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Evidence from the COVID-19 Pandemic

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Misperceptions of Public Opinion During Crises: Evidence from the COVID-19 Pandemic

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ABSTRACT

How we perceive the public opinion climate can have important consequences on our own opinions and behaviors. Such perceptions are especially relevant during moments of widespread crisis, as they may influence support and compliance with crisis response measures. In this paper, we address what factors inform misperceptions of public opinion during these important moments. We focus on two complementary processes, internal and external crisis information processing, to explain variation in public opinion misperceptions of three measures during the COVID-19 pandemic (masking, use of a contact tracing app, and vaccination). Analyses of 82 weekly waves of longitudinal rolling cross-sectional surveys of the Swiss population during two years of the pandemic ($N = 36{,}667$) demonstrate that individuals regularly underestimated the popularity of these measures. We find that those who were in the opinion minority (usually those strongly opposed to these measures) had less accurate estimations of public opinion. News media played an important role for misperceptions. When it comes to the correction of misperceptions, individuals reporting to be regular news readers were more likely to have more accurate perceptions of public opinion. Combining the survey data with measures of media salience across news media published during this period, ARIMA time series modeling shows that the salience of measures in the media affects public opinion misperceptions for app usage and masking. Implications for the field of political communication are discussed both in the context of the COVID-19 pandemic, and for crises more generally.

KEYWORDS

Misperceptions; public opinion; social norms; media effects; longitudinal analysis; COVID-19; public health

Introduction

Public opinion is crucial during moments of crisis, shaping a government's ability to effectively respond to outstanding circumstances. While much research has been dedicated to understanding fluctuations in public opinion itself during crises (de León, 2023; de León et al., 2022), less has been said about *perceptions* of the public opinion climate. Whether citizens believe crisis response measures are broadly popular can have significant

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consequences during crises. Inaccurate perceptions of public opinion can influence individuals' own opinions (Huck et al., 2009), embolden those with unpopular opinions (Dvir-Gvirsman, 2015), make others less likely to voice their support for emergency measures (Noelle-Neumann, 1974), and reduce social cohesion (Ploger, 2024). To examine the dynamics of public opinion (mis)perceptions, we focus on the case study of three COVID-19 measures in Switzerland.

To understand these processes, we synthesize two complementary but mostly disconnected streams of literature on a) public opinion formation and b) social norm development. Bringing together these theoretical approaches, we propose two sets of processes influencing misperceptions of public opinion: internal cognitive processes and external information processing (particularly from the news media). This approach allows both theoretical and empirical contributions. Theoretically, it bridges the domains of social norms and public opinion formation, shedding light on the interconnectedness of concepts and providing a broader theoretical framework for studying misperceptions of public opinions and norms. This is especially important in the context of a global health crisis – it allows the integration of perceived norms, which have mostly focused on health behavior, and public opinion, a domain dominated by political science, at the moment when the societal integration of politics and health was most salient. Empirically, we make use of a large set of weekly survey waves (82) and a large-scale media data collection during the COVID-19 pandemic and its aftermath to provide nuanced insights into the development of public opinion misperceptions.

Theoretical Background

Misperceptions and Their Importance

Public opinion is hard for people to estimate. We follow Childs in understanding it as "any collection of individual opinions" (Childs, 1939, p. 337), especially "those collections of opinions which exert the greater influence upon government and public policy" (Childs, 1939, p. 337). *Perceptions* of public opinion therefore employ both questions of sensitivity to what others think but also understanding the prevalence of a given opinion in proportion to others (Childs, 1939). When attempting to gauge these collections of opinions toward a specific issue, we often rely on a combination of heuristics – mental shortcuts helping us form an understanding of what others think (Zillmann, 1999). However, this "pseudo-statistical organ" (Noelle-Neumann, 1974) which we employ to determine public opinion is prone to misperceptions.

While the misinterpretation of others' beliefs can have far-reaching consequences, misperceptions in public opinion during crises remain largely unexplored. During periods characterized by national or international emergencies, governments rely on public opinion to garner support for crisis response measures. From a strategic perspective, it becomes imperative that public opinion is perceived as favoring the implementation of these measures, as this increases the likelihood of compliance among the population.

Based on public opinion and social norms literature, we propose that perceptions of public opinion during crises are shaped by two interrelated processes: internal and external information processing. Delving into these processes in detail, the following section theorizes how the public tends to underestimate the level of support for crisis response

measures. Furthermore, we examine how belonging to a minority opinion group can intensify misperceptions. Additionally, we examine the crucial role that the news media can play in rectifying these erroneous perceptions, serving as a mechanism to align public understanding with actual public sentiment.

Internal Information Processing

Underestimation

A large body of social norms literature has documented a reoccurring bias in our perception of others' opinions and behaviors: individuals generally overestimate behaviors and attitudes that they consider to be problematic and underestimate behaviors viewed as favorable (Berkowitz, 2005). Research on social norms and health behavior has reliably replicated these results across a number of health behaviors, including sexual behavior (condom use underestimation; -Scholly et al., 2005), and substance consumption (alcohol and drug-use overestimation; Perkins & Craig, 2006). While this under-and-over estimation is attributable to numerous psychological processes (see Berkowitz, 2005), work has consistently highlighted the role played by event salience (Zillmann, 1999). Behaviors and opinions considered to be problematic, risky, or unethical weigh more heavily on our minds, leading to an overestimation of their occurrence, while attitude-consistent behaviors do not. Such a mechanism is reinforced by the fundamental attribution error, which suggests that individuals witnessing wrongdoing will assume the wrongdoer behaves this way regularly when it is actually an exceptional case (Cooter et al., 2008).

We expect that this underestimation of compliance with preventive behavior likely took place during the COVID-19 pandemic. Considering the government efforts to communicate the benefits of preventative measures of mask-wearing, use of the contact-tracing app, and vaccination, these issues had a normative appeal – the measures should be followed to be effective. Therefore, in line with the social norms literature, instances of noncompliance or criticism of these measures would likely have a higher salience and, because of the fundamental attribution error, be considered to be more widespread than they are. Moreover, pluralistic ignorance likely exacerbated this effect. If individuals feel that opposition to the measures is widespread, those supporting the measures may incorrectly believe they are in the opinion minority, leading them to be less likely to speak out (Noelle-Neumann, 1974), further cementing the erroneous impression that public opinion does not favor the roll out of these measures. It is therefore likely that individuals underestimate support for these measures:

H1.1: ***The general public*** *underestimated support towards COVID-19 prevention measures throughout the pandemic.*

Minority-Majority Position

Social norms and public opinion literature have explored how an individual's own opinion influences their view of public opinion, especially in the false consensus effect. This cognitive bias leads people to overestimate the extent to which others share their beliefs, attitudes, and behaviors, shaping their perception of public opinion (Ross et al., 1977). It is dictated by our tendency to surround ourselves with like-minded individuals, making it easier to assume that our beliefs are more widely held than they actually are (Wojcieszak,

2008). Additionally, individuals are more likely to recall information that supports their own views, further reinforcing our perception of a false consensus. Such a misperception of others' beliefs, attitudes, and behaviors is important to self-congruency, as people enjoy feeling their thoughts are shared by others (Festinger, 1954). A large field has shown the pervasiveness of the false consensus effect across a range of subjects, from bread-type preference (Ross et al., 1977) to populist attitudes (Schulz et al., 2020).

Groups that are in the opinion minority are more likely to project their own opinions onto others (Dvir-Gvirsmam, 2015; Sanders & Mullen, 1983), as minority group status leads to a stronger detachment from the sentiment of the population at large. These individuals are, therefore, more likely to believe their opinion is more prevalent than it is in reality. Individuals belonging to minority groups have especially strong misperceptions due to a desire for social support for their unpopular opinions (Marks & Miller, 1987). A process rooted in motivational reasoning, minority opinion status leads individuals to feel socially threatened, causing them to overestimate support for their opinion as a coping mechanism (Kenworthy & Miller 2001). This minority overestimation has been documented in health behavior as well as political opinion. Dvir-Gvirsman (2015), for instance, showed that minority opinion groups – especially conservatives – overestimated the support for their opinions. This minority-group overestimation increased with the size of majority group, as the threat to their minority position was perceived to be greater. Similarly, Wojcieszak (2008) showed that such minority overestimations occur for extreme ideological groups, such as neo-Nazis online.

Public opinion misperceptions also occur among the majority misperceiving their in-group's views on an issue, a notion captured by the concept of pluralistic ignorance, where individuals holding the majority opinion incorrectly believe that they are in the minority. The phenomenon arises when people misinterpret the prevailing opinion climate, often underestimating the consensus for their own position (Prentice & Miller, 1996). This misperception is driven by group identification and a desire to conform, leading individuals to suppress their views to avoid social isolation or embarrassment. In contexts where positive behaviors are not publicly visible, such as health behaviors, pluralistic ignorance is particularly prevalent (McGuire et al., 2022). For instance, research on gun control and climate change in the United States has shown that people often underestimate public support for these issues, leading to diminished advocacy and self-censorship (G. Dixon et al., 2020; Geiger & Swim, 2016). In such cases, the fear of standing out from what is perceived as the dominant view can prevent individuals from acting in accordance with their true beliefs, reinforcing a skewed perception of public opinion. This misperception, reinforced by a visible and vocal minority opposed to these measures, can create a distorted perception of public opinion, suppressing advocacy and public engagement (G. Dixon et al., 2020; Geiger & Swim, 2016). However, even though majority opinion groups can misperceive the opinion climate, on the whole, studies have found that this misperception is larger among opinion minority groups (G. N. Dixon et al., 2024; Dvir-Gvirsman, 2015; Wojcieszak, 2008), suggesting that false consensus among minority groups is a stronger driver of misperceptions than pluralistic ignorance (and its self-censorship effects) among majority groups.

The roll-out of public health measures during the COVID-19 pandemic (such as masking, contact tracing, and vaccination) was met with a variety of responses, including small vocal minorities opposed to such preventive measures (Frei et al., 2021; Grande et al., 2021).

To date, only a limited amount of research has attempted to uncover how belonging to minority opinion groups shaped public opinion perception. In line with past work, recent research on childhood vaccination has signaled that belonging to an opinion minority group (specifically, being vaccine skeptic) can increase misperceptions of public opinion toward vaccination. We expect to see such a minority bias play out in regards to the COVID-19 pandemic, across attitudes toward COVID-19 vaccination as well as the other two preventative measures under study:

H1.2: *People within minority opinion groups tend to over-estimate public support for their own opinion and therefore have greater misperceptions.*

External Information Processing: News Media and Misperceptions of Public Opinion

Public opinion scholars have long been fascinated with how our subjective perceptions of reality – the "pictures in our heads" (Lippman, 1922) – are influenced by the news media. Work in both public opinion (Mutz & Soss, 1997) and social norms research (Yanovitzky & Stryker, 2001) has been dedicated to this topic, showing that the media serves as a crucial link between individuals and broader society (Geber & Sedlander, 2022), offering information about what people care about and think beyond their immediate surroundings (Tankard & Paluck, 2016). Consequently, the media can influence our perceptions of the public opinion climate (Eveland, 2002). Literature on the links between media consumption and political knowledge is informative here. Theoretically, news readership serves the important function of informing individuals of the current state of affairs and contributing to the shared reality that public opinion inhabits (Stromback, 2005). Empirically, a variety of evidence has suggested that news readership fosters knowledge of politics (Baum, 2003; Castro et al., 2022; Moeller & de Vreese, 2019) and affects perceptions of opinions toward crisis measures (Geber & Hefner, 2019). As such, regularly following political affairs through news readership likely leads to more accurate perceptions of the public opinion on different political issues. Nevertheless, relatively little has been written about this relationship during crises. Considering people pay more attention to the media (especially political media) during exceptional times (de León & Vermeer, 2023; de León et al., 2021; Van Aelst et al., 2021), as well as trust more in the media during crises (Adam et al., 2023), we argue that news readership may be related to correct perceptions of public opinion around COVID-19 crisis.

While the different quality levels and ideologies present in news media choices might have differential effects on perceptions of public opinion (Ploger, 2024), we argue that regularly following legacy news media outweigh such ideological considerations. This is because, firstly, Switzerland is shown to be a country with relatively low polarization and media bias (Jandura & Udris, 2019), for instance, in comparison with the American case. To this point, research found that the Swiss media did not cover the pandemic in a one-sided or alarmist manner and that reporting improved over the course of the pandemic (Eisenegger et al., 2021). For Germany, whose media system is comparable to the Swiss, Reinemann et al. (2024) also found that the media "did not cover the pandemic in a fundamentally exaggerated or one-sided way" (Reinemann et al., 2024). Secondly, the argument here is not that all news consumption leads to accurate perceptions of the public opinion climate. Even

the most balanced of newspapers will have opinion pieces that misrepresent the popularity of measures and political views. Rather, the argument is that, on average, those who regularly consume established mainstream news sources will have a more accurate evaluation of public opinion when compared to those who do not. This is in part because of the capacity of knowledge transfer on the first group, but also because of characteristics of the second group. Those who do not regularly read news include people such as complete news avoiders, who have been shown to have overall lower political knowledge and more prone to hold misbeliefs (Damstra et al., 2023), as well as those who turn to non-news sources of information, such as social media, which has been shown to lead to misperceptions and reduced political knowledge (Van Erkel & Van Aelst, 2021).

We, therefore, hypothesize:

H2.1: *Individuals who follow legacy news sources are likely to have more accurate perceptions of the public opinion climate.*

If we hold the previous hypothesis to be true, misperception correction should not only be linked to news readership but also to the media coverage of the specific issues individuals hold misperceptions on. Therefore, coverage (or salience) of a given issue should produce perceptions of the public opinion climate on that issue that are more accurate. This idea is based on two complementary processes. First, if an issue is more covered in the news (especially during moments of crises when individuals pay more attention to the news media) there are more opportunities for individuals to receive correcting information on the state of public opinion on the measures (de León, 2023). Secondly, public opinion authors who have integrated agenda-setting theory with the third-person effect (Gunther et al., 2006; Huck et al., 2009; Jeffres et al., 2008) argue that increased salience in the media does not only impact an individual's perception of an issue (agenda setting) but will also have an effect on their perceptions of others' opinions, as has been shown for the COVID-19 pandemic and perceptions about vaccination norms (Geber et al., 2024). Because of the tendency to believe that others are more susceptible to media effects (Gunther & Storey, 2003; Gunther et al., 2006), the salience of an issue in the media will be perceived to be shaping the opinions of others (third-person effect). In the case of opinions on COVID-19 prevention behavior, which is hypothesized to be routinely underestimated, the salience of these issues in the media is expected to be linked to more accurate public opinion perceptions:

H2.2: *The more a topic is covered in the media (higher salience), the more accurate perceptions of public opinion on that topic will be.*

Methods & Data

Survey Data

This study is part of a larger project (see Geber et al 2024) and makes use of an original longitudinal dataset: an 82-wave longitudinal survey of the Swiss population with 36,667 observations and 20,882 unique participants. The sampling thereby was cross-sectional at

the week-level, meaning that every week starting on September 7th 2020, and ending on April 3rd 2022, a new sample of 425 Swiss citizens were surveyed. Fieldwork was conducted by the survey company LINK (part of YouGov).When weights are applied, the weekly surveys were representative of individuals aged 15 to 79 who lived in Switzerland, used the internet at least once a week for personal purposes, and were capable of completing a survey in German, French, or Italian (see Appendix 1 for details).

Media Data

Articles from the websites of the 22 Swiss legacy news media with the highest reach within each language region (i.e., German, French or Italian) were collected for the same period as the survey data (September 7th 2020 to April 3rd 2022). The sample covers a variety of media types, including both regional and mass market news outlets (Blick, 20 minuten, Le Matin, 20 minutes, Bluewin, Tio, Watson), subscription media (NZZ, Tagesanzeiger, 24 heures, Le Temps, Basler Zeitung, Aargauer Zeitung, Berner Zeitung, Corriere del Ticino, Le Nouvelliste, Luzerner Zeitung, Südostschweiz, St. Galler Tagblatt), and public broadcasters (SRF, RSI, RTS). Please see Appendix 6 for further description of the sample of outlets, including language, reach, and media type. As online news websites are the most used source for news in Switzerland, they are well suited to get a representative picture of the salience of issue salience in the Swiss public. The articles for the 22 outlets were accessed through the Swissdox@Liri database, which provides researchers access to the content of most Swiss publishers. We collected all articles that had at least one explicit reference to the pandemic, with a total of 124,850 articles that matched the keywords "*covid*" or "corona*" across the 82-week period of study.

Measurements

Actual Public Opinion

To measure actual public opinion on COVID-19 prevention measures, survey participants were asked, "How important do you think it is to [follow measure]?" for mask-wearing, use of the contact tracing app, and vaccination on a 5-point scale.

Perceived Public Opinion

To measure perceived public opinion, participants were asked, "According to you, how important is it in the view of the Swiss population [follow measure] in these situations?" for mask-wearing, use of the contact tracing app, and vaccination, on a 5-point scale.

Misperceptions of Public Opinion

To measure misperceptions of public opinion, actual public opinion was calculated at the weekly level. Following Dvir-Gvirsman (2015), perceptions of public opinion at the individual level were subtracted from the average actual public opinion, lagged by one week. Therefore, the variable captures, for each week, how far each individual was from estimating the actual public opinion of the previous week.

Minority/Majority Opinion Groups

To determine whether individuals belonged to the minority or majority opinion groups, the 5-point scale for opinions on measures was rescaled into three groups: against the measure (scale points 1 and 2), neutral (scale point 3) and in favor of the measure (scale points 4 and 5). The analysis centered on those either in favor or against the measure: for each wave, it was determined whether each individual's opinion belonged to the opinion majority (whether more people agreed with the individual's opinion) or the opinion minority (whether more people disagreed with the individual's opinion). For example, in wave 32, 85% of the Swiss population deemed masking to be important or very important, while only 7% deemed it to be not important or not at all important – therefore individuals that were supportive of the measure are said to be the opinion majority, while those critical of the measure are deemed the opinion minority.

Newspaper Readership

To measure newspaper readership, we used secondary data from the research institute, LINK, who once a year ask participants "Which of the following newspapers do you read regularly – that is, usually at least three out of six consecutive issues?" Participants were asked to select newspapers from a presented list of 12 titles covering the outlets with the greatest reach in each language region. Based on this information, we calculated regular newspaper readership.

Issue Salience in the Media

With a dictionary-based approach, we identified articles with at least one reference to masking (*maske*|*masque*|*maschera*|*maschere*|*mascherina*|*mascherine*), vaccination (*impf*|*vaccin*), and the tracing app (*tracing-app*|*tracing app*|*swisscovid*|*corona-app*|*covid-app*|*covid app*), covering the German, French, and Italian language regions. While simple, dictionaries have been shown to perform satisfactorily, and on occasion, better than more advanced NLP methods (Makhortykh et al., 2024, 2025), and are often times preferred due to the transparency inherent to their logic which is especially relevant for multilingual settings like in this study. For analyses, these count variables were scaled. Appendix 6 contains all details on the results of the content analysis, including raw counts per outlet per week per measure.

A validation against a random sample of 100 manually coded articles revealed strong accuracy of the method (0.99 for masking, 0.97 for vaccinations, 0.95 for the tracing-app). We additionally checked our measure against a common alternative for news salience: whether the issue is mentioned only in article titles. The two measures are significantly correlated and display similar overtime fluctuation (see Appendix 8 for details).

Descriptive statistics of all variables employed can be found in Appendix 3 Table A2.

Analysis

To address **H1.1**, perceived and actual public opinion are presented visually, along with a series of T-tests to determine the mean differences between these two groups. For **H1.2**, on differences between minority and majority opinion groups, the differences between minority and majority opinion groups are represented visually, along with T-tests to statistically test these differences.

For **H2.1**, a multivariate regression model was employed to assess the accuracy-enhancing effect of news readership on misperceptions of public opinion. Because a random effects model was deemed inappropriate (Appendix 4.1), we opted for a pooled OLS regression model to estimate the relationship between these variables while controlling for a number of potential demographic confounders, as well as wave numbers. Additionally, robustness tests were conducted by modeling the relationship 82 times for each variable – once for each wave.

Lastly, for **H2.2** on the relationship between media salience and misperceptions, we make use of the time-series nature of the data to construct dynamic regression models with autoregressive integrated moving average (ARIMA) errors (Hyndman & Athanasopoulos, 2021), which combine linear regression and ARIMA. The regression models were used to investigate the influence of the key independent variable – the salience of media reporting on a given measure – on the dependent variable of public opinion misperceptions. The ARIMA approach considered the temporal structure of the data and estimated the extent to which future values of dependent variables are affected by a series of past observations (autoregressive effect). This allowed us to analyze the data in a manner that accounted for both linear regression and temporal dynamics. It is important to note that the time series analysis models misperceptions at the population level as a product of aggregate media salience. This means that the analysis does not account for individual-level readership of the different news sites, but rather treats public opinion misperceptions and pooled measure salience as two pooled variables with a weekly measurement.

There is no clear conclusion as to the time needed for media effects to play out in the population (Luo et al., 2019). We therefore take an approach that combines both theoretical and empirical approaches. Theoretically, past work on agenda-setting has suggested an "optimal time frame of 1 week to 2 weeks for network newscasts, 3 to 4 weeks for newspapers;" we therefore include this range of time lags as possibilities. When there is no strong theoretical basis on which to rely, researchers have determined the appropriate time lag by using empirical measures of goodness of fit. Wells et al. (2019) highlight that "several information criteria are available to determine an appropriate number of lags in a time series model. The most common include the Akaike information criterion and Bayesian information criterion (Lütkepohl, 1984), which are used to compare the fit of models with different lag lengths." In our study, we followed this recommendation, also guided by the process recommended by Hynderman and Athanasopoulos (2021) of testing different lag specifications and comparing the AICc to determine which time lags are most appropriate. Similar approaches, incorporating and comparing multiple time lags, has been used in numerous studies (see Conway et al., 2015; Geber et al., 2024; Green-Pedersen & Stubager, 2010; Neuman et al., 2014). The models therefore considered up to four time-lags, capturing short-term effects on a weekly basis and long term effects on a monthly basis. The best-fitting models varied in the number of predictor time lags, ranging from one to four lags.

The final models included as many lags of the salience of media reporting as suggested by the AICc.

Replication materials canbe foundin the following repository: https://osf.io/gf9rh/

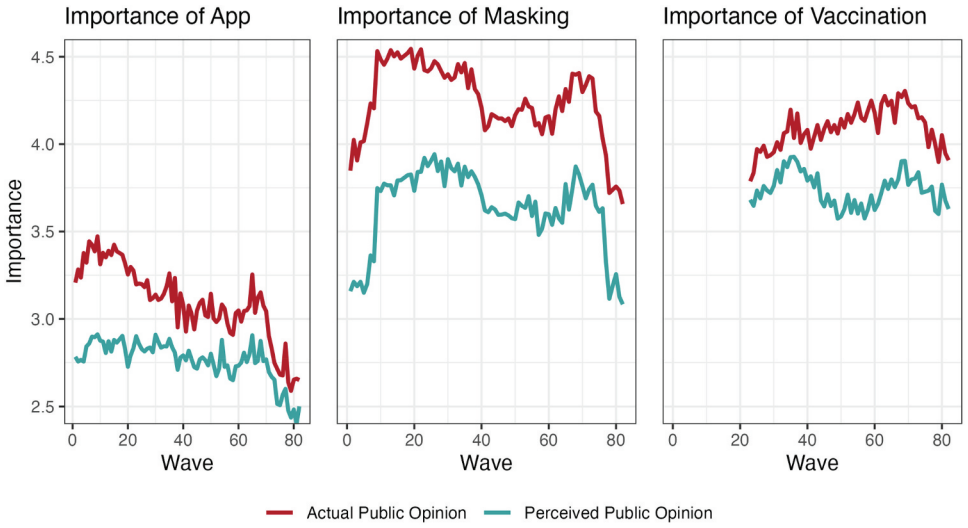

Figure 1. Differences in actual and perceived public opinion across three pandemic measures.

Results

To address **H1.1**, which expected participants to routinely underestimate the importance of prevention measures in the public's eye, actual public opinion and perceived public opinion are plotted over the 82-week period in Figure 1. We can see that public opinion differed significantly across the different measures: tracing app usage was of the lowest importance in the public's eye, with the highest score of 3.5. Masking, however, was considered an important measure, regularly above 4 on the 5-point scale, as well as vaccination.

When it comes to perceived public opinion, we can observe that throughout all waves across all measures, public opinion was estimated to be lower than it was in actuality. Employing T-tests across the entire time period, we can see that this difference was starkest for mask-wearing, with a statistically significant ($p < 0.001$) average gap (or misperception) of 0.61 on the 5-point scale. This was followed by the misperception of vaccination, with an average underestimation of 0.35 ($p < 0.001$), and usage of the contact-tracing app, with an average underestimation of public opinion of 0.33 ($p < 0.001$). These statistically significant differences across all panel waves allow us to confirm **H1.1** on the underestimation of public support for these measures. Nevertheless, it is important to contextualize these differences – on our 5-point scale, the smallest underestimation of 0.33 is only an underestimation of 6% of the scale, while the largest underestimation (for masking) accounts for about 12% of the scale. Therefore, while the differences are significant and consistently in the same direction, the degree of underestimation is not excessive. It seems that, generally, the Swiss population had a good idea of public opinion on these issues.

Figure 2 addresses **H1.2** on differences in the perception of public opinion between majority and minority opinion groups. Here, data is presented in the same manner as Figure 1, except that perceived public opinion is split between those in minority opinion groups (blue) and majority opinion groups (green). For perceived opinions on masking and vaccination, the pattern is clear: minority opinion groups are significantly worse at estimating public opinion, routinely further than the estimates produced by majority opinion

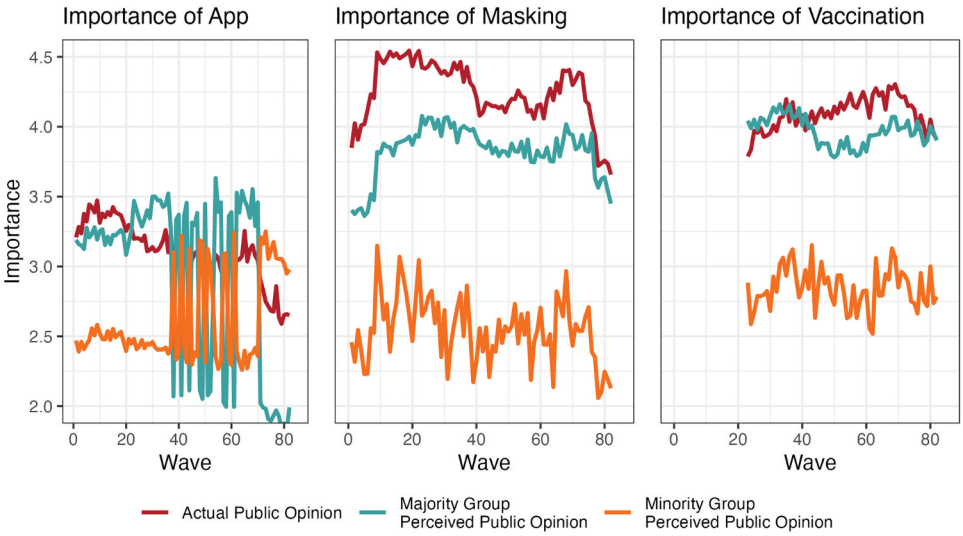

Figure 2. Differences between majority and minority opinion groups in public opinion misperceptions.

groups. This visual pattern is confirmed in statistical tests: on average, vaccination minority opinion groups underestimate public opinion by −1.25 on a 5-point scale, ten times the majority's average underestimation of −0.13 ($p < 0.001$). Larger differences appear for masking: minority opinion groups underestimated public opinion by −1.69, while majority groups did so at an average of −0.43 points ($p < 0.001$). For the contact-tracing app, visual inspection of Figure 2 presents mixed results. This is confirmed in statistical tests showing that on average, majority groups had an overestimation of 0.22 while the minority opinion groups' underestimation was −0.98 – a difference much smaller than that for masking and vaccination. To shed more light on the complicated pattern that emerges for differences between minority and majority opinion groups in the case of the app, we turn to Figure 3.

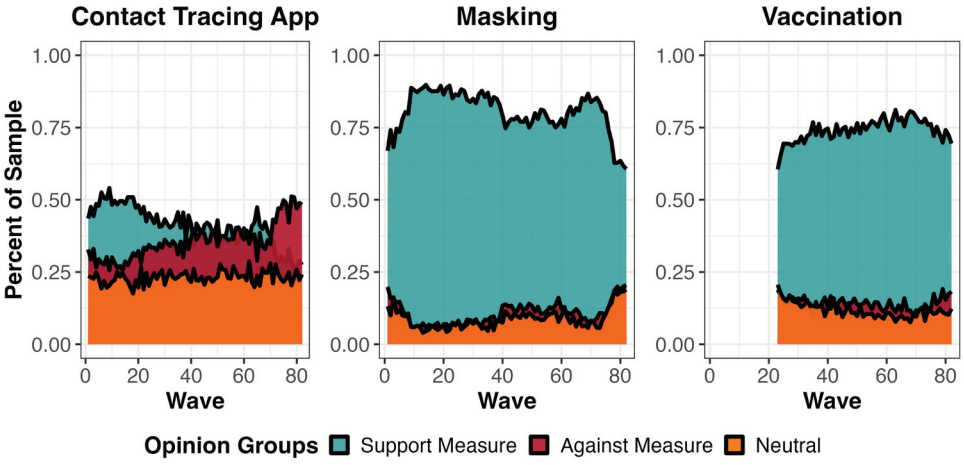

Figure 3. Distribution of samples supporting, opposing, and holding a neutral attitude towards each given measure.

Here, the percent of respondents supporting, opposing, and holding a neutral attitude toward each measure was calculated for each wave, illustrating which opinions were in the majority, and to what extent. For the contact tracing app it immediately becomes apparent why we see confusing patterns in Figure 2: starting in wave 38, it is not clear whether those opposing or those supporting the contact tracing app are in the minority group, leading to a confusing picture. Conversely, for masking and vaccination the picture is clear – it is those supporting the measures who are in the large majority group, averaging 75% of the population across most waves. This demonstrates that when no clear majority-minority distinctions are present, misperceptions of public opinion on the whole become more accurate. On the whole, these results therefore show that minority opinion groups' perceptions of public opinion were a lot more wrong than majority groups, allowing us to confirm **H1.2**.

Figure 4 displays the results of three OLS regression models predicting misperceptions at an individual level. Here, the dependent variable (misperceptions) is a measure of how far each individual's *perception* of public opinion is from *actual* public opinion of the previous wave. In the model, a positive coefficient is associated with more accurate perceptions of public opinion, while a negative coefficient is associated with more inaccurate perceptions. For the models 36,176 observations were used (instead of the full sample of 36,667), as 491 observations were dropped because of missing values. This was mainly due to Wave 1 observations being dropped, as there was no previous comparison wave to use in creating the misperception variables. Therefore, in terms of missing values by variable, there were 448 missing misperception values, 47 missing newspaper readership values, and 47 missing education values.

In these models, we include a variable that captures newspaper readership, allowing us to estimate the potential accuracy-enhancing effect of news readership on misperceptions, as

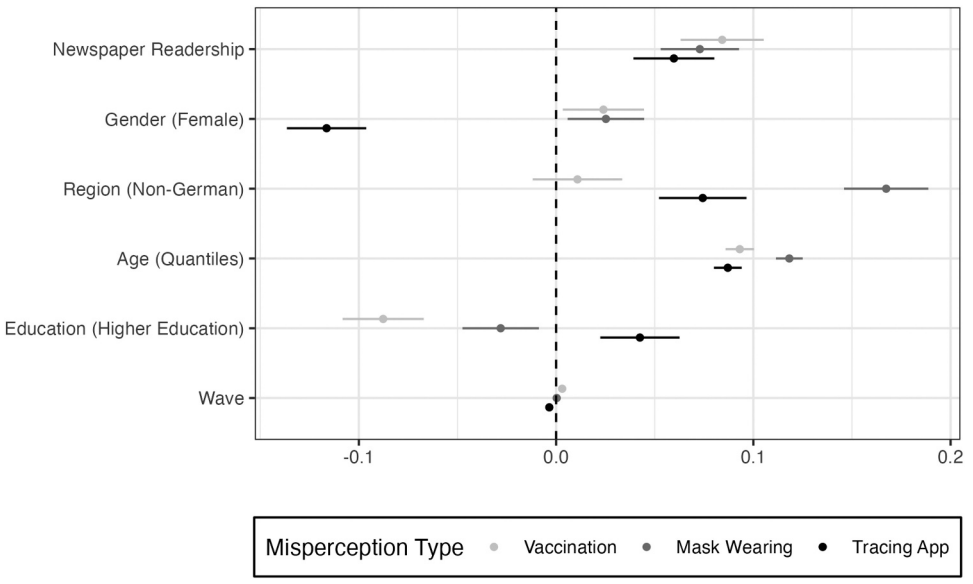

Figure 4. Regression models estimating the effect of individual-level variables on reducing misperceptions.

suggested by **H2.1**. We can observe that news readership has a positive effect on reducing misperceptions of public opinion: those regularly reading the news had estimates that were 0.06 more accurate for vaccination ($p < .001$), 0.073 for masking ($p < .001$), and 0.084 for app usage ($p < .001$). With these results, we confirm **H2.1**. The results of these models remain robust across five alternative specifications, including several heteroskedasticity-consistent standard error estimators (HC0, HC1, HC2, HC3) and random effects multilevel models that account for wave-level clustering (see Appendix 4). We conducted robustness checks by running the same model for each wave (82 separate models for masking and app usage; 52 for vaccine), and inspecting the coefficient of news readership. When it comes to the direction of the estimate, 50 of 58 were in the expected direction for vaccination, 75 of 82 for masking, and 72 of 82 for the tracing app. While all the statistically significant effects ($p < .05$) are all in the expected positive direction, only a handful (app: 14; mask: 13; vaccine: 8) of these coefficients were statistically significant (Appendix Figure A2–A4).

In addition to the effect of news readership, the models include several control variables: gender, region, age, and education, each showing distinct impacts on misperceptions. Gender reveals that women are more prone to vaccine misperceptions (−0.116, $p < .001$), but slightly less prone to misperceptions about masking (0.025, $p < .01$) and app usage (0.024, $p < .05$). Individuals from non-German-speaking areas are more likely to hold misperceptions about vaccines (0.074, $p < .001$) and masking (0.167, $p < .001$), though this effect is negligible for app usage. Age is positively associated with lower misperceptions across all topics: vaccines (0.087, $p < .001$), masking (0.118, $p < .001$), and app usage (0.093, $p < .001$). Education has a minimal but statistically significant negative effect on vaccine misperceptions (−0.003, $p < .001$), positive effect on app misperception (0.003, $p < .001$), but no impact on masking. These control variables, although not the primary focus of the study, contribute to understanding the broader patterns of misperception and provide context for the observed effects of news readership. More importantly, though, they serve to show that the effect of news readership is the only one (other than age) that consistently is associated with lower public opinion misperceptions at a statistically significant level.

Lastly, to address the relationship between public opinion and misperceptions, we turn to the analyses of media coverage. Figure 5 showcases the number of articles discussing each of the three measures throughout the 82 weeks covered by our data collection. Such a graph allows us to judge the salience of each measure in the media.

To address **H2.2** on the relationship between media salience and misperceptions, three ARIMA time-series models were conducted. Table 1 shows the results of the best-fitting models that were selected through the process detailed in the Methods section. We first inspect the models for masking.

Here, an increase in media reporting on masking is related to a positive and statistically significant ($p < 0.05$) effect on misperceptions of public opinion on masking at a three-week lag. This means that the increased salience of mask measures three-week prior is related to a decrease of misperceptions of 0.413, in line with expectations from **H2.2**. We see that there are statistically significant effects of the salience of the contact tracing app in the media on misperceptions of public opinion on this measure. We see that an accuracy-enhancing effect is manifested with a two-week lag – increased coverage of the app two-weeks prior leads to an accuracy increment of 0.492, a sizable effect. Nevertheless, at a four-week lag, the opposite takes place, a significant negative effect of −0.640. This means that increased coverage

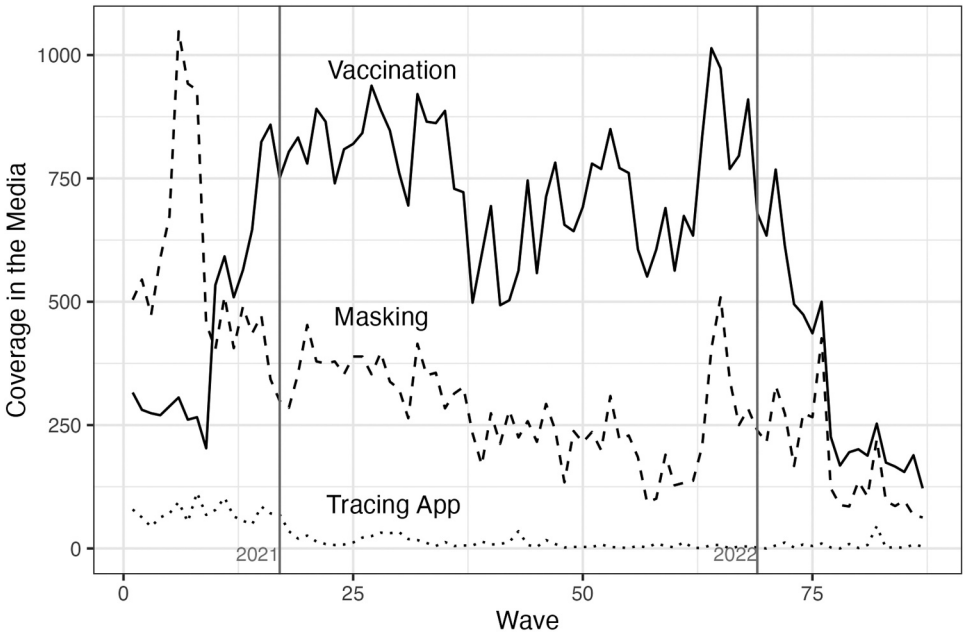

Figure 5. Salience of measures in the Swiss media over period of study.

Table 1. Results of ARIMA regression models modelling misperceptions on measures as a result of their salience in the media.

	Tracing App		Masking		Vaccination	
Regression Terms	β	p	β	p	β	p
Noise Terms						
ar1	−0,212	0,091	—	—	0,235	0,073
ar2	—	—	—	—	0,267	0,041
ar3	—	—	—	—	0,286	0,033
Control Variables						
COVID-19 Salience	−0,024	0,885	−0,198	0,38	−0,057	0,816
Duration of Panel	0,393	0,023	−0,187	0,379	−0,433	0,217
Salience of Measure						
1 Lag	−0,091	0,68	−0,383	0,061	0,013	0,933
2 Lags	0,492	0,049	−0,23	0,321	—	—
3 Lags	0,273	0,272	0,413	0,031	—	—
4 Lags	−0,64	0,004	—	—	—	—

of the contact tracing app four-weeks prior is related to an exacerbation of misperceptions, contrary to expectations of **H2.2**. Lastly, we see no relationship between media salience and vaccine misperceptions. As a robustness check, a series of placebo models were conducted in scenarios where no relationship was anticipated. Instead of analyzing the sample of participants who reported being news readers, we focused on those who stated they did not read the news. Since these individuals do not engage with news media, we did not expect changes in media salience to influence their perceptions of public opinion. Appendix 5.2 supports these findings, showing no statistically significant effect of media coverage salience on misperceptions of public opinion among non-news readers.

Discussion

This paper addresses the formation and evolution of misperceptions of public opinion during the COVID-19 pandemic in Switzerland. Because perceptions of public opinion toward health measures can have significant implications for individuals' willingness to follow these measures, studying the dynamics of misperceptions during the COVID-19 pandemic is crucial. Making use of 82 weekly survey waves asking participants about their actual opinions toward COVID-19 measures, as well as their perceptions of the opinion climate – and pairing this with a large-scale content analysis of media coverage throughout this same period – the paper accomplishes two main objectives. First, it lays out important descriptive insights into misperceptions of public opinion on key measures during the pandemic, as well as media coverage on these dimensions. Second, it brings together and empirically tests how theories on social norms and public opinion formation shape processes of misperception formation, proposing two complementary processes based on internal and external information processing. It therefore advances both our theoretical and empirical understanding of political communication during times of crisis.

The first set of findings relates to the direction of misperceptions. Do individuals over- or under-estimate support for public health measures during crises? Building on a long tradition of literature on social norms (Berkowitz, 2005), we expected individuals to generally underestimate public support for measures against the COVID-19 pandemic. We found substantial evidence supporting this proposition. For *every wave* in the data, individuals underestimated public opinion on all three measures addressed in this study: masking, vaccination, and using the contact tracing application. The biggest underestimation, however, was on masking – a puzzling result considering that of the three measures, masking is the only one publicly visible. Nevertheless, if one considers exemplification theory (Zillmann, 1999; Zerback & Fawzi, 2017), this large gap makes more sense. Visible instances of the population not masking when they were supposed to be were likely easier to recall, making these instances highly salient to individuals when judging public support for masking. Such exemplar effects were likely much less common on the tracing app and vaccination; measures that were not publicly visible.

Our second set of findings relates to the differences in misperceptions between opinion minority and majority groups. We find that individuals who held minority opinions on COVID-19 measures – i.e. opinions that were unpopular – were far more likely to be wrong in their predictions of public opinion, while opinion majorities' estimates were more accurate. This difference was found across all measures, and the effects were substantial. Additional analyses reveal, however, that for the vast majority of waves, minority opinion groups were those opposed to the measures. This raises an important question: is the increased misperception by opinion minority groups driven by opposition to the measures, or by opinion minority group belonging? It is likely a combination of both. Those opposed to the measures overrepresent their own opinions in their imagination of the public – nevertheless, the fact that they belong to a small group in society sharing these sentiments likely exacerbates this effect. This finding mirrors theories of opinion overrepresentation by small societal groups – "false consensus" by those who think that their unpopular opinion is shared by most (Dvir-Gvirsman, 2015; Wojcieszak, 2008). The identification of these patterns during the COVID-19 pandemic is highly informative for policymakers. It suggests

that individuals opposed to public health measures may genuinely believe their opinions are widely shared, potentially reinforcing their resistance to compliance. This insight is crucial for developing strategies to address such misperceptions in future crises, where public cooperation is essential.

This study also addresses the role that the news media can play in correcting misperceptions, finding tentative evidence that news media can help increase the accuracy of public opinion perceptions. First, regression analyses suggested that individuals who reported reading the news on a regular basis were less likely to hold misperceptions on public opinion. This effect was documented across all three prevention measures, suggesting that regular readership of the news was related to more accurate perceptions of public opinion on prevention measures. Such an effect is in line with past political communication work on the links between news consumption and political knowledge (Baum, 2003; Mutz & Soss, 1997): it is plausible that individuals received more information on public opinion on measures directly from the media, allowing more accurate approximations of public sentiment (Peter & Beckers, 2022). While this is an encouraging outcome, it also raises concerns given the increasing trend of news avoidance (Toff & Nielsen, 2022) and the growing reliance on alternative sources of information (de León et al., 2024)). This shift highlights a critical challenge: reengaging these audiences is essential to ensure accurate perceptions of public opinion, particularly in times of crisis or when addressing controversial issues. Policymakers and media organizations must develop strategies to draw these disengaged groups back into the fold of more reliable news consumption.

A second piece of evidence linking media and misperceptions of public opinion was provided by time series analyses estimating the effect of measure salience in the media to misperceptions. Here, the results were mixed. We see that media coverage of vaccination had no effect on misperceptions; media coverage on masking had a positive (accuracy-enhancing) effect on misperceptions; and media coverage on the contact tracing app had both a corrective and exacerbating effect on misperceptions of the contact tracing app. These mixed results are likely a result of the reality of the differences between the measures. This absence of a media salience effect on vaccination may be attributed to the highly politicized nature of the vaccine issue. Unlike masking or the contact tracing app, vaccination became deeply entangled in political and ideological debates, which may have made individuals' perceptions of public opinion more rigid and less susceptible to influence by media coverage. In other words, because the vaccine issue was already so highly polarized, media coverage may have had limited capacity to shift or accurate public misperceptions. This suggests that when an issue becomes heavily politicized, as was the case with vaccination, media coverage alone may be insufficient to influence public perceptions, highlighting the complex dynamics at play in how public opinion is shaped during crises. On the other hand, accurate perceptions of opinion on mask wearing were positively related to media coverage. This could be due to the fact that masking already stood as the issue with biggest misperceptions. Coverage of masking therefore had more space to offer corrective effects. Lastly, our time series modeling shows that media salience has an initial corrective effect on misperceptions of public opinion on the tracing app. Nevertheless, when looking at four-week lag in salience, we see a negative relationship: higher salience in the media is associated with higher levels of misperceptions. On the one hand, these contradictory effects could be related to the relatively low-salience of the issue in the media: as this issue became less discussed, flares in its coverage might have led to conflicting effects rather than corrective

ones. Such a conclusion speaks to the ambiguous nature of lags in communication processes, as "'real' lag lengths of media effects are often not known, especially [with] the increasing churn of the news cycle, which raises thorny new questions for researchers testing for media effects" (Wells et al., 2019, p. 15). On the other hand, such conflicting effects are a feature of time-series modeling, and many times reflect secondary processes such as a the series regressing to the mean or normalizing.

Results from these time series analyses build upon our previous findings linking regular news readership to accurate perceptions of public opinion: in some cases, we find a measurable relationship between coverage in the media and (mis)perceptions of public opinion on these COVID-19 policies. In both cases, the evidence points to the potential of the media to shape (and correct) what we think others think. It suggests that media organizations should carefully consider how they cover public health measures, as this coverage can have significant consequences for public perceptions and behavior. This has broader implications for how the media should approach coverage during future crises or other controversial issues, where the accurate communication of public opinion could play a crucial role in guiding public response and ensuring the effectiveness of policy measures.

While media coverage undoubtedly played a significant role in misperceptions of public opinion, it is indisputable that other external factors shaped these perceptions over time. Government communication campaigns, for instance, were likely pivotal in shaping public understanding, yet the effectiveness and reception of these campaigns have been understudied. Developments in the measures themselves, particularly the emergence of speculations and concerns about potential side effects of the vaccines, likely fueled misperceptions of attitudes toward the vaccines as vocal skepticism rose among small yet loud segments of the population. Furthermore, legacy news media are not the only information source that likely had an impact on misperceptions. The proliferation of "alternative" information sources, which often disseminated misinformation or unverified claims, likely further complicated the public's understanding of the opinion climate (de León et al., 2024). These sources, coupled with existing partisan and ideological attitudes, likely interacted in complex ways to influence how misperceptions were formed, reinforced, or challenged over time. Similarly, the use of social media likely fueled misperceptions. This is especially likely among opinion minority groups – the affordances of social media platforms allow for community building and communication of individuals who would otherwise not have had like-minded interactions offline (Hameleers, 2020; Hopster, 2021). Social media is therefore likely to exacerbate the strong false consensus effect that was identified in earlier work on public opinion misperceptions by online communities (e.g. Wojcieszak, 2008).

This paper is not without its limitations. The effect of the simple measurement of salience of measures in the media on both misperceptions of masking and tracking app use suggests there is more to uncover. While the simplicity of the analysis is by design (aiming to focus on salience in media coverage) it's also one of its weaknesses, as it does not distinguish between, for example, lack of adoption, or the communication of public opinion. Future research should follow this path, asking how different coverage and framing of measures have differential effects on perceptions of public opinion.

Such a more nuanced analysis might also produce time series insights that are easier to interpret, as the different effects identified in this study might be due to the differential effects of distinct coverage. Furthermore, the analyses employed here do not allow us to make causal claims about the relationship between news readership and misperception

correction – it could be the case that, for example, individuals who held minority views avoided established legacy news. Future research should aim to use (quasi-) experimental designs to understand how exposure to information on measures helps to correct misperceptions of public opinion on these measures. Lastly, as this study centers on the COVID-19 pandemic, it is impossible to extend our conclusions beyond this particularly timeframe. While we would like to think that it does provide broader insights about perceptions of public opinion during a crisis in general, the COVID-19 pandemic had a lot of unique features. Future research should therefore aim to extend the findings presented here to both non-crises times, as well as other crises that are different in nature.

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