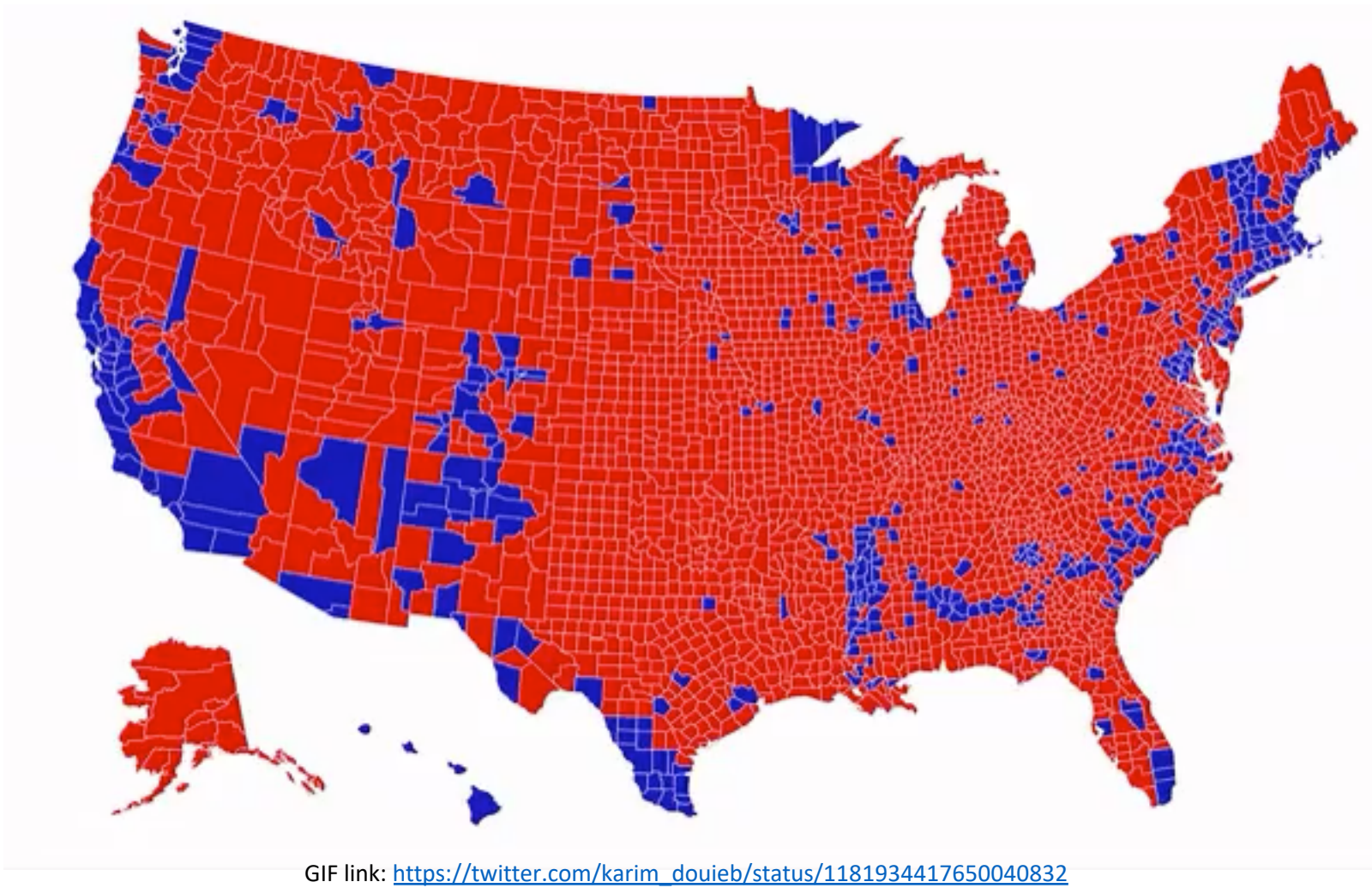


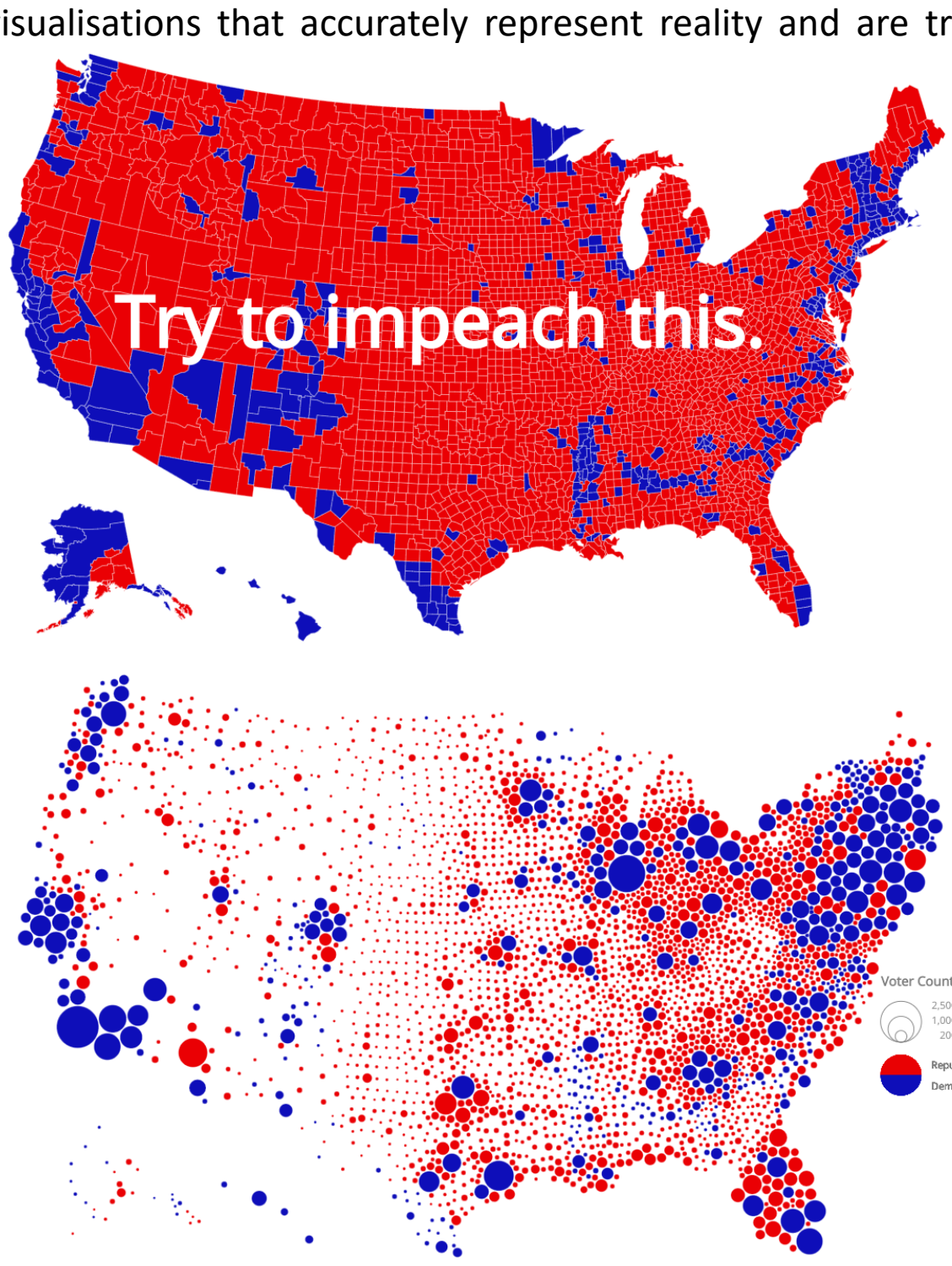
GIF link: https://twitter.com/karim_douieb/status/1181934417650040832

Inspirational Map

The data visualisation transitions from a choropleth map of 2016 election results in US counties to a dot map with sizes proportional to the population of the counties. This GIF was created in response to Lara Trump's post where she supports her father during his impeachment trial using the first map. We find this map inspirational as it highlights the many ways the same data can be adapted and used for different purposes. More specifically, it shows the importance of voting population over geographical size and thus gives a better reflection of the election results. The use of two dimensions of colour and dot size is useful for readers to better understand how each district voted, the relative size of each voting district and gauge the importance of certain regions to the overall outcome. For instance, the size and density of dots on the east coast clearly shows the importance of the region in deciding the outcome.

What makes the data visualisation so effective is its short dwell time, it quickly shows a lot of information to visitors scrolling through social media platforms and reaches a large audience. Being a GIF, it moves and attracts attention. This also shows the evolution of maps and the many new techniques with which data can be represented. In some cases, the map was complemented by a caption of 'Land doesn't vote – people do', which in a few words summarises what the visualisation tries to communicate.

Despite its merits, the visualisation does not explicitly state the outcome of the election and the year is only mentioned in the post's caption, thus it might not satisfy the global audience's demands. In addition, as with most election maps, it ignores the differences between margins of elections and so we do not know which districts had close elections. There is also no legend and so it presupposes that everyone knows what the colours mean. In the age of disinformation, fake news and Trumpism it is even more important to create data visualisations that accurately represent reality and are transparent of their purpose.

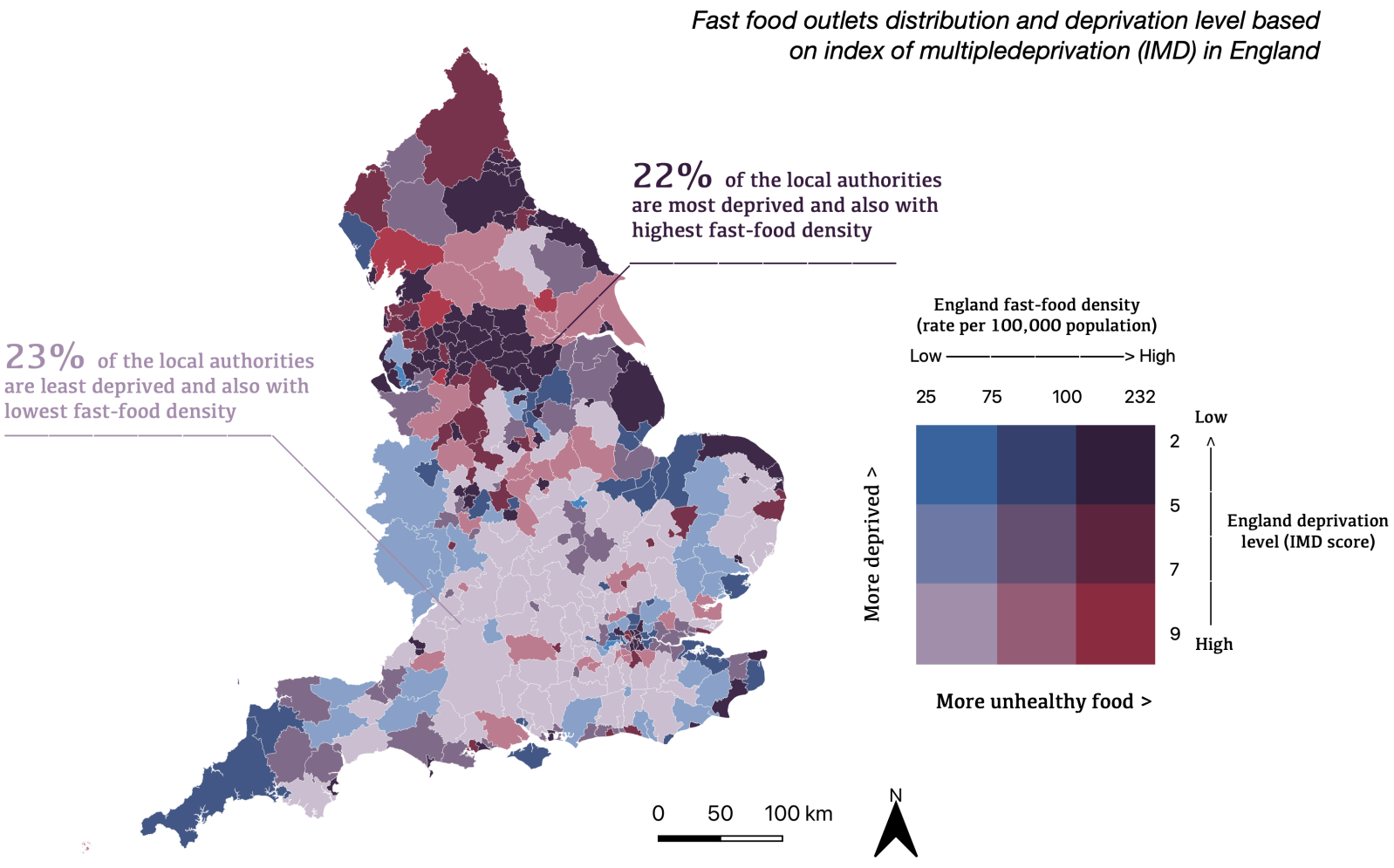


Stills from the GIF: Choropleth map showing 2016 US election results and Dot map (counties are represented by proportionally sized dots) showing 2016 US election results

References:

Try to impeach this? Challenge accepted! (2016). Available from: http://try-to-impeach-this.jetpack.ai/ [Accessed 22 March 2021].

Be aware of health environment inequality in England



Social Map

The map above illustrates the distribution of fast-food outlets and IMD (Index of Multiple Deprivation) score across English local authorities (LA), where lower IMD scores correspond to greater deprivation. With increasing data in the UK pointing toward increased exposure to fast-food outlets (Homer, 2018) and poorer health outcomes, this map was created to reflect how fast-food density and ostensibly obesity risk varies across England. It also considers how this relates to deprivation. Ultimately, the map seeks to highlight societal inequality in the form of food environment exposure and subsequent health outcomes.

Designed as a bivariate choropleth map, two 3-class univariate maps were combined to produce the 9-class bivariate map, allowing the color schemes to simultaneously portray how intense fast-food density and deprivation levels are for any given LA. Towards this end, fast-food density, calculated per 100,000 population, was plotted in increasing shades of red while deprivation levels intensified in shades of blue. Violet areas experience high deprivation and greater fast-food exposure while grey areas had low relative values of both deprivation and fast-food density.

We observe a substantial number of violet and grey-coded LAs, indicating that more deprived areas are also more fast-food dense and vice versa – this in line with studies such as Fraser & Edwards (2010). This demonstrates inequality in the likelihood of living in an obesogenic environment – this inequality affects the type of food consumed and may be the cause of obesity's disproportionate effect on the poorest in society. This finding brings into question the status quo on the causes of obesity - that while individual factors may contribute, the surrounding food environments also play a major role towards being obese (Burgoine et al., 2014). Researchers in this field have often suggested using local planning regulations as a weapon to combat rising obesity (Fraser et al., 2010). Topically, the UK Government's 2020 obesity campaign made no mention of improving food environments, despite acknowledging its impacts; instead, choosing to emphasize individual choice (DHSC, 2020). Our map and relevant literature questions their decision.

The Northern region experiences significantly greater deprivation and fast-food density than the South, suggesting that there is geographic clustering in terms of deprivation levels and fast-food exposure. In other words, beyond small scale LAs, the aggregate region one resides in also reflects food environment inequality in England. This North-South divide is demonstrated in the locations of the most deprived and fast-food dense areas and the least deprived and fast-food scarce. An example of the former is Wakefield city, previously a coal mining town that has historically been plagued by unemployment and inequality. On the other hand, latter areas include the town of Stroud, a prosperous Southern town, rural and affluent. Stroud is also known as the birthplace of the organic food movement, perhaps explaining their lack of fast-food outlets.

References:

Burgoine, T. et al. (2014). Associations between exposure to takeaway food outlets, takeaway food consumption, and body weight in Cambridgeshire, UK: population based, cross sectional study. *Bmj*, 348.

DHSC (2020). *Tackling obesity: empowering adults and children to live healthier lives.* Policy Paper.

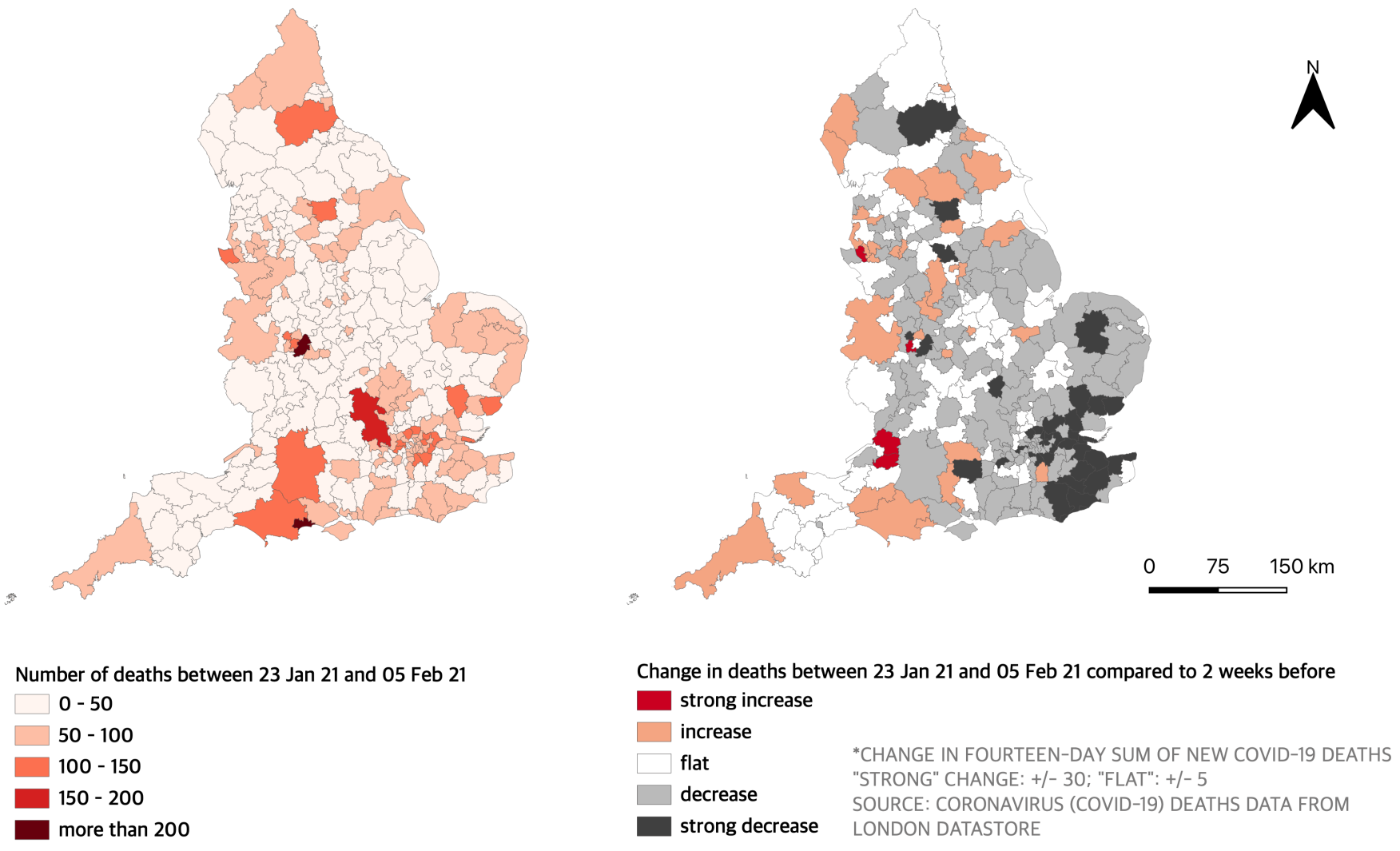
Fraser, L.K. and Edwards, K.L. (2010). The association between the geography of fast food outlets and childhood obesity rates in Leeds, UK. *Health & place,* 16 (6), pp. 1124-1128.

Fraser, L.K. et al. (2010). The geography of fast food outlets: a review. *International journal of environmental research and public health,* 7 (5), pp. 2290-2308.

GOV.UK (2018). *Fast food outlets: density by local authority in England*. Available from: https://www.gov.uk/government/publications/fast-food-outlets-density-by-local-authority-in-england [Accessed 22 March 2021].

GOV.UK (2019). *English indices of deprivation 2019.* Available from: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019 [Accessed 22 March 2021].

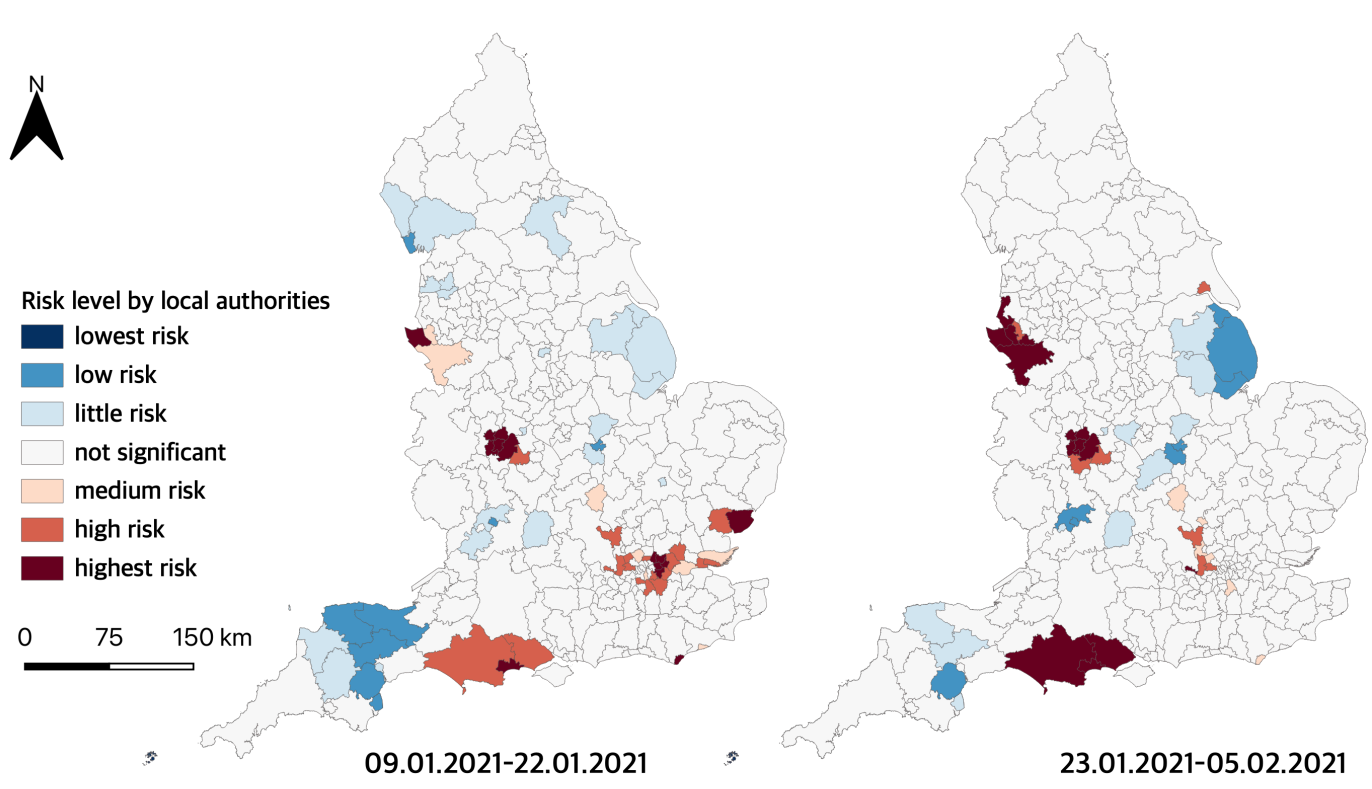
Homer, A. (2018). *More takeaways on high street despite anti-obesity push.* Available from: https://www.bbc.co.uk/news/uk-45875294 [Accessed 22 March 2021].



COVID-19 Map

The maps have been produced by the British Government to inform the public of relative changes in COVID-19 related deaths following the relaxation of restrictions over Christmas and the subsequent third national lockdown in January. In the figure above, the graph on the left shows the number of COVID-19 deaths published from 23 January to 5 February. Considering there is typically a 2-week lag between infection and death in the most vulnerable, the deaths during this period are those that occurred following the third national lockdown. We are pleased to report that most areas reported between 0 and 50 deaths, but we note particularly high counts in certain South-east and North-west regions including Buckinghamshire and North Yorkshire. There remains work to be done.

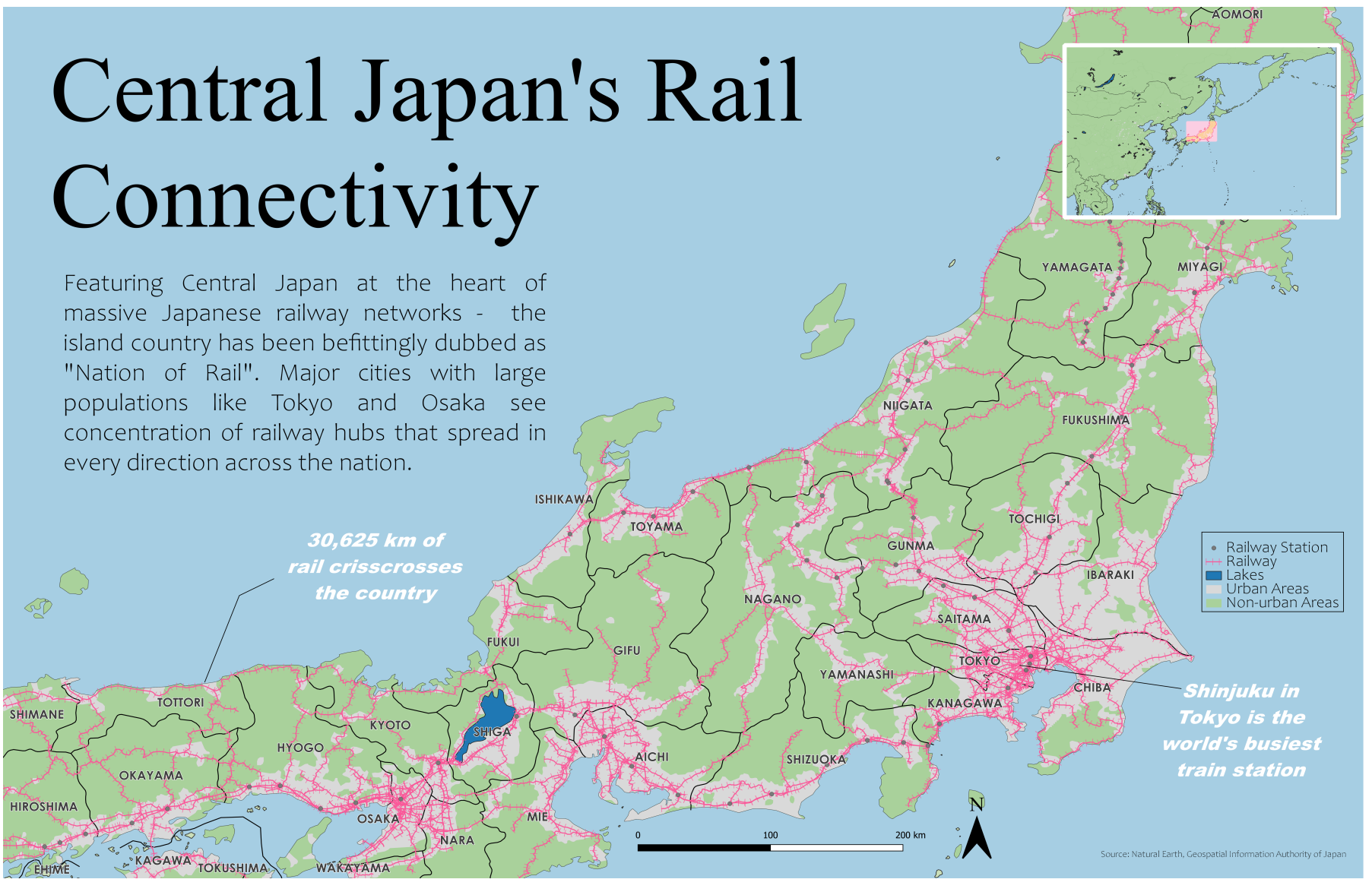
The graph on the right simultaneously allows us to see where we were after Christmas and how the lockdown has affected the situation. It compares the deaths between 23 January and 5 February to the 2 weeks before. In this way, it shows us how the January lockdown has affected the death rate caused by Christmas mixing. Mapping the number of deaths against that of 2 weeks before (9 to 22 January), we observe a large portion of the country covered in 'greys' and 'blacks', indicating that there was a drop in COVID-19 deaths in the latter half of January compared to the beginning of January for many local authorities (LAs). This is good news and telling of an effective lockdown, helping to protect the elderly and vulnerable. The largest decrease have occurred in the former hotspots of the South-east and North-west LAs that we mentioned earlier. Other LAs experienced increased COVID-19 deaths, so unfortunately the lockdown has not fully done its job in every region.



These next graphs show the COVID-19 hot and cold spots in terms of risk. Again, it compares the two 2-week periods in January. It complements the previous graphs by clearly showing areas where the risk has risen and fallen. We are pleased to see that the high-risk cluster across the North-east has decreased and more areas have become low risk over January. There is still much work to be done as many areas in the South-east are still in the highest risk. For these reasons, regardless of improving or worsening circumstances in your LA, we must keep practising social distancing and continue to fight against the pandemic. It is, after all, our individual duty to protect the NHS and our own families.

References:

ONS (2021). *Death registrations and occurrences by local authority and health board*. Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/datasets/deathregistrationsandoccurrencesbylocalauthorityandhealthboard [Accessed 22 March 2021].



Visual Hierarchy

The map above was made using Natural Earth data. It features the rail connectivity of Central Japan, highlighting railway stations, railways as well as physical data including province boundaries, bodies of water, urban and non-urban areas. With these elements in place, the map exhibits the sophisticated rail network that facilitates transport throughout the nation, that of which characterises Japan as an '*International rail genius'*. It focusses on the concentration of railways across urban regions, zooming into Central Japan, an area that encompasses numerous major cities, including the capital, Tokyo.

The map conveys how the massive Japanese railway sprawls across Central Japan, a feature we have showcased through our visual hierarchy – we have tried to take the reader across the page as if they were on a train journey. To do this, we laid out the map in a manner to both emphasise important elements and provide supplementary details, all the while remembering the main message. As such, the title of the map is large, situated at the top and in a bold black colour, an apparent contrast from the rest of the lightly-coloured map, immediately drawing the reader's attention and informing them about the contents of the map. The title is quickly followed with a caption providing insight on what the map is illustrating and why it is interesting. At this point, readers should have shifted their focus to the main map, where the title and caption are visualised. This is where an unconventional pink was used to strikingly portray the vast railway network that crisscrosses each and every province. We used logical colours green and blue to represent non-urban land and water respectively as well as a light grey tone for urban regions to signify its manmade nature. The legend is conveniently located to the right of the main map to educate readers on the meaning of the lines and colours seen within the map. While digesting the main map, readers are also treated to textual information not included in the map, elevating understanding of the central massage and appreciation of the map itself. These information pieces are white-coloured, italicised and with a more informal font to communicate a sense of *"fun-fact"* telling. Lastly, the locator graph is situated at the top right-hand corner to aid viewers in understanding which area of Japan they were looking. Its scale was chosen for a balance between a macro and micro globe view.

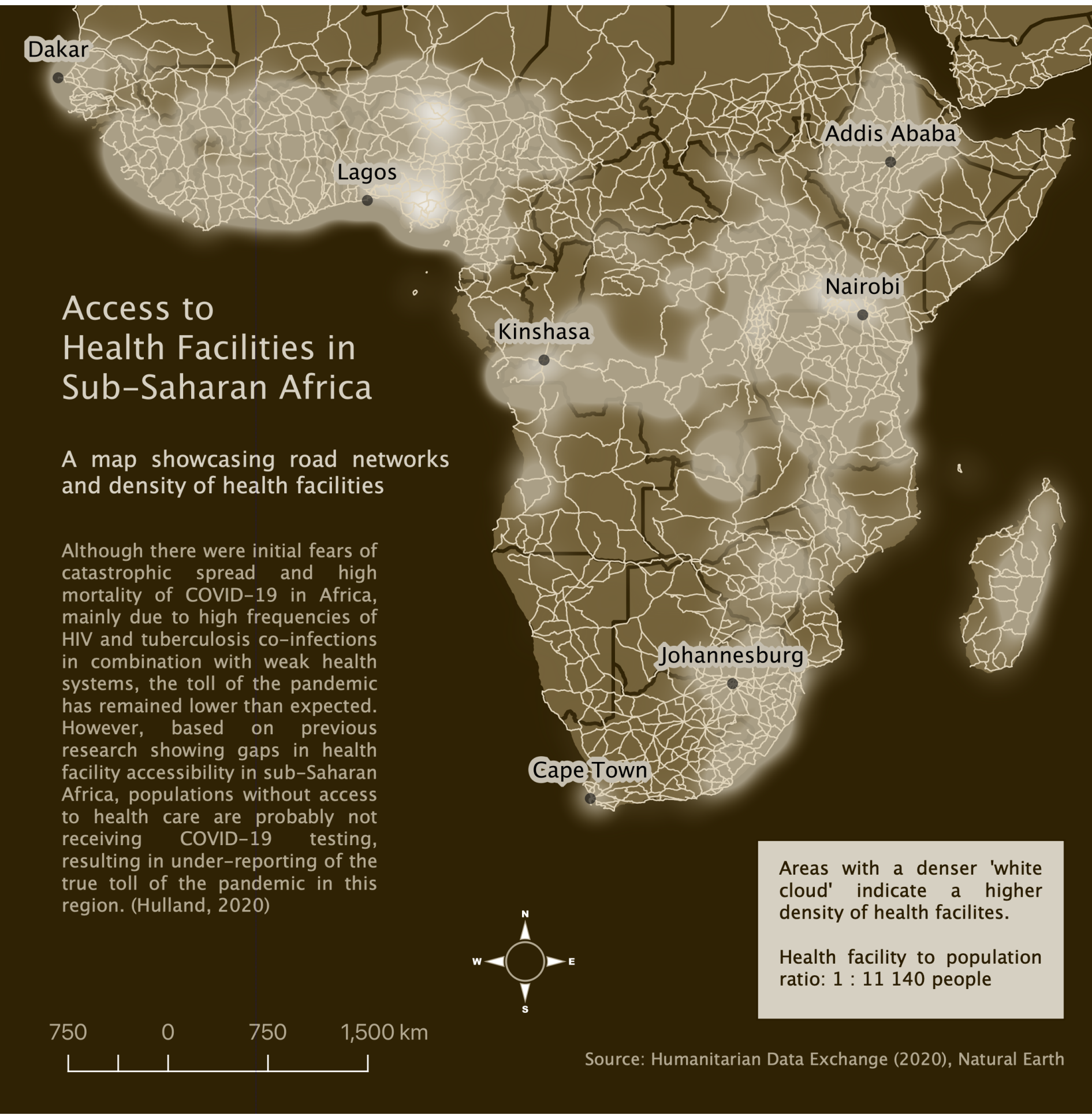
Overall, this is a well-balanced graph in terms of space – it is not too cluttered nor empty. More importantly, it reinforces the importance of creating a map while considering visual hierarchy through, size, font, colour and placement. It almost seems that a reader would go on an anti-clockwise visual journey to take in this map.

References:

Geospatial Information Authority of Japan (2016). *Global map Japan version 2.2 vector data*. Available from: https://www.gsi.go.jp/kankyochiri/gm_japan_e.html [Accessed 21 February 2021].

Humanitarian Data

The map uses data available from the Humanitarian Data Exchange website and geographic data from the Natural Earth database. We have decided to include road networks and a heatmap of health facilities present in Sub-Saharan Africa. As the text legend also emphasises, areas that appear whiter on the map have a denser distribution of health facilities. The legend also includes the ratio of health facility to population and was given a lighter background to draw attention early in the visual hierarchy. The monochromatic approach was inspired by the maps featured in the Week 6 lecture.



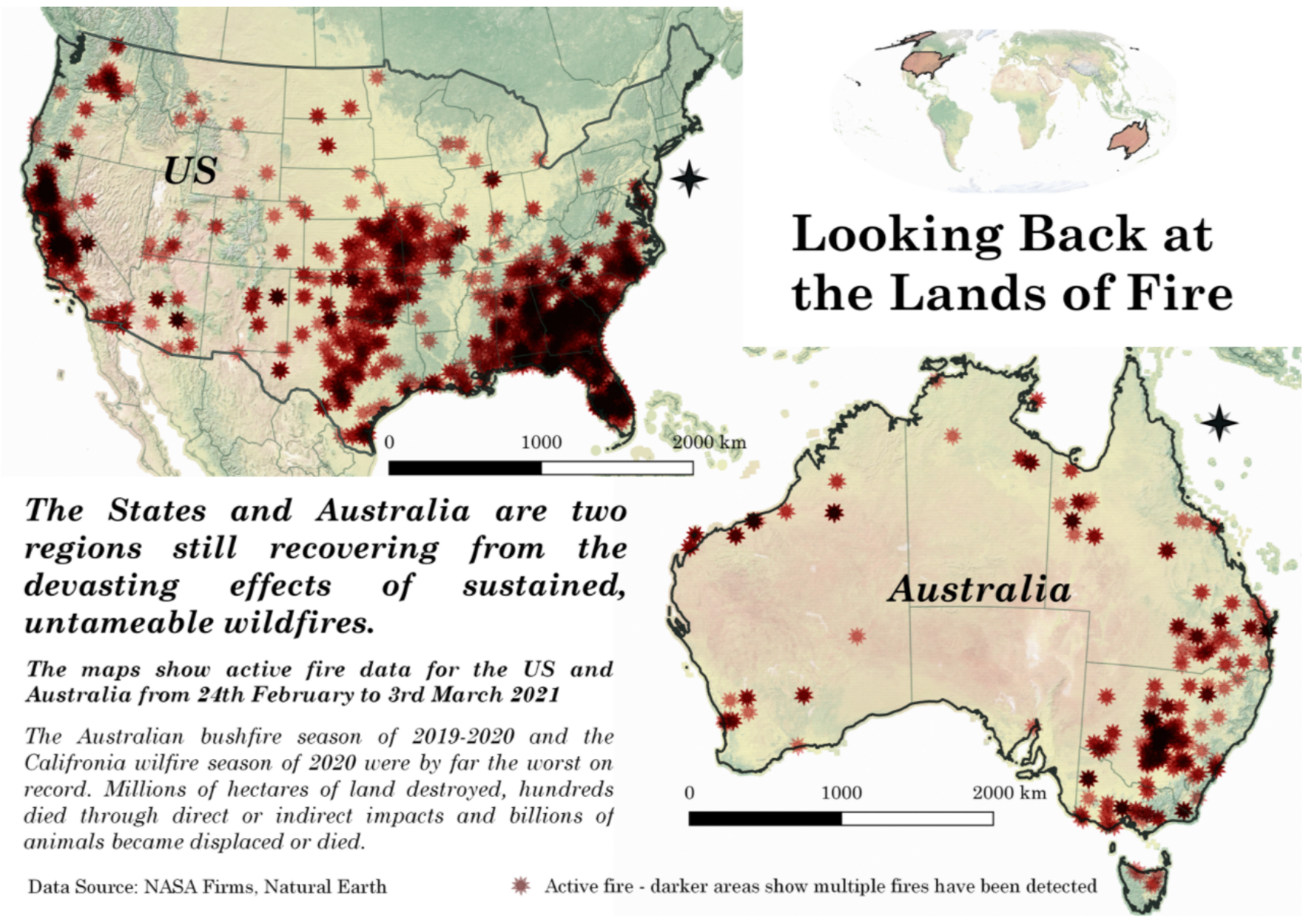
The purpose of the map is to draw attention to the potential cause of why the current Covid-19 pandemic was not so prevalent in Sub-Saharan Africa as in the Global North. It was expected by experts that if the virus reached Africa, it would have a catastrophic effect on the continent due to other infectious diseases already present as well as the less developed healthcare system. In reality, there seems to be no news coverage of such a disastrous spread; however, this does not necessarily mean that the virus somehow avoided Sub-Saharan Africa. It could easily be the case that it is simply not known how the virus is affecting the region since epidemiologists are not able to identify infectious cases. The map tries to highlight this fact by showing the density of health facilities, which could be the places where people could get tested. Some habitants need to travel 6 hours to the nearest health facility (Hulland, 2020). In the map, the context is explained in the long text to the left of the continent.

The map might at first glance suggest a disease map, but hopefully once the readers have read the title and legend it will become evident that it is rather a map for 'access to healthcare'. We wanted to explore the data with heat maps and monochromatic looks, but the map might be improved if the metaphor for 'access' is rather the colour green and not white. We have attempted this improvement in the Week 8 map. A bubble map instead of a heat map might also better present the purpose of the map. Nonetheless, it was great to experiment with the radius for the kernel density, the opacity of the heat map and to find solutions to present the maximum of information with just one colour hue.

References:

Hulland, E. (2020). COVID-19 and health care inaccessibility in sub-Saharan Africa. *The Lancet Healthy Longevity,* 1 (1), pp. e4-e5.

Humanitarian Data Exchange (2019). *Health Facilities in Sub-Saharan Africa*. Available from: https://data.humdata.org/dataset/health-facilities-in-sub-saharan-africa [Accessed 19 March 2021].



Projections

Using NASA satellite data collected from 24 February 2021 to 3 March 2021, the above map displays active fires in two of the world's worst fire-hit countries, the United States (U.S) and Australia. It is designed with the purpose of triggering readers' memories of the wildfires that blazed across these lands recently – and to show that the very same fires still exist, even as its media coverage has dropped drastically.

We titled the map with such a purpose in mind, using the emotive phrasing of "looking back" to suggest that we have past the catastrophic bushfire seasons, yet its devasting effects are not to be forgotten. The short paragraphs on the bottom left-hand corner elaborate on this point, giving the reader context which cannot be retrieved from the map itself. To show that the extent of the fire has improved but is still raging in parts of the U.S and Australia, we used spiky symbols with a fiery red tone to translate the danger of ongoing fires which also engage the reader. As darker areas show multiple fires, the map illustrates that the Southeast and Western coast of the U.S and states Victoria, New South Wales and Queensland are still burning badly today. A muted green color was used for land areas to elicit a natural forest character. Beyond elements used to accentuate past and present fires, the black country parameter outlines are helpful to the reader in understanding the relevant national borders. This is especially functional for the U.S as it is connected to two other big land masses, Canada and Mexico. Moreover, the layout for the map is engaging and minimizes negative spaces without overcrowding.

Moving onto map projections, we employed the '*Australian Albers'* and '*US National Atlas Equal Area'* projections for the countries. The former projection was selected for Australia because it preserves a proportional size of the country to the actual Earth area and minimally distorts shape. Furthermore, due to its usage of two standard parallels at 20° N and 60° N, it reduces distortions as compared to projections with only one standard parallel and is thus most suitable for land masses with East-West orientations at mid-latitudes, traits of which fit Australia's (Kennedy & Kopp, 2000). The '*Australian Albers'* projection was therefore used, allowing readers to have an accurate macro geographic view of Australia. The latter projection, '*US National Atlas Equal Area',* was selected for similar reasons for the States although it is noteworthy that this projection also better presents each state in proportion to others (Corey, 2013). For the inset, we went with the '*Mollweide'* map projection to showcase the cylindrical shape of the globe.

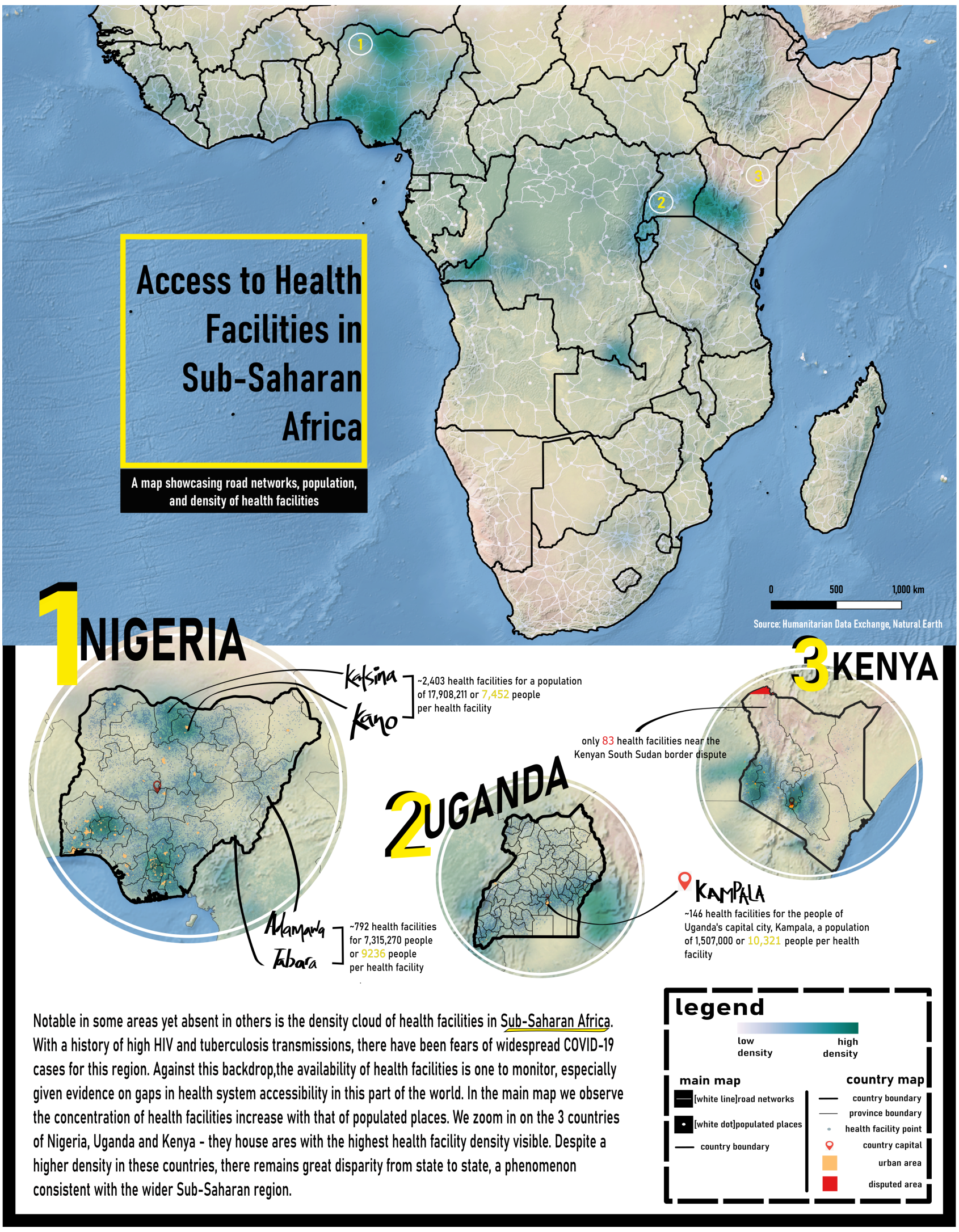
In summary, this map is well put together, addressing its aim and audience while providing readers with a purposeful map-reading journey with visual hierarchy and map projections considered. It ultimately draws a sense of relief from the height of the American wildfires and Australian bushfires that jointly cost more than USD200 billion, countless animal life and homes – all while evoking a quiet sense of danger for the fires that continue to burn today.

References

Corey, M. (2013). *Choosing the right map projection.* Available from: https://source.opennews.org/articles/choosing-right-map-projection/ [Accessed 22 March 2021].

Kennedy, M., & Kopp, S. (2000). Understanding map projections. *GIS by ESRI.*

NASA Firms (2020). *Active Fire Data*. Available from: https://firms.modaps.eosdis.nasa.gov/active_fire/#firms-shapefile [Accessed 25 February 2021].

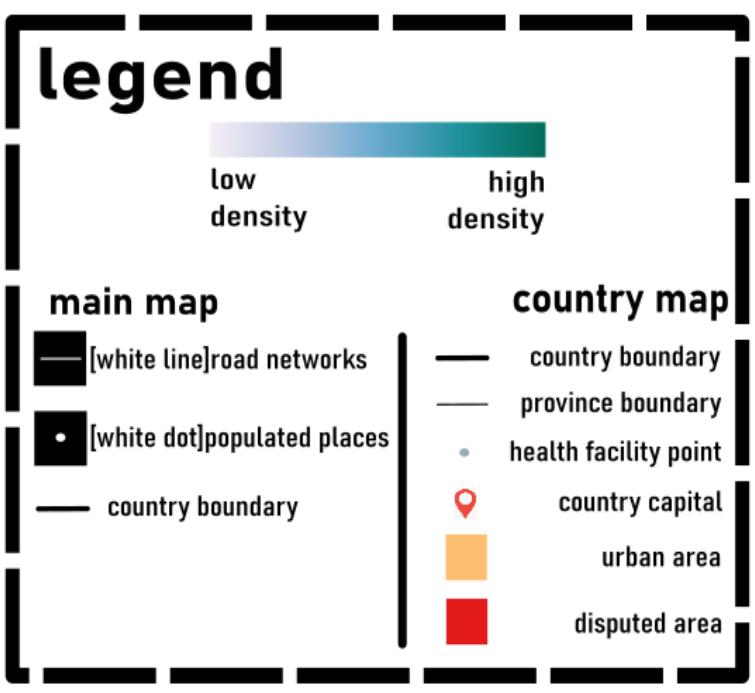


Base map

We have improved the Week 6 Health Facilities map in various ways, including a better base map that highlights the continent's geographic context. A base layer by Natural Earth was used as it could showcase the continent well with elevation, even though the elevation wasn't extremely pronounced. Road networks were added to show the accessibility of health facilities. We also included populated places to see if they are indicative of where health densities are located. We note a lower density of health facilities where the continent has drier areas.

We changed the heat map's colour to green so that the readers more easily associate the density to health facilities rather than to disease. As the colour green now could interfere with the forest greens of the Natural Earth raster layer, we used a turquoise blue palette for the heat map. The visual hierarchy starts with the title in the large yellow box, nicely goes through the three countries with the yellow numbering. The quality of the legend unfortunately was reduced by PowerPoint and so a larger version was copied below.

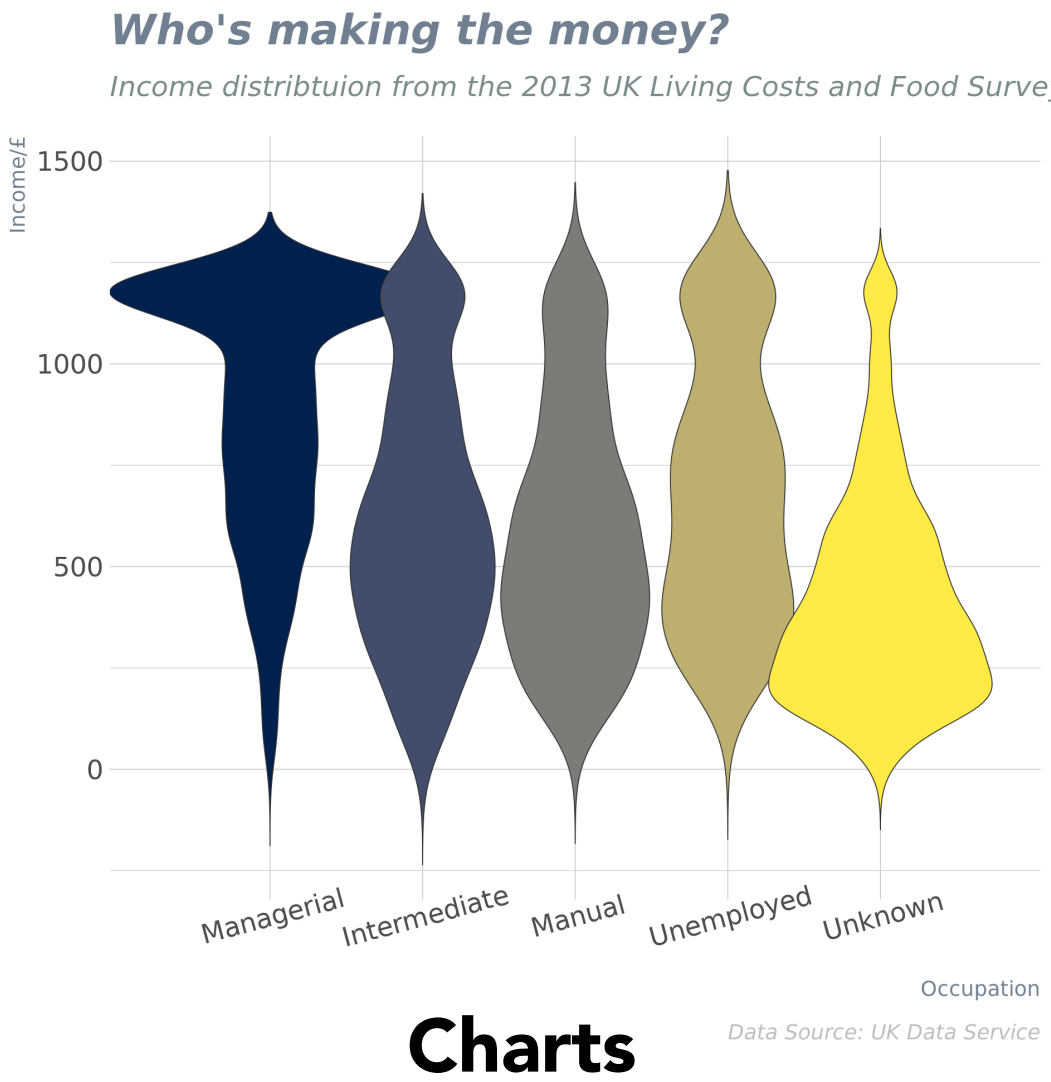
We have highlighted countries with the densest areas by using circular crops. They are numbered so that it is clear which area they correspond to on the continent map. The ratio between people and health facilities is also included with stylistic handwritten strokes and labels that point to some urban areas. The ratio was calculated using point clusters in QGIS and the data for the population and the number of health facilities were compiled from various Internet sources.



For the country insets, road networks and populated places were taken out to focus on provinces within the countries instead. This way we show that even within the countries with the visibly densest areas, density differs greatly from province to province and so provide a micro view of how the density is spread across the sub-Saharan region. The layer of unique health facility points were also mapped beneath the heat map so we can see the true density without the heat map effect. Urban and disputed areas were lastly selected in anticipation that health facilities will be dense around former and sparse around latter.

References:

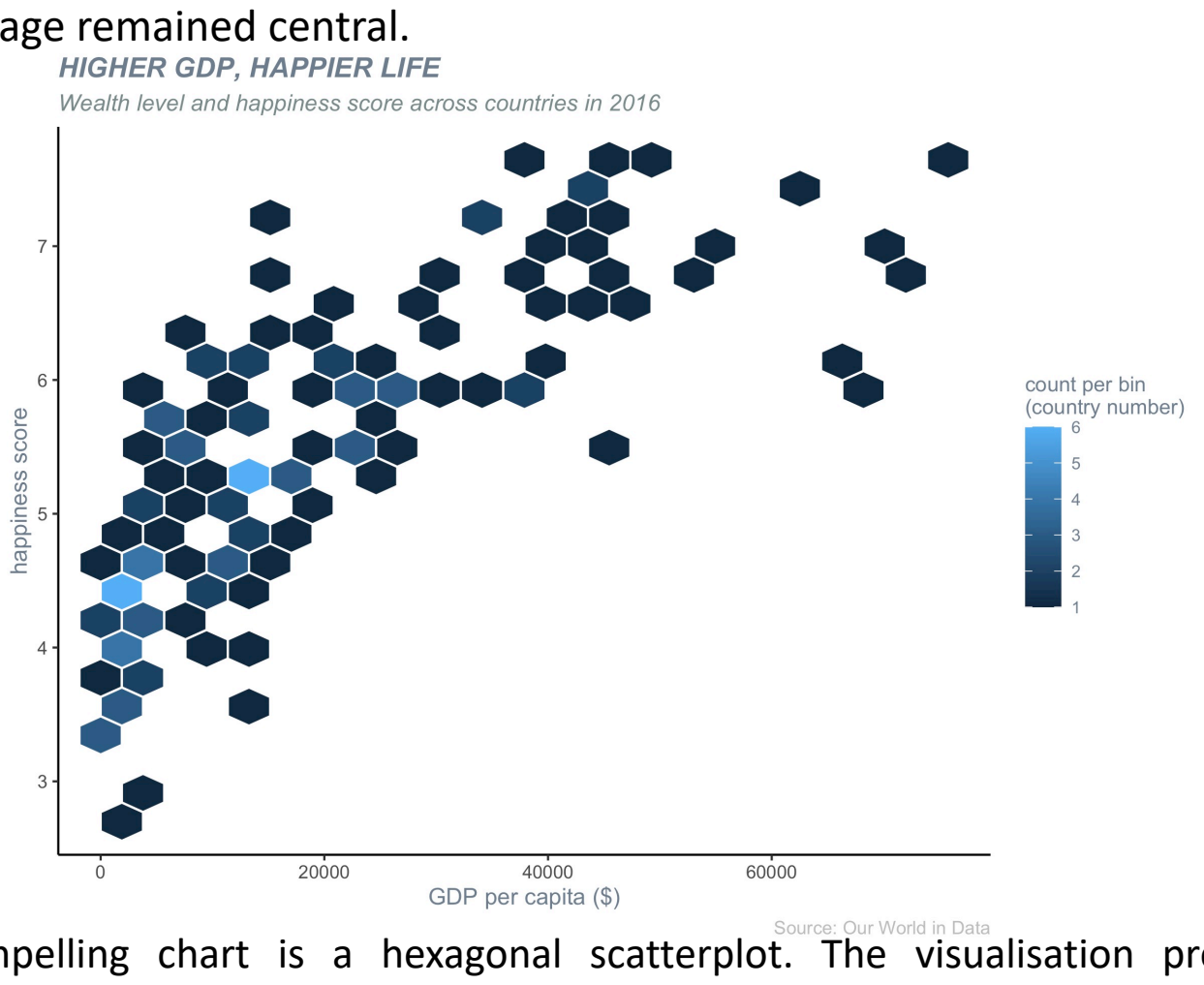
Humanitarian Data Exchange (2019). *Health Facilities in Sub-Saharan Africa*. Available from: https://data.humdata.org/dataset/health-facilities-in-sub-saharan-africa [Accessed 19 March 2021].



Charts

The graph above is a violin chart showing the income distribution (gross weekly household income) by occupation level for participants in the 2013 UK Living Costs and Food Survey. This is a cross-sectional household survey undertaken by the Office for National Statistics. The most compelling finding from the chart is the stark difference in shapes between certain occupations and the similarities between some. The managerial and unknown categories have almost a mirror image: managers have the highest density at the top end of the income distribution whilst the 'unknown' category is at the bottom end. The 3 categories in the middle have roughly similar shapes: the highest density is just below the middle of the distribution with smaller bumps higher up. The first finding is to be expected but the fact that the 3 middle occupation levels (including the unemployed) have similar shapes would be quite a surprise to most.

Violin charts are an intuitive and eye-catching medium for presenting distribution data. They are essentially a hybrid between a boxplot and a kernel density plot. The chart clearly shows important aspects like range and median, but the peaks highlight density which is more comprehensible to the average reader. Discrete colouring was chosen to allow the reader to easily differentiate between the graphs for each occupation, the ordering of the graphs was also considered – they are ordered from more senior to less senior. This was done so that the reader can logically compare adjacent occupation levels. This particular colour palette was chosen to be accessible to those with colour blindness, expanding the possible readership. The title, subtitle and caption are in keeping with the blue colour theme to make the whole chart cohesive, however their colours have been muted so that no attention is withdrawn from the chart itself – the chart is so easy to understand that the title and subtitle are not needed as explanatory elements but only to provide further information. Other visual hierarchy elements such as a legend or textbox were excluded to prevent the chart area from becoming cluttered. The main message of the graph is the violin shapes so the spacing was balanced and kept intentionally simple so that the message remained central.



Our second compelling chart is a hexagonal scatterplot. The visualisation presents the relationship a country's GDP shares with its people's happiness, as well as the overall conditions of countries across the globe. Hexagonal bins positioned in an 'upward' curve represent how higher country GDP per capita is positively correlated to people's happiness scores. We also used gradient colour to include additional information to communicate the number of countries situated at the same position on the plot. For example, extremely light blue hexagonal bins indicate that 6 countries have similar GDP per capita and happiness data. The relevant legend is situated cleanly on the right of the graphic, enabling readers to quickly understand what each colour represents.

References:

Our World in Data (2017). *Happiness and Life Satisfaction.* Available from: https://ourworldindata.org/happiness-and-life-satisfaction [Accessed 22 March 2020].

University of Manchester, Cathie Marsh Institute for Social Research (CMIST), UK Data Service, Office for National Statistics, (2019). *Living Costs and Food Survey, 2013: Unrestricted Access Teaching Dataset*, [data collection], Office for National Statistics, [original data producer(s)]. Available from: http://doi.org/10.5255/UKDA-SN-7932-2 [Accessed 24 March 2021].