The data divide

Public attitudes to tackling social and
health inequalities in the COVID-19
pandemic and beyond

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Institute

March 2021

Contents

This research is part of a partnership with the Health Foundation exploring how the accelerated adoption of data-driven technologies and systems during the pandemic may have affected inequalities

Key messages

1. **Data-driven technologies have not been experienced equally.** Symptom-tracking apps, contact-tracing apps and consumer-facing mental and physical-health apps have been of immense use and value during the pandemic, particularly for health purposes, but not for everyone.

2. **The digital divide has shaped a 'data divide'.** The digital divide, between those who do and don't have access and capabilities to use technologies, has an onward effect on who can be represented by, and has agency to shape, data-driven technologies. The longer-term consequences are disenfranchisement of those excluded digitally from consideration in design and development, with benefits reinforced for those who are included. We identified the following themes through our public attitudes research:

    a. **There is a data divide based on access.** A significant proportion of the public lacks adequate access to data infrastructures, such as broadband, connectivity and smartphones. **A fifth (19%) of respondents said they did not have access to a smartphone, and another 14% said they do not have access to broadband internet.** The most clinically vulnerable people – those who identified as having a disability, and those on the lowest household incomes (less than £20,000 p.a.) – were among people most likely to report that they do not have access to either broadband or a smartphone.

        Closing the data divide must start with closing the digital divide.[1]

    b. **There is a data divide based on knowledge, awareness and skills.** A large proportion of the public lacks awareness of the existence of, and the potential to use and adopt, some of the

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1   The Carnegie Trust's report 'Learning from Lockdown' proposes twelve key steps to eliminate digital exclusion. It calls for the prioritisation of co-production, the collection of quality data and significant investment and capacity building to help provide a 'digital safety net' to those who need it.

technologies we asked about. **60% of survey respondents had not heard of symptom-tracking apps such as the ZOE COVID Symptom Study, and 52% had not heard of the availability of online medical appointment services.**

This illustrates a significant knowledge gap about the range of digital health services on offer, which affects people's ability to access – and therefore benefit equally – from technologically mediated healthcare. **Policymakers and developers should be mindful of this knowledge gap in designing, using and implementing digital health technologies.**

c. **There is a data divide based on experiences of use, acceptability and comfort.** A stark difference is apparent when comparing public attitudes between those who have chosen to use the technologies, and those who have chosen not to use the technologies (and their reasons for doing so and not doing so). Over 50% of respondents who indicated they used a particular app were 'very comfortable with its use', and less than 50% of respondents who indicated they did not use the app were 'very comfortable'.

This gap suggests that developers and policymakers should involve those who are not using their technologies alongside those who are, in the co-design of technologies.

d. **There is a data divide based on reasons for using or not using technologies.** Belief in accuracy and effectiveness strongly correlated with why people chose (or chose not) to use technologies. Personal health benefits were the most common motivator for using technologies such as personal-fitness and mental-wellbeing apps, which centred on a greater focus on individual benefit. People with disabilities or identified as clinically vulnerable were less likely to feel such apps would be effective. The expectation that apps would benefit others was the most common motivator for use of apps such as symptom trackers and contact tracers.

Policymakers and developers seeking to ensure equitable uptake of data-driven technologies should place emphasis on understanding differential attitudes before and during implementation, and look to ensure technologies are effective for all groups in society.

3. **There is a minor disparity in views and attitudes to technologies between Black, Asian and minority ethnic and White communities, but the disparity is not significant.** A person's ethnicity was not a strong correlator in this survey with how likely they were to be comfortable with, or use, a particular pandemic technology.

    More mixed-methods research is needed to understand better how data-driven technologies impact on racial inequalities, and to understand the wider structural determinants of unequal outcomes for those from minority ethnic communities. In the meantime, **policymakers and developers should exercise caution in assuming that unequal health and social outcomes result exclusively from differential attitudes to technologies on the part of minority ethnic communities.**

4. **Vaccine passports in particular engender concern among minority ethnic communities.** People from Black, Asian and minority ethnic communities indicated higher levels of concern than White respondents **(a difference of 18%)** that they would be discriminated against through vaccine passports.

    We will undertake follow-up qualitative research to understand what particular conditions have generated this differential concern as part of the ongoing research partnership with the Health Foundation.

5. **The majority of the UK public is also concerned about the potential discriminatory impact of vaccine passports, currently under consideration.** While two thirds (64%) of the public are not concerned that vaccine passports will be discriminatory against themselves as individuals, slightly **more than half (54%) do think it is likely they would lead to discrimination against marginalised groups.** People from ethnic minority backgrounds and communities, and on lower incomes (total household income under £20,000), were also more likely to express concern about the risk of discrimination towards themselves than those who did not fall into those categories.

    Developers and governments considering the roll out and implementation of this technology should exercise caution, and take a thoughtful and measured approach.

Context: accelerated technology adoption during COVID-19

The pandemic has disrupted how we all live, work and interact with core services, including particularly healthcare, as the 'frontline' in the pandemic response.

There has been a paradigm shift in technology adoption during the pandemic. The public has increased their use of technology,[2] as emergency measures have forced society and the economy to become more reliant on, and mediated by digital technologies and data infrastructures. Accelerated change has been enabled by the widespread adoption and use of data-driven technologies – what is described as a 'digital surge'.[3]

These changes must be understood in the context that **the pandemic has not impacted on people equally, as COVID-19 has also contributed to worsening inequalities.** The evidence base increasingly demonstrates that some people and groups have been 'left behind' with health and social inequalities exacerbated.[4]

In the UK, reviews from the Office for National Statistics and from Public Health England identified that those from minority ethnic communities were disproportionately dying from COVID-19.[5] People from areas ranking in the top 10% of the Index of Multiple Deprivation (IMD) are much more likely to be classified as extremely clinically vulnerable, with a higher proportion experiencing long-term health problems or disabilities.[6] Six in ten people believe that the pandemic has increased inequality in the UK.[7]

2   GOV.UK. (2021). *COVID-19 repository and public attitudes retrospective.* [online] Available at: https://www.gov.uk/government/publications/covid-19-repository-and-public-attitudes-retrospective [Accessed 19 Mar. 2021].

3   De', R., Pandey, N. and Pal, A. (2020). 'Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice.' *International Journal of Information Management*, [online] 55, p.102171. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7280123/ [Accessed 19 Mar. 2021].

4   Leslie, D., Mazumder, A., Peppin, A., Wolters, M.K. and Hagerty, A. (2021). 'Does "AI" stand for augmenting inequality in the era of covid-19 healthcare?' *BMJ*, [online] 372, p.n304. Available at: https://www.bmj.com/content/372/bmj.n304.

5   GOV.UK. (2020). *COVID-19: review of disparities in risks and outcomes.* [online] Available at: https://www.gov.uk/government/publications/covid-19-review-of-disparities-in-risks-and-outcomes [Accessed 19 Mar. 2021].

As the delivery of healthcare has relied increasingly on technologies in response and recovery, health and social inequalities in the UK are being exacerbated by digital exclusion

In healthcare, medical professionals have been under immense pressure to respond quickly to manage and mitigate the impact and spread of COVID-19, while simultaneously meeting the demands of ordinary NHS workloads.[8] Many physical and mental-health practitioners have opted for online medical consultations unless face-to-face care is identified as essential or necessary. Services have had to make difficult balancing acts between ensuring adequate resources (in terms of hospital beds and wards) for pandemic responses and other critical health needs. As the delivery of healthcare has relied increasingly on technologies in response and recovery, health and social inequalities in the UK are being exacerbated by digital exclusion.[9]

Within the context of the pandemic, the NHS has embarked on its largest and most significant patient data-sharing initiative, through public-private partnerships and also across different parts of the health service.[10] Other high-profile efforts to deploy technologies to support the pandemic response include the introduction of digital contact-tracing technologies, and early consideration of the potential for the introduction of vaccine passport and certification programmes.[11]

Beyond adoption of data systems by public-sector institutions, research has shown that COVID-19 has led to a 25% increase in downloads of commercial health mobile phone apps in the UK.[12] There are approximately 370,000 health apps available online, despite widespread concern that they do not meet NHS standards.[13]

6   Local Trust (2020) 'Communities at risk: the early impact of COVID-19 on "left behind" neighbourhoods.' *APPG Left Behind Neighbourhoods* (2020). [online]. Available at: https://www.appg-leftbehindneighbourhoods.org.uk/wp-content/uploads/2020/07/Communities-at-risk-the-early-impact-of-COVID-19-on-left-behind-neighbourhoods.pdf [Accessed 19 Mar. 2021].

7   GOV.UK. (2021). *Most people believe inequality has increased due to the pandemic.* [online] Available at: https://www.gov.uk/government/news/most-people-believe-inequality-has-increased-due-to-the-pandemic [Accessed 19 Mar. 2021].

8   The Health Foundation (2020). *Understanding and sustaining the health care service shifts accelerated by COVID-19.* [online] Available at: https://www.health.org.uk/publications/long-reads/understanding-and-sustaining-the-health-care-service-shifts-accelerated-by-COVID-19#lf-section-95026-anchor [Accessed 19 Mar. 2021].

9   Baker, C., Hutton, G., Christie, L. and Wright, S. (2020). 'COVID-19 and the digital divide.' *post.parliament.uk*. [online] Available at: https://post.parliament.uk/covid-19-and-the-digital-divide/.

10   Public Technology. (2020). *Hancock issues six-month order for NHS to share confidential patient data.* [online] Available at: https://www.publictechnology.net/articles/news/hancock-issues-six-month-order-nhs-share-confidential-patient-data [Accessed 19 Mar. 2021].

11   Ada Lovelace Institute (2021). *What place should COVID-19 vaccine passports have in society?* [online] Available at: https://www.adalovelaceinstitute.org/summary/covid-19-vaccine-passports

There is great
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There is great potential to design more inclusive, fair and accessible approaches to health technologies. Initiatives such as OpenSAFELY have been successful in using data to highlight inequalities.[14] The NHS AI Lab is developing an approach to impact assessment in shaping AI technologies.[15] But being able to do so requires a deep and rich understanding of people's experiences of those technologies, and in particular of the nature of exclusion, especially of those most underrepresented. It also needs a clearer sense of the conditions that enable public confidence and trust among all groups and individuals in society.

The research partnership between the Ada Lovelace Institute and the Health Foundation seeks to understand the impact of data-driven technologies on health and social inequalities during COVID-19 and beyond. It takes a tripartite lens and focus, recognising that it is important to understand the effects technologies have had on **health and social outcomes**, on the **healthcare system**, but also on **those who are most likely to experience those technologies – people**.

It is against this backdrop that the Ada Lovelace Institute, working in partnership with the Health Foundation, commissioned Survation to undertake the first survey of its kind: to understand public attitudes in the UK to a range of pandemic technologies seeking to engender health outcomes.

12   ORCHA. (2020). *COVID-19: Digital Health Trends Report.* [online] Available at: https://orchahealth.com/covid19-digital-health-trends-report/ [Accessed 19 Mar. 2021].

13   Kleinman, Z., (2021) 'Most healthcare apps not up to NHS standards' *BBC News* [online] 16 Feb. Available at: https://www.bbc.co.uk/news/technology-56083231 [Accessed 19 Mar. 2021].

14   Williamson, E.J., et al. (2020). 'OpenSAFELY: factors associated with COVID-19 death in 17 million patients.' *Nature.* [online] Available at: https://rdcu.be/b5wCF.

15   The Ada Lovelace Institute. (2021). *Algorithmic impact assessment in healthcare.* [online] Available at: https://www.adalovelaceinstitute.org/project/algorithmic-impact-assessment-healthcare/.

This report summarises the findings from a public attitudes survey that is intended to inform a wider, mixed-methods, deliberative research programme

Methodology

The Ada Lovelace Institute commissioned Survation to conduct a telephone-based, nationally representative survey of 2,023 UK British adults, between 27 January and 24 February 2021. The survey asked about public attitudes towards a range of technologies deployed during the COVID-19 pandemic for health outcomes, including mental and physical-health apps, symptom-tracking apps, digital contact-tracing apps and vaccine passports. This survey included a sample boost of 541 respondents from a minority ethnic background within an overall sample size of 2,023, which was subsequently weighted to adjust for the nationally representative results.

This primary research was commissioned with the intention to address some of the gaps illustrated by the Ada Lovelace Institute/Health Foundation research partnership's public attitudes tracker,[16] as well as to inform specific research questions about the impact pandemic technologies have had on social and health inequalities.

This report summarises the findings from a public attitudes survey that is intended to inform a wider, mixed-methods, deliberative research programme undertaken in partnership with user-led charities and people across the country over the next two years.

There is widespread research on the digital divide, especially during the pandemic.[17] We extend that lens to introduce the framing of the 'data divide' – which manifests in a range of different ways, indicating that developing a comprehensive understanding of the ways in which health and social inequalities play out will require a nuanced approach.

You can read more about the research methods at the end of this report. We have also published the quantitative data that underpins this report on GitHub.

16   The Ada Lovelace Institute (2021). *Public attitudes to COVID-19, technology and inequality: a tracker.* [online] Available at: https://www.adalovelaceinstitute.org/feature/public-attitudes-covid-19-technology-inequality-tracker/ [Accessed 19 Mar. 2021].

17   Carnegie UK Trust. (2020). *Learning from Lockdown: 12 Steps to Eliminate Digital Exclusion.* [online] Available at: https://www.carnegieuktrust.org.uk/publications/learning-from-lockdown-12-steps-to-eliminate-digital-exclusion/.

Headline findings

Understanding the extent of the 'data divide' and the four different ways it has widened

We define a 'data divide' as the gap between those who have access to – and feel they have agency and control over – data-driven technologies, and those who do not. It interacts with the 'digital divide' by manifesting in the way that data systems are designed, developed and shaped by those who are most likely to be represented or able to have access to them. This means the digital divide has a determining effect on who is able to be represented by and shape data-driven technologies. All this perpetuates and compounds social and health inequalities.

Some key elements of the data divide to emerge through the public attitudes survey include:

1. **Differential access:** People may not have access to the fundamental technologies that make their participation in an increasingly 'datafied' society possible, including smartphones and broadband.[18] This has the dual effects of making their needs and interests invisible ('below the data line'), and of disenfranchising the digitally excluded from consideration in design and development of technologies.

2. **Differential knowledge, awareness and skills:** Even if people have access to the fundamentals, they also may not be aware of what tools are available, which can also contribute to their lack of access and agency, through reduced 'digital literacy'.[19]

18   The Ada Lovelace Institute. (2020). *The data will see you now.* [online] Available at: https://www.adalovelaceinstitute.org/report/the-data-will-see-you-now/.

19   Yates, S. J., & Lockley, E. (2020). 'Digital Engagement and Class: Economic, Social, and Cultural Capital in a Digital Age.' *In S. J. Yates, & R. Rice* (Eds.), The Oxford Handbook of Digital Technology and Society. Oxford: Oxford University Press.

3. **Differential experiences and comfort:** Even with both access to infrastructure and awareness about data-driven technologies, there may be historic and structural reasons for why digitally excluded people feel they benefit less, and have greater levels of discomfort with 'datafication' and use – even if they do know about, and have the capacity to use, these technologies. For example, some groups may have experienced a risk of having been 'oversurveilled' or 'overprofiled' without their prior knowledge or consent in an untrustworthy ecosystem, undermining their levels of trust and comfort with technologies. This is evidenced in a recent report by the US-based Social Science Research Council.[20] In Singapore, a TraceTogether wearable device devised to create COVID-19 notification systems for those less likely to have smartphones also created the risk of continuous surveillance. Other examples point to people experiencing indirectly punitive measures as a consequence of exercising their right to 'opt out'.[21]

4. **Differential reasons for using or not using technologies:** People may have different reasons for choosing different technologies in different contexts, as well as different reasons for choosing not to use technologies – for example, if their personal needs cannot be addressed adequately by a healthtech intervention given their individual circumstances and contexts.

The survey results provide evidence to support research about each of these conditions:

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20   The Social Science Research Council. (2021). 'Surveillance and the "New Normal" of Covid-19: Public Health, Data, and Justice.' *Social Science Research Council.* [online] Available at: https://covid19research.ssrc.org/public-health-surveillance-and-human-rights-network/report/.

21   The Social Science Research Council. (2021).

1 – A data divide based on access

COVID-19 has thrown a spotlight on the data and digital divides in the UK. A large proportion of the public lack adequate access to fundamental data infrastructure, such as ownership of a computer, broadband, connectivity and smartphones, so are unable to benefit fairly from the use of data-driven technologies in health. The consequences of this are exclusion from datasets, resulting in 'missing data' and the creation of a class that is 'below the data line'. Closing the data divide must start with closing the digital divide.

Nearly a fifth (19%) of respondents said they did not have access to a smartphone, and another 14% said they do not have access to the internet. 8% said they had neither a smartphone or access to the internet.[22] The most clinically vulnerable, those who identified as having a disability and those on the lowest incomes (less than £19,999) were among those who most likely not to have access to either broadband or a smartphone, in addition to those above the age of 65:
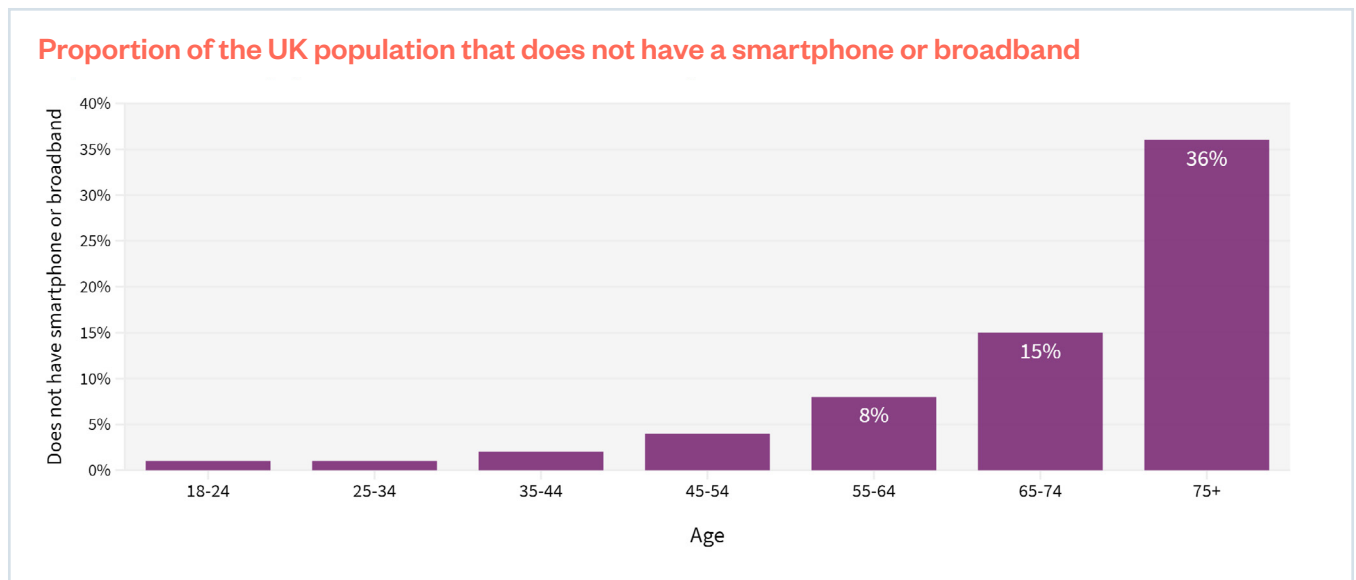
Proportion of the UK population that does not have a smartphone or broadband

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22   This figure is likely to be slightly higher than reported, as all survey respondents would have required access to a landline or a mobile telephone.
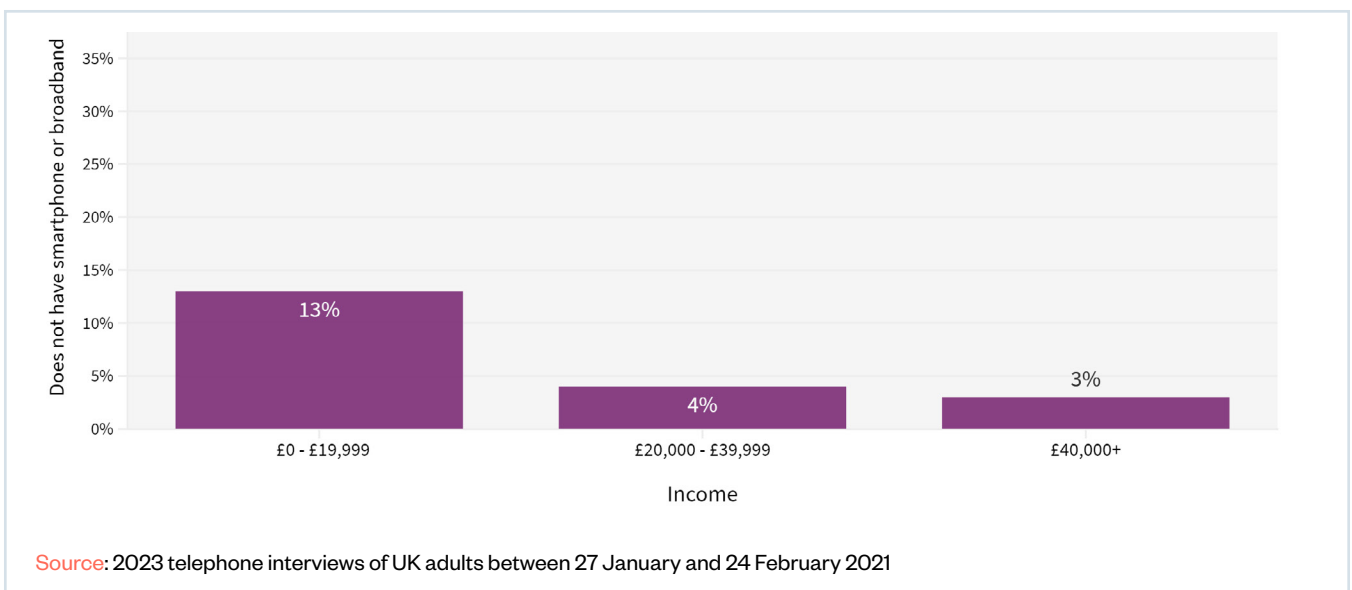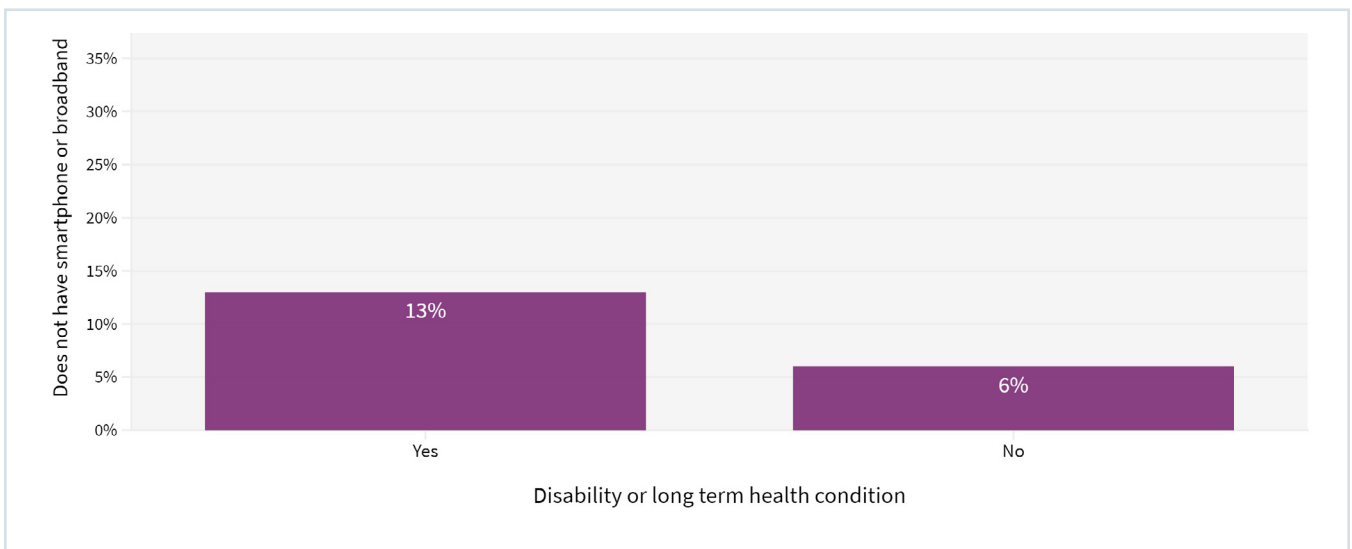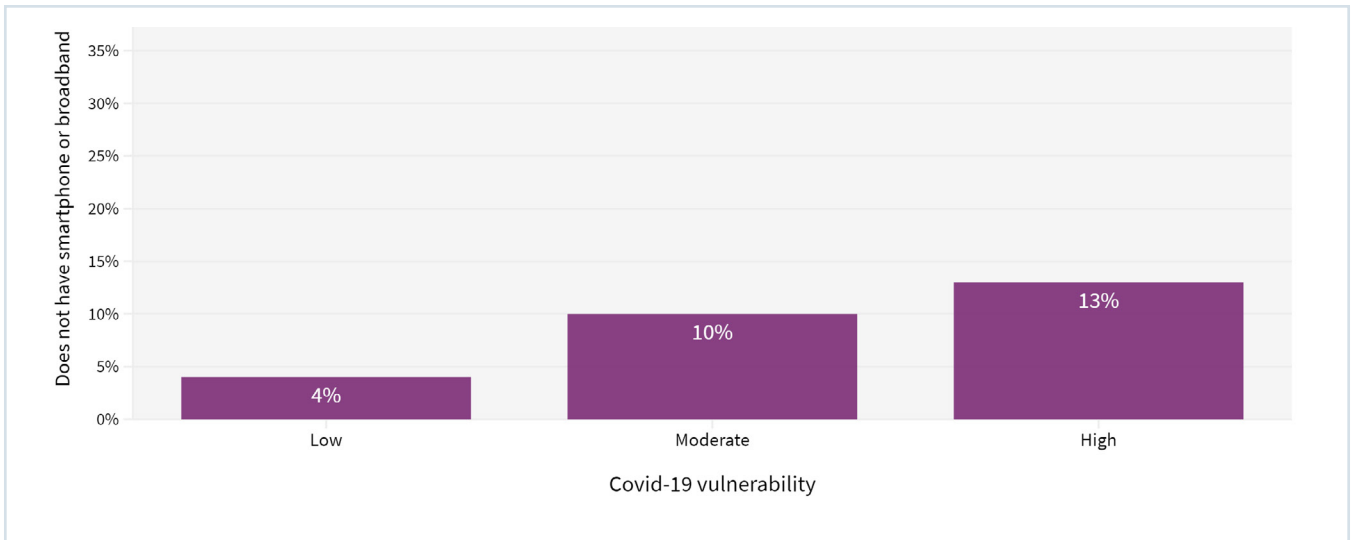
Covid-19 vulnerability

- Low: 4%
- Moderate: 10%
- High: 13%

Disability or long term health condition

- Yes: 13%
- No: 6%

Income

- £0 - £19,999: 13%
- £20,000 - £39,999: 4%
- £40,000+: 3%

Source: 2023 telephone interviews of UK adults between 27 January and 24 February 2021

There has been a widespread perception that digital exclusion impacts disproportionately on the elderly, but recent research has shown that it is not just a generational issue.[23] Even before the pandemic, just over one quarter (27%) of the public did not have the digital skills necessary for day-to-day life in Britain, and over half of that number were under the age of 60.[24] And an Ofcom survey between January and March 2020 identified that nearly 13% of UK adults do not use the internet, and that nearly 10% of households with children did not have home access to a laptop, desktop PC or tablet.[25]

23   Holmes, H. and Burgess, G. (2020). 'Opinion: Coronavirus has intensified the UK's digital divide.' *University of Cambridge.* [online] Available at: https://www.cam.ac.uk/stories/digitaldivide

24   Lloyds Bank (2020). *Lloyds Bank UK Consumer Digital Index.* [online] Available at: https://www.lloydsbank.com/assets/media/pdfs/banking_with_us/whats-happening/lb-consumer-digital-index-2020-report.pdf.

25   Ofcom. (2020) *Adults Media Use and Attitudes.* [online] Available at: https://www.ofcom.org.uk/__data/assets/pdf_file/0031/196375/adults-media-use-and-attitudes-2020-report.pdf [Accessed 19 Mar. 2021].

2 – A data divide based on knowledge, awareness and skills

Among people-facing technologies that have been developed and deployed during the pandemic, there remains a significant knowledge divide in the form of an availability gap that risks impacting on ability to benefit from access.

Well over 50% of respondents to our survey had not heard of symptom-tracking apps, of the availability of medical consultation services such as online GP appointment-booking services and of mental-wellbeing apps. The only outlier, unsurprisingly, due to a significant communications campaign since its implementation, was awareness of digital contact-tracing apps (just over 20% had not heard of).

How aware are people of health-related apps?

Question asked: Have you or have you not used the following types of smartphone apps?

Legend: ■ Have not heard of   ■ Don't know   ■ Have not used   ■ Have used

App	Have not heard of	Don't know	Have not used	Have used
Symptom tracking apps, e.g. ZOE COVID Symptom Study, Healthily	60%	4%	25%	11%
Medical consultation services, e.g. online GP appointment booking apps	53%		29%	15%
Mental well-being apps, e.g. Headspace	52%		35%	10%
Personal fitness apps, e.g. Strava, Fitbit	39%		33%	26%
Contact tracing apps, e.g. the NHS COVID-19 app, Protect Scotland, StopCOVID NI	23%		34%	42%
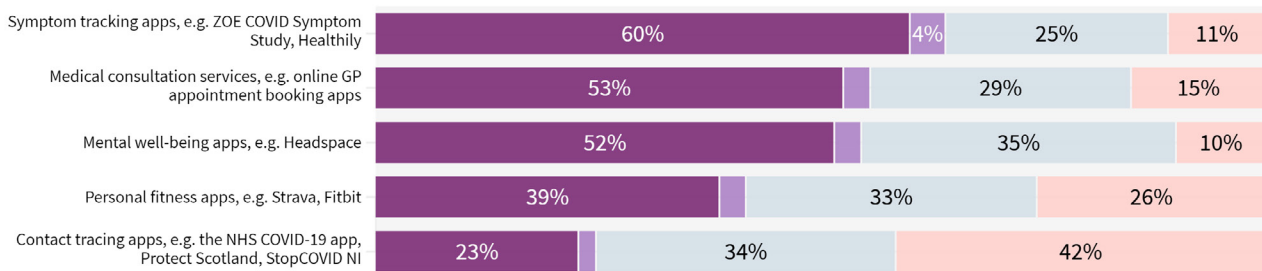
Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021

As these figures demonstrate, a large proportion of the public lacks awareness of the existence of, and the potential to adopt and use, some of those technologies. This points to a significant knowledge gap about the range of digital services on offer, in turn impacting on people's ability to access and therefore, benefit equally from technologies.

As early as 2008, Glied and Lleras-Muney proposed that 'improvements in health technologies tend to cause disparities in health across education groups because education enhances the ability to exploit technological advances. The most educated make the best use of this new information and adopt newer technologies first.'[26] Their study also finds that those with a greater level of education are more likely to be advantaged in surviving diseases that have had more health-related technological progress.

26   Sherry Glied and Adriana Lleras-Muney (2008). 'Technological Innovation and Inequality in Health.' *Demography,* 45(3), pp.741–761.

3 – A data divide based on use, acceptability and comfort

How comfortable do people feel using health-related apps?

Question asked: How comfortable, if at all, do or would you feel using the following types of smartphone apps?

Legend: ■ Very comfortable ■ Quite comfortable ■ Not that comfortable ■ Not at all comfortable ■ Don't know

Symptom-tracking apps

	Very comfortable	Quite comfortable	Not that comfortable	Not at all comfortable	Don't know
Respondents who have used the relevant app	68%	22%	4%		
Respondents who have not used the relevant app	27%	39%	10%	15%	10%

Medical-consultation apps

	Very comfortable	Quite comfortable	Not that comfortable	Not at all comfortable	Don't know
Respondents who have used the relevant app	58%	34%	4%		
Respondents who have not used the relevant app	35%	39%	11%	11%	4%

Mental-wellbeing apps

	Very comfortable	Quite comfortable	Not that comfortable	Not at all comfortable	Don't know
Respondents who have used the relevant app	58%	34%	4%		
Respondents who have not used the relevant app	35%	39%	11%	11%	4%

Personal-fitness apps

	Very comfortable	Quite comfortable	Not that comfortable	Not at all comfortable	Don't know
Respondents who have used the relevant app	64%	31%			
Respondents who have not used the relevant app	31%	37%	11%	11%	9%

Contact-tracing apps

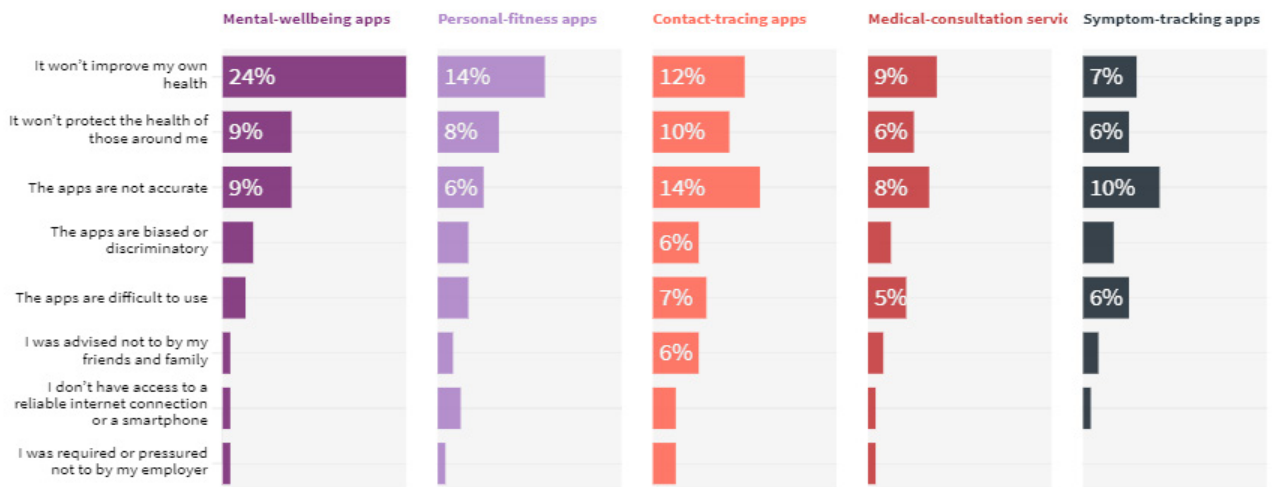|	Very comfortable	Quite comfortable	Not that comfortable	Not at all comfortable	Don't know
Respondents who have used the relevant app	51%	37%	7%		
Respondents who have not used the relevant app	24%	35%	20%	14%	8%

Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021

There is a data divide when it comes to levels of comfort with the technologies themselves, even just among those who are aware of them. This was usually strongly correlated with use. While above 50% of respondents who indicated they used the relevant app were 'very comfortable with its use', less than 50% of respondents who indicated they did not use the app were 'very comfortable', with a much more sizable minority of between 24-50% indicating that they were less comfortable with use.

This gap suggests that developers and policymakers should consider in co-design the involvement of those who are *not* using technologies as much as they consider the involvement of those who are using their technologies.
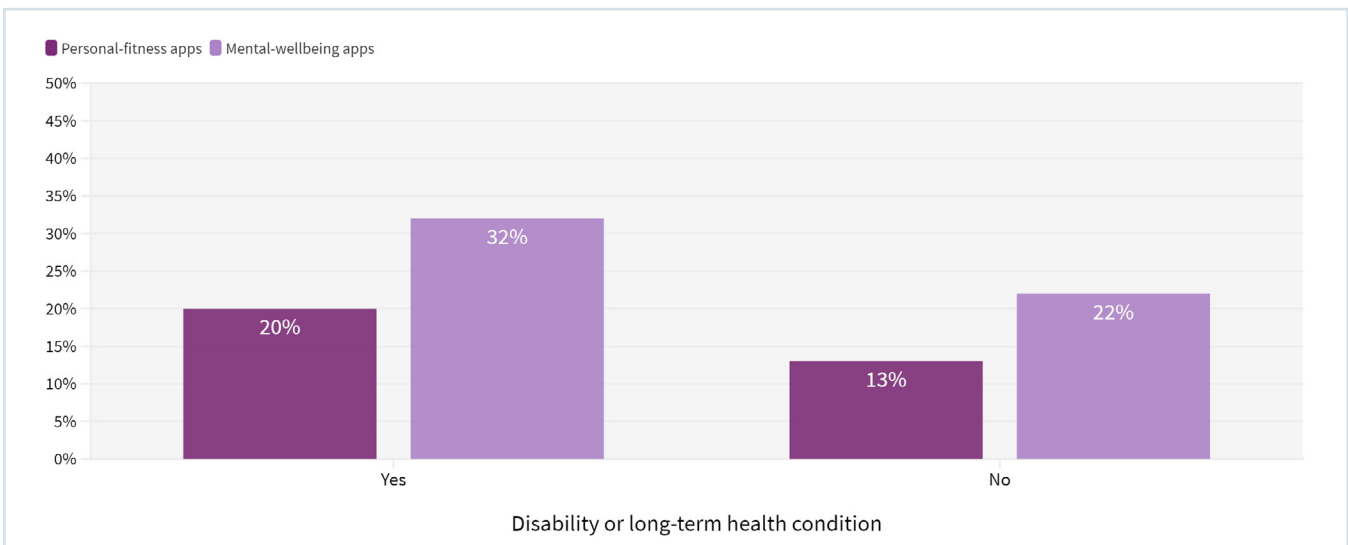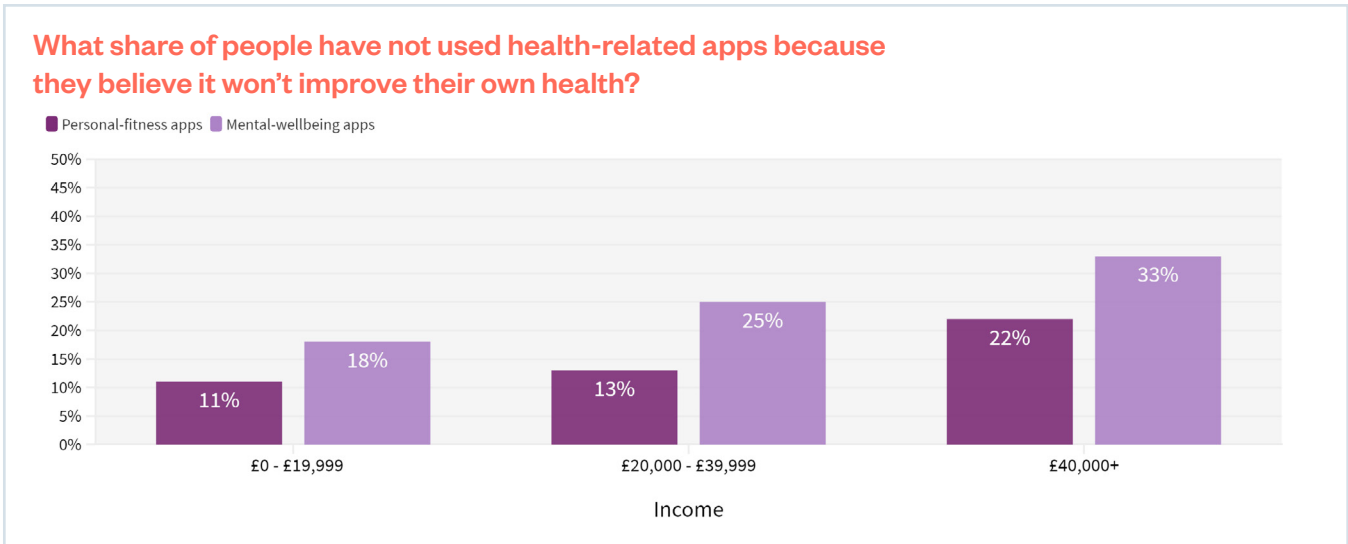
Why do people not use health-related apps?

Question asked: Which of the following reasons describe why you have not used these apps?

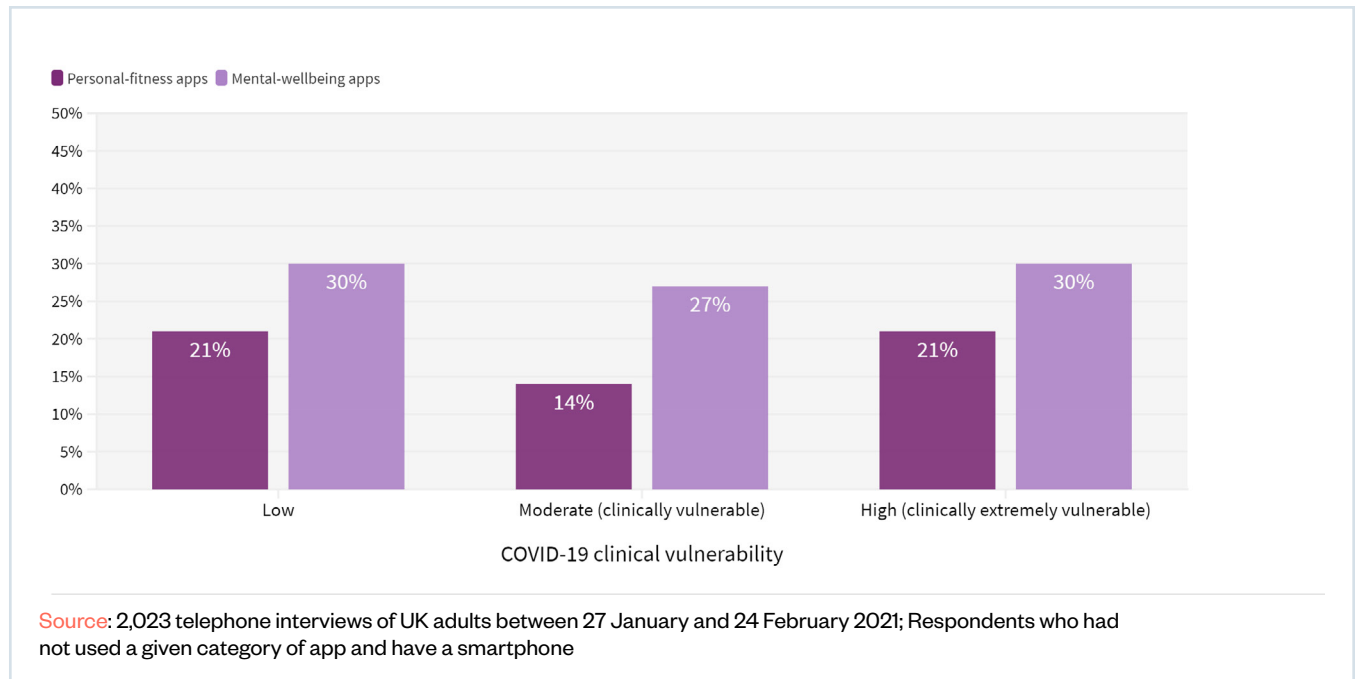|	Mental-wellbeing apps	Personal-fitness apps	Contact-tracing apps	Medical-consultation services	Symptom-tracking apps
It won't improve my own health	24%	14%	12%	9%	7%
It won't protect the health of those around me	9%	8%	10%	6%	6%
The apps are not accurate	9%	6%	14%	8%	10%
The apps are biased or discriminatory			6%		
The apps are difficult to use			7%	5%	6%
I was advised not to by my friends and family			6%		
I don't have access to a reliable internet connection or a smartphone					
I was required or pressured not to by my employer					

Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021; Respondents who had not used a given category of app and have a smartphone

The main reasons respondents cited for not using the apps tended to centre on views about efficacy and accuracy. As the chart above illustrates, a significant proportion of people who chose not to use the apps listed above believed that they would not be effective in improving their own health, that they would not be effective in improving health outcomes for others – particularly in relation to contact-tracing and symptom-tracking apps – and the belief that the apps themselves would not be accurate.

Concerns about bias and discrimination, and advice not to download the app from friends and family, was also a consideration for those who did not use a contact-tracing app. Concerns that the app would not be accurate was greater in the case of digital contact-tracing than, for instance, in the case of using a mental-wellbeing app.

What share of people have not used health-related apps because they believe it won't improve their own health?

■ Personal-fitness apps ■ Mental-wellbeing apps

Income

■ Personal-fitness apps ■ Mental-wellbeing apps

Disability or long-term health condition

continued...

Personal-fitness apps   Mental-wellbeing apps

50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%

Low: 21% / 30%
Moderate (clinically vulnerable): 14% / 27%
High (clinically extremely vulnerable): 21% / 30%

COVID-19 clinical vulnerability

Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021; Respondents who had not used a given category of app and have a smartphone
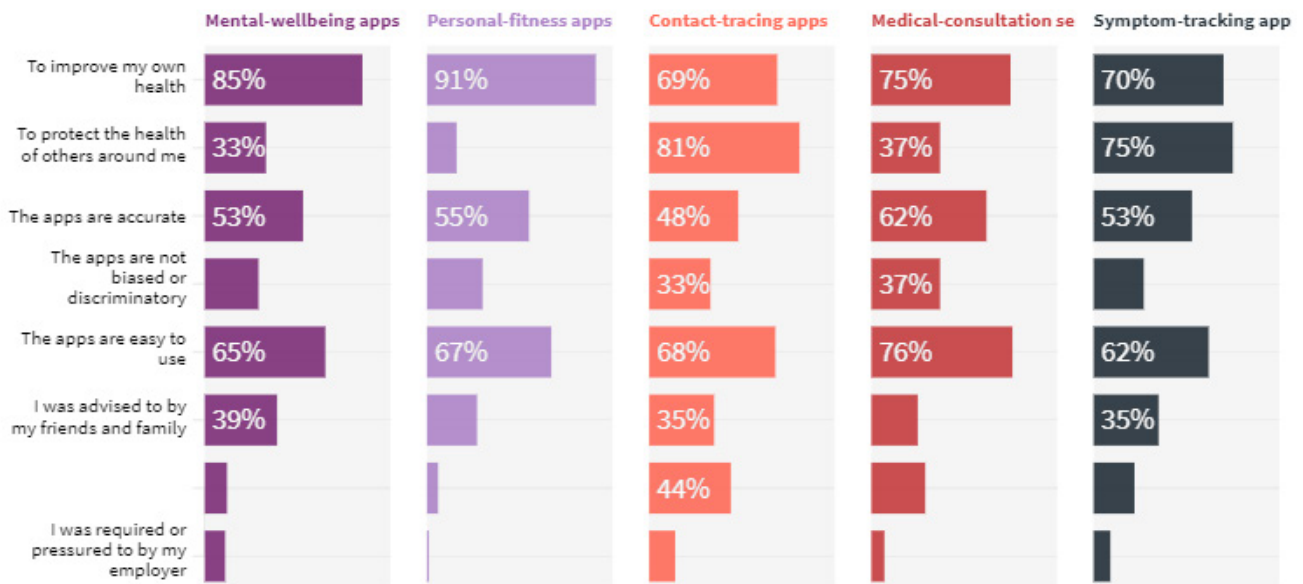
The primary reason most people did not use consumer-facing apps, such as mental-wellbeing or personal-fitness apps, was the belief it would not improve their own personal health. There were also noticeable differences across income, disability and COVID-19 vulnerability, with those who have a disability or are more vulnerable to COVID-19 being more likely to give this reason, as well as, somewhat counterintuitively, those on higher incomes (of over £40,000 a year).

The reasons underpinning this result require further mixed-methods research, but one hypothesis to test in the case of long-term health conditions is that there was limited expectation that these apps would be effective in helping to address more complex conditions and clinical needs. Policymakers and developers seeking to ensure equitable uptake should place emphasis on understanding differential attitudes before and during implementation, seeking to ensure technologies are effective for all groups in society.

4 – A data divide in the reasons for using or not using technologies: collective and individual benefit

Why do people use health-related apps?

Question asked: Which of the following reasons describe why you have used these apps?

|	Mental-wellbeing apps	Personal-fitness apps	Contact-tracing apps	Medical-consultation se	Symptom-tracking app
To improve my own health	85%	91%	69%	75%	70%
To protect the health of others around me	33%		81%	37%	75%
The apps are accurate	53%	55%	48%	62%	53%
The apps are not biased or discriminatory			33%	37%	
The apps are easy to use	65%	67%	68%	76%	62%
I was advised to by my friends and family	39%		35%		35%
			44%		
I was required or pressured to by my employer					

Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021; respondents who had used a given category of app and who have a smartphone

Survey respondents who used an app distinguished their primary reasons for using some of the new, government-mandated pandemic technologies – such as contact tracing and symptom tracking – from their primary reasons for using more consumer-facing technologies. With apps such as symptom-tracking and contact-tracing apps, collective goals such as protecting others' health were the most common motivator (with over twice the percentage of respondents giving that as their answer compared to the other technologies). In contrast, personal health benefits were the most common motivator for other technologies, such as personal-fitness and mental-wellbeing apps, which centred on a greater focus on individual benefit.

There is some disparity between minority ethnic communities and White communities' public attitudes but it is not significant

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**Do minority ethnic communities use health-related apps differently?**

Question asked: Have you or have you not used the following types of smartphone apps?
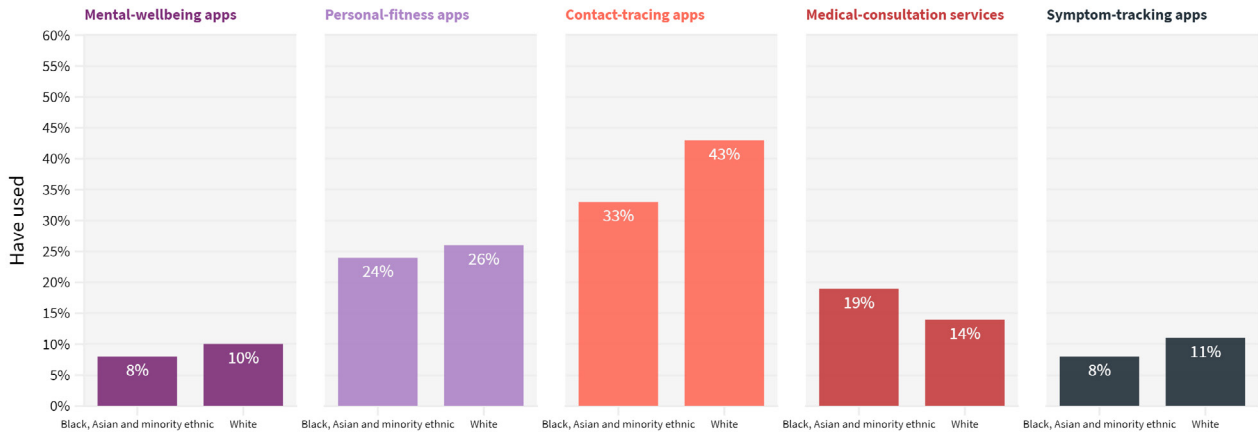
Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021

Do minority ethnic communities feel more or less comfortable using health-related apps?

Question asked: How comfortable, if at all, would you feel using the following types of smartphone apps?
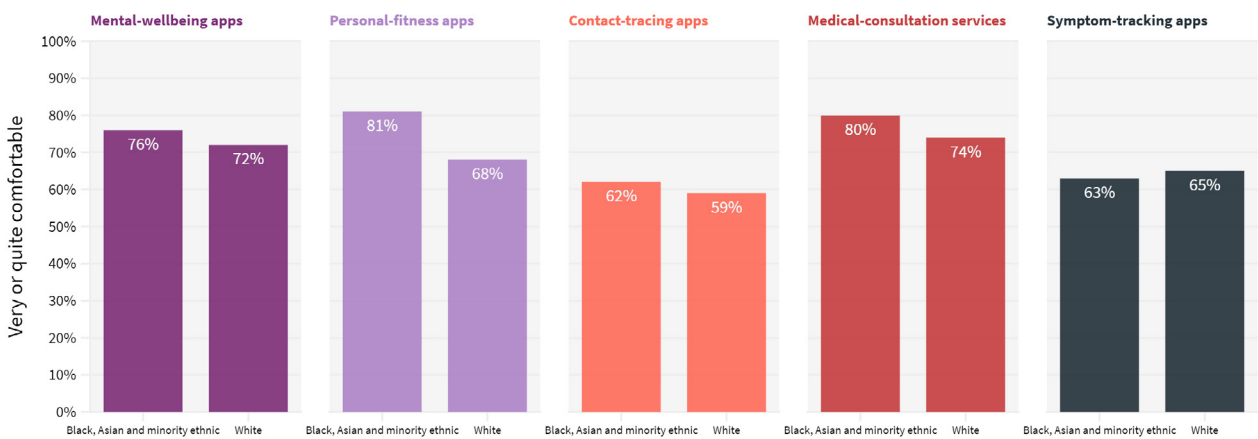
Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021; respondents who have not used the relevant app, and who have a smartphone

This survey included a sample boost of 541 respondents from a minority ethnic background within an overall sample size of 2,023, which was subsequently weighted to adjust for the nationally representative results. The sample size enabled us to identify that, across the majority of technologies we surveyed respondents about, a person's ethnicity was **not, in isolation** a strong correlator of how likely they were to be comfortable with, or to use, a particular pandemic technology.

A recent Public Health England report has noted that the pandemic has had a disproportionate impact on ethnic minorities, and that there are some challenging trends that engender 'missing data', leading to unequal racial impacts and risk of bias through the lack of adequate data on race and/or ethnicity at risk of perpetuating technologically mediated unequal social and health outcomes from technologies.

More mixed-methods, and in particular, qualitative research complemented with a data-based analysis of healthcare outcomes is required to test this finding, as well as to understand some of the structural reasons that could be contributing to unequal health and social outcomes for minority ethnic communities through the implementation and use of data-driven technologies.[27]

27   GOV.UK. (2020). *COVID-19: review of disparities in risks and outcomes.* [online] Available at:
     https://www.gov.uk/government/publications/covid-19-review-of-disparities-in-risks-and-outcomes [Accessed 19 Mar. 2021].
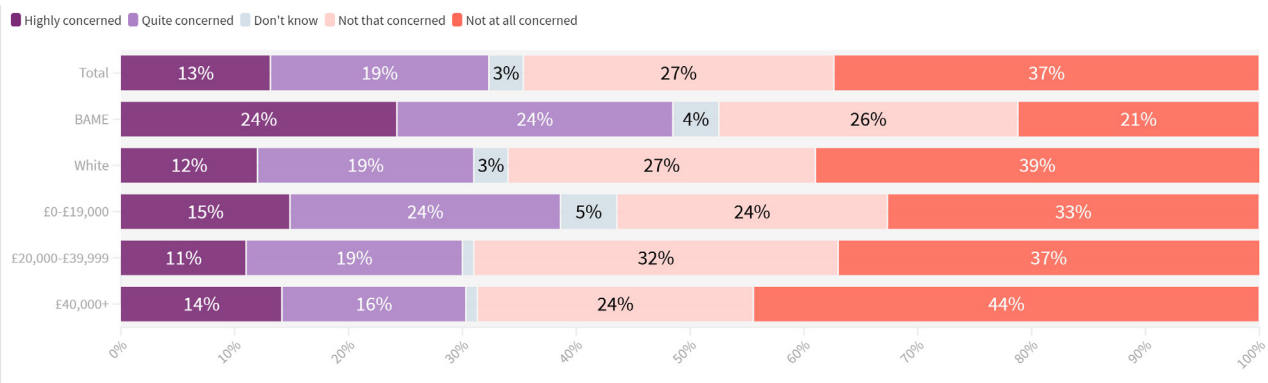
Gaining a clearer picture of the impacts is itself a challenge, given the limited data about ethnicity that is collected by health services. In the meantime, policymakers and developers should exercise caution in assuming that unequal health and social outcomes result exclusively from differential attitudes to technologies on the part of minority ethnic communities.

The outlier from the trend: public attitudes towards vaccine passports

We identified one notable exception in the data, which related to public attitudes to the introduction of vaccine passports. The context for this is that, as the figures below illustrate, respondents had limited concerns that they themselves would be discriminated against. But people from Black, Asian and minority ethnic backgrounds, and people on an income of less than £20,000 a year, indicated higher levels of concern that they would be unfairly discriminated against than White respondents and higher-income respondents.

How concerned, if at all, would you be that a vaccine passport scheme would lead to you being discriminated against?

Question asked: How concerned, if at all, would you be that a vaccine passport scheme would lead to you being discriminated against?

Legend: Highly concerned · Quite concerned · Don't know · Not that concerned · Not at all concerned

	Highly concerned	Quite concerned	Don't know	Not that concerned	Not at all concerned
Total	13%	19%	3%	27%	37%
BAME	24%	24%	4%	26%	21%
White	12%	19%	3%	27%	39%
£0–£19,000	15%	24%	5%	24%	33%
£20,000–£39,999	11%	19%		32%	37%
£40,000+	14%	16%		24%	44%

Source: 2023 telephone interviews of UK adults between 27 January and 24 February 2021
Unweighted respondents: White (1,459), BAME (541); £0–£19,999 (587), £20,000–£39,999 (457), £40,000+ (453)

People from minority ethnic backgrounds reported that they are more concerned that they will be discriminated against as a result of the implementation of vaccine-passport schemes than people who are White – 49% of those from minority ethnic backgrounds were concerned they would face discrimination compared to 31% of White respondents.

Discovering reasons for this, particularly as it is an outlier finding, warrants further mixed-methods qualitative exploration to help inform a deeper understanding of the structural considerations and factors relating to risks of bias and discrimination. As the above chart demonstrates, another relevant factor was income – with those on higher income levels much more likely than those on lower income levels to say they were not that concerned, or not at all concerned, about vaccine passports.

The majority of the UK public is concerned about the potential discriminatory impact of vaccine passports:

While two thirds (64%) of the public are not concerned that vaccine passports will be discriminatory against them as individuals, slightly more than half (55%) do think that they are likely to lead to discrimination against marginalised groups, such as young people, people who are shielding, members of the LGBTQI+ community, people from a minority ethnic background or those who are in precarious work (e.g. on zero-hours contracts or gig workers). Only 36% said they did not think it was likely vaccine passports would lead to discrimination against marginalised groups.

There is substantial public concern that vaccine passports will be discriminatory and undermine public confidence, with particular concern about fairness among the majority of members of the public. This means that developers and governments considering the roll out and implementation of this technology should exercise caution and take a thoughtful and measured approach:

How likely, if at all, do you think it is that a vaccine passport scheme would lead to marginalised groups being discriminated against?

Question asked: How likely, if at all, do you think it is that a vaccine passport scheme would lead to marginalised groups being discriminated against?

■ Highly likely ■ Quite likely □ Don't know ■ Not that likely ■ Not at all likely

22%	34%	9%	23%	13%

Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021

To what extent do you agree or disagree that these apps would influence people to get vaccinated?

Question asked: To what extent do you agree or disagree that these apps would influence people to get vaccinated?

■ Strongly agree ■ Somewhat agree ■ Neither agree nor disagree ■ Somewhat disagree ■ Strongly disagree ■ Don't know

| 37% | 33% | 12% | 8% | 6% | 3% |

Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021

Despite mixed feelings around the discriminatory impact of vaccine passports, the majority of the public (70%) feel that the introduction of vaccine passports would positively influence the increase of vaccine uptake. However, as the above data illustrates, they are still concerned about the adverse impact on marginalised groups and divided in their views when it comes to fairness.

Lack of consensus regarding a ban on vaccine passports

To what extent do you agree or disagree that the government should ban these apps from being developed and used?

Question asked: To what extent do you agree or disagree that the government should ban these apps from being developed and used?

■ Strongly agree ■ Somewhat agree ■ Neither agree nor disagree ■ Somewhat disagree ■ Strongly disagree ■ Don't know

| 9% | 13% | 29% | 25% | 20% | 4% |
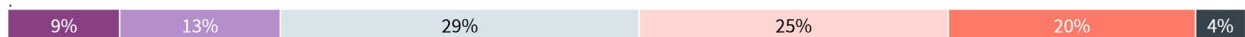
Source: 2,023 telephone interviews of UK adults between 27 January and 24 February 2021

While twice as many respondents (45%) disagreed with a ban on vaccine passports compared to those agreeing there should be a ban (22%), a third of respondents (33%) are still undecided. These responses highlight a lack of broad societal consensus, and reinforce the extent to which debates about these types of technologies, adopted during the pandemic, reflect a broader set of 'data divides' when it comes to the range of public attitudes across the UK.

Appendix 1 – Approach and demographic breakdown of respondents

The Ada Lovelace Institute commissioned Survation to undertake a nationally-representative survey of 2,023 British adults between 27 January and 24 February 2021. The sample was weighted to match the known profile of the British adult population based on age, sex, region and ethnic group. The table below represents the breakdown of respondents by demographic groups in our overall sample, both weighted and unweighted.

Respondents were asked a series of questions on their use of mental and physical-health apps, symptom-tracking apps, digital contact-tracing apps, their comfort with those systems and reasons for comfort or discomfort. They were then asked about their perceptions of vaccine-passport schemes.

Respondents were asked:

- 'Which of the following do you have?', and given a choice of smartphone, broadband, internet or none of these.

They were then asked:

- 'Have you or have you not used the following types of smartphone apps? If you have never heard of these types of apps, please state "Have not heard of"' for:

  — Mental-wellbeing apps, e.g. Headspace
  — Personal-fitness apps, e.g. Strava, Fitbit
  — Medical consultation services, e.g. online GP appointment-booking apps

— Contact-tracing apps, e.g. the NHS COVID-19 app, Protect
   Scotland, StopCOVID NI
— Symptom-tracking apps, e.g. ZOE COVID Symptom Study,
   Healthily: Self-Care & Health Journal

Respondents were then asked, for apps they had heard of and used:

- 'How comfortable, if at all, have you felt using the following types of
  smartphone apps?'
- 'How comfortable, if at all, would you have felt about using the following
  types of smartphone apps, before the COVID-19 pandemic?'
- 'Which of the following reasons describe why you have used these
  apps? Please select all that apply.'

Respondents were then asked, for apps they had heard of and not used:

- 'How comfortable, if at all, would you feel using the following types of
  smartphone apps?'
- 'How comfortable, if at all, would you have felt about using the following
  types of smartphone apps, before the COVID-19 pandemic?'
- 'Which of the following reasons describe why you have not used these
  apps? Please select all that apply.'

In introducing the issue of vaccine passports, respondents were provided
the following information by Survation:

'Companies are developing "vaccine passport" apps that allow
you to prove you have been vaccinated to organisations such as
airlines, employers, pubs, insurance companies, the police etc.
These organisations may then treat people differently based on their
vaccination status, such as requiring it to access an office or venue.'

Respondents were then asked:

- 'To what extent do you agree or disagree that these apps would influence people to get vaccinated?'
- 'To what extent do you agree or disagree that enough information is available about the effects of vaccines on the individual health risk and spread of COVID-19 for these apps to be used?'
- 'To what extent do you agree or disagree that it would be fair to treat vaccinated people differently from those who haven't yet been vaccinated or are unable to be vaccinated?'
- 'How likely, if at all, do you think it is that a vaccine-passport scheme would lead to marginalised groups, such as young people, people who are shielding, members of the LGBTQI+ community, people from an ethnic minority background, those who are in precarious work (e.g. on zero hours contracts or gig workers) to be discriminated against?'
- 'How concerned, if at all, would you be that a vaccine-passport scheme would lead to you being discriminated against?'
- 'To what extent do you agree or disagree that the Government should ban these apps from being developed and used?'

The table on the next page shows the demographic distribution of the sample, before and after weighting.

Survey sample

		Total weighted	Total unweighted
	Total	**2,023**	**2,023**
Sex	Female	51%	56%
	Male	49%	44%
Gender	Woman	51%	55%
	Man	47%	43%
	Transgender	<1%	<1%
	Other	<1%	<1%
Age	18-24	12%	4%
	25-34	17%	7%
	35-44	18%	14%
	45-54	18%	22%
	55-64	15%	19%
	65-74	11%	16%
	75+	10%	18%
Region	London	13%	17%
	South	32%	29%
	Midlands	16%	19%
	North	24%	21%
	England	84%	86%
	Scotland	9%	9%
	Wales	5%	4%
	Northern Ireland	3%	1%
Ethnicity	White	88%	72%
	Black, Asian and minority ethnic communities	11%	27%
Household income p.a.	£0−£19,999	25%	29%
	£20,000−£39,999	24%	23%
	£40,000+	25%	22%
Disability or long-term health condition	Yes	19%	21%
	No	79%	77%
COVID-19 clinical vulnerability	Low	56%	47%
	Moderate (clinically vulnerable)	26%	30%
	High (clinically extremely vulnerable)	14%	19%

About the Ada Lovelace Institute

The Ada Lovelace Institute was established by the Nuffield Foundation in early 2018, in collaboration with the Alan Turing Institute, the Royal Society, the British Academy, the Royal Statistical Society, the Wellcome Trust, Luminate, techUK and the Nuffield Council on Bioethics.

The mission of the Ada Lovelace Institute is to ensure that data and AI work for people and society. We believe that a world where data and AI work for people and society is a world in which the opportunities, benefits and privileges generated by data and AI are justly and equitably distributed and experienced.

We recognise the power asymmetries that exist in ethical and legal debates around the development of data-driven technologies, and will represent people in those conversations. We focus not on the types of technologies we want to build, but on the types of societies we want to build.

Through research, policy and practice, we aim to ensure that the transformative power of data and AI is used and harnessed in ways that maximise social wellbeing and put technology at the service of humanity.

We are funded by the Nuffield Foundation, an independent charitable trust with a mission to advance social wellbeing. The Foundation funds research that informs social policy, primarily in education, welfare and justice. It also provides opportunities for young people to develop skills and confidence in STEM and research. In addition to the Ada Lovelace Institute, the Foundation is also the founder and co-funder of the Nuffield Council on Bioethics and the Nuffield Family Justice Observatory.

Find out more:

Website: adalovelaceinstitute.org
Twitter: @AdaLovelaceInst
Email: hello@adalovelaceinstitute.org

About the Health Foundation

The Health Foundation is an independent charity committed to bringing about better health and health care for people in the UK.

Our aim is a healthier population, supported by high quality health care that can be equitably accessed. From giving grants to those working at the front line to carrying out research and policy analysis, we shine a light on how to make successful change happen. We use what we know works on the ground to inform effective policymaking and vice versa.
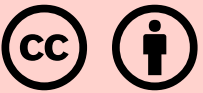
We believe good health and health care are key to a flourishing society. Through sharing what we learn, collaborating with others and building people's skills and knowledge, we aim to make a difference and contribute to a healthier population.

Find out more:

Website: health.org.uk
Twitter: @HealthFdn
Email: info@health.org.uk