf (england.nhs.uk)

Public Health England (2020) Disparities in the risk and outcomes of COVID-19. Public Health England. Disparities in the risk and outcomes of COVID-19 (publishing.service.gov.uk)

SAGE. (2020). *Role of Community Champions networks to increase engagement in context of COVID-19: evidence and best practice, 22 October 2020*. Retrieved from https://www.gov.uk/government/publications/role-of-community-champions-networks-to-increase-engagement-in-context-of-COVID-19-evidence-and-best-practice-22-october-2020

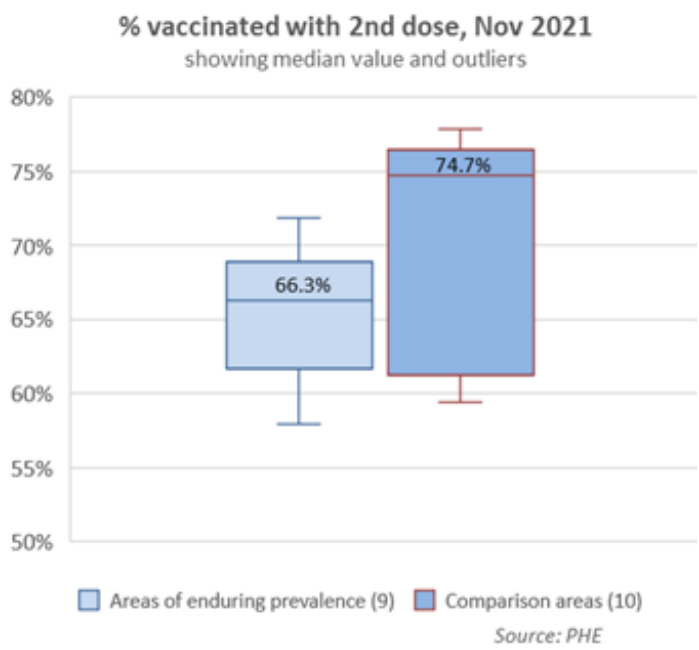
SAGE (2021) Paper from the Regional Variation subgroup of SAGE on understanding factors that lead to enduring prevalence. Scientific Advisory Group for Emergencies. S1212_Places_of_enduring_prevalence.pdf (publishing.service.gov.uk)

Singanayagam, A., Hakki, S., Dunning, J., Madon, K. J., Crone, M. A., Koycheva, A., & Lackenby, A. (2021). Community transmission and viral load kinetics of the SARS-CoV-2 delta (B. 1.617. 2) variant in vaccinated and unvaccinated individuals in the UK: a prospective, longitudinal, cohort study. The Lancet Infectious Diseases. https://www.sciencedirect.com/science/article/pii/S1473309921006484

The OpenSafely Collaborative, MacKenna, B., Curtis, H. J., Morton, C. E., Inglesby, P., Walker, A. J., . . . Goldacre, B. (2021). Trends, regional variation, and clinical characteristics of COVID-19 vaccine recipients: a retrospective cohort study in 23.4 million patients using OpenSAFELY. *medRxiv*, 2021.2001.2025.21250356. doi:10.1101/2021.01.25.21250356

UK Health Security Agency (2021) Updated UK Health Security Agency and Government guidance on self-isolation. https://www.england.nhs.uk/coronavirus/publication/updated-uk-health-security-agency-and-government-guidance-on-self-isolation/

Appendix 1a: Vaccination rates in AEP and CA



(non-significant difference, p=0.079)

Uptake percentages calculated by dividing the total number of vaccinations given to people of all ages by the mid-year 2020 population estimate for people aged 12 and over, published by the Office for National Statistics. https://coronavirus.data.gov.uk/details/vaccinations?areaType=ltla&areaName=Rochdale

Appendix 2: Interview schedule

Enduring Prevalence Research

Semi-structured interview schedule

The aim of this interview is to help us gain an understanding of why certain places appear to have higher prevalence of COVID-19 infections than others. We would like to gain views from Directors of Public Health and other local stakeholders who can share their knowledge and experience at the local authority level to discuss potential reasons for enduring COVID-19 prevalence in some regions. We would like to hear your general thoughts on the current situation, what happened in terms of mitigation measures in past waves of the pandemic and what approaches may be taken locally/ regionally to anticipate and reduce areas of enduring prevalence.

Background

Can you please tell me a little about your current role and the local authority in which you work?

Prompts:

- How would you describe your local authority in terms of its population/level of deprivation/manufacturing base etc.?
- How would you describe the region which your local authority is located in?

How would you describe the changes in COVID-19 prevalence in your LA over the course of the pandemic?

Prompts:

- Rates during the different waves
- How does this compare to neighbouring LAs and LAs with similar characteristics?

We would now like to hear your broad views on potential risk factors for regional enduring prevalence of COVID-19.

1. **In your opinion, what are the main factors that contribute to differences in the prevalence of COVID between locations/places?**
   Prompts:
   - What about e.g., population factors, deprivation, nature of work, effectiveness of contact tracing, regional commutes between LAs?
   - What is the interplay between the different factors?

2. **Why do you think certain areas have <u>sustained</u> high levels of prevalence?**
   Prompts:
   - What and how are these factors driving enduring prevalence?

3. **Has the importance/role of these factors changed throughout the timeline of the pandemic? If so, how?**

We would now like to hear your broad views on strategies and factors that have been effective in preventing or reducing regional prevalence of COVID-19.

4. **How effective do you think national level strategies, policies and guidance are in reducing transmission?**
   Prompts:
   - What are most effective strategies/policies at the national level?
   - Has the effectiveness of strategies changed throughout the timeline of the pandemic?

5. **Can you tell us about local/regional strategies that have been effective in helping reduce COVID-19 infection rates?**
   Prompts:
   - Examples of strategies/ policies: regulation, guidelines, fiscal measures, environmental/social planning, service provision, legislation, and communication/marketing?
   - What have been the most effective prevention strategies for your area/ community?
   - Why have interventions been effective/failed? (e.g., different organising of test & trace system)
   - What has helped/hindered the introduction of these strategies?
   - How effective have these strategies been at different times during the pandemic?
   - How is the effectiveness of strategies affected by specific characteristics of localities, places, population, economies?
   - What could be done to intervene earlier and curtail prevalence in regions?

6. **How have you identified any particular population groups for tailored interventions?**
   Prompts:
   - Is this based on previous data about inequalities or new covid-related data?
   - How have you dealt with challenges associated with reaching certain population groups in your interventions?

7. **How has the response to COVID-19 been organised locally?**
   Prompts
   - Which organisations have taken a lead? How have local organisations been working together? E.g., joint forums, with LAs / CCGs / ICSs, resilience hubs?
   - Has there been any misalignment/conflict between local, regional, and national strategies/policies/guidance and how have you managed this in your LA?

8. **How have LAs been sharing information and learning?**
   - Have there been opportunities for you to learn from other DsPHs? Are there forums you find useful in exchanging experiences and knowledge?
   - What do you do differently to other LAs? Why?

We are now interested in the data available and its use in decision making and what future research priorities might be.

9. **What data, evidence and knowledge is used to inform local decision making?**

Prompts:

- What sources of data/information do you find useful?
- How is existing knowledge / data used to inform guidance?
- What are key data or knowledge gaps that need to be addressed?
- How could data be used to anticipate places of enduring prevalence in the future?
- Have there been any issues around data sharing (e.g., between local/regional/national teams)?
- Has behavioural science informed your approach to encouraging hand hygiene, physical distancing, wearing of face coverings, self-isolation, etc? If so, how?

10. **What future research do you think would be most useful to provide insights that can support LA practice and decision making?**

    Prompts:

    - Is there anything that would need more research (e.g. patterns/correlations that cannot be explained)?
    - What are the key questions for research relating to enduring prevalence and future planning?

11. **In your opinion, what are the future challenges for preventing or reducing local / regional enduring COVID-19 prevalence?**

    Prompts:

    - Emergence of new variants of COVID-19
    - Support for people to self-isolate (e.g., financial support)
    - Impact of vaccination programme
    - National strategy for COVID19 transmission management
    - Support for places of enduring prevalence in the COVID-19 recovery

12. **Are there any other stakeholders you would recommend us contacting to gain a better understanding of disparities in prevalence of covid-19 infection? (names / locations / roles)**

Finally, is there anything you thought we might discuss, that we have not covered?

The PROTECT COVID-19 National Core Study on transmission and environment is a UK-wide research programme improving our understanding of how SARS-CoV-2 (the virus that causes COVID-19) is transmitted from person to person, and how this varies in different settings and environments. This improved understanding is enabling more effective measures to reduce transmission – saving lives and getting society back towards 'normal'.

Published by the PROTECT COVID-19 National Core Study 03/2022