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The trustworthiness of peers and public discourse: exploring how people navigate numerical dis/misinformation on personal messaging platforms

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ABSTRACT

Numbers are essential to how citizens understand the world, but also have distinctive power to confuse or manipulate. Numerical claims permeate online dis/misinformation, yet relatively little is known about how people engage with them. We conducted in-depth interviews (W1N = 102, W2N = 80) to explore how people gauge the trustworthiness of numbers on personal messaging platforms – highly popular yet difficult-to-research online spaces. Adopting a relational approach to informational trustworthiness, we find that numbers were not perceived as objective facts but as biased, technical, and verifiable. This spurred participants to engage in three practices to establish trustworthiness: contextualising peers' motivations with reference to public discourse, selectively trusting peers' competence in light of public signals of salient expertise, and using public sources to assess what peers share. These practices, which we found endured over time, suggest that norms of verification and correction on messaging platforms involve a complex integration of information from interpersonal relationships and public discourse.

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Numbers have unique power in public discourse. For example, reporting statistical information increases the credibility and quality of news items for audiences (Koetsenruijter, 2011; Urban & Schweiger, 2014), and medical messages are more trusted when they contain numbers (Gurmankin et al., 2004; Shoots-Reinhard et al., 2022). The Covid-19 pandemic's deluge of infections, hospitalisations, and deaths increased the importance of numerical information in daily life. These metrics helped news audiences better understand the pandemic response (Groot Kormelink & Klein Gunnewiek, 2022; Lawson & Lugo-Ocando, 2022). But numbers have often been used in misleading ways, posing a

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risk to public health (UK Office for National Statistics, 2022). There is a long history of spurious numerical claims about climate change, public health, and immigration (e.g., Lind et al., 2022; West & Bergstrom, 2021). Poor objective and subjective numeracy mean individuals struggle to judge numbers (Gilmore et al., 2018; Peters, 2020). But even the highly numerate can be deceived (Stubenvoll & Matthes, 2022) because when people are exposed to accurate numbers inconsistent with their prior beliefs, they are more likely to misremember them (Coronel et al., 2020).

This makes numbers especially relevant to the study of mis/disinformation,[1] and some recent research has traced how they circulate on public social media platforms (Lee et al., 2021; Starbird et al., 2023). A strand of new research centres on how people establish the trustworthiness of quantitative data in a complex media environment that increasingly includes people's everyday social relationships online (Dahl & Ytre-Arne, 2023; Kennedy & Hill, 2018; Mangold et al., 2022; Radinsky & Tabak, 2022). These relationships matter for the spread of misperceptions because so much online behaviour involves people interacting with peers in horizontal communication networks. An important manifestation of this shift is the rise of personal messaging platforms: WhatsApp alone has more than two billion active monthly users (WhatsApp, 2020); Facebook Messenger has more than a billion (Facebook, 2017). To the best of our knowledge there is no research on how numbers are judged on these platforms. This is the focus of our study.

The distinctiveness of personal messaging

Messaging platforms have distinctive implications for the spread of numerical dis/misinformation and assessments of trustworthiness. They are not entirely private nor are they fully public, but have been conceptualised as hybrid public-interpersonal communication environments (Chadwick et al., 2023). Numbers often cascade from public discourse into interpersonal networks on these platforms and are imbued with the biases inherent in communication by journalists, politicians, celebrities, and experts in the public world. When numbers enter personal messaging, however, they are often set within more private, local, and interpersonal dynamics (Nemer, 2021). This reconfigures their reception.

Unlike on news websites, on personal messaging there are no journalists to sift, filter, or deprioritise poor quality information. Neither is there scope for automated interventions that remove or down-rank posts, as happens on public social media platforms. Whether disinformation spreads on personal messaging therefore depends a great deal on the character of the social relationships and social norms among messaging peers (Chadwick et al., 2022). Importantly, however, these relationships and norms are not hermetically sealed because people often mobilise information from the public world to achieve goals in their everyday lives. Nor are these relationships and norms atemporal: they change over time, as people draw from changing public discourse to inform their interactions with peers. Thus, we argue that it is important to examine the strategies people use to appraise the trustworthiness of numbers shared by their peers on personal messaging. But it is equally important to explore how these strategies are informed by how people gauge the public world to verify and correct potentially misleading claims. With this approach, our research aims to augment the work on engagement with disinformation on public social media platforms (Lee et al., 2021; Starbird et al., 2023) with hitherto undocumented knowledge of how citizens determine the trustworthiness of

numerical information in the important, but often hidden, spaces of everyday life constituted by personal messaging.

Our study's contribution

To explore these issues, we conducted qualitative fieldwork over 18 months with a sample of 102 members of the UK public who use personal messaging and whose characteristics reflected key features of the population. To briefly summarise our findings, we show that, when participants tried to assess the trustworthiness of numbers, they often recognised, and even took advantage of, the hybrid public-interpersonal context these platforms afford. Numbers were not perceived as certain, objective, and atemporal facts but as biased, technical, and verifiable. This basic understanding provided a foundation for participants to actively engage in three main practices to establish numbers' trustworthiness. Crucially, each of these three practices involved a distinctive way of integrating information from the public world into the world of personal messaging and vice versa. Participants (a) contextualised peers' motivations with reference to public discourse, (b) selectively trusted peers' ability and expertise with reference to public awareness of what kinds of expertise were most important, and (c) used public sources to check, and, in some cases, directly challenge misleading information shared by peers in interpersonal contexts. These practices remained broadly consistent over time. Our exploratory study suggests that norms of verification and correction on these highly popular and difficult-to-research platforms involve a complex integration of information from interpersonal relationships and information from public discourse.

Trustworthiness of information on personal messaging: a relational and experiential approach

Trust is complex because it is relational (Steedman et al., 2020), especially on personal messaging platforms. A person may say they perceive numbers published by the news organisation *The Guardian* as trustworthy. But what happens when they see statistics from *The Guardian* shared on WhatsApp by a nephew, they consider untrustworthy? The receiver might immediately perceive the headline as untrustworthy because the social norm in the WhatsApp group is to reject content sent by the nephew. Or they might consider *The Guardian*'s trustworthiness to be greater than the untrustworthiness of their nephew and elect to trust the headline.

These and multiple related scenarios centre on trustworthiness – the different reasons to trust. These are far from simple because the reasons to trust and distrust are not always binary opposites: to trust someone because of their honesty, for example, does not always mean that what a dishonest person says is always considered untrustworthy. There is nothing automatic in how these reasons lead to specific expectations of trust (Möllering, 2001, p. 404).

When it comes to the trustworthiness of media, research has often focused on the trustworthiness of experts (Hendriks et al., 2015) and has dwelt less on the role of relationality and interpersonal relationships (Hovland & Weiss, 1951; Mangold et al., 2022; Strömbäck et al., 2020). This is despite research that has emphasised the importance of group dynamics, solidarity, and trust (e.g., Polletta & Callahan, 2017). We want to suggest that approaches to trustworthiness and dis/misinformation online would

benefit from foregrounding relational interactions and interpersonal social experience (Hardin, 2002). However, as we show, this should also involve recognising that messaging affordances mean individuals often place these judgements in the context of their assessments of broader public discourse.

Trustworthy peers

When people see numbers on personal messaging they have usually been shared by peers. We therefore need to understand how people establish peers' trustworthiness. Relational theories of trust emphasise what Hardin (2002) termed 'optimistic expectations' (p. 118) that a peer will provide reliable and accurate information. This expectation emerges from people's assessments rooted in prior experiences of interacting with peers. We can augment Hardin's approach with a focus on two subvariants of this prior experience.

One is motivation: why is this person sharing this numerical information? (Hunt & Wald, 2020). This assessment may be positive when people think their peer has 'goodwill' – experience of past interactions that create solidaristic social bonds (McCroskey & Teven, 1999). This context of goodwill emerges from the social relationship (the friendship) and not from some externally driven motivation to improve the quality of information in general circulation. In contrast, assessments of trustworthiness may be negative when someone is known for sharing content with externally driven intentions that override goodwill, for example if they often send a peer statistics to discredit a political cause to which they are ideologically opposed. In this way, our conceptualisation of motivation also encapsulates the integrity and benevolence of peers (Hendriks et al., 2015) but treats these as emergent in interpersonal interactions rather than as fixed characteristics.

A second subvariant is competence: does the peer have the skills and other characteristics to be trusted? (Mayer et al., 1995). Given that numbers are products of complex rule-based processes, we can expect someone with the competence to interrogate numbers to be seen as trustworthy. But competence is also bound up with reputation and expertise (Hendriks et al., 2015; Turcotte et al., 2015; Utz & Wolfers, 2022). Reputation assessments involve observing patterns of behaviour over time. Expertise often centres on peoples' qualifications (Metzger & Flanagin, 2015) – whether they are an accredited accountant or doctor, for example – but is also rooted in interaction experiences and first-hand encounters (Flanagin & Metzger, 2013).

Little is known about how these two subvariants of trustworthiness – assessments of motivation and assessments of competence – play out in peer relationships in online settings, and how they shape people's attempts to identify and challenge misleading claims.

Trustworthy public discourse

If not all peers are trustworthy, and even trustworthy peers can sometimes provide deceptive information, people will often need to externally verify numbers. This will involve switching from the interpersonal to gauging public discourse. Existing research points to several ways people assess public discourse to discern between trustworthy and untrustworthy information.

At its most passive, people establish the consistency of information as part of their daily routine of visiting websites and social media (Metzger et al., 2010). But there are

more active practices. Increasingly, people seek out fact-checking websites to verify claims made by journalists, politicians, celebrities, and scientists. Others will use search engines to find a suitable range of legitimate sources (Aharoni et al., 2022).

Wineburg et al. (2022) define this practice of actively looking across multiple sources as 'reading laterally.' They recommend that media literacy programmes ought to encourage it among news audiences (Wineburg et al., 2022). Related research has shown that lateral reading is more common among those who take opinion leadership roles in online peer groups (Dubois et al., 2020). Seeking out information is not without risk, however. As Tripodi has argued, there is an 'IKEA effect' of misinformation: audiences can be empowered by a false sense of autonomy when they seek out their own facts (Tripodi, 2022, p. 207). Peers may or may not counteract this effect.

Overall, these ideas raise the important question of what forms of lateral reading behaviour might protect people from misleading numbers online and how interpersonal peer relationships matter in it. There is limited evidence concerning how verification practices are used for assessing numbers (Radinsky & Tabak, 2022), and previous research has focused on news audiences or public social media platforms (Marwick & Partin, 2022; Tripodi et al., 2023) rather than personal messaging. It is important to examine whether, when, and how people engage in verification on personal messaging. As we show, this involves examining how they switch from peer-based personal messaging to broader public discourse – and back again – to judge trustworthiness, and how stable these practices are over time.

Research questions

Based on the above discussion, three main research questions inform our exploratory study. The first two questions emerge from our conceptual explication concerning the trustworthiness of peers and public discourse, respectively. The third question centres on the *dialectical interrelationships* between the two sets of trust-generating behaviours covered by the first two questions. These interrelationships have not been conceptualised or documented in prior research; our focus on them forms one of our original contributions with this study.

RQ1: How did participants establish the trustworthiness of peers who share numbers on personal messaging?
RQ2: How did participants use public discourse to inform their perceptions of the trustworthiness of numbers on personal messaging?
RQ3: How and why did these two sets of behaviours interrelate?

Research design, data, and method

Our approach is relational. It situates people's use of personal messaging platforms within their everyday lives and social relationships. We conducted in-depth interviews with a sample of UK residents that broadly reflected the key demographic features of the wider population. There were two waves: a first wave ($N = 102$) from April to November 2021 and a second wave of follow-ups ($N = 80$) from October 2021 to July 2022. Loughborough University granted ethical approval.

Sampling

To recruit participants, we used Opinium, an established survey company that maintains an online panel of 40,000 people. We designed a screening questionnaire to select people who used at least one of the following apps a few times a week: WhatsApp, Facebook Messenger, iMessage, Android Messages, Snapchat, Telegram, Signal. As Figure S1 in the Supplementary Information (SI) file shows, WhatsApp and Facebook Messenger were by far the most popular. We recruited participants that roughly reflected the UK population across age, ethnicity, educational attainment, and basic digital literacy (see Figures S2 and S3, SI file). We recruited from three regions: London, the East Midlands, and Northeast England. This allowed for a detailed, interpretive analysis of a reasonably representative group of people from different backgrounds. The level of digital literacy of our sample of 102 participants, potentially important for this study, deviated only slightly from the national UK distribution (see Figure S2, Appendix). We deployed an iterative strategy, with six rounds of recruitment and interviews for the first wave. For the second wave, we recontacted participants and invited them all for a second interview, in which 80 participants took part.

Procedure

After participants accepted our invitation, they granted informed consent and were compensated with payment for their first interview (£35) and subsequently, where relevant, for their second interview (£25). Interviews were conducted on Zoom, were semi-structured, and guided by the themes in the research literature we discuss above and from prefieldwork pilot interviews. Interviews lasted on average for about 1 h, 5 min.

The focus in the interviews was on setting information flows on personal messaging within peoples' everyday experiences, relationships, attitudes, practices, and routines (see S6, SI for the interview guide). Two waves of interviews allowed us to explore if these changed over time. We used a concentric circle diagram as a visual aid during the start of the interview to set peoples' relationships with peers in three categories: very close ties, somewhat close ties, and acquaintances (see Figure S5, SI). We asked questions concerning people who fell into each category and how often they came across information shared by them. The fourth category we termed 'the world beyond.' It comprised news organisations and other public sources. We also asked participants to look at their personal messaging apps during the interviews, so they could refer to specific examples of recent messages.

Analysis

Using NVivo we conducted emergent interpretive coding of the transcripts (Corbin & Strauss, 1990). Guided by the concepts in prior research, we nevertheless were keen to remain open to themes that emerged organically from the interviews. The first coding was conducted by the project's Principal Investigator (second author of this current article). This was discussed and augmented by the team as a whole. Coding consistency was refined by collectively adding and amending codes. After this, we moved to axial coding (Corbin & Strauss, 1990, p. 13) using NVivo's matrix function to explore how themes intersected. This process involved determining different topics of dis/misinformation then identifying where numerical misinformation was particularly salient. In part, the

prominence of numbers reflected the general importance of numerical data during the height of the Covid pandemic, but other topics, such as Brexit, tax evasion, political campaigns, racism, and financial scams, for example, were evidently important to participants. Where we discuss responses to accurate numerical information – for example scientific statistics – they are key to our analysis because they allow us to better contextualise participants' responses to misleading and false information.

Understanding numbers and dis/misinformation

Prior research in the 'fuzzy trace' framework in psychology has emphasised that people recall numbers as 'gist' representations (relative statements) and verbatim representations (specific, exact numbers) (Reyna et al., 2021). While use of verbatim representations in reasoning is linked to higher levels of objective numeracy, most people rely on gist representations in daily life (Reyna & Brust-Renck, 2020). Including both specific and gist references enabled us to analyse comments by participants who were not particularly confident in using numbers, and often talked in more abstract – yet highly revealing – terms about the numerical. Throughout, our approach focuses only on cases where numbers were integral to participants' experiences of encountering dis/misinformation. In practice, this meant that, in all of the examples we discuss, participants' sense-making was shaped by their assessments of numerical information. The dis/misinformation, even though it may have contained different types of claims, narratives, and information, could not be adequately understood and did not 'work' without its numerical aspects.

To understand the extent to which participants referred to numbers in these conversations, we identified all references to dis/misinformation and recorded whether there was a verbatim reference (e.g., 'we had 90-odd thousand cases yesterday') or a gist one (e.g., 'the only reason that cases are so high … '). Not only does this reflect the common use of both verbatim and gist reporting in how public health communicators convey numerical meaning, it also reflects how journalists most often report statistics (Cushion et al., 2017). For example, vaccine side-effects are often deliberately described as 'common' or 'very rare' (Shoots-Reinhard et al., 2022). At the same time, of course, misuse of these categories can cause deception.

Discussion of numbers was prevalent among participants: 95.1% (97 of 102 participants) used gist and verbatim representations; 62.7% (64 of 102 participants) used verbatim representations. For the group in the sample who used both types, digital media literacy (measured by our recruitment screening – see SI) roughly matched our overall sample. The group that used verbatim representations had a slightly higher level of digital media literacy than the overall sample (Figure S4, SI). The 24 specific participants directly discussed in the Findings section below (24) also had a slightly higher level of digital media literacy than our overall sample (see Figure S4, Online Appendix, for a full breakdown).[2] We use pseudonyms throughout to preserve anonymity.

Findings

Distrusting peers: contextualizing motivations and bias

Participants consistently emphasised that numbers were biased rather than objective facts. For some, this involved seeing numbers as misleading. Renée (58, woman, East

Midlands) recalled a message from her son, which described a false conspiracy theory concerning American retailer Wayfair, positing that the artificially high price of some of its cabinets was because the furniture was linked to international child sex trafficking (see Snopes, 2020). The number ($13,000) played a crucial role in anchoring the faulty epistemology of the conspiracy theory, but Renée treated the number with scepticism. Others pointed to the relativism of data: the way opposing arguments could use data to back up their positions. Julia (43, woman, London) talked about looking at both sides of the debate that specific Covid vaccines were 'causing heart inflammation in young people.' After looking at 'how data was analysed and the risk factors' Julia said she had decided that she 'cannot really prove either side' because both arguments had convincing data.

For some participants, this bias emerged in how data could be ignored. During the second round of interviews some participants emphasised how the same Covid data that were given attention during the early and middle stages of the pandemic were now being sidelined. Barry (39, male, London) noted that 'we had 90-odd thousand cases yesterday' but it wasn't being talked about. Georgios (39, male, London) said that 'the numbers are still up,' but from a media point of view 'it's gone,' he said. The lack of attention to these numbers was seen as motivated by a change in government policy. Scott (48, male, Northeast) explained that despite high 'death rates' the government had 'just moved on from it.' For Effat (29, female, Northeast) this disconnection between data and government policy led her to believe that the virus was never a serious threat, while Agatha (54, female, East Midlands) stopped checking the numbers altogether because she thought they bore no relationship to the introduction of public health precautions.

The examples above show how numbers were seen as being able to mislead, support opposing positions, or be strategically ignored. These are important themes in the bias of numbers in political rhetoric (Lawson & Lovatt, 2020), and key to the way Covid sceptics talk about data visualisations on social media (Lee et al., 2021). To untangle bias, some participants talked about the motivation of peers who share numbers on personal messaging platforms (Hunt & Wald, 2020). This allowed them to assess trustworthiness.

Participants assessed peers' motivations using their knowledge of public discourse. Julia explained that she would receive numbers-based health messages from a friend. For example, '[d]rink this juice of this plant every morning, and they will take five years off your life.' Julia did not see these types of numerical claims as trustworthy. She contextualised her friend's motivations within the broader discourse of what she called 'medical trends' about nutrition, which was characterised by sensationalised claims based on poor evidence.

This process of setting friends' motivations within broader public discourse was detailed most clearly when numbers were linked to politics. Christine (59, female, East Midlands), referred to interactions with her sister-in-law on WhatsApp. During rising Covid-19 cases, she received a message from her claiming that 'the only reason that cases are so high, is because they're doing so much testing.' Christine was aware that this claim was misleading. She used this example as evidence of her sister-in-law's general reputation for sharing slanted figures on WhatsApp. For Christine, this stemmed from what she said were her relative's 'distinctly dodgy views' and her skewing 'incredibly right' on the political spectrum – in opposition to Christine's 'left wing' position. This would also emerge in her follow-up interview, where Christine explained that her

sister-in-law derided her views about gender and sex as 'too woke' and reflecting so-called 'woke culture.'

Similarly, Evan (51, male, East Midlands), referred to conversations with a friend on personal messaging. Evan described an example concerning the finances of a British Conservative politician whom Evan's friend said was 'being accused of funnelling these millions away in some foreign country to avoid paying tax.' For Evan, these types of stories were forwarded by his friend from 'a little-known Labour group that just pushes Labour stories and anti-Conservative stories.' Therefore, he responded, saying 'I saw an interview with him [the politician] saying he said it was totally inaccurate and it was the left wing of politics, just trying to show him in a bad light.' For Evan, his friend's motivation for sending this numerical claim was part of a broader battle between the left and right in British politics.

Anish (38, male, London) engaged in a similar practice of correcting an untrustworthy peer. Anish referred to a discussion in a family group on WhatsApp in the early months of 2021, when Covid cases in India had decreased significantly: '[T]here was this news article or something that a cousin shared where they were saying, so only these two states [in India] are continuing to report cases while all the other places, they don't seem to have cases.'

Anish was immediately suspicious of this news article. This was mainly because he could place his cousin's motivation within a broader political context, which sat at the heart of the family WhatsApp group. As Anish explained, his family are from Kerala, one of the two Indian states that were then continuing to report infections. When the article was shared in the family group, the ruling Communist party had just been re-elected. Anish's family, however, were opposed to the Communists. Anish did not share this opposition. This political tension underpinned the group dynamics:

> We knew that he [the cousin] was actually anti-Communist Party, pro right-wing party, and so one of the reasons I responded was basically to also point out that I was fairly sure that one of the reasons he shared that information is because that's part of the […] kind of messages that you see from people who belong to the other party […] I knew he was a supporter of that political view and I was quite aware that that message probably came from that kind of source where they were basically just disparaging what these two states were doing, including the one where we are from.

Anish positioned his cousin's motivation for sharing this news article as part of a broader partisan strategy to disparage the newly elected government, as opposed to sharing information because he had Anish's best interests at heart (goodwill). Thus, Anish challenged his cousin:

> [S]o basically I responded and said, 'well that just probably shows that the testing in those two states is working.' […] 'It doesn't mean that the other states don't have cases.' And then he responded and said, 'Well, OK, you seem to be cherry picking for political purposes but whatever.'

Anish's practice of correction was effective. In the follow-up interview, he explained that his continued correction of his cousin's untrustworthy posts meant that his cousin no longer posted content on the WhatsApp group. Furthermore, Anish's inference about testing capacity was closer to the truth. The lack of cases in other states was due to poor testing capacity, not better public health policies (BBC, 2021).

Trusting peers: expertise and reputation

The above accounts demonstrate how participants used knowledge of public discourse to contextualise peers' insincere motivations. But not all peers were perceived as untrustworthy. Diana (64, female, Midlands), explained that one person in a messaging group she belonged to was 'very hot on keeping us all informed about the vaccine.' Similarly, Lydia (29, female, London) explained that her friend who was a doctor was by far the 'most forthcoming' when it came to sharing quantitative information in her friends' WhatsApp group. But why were certain messaging peers considered trustworthy?

To answer this question, we need to shift from the theme that numbers are biased toward the theme that numbers are technical knowledge. This places emphasis on the complex rule-based nature of mathematics and statistics and how these data were set within the specific context of healthcare. Participants reported that they needed to evaluate the ability of peers to deal with the technicalities of numbers, and this was articulated through interpersonal constructions of expertise and reputation. At the same time, these assessments were made with reference to the public salience of the expertise and reputation, given what people were observing in public discourse regarding the pandemic.

Participants consistently referred to receiving numerical information from peers that had some form of expertise in healthcare; doctors and nurses were deemed particularly trustworthy. Archie (66, man, Northeast), referred to receiving data reports from his friend who worked as part of the National Health Service. Philippa (34, female, London), Bohai (35, man, London) and Sandra (64, female, Northeast) mentioned trusting family members who were either doctors or nurses when it came to discerning the truth about Covid-19 case numbers and the efficacy and side-effects of vaccinations.

In these discussions we saw how expertise emerged from both qualifications and experiential credibility (Metzger & Flanagin, 2015). An account from Lydia draws out this relationship further. She explained how she was part of a WhatsApp group with a small set of friends. One friend, a doctor, regularly provided updates about the progress of the pandemic:

> [W]hen the other friend was being a little bit worried about how many people are meeting up and stuff, our doctor friend actually turned around [and] said 'actually Covid's getting better, it's not as bad as it was, you know, we're really on, in the right direction,' at the same time, this was obviously a year ago, or so and I was like 'well she's a doctor, I'm gonna trust her,' you know, so it was, we, we were kind of taking whatever she said as the fount of knowledge.

Lydia's 'other friend' was worried about meeting people in person, but this fear was challenged by her 'doctor friend' who referred to a loose notion that the pandemic – whether that be cases, hospitalisations, deaths, or the R value – was going 'in the right direction.' The trustworthiness Lydia and her friends ascribed to the doctor friend was considerable. This was rooted both in her qualification as a doctor and in her direct professional experience during the pandemic. Lydia explained:

> [S]he was working on a Covid ward. So anytime she, she would send lots of, kind of links to articles or data sources, and she was like 'this is really good, this is really helpful, blah blah blah' and we'd always read them and kind of trust whatever she says, cos she's, you know, there on the front line dealing with it.

These accounts emphasise how trustworthiness relied on qualifications and experience in dealing with data, but also within the context of interpersonal interactions (Mihelj et al., 2022). This involved specific issues around vaccination side effects as well as general notions of the scale and threat of cases in healthcare settings that participants gleaned from public news reports. Personal messaging made it easier for public and 'objective' criteria of trustworthiness to be translated into interpersonal contexts.

But certain peers were also trustworthy because they had a general reputation for dealing with numbers. When it was mentioned, this was usually linked to rationality, analytical capacity, science, and generic 'cleverness.' Denisse (27, female, London) referred to a large family WhatsApp group where people would consistently share claims that she said had 'no factual evidence behind things' or 'scientific background.' Denisse would message her father privately about the content on the group, relying on him because he was a 'very rational' person who never engaged with conversations that were not based in science. This reputation for rationality was perceived as crucial for dealing with the technical nature of numbers, which were presented as specialised knowledge based in rules and often set in opposition to the 'subjectivity' of non-numerical information. 'Rationality' was also emphasised by Ryan (41, male, East Midlands). He explained that his daughter was frustrated with her friends because they would not get vaccinated. His daughter knew from public sources that 'the facts are very plain, the vaccination saves lives' because, as Ryan explained, she was 'a rational person, a lawyer-to-be.'

This also emerged when Lydia talked further about her friend who was a doctor. When asked if she would 'trust anything and everything' her friend sent, Lydia said 'I would, yeah, she's a very, she's very clever, and she's very kind of analytical.' The reputation for being 'clever' and 'analytical' was not just a quality possessed by Lydia's friend, it also manifested in how all the numbers her friend sent on WhatsApp were intrinsically 'backed up by data and research,' even if this was not explicitly obvious. This numerical expertise was more pronounced in the follow-up interview. Lydia's friend had stopped working on the Covid ward and therefore did not have the experiential credibility she had before, but she was still considered trustworthy as a source for 'pollution statistics' and data related to 'climate change.' This positioned Lydia's friend as having both the expertise to handle numerical information and the visible reputation for it, due to the way she reinforced her analytical expertise with *public* information she shared in the *interpersonal* messaging context. This theme resonates with some recent work in science communication that calls for fusing expertise and reputation into a concept of 'competency' (Besley et al., 2021).

Trusting public discourse: checking and challenging

Other participants also perceived numbers as a matter of technical knowledge. But they more directly gauged the public world outside messaging to assess the validity of numbers they encountered on personal messaging.

For example, Bella (32, female, East Midlands) talked about sending a link to a study she found online showing the very low risk of blood clots with the AstraZeneca Covid vaccine to reassure her friend in a messaging group chat. Justin (39, male, Northeast) said he knew 'the statistics' he was sharing on messaging were 'reliable' because he 'went and found the source.' Rob (68, male, Northeast) said that even if a claim came from an organisation he trusted, such as the BBC, he would 'go to the actual figures themselves.'

Others were more specific in explaining how they gauged public discourse, describing practices that echo Wineburg et al. (2022) 'reading laterally.' Crucially, however, this did not just involve looking across different publicly-accessible sources – Wineburg and colleagues' definition of 'reading laterally' – it also meant switching between these public sources and the interpersonal spaces of messaging. For example, Anish saw a message claiming that the cases of mucormycosis (a.k.a 'black fungus') were on the rise due to mask wearing to protect against Covid-19. But after doing 'some background reading' online he found the message was 'not exactly trustworthy at all.' Blair (64, male, East Midlands) dismissed a claim he saw on messaging that Covid was 'just a bad case of the flu' because had seen in news reports that this was false and 'the case numbers were going up,' as were 'the number of people who were dying.' Blair emphasised this process of 'trying to balance what you read' in the follow up interview, emphasising how he would 'double check' information – often using Wikipedia to cross-check facts that had been shared with him by friends.

Sophie (32, female, Northeast), challenged a friend in a group chat who had posted about the side effect of Covid vaccines. Sophie shared an article in the group that showed the risks of blood clots from taking the contraceptive pill were higher than the risks associated with vaccination. Similarly, Szymon (45, male, London) explained how he regularly shared quotes from public sources in personal messaging, pointing to a specific example where he countered a friend's claim that '30,000 people' had recently died from flu. These four examples highlight how lateral reading on personal messaging involves actively moving from private to public and back again.

Farhan (56, male, London) provided a more detailed explanation of how this checking-and-challenging process worked. He discussed his relationship with Clive, who was a work colleague and friend. The pandemic response had become a source of some conflict between them. As Farhan explained it, Clive was 'anti-vax' and refused the vaccine because of 'the profit the vaccine companies are making out of it.' The argument came to a head when Clive shared an antisemitic conspiracy theory image containing a picture of Jacob Rothschild, surrounded by text stating that the Rothschild family was 'worth $500 trillion' and secretly controlled 'the news, the media, your oil and your government.' Farhan explained that he was immediately suspicious of the $500 trillion figure, so he 'Googled it and tried to find the facts from reliable sources.' He found that the $500 trillion figure was inaccurate – it was actually $500 billion. Farhan then challenged Clive about this inaccuracy, but Clive disputed Farhan's correction.

This point of contention over the amount may seem arbitrary. But for Farhan, this correction was also part of his push to change his friend's conspiracy-theory fuelled view of vaccinations – something that Farhan described as a partial success as Clive had 'changed his views slightly.' Here the ability to switch laterally from personal messaging to public discourse and back again was essential for Farhan to check and correct the number in the image shared by Clive but it also fulfilled a broader purpose.

Conclusion

As we have shown, to determine which numbers were trustworthy, our participants relied on three practices, each underpinned by a particular understanding of numbers and a particular way of integrating information from the public world into the world

of messaging. First, they untangled the bias of numbers by contextualising peers' motivations within broader public discourse. Second, they dealt with the technical nature of numbers by relying on peers with what they considered requisite expertise and reputation, given public events. Third, they saw numbers as verifiable information that can be checked against public discourse, which in turn could also be used to challenge and correct in interpersonal settings.

Across the three approaches, participants did not have a simplistic, literal understanding of numbers. They saw them as technical knowledge that emerge from the disciplines of mathematics and statistics. But they also recognised the uncertainty baked into them as forms of knowledge (Ratcliff & Wicke, 2022). Instead of discussing this uncertainty in technical, statistical terms participants emphasised that numerical statements could be biased, and their accuracy, reliability, and validity could be checked and challenged (cf. Radinsky & Tabak, 2022). Emphasising these two characteristics, however, did not seem to diminish the credibility or usefulness of numbers, a finding that resonates with findings in science communication on how communicating 'technical uncertainty' does not undermine credibility (Gustafson & Rice, 2019; van der Bles et al., 2020). Instead, it underpinned participants' practices to help them establish trustworthiness.

For participants who were not particularly confident in assessing numbers, the technicalities pushed them to rely on peers. One way they assessed the trustworthiness of peers was through reputation and expertise. While these two concepts are not new in the research on trustworthiness, they are often operationalised as distinct entities (see Mayweg-Paus & Jucks, 2018). In contrast, our findings uncover the way peers' trustworthiness can emerge from a relationship between expertise and reputation. The peers considered most trustworthy to relay numbers were those known for their ability (articulated as 'rationality,' 'analytical,' and 'cleverness'), their expertise, which was often expressed in terms of medical qualifications, their experience in dealing with the numerical, and their history of interactions. Instead of anchoring themselves to numbers in the news, as previous research has highlighted (Stubenvoll & Matthes, 2022), these participants *anchored themselves to trustworthy peers by contextualising those peers' competency*, increasing their resilience to dis/misinformation in the process.

Our findings also emphasise the importance of understanding interactions on personal messaging as hybrid integrations of the public and the interpersonal (Chadwick et al., 2023). These networks are not isolated environments containing only interpersonal interactions. They are linked both implicitly and explicitly to public discourse. As we have shown, participants relied on peers with the requisite expertise and reputation to mediate the flow of information from public discourse, but assessments of what were considered appropriate expertise and reputation were themselves grounded in awareness of public events. Again, personal messaging provided this complex, relational integration of public and interpersonal.

To untangle the bias of numbers, participants also emphasised the need to appreciate their peers' motivations for sharing numerical information. This showed an awareness of the role motivated reasoning can play in how people remember and share numbers, with participants often trusting those with similar political beliefs to themselves (Pasquetto et al., 2022). But importantly, these motivations were not just seen as isolated cognitive processes. They were contextualised within pre-existing knowledge of public discourse and involved an awareness that peers could sometimes act as

interpersonal mouthpieces for broader political communication strategies and apparatuses (Lawson, 2023).

The relationship between the private and the public domains also emerged in the ways participants verified numbers. Participants would encounter numbers on messaging, go to public discourse to check whether they were accurate, reliable, or valid and, in some cases, return to the original conversation to correct their peers. Exposure to false information on these platforms can lead to purposive verification outside the platforms through an evaluation of specific numbers. Yet this exposure is shaped by changes in public discourse. Between the first and second set of interviews, participants outlined how the news media and politicians had shifted attention away from Covid and toward Russia's invasion of Ukraine and rising energy prices. This was reflected in messaging conversations too. Once useful numbers concerning cases, hospitalisations, and deaths (see Dahl & Ytre-Arne, 2023; Groot Kormelink & Klein Gunnewiek, 2022) became less relevant to many participants' interactions with their peers.

While the external data changed over time, however, the practices of determining the trustworthiness of numbers remained relatively stable. Further research is needed to explore this in depth, but our findings suggest that there was consistency because trustworthiness in these spaces of interaction is not solely source-dependent or case-dependent but stems in part from the norms of verification and correction in people's everyday social relationships of goodwill (McCroskey & Teven, 1999) – a factor that we think ought to be explored more broadly in studies of dis/misinformation.

There are limitations to our study's method. The trustworthiness practices we identified were derived from participants' reflections on the numerical dis/misinformation they encountered. Studying these *perceptions* of misinformation is important (Jones-Jang et al., 2021; Matthes et al., 2022; Stubenvoll et al., 2021). But on its own our approach does not allow for the objective verification of how effective these trustworthiness practices were for detecting known dis/misinformation circulating at the time. While we took care to establish which numerical claims were objectively dubious, in theory people might engage in these practices and determine that misleading numbers are, in fact, trustworthy. An experimental method could be used to overcome this limitation by determining how different, objectively-measured levels of misperceptions about numerical information influence peoples' practices of establishing trustworthiness.

Nevertheless, our findings could potentially inform new interventions to blunt the impact of numerical dis/misinformation. People need to be able to distinguish between trustworthy and untrustworthy peers, especially if they do not feel confident in interpreting numerical information. Relying on peers who display expertise and reputation is a good starting point, but people might also be encouraged to assess peers' motivations for sharing numbers even when the context is one of goodwill. A useful way to do this is to encourage people to read interpersonal motivations laterally, within a broader political context. But people also need tools, training, and confidence to move from personal messaging platforms to public discourse so they can evaluate numbers and reintroduce that knowledge into messaging without falling prey to how 'doing your own research' can increase vulnerability (Tripodi et al., 2023). Those in trustworthy positions in personal messaging interactions also need to take their responsibility seriously, and fresh attention should be paid to the power of individuals to operate as trusted sources in

these new contexts. Our holistic, relational approach provides a new way of understanding not just numerical dis/misinformation but other types as well – with the key benefit that it grounds analysis in people's central everyday experiences online.

Notes

1. The distinction between disinformation and misinformation is an important one. We use the compound term dis/misinformation to refer to when both are implicated, and the singular terms when one or the other is implicated.
2. We thank one of the three anonymous peer reviewers for suggesting we report the detailed digital literacy profiles of our participant groups.

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