Journalist Fellowship Paper

Bridging Journalism's Data Viz Accessibility Gap

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Introduction

In the geo-political chaos of the 2020s, data journalism and the visual representation of data have become an integral tool for translating an increasingly confused narrative for news audiences.

Readers have come to expect high-quality infographics and interactive charts and graphs that tell the stories that really matter to them. It's not hard to understand why: in a world drowning in data, anything that can quickly and easily make sense of it is of immense value. But as the use of visual data journalism becomes more embedded in day-to-day newsroom operations, there's a very real danger that those who can't decipher visual information in the usual way will be left behind. As a blind journalist I'm one of the millions of people who've been left out of this visual data revolution.

During the COVID-19 pandemic there was no shortage of news about the spread of the virus, but it was the charts, graphs and other data-visualisations amplified by newsrooms across the world that made the severity of the situation plain to see.

For many blind and visually impaired people like me, those charts and graphs were un-navigable – meaning the information afforded to sighted people just didn't exist for us. A 2021 Massachusetts Institute of Technology (MIT) research project looked at how a simple chart produced early on in the pandemic by the Centers for Disease Control and Prevention (CDC) was of no use to millions of blind people.[1]

The chart showed how measures like mask wearing and social distancing could "flatten the curve" and reduce the peak of infections. It was shared widely across social media and amplified across news sites. Qualitative data gathered during the MIT project found alternative text – which makes images accessible for people who use screen readers to navigate the web – was often missing from online charts.[2,3] When it was included, the alt-text was frequently uninformative or even incorrect.

Analysis of health messaging shared across Twitter during the COVID-19 pandemic carried out by researchers at Carnegie Mellon University found that of 55

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[1] Zewe, A. (2021) *Making data visualizations more accessible*, *MIT News*. Massachusetts Institute of Technology. Available at: https://news.mit.edu/2021/data-visualizations-accessible-blind-1012 (Accessed: December 6, 2022).

[2] *Alternative text* (2021) *WebAIM*. Available at: https://webaim.org/techniques/alttext/ (Accessed: December 6, 2022).

[3] Anonymous (2021) *An introduction to screen readers*, *AbilityNet*. Available at: https://abilitynet.org.uk/factsheets/introduction-screen-readers (Accessed: December 6, 2022).

government agencies disseminating health information about COVID-19, only 12 had included any meaningful alternative texts for their visual data.[4]

The problem of accessing this vital pandemic information became so pronounced that a blind web developer from Boston took it upon himself to create an accessible website that pulled all health data into one accessible place.[5]

The Royal Institute for Blind People (RNIB) estimates around 2 million people are living with some sort of sight loss in the UK.[6] The global estimate by the World Health Organisation (WHO) is that 236 million people have moderate to severe sight loss, around 39 million of whom are blind.[7]

Quality of life with visual impairment depends on various factors, a key one being access to information. Article 21 of the United Nation's Convention on the Rights of Persons with Disabilities (CRPD) states "Parties shall take all appropriate measures to ensure that persons with disabilities can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information and ideas on an equal basis with others and through all forms of communication of their choice." It goes on to encourage "mass media, including providers of information through the Internet, to make their services accessible to persons with disabilities".[8]

Innovative text-to-speech synthesis – in the form of screen readers, optical character recognition and speech recognition software – has helped to empower blind and visually impaired people to navigate the digital landscape in a similar way

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[4] Gleason, C. *et al.* (2020) "Disability and the COVID-19 pandemic," *ASSETS '20: The 22nd International ACM SIGACCESS Conference on Computers and Accessibility*, 5, pp. 1–14. Available at: https://doi.org/10.1145/3373625.3417023.

[5] Littlefield, T. (no date) *Covid-19 statistics tracker, CVStats v. 2.0.2*. Available at: https://cvstats.net/ (Accessed: December 6, 2022).

[6] *Key information and statistics on sight loss in the UK* (no date) *Royal National Institute of Blind People*. RNIB. Available at: https://www.rnib.org.uk/professionals/health-social-care-education-professionals/knowledge-and-research-hub/key-information-and-statistics-on-sight-loss-in-the-uk/ (Accessed: December 6, 2022).

[7] *Vision Impairment and blindness* (2022) *World Health Organization*. World Health Organization. Available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment (Accessed: December 6, 2022).

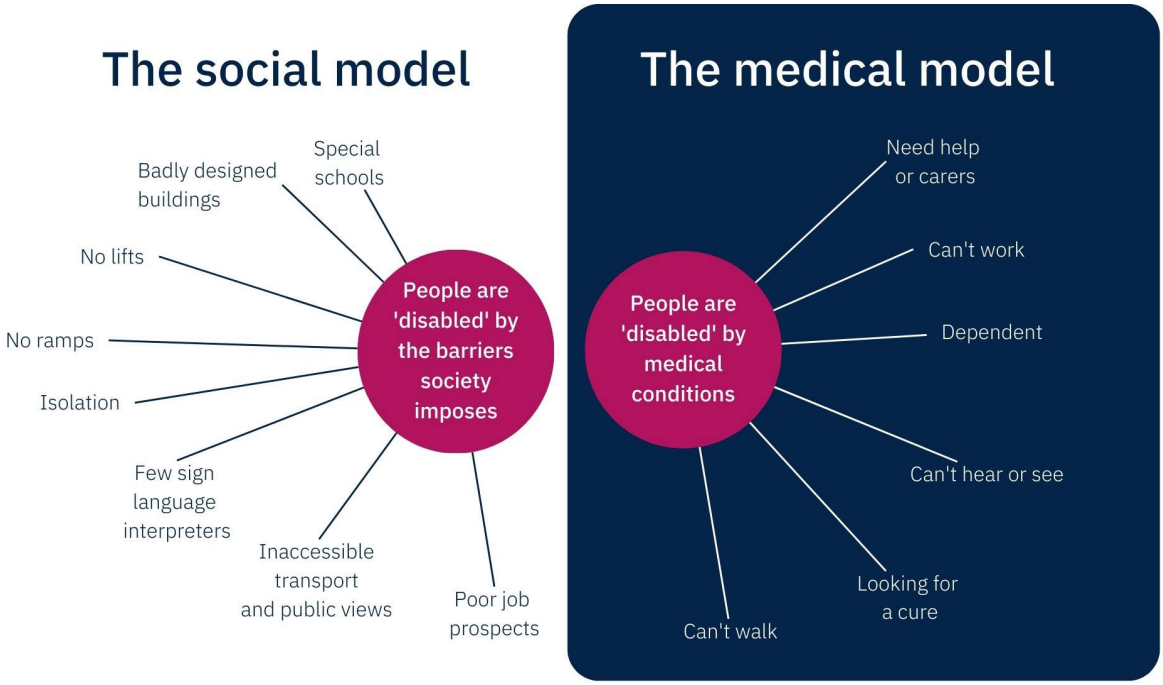
[8] *Article 21 – freedom of expression and opinion, and access to information enable* (no date) *United Nations*. United Nations. Available at: https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities/article-21-freedom-of-expression-and-opinion-and-access-to-information.html (Accessed: December 6, 2022).

to people with sight. Without assistive technology solutions in place, data visualisations now represent a new barrier to access.

In this paper I'll explore the issues around unequal access to information and look at how we can begin to make visual data journalism more accessible to blind and low vision screen reader users and review some emerging solutions. I'll also lay out a set of recommendations for how I think newsrooms could start bridging this widening inaccessibility gap.

What do we mean by web accessibility?

Before we look at web accessibility it is probably useful to explain the different models of disability and how each of these impact disabled people's experiences.



Graphic representation of the social model vs the medical model of disability.

The medical model states that disability is a medical condition and suggests fixing the impairment is the desired outcome. This negates any responsibility of society to make adjustments for how the disability impacts the individual.

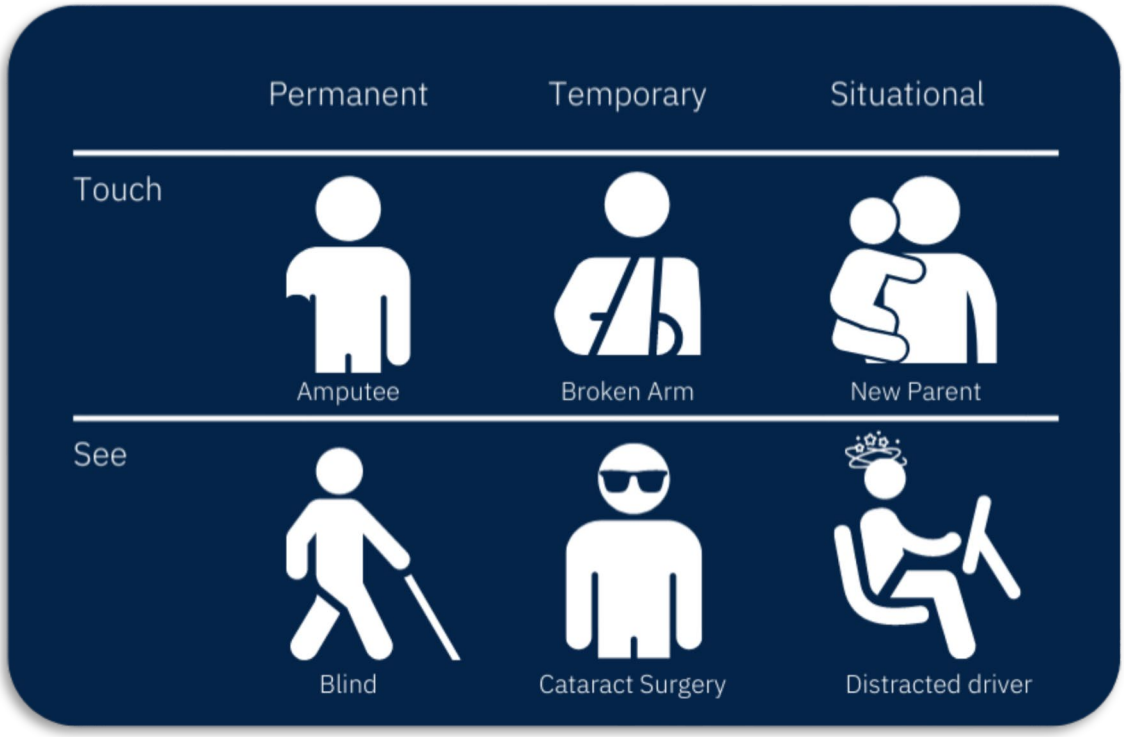
The social model posits that disability is part of someone's character and that they're disabled due to the attitude of society and the lack of any meaningful adjustments to their external environment.

Consider someone in a wheelchair who can't get into a restaurant due to steps into the building. The social model argues that by simply adding a ramp you can remove the societal disability. It's the same argument for blind people and visual data: just because someone can't see the visual image doesn't need to mean they shouldn't have access to the information.

Through the same lens, many able-bodied people might think web accessibility is about catering to people with disabilities. It is not. As UK non-profit organisation

Ability Net says, universality is about ensuring tools and websites are designed in a way that benefits everyone who might need to navigate the web in a different way.[9]

They say that by making content more accessible, more people in more locations can access that content and understand it more easily. They also advocate for an inclusive design approach which they believe benefits more people due to "situational disabilities". This infographic from Microsoft illustrates how situational disabilities impact most people at some point in their lives.



Reproduction of the Microsoft infographic

The current benchmark for web accessibility used by many organisations, including the BBC, are the Web Content Accessibility Guidelines (WCAG). These were first introduced in 1999 by the World Wide Web Consortium (W3C) as the Web Accessibility Initiative (WAI) in collaboration with organisations and individuals within the global accessibility community.

Currently on their third iteration, WCAG sets out best practice for accessibility for various types of disabilities. Whilst they have guidelines for the use of alt text

[9] *A Digital World accessible to all.* (no date) *AbilityNet*. Available at: https://abilitynet.org.uk/ (Accessed: December 6, 2022).

descriptions in order to make images more accessible to blind screen reader users, the guidance for making visual data journalism accessible is minimal. It relies heavily on the alt text description and a longer description which they recommend sits alongside the image.

There are three compliance levels within WCAG: A, AA, and AAA – or minimal, acceptable, and optimal accessibility. Each level includes guidelines that must be met to consider the website accessible for all users. The distinction between conformance levels gives developers more flexibility, so even very complex websites or cutting-edge technologies can maintain a minimum level of compliance.

WCAG Level A	Minimal compliance
WCAG Level AA	Acceptable compliance
WCAG Level AAA	Optimal Compliance

Table illustrates WCAG Levels A-AAA as described in previous paragraph

The AA level of compliance is something many organisations adhere to, including the BBC. But let's talk about the difference between something being technically accessible and how it's actually experienced. If we return to the example of the wheelchair user who needs a ramp to get into the restaurant, what does it mean if the ramp is round back with the bins and delivery vans? Yes, the restaurant is acceptably compliant, but is that really a positive user experience?

It is the same for digital accessibility. Disabled people should be able to access information and experience the internet in a comparable way to the rest of society. Many accessibility advocates believe that, with a little more effort and consideration, the acceptable level could and should be increased to optimal or more to ensure user experience is equitable.

What is data visualisation supposed to do?

Data visualisations such as charts, diagrams and maps are an effective way to represent, analyse and explore data as well as identify and communicate insights.

They take advantage of the human brain's high bandwidth visual system and ability to quickly identify patterns.[10] When presented with a table of numbers, for example, it mightn't be obvious whether there's any sort of pattern to the data, but when presented on a line graph or bar chart a steadily increasing or decreasing trend can be revealed.

Clear data visualisations also have the added benefit of being able to bridge language barriers because, bar a few cultural caveats, visual designs are language agnostic.[11] Data viz designers also utilise to great effect the well-known psychological phenomenon of "at a glance perception", whereby people who can see can take in huge amounts of visual information at once.

From this perspective, it's fair to consider visual data an accessibility tool in and of itself. By taking complicated data and rendering it down to a visual medium, data viz practitioners are making information more accessible to a wider cohort of people.

It's not a huge leap from this position to understand that by not thinking about those of us who don't digest information in a visual way, those same data viz designers are creating a barrier to accessing that information. Consider this through the lens of the social model of disability, and you can see how the system design is creating a disability.

The Association for Computing Machinery believe this is something everyone should be concerned about. So much so that in May 2021, they proclaimed it an equity issue that is likely to have severe consequences if not addressed.[12] The ACM also say the data viz community hasn't paid enough attention to the needs of disabled people, arguing that it's time for the visualisation, accessibility, and other relevant communities to work together to address this important issue. They also

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[10] Barkman, R.C. (2021) *Why the human brain is so good at detecting patterns*, *Psychology Today*. Sussex Publishers. Available at: https://www.psychologytoday.com/gb/blog/singular-perspective/202105/why-the-human-brain-is-so-good-detecting-patterns#:~:text=Humans%20can't%20help%20but,humans'%20ability%20to%20recognize%20patterns (Accessed: December 6, 2022).

[11] This blog from data viz specialists Highcharts is a great description of what visual data is and why it is so useful for translating complicated data into an easy-to-understand format. ADD URL

[12] Marriott, K. *et al.* (2021) "Inclusive Data Visualization for people with disabilities," *Interactions*, 28(3), pp. 47–51. Available at: https://doi.org/10.1145/3457875.

say that this accessibility deficit needs to be adequately prioritised by organisations who use data visualisations on a regular basis.

Alt text and Context

There's a plethora of resources available for digital journalists who want to know more about alternative text and how to use this tool properly. The WCAG guidelines have quite straightforward guidance for best practice.

In reality, however, you'll find as many people disagreeing about how best to use alt text as you'll find those championing the WCAG method. Accessibility consultancy Tetralogical go as far as to say the term "alt-text" is redundant as for screen reader users there is no alternative. They encourage people to use the term "text description" instead.

Accessibility advocate and disability expert Sheri Byrne-Haber also argues that no single answer exists to the question, "What is the right alt-text for an image?" In a 2020 blog she asked her readers to choose the right alt text from eight possible descriptions for this image of a Jack Russell dog wearing sunglasses on a beach.[13]

Jack Russel in a hammock wearing sunglasses. Stock Photo

[13] Byrne-Haber, S. (2020) "Context is the most critical aspect of alt-text everyone seems to miss," *Sheri Byrne Haber*, 1 October. Available at: https://sheribyrnehaber.com/context-is-the-most-critical-aspect-of-alt-text-everyone-seems-to-miss/ (Accessed: December 6, 2022).

The answer to the trick question was that all the suggested descriptions for the image could have been used because the right option depended entirely on the context of the piece.

In a 2020 blog post for Nightingale (the online journal for the Data Viz Society), data viz designer Amy Cesal looked at how best to create alternative text for data visualisations.[14] She recommends a snappy and succinct but descriptive alt text, with a longer description of what the chart is and what it's supposed to portray above or below it. Finally, it's important to provide access to additional information so screen reader users are able to interrogate the original data set for themselves.

These three small additions to the way we present data viz would be of huge benefit to blind or visually impaired people and require no additional resources. The only barrier is in mass adoption of these practices in any meaningful numbers. More awareness of the needs of blind people and the various solutions available need to be trumpeted louder by all of us.

Cesal has also written extensively on the importance of visual data accessibility style guides and how they can be incorporated into an organisation's workflow in order to ensure uniformity in user experience[15]. As Cesal points out, however, style guides are only of benefit if they're adhered to and updated as advancements in accessibility practices and technology are made.

[14] Cesal, A. (2020) "Writing Alt Text for Data Visualization," *Medium*. Nightingale, 23 July. Available at: https://medium.com/nightingale/writing-alt-text-for-data-visualization-2a218ef43f81 (Accessed: December 6, 2022).

[15] Cesal, A. (2019) "What Are Data Visualization Style Guidelines?," *Medium*. Nightingale, 10 July. Available at: https://medium.com/nightingale/style-guidelines-92ebe166addc (Accessed: December 6, 2022).

Accessibility transcends compliance

As we have discussed, many organisations approach data viz accessibility from a WCAG compliance perspective: for newsrooms and other organisations, it is entirely voluntary and relies on awareness of the issues and a willingness to try and fix them.

Frank Elavsky, a researcher at the Human-Computer Interaction Institute at Carnegie Mellon University and a recognised expert in the accessibility of visual data journalism, believes many organisations following the WCAG guidelines should be going further than just compliance. He suggests they need to be encouraging and championing accessibility best practice from an institutional perspective. With the massive rise in data-driven journalism and the near ubiquitous appearance of data in public life, he said more robust and thorough accessibility considerations are long overdue.

In his essay, *The Right Tools for the Job: Learning and Building for Data Visualisation and Accessibility*, Elavsky highlights the explosion in data viz for information sharing: sports results, COVID infection rates, stocks and share prices, local and national election results – all increasingly reported in creative and visual ways. "There's been a huge advancement in faster and better tools for creating these visual data representations, but these empowering advancements haven't been made available to disabled people," he said. "Those not able to access data visualisations have been left with clunky, broken and ineffective systems."

Chief BBC North America Political Correspondent Gary O'Donoghue agrees with Frank. In a recent internal BBC seminar on Reframing Disability, Gary warned that there's a very real danger of journalism "walking eyes wide open into a new digital divide". A divide with the potential to leave millions of blind and visually impaired people behind as the digital inaccessibility gap continues to grow.

At the same BBC event, blind journalist Emma Tracey, co-host of the disability focused podcast *Access All*, echoed what Gary O'Donoghue had to say. When asked what she thought of the current provision for accessibility in visual data journalism she said she thought it was, "non-existent as far as I'm aware". She added: "The alt text tells me what the chart is, not what it contains. It's also often unclear from the text of the article whether or not all the info from the chart is included in the article."

One of the biggest problems for many data viz practitioners and designers is that there's no single solution or source of truth on how to make visual journalism more accessible, particularly for blind people. In 2021, Frank Elavsky produced the Chartability framework: a set of guidelines broadly based on the existing WCAG

guidance with additional criteria specifically aimed at data viz practitioners.[16] Frank believes these additional checks and balances could really help data viz professionals make their content more accessible for more people.

He's not sure though if the organisational ambition is there to adopt the framework. "I think that accessibility is often viewed from the perspective of compliance," he told me. "When it comes to things like charts and graphs [...] they simply aren't as much of a priority. Chartability really fits a niche of work where people are trying to anticipate what accessibility means for something like visualizations, as opposed to most places which are just working to hit the bare minimum."

Research published by AbilityNet at their TechSharePro conference in November 2022, Europe's biggest event for digital accessibility, echoed what Frank had to say.[17] The research, which surveyed over 400 senior company leaders from across many sectors, found that the main motivator for accessibility is to meet legal requirements with relatively low levels of understanding of the importance of accessibility to achieve core business objectives. Consequently, time and resources are often under-allocated.

In *Visual Accessibility in the Wild: Challenges Faced by Visualisation Designers 2022*, researchers from Boston College surveyed 144 data viz practitioners and designers for their thoughts on accessibility of data visualisations.[18] They found a shortfall in accessibility considerations in many data viz design tools was a major factor, and some survey participants said a lack of solid guidelines for making data viz more accessible meant they didn't always know how to make their designs of use to a wider audience. Other hurdles to accessible data viz highlighted included a lack of awareness, an unsupportive environment and infrastructure at the workplace and insufficient provision of resources such as time, budget, training, and expertise.

The research also found that when data viz designers do have an interest in making their content accessible for screen reader users, the lack of feedback on their work means they don't know if what they've done is of benefit or not.

When accessibility evangelist Doug Schepers tells people he makes data viz for blind people the response is almost always a quick pause whilst the gears of their mind

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[16] Elavsky, F., Bennett, C. and Moritz, D. (2022) "How accessible is my visualization? Evaluating visualization accessibility with Chartability," *Computer Graphics Forum*, 41(3), pp. 57–70. Available at: https://doi.org/10.1111/cgf.14522.

[17] Mannion, A. (2022) *Attitudes to Digital Accessibility 2022 survey report - key findings*, *AbilityNet*. Available at: https://abilitynet.org.uk/attitudes2022survey (Accessed: December 6, 2022).

[18] Joyner, S.C. *et al.* (2022) "Visualization accessibility in the wild: Challenges faced by visualization designers," *CHI Conference on Human Factors in Computing Systems*, 83, pp. 1–19. Available at: https://doi.org/10.1145/3491102.3517630.

start spinning, followed by: “How does that work?”. Schepers, like many others, believes there’s no single correct way to make your content accessible – but he said this shouldn’t stop designers thinking creatively. “You need to consider your audience, and what you’re trying to convey,” he told me, “and decide how you want to convey the information to them. You don’t just take every dataset and render it as a bar chart and call it a day. You think about the message you’re trying to send, and you pick the correct chart type, the right subset of the data, the correct framing, the clearest symbols, and the pithiest prose to craft your message. You adapt, remix, and innovate.”

What solutions are available then?

The problem of how to make a visual medium accessible is something many people across the world are trying to figure out.

Leonie Watson, Director of accessibility consultancy Tetralogical and a member of the W3C board of directors, believes current WCAG guidelines are no longer sufficient for the types of charts and infographics increasingly being used by many news organisations.

"Charts and infographics often contain a lot of information in a compact form," she explained. "Adequate text descriptions can therefore require a lot of space. This frequently results in a reluctance to provide adequate text descriptions because it takes up precious screen real estate."

Watson believes that by using simple HTML coding to provide a disclosure element on an image, it's possible to include additional information and text descriptions for the image without using up this screen real estate. "Once it was assumed that only blind and partially sighted people benefitted from text descriptions, but it is now understood that people like to consume information in different ways.

"The solution is to make it possible for anyone to access a detailed description of a chart or infographic, without it having to be included in the prose of the article. The proposed pattern is to use a disclosure component."

A disclosure component is a button that, when activated, displays additional content on-screen. In this case the button would contain the chart or infographic image with a short text description, and when activated it would disclose the detailed description of the graphic, either with additional links, list, text descriptions or screen-reader-friendly tables. Typical examples of disclosure components might be accordion elements on a website which could reveal longer answer to frequently asked questions.[19]

For many newsrooms, the beauty of this solution would be the hidden element which addresses concerns about losing valuable screen space. Using a solution that opens more information to those who need it is a fantastic workaround.

[19] A more detailed technical explanation of how disclosure elements work is available in appendix one.

It also has the added benefit of giving people who process information in a different way the option of being able to read the longer description or table in a way that suits them.

Watson co-authored a set of "inclusive design principles" where this approach is explained in full.[20] Written along with Henny Swan, Ian Pouncey, and Heydon Pickering, "these [...] principles are about putting people first. It's about designing for the needs of people with permanent, temporary, situational, or changing disabilities – all of us really."

A research team at the Massachusetts Institute of Technology have also been working on a solution using W3C "tree view" norms.[21] The Olli project is an open-source library for converting data visualisations into text formats that can be easily navigated by screen reader users with just the keyboard.[22]

Dr Daniel Hajas is the Innovations Manager at the University of London's Disability Innovations Lab and has been working closely with the MIT research to find the best possible experience for blind screen reader users when navigating visual data. Dr Hajas, a screen reader user himself, thinks the project has great potential for people who use screen reader technologies. "They will not only gain access to data and the story it tells," he explained, "but they will also have access facilitated in a manner of user experience I have not seen very often before."

Dr Hajas also thinks making data viz a more accessible medium for blind people could have profound implications for many people's life choices, including his, simply because they can now understand in their own way the data presented to them "I might make investment decisions based on my own analysis and interpretation of data, and not the interpretation given by someone who authored an alt text," he told me.

Many blind people have accepted an image- and data-viz-free world simply because there was no option before. "We don't miss what we never knew," he said.

"However, I think this is a barrier that disruptive disability innovation can address. I believe Olli is disruptive enough to shift the needle. Think about touchscreen displays: [before] iPhone smart phones came out, blind people thought they would be excluded. We all wanted button phones because they are tactile. And now? We

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[20] Swan, H. *et al.* (no date) *Inclusive Design Principles*. Available at: https://inclusivedesignprinciples.org/ (Accessed: December 6, 2022).
[21] Web Accessibility Initiative. (no date) *Tree View*, *Web Accessibility Initiative (WAI)*. Available at: https://www.w3.org/WAI/ARIA/apg/patterns/treeview/ (Accessed: December 6, 2022).
[22] Blanco, M. (no date) *Olli*, *MIT Visualization*. MIT Visualization Group. Available at: https://mitvis.github.io/olli/ (Accessed: December 6, 2022).

needed Apple to crack touch-screen interaction for blind users. I think Olli is our Apple Voice Over interaction for data visualisations on the web. Once people realise what it can do, they will want to browse their health, fitness, and financial data trends."

Build it and they will come

Across the world, newsrooms are slowly waking up to the need to make their visual data journalism more accessible to disabled people. The *New York Times* recently announced Jaime Tanner was to become their new Accessibility Visuals Editor, a post which did not previously exist. Announcing the appointment, Deputy Managing Editor Steve Duenes said the appointment demonstrated the *New York Times'* commitment to accessibility and that it would help boost accessibility best practices across the publication. He was also explicit in saying that this was part of their plans to grow audiences for their journalism.

Tanner, whose background is in data viz, said one of the first things she's keen to do in her new position is to understand how the newsroom works. "We're publishing things every day," she told me. "There's so much I want to do and so much I want to get to, but at the same time I'm learning a tonne and it takes time to set up a strategy and what the goals should be and what to prioritise."

Tanner has already found that making visual data more accessible is something her colleagues in the newsroom are keen to build on and which is seen as an exciting opportunity. "I think everyone's eager and willing to do what they can to make this work more accessible," she said. "The thing that keeps you going is knowing that folks are excited and eager to do it, and happy to do it."

The *Washington Post* also has ambitions to make all its visual data journalism more accessible, but Graphics Director Chiqui Estaben said that whilst they have accessibility in mind for all their visual journalism, they're just scratching the surface. He said they do use alt-text on their content, but admitted: "There will be something lost in the translation because that's the first reason why we do visuals: [to make complex text easier to ingest]. But our goal is that the people who access [our data viz] should at least be able to understand the main takeaways and most important details."

In their essay *Creating Better Screen Reader Experiences*, accessibility and UX expert Sarah Fossheim said that, whilst making data visualisations accessible to screen readers may seem like extra work, data practitioners can actually create good and meaningful experiences for all audiences if they have the foresight to consider accessibility from the beginning.

"If we want to create data visualisations with a good user experience, we need to understand who our users are and include them in our processes," they explain. They suggests using "accessibility personas" to grapple with what the end users' needs might be. These accessibility personas are a tool used by developers and UX

designers to humanise the user experience of anyone using the web.[23] By thinking of a young woman, for example, who's just had a baby and who's blind, or a middle-aged man with cognitive issues, you can begin to consider how users similar to your imaginary personas will interact with anything you design.

The *Financial Times* is another publication that takes accessibility extremely seriously. For Alan Smith, who leads the *FT*'s Visual and Data team, the challenge is being able to deliver accessibility at scale and not just in one-off projects. "It's one thing to come up with a researched thing which allows you to explore the nuances of best practice and to tweak things on an individual project," he said. "It's a bit more of an issue when, like at the *FT*, you produce something like 20,000 charts a year. We might say it'd be great to have sound on our charts, but there's no way we can build 17,000 charts a year which have sound on because the infrastructure just isn't there for that kind of volume."

Smith is also aware that accessibility considerations and requirements can sometimes pull in different directions which adds to the complexity of finding a viable solution. Someone with a cognitive impairment, for example, might benefit greatly from visuals rather than paragraphs of text, whilst for screen reader user paragraphs of text are the more accessible option. "Having something that is flexible enough to take into account a variety of accessibility requirements for us simply doesn't exist at the scale we need to deploy it at," Smith explained.

For one-off projects at the *FT* which have a bit more of a lead in time, accessibility requirements are considered very early in the project lifecycle. The *FT* work closely with an external accessibility consultancy who they lean on to offer best practice and advice for projects they're developing.

Joanna Kao is the tech lead in the Visual Data team at the *FT*. She said the relationship with the accessibility consultancy is something that's evolved over time and is now a continuous feedback loop for the work her team is doing.

Something else the *FT* are doing is creating consistency in their use of alt-text descriptions across all their visual data journalism. Smith's team has its own internal "playbook" of sorts, which journalists and developers in the visual journalism team can draw on to ensure best practice and consistency. The big problem for Smith and his team is the ongoing issue of how to create solutions at

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[23] Crowther, A. (2020) "Creating Accessibility Personas," *UX Design*. UX Collective, 27 September. Available at: https://uxdesign.cc/creating-accessibility-personas-e7749d4096b4 (Accessed: December 6, 2022).

any meaningful scale which would ensure accessibility happens everywhere across the *FT*.

“You need all the gates to be open at once,” he explained. “You need your infrastructure gate to be open. You need your content management system gate to be open. Your third-party tooling. You need your own accessibility standards in place. Industrialised accessibility for us is the big challenge. How do you guarantee it by default rather than exception?”

The curb-cutting effect

When accessibility is taken seriously, a strange and beautiful thing begins to happen. The "curb cutting" effect was first recorded in the 1960s when disability rights campaigners persuaded the Californian local authorities to install ramps on their sidewalks to accommodate wheelchair users.

It soon became clear that this simple act of dropping a curb meant that mothers with pushchairs, people on bicycles and skateboards or elderly people also benefitted from being able to use the ramp.

In web accessibility, the electronic curb cutting effect has become a recognised benefit of making things more accessible for disabled people: Siri on Apple iPhones, voice dictation for emails and messaging, closed captioning for deaf people are all examples of accessibility designs now being used more widely across society.

A Verizon Media study from 2019 found that 80% of people were likely to watch an entire video if it had closed captions, even though 80% of people doing so weren't deaf or hard of hearing. Alt-text is also extremely useful for people who can see if they're somewhere where the wi-fi signal is weak or non-existent.

In 2019, Facebook and Instagram experienced a power outage which meant photographs on the platforms couldn't load properly. In place of the photos, alt-text displayed – giving users an idea of what the images might be, albeit AI-generated text that was lacking in human contextualisation.

It's also worth knowing that a good alternative text description on an image can help with search engine optimisation. "Make something easier to use for people that need extreme usability, and you'll make it better all round," said Robin Christopherson, Head of Digital Inclusion at AbilityNet.

Alternatives to alt text

There are modalities apart from alt-text that can be used to give disabled people access to the same level of information as anyone else. Tactile representations of maps, for example, are a great way for blind people to visualise something we can't see.

An example of a tactile map in use. REUTERS/Eric Gaillard

Chancey Fleet is the Assistive Technology Coordinator at the New York Public Library, where she founded and maintains the Dimensions Project: a free open lab for the exploration and creation of accessible images and data representations through tactile graphics.

Explaining the importance of her work at an event held by the Human-Computer Interaction Institute at Carnegie Mellon University in November 2022, Fleet said: "Tactile graphics give us access to spatial understanding, cognition and self-expression in a way that text-only does not do." Many blind people, she said, have been living in "avoidable image poverty" and tactile representations of many maps, charts and graphs are a great way to address this information deficit.

A great example of this was the "flattening the curve" graphic mentioned at the beginning of this paper. You'll remember how it spread across social media at the beginning of the pandemic in March 2020. Through careful and thoughtful consideration, Fleet's team made it accessible through the creation of a downloadable tactile graphic which made it a lot more accessible to blind people.

The downside to the tactile solution is access to the equipment, which can cost a lot of money. Fleet believes this is due to the lack of awareness of the benefits of tactile representations and thinks the blind community need to do more to push for wider adoption of the technology. "Many blind people understand that we have a reflexive right to books in accessible formats, be it braille, audio or digital," she told me. "Many of us understand that we also have a right to things like accessible voting machines and an accessible web, but most of us have had so little experience of tactile graphics that we don't have that reflexive assertion of rights."

For news organisations, like the BBC, that might be keen to utilise the technology for their blind readers, I was keen to find out how much extra work might be needed to make charts and graphs accessible in a tactile format. Not surprisingly, the answer from Fleet was that it all depends on the graphic. "That flattening the curve graphic I'm told only took an hour to produce," she said. "There are some images which I think require a lot more work – a lot more nuance and thought."

Fleet also believes the choice of what to make available as a tactile is important. "It makes sense to focus on newsworthy images and data representations of enduring interest rather than ephemeral interest," she said.

In San Francisco, non-profit organisation LightHouse for the Blind are using tactile representations of charts and maps to allow blind and visually impaired people to literally touch the news.[24] The first tactile representation they produced for the "Touching the News" project was in March 2021 when the Ever Given container ship got stuck in the Suez Canal for six days. Their downloadable tactile graphic consisted of two maps: one showed the canal with the Mediterranean Sea at the north end and the Red Sea at the south end. The location where the Ever Given was stuck was clearly marked at the very southern end of the canal. The other map was titled "Alternative route for shipping whilst Suez Canal blocked" and showed the much longer alternative route ships would have to take whilst the canal wasn't available.

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[24] Dixon, J. (2021) *Touching the news and other tactile graphics offerings from the San Francisco Lighthouse*, *The American Foundation for the Blind*. Available at: https://www.afb.org/aw/22/9/17689 (Accessed: December 6, 2022).

Since then, the project has produced many tactile maps and charts illustrating different topical news stories. Tactile representations as diverse as maps of Ukraine and its key regions and cities and surrounding countries, charts showing America's gun culture, graphics illustrating the health footprint of the COVID-19 pandemic and the timeline of the 6 January insurrection on Capitol Hill have all been produced in a tactile format by the non-profit. All these images appear constantly on news outlets but simply aren't available to blind or visually impaired people.

Another fast-evolving solution for making data accessible to a wider demographic is the use of sonification – using to create an audio representation of data visualisations. In 2021, musician and visual data designer Carni Klirs used this technique to represent what 450,000 Covid deaths sounded like. The sonification piece was striking in its simplicity and illustrated the density of deaths in a creative and imaginative way.

For many blind people, including me, the technique of using sound to represent data can lead to cognitive overload. An August 2022 piece claimed to illustrate images of the Carina Nebula taken by NASA's James Web telescope. It's a beautiful soundscape full of emotion, but no one has been able to explain to me how it represents the images captured by the telescope.

One recent research project looking into the practical use of sonification for representing visual data for blind screen reader users was Sonify.[25] In a proof-of-concept project, Sonify was a partnership of Bloomberg and Carnegie Mellon University to explore how sonification might be applied to charts and graphs regularly used by Bloomberg in their business reports, and whether it could be of real benefit to people needing to access information in a non-visual way.

Apple have also recently included sonification in their latest operating systems for iPhones and Macs. This is available to anyone through the accessibility settings on their device and offers an audio representation of graphs and charts.

In Australia, *The Guardian* is also looking at how they could utilise sonification and implement it into their day-to-day storytelling. The "Noisycharts" project "turns news into noise" by giving an audio representation of topical news events.[26] So far, they've illustrated the decline in Mark Zuckerberg's net worth following Meta's

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[25] *Sonify* (no date) *Sonify - making graphs accessible*. Available at: https://hcii.cmu.edu/mhci/capstone/2016/bloomberg/index.html (Accessed: December 6, 2022).
[26] Evershed, N. (2022) "What is the sound of Facebook's value crashing? Noisycharts turns news into noise," *The Guardian*, 15 November. Available at: https://www.theguardian.com/news/datablog/2022/nov/16/noisycharts-sound-graphs-data-sonification-introducing-guardian-australia-software-tool-app-examples (Accessed: December 6, 2022).

foray into VR, the record-breaking rainfall in Sydney in 2022, and the massive fall in the pound following the UK governments so called mini budget in September 2022.

They've also looked at more fun topics like the meteoric rise in popularity of the cavoodle dog breed in Australia, which used dog barks for the various data points on the audio chart. Writing for a *Guardian Australia* blog in November 2022, visual designer Nick Evershed said the project was explicitly designed to get their content out to a wider audience. "In short, I want to [...] bring our data journalism to new audiences on other platforms," he said. "Importantly, one aim is to make our data journalism more accessible for vision-impaired people."

Conclusion

From my research, it is clear that a lot more could be done to accommodate people who navigate the web in a different way.

Making a visual format accessible for people who can't see is challenging, but there's a huge community already invested in working out viable solutions. The tension that remains for them is in receiving a clear mandate for this work from senior leaders within organisations. Accessibility champions in the data viz community are being left to figure things out and implement solutions on their own. Limited time and resources mean that this isn't always achievable, and the uneven experience for audiences continues.

A second issue: guidelines available for organisations and data viz designers are minimal. The WCAG framework lays out the bare minimum that should be done for blind people. It doesn't offer a pathway for making the experience of visual data equitable for blind people. This may come in the next iteration of the WCAG guidelines, but these won't be published for a few years yet, which leaves a gaping chasm for innovation. There's a very real opportunity for any organisation that dares to go further than compliance with WCAG and make a meaningful difference in how they present their visual data journalism.

My interviews with data viz teams and journalists made it clear that there are competing demands for them to contend with. Quick charts are being created day to day with little to no thought for accessibility. Quite often these charts are produced by data viz practitioners and rendered down into unreadable PNG file to be pulled into a content management system by journalists who've then got the responsibility to add a meaningful alternative text description. That is not always happening.

This is an area where I believe we could gain quite significant benefits through simple awareness training about the need for and benefit of contextual alternative text.

Alt text is currently expected to do a lot of the heavy lifting in making visual data more accessible. More work needs to be done across various organisations to ensure quality control is in place. And Clear lines of responsibility are also needed so everyone working in data viz understands fully what the criteria is for accessibility, and more importantly, how to implement it.

It's also worth exploring other modalities for accessing information such as tactile maps and charts, and sonification. These areas offer very real opportunities for organisations to go further in a creative and imaginative way. The curb cutting

effect of this approach could be of benefit to everyone, and not just blind and visually impaired audiences. Sonification, for example, could be a fantastic addition to the offering for smart speakers.

During my time on the Reuters Institute, I realised that a lot of people simply aren't aware of the needs for blind people when accessing visual information. I've also found that when they become aware of the issues and how to fix them, they're delighted to be able to help. Our fellowship had a WhatsApp group to keep in touch and organise various events. When my fellow fellows understood what alt text was, and how it was of benefit to me, they simply added it to every single image or photo they shared within the group. This was done organically and soon became business as usual.

It was also interesting to see how the group took on a combined responsibility mindset when someone genuinely forgot to add the alt text, with other members jumping in to add it. This community approach to accessibility is something organisations can really leverage to foster a genuine ambition to do more.

From all the people I've spoken to for this project – those involved in accessibility and those with little understanding. – It's obvious that when the issue is explained and a solution offered, genuine change begins to happen.

As a society we've all got a responsibility to lift those who need lifting. With a concerted effort we can lift everyone.

Appendix 1

TetraLogical

Data visualisation content guidance

BBC

November 2022

Overview

This document provides content authoring guidance for writing long descriptions for data visualisations. The guidance is based on a set of example images that are typical of those used by journalists on the BBC News website. The images fall into two categories:

- Infographics
- Charts

Patterns

Charts and infographics often contain a lot of information in a compact form. Adequate text descriptions can therefore require a lot of space. This frequently results in a reluctance to provide adequate text descriptions because it takes up precious screen “real estate”.

Once it was assumed that only blind and partially sighted people benefited from text descriptions, but it is now understood that people like to consume content in different ways. The solution is to make it possible for anyone to access a detailed description of a chart or infographic, without requiring it to be included in the prose of the article. The proposed pattern is to use a “disclosure component”.

Disclosure components

A disclosure component is a button that, when activated, causes additional content to be displayed on-screen. In this case the button would contain the chart or infographic image with a short text description, and when activated it would disclose the detailed description.

A disclosure component can be created using two standard HTML elements: <details> and <summary>:

```
<details>
     <summary>…</summary>
…
</details>
The <details> element represents the disclosure component and the
<summary> element represents the button. The content that gets
disclosed goes after the <summary> element.
The image goes inside the <summary> element (using the HTML <img>
element):
<details>
<summary><img src=”chart.jpg” alt=”Short description here”></summary>
…
</details>
```

The <img> element must have an alt attribute. This briefly describes the chart or infographic without going into detail.

The content inside the <details> element can be created using standard HTML elements. For the purposes of providing detailed descriptions for charts or infographics, this content will likely take one of these forms:

- Content represented with headings, lists, links, and text
- Content represented as tables

Infographics

The example infographics are all relatively simple. They consist of text and icons that re-enforce the message of the text; for example a green tick icon next to the word “Retained” and a red cross icon next to the word “Scrapped”.

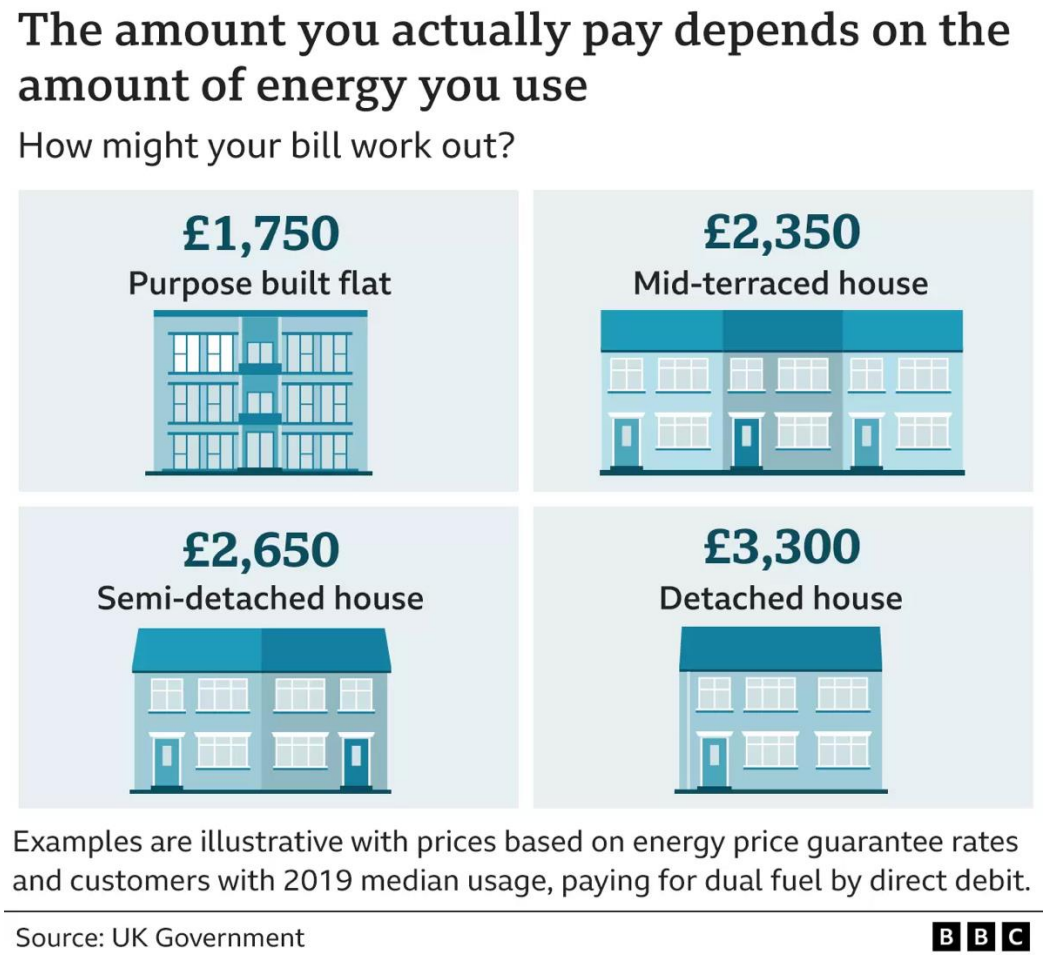
Basic guidance

Include the text from the infographic in the text description. The text should be exactly as it appears in the infographic. Do not describe the icons.

Specific guidance

infographic_energy-bill-by-house-type.png

This infographic is used in the article What Jeremy Hunt’s Statement Means for You.



The infographic shows the amount that people are likely to have to pay for energy bills depending on the type of house they live in:

- £1,750 for a purpose built flat
- £2,350 for a mid-terraced house
- £2,650 for a semi-detached house
- £3,300 for a detached house

Other than its title, the infographic also includes four stylized images representing the different types of dwelling, plus a brief disclaimer, and the credits for the image itself.

The detailed description for this infographic would take the form of standard content inside the disclosure component:

```
<details>
<summary>
  <img src=” infographic_energy-bill-by-house-type.png” alt=”Energy
bills by house type”>
</summary>
<ul>
<li>£1,750 for a purpose built flat</li>
<li>£2,350 for a mid-terraced house</li>
<li>£2,650 for a semi-detached house</li>
<li>£3,300 for a detached house</li>
</ul>
<p> Examples are illustrative with prices based on energy price
guarantee rates and customers with 2019 median usage, paying for dual
fuel by direct debit.</p>
</details>
```

infographic_mini-budget-measures-scrapped-and-retained.png

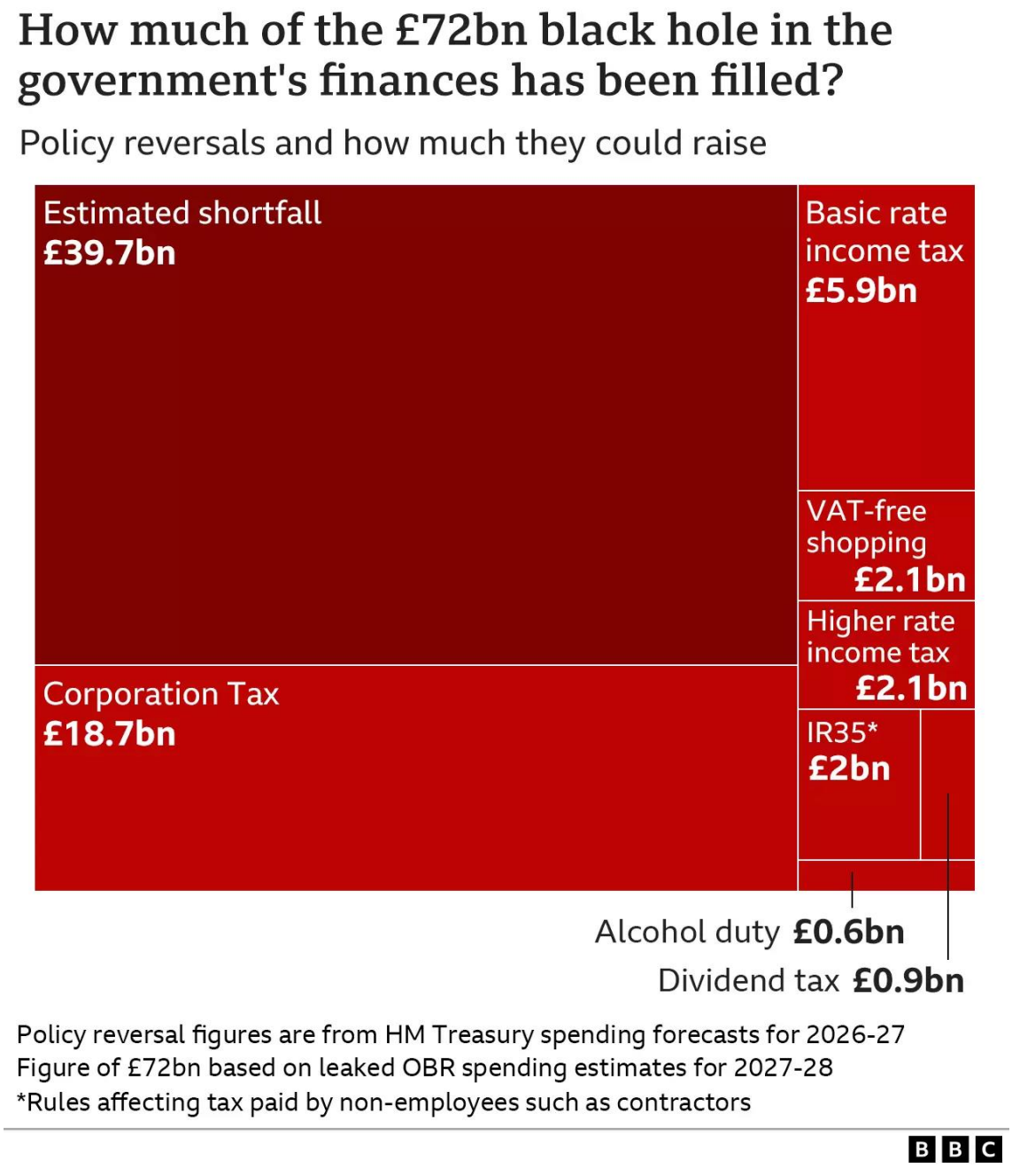
This infographic is used in the article What Jeremy Hunt's Statement Means for You.

The infographic contains a list of all measures included in the mini-budget, and which have been retained or scrapped. As noted before, a green tick icon

indicates which measures will be retained and a red cross icon denotes those that will be scrapped. As such, the content inside the disclosure component would take the form of standard HTML content.

infographic_money-raised-by-policy-reversals.png

This infographic is used in the article Warning of Scary Spending Cuts After Tax U-turn.



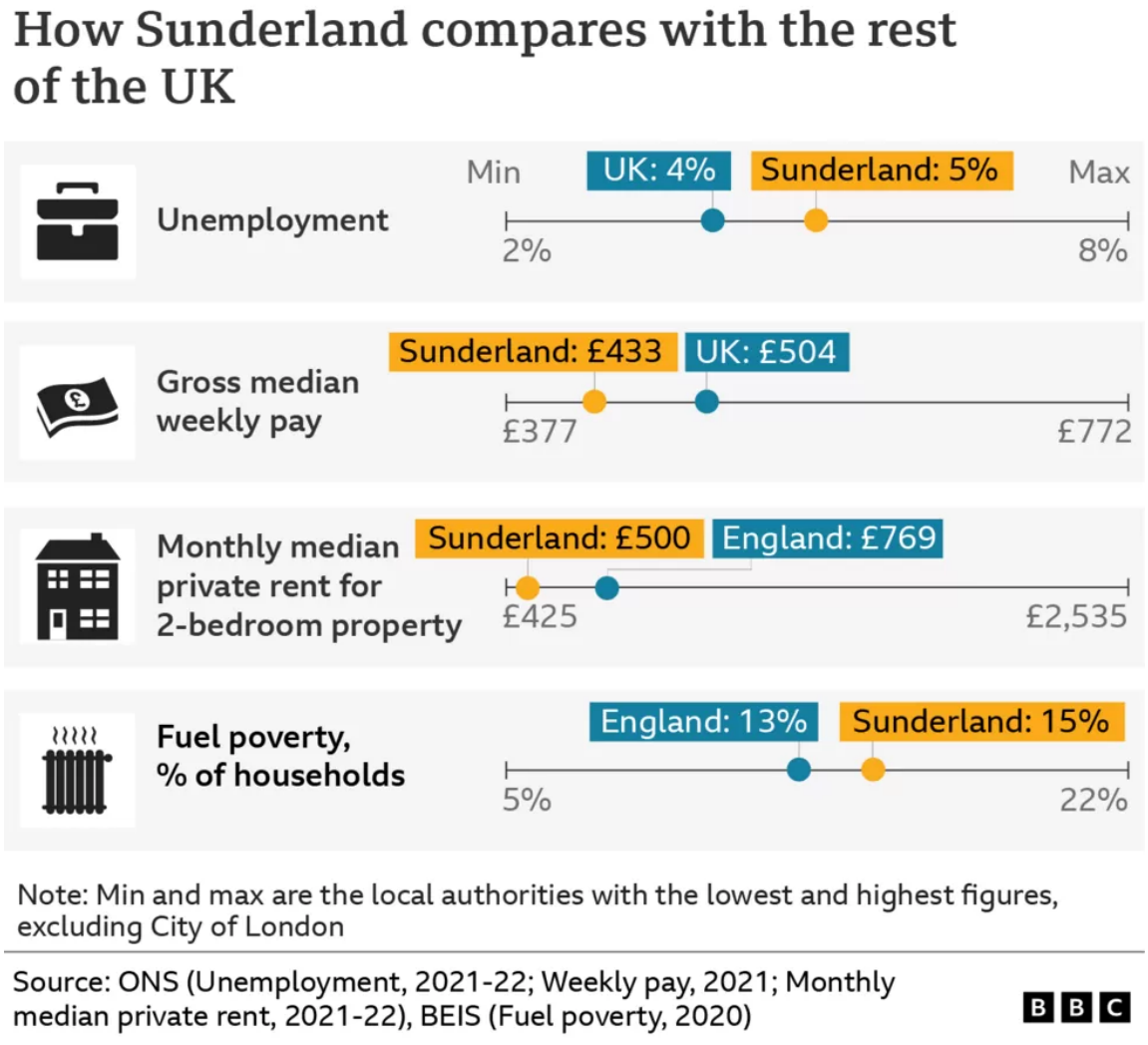
The infographic summarises how the UK government is planning to raise money by reversing some of the policies of the mini-budget.

Other than a title, disclaimer and accreditation, this infographic contains eight figures each preceded by a label: "Estimated shortfall £39.7bn", "Corporation tax £18.7bn", "Basic rate income tax £5.9bn", and so on. These figures are placed within squares of different sizes, to visually convey their relative size (with £39.7bn being the largest figure and £0.6bn being the smallest).

As with the previous infographics, the content inside the disclosure would take the form of standard HTML.

infographic_sunderland-unemployment-pay-rent-fuel-vs-uk.png

This infographic is used in the article [It used to be Homeless People Now it's Working People].



The infographic shows how Sunderland is performing in the following four areas, compared to the rest of the UK:

- Unemployment (Sunderland: 5%, UK: 4%)
- Gross median weekly pay (Sunderland: £433, UK: £504)
- Monthly median private rent for 2-bedroom property (Sunderland: £500, UK: £769)
- Fuel poverty (Sunderland: 15%, UK: 13%)

For each category, the infographic also shows the UK minimum and maximum values (excluding the City of London).

Compared to the other previous infographics, this is more content-rich: it includes text, four images that reinforce the meaning of text (for example, a briefcase next to the word "Unemployment"), and four sliders with data displayed on each one.

This data can be represented as a table. This lets screen reader users navigate through the content left-to-right across rows, or up-and-down through columns:

```
<details>
<summary>
  <img src=” infographic_sunderland-unemployment-pay-rent-fuel-vs-
uk.png” alt=” How Sunderland compares with the rest of the UK”>
</summary>

<table>
<caption>How Sunderland compares with the rest of the UK</caption>
    <tr>
        <td></td>
        <th>Sunderland</th>
        <th>UK / England</th>
        <th>Minimum</th>
        <th>Maximum</th>
      </tr>
      <tr>
        <th>Unemployment</th>
        <td>5%</td>
        <td>4%</td>
        <td>2%</td>
        <td>8%</td>
      </tr>
      <tr>
        <th>Gross median weekly pay</th>
```

```
        <td>£433</td>
        <td>£504</td>
        <td>£377</td>
        <td>£772</td>
      </tr>
      <tr>
        <th>Monthly median private rent for 2-bedroom property</th>
        <td>£500</td>
        <td>£769</td>
        <td>£425</td>
        <td>£2,535</td>
      </tr>
      <tr>
        <th>Fuel poverty, % of households</th>
        <td>15%</td>
        <td>13%</td>
        <td>5%</td>
        <td>22%</td>
      </tr>
</table>
</details>
```

Alternatively, the data in the infographic could be represented as a series of headings and description lists:

```
<h2>How Sunderland compares with the rest of the UK</h2>
<h3>Unemployment</h3>
<dl>
    <dt>Sunderland</dt>
    <dd>5%</dd>
    <dt>UK / England</dt>
    <dd>4%</dd>
    <dt>Minimum</dt>
    <dd>2%</dd>
    <dt>Maximum</dt>
    <dd>8%</dd>
</dl>
<h3>Gross median weekly pay</h3>
<dl>
    <dt>Sunderland</dt>
    <dd>£433</dd>
    <dt>UK / England</dt>
    <dd>£504</dd>
    <dt>Minimum</dt>
    <dd>£377</dd>
    <dt>Maximum</dt>
    <dd>£772</dd>
```

```
</dl>
<h3>Monthly median private rent for 2-bedroom property</h3>
<dl>
    <dt>Sunderland</dt>
    <dd>£500</dd>
    <dt>UK / England</dt>
    <dd>£769</dd>
    <dt>Minimum</dt>
    <dd>£425</dd>
    <dt>Maximum</dt>
    <dd>£2,535</dd>
</dl>
<h3>Fuel poverty, % of households</h3>
<dl>
    <dt>Sunderland</dt>
    <dd>15%</dd>
    <dt>UK / England</dt>
    <dd>13%</dd>
    <dt>Minimum</dt>
    <dd>5%</dd>
    <dt>Maximum</dt>
    <dd>22%</dd>
</dl>
</details>
```

Charts

The example charts are all relatively simple. They contain data that is represented in the form of a bar chart or line graph. The intent is to show the general trend of data over time, rather than the specific fluctuation of values at any particular moment in time.

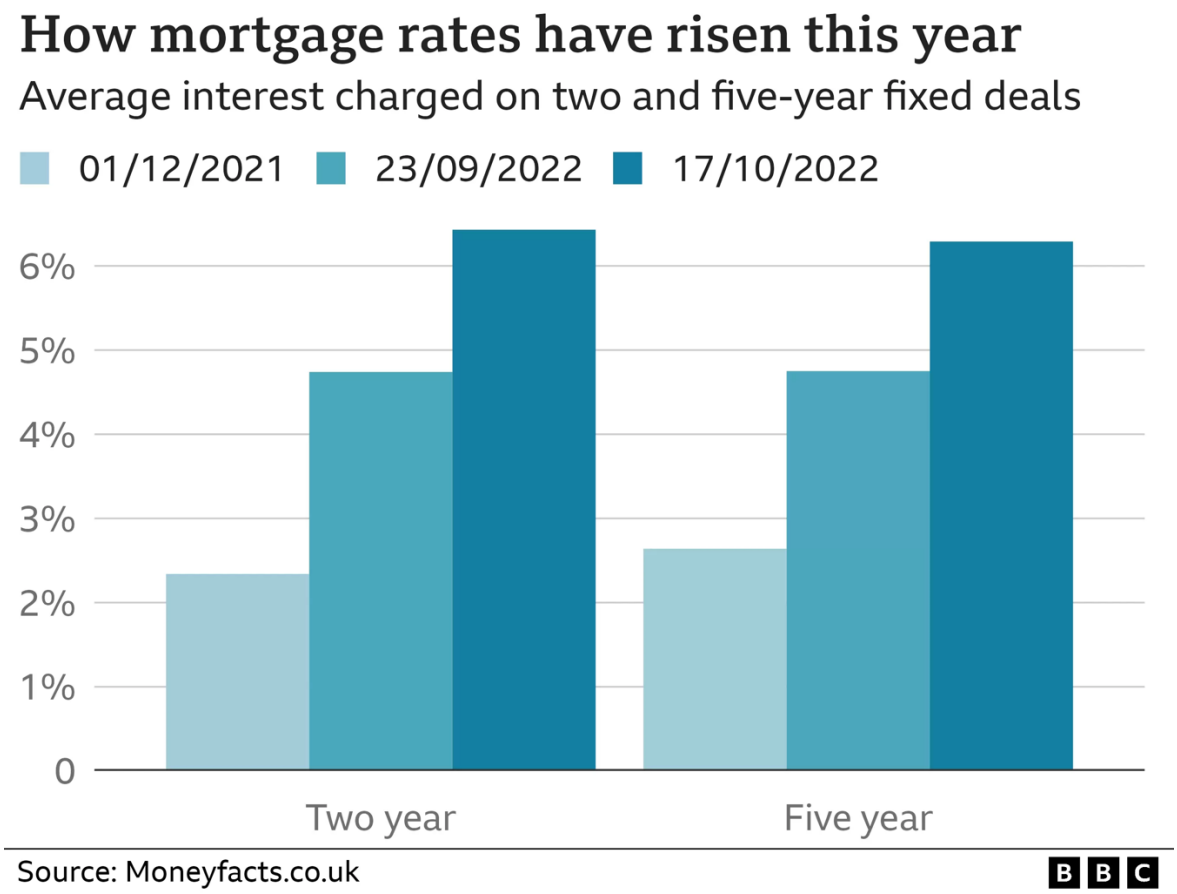
Basic guidance

Represent the data in the chart as a table, or a series of headings and lists. Only the data shown the chart should be included in the detailed description.

Specific guidance

bar-chart_mortgage-rates-over-ten-months.png

This chart is used in the article What Jeremy Hunt's Statement Means for You.



This is a bar chart, with two groups of data sets: one for two-year mortgages, another for five-year mortgages. Each group contains three data sets represented by the bars in the chart. One for mortgage rates on 01/12/2021, a second for rates on 23/09/2022, and a third for rates on 17/10/2022. The purpose of the chart is to show that over the 10-month period mortgage rates have more than doubled, from just over 2% to over 6%.

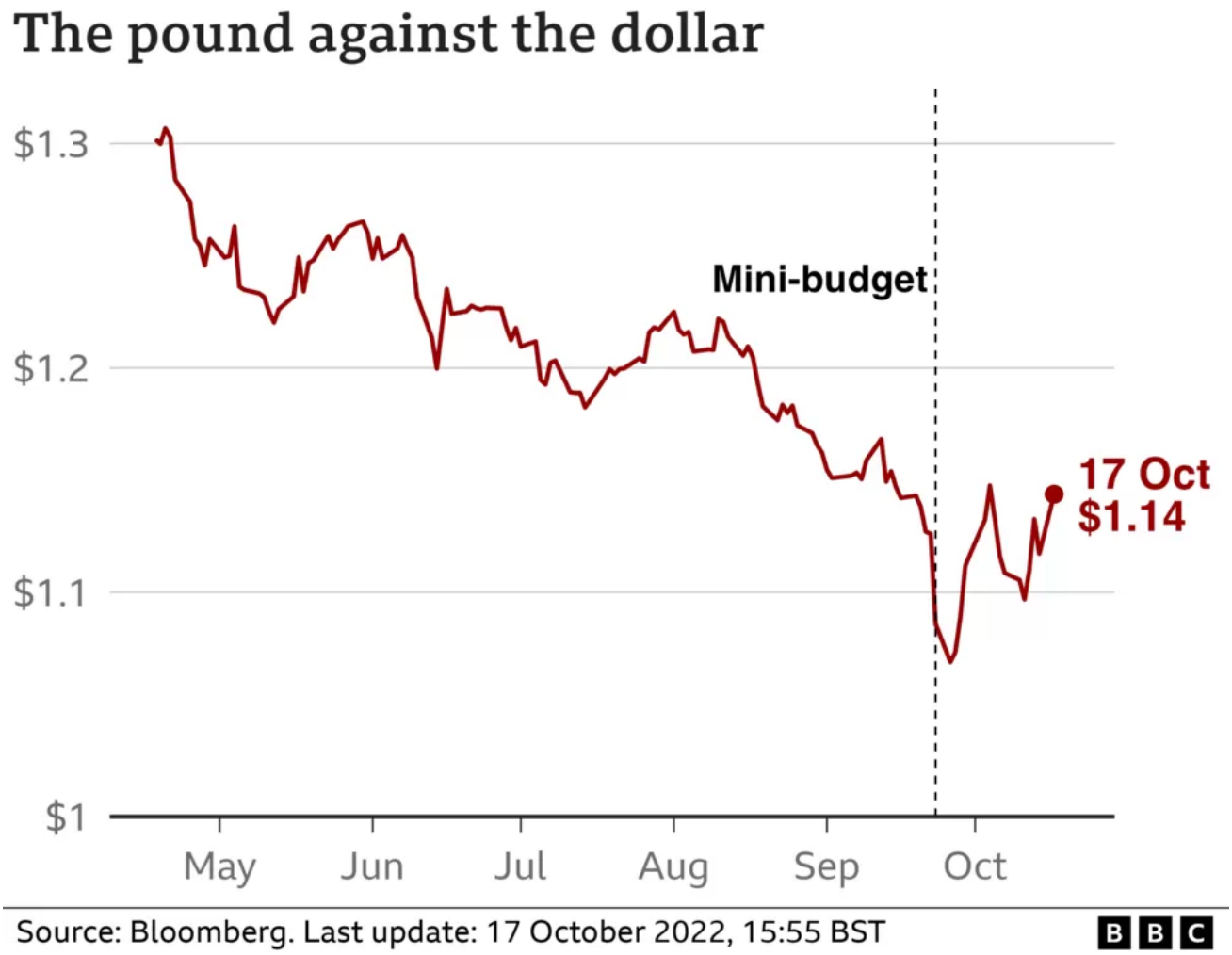
Like the last infographic, the data in this bar chart could be represented as a table inside the disclosure component:

```
<details>
<summary>
  <img src=" bar-chart_mortgage-rates-over-ten-months.png"
alt="Mortgage rates over 10 months">
</summary>

<table>
    <caption>Average interest charged on two and five-year fixed
deals</caption>
    <tr>
```

```
        <td></td>
        <th>01/12/2021</th>
        <th>23/09/2022</th>
        <th>17/10/2022</th>
      </tr>
      <tr>
        <th>Two year</th>
        <td>2.3%</td>
        <td>4.8%</td>
        <td>6.3%</td>
      </tr>
      <tr>
        <th>Five year</th>
        <td>2.7%</td>
        <td>4.8%</td>
        <td>6.2%</td>
      </tr>
</table>
</details>
Alternatively, it could be represented as a series of headings, lists,
and text:
<details>
<summary>
  <img src=" bar-chart_mortgage-rates-over-ten-months.png"
alt="Mortgage rates over 10 months">
</summary>

<h2>How mortgage rates have risen this year</h2>
<p>Average interest charged on two-year fixed deals:</p>
<dl>
    <dt>01/12/2021</dt>
    <dd>2.3%</dd>
    <dt>23/09/2022</dt>
    <dd>4.8%</dd>
    <dt>17/10/2022</dt>
    <dd>6.3%</dd>
</dl>
<p>Average interest charged on five-year fixed deals:</p>
<dl>
    <dt>01/12/2021</dt>
    <dd>2.7%</dd>
    <dt>23/09/2022</dt>
    <dd>4.8%</dd>
    <dt>17/10/2022</dt>
    <dd>6.2%</dd>
</dl>
</details>
```

line-chart_pound-vs-dollar-over-six-months.png and line-chart_uk-government-bond-yield-over-one-month.png

This chart is used in the article [Pound Rises and Borrowing Costs Fall as Chancellor Moves to Calm Markets](#).



The chart consists of two line graphs, each containing a single data set (each represented as a line). The first one shows the value of the pound against the US dollar from May 2022 to October 2022, the second shows the value of the yields on UK 30-year bonds between 14 September 2022 and 17 October 2022. In both cases, while several fluctuations can be observed, the key message is about the value of the pound or the yield on the date the mini-budget was announced, and on 17 October, when the article was published.

Like the previous chart, the data in this line graph could be presented as a table or as a series of headings, lists, and additional text.

Additional guidance

Image credits

Where the source of the image is included in the image, it must be included in the longer description too. This is best done by including a final paragraph inside the <details> element:

```
<details>
<summary>…</summary>
…
<p>Image credits go here.</p>
</details>
```