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Understanding public health communication design globally during the Covid-19 pandemic: The Good, the Bad and the Ugly

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Abstract | The aim of the study reported in this paper is to develop an understanding of official public health communication design on Covid-19 globally. As a new disease, the rapid rise in the sheer volume of new scientific information about Covid-19 surpasses human processing capabilities, impacting the public and policy makers, creating an ‘infodemic crisis’. Following a two-stage message/language framing and visual design analysis of crowdsourced official Covid-19 Public Health material we present findings from 46 countries, across five continents, and more in-depth analysis of 32 material from 17 countries. This is the first of its kind paper offering an analysis of the global situation on Covid-19 public health communication design; and six draft recommendations on how to effectively plan communication and frame messages that are compelling and actionable to the local audiences considering their social, cultural and economic circumstances.

KEYWORDS | COMMUNICATION DESIGN, PUBLIC HEALTH, COVID-19, VISUAL DESIGN,
DESIGN FOR HEALTH

1. Introduction

The coronavirus disease 2019 (Covid-19) pandemic has ushered a new era of increased conspiracy theories, fake news and misinformation, regarding the aetiology, outcomes, prevention, and cure of the virus (Tasnim, et al, 2020; Van Bavel, et al, 2020).

This has made it very difficult for the public to distinguish scientific evidence and facts from less reliable sources of information, often leading to counterproductive practices that increase the spread of the virus.

Governmental agencies rely on public affairs messaging to address public health crisis (Barbour, et al, 2015). In this unprecedented situation, Governments across the globe and policy makers are looking at each other for solutions inspiration, trialled policies and interventions they can implement by their own national and regional authorities. But have failed to establish international cooperation and knowledge exchange to cope with this. In this context, local COVID-19 communication plays a key role in informing citizens.

In response to that, the Design Research Society Special Interest Group on [Global Health](#), has developed an open access [repository](#) containing crowdsourced information on Covid-19 public health messages and information set by official national and international bodies. The aim is twofold. First, to develop an official of data on public messages and information on Covid-19 that researchers, public health authorities and policy makers can access and forward to communities globally. Second, to conduct a multinational and multicultural visual and language communication analysis of Covid-19 public health messages included in it. The latter is presented in this paper.

2. Background and Related Work

2.1 The Infodemic Challenge of Covid-19

Infodemic refers to an exponential increase in the volume of information associated with a global issue such as an epidemic (WHO, 2020). As COVID-19 has been a relatively unknown virus, in terms of the impact on humans, we are witnessing a rapid rate of new scientific information being published (Eysenbach, 2020).

Since the Ebola outbreak in West Africa, in 2014-2016, the health sector has learned that trust in health authorities, community engagement and accurate information can go a long way to help the public comply with public health measures (Gilmore et al, 2020). The need for official messaging during the COVID-19 pandemic is arguably far greater than in more commonly encountered hazard settings, and the demands on communicators to inform and motivate are higher (Sutton et al, 2020).

Governments and international health bodies are engaging the scientific community for evidence-based recommendations on how to minimise harms and better manage the

pandemic (Sutton et al, 2020). The widespread of misinformation related to the diagnosis and prevention of Covid-19 has confused both the general population and policy makers who are regularly issuing new and revised guidelines for disease prevention and treatments (Tasnim et al, 2020).

The main challenge here is not just the sheer volume of information, but critically its translation and communication into actionable recommendations that are contextually, socially and culturally relevant for different audiences across different parts of the world; especially among countries with low income, low life expectancy, and less education (Savoia et al, 2013; Gagliardone, 2016a; Brisset-Foucalt, 2016).

The Covid-19 pandemic has resulted in an enhanced requirement for communication with the public on an ongoing basis, not only to pass on warnings and alerts, but also to inform, educate, and continuously motivate individuals in their roles as de facto responders in the ongoing disaster (Sutton et al, 2020). There is a need for more targeted public health information within communities and for partnerships between public health authorities and trusted organizations that are integral to these communities (Van Bavel et al, 2020; Srinivasan & Lopes, 2020).

2.2 Lessons from past epidemics/pandemics

As demonstrated by recent public health crises, such as the global Ebola outbreak, it is clear that threats to public health do not respect national boundaries (Barbour et al, 2015).

Communication of timely risk information is absolutely vital for behavioural change to protect public health and safety. However, prior work on messaging in response to emerging health threats such as Zika and Ebola has shown that effective messaging strategies can depend upon details of the threat itself (Sutton et al, 2020).

Past outbreaks' analysis, such as that of Ebola and the Zika virus, shows that effective communication about the outbreak to the public and how to prevent its transmission take time and offers lessons for the current Covid-19 pandemic public health communication messaging (WHO, 2015; WHO, 2016). Covid-19 presents a challenging context for communication about prevention, containment, and treatment as well. Rather than a single, one-time big event, we have seen that Covid-19 presents as a rising tide or prolonged risk incident with several waves of occurrence.

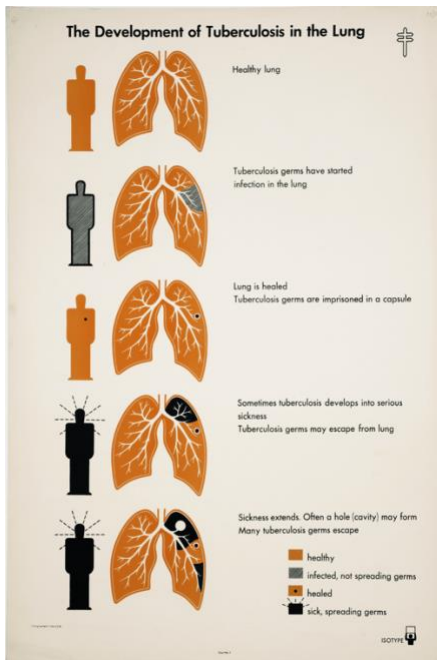


Figure 1. The development of tuberculosis in the lung', 1938. Charts from the 'Fighting tuberculosis' exhibition produced for the National Tuberculosis Association in the USA in 1938 (Black, 2017)

Public health officials and scholars agree that cultural values and traditions significantly influence responses to pandemic (Vaughan & Tinker, 2009; Lin et al., 2014). Work from the early 20th century on poster leaflet design to raise awareness on Tuberculosis (TB) in Nigeria, has demonstrated the importance of mapping visual characteristics, such as the use of colour, to match it with existing cultural associations and perceptions. For instance, lungs marked in yellow, to designate a healthy person; red, to represent tuberculosis due to associations with danger and misfortune – see Figure 1 (Kindel, 2013 in Black, 2017).

As in the cases of responses to influenza, covid-19 risk information, are influenced by existing psychological, social, cultural, health, and socioeconomic factors, which greatly affect how individuals interpret health risk communications, as well as their willingness and ability to act in a timely manner. Lessons learned from historical and recent public health crises suggest that inappropriate communications and insufficient planning can greatly compromise risk reduction (Maunder, 2004; Vanderford et al., 2007; Vaughan & Tinker, 2009).

2.3 The role of Design Communication in Public Health

Public health communication must successfully instruct, inform, and motivate appropriate self-protective behaviour, update risk information, build trust in officials and dispel rumours (Vaughan & Tinker, 2009). Communicating effectively with the public about specific threats is the key to successful emergency management and public health, helping to mitigate the risks. It supports the implementation of protective actions and contributes to minimizing negative mental health impacts of disasters (Savoia et al, 2013).

Traditionally, the field of health communication has been grounded in the natural and human sciences where gold standard research is still based on defining prior hypotheses and testing them (Neuhauser Kreps, 2014). Information design and data visualization has recently emerged as a new field on the communication of public health. Information design is cross-disciplinary, including typography and graphic design, applied linguistics, applied psychology, ergonomics, and systems engineering and has been found to be particularly valuable in health communication (Black et al, 2017; Walker, 2019, Noël et al, 2019; Walker et al, 2020). It is concerned with both language and with visual presentation so that messages are presented clearly and address the needs of the audiences (Neuhauser et al, 2009; Walker, 2019).

Health communication approaches are often intended to translate evidence-based research findings to the public. However, the traditional approach has emphasized the expert design and delivery of generic (one-size-fits-all) messages that are not always relevant to people's personal characteristics or social settings (Neuhauser & Kreps, 2014; Lin et al, 2014). This is because, much day-to-day health communication nowadays (as in the case of Covid-19) is produced by people who do not fully understand typographic principles, which can result in sub-optimal presentation of information (Noël et al, 2019; Walker, 2017). Information design methods involve collaboration and discussion between all those involved, such as scientists, clinicians, designers, writers, technicians and intended audiences (Walker, 2019) and could thus contribute significantly to the design of more effective public health communication material on Covid-19. It can help people retain information that is relevant to them or their situation and it can make the difference between taking action or not, contributing to behaviour change (Walker, 2017).

3. Methodology

3.1 Methods

Our methodology is formed around our research question. This is to explore *how might communication design analysis of official Covid-19 public health material help develop*

recommendations that are contextually, socially and culturally relevant for public audiences across different parts of the world.

The study includes two parts. The first part of this study comprises documentary research of crowdsourced information on Covid-19 Public Health messages and Information, set by official national and international bodies, such as Government, Ministries and International Health organisations. This has led to an open [repository](#) which at the time of writing includes data from 46 countries from across five continents. These were collected between April and November 2020.

The second part includes the Information design analysis through language and message framing, as well as visual design framework. The analysis of the language and message framing was done through 15 points divided in five themes: culture, language, social, structure and inclusivity. While the visual design framework analysed another 15 aspects divided in 4 themes: impact, structure, colour and inclusivity. A selection of established documents on public health communication design were collated and reviewed (the WHO Strategic communications framework for effective communications [WHO, 2017]; the Johns Hopkin's Bloomberg School of Public Health *Field Guide to designing a health communication strategy* [O'Sullivan et al, 2003] and the US Centre for Medicare & Medicaid Services *The Toolkit for Making Written Material Clear and Effective* [McGee, 2010]) in the development of the language and message framing and visual analysis framework the team used to analyse the public health Covid-19 communication documents. The process followed the thematic analysis methodology by Braun and Clarke (2008). Once the team was familiarised with the documents, we began the code generation. This was done by looking at each document guideline and coding data by writing notes through the use of notes within the electronic version of the document. After the data coding and collation, we started to look for overarching themes based on the initial research questions. This process produced a number of guidelines, which were reviewed amongst the team and then consolidated and updated to provide the framework guidelines, shown in Table 1. Although we recognise that designers employ picture, symbols, typography, colour patterns in an integrative manner to compose the final visual product, it was necessary for the purposes of our investigation to deconstruct the different visual elements to explore them both individually and as a whole message too.

Table 1: Framework guidelines employed for data analysis

Message and Language Framing	Culture	Does it use words that are familiar and culturally appropriate for the intended readers?
		Are suggestions or instructions, specific, realistic, and culturally appropriate for the intended readers?
	Language	Is the material/message framed in a friendly/positive way/tone?
		Is the material written in a conversational style, using the active voice?
		Is it keeping sentences simple and relatively short?
		Is it being direct, specific, and concrete?
		Is it written as simply as possible, taking into account the reading skills of the intended audience?
		Does it use devices that engage and involve readers, such as stories and quotations, questions and answers, etc?
	Social	Do readers trust the information sources (is it based on information sources the intended audience will trust)?
		Does it emphasise the health impact here and now?
		Does it encourage action now?
	Structure	Is it giving the context first, and incorporating definitions into the text?
Does the material say how to get help or more information?		
Inclusivity	Is it gender neutral or inclusive?	
	Can readers relate to the health statistics given (do they match as closely as possible to the characteristics of the intended readers and their communities)?	
Visual Design	Structure	Is the size, shape, and general look of the material designed with its purpose and users in mind (I.e. more important elements in larger size, etc)?
		Is there a clear and obvious path for the eye to follow through each page?
		Does it have a clear and consistent style and structure?
		Are the visuals that are clear, uncluttered, and consistent in style?
	Colour	Are the colours appealing to the intended readers and free from unwanted connotations or problematic cultural significance?
		Is colour used in a consistent and deliberate way that reinforces the meaning of your messages and enhances their impact?
		Is colour used sparingly (3-5 colour palette)?
		Is text and colour legible?
	Inclusivity	Does the in a colour take into account that some readers are likely to have diminished or limited colour perception (i.e. colour blind, older people vivid colour limited perception)?
		Are visuals gender neutral or gender inclusive?
	Impact	Does the material look appealing at first glance?
		Do the visuals relate directly to the information in the material and reinforce the key messages?
		Are the visuals culturally appropriate for the intended readers?
		Are charts/figures simple and easy to understand?
		Can the visuals evoke affect appropriate for the intended audience?

3.2 Data Analysis

Data analysis was carried out in two stages. The first stage was an analysis of the documents to evaluate the guidelines set above and how they were implemented. The data analysis included samples from each country that included a combination of text-based only (i.e. website information on Covid-19, FAQs, prevention instructions/guidelines); visual and text (i.e. websites, posters on handwashing, mask wearing, prevention, self-isolating, etc). Only documents targeting the general public were examined, as those aimed at expert and professional groups (such as healthcare professionals, etc.) were out of the scope of the study.

The data analysis composed of language and message framing (Akl et al, 2011) and visual analysis (Welhausen, 2015) following the guidelines set in our message framing and visual analysis framework. During this stage, from a pool of eight (with different sociocultural backgrounds, that understood the first language of the communication analysed and with some of them being from those countries), two researchers scored independently (scale 1-5) the documents sampled from a country and added notes. These were reviewed by a third researcher who scored them also in cases where there was a large score discrepancy (more than 2 points). The stage one analysis took place between July to September 2020.

The second stage comprised of a more in-depth content analysis of the sub-sample of the documents that were explored in stage one. This focused on further analysing good and bad practices of public health communication messages and visual elements applied in the context of Covid-19. The aim was to look at a representative samples of good, mixed, bad and ugly official covid-19 public health message documents, in order to develop recommendations and a toolkit that will guide experts and practitioners to communicate with impact, so that the public understands and supports action on COVID-19. A total of 32 documents from 17 countries were further analysed by researchers individually from October to November 2020. An inductive detection of the primary themes that emerged in the documents was conducted to determine the themes and major issues explicitly stated to examine deeper themes in covid-19 public health communication. A series of groups discussion among all researchers followed, in order to establish common language and message framing and visual analysis practices and patterns, which in turn led to the development of recommendations.

4. Initial Findings

A total of 122 materials from 31 countries across five continents (Africa: 7, America: 8, Asia: 9, Europe: 6, Oceania: 1) were examined. Our findings show that when it comes to the design of Covid-19 public health communication material there are a range of practices (both positive and negative) found across the material reviewed, irrespective of the country or region they come from. Some are found across most material and countries, some across

several and a few in more specific materials and countries. We present these below in relation to the message and language framing, and the visual design.

4.1 Language and Message Framing

The analysis revealed that cultural aspects, such as culturally appropriate words or instructions, of the message was considered as an important aspect while transmitting the message. Whereas the structure aspects, giving the context and details about how to get more help, within the visual communications would require more attention.

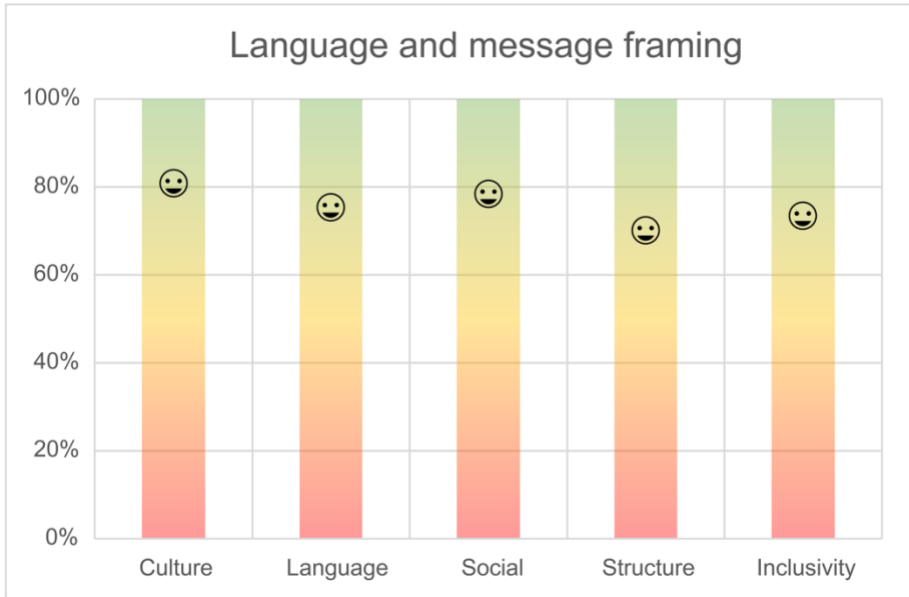


Figure 2. Summary of the language and message framing analysis.

Based on the reviewed visual examples, the most important aspects for a clear language and message framing were considered to be the suggestions or instructions set in the right context and realistic; short and simple sentences; gender inclusivity; and direct, specific and concrete message. While other aspects, such as directing for more information and the emphasis of the here and now impacts were not considered as important.

4.1.1 Good practices

More precisely, the majority of the material reviewed, scored high in terms of some aspects of language. They were written in a gender inclusive language and provided messages that are appropriate to diverse communication means (e.g. Facebook, Instagram, Twitter) beyond the traditional posters, brochures and leaflets. They kept sentences relatively short

with most instructions being direct, specific and concrete. Also, several of the materials employ words that are familiar and culturally appropriate for the intended readers. A few of these are written in conversational style. Also, most materials made use of sources that are trusted by the readers, coming from authoritative and well respected national and international bodies.

4.1.2 Bad practices

Structure formed one of the weakest point of the majority of material reviewed. More precisely, many materials did not provide the context first around Covid-19 nor did they explain why it is important that these instructions are followed for the benefit of public health. Some materials lacked accessible further guidance on the measures proposed or guidance on where to get further information if needed.

In terms of language, several of the communication materials may be difficult to be understood. These materials use only plain text and adopt a technical language (from medical sciences). These will likely not to be understood especially by disadvantaged communities and people from a low-education background. On top of not considering the reading skills of the information recipients, many of the materials reviewed did not frame the main message in a friendly or positive tone. A few of the materials reviewed, did also convey contradicting and misleading messages that neglect cultural aspects. For instance, “adopt a friendly behaviour without physical contact but always with *a smile on your face...* *The use of masks is recommended everywhere*” was included in a material from a Latin American culture. In cultures, such as Latin American ones, in which hugging, kissing and handshakes are used to express a ‘friendly behaviour’ such messages are confusing and would be worth suggesting safer alternatives.

Regarding the social impact of the language and message used, some materials failed to emphasise the health impact of Covid-19 here and now. As a result, they did not encourage immediate action to be taken by the intended readers.

4.2 Visual Design

The analysis revealed that structure aspects, such as clear message framing and consistent and clear structure, of the message was considered as an important aspect while transmitting the message. Whereas the impact aspects, such as making the materials visually appealing and using the appropriate visuals, within the design would require more attention.

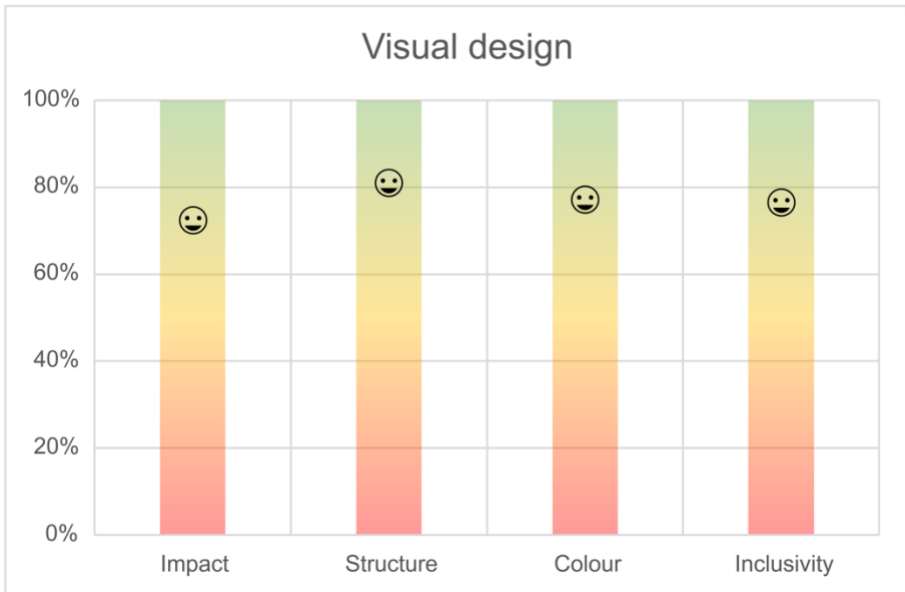


Figure 3. Summary of the visual design analysis.

According to the reviewed visual examples, the most important aspects for a visual design were considered to be a consistent style and structure; obvious path for the eye to follow; and gender neutral or gender inclusive. While other aspects, such as the size of the material and its elements; reader's diminished or limited colour perception; and the text-visuals relation were the least taken into account.

4.2.1 Good practices

In terms of the visual design most material followed a clear and consistent structure offering and easy path to for the eye to follow on the document. Also, those material, which included charts or figures, made good use of these by incorporating ones that are simple and easy to understand. The majority of the materials included legible text and colour, using legible fonts and appropriate contrast of colours. Also, several of them used colour sparingly, employing a maximum of five colour palette. Examples of these aspects are shown in the discussion section.

4.2.2 Bad practices

One of the least scored areas among the materials analysed was visual design. More precisely, the images used, such as photos, illustrations, etc., did not relate directly to the

information and conversely, they did not use effectively the visuals to reinforce the key message. Moreover, the visuals in several cases were not culturally appropriate for the intended readers, as they give instructions that do not make sense or are not possible to be followed in the context as our examples illustrate. As such, the visuals employ in certain cases are nor appropriate neither compelling for the intended audience.

In terms of structure, several materials did not consider the size, shape, and general look of the material designed with its purpose and users in mind. Simple visual design practices, such as depicting more important elements in larger size were ignored. Also, some material included visuals that were unclear, cluttered, and inconsistent in style. In most of these cases they visuals were a direct copy paste from other sources without any editing or processing taking place.

Regarding colour, this was generally well applied, except for circumstances where it was used in an inconsistent and unintentional way, (for example using colours randomly without a clear purpose such as in drawing attention to a specific message or instruction, etc) diminishing the meaning of their messages and decreasing their impact.

As far as inclusivity, this was not applied universally and often seemed to be an afterthought. For example, many materials did not take into account that some readers are likely to have diminished or limited colour perception (i.e. colour blind, older people vivid colour limited perception). Gender inclusivity was another issue with several material, which had made use of visuals, being either gender biased or gender exclusive. The lack of diversity is also noticed regarding social, linguistic and ethnic group backgrounds.

4.3 Analysis per Country and Region

Although assessing the official Covid-19 public health communication messages and visuals of each country is beyond our intention, we include the Figure below of the countries analysed, as it provides some useful insights. First it emerges that only about a third of the countries we reviewed their material score consistently for both the message/language framing and visual design. Most of these which scored high for both elements, seem to be countries in North and South America. Also, it becomes clear that most countries did better in terms of language and message framing when compared to their scores in visual design. This highlights opportunities for improvement and the need for more involvement of design researchers and designers in the development of public health communication material for Covid-19.

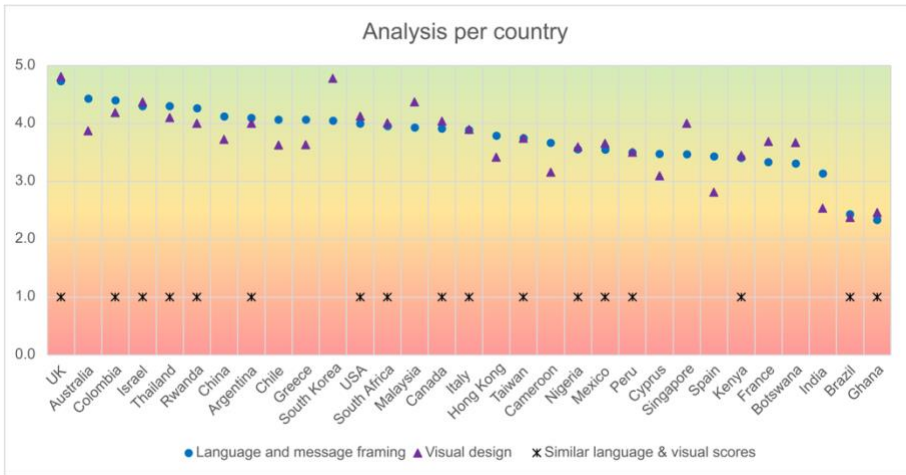


Figure 4. Analysis of language and message framing vs visual design per country

The analysis by countries show that there is a wide segregation between those countries that performed well and those that did not. More than half (17) of the countries had similar scores between language and message framing and visual design. Nine countries gave a higher importance to language and message framing, while five gave it to visual design.

4.4 Analysis of Covid-19 public health communication examples

In this section we present a representative sample of some good, mixed, bad and ugly examples¹ in terms of message and language framing as well as visual design.

4.4.1 Good examples

In terms of message and language framing, the following example, from the Rwandan Ministry of Health on ‘The Do’s and Don’ts of face mask guidelines’, demonstrates several good visual design and communication features. It features a consistent visual style, with an uncluttered layout that incorporate an easy path for the eye to follow. Important icons are bigger in terms of size and use contrasting colours to help readers distinguish clearly what they can and cannot do. In terms of message framing, the instructions are very practical and culturally appropriate and specific, as they provide a useful context on when, how to use, how to wash and procure, as well as common mistakes people make in all these points.

¹ For more visual samples collected worldwide visit: <http://imagination.lancaster.ac.uk/wp-content/uploads/2020/04/Good-Bad-Ugly-Presentation-Analysis.pdf>

Consistent visual style



Important ICONS with contrasting colors help people distinguish what they can and can't do.

Uncluttered layout, with clear eye path

Rwanda

Showing how/where to get more info/help

Figure 5. Communication material by the Rwandan Ministry of Health on The Do's and Don'ts of face mask guidelines

Although there were not many examples of this, offering a variety of complexity levels for the same message are particularly useful. The example below from the Italian Ministry of Health provides granularity of content and instructions on handwashing, which enables readers to access various levels of information at their own pace.

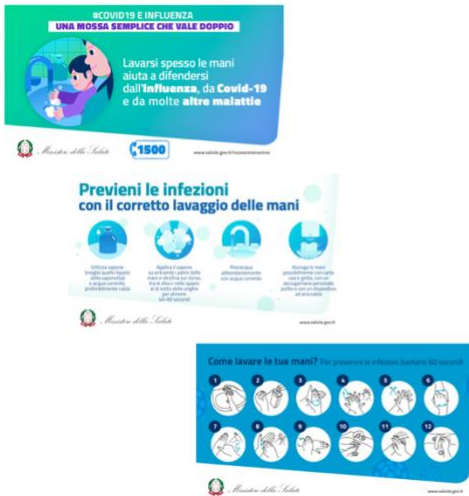


Figure 6. Multilevel communication material by the Italian Ministry of Health on handwashing to prevent the spread of Covid-19

The example, below, from Yukon, Canada answers a single question well, by making use of gentle humour does not detract from serious points. It employs culturally relevant image using a practical, recognisable huskies to demonstrate the two-metre social distance rule, whilst maintaining gender inclusiveness in the visual.

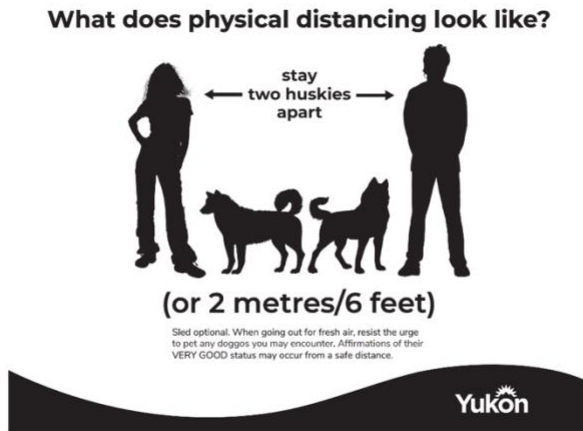


Figure 7. Communication material by the Yukon regional government in Canada on social distancing

4.4.2 Mixed examples

Several materials featured mixed practices, with some good elements but also some message or visual design issues. For instance, the poster in Figure 8, provides culturally relevant image and slogan urging taking action now. It also includes a positive message framing and it is available in both French and English (the official languages of Kenya). Despite these, it includes, at the bottom of the poster, visuals which apart from being gender-biased are too small to see, as are the captions that accompany them.



Figure 8. Poster by the Kenyan Ministry of Health on supporting the fight against Covid-19

In another example, from Peru, with the support of the Ministry of culture two general posters were translated to four Quechua dialects and Ayamara (official languages of Peru), and eight minority native languages. This is very positive in terms of inclusiveness and reach in the wider population of the country. However, the translation of the language did not follow with 'translation' of the advice to the local practices of these indigenous communities; as most people in these minority groups do not have access to running water in their homes rendering the guidance culturally irrelevant.



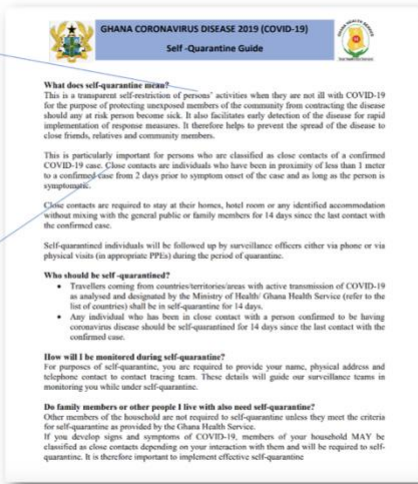
Figure 9. Communication material by the Peruvian Ministry of Health on protecting oneself from Covid-19 (Left: Quechua language from central Andes, approx. 1 million speakers), (Right: Yine language in the Amazon, approx. 3000 speakers)

4.4.3 Bad examples

The following self-quarantine document targeting the public in Ghana, utilises the third person which although makes it authoritative, it makes the instructions that appear in it impersonal. To make matters worse there is a mix of first and third person confusing the readership and the messages it provides. Overall, the language used inappropriate for the wider public and the everyday person. Following this, there is inconsistency in terms of the advice given, as there is a mix of specific and clear with unclear and unspecific advice. Lack of visuals further add to this, as their inclusion could potentially help in enhance understanding on the practical advice found in the document.

Use of 3rd person makes this impersonal

Language inappropriate for wider public



Good specific and clear advice

Mix of 1st and 3rd person makes this confusing



Lack of visuals to enhance understanding

Unclear and unspecific advice

Figure 10. Communication material by the Ghanaian Ministry of Health on self-quarantine

The following example, from Brazil's Ministry of Health website, presents several issues. All information is provided as plain text. So, the guidance is not inclusive as literacy is a requirement for understanding and is still a problem especially among disadvantaged communities. Some proposed measures present higher exposure to risks, compared to standard ones such as "Keep at least 1 (one) meter-distance from other people in public and social places". Also, part of the advice provides confusing and mixed messages. For instance, there is the advice to "Avoid hugs, kisses and handshakes, adopt friendly behaviour without

physical contact, but always with a smile on your face" and the last preventative measure recommends wearing masks everywhere. Safer ways of greeting during the pandemic should be suggested since a smile cannot be always recognised behind a mask and Brazilians are used to warmly greet people in person as a way of being friendly.

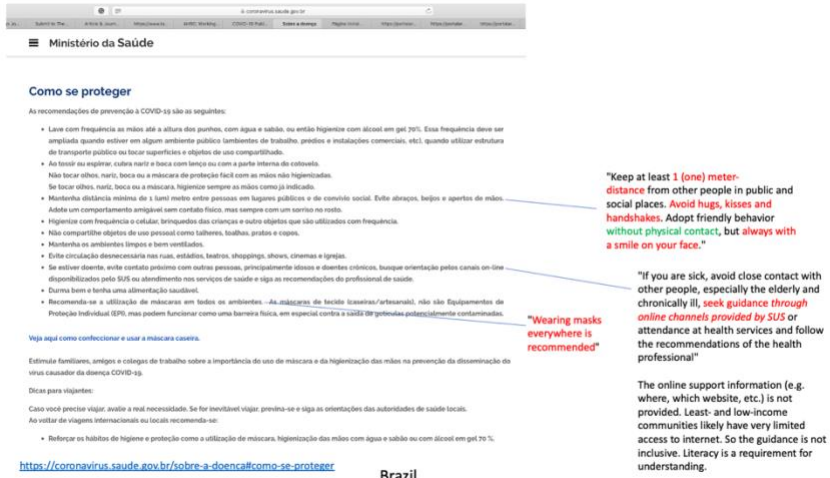


Figure 11. Online communication material by the Brazilian Ministry of Health on how to protect from Covid-19

In the example below, the poster is too busy in terms of visuals, whilst several of the clipart used are too small to see as is their corresponding caption. Some of the advice provided, such as 'Maintain at least 1 metre distance in marketplaces, medical stores, hospitals, etc' are unrealistic given the high-density population of cities in India. Another issue in this example, is the use of visuals, where the characters featured in them, do not represent the country's population demographics, as they feature only white persons. This is an element which has been observed in several materials from several countries from the Global South who seem to have copied and pasted messages as well as visuals from Global North countries' material.

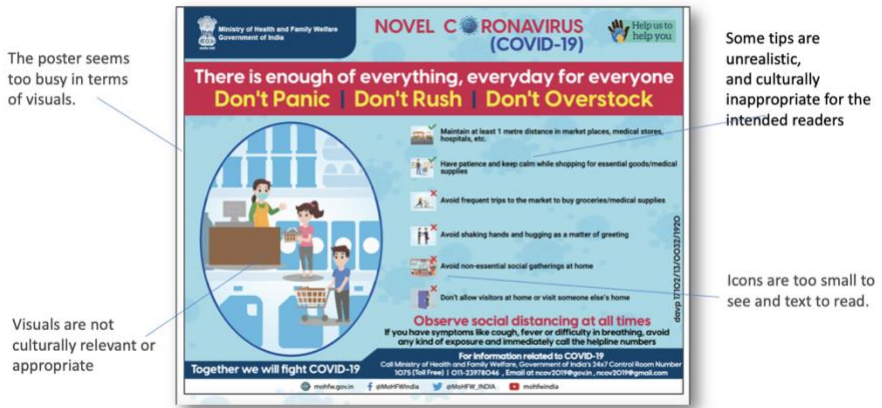


Figure 12. Communication material by the Indian Ministry of Health on not overstocking

4.4.4 Ugly examples

In relation to the example discussed above, the following one from South Africa does not include do consider ethnic diversity in its visuals, illustrating a predominantly all white family. Furthermore, there are no signposts on where or how to get more information and the text in the centre in white appears blurry due to incorrect application of antialiasing. Lastly, the message it provides appears to be distant 'WHO advise people to...' as it does not directly address the population and does not call for immediate action.

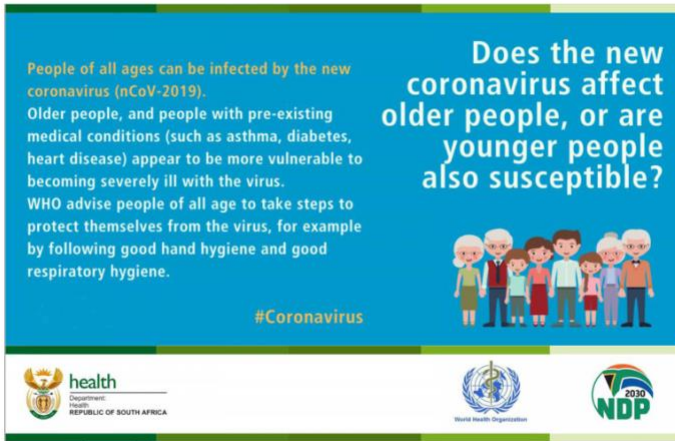


Figure 13. Communication material by the South African Department of Health on Covid-19

The example below, presents a too busy layout design and incoherent messaging. There is an inconsistent style that mixes cartoon with real images. The main image occupies most of the poster whilst not being essential. In fact, the cartoonish doctor clipart contradicts the seriousness of the message that is being portrayed. In terms of visual layout, the composition of the five small images at the bottom of the poster lack alignment. The text for getting more information and the contact number are too small to be read.



Figure 14. Communication material by the Taiwanese Ministry of Health on hand-washing

4.5. Other health related visual examples

The Royal College of Paediatrics and Child Health (RCPCH) has been working to raise the awareness of the impact of air pollution on child’s health, particularly to those with respiratory allergies such as asthma and rhinitis. The ‘*The inside story: Health effects of indoor air quality on children and young people*’ campaign was launched in January 2020, just before the COVID-19 pandemic started. Hence, it results appropriate to compare the visuals from this campaign to those presented here.

They have produced an extended report, however, the graphic content is used to advertise this campaign. They successfully use appropriate message and language framing, as well as visual design. A similar analysis as the one presented in this work revealed that the key areas are for the **language and message framing** were the use words appropriate for the intended

reader; the suggestions are specific and realistic and are gender inclusive. However, there are some parts that would be benefit for more emphasis such as the impact here and now. While for the **visual design**, the visuals were gender neutral images; have a clear structure and eye path; reinforce the information presented; and have a defined colour palette used consistently as shown in the Figure 15.





	<p>Birth and infancy</p> <ul style="list-style-type: none"> • Respiratory problems - wheeze, rhinitis, atopic asthma, respiratory infections • Low birthweight and pre-term birth 	<p>Things that make the air dirty</p> <table border="0"> <tr> <td>Mould</td> <td>Dust</td> </tr> <tr> <td>Gas</td> <td>Carbon monoxide</td> </tr> <tr> <td>People smoking</td> <td>Cleaning products</td> </tr> <tr> <td>People spraying</td> <td>Nail varnish</td> </tr> <tr> <td>Cooking smells</td> <td>Body smells</td> </tr> </table> <p>.....</p> <p>Source: RCPCH & Us voice bank 2019</p>	Mould	Dust	Gas	Carbon monoxide	People smoking	Cleaning products	People spraying	Nail varnish	Cooking smells	Body smells
Mould	Dust											
Gas	Carbon monoxide											
People smoking	Cleaning products											
People spraying	Nail varnish											
Cooking smells	Body smells											
	<p>Pre-school</p> <ul style="list-style-type: none"> • Respiratory problems - wheeze, allergies, asthma, risk of respiratory diseases and pneumonia • Eczema and atopic dermatitis • Greater hyperactivity, impulsivity and inattention 											
	<p>School age</p> <ul style="list-style-type: none"> • Respiratory problems - wheeze, rhinitis, asthma, throat irritation, nasal congestion, dry cough • Eczema, dermatitis, conjunctivitis, skin and eye irritation • Reduced cognitive performance, difficulty sleeping 											
<p>Ideas to make the air cleaner</p> <table border="0"> <tr> <td>Opening windows (fresh air in)</td> <td>Cleaning more</td> </tr> <tr> <td>Closing windows (keep dirty air out)</td> <td>Air flow in kitchens</td> </tr> <tr> <td>Dehumidifiers</td> <td>Plants in the house</td> </tr> <tr> <td>Air purifiers</td> <td>No carpets</td> </tr> <tr> <td></td> <td>Cleaning products (chemical free)</td> </tr> </table> <p>.....</p> <p>Source: RCPCH & Us voice bank 2019</p>		Opening windows (fresh air in)	Cleaning more	Closing windows (keep dirty air out)	Air flow in kitchens	Dehumidifiers	Plants in the house	Air purifiers	No carpets		Cleaning products (chemical free)	
Opening windows (fresh air in)	Cleaning more											
Closing windows (keep dirty air out)	Air flow in kitchens											
Dehumidifiers	Plants in the house											
Air purifiers	No carpets											
	Cleaning products (chemical free)											
	<p>Children with respiratory allergies (such as asthma and rhinitis)</p> <p>Taking steps to reduce exposure to allergens (from house dust mites, moulds and pets) is recommended to reduce symptoms and exacerbations.</p> <p>Depending on the allergy, measures which can help include:</p> <ul style="list-style-type: none"> • reducing dust and dampness in the home • reducing items which collect dust such as soft toys and, if possible, replacing carpets with hard flooring. • washing bedding and covers (at 60°C every two weeks), or using allergen-impermeable covers • avoiding direct exposure to furry pets if the child is sensitised. 											

Figure 15. Communication material by the RCPCH for 'The inside story: Health effects of indoor air quality on children and young people.'

5. Discussion and Draft Recommendations

Based on the findings and the examples presented above, we propose a set of draft recommendations for the design of public health communication material for Covid-19

Although there are still a few steps to be completed in the development of a full list recommendations for the public health communication material for Covid-19, our initial analysis reveals some patterns and insights that are emerging. We discuss these below.

First, ***give the context first, and incorporate definitions into the text***. As mentioned above several material did not provide any context regarding Covid-19 or included any definitions in layman terms. Most critical is the clarification of why should individuals, and the public as a whole, follow the guidelines and instructions offered in the material. This is because, even the most valid and reliable scientific information may be ignored, minimized, or processed in a way that results in unanticipated public responses when a communication plan overlooks the reasoning strategies of the audience of the message (Vaughan & Tinker, 2009). Lessons from past health campaigns demonstrate, that these are most successful when communication addresses motivations, emotions, and ideas that might contribute to desirable behavioural change but also are compatible with individuals' reasoning strategies (Vaughan & Tinker, 2009).

Second, ***provide clear messages that consider the cultural aspects, and instructions that are specific, realistic, and culturally appropriate for the intended readers***. Our findings revealed that many materials provided often instructions which were not culturally appropriate and guidelines which could not be practically implemented within the targeted socio-economic groups they were targeting. During a pandemic, the way new information is filtered, processed, and evaluated is influenced by individuals' daily life circumstances, cultural and psychological risk orientation and traditions regarding health practices. Guidance from socio-ecological, social cognitive models, suggest that health communication is more effective when it is relevant to people's personal and social contexts (Neuhauser et al, 2009). As such the messages themselves must be compatible with the cultural orientations and socio-economic priorities of affected populations (Vaughan & Tinker, 2009).

Health communication materials are intended to solve "wicked" problems in highly changeable sociocultural, political environments among very diverse people. However, they are often not designed to meet the needs of diverse population groups (Neuhauser & Kreps, 2014). Reaching vulnerable populations, who usually bear the brunt of the effects (financial, health, social) in pandemic situations is very important. Yet, reaching these populations and communicating effectively with them is a critical public health challenge (Neuhauser et al, 2009). The following recommendations consider ways of tackling these.

Third, ***use creative mechanisms that engage and involve readers*** (i.e. stories, quotations, analogies, etc.). Our analysis revealed that this was one of the weakest elements in message and language framing. A handful of material made use of creative devices to engage and involve readers, such as the example from Canada, which used Huskies to provide an

analogy for physical distance embedding gentle humour. Still such mechanisms and especially inclusion of narratives and storytelling are very powerful and have in the past been employed in health communication (Edgar & Volkman, 2012; Walker, 2019). More precisely, data suggest that narrative message design encourages information sharing as they are perceived as having a story structure and being more understandable and less information overloading, and more transporting (Barbour et al, 2015). Therefore, mechanisms such as storytelling, form compelling tools for adding credibility and authenticity (Edgar & Volkman, 2012) to Covid-19 public health messages, especially as they are found to be emotionally evocative and thus more likely for us to act on the message(s) they contain. Furthermore, they provide us with a better understanding about a situation for instance, the experience of suffering from Covid-19, which in turn helps us understand more about the disease itself.

Fourth, ***write them as simply as possible, taking into account the reading skills of the intended audience***. Matching readability more closely to users' literacy levels (Neuhauser et al, 2009) is a key component, which several of the materials reviewed did ignore. As already mentioned some material, especially in Global South contexts, literally translated material into the local languages. This increased the message and language complexity. Instead linguistic adaptation should be employed to incorporate culturally relevant concepts, and adapt rather than simply translate messages (Neuhauser et al, 2009).

Fifth, ***use visuals that relate directly to the information in the material and which, reinforce the key messages evoke affect appropriate for the intended audience***. Visuals (photos, illustrations, symbols, and other images) and data visualisations can dramatically shape how risks are perceived. Many of the materials analysed did not take that into account, as there were examples, as illustrated in the sections above. In fact, there were cases where language-based content communicated one message about risk, while the visual strategies used communicate a very different message. Effective use of picture is influenced by the context they are used, the level of literacy skills and the extend they are combined with written direction, and the graphic form of the picture whether a line drawing, cartoon, photo, etc. (Walker, 2017). Incorporating culturally relevant visuals (Neuhauser et al., 2009) as well as use of scale and the simplification of images can attract attention and stimulate curiosity (Walker, 2017) and generate affect.

Sixth, ***use active voice and emphasise the health impact here and now to encourage action now***. Emphasising the health immediate impact in a way that encourages the intended readers of communication material to take action now is absolutely critical. Pandemics are, ultimately, disasters, and the critical role of immediacy that is central to effective disaster response is also inescapable (Sutton et al., 2020) in the case of Covid-19. Much research indicates that using the active voice makes content livelier and easier to read and understand, than the same text written in the passive voice. It can also suggest link with the reader (Walker, 2017; Walker, 2019).

6. Conclusion and Limitations

It is clear from past health epidemics, that trust and accurate information can significantly help the public in following public health measures which help decrease the spread of disease. However, in the COVID-19 pandemic we witness an 'infodemic', which has confused both the general population and policy makers.

Our study presents the positive and negative aspects regarding language and visual design of COVID-19 public messaging in a variety of countries. It also provides draft recommendations on how to effectively plan communication and frame messages that are compelling and actionable to the local audiences considering their social, cultural and economic circumstances.

The analysis presented in this paper focuses on visual communication aspects identifying features that contribute to success and failure of public messaging. There is still the need to understand to which extent visual communication is effective in mitigating pandemic impacts considering for instance dissemination (e.g. web analytics, number of accesses, downloads). This is something we are exploring at the time of the paper write and we aim to present in future papers, once that analysis is also completed.

Mitigation of risks is also influenced by other aspects such as cultural, social, economic and political determinants, including politics and policy. Thus, visual communication works in a two-way relationship combined with other contextual factors that should be considered. Moreover, information should also be accessible considering disabilities. We have also started work on testing some of the material with members of the public and experts, which will be reporting in future work.

In the next pandemic, be it now or in the future, the single most important weapon against the disease will be a vaccine. The second most important will be communication (Gesser-Edelsburg et al, 2014). We envisage that our work will contribute towards the latter.

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