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# Risk and Health Communication during Covid-19: A Linguistic Landscape Analysis

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## ABSTRACT

Since the outbreak of Covid-19 health communicators around the globe have had to reach, urge, and persuade individuals and communities to adopt appropriate health protective behaviors. They have used a mix of communication channels, including outdoor media and public signage which are the focus of this paper. Drawing on a comparative linguistic landscape analysis, this paper critically examined the amount, content, and prominence of Covid-19 signage in Hackney, a London borough severely hit by the first wave of the pandemic. Having analyzed 1288 signs collected between May and July 2020, we found significant differences in Covid-19 signage between deprived and less deprived areas. These differences (e.g., in messaging about staying at home) have created inequalities in access to Covid-19 related health information and guidance. We also explored the changes in Covid-19 signage over time and the tailoring of risk and health messages to minority communities.

## Introduction

The Covid-19 pandemic presents numerous new challenges to public health communication. Government and health agencies worldwide have had to reach out and urge individuals and communities to adopt and maintain behaviors that mitigate the spread of the virus. To increase coverage and impact, they have used a mix of different channels to convey Covid-19 related information, including regular press briefings and public health campaigns on traditional media, dedicated websites, mobile applications and telephone hotlines, campaigns on social media platforms, as well as health alerts sent by text messages, e-mails, and the post. Other common channels have included posters, leaflets and billboards displayed in public places; which will be the focus of this paper. More specifically, this paper will explore how public health advice and guidance on Covid-19 manifested itself through public signage in areas of a London inner city borough that were hit hard by the first wave of pandemic. By critically examining the amount, content, and prominence of signage, we aim to address the following research questions:

- (1) *What differences, if any, exist between deprived and less deprived areas?*
- (2) *How did Covid-19 messaging change over time?*
- (3) *How are messages tailored for different areas and communities?*

A total of 1288 photographed and geotagged signs referencing coronavirus, government and public health advice and health-protective measures comprise the data; these were collected by the first author between May and July 2020 in six London

(Hackney) neighborhoods with different levels of deprivation. To our knowledge, this is the first investigation into the role of public signage in public health and risk communication during a pandemic.

## Public health and risk communication during a pandemic

Lessons learned from previous public health crises, including the 2003 SARS outbreak (Frost et al., 2019) and the H1N1 influenza pandemic (Driedger et al., 2018), suggest that inappropriate communication can greatly compromise efforts to control disease transmission. Few would dispute that “even the best strategies can be rendered ineffective by inadequate health risk communications or failure to integrate a communication perspective [...] at every stage of planning, response, and recovery” (Vaughan & Tinker, 2011, p. S324). The public needs to be informed regularly about possible threats and their implications, along with clear directions – calls to action – about how to protect themselves and their families (Jong, 2021). To achieve this, government and health agencies worldwide have pandemic communication strategies in place which generally emphasize the importance of clear messaging, openness, and transparency in communicating risks and restrictions, emerging science, and the likely evolution of the outbreak. The United Kingdom’s communications framework is underpinned by the same principles (DHSC, 2012). Despite this, the rapid escalation of Covid-19 has been associated with conflicting and confusing communication both about the virus and the response to it (Ratzan et al., 2020a).

The factors influencing people's receptiveness to public health messages during a pandemic are also multiple – including health disparities (Vaughan & Tinker, 2011; Viswanath et al., 2020), health and media literacy (Austin et al., 2021; Levin-Zamir, 2020), language (Piller et al., 2020), information exposure and media resources (Ihm & Lee, 2021; Nazione et al., 2021), personal beliefs and attitudes (Benham et al., 2021), social, religious, and cultural norms, and confidence in information sources/messengers (Privor-Dumm & King, 2020). Similarly, health communications need to explicitly address the specific risk circumstances and beliefs of different communities (SPI-B, 2020, July 22). It is therefore generally recommended to use messages that are compatible with the targeted population's reasoning strategies and resources and have personal relevance/appeal for them (Vaughan & Tinker, 2011).

Our data does not allow us to consider all the aforementioned factors comprehensively; however, this paper will focus on four particularly important elements. These are summarized in Table 1.

### Why a linguistic landscape analysis?

Since Covid-19 was first detected in the UK, new signs have been installed in public places pointing out both risks posed by the virus and appropriate health-protective behaviors such as wearing a face covering and social distancing. Like other tools of pandemic communication, these signs are expected to “maximize the public's capacity to act as an effective partner by encouraging prevention, promoting containment, and fostering resilience and recovery” (Vaughan & Tinker, 2011, p. S324). They also provide guidance to the public in its adaptation to rapidly changing circumstances, from calls for minimally disruptive actions (e.g., frequent handwashing) to actions that raise concerns, are difficult or fuel controversy among sections of the community (e.g., staying at home and away from others).

The use of outdoor media in public health campaigns has been declining in recent years as health communicators' focus shifted toward social media platforms (e.g., Jong, 2021; Ratzan et al., 2020a). This is evident in the UK's earlier pandemic communication strategy (DHSC, 2012) which did not (explicitly) consider outdoor advertising for public communication. Despite this, however, public signs have been extensively used for Covid-19 related messaging, in all probability, because of the pandemic's profound impact on our perception and use of public space. According to the World Health Organization (2020), Covid-19 has also spurred an infodemic or overabundance of information, particularly in new media environments (see also Viswanath et al., 2020). Health communicators are proactively seeking ways to be louder than perpetrators of false

information (Ratzan et al., 2020b) and transparent messaging through outdoor media could be an effective strategy to tackle mis/disinformation, especially in low-resource deprived communities.

### Why inner-city areas such as Hackney?

Data released by the Office for National Statistics (ONS) after the first wave of pandemic showed that the highest rates of deaths involving Covid-19 were in deprived, inner-city areas, including the London Borough of Hackney. On 01 May 2020 Hackney ranked third among the worst hit regions with an age-standardized mortality rate of 127.4 deaths linked to the disease per 100,000 population (ONS, 2020). The mayor of Hackney blamed the links between inequality, poverty, ethnicity, and health for his borough's high death rate (Giles & Wallis, 2020). Hackney is among the most-deprived local authorities in England on the UK government's Indices of Multiple Deprivation (London Councils, 2019). Recent improvements in the borough are mostly attributed to the rapid gentrification of the area; however, high levels of poverty and inequality remain (Trust for London, 2020).

Hackney is also a melting pot of people from different ethnic, cultural, and linguistic backgrounds. As discussed above, acceptance of public health measures may partly depend on meeting the specific communication needs of all populations, especially those who are at greater health risk. Evidence is emerging that this pandemic could be disproportionately affecting people from black, Asian, and minority ethnic (BAME) communities (Kirby, 2020). This raises new questions about the need for targeted communications, particularly in areas like Hackney where 39% of residents are foreign born and over 45% of population is made up of multi-ethnic or BAME communities (Hackney Policy and Insight Team, 2018).

To account for this diversity, signs from six lower layer super output areas (LSOAs<sup>1</sup>) with different populations and levels of socioeconomic deprivation will be considered.<sup>2</sup> The surveyed area (approximately 65.3 hectares) is shown on Map 1.

Pandemics are prolonged events and guidance to the public may change as cases accumulate, expert consensus grows, and governments shifts their response. A timeline of Covid-19 measures and messaging in the UK (shown in Appendix 1 of the Supplemental Material) thus provides the necessary context for this study.

### Method and analysis

Research into displayed language (signs) in a particular space is referred to in sociolinguistics as linguistic landscaping (Carr, 2019; Gorter, 2018). Linguistic landscape studies have been mainly focused on the visibility and salience of languages in regions with long-standing linguistic conflicts (e.g., Cenoz & Gorter, 2006; Landry & Bourhis, 1997; Rubdy & Ben Said, 2015; Scollon & Scollon, 2003), and more recently on urban multilingualism (e.g., Backhaus, 2007; Carson & Kalantar, 2016). However, the field is currently witnessing both a thematic diversification and methodological consolidation (Purschke, 2020) owing in part to

**Table 1.** Communication factors and strategies.

Language preferences	Availability of information in community/foreign languages Multimodality (use of images and symbols)
Targeting	Public health information and campaigns targeted at specific communities/social groups, including particular risk circumstances
Appeal	Strengthening the personal relevance of communications
Trusted sources	Directing public to credible (additional) sources of information

technological advances and the development of mobile research applications for linguistic landscape studies. These allow for consistent data collection and storage, visualization of the collected signs on maps in real time, as well as annotations that are both automatically generated (geolocation and date of upload) and created by the researcher for analytical purposes. Given all the above, linguistic landscaping emerges as a promising methodology for examining risk and health communication in the public space and for producing insights that are both actionable and potentially applicable in other contexts.

The data for this publication was collected in three cycles following each major change to social distancing rules and public health advice. Figure 1 shows the total number of signs photographed at each three-day data collection cycle.

Because of the historical layering of language in the landscape, Cycle 1 could capture elements of the pre-lockdown public information campaigns as well as signs installed (immediately) before and during the nationwide lockdown. Cycle 2 took place during a planning phase when schools, business, pubs, and restaurants were putting in place the infrastructure to reopen Covid-safely, and finally, Cycle 3 was completed in mid-July after most of the lockdown restrictions imposed in the first wave had already been lifted.

Signs referencing Covid-19, Coronavirus, social distancing rules and/or protective action(s) were photographed using an iPhone 6S along a total distance of 90 kilometers. The area shown on Map 1. was covered in its entirety in each cycle of data collection. The photographs were stored together with metadata (date and geolocation) in a cloud-based storage. A selection is shown in Appendix 3 of the Supplemental Material. The photographs taken during the second round of data collection are also accessible to the public through the public image repository of Lingscape (<https://lingscape-app.uni.lu/pin/list>)<sup>3</sup> – a citizen science mobile application for linguistic landscaping. After initial screening, a total of 1288 signs were retained for coding and analysis.

The coding framework was developed by the authors iteratively to encompass:

- common coding categories used in linguistic landscape studies (e.g., language, authorship, location, and prominence)
- the specific content of messaging; and

- the presence (absence) of factors and strategies affecting the acceptance of public health measures (e.g., language and modality, communicative function, and targeting as per Table 1).

The coding was completed by the first author (examples of fully coded data are shown in Appendix 2 of the Supplemental Material, along with additional information on how the different categories were operationalized). To assess the reliability of message-specific codes the second author independently recoded a random subset (20%) of all unique signs. Inter-coder reliability was calculated using Krippendorff's alpha:  $\alpha = 0.98$ . Any disagreements were resolved through discussion. The coded data were recorded in Excel and analyzed in SPSS (version 26.0). As a method of analysis, the study uses descriptive statistics and Chi-square tests to explore the changes in messaging over time, as well as the differences between deprived and less deprived areas. For the purposes of this paper, we consider "deprived" those LSOAs that are within the most deprived 20% of areas nationally according to the 2019 Index of Multiple Deprivation – that is, 026B, 026D and 027 H as per Map 1. Following from this, 026a, 026 C and 027I are the "less deprived" areas (these are within the most deprived 30–50% nationally). Differences with  $p$ -values  $<0.05$  are considered significant.

*Research ethics.* The study did not require an ethics committee approval given that it did not involve human participation and was observational in nature.

## Results

### Descriptive results

The majority (705) of the 1288 collected Covid-19 related signs contained explicit public health guidance – these will be the focus of the analysis in the next sections. The remaining signs informed the public of temporary closures and restricted service, offered help for those shielding and self-isolating (e.g., with food shopping, dog walking and other daily tasks), expressed support/gratitude toward health and other key workers, and in Cycle 3, informed the public about re-openings. Around 43% of all signs were authored by public bodies (Hackney Council, National Health Service, HM Government, Mayor of London, and Transport for London),

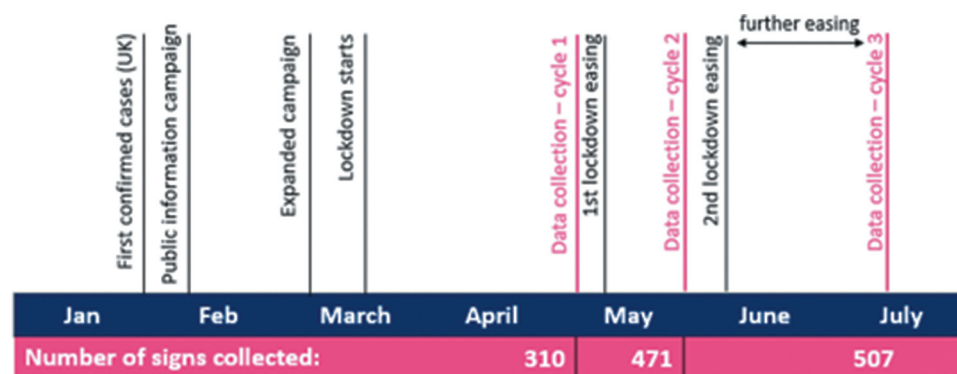


Figure 1. Data collection.

followed by voluntary organizations (25.5%), the business sector (25%), members of the public (6%) and other (0.5%). On average, each sign was displayed on at least four occasions with each display being counted as one. The 705 signs containing explicit public health guidance thus comprised 179 unique items. These often conveyed multiple messages, for instance, in Cycle 3, construction workers were reminded via multi-message signs to keep two meters distance, adhere to hand hygiene guidelines and stay at home if showing any symptoms. A total of 237 signs appeared at more than one data collection point. These repeated observations were removed from the data set to meet the assumption of independence, leaving a total of 468 observations to perform the chi-square analyses discussed in the next section.

### Differences between deprived and less deprived areas

A series of chi-square tests was performed to examine the relation between the total number of signs and deprivation, at each point of data collection, the messages they contained and their prominence. Overall, there was a substantial difference in the total number of signs across all three data collection periods, with more signs containing explicit public health guidance displayed in less deprived areas ( $n = 290$ ) compared to the more deprived areas ( $n = 178$ ). There were also differences between deprived and less deprived LSOAs in the content of messaging, with more messages about self-isolation, wearing a face covering, limiting travel, avoiding contact, staying at home, and getting a test all seen in less deprived areas. These results are summarized in Table 2.

Messaging around spatial distancing (keeping 2 m apart and avoiding crowding) dominated the linguistic landscapes of both deprived and less deprived areas. However, the former had less signage in all key areas of messaging, with differences being significant for guidance on self-isolation, distancing, and guidance to avoid physical contact (e.g., handshaking, touching one's face, paying with cash or, unnecessarily touching goods or surfaces). The difference was also apparent for limiting travel, although a chi-square test could not be performed to check the significance in the distribution of these signs.

Nationwide public health campaigns were also more likely to reach and become displayed in less deprived LSOAs. The "Stay at home. Protect the NHS. Save Lives" campaign, which had become the mantra of the lockdown in Britain, was almost entirely absent from the linguistic landscape of deprived areas (except for two drawings which were both authored and displayed by members of the public). The dominant message in these areas was in fact often the opposite ("Help us keep [...] open"), especially in parks and green spaces which were kept open throughout the lockdown to enable exercising. The ten-fold difference between deprived and less deprived LSOAs in the reach of UK-wide campaigns remained significant also after the launch of the "Stay alert. Control the virus. Save lives" campaign, which accompanied much of the reopening efforts throughout May-July 2020.

The differences in reach and messaging between deprived and less deprived areas were further accentuated by the fact that most easy-to-read and highly visible signs were displayed in less deprived areas (Table 3 and Figure 2).

Overall, Covid-19 signage in deprived areas lagged behind that in less deprived areas in terms of both amount and prominence. Signage in deprived areas was also less comprehensive, with important public health guidance (e.g., on when and how to self-isolate) often missing or having very limited presence.

### Changes in messaging over time

Overall, more deprived areas had fewer signs at each data collection point and responded less effectively to the emergence of new information and public health guidance. The main differences in messaging between deprived and less deprived areas over time are summarized in Table 4.

Early information campaigns on Covid-19 in the UK were predominantly focused on the promotion of respiratory and hand hygiene practices (DHSC, 2020e & 2020d February 2 and March 4). Elements of these campaigns were still visible in May 2020 and were documented in the first cycle of data collection. In mid-May, guidance on hand washing and cough/sneeze etiquette gained renewed importance when schools, the hospitality sector and non-essential businesses

Table 2. Differences between deprived/less deprived areas (Content).

	Deprived (number of signs)	Less Deprived (number of signs)	Chi-square
Respiratory and hand hygiene	36 (20%)	60 (21%)	$\chi^2(1, n = 468) = .000, p = .99, phi = .006$
<b>Self-isolation</b>	15 (8%)	52 (18%)	$\chi^2(1, n = 468) = 7.37, p = .007, phi = .13$
Symptoms	7 (4%)	21 (7%)	$\chi^2(1, n = 468) = 1.6, p = .21, phi = .07$
<b>Distancing</b>	124 (70%)	174 (60%)	$\chi^2(1, n = 468) = 4.04, p = .04, phi = -.10$
No gatherings/ personal contact	18 (10%)	28 (10%)	$\chi^2(1, n = 468) = .000, p = .99, phi = -.007$
Face covering	6 (3%)	24 (8%)	$\chi^2(1, n = 468) = 3.64, p = .06, phi = .01$
Limit travel	2 (1%)	20 (7%)	-
<b>Avoid contact</b>	13 (7%)	43 (15%)	$\chi^2(1, n = 468) = 5.24, p = .02, phi = .11$
UK wide campaign	4 (2%)	55 (19%)	-
Get a test	0	10 (3.4%)	-
Information about further guidance	55 (31%)	96 (33%)	$\chi^2(1, n = 468) = .16, p = .69, phi = .02$
Total signs	178	290	

Multi-message signs were coded for each content category that applied to them; the  $\chi^2$  tests are reported with Yates' continuity correction; Chi square tests were not conducted to show significance where less than 80% of cell counts were < 5 or cells contained 0.



**Table 3.** Differences between deprived/less deprived areas (Prominence).

	Deprived	Less Deprived	Chi-square
1 (least visible)	63 (35%)	8 (3%)	$\chi^2(4, n = 468) = 103.02, p < .001, phi = .47$
2	32 (18%)	78 (27%)	
3	64 (36%)	110 (38%)	
4	7 (4%)	29 (10%)	
5 (most visible)	12 (7%)	65 (22%)	

1 = (hand-written signs, small flyers, >A5 signs), 2 = (> A3 flyers and posters), 3 = (A3-A2 posters, road signs, stickers, and chalkboards), 4 = (large posters and pavement signs), 5 = (banners and digital advertising)

started (planning for) reopening. As shown in Table 4, there was a gradual increase in respiratory and hand-hygiene signage in both deprived and less deprived areas.

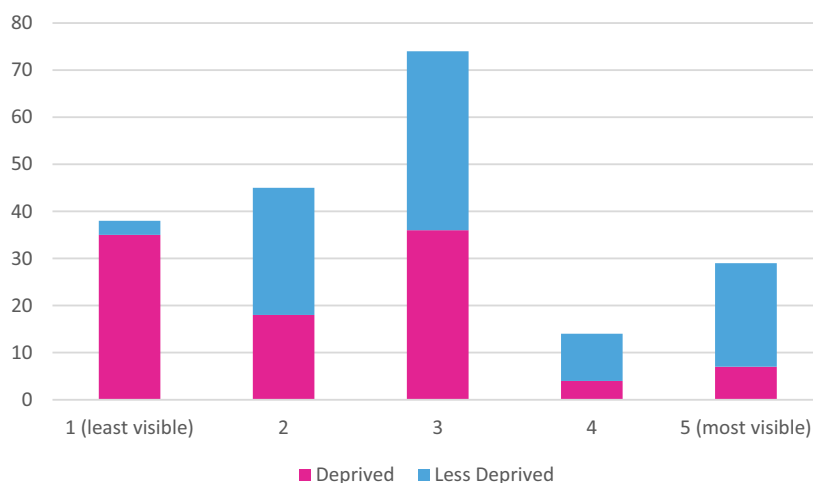
Self-isolation guidance for travelers returning from affected areas (PHE & DHSC, 2020, February 07) and households with possible Covid-19 inspection (PHE, 2020b, March 12) were other foci of early messaging in the UK that quickly became part of the linguistic landscape. But whilst the messaging around self-isolation remained largely unchanged in deprived areas throughout February-July 2020, the less deprived LSOAs saw a significant increase in signage over the same period. The results were roughly the same for guidance on avoiding physical contact to mitigate the spread of the virus.

From the start of the outbreak, public signage has also been used in deprived and less deprived areas to convey information about Covid-19 symptoms, although in a limited way. The data in Table 4 show some increase in signage in the less deprived LSOAs, while the amount and content of messaging in deprived areas remained largely the same after the first cycle of data collection. This meant that important updates, for instance, information about possible new symptoms like loss/change in sense of smell or taste, were only conveyed through the linguistic landscape of less deprived neighborhoods. Most of the messaging around symptoms appeared in combination with self-isolation guidance and/or bans to enter certain places.

The first Covid-related guidance on travel and public transport usage was published as early as March 2020 (DFT, 2020b, March 26); yet there was little to no information displayed in deprived LSOAs regarding safer travel guidance or (non)essential travel. Messaging in the less deprived areas was also limited, however, there were some signs displayed at key locations (e.g., bus stops) instructing the public to avoid all non-essential travel and to travel at quieter times, as well as calls to wear face covering and consider alternative means of transport like walking or cycling.

The initial messaging from the government about face masks and coverings was contradictory. In England, wearing them became mandatory only on June 12 for public transport and July 24 in all enclosed public spaces. This delay in endorsing face coverings for the public was clearly reflected in the linguistic landscape of the areas under study. As can be seen from Table 4, no signs with face covering guidance were recorded in Cycle 1. In more deprived LSOAs the signage remained limited throughout May-July 2020: it included solely a couple of mid-sized posters displayed by business owners, and a street painting by a local artist. By contrast, the less deprived areas saw an immediate increase in messaging shortly after the publication of relevant guidance documents (DHSC, 2020b, May 11; DFT, 2020a, June 12).

The more deprived areas recorded significant changes over time in just two key areas of Covid-19 messaging: respiratory and hand hygiene, and distancing.<sup>4</sup> In Cycles 1 and 2, most of the physical distancing signs belonged to the local council and were predominantly placed in parks, council homes and estates to remind residents to keep a two-meter distance and avoid gatherings in group. These signs were not removed or updated when the rule-of-six came into effect on June 01, allowing people to meet with individuals from up to six other households. The sharp rise in distancing signs in Cycle 3 was related to the re-opening of schools, hospitality and non-essential businesses and the increased outdoor signage which accompanied this process. At the time of this research, guidance on contact tracing and testing was in large part absent from the linguistic landscape.

**Figure 2.** Differences between deprived/less deprived areas (Prominence).

**Table 4.** Differences over time.

		Cycle 1	Cycle 2	Cycle 3	Chi-square
Respiratory and hand hygiene	<b>Deprived</b>	14 (39%)	9 (25%)	13 (36%)	$\chi^2 (2, n = 178) = 7.9, p = .02, V = .21$
	<b>Less deprived</b>	7 (12%)	21 (35%)	32 (53%)	$\chi^2 (2, n = 290) = 8.26, p = .02, V = .7$
Self-isolation	Deprived	7 (47%)	3 (20%)	5 (33%)	$\chi^2 (2, n = 178) = 2.9, p = .23, V = .13$
	<b>Less deprived</b>	5 (9%)	24 (46%)	23 (44%)	$\chi^2 (2, n = 290) = 8.60, p = .014, V = .17$
Avoid contact	Deprived	2 (15%)	2 (15%)	9 (69%)	-
	<b>Less deprived</b>	3 (7%)	13 (30%)	27 (63%)	$\chi^2 (2, n = 290) = 12.81, p = .002, V = .21$
Symptoms	Deprived	4 (57%)	0	3 (43%)	-
	Less deprived	3 (14%)	11 (52%)	7 (33%)	$\chi^2 (2, n = 290) = 3.42, p = .18, V = .11$
Limit travel	Deprived	0	0	2 (100%)	-
	Less deprived	4 (20%)	8 (40%)	8 (40%)	$\chi^2 (2, n = 290) = .40, p = .82, V = .04$
Face covering	Deprived	0	0	6 (100%)	-
	Less deprived	0	9 (37%)	15 (63%)	-
Get a test	Deprived	0	0	0	-
	Less deprived	0	6 (60%)	4 (40%)	-
Distancing	<b>Deprived</b>	23 (19%)	15 (12%)	86 (70%)	$\chi^2 (2, n = 178) = 40.32, p < .001, V = .48$
	Less deprived	40 (23%)	57 (33%)	77 (44%)	$\chi^2 (2, n = 290) = 2.33, p = .32, V = .09$
No gatherings/personal contact	Deprived	13 (72%)	2 (17%)	2 (11%)	-
	<b>Less deprived</b>	17 (61%)	5 (18%)	6 (21%)	$\chi^2 (2, n = 290) = 18.27, p < .001, V = .28$
UK wide campaign	Deprived	1 (25%)	2 (50%)	1 (25%)	-
	Less deprived	12 (22%)	25 (46%)	18 (33%)	$\chi^2 (2, n = 290) = 3.68, p = .16, V = .16$
Total signs	Deprived	57 (32%)	24 (14%)	97 (54%)	$\chi^2 (2, n = 468) = 25, p < .001, V = .23$
	Less deprived	72 (25%)	124 (27%)	215 (46%)	

Multi-message signs were coded for each content category that applied to them; Chi square tests were not conducted to show significance where less than 80% of cell counts were < 5 or cells contained 0.

The reach of UK-wide campaigns in deprived areas was very limited throughout the study period (4 signs in total); in comparison, the “Stay alert. Control the virus. Save lives” campaign alone generated 43 new signs in less deprived areas through Cycles 2 and 3 (Table 4). Finally, we have observed two other, more general shifts in Covid-19 messaging over time: first, the personal relevance of communications was gradually reinforced through positive framings and imagery, especially in the linguistic landscape of less deprived LSOAs (this is discussed in more detail in the next section); and second, Covid-19 advice and guidance became part of broader messaging around park rules, site safety (e.g., construction sites) and the Brexit transition period to mention but a few examples. Whether this latter shift indicates a normalization of Covid-19 measures and restrictions remains to be seen.

### Tailoring of messages to communities and social groups

The last analyses examined the tailoring of messaging according to the factors and strategies presented in Table 1. As regards information availability in community/foreign languages, of the 705 signs containing explicit public health guidance only three had information displayed in languages other than English. The number of non-English or multilingual signs was minimal also in the rest of the data set, which, as explained in the descriptive analysis, included help offers for those shielding and self-isolating, messages of support to the NHS/key workers, as well as information about temporary closures and re-opening.

In terms of multimodality, roughly 70% used symbols ( $n = 423$ ) or images/photos ( $n = 83$ ) to reinforce the messaging with a visual explanation. Images and photos were principally deployed in nationwide public health campaigns displayed in

public places (e.g., DHSC, 2020d, March 04; and the “Stay alert. Control the virus. Save lives” campaign). Early information campaigns (February and March 2020) used mostly visualizations of the virus, while later campaigns shifted toward a greater use of photos depicting people of different ages, gender, and ethnicities (including BAME groups), presumably to increase the persuasiveness and personal relevance of messaging.

The personal relevance of communications was also strengthened over time through the re-framing of public health and risk messages. For example, “Keep a safe distance.” was replaced by “Keeping apart. Keeps us safe.” “Got symptoms? Get tested.” by “To protect me. Get a test.” “Wear a face covering” by “I wear this to protect you. Please wear yours to protect me.” These re-framed messages were, however, only present in the second phase of the “Stay alert. Control the virus. Save lives” campaign, which also meant that their reach and use was limited to less deprived LSOAs.

Turning now to the targeting of messages to specific communities and social groups, we did not encounter any examples of communications aimed specifically at foreign born, multi-ethnic or BAME communities. Guidance for clinically vulnerable people, for those who could not work from home and/or lived and had to self-isolate in multi-generational households (see PHE, 2020b, March 12), or who had experienced domestic abuse during the pandemic (see Home Office, 2020, April 11) was not detected in the linguistic landscape of the studied areas either. The same was true for social distancing guidance for young people (see Cabinet Office, 2020, May 24).

In the final part of the analysis, we also looked at messages directing the public to credible sources of Covid-19 information. These almost always appeared as part of multi-message signs authored by public bodies. The most frequently referenced sources of additional information included the dedicated

**Table 5.** Information about further guidance.

	Cycle 1	Cycle 2	Cycle 3	Chi-square
<b>Deprived</b>	40 (73%)	9 (16%)	6 (11%)	$\chi^2 (2, n = 178) = 69.42, p < .001, V = .62$
<b>Less deprived</b>	39 (40%)	30 (31%)	29 (30%)	$\chi^2 (2, n = 290) = 18.48, p < .001, V = .25$

coronavirus web pages of the NHS and local council, as well as a free-to call (non-emergency) medical helpline. No significant difference was found between the deprived and less deprived LSOAs in the total number of signs referencing further guidance (see Table 2), even though the former fell behind in the amount of new signage after Cycle 1 (Table 5).

As explained earlier, messages directing the public to additional sources of guidance appeared mainly in communications from public actors like the local council or the NHS. Signs issued by businesses, community-based organizations and other voluntary sector actors seldom referenced further public sources of Covid-19 information, even though announcements of temporary closures and post-lockdown reopening often contained statements of agreement/compliance with government guidelines and recommendations. Part of these signs was presumably meant to reassure costumers and visitors about a venue's commitment to safety measures, but as a secondary effect, these signs also reinforced and acted as a conduit for public health messaging around social distancing.

## Discussion

This study sought first to examine the amount, content, and prominence of Covid-19 signage in inner-city areas of London, and second to draw comparisons between the linguistic landscapes of neighborhoods with different levels of deprivation. The results revealed significant differences in the amount and comprehensiveness of Covid-19 messaging, with deprived LSOAs having fewer and less prominent signs at each data collection point and responding less effectively to the emergence of new information and public health guidance. Overall, calls to spatially distance dominated the linguistic landscapes of both deprived and less deprived areas, however, the latter had significantly less or no messaging around other key measures including staying at home and/or self-isolation, limiting non-essential travel and wearing a face covering. The relative absence of nationwide Covid-19 campaigns like "Stay alert. Control the virus. Save lives" in deprived LSOAs was particularly concerning given evidence that people facing deprivation experience a higher risk of exposure to Covid-19 as well as more severe outcomes (Bibby et al., 2020). The lack of reach of these campaigns did not only influence which public health measures were (not) promoted in deprived areas, but also impacted on the framing of messages. Several lines of evidence (e.g., Benham et al., 2021; Coroiu et al., 2020) have recently suggested that frames focused on the responsibility of protecting others are effective in improving adherence to Covid-19 measures and, as we saw in our data set, various health and risk messages were amended over time using

precisely this framing. Changes in framing were, however, mainly observed in less deprived areas with deprived LSOAs lagging behind also in this respect.

Taken together, these differences resulted in potentially unequal access to Covid-19 related health information and guidance. This finding broadly supports the work of Viswanath et al. (2020), Austin et al. (2021), and Piller et al. (2020), who directed attention to health communication inequalities during this global health crisis. The above findings also provide valuable learnings for the roll-out of future information and public health campaigns, for instance, around vaccination. Doctors and researchers have already raised concerns about worrying disparities in vaccine coverage (Sample, 2021, January 27), highlighting the need for measures to tackle vaccine hesitancy and improve uptake in deprived and ethnically diverse LSOAs – outdoor advertising developed in partnership with local communities could be an effective strategy to achieve exactly this.

The third objective of this study was to explore if and how changes in messaging in the public space followed the unraveling of the Covid-19 crisis. Overall, the linguistic landscape of both deprived and less deprived areas accurately reflected the major changes in social distancing rules throughout May-July 2021. At the same time, deprived areas were overall playing catch-up in other key areas of public health messaging, including guidance on face coverings, self-isolation, and travel to mention but a few. Contrary to expectations, we hardly found any signs calling on people to stay at home during the lockdown (see DHSC, 2020c, March 23) or urging them to take a test once Covid-19 testing had become widely available (DHSC, 2020a, June 26). These gaps in messaging could be attributed, partially, to the limited reach of nationwide campaigns which reinforced existing inequalities in access to information. Similarly, even though signs from the local council were evenly distributed, differences still emerged in both the content and prominence of signage between deprived and less deprived LSOAs, not least because of the resources businesses, hospitality venues, educational institutions, and residents could deploy to create (purchase), display, and update Covid-19 signs. This is where the impact of deprivation on health and risk messaging became evident.

On the upside, of the 1288 signs gathered and analyzed in this study none seemed to feature false, deliberately misleading, or harmful information about Covid-19. This provides some support for the premise underpinning this research, that a balanced health and risk messaging through the linguistic landscape can be a powerful tool for informing and guiding the public and tackling mis/disinformation. Research on how outdoor messaging might impact on risk and efficacy perceptions (as in Nazione et al., 2021) and observed behaviors (e.g., social distancing in public, vaccination rates etc.) could be an extension to the current study.



The fourth objective of this study was to investigate the tailoring of messages to specific communities and social groups. One of the most important observations to emerge from the data in this connection was the lack of information displayed in community/foreign languages. This was unexpected given the ubiquity of multilingual signage in London, including Hackney (Johnson, 2017), as well as the resident population's linguistic profile: according to the latest census data, in around 20% of Hackney households no people aged over 16 have English as a main language. This suggests a clear need for Covid-19 information and guidance in community/foreign languages, and while symbols and images often added much needed visual explanations, some guidance pieces likely remained inaccessible for people with limited (no) reading competence in English. Multilingual messaging is also relevant for trust building and increasing adherence to Covid-19 measures (Piller et al., 2020).

Regarding other strategies of message targeting, we did not find any examples of Covid-19 communications aimed specifically at multi-ethnic or BAME communities, despite them representing around 45% of the local population (Hackney Policy and Insight Team, 2018). BAME workers are more likely to work in key sectors (i.e., unable to work from home), rely on

public transport, and live in multi-generational (overcrowded) households which make physical distancing and self-isolation difficult (PHE, 2020a, June 20). All these factors increased their risk of contracting Covid-19, and yet, no guidance on risk mitigation mindful of BAME communities' particular circumstances, risks, social and cultural norms was detected in the linguistic landscape. The gradual emergence of images depicting people of different ethnicities suggested a first move toward more sensible and inclusive health messaging, however, the overall signage fell short of reflecting local people and realities. The findings of this study thus add to a growing call to localize and co-produce health messages with target communities (e.g., Privor-Dumm & King, 2020; von Heimburg & Cluley, 2021) both during emergencies like the Covid-19 pandemic but also in the longer-term.

This study also contributes to theory by highlighting some of the uses, benefits, and limitations of outdoor media in public health and risk messaging. Despite its ubiquity, this channel of communication has been largely neglected in recent debates about communication during health crises (e.g., Jong, 2021). This study puts outdoor media back to the forefront of (health) communication research whilst discussing its role in tackling information and communication inequalities (Viswanath et al., 2020). Another



Map 1. Area of research.

important theoretical contribution relates to the inclusion of deprivation as a key factor in researching urban landscapes and the public signage within them. Finally, the study also complements prior theories by considering multimodal information (i.e., written text, symbols, and images) when assessing message targeting. Further work is needed to fully understand how the simultaneous use of different languages and modalities helps generate, contextualize, and reinforce risk and health discourses.

There are several limitations that need to be considered when interpreting the findings of this study. First, our analysis did not consider the overload of Covid-19 signs in certain places (e.g., signage outside of supermarket chains), and how this affected the overall effectiveness of messaging. Future studies may benefit from using geostatistical mapping techniques to examine the spread and volume of signage in a more nuanced way. Second, given the social distancing measures in place at the time of the study, we could not obtain data directly from local residents about their perceptions of Covid-19 messaging in public spaces and ways to improve it. This is certainly an important direction for future research. Finally, our findings are not necessarily applicable to other areas, therefore further investigations of both urban and rural linguistic landscapes are required to fully understand the role of public signage in health and risk communication during a pandemic. Notwithstanding these limitations, this study has offered important insights for the roll-out of future outdoor information and public health campaigns, especially in diverse, deprived and densely populated inner-city neighborhoods. The study has also made a methodological contribution by introducing linguistic landscaping to a new area of inquiry and research. We hope this paper will prove useful to other researchers who are looking to undertake similar studies on risk and public health messaging in the future.

## Notes

1. LSOAs are geographical units used for statistical purposes. They were designed to contain similar numbers of residents (approximately 1500) and group together similar types of dwellings.
2. The Index of Multiple Deprivation is the official measure of relative deprivation in England. It is comprised of indicators in seven domains: income, employment, health deprivation and disability, education, crime, barriers to housing and services, and living environment.
3. Project: Hackney2.
4. The results for “Face covering” in deprived areas have been interpreted with caution due to the small sample size.

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