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Dissemination in Social Media and Blogs of Public Health Information and Misinformation on Covid-19 Containment in Switzerland

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Abstract

Future epidemics are perceived as inevitable. Dissemination of information can enhance awareness, serving as an initial stride towards fostering desired epidemic-controlling actions among the public. In this study, a qualitative content analysis of Covid-19- and Switzerland-related social media and blog contributions points at a limited adoption of public health key messages and a negative reputation of the informing authorities. The authorities are to a marginal extent the source of information and a controversial sentiment towards vaccination emerges. In addition, we find a large share of disseminated information that is not conducive to pandemic containment. Within this, a substantial volume of misinformation emerges in statements on Covid-19-related issues. The misinformation consists primarily of unsubstantiated health consequences of the Covid-19 vaccination (both efficacy and side effects), and, less often, of trivialisation or denial of the pandemic. Furthermore, in a phase of political campaigning on a Covid-law referendum in Switzerland, social media contributors often portray pandemic containment as an undue, unlawful, or autocratic imposition on individual and collective freedom, and as a tool deployed for political repression. In addition, the pandemic or its containment are embedded in various conspiracies by users and containment measures are contested with religious, naturopathic or esoteric arguments.

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Keywords

Covid-19 vaccination, social media listening, public health key message adoption, misinformation, qualitative content analysis.

It is not a question of whether, but when, a new epidemic will emerge (Coccia, 2023b, Salmanton-García, et al., 2024). Public health authorities will again be tasked with monitoring, controlling and containment. A necessary requirement for successful containment is the compliance of a population with the advice, instructions and measures of the mandated authorities and expert panels. Communication of information can lead to increased awareness and is an essential first step towards the intended epidemic-containing behaviour of the public. The outbreak of the Covid-19 pandemic highlighted the importance of communication in public health emergencies. Recognizing its vital role, the World Health Organization (WHO) developed clear guidelines for communication in combatting the spread of Covid-19.

The study at hand does not investigate behaviour as an outcome of communication, campaign messages or other disseminated information. Nevertheless, in social media and blogs, the topics discussed and the opinions expressed can be regarded as important indicators of the acceptance of, and potential support for, public health policies.

In Switzerland, between 1 July and 31 December 2021 (2H 2021), waves of Delta and Omicron variants of the Covid-19 infection surged. Various vaccination campaign efforts and containment activities were implemented, including booster inoculations. In addition, a referendum on a Covid-law was conducted. This study investigates social media contributions and blogs published during 2H 2021 and focuses on the adoption of key messages of public health authorities (RQ1), the sources of the disseminated information (RQ2), the reputation of public health authorities and the sentiment towards containment measures (RQ3), as well as on the character and salience of information not conducive to vaccination and containment, such as legitimate questions and doubts, but also misinformation (RQ4). For the purposes of this study, misinformation[1] refers to "cases in which people's beliefs about factual matters are not supported by clear evidence and expert opinion" (Nyhan & Reifler, 2010, p. 305). The sample[2] consists of (Swiss-/German-language) Covid-19- and Switzerland-related contributions of individuals not professionally engaged with the pandemic during the field time 2H 2021.

The research findings contribute to the academic understanding of the challenges associated with health communication on epidemic containment and provide practical implications for future public health communication by stakeholders in and beyond Switzerland.

Relevant Research

Communication plays a key role in raising awareness, as highlighted in the transtheoretical model of behaviour change (Prochaska, 2020). It is regarded as vital in the managing and containing of crises and risks (Coombs, 2010, 2014). Kreps (2023) finds that "health promotion is a complex communication process that involves identifying and recommending adoption of the best available evidence-based guidelines for […] health risks" (p. 131). Guidelines can be condensed in key messages.[3] Effective communication may reduce anxiety and foster trust between the public and health authorities. Trustworthy information encourages adherence to guidelines and necessary precautions (Varghese et al., 2021). The reputation of health authorities is the perception of past actions and achievements and the current ability to deliver

valuable results to stakeholders. Reputation can be distinguished along dimensions, such as competence and trustworthiness. A positive reputation of authorities and sentiment[4] towards measures enhance the chances of successful crisis communication (Ali et al. 2020; Christensen & Lægreid, 2020).

The Covid-19 pandemic posed unprecedented challenges due to its rapid evolution and complexity (Funke et al., 2023, Hu et al., 2023. Rubinelli et al., 2023). Cooks et al. (2022) emphasize the significant impact of information exposure on behavioural responses to health risks. Addressing challenges through effective communication can mitigate confusion and resistance to Covid-19 containment measures among different societal groups.

On social media, people exchange user-generated information and thus establish a social relationship (Aichner & Jacob, 2015), blogs are regularly updated websites where contributors inform on a topic. Social media can play a significant role in crisis management, by delivering information, communicating with the public, and establishing public confidence in government policies (Liu et al., 2023). During the first full lockdown in Switzerland, *Instagram* was among the most relevant information sources for adolescents (Friemel et al., 2020).

However, studies point at the prevalence of misinformation regarding Covid-19 (Brennen, et al., 2020; Dhawan et al., 2021; Seo & Faris, 2021; Song et al, 2021), also in the Swiss and German-speaking context (Geber & Ho, 2023; Hameleers et al., 2021; Schaefer et al, 2022; Staender et al., 2021). A large amount of health-related information on *Twitter* is found to be misleading in the early stages of the pandemic (Kouzy et al., 2020). Friemel and Geber (2021) found that a high reliance on social media was linked to lower perceptions of others practicing and valuing social distancing and indirectly reduced compliance. Belief in conspiracy theories[5] reduced trust in authorities and prosocial behaviour as well as compliance with containment measures (Pummerer et al., 2022a). Scholars discuss the substantial extent of (social media) misinformation regarding Covid-19 vaccination and its consequences (Gisondi et al., 2022; Kim et al., 2022; Kricorian et al., 2022; Pierri et al., 2022), such as negative effects on attitudes towards health authorities and acceptance of Covid-19 containment measures (Kessler & Schmid, 2022). Frischlich and Humprecht (2021) discuss (dis-)trust in public authorities, media, etc. in various countries in the context of the Covid-19 pandemic crisis. The omnipresence of the problem is depicted in meta-analyses by de Saint Laurent et al. (2022) and Skafle et al. (2022). Misinformation can vary by community (Leuker et al., 2022) which has implications for debunking.[6]

Regarding Switzerland- and Covid-19-related content on the most-used social media, the uptake of public health information, the reputation of the informing authorities, the sentiment towards containment, as well as the character and prominence of misinformation constitute a research gap and are for practical purposes of applied public health communication not comprehensively outlined.

Research Questions

The following research questions have scientific relevance for public health and crisis communication and may provide a basis for redesigning communication efforts by stakeholders engaged in health crisis containment.

> *RQ1:* Which key messages are communicated by the Federal Office of Public Health (FOPH) regarding Covid-19 vaccination and pandemic containment-related topics, and to what extent are the messages adopted in social media?

The FOPH is the national public authority in Switzerland mandated with informing on Covid-19 to contain the pandemic. For investigation, the FOPH provided the key messages of its 2H 2021 (1 July to 31 December) communication campaign on vaccination and containment.

Adoption of a key message refers to concurrence with it by im-/explicit replication, in the content of a social media contribution or blog, The adoption of key messages is in itself relevant in health crisis communication. It can be regarded as an indicator of social media users' awareness, acceptance or support regarding containment measures.

> *RQ2:* Which sources of information can be made out in the social media contributions discussing the Covid-19 pandemic, containment and vaccination?

When large shares of the disseminated information originate from mandated authorities and expert panels such as FOPH, the chances of achieving the Covid-19 containment and vaccination campaign's objectives are enhanced. The analysis of explicit (visible) and implicit (inferable) sources of information in contributions thus sheds light on an important facet of information on Covid-19 in social media.

> *RQ3:* To what extent are the reputation of the informing public authorities and the sentiment towards Covid-19 containment measures positive in social media?

The reputation of informing authorities and sentiment towards vaccination and containment measures provide an indicator of the perception in social media of the campaign initiators and instruments. The reputation/sentiment index value reflects the relation between (weighted) positive and negative assessments.[7] Comparisons across the assessed subjects in the six eventful months of the observation period 2H 2021 deepen the insights.

> *RQ4:* Which issues are addressed in the statements that are not conducive to pandemic containment and vaccination?

A final focal point of the study is charting in detail the character and salience of information that is regarded as not conducive[8] to vaccination and containment, to close an apparent research gap and to enable the adaptation of communication strategies.

Data and Method

The FOPH formulated the key messages in German that were subsequently translated for reporting in cooperation with the researchers.

The user-generated contributions in social media were collected by a specialized media-monitoring tool of Ubermetrics Technologies.[9] Excluded sources were private news and non-public communication; password-protected forums or websites; and websites that take technical precautions to avoid being searched. The number of social media contributions on Covid-19 discussion was 26,471 in 2H 2021. The sampled platforms are the most-used social media in Switzerland from which data is available: *Twitter*, *Instagram*, *YouTube* (comments), and *Facebook*; blogs are included. The query was based on keywords: Covid-19 (and synonyms) AND Switzerland (and Canton names) OR public authorities like Bundesrat, @BR-Sprecher, BAG), whilst excluding social and online media of federal offices, (health)

authorities, public media, political parties, and other professional communicators and institutions, to investigate exclusively the contributions of users not professionally engaged with containment of Covid-19.

The population of contributions was chronologically sorted. From this population of 26,471 contributions, we drew from August to December per month a systematic random sample for manual qualitative content analysis. The representative sample consists of 1,963 analysed social media contributions. Next to the representative sample, we analysed the top 50 most-viral contributions of each month. This sample is not random and was not combined with the representative sample. To deepen insights and reflect on the contributions that may be regarded as influential, we compare the results of the representative sample to the findings of the most viral contributions.

The deployment of qualitative content analysis bases on work by Mayring (2000; 2015). Mayring (2000, pp. 3-5) introduces two different sequential procedural approaches. The conducted process consists first of inductive category development to chart the character of information, followed by deductive category application to analyse the salience (i.e. importance, prominence) of the developed categories.[10] In the first phase, the material is worked through, and categories are devised step by step. In feedback loops, the categories are adapted and checked for reliability. For example, we developed for the coding of statements in social media contributions a general category 'not conducive to containment goals' (1st level category/code), with as descending subcategories 'misinformation' (2nd level), 'vaccination: unsubstantiated health effects' (3rd level), and 'epilepsy' (4th level; see Figure 1).

In deductive category application (manual coding)[11], the unit of analysis is firstly the entire social media contribution (post, tweet, blog, comment). We assigned one value per contribution for the variables: the main source of information; the triggering event; the main topic; the actor or focus; and vaccination- or containment-conduciveness. The latter is a binary interpretative code that indicates the presence or absence of statements in the contribution that can be understood as not supportive of containment or vaccination. Secondly, the unit of analysis is the delimitable, internally coherent statement within the contribution. We weighted statements based on their position in the contribution.[12] Per contribution, multiple statements can be coded

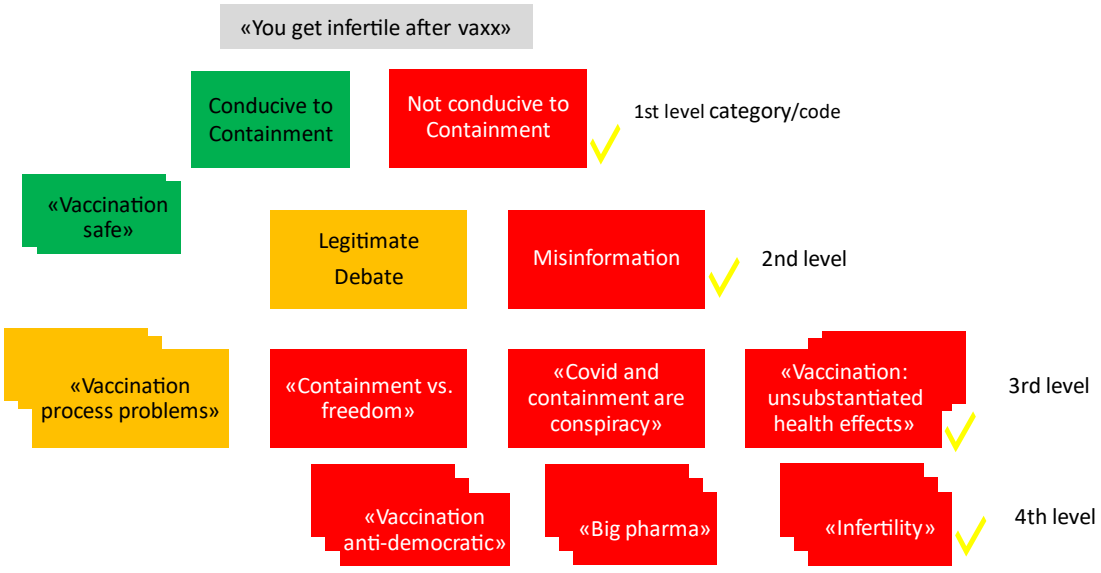

Figure 1. Category System for Content Analysis: Deployment to an Example

for the variables: issue-category; issue-specification; issue-subject; issue-validation. The latter is once more an interpretative code, the statement is either conducive, misinformative, or an argument in legitimate debates (i.e. not entirely conducive). Thirdly, per contribution, multiple positive or negative assessments (of investigated subjects such as vaccination X and public authority Y) can be registered. Fourthly, per contribution, multiple statements can be recorded as disseminating a specific key message.

Mayring (2015, pp. 125–129) lists different validity criteria: semantic, sample, correlative and construct validity criteria are met. The intra- and intercoder reliability scores (two coders, percent agreement) were satisfactory.[13]

Results

Conduciveness to Pandemic Containment and Vaccination Goals

To render an initial overview, we determined whether the content of a social media or online blog contribution can be regarded as conducive to the FOPH vaccination campaign goal: as many people as possible must be vaccinated in as little time as possible. If the content included statements rejecting, criticizing, or doubting vaccination or containment in general, in any form, we coded the contribution as not supportive of the goal.[14] Of the sample, 42% of the contributions is goal-conducive, but the largest share contains information that is not (entirely) supportive of containment or vaccination. The share of contributions with information conducive to vaccination/containment is per platform: *Twitter* 48%, *Instagram* 37%, *YouTube* comments 12%, and blogs 62%.[15] In the sample of viral contributions, two-thirds of the contributions do not include statements conducive to containment or vaccination.

In the next step, the statements on issues are investigated. The statement is coded as misinforming (share of sample: 52%), supportive of vaccination and/or containment measures (32%), or as part of an argument that can be regarded as justified, understandable, legitimate (16%), e.g., questions pertaining to the duration of protection of the full vaccination posed in October and November when information perceived as inconclusive and contradictory circulated. In general, this category consists of reasonable, non-polemic questions or criticism that does not disseminate misleading information but can nevertheless incite hesitancy on pandemic, vaccination, and other containment issues. In the sample of the 300 most-viral contributions, the pattern is similar.

Adoption of Key Messages (RQ 1)

At the beginning of the observation period in July 2021, the vaccination rate of the inhabitants of Switzerland lagged behind other European countries and was regarded (by the FOPH) as insufficient. The investigated key messages pertain largely to vaccination. In the sample, literal rendering of key messages is seldom encountered; implicit replication, as evident part or background of stated arguments, qualifies here as message adoption.

Overall, the share of contributions that incorporated at least one key message varied but can be considered as not optimal from the perspective of the crisis communicator FOPH. The adoption was strongest in July (41% of the sample of 200 contributions), and lowest in October (25% of 352 contributions). In Figure 2, we present the key messages, and the size of the bars indicates the key messages' share of the sample of statements that adopt at least one key message.[16] Of the most viral contributions, one-third disseminate a key message.

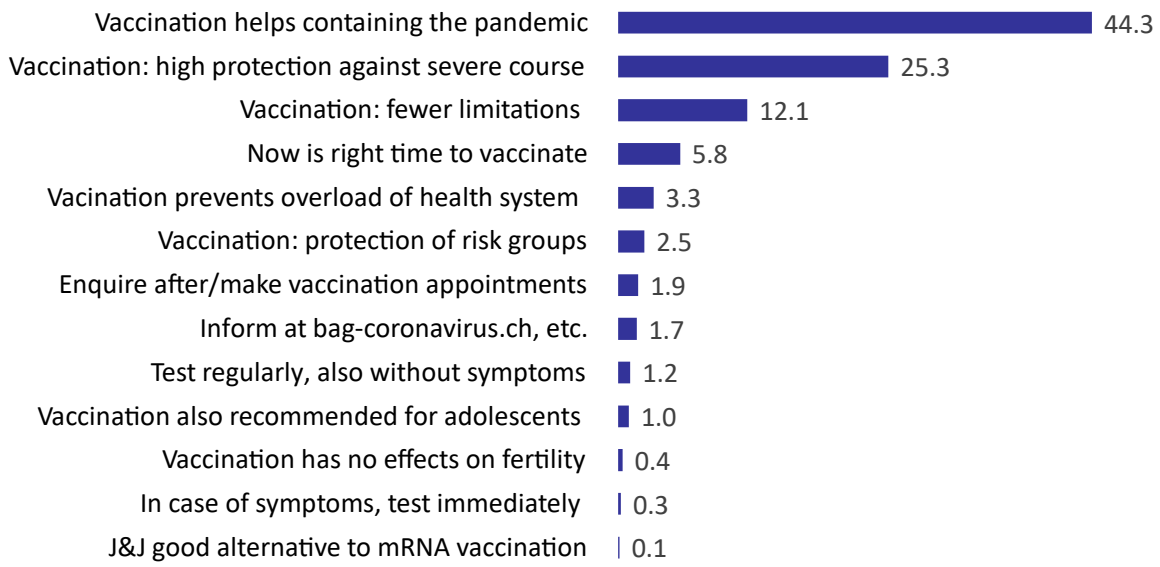

Figure 2. Key Message Adoption, July 1 – December 31, 2021
Note. Weighted index values, % of sample, *n* = 688 statements.

Containment of the pandemic by means of vaccination is the most adopted key message. Ego-centred messages appealing to people's individual health and freedom from restrictions (e.g. "Glad I can go places again")[17] are very prominent. The message "Now is the right time to vaccinate" gained prominence in the second half of the field time, when the deployment process of the booster (third) vaccination emerged as a topic. Messages emphasizing solidarity (protect risk groups and the health system) do not resonate very strongly. The various alerting, advisory and guidance messages have a marginal presence. Not or barely adopted messages are an all-clear on vaccination-induced infertility, and the Johnson & Johnson vaccine as a well-functioning alternative to mRNA inoculations. The same pattern of adoption of the (top) FOPH key messages emerged in the 300 most-viral contributions.

Sources of Information in Contributions (RQ 2)

Investigated in the study was user-generated content published by private users not professionally involved in Covid-related matters. Of the contributions, 55% do not disclose any acknowledged (explicit) or detectable (implicit) source of information.

As the mandated authority on informing to contain the pandemic, the FOPH (7%) and various authorities (4%) are not often the sources of information in the contributions. Public media rate second as the source of information (17%), before anti-containment or vaccination activists[18] (7%). The latter thus have an equally large share of voice, or influence, or control over coverage, as the FOPH, the public authority tasked with informing. Amongst the most viral contributions, the pattern is similar, but private users are even more often the source of information. Media and activists take second place as source, while the FOPH and other health authorities are seldom the source of information.

Regarding contributions containing misinformation, the main sources are users (55%), public media (often including Swiss and foreign 'alt' or 'resistance' media outlets; 16%), anti-vaccination and containment activists (14%), and the FOPH and authorities. Information of the latter (mostly figures on vaccination rates, hospitalisations, deaths etc.) is often presented by contributors without the original context.

Reputation, Sentiment: FOPH, Authorities, Vaccination, Covid-Certificate (RQ 3)

The sentiment towards the Covid-19 vaccination turns from neutral to negative in August and recovers only in November. Next to factual questions and doubts, persistent misinformation about efficacy and side effects exercises negative pressure on the sentiment. On November 28, a national referendum was conducted on a 'Covid law' that enables the authorities to continue to implement various pandemic containment and crisis management measures. The in social media very prominent opposition against the law criticises the vaccination, often by presenting decontextualised figures, and anecdotal evidence. In November, the pro-Covid-law share of the public seems to some extent mobilized (over 60% of voters supported the law) and communicates its opinions in social media with positive effects on the sentiment towards the vaccination. In December, the critics of vaccination are less active, allowing the sentiment to improve slightly further. In the most viral posts, the overall sentiment index value of vaccination is slightly positive at 1.3.

As the bearer of unwelcome news and the initiator of inconvenient measures in an ongoing public health crisis – and considering the venting nature of social media (Jalonen, 2014) – a positive reputation of the FOPH would be unexpected. Whilst marginally present (i.e. a moderate number of assessments), the FOPH reputation declines strongly in September to not recover anymore in the observation period. The multifaceted criticism consists primarily of arguments opposing the Covid law as well as misinformation. In addition, lamentations over the FOPH's alleged 'slow' vaccination process and 'flawed' policies and communication emerged.

Unspecified Swiss and foreign authorities are the culprits of virulent and flawed critiques of pandemic containment (e.g. "Them up there want us to bow to useless Corona measures") and are wrongly portrayed by online posters as originators and actors in conspirative repression ("Politicians and officials invented Corona pandemic to subdue us").

The Covid-certificate that proves inoculation becomes a subject of assessments in social media after an expansion of its deployment in public life in September. The certificate's sentiment index value is stably negative, Only the positive assessments of its deployment to enable 'normal' daily life and social events prevent a complete sentiment collapse. In December, the reputation / sentiment values of all investigated subjects improve slightly, mainly due to the reduced activity of critics (fewer contributions). This is accompanied by a since November stable degree of support for containment and vaccination and an increase in demands for stricter measures (e.g. mandatory vaccination) and faster implementation (e.g. vaccination of children). See Figure 3.

In the 300 most-viral posts, the FOPH, various authorities and the Covid-certificate all have a more negative reputation than in the representative sample; very few positive assessments emerged.

Information Not Conducive to Vaccination and Containment (RQ 4)

A large share of the content in social media in the observation period is not conducive to containment and misinforms. A specification of the issues mentioned in statements was conducted and Figure 4 depicts the salience of the issues regarded as misinformation in the sample.

The frequently communicated unsubstantiated health effects consist of false claims of the strength and duration of the vaccination efficacy ("It does not work anymore after period X, Y,

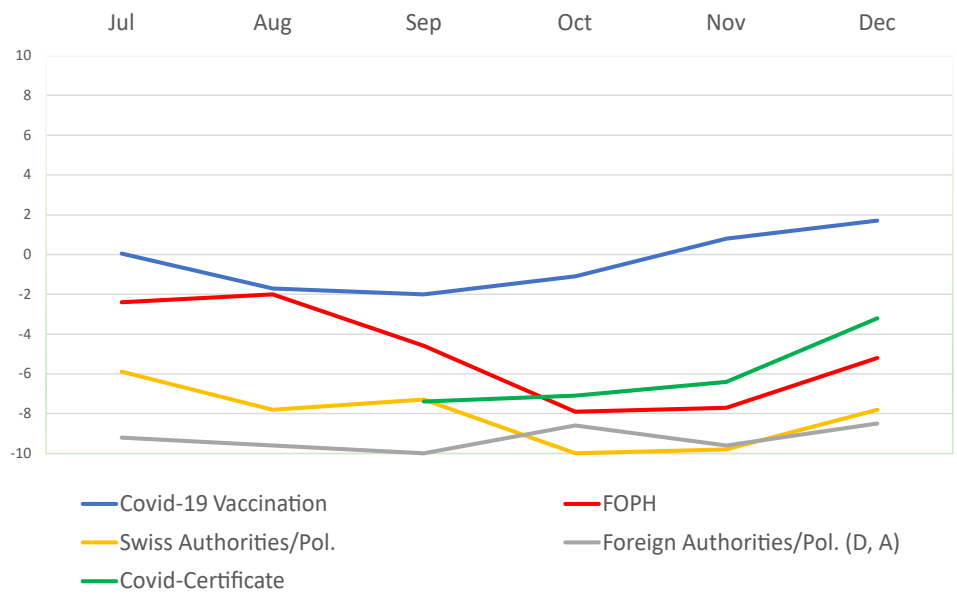

Figure 3. Reputation/Sentiment, July 1 to December 31, 2021
Note. Weighted index values, Jul. *n* = 227, Aug. *n* = 491, Sep. *n* = 595, Oct. *n* = 485, Nov. *n* = 540, Dec. *n* = 437 statements.

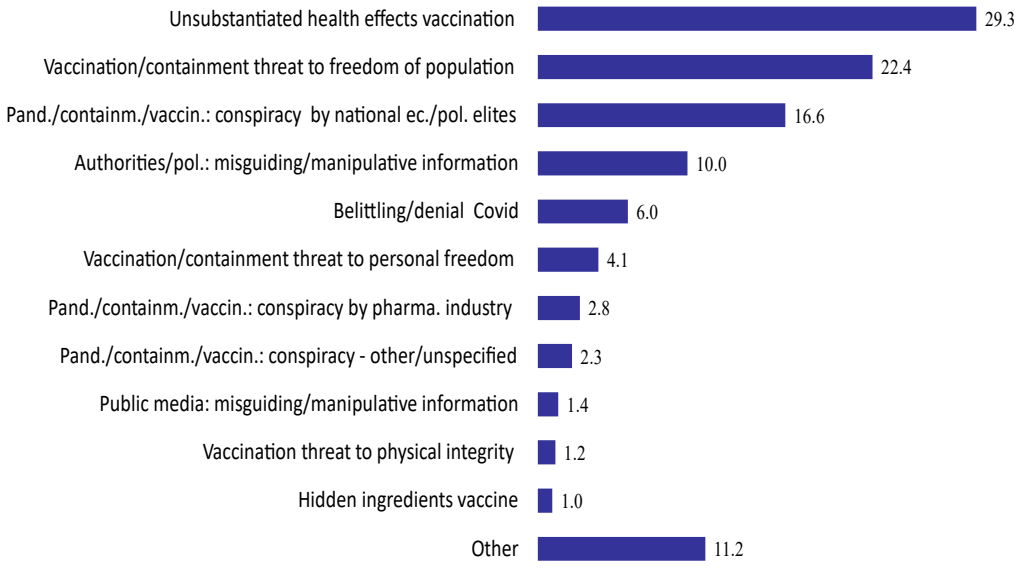

Figure 4. Misinformation: Types of Issues, July 1 to December 31, 2021
Note. Weighted index values, % of sample, *n* = 1528 statements.

Z") and its side effects and to a lesser extent of flawed statements on the impact of the Covid-19 infection itself. Vaccination and pandemic containment, wrongly presented as an imposition on or a threat to the collective and personal freedom of 'the people,' or as an infringement of human or constitutional rights ("It is inhuman / anti-democratic for them to tell people how to behave / to force people to vaccinate") are prominent topics. Conspirative notions about pandemic, containment and vaccination emerged; alleged perpetrators are the economic and political elites (often incorporating the public media), the pharmaceutical industry, an international elite, or foreign powers engaging in a geopolitical power play. Pandemic and vaccination are falsely portrayed as the product of misleading or manipulative information by

authorities or politicians and the public media. The severity – or even existence – of Covid-19 is misleadingly denied. A strand of flawed information argues against vaccination and containment with the preservation of natural and physical integrity ("Not in my body"), based on naturopathic, esoteric ("No interference with nature's way") or religious convictions ("God will solve it"; "it's God's will"). See Figure 4.

In the most viral contributions, the same misinformation issues are most prominent, but in comparison the focus is stronger on misleading allegations that the population's freedom is threatened and the public manipulated by authorities, than on (falsely overstated) negative health effects of vaccination.

From 1 September, to enhance the insights, the research team dissected further the information not conducive to vaccination or pandemic containment.

Table 1. Information Not Conducive to Pandemic Containment and/or Vaccination. Specific Issues: Vaccination Efficacy / Side Effects, September 1 to December 31, 2021

Issues & Statements	%
Vaccination efficacy / side effects	**30.2**
Misinformation "Vaccination: protection weaker than indicated by proponents"	6.2
Misinformation "Death often caused by vaccination"	3.1
Misinformation "ICUs filled up (only) with vaccinated persons"	3.1
Misinformation "Severe disease often caused by vaccination"	3.0
Unsubstantiated health effects of vaccination – other	2.6
Misinformation "Vaccinated persons are more infectious than unvaccinated ones"	2.1
Legitimate debate: health effects of vaccination	1.4
Legitimate debate: strength of vaccination protection	1.2
Legitimate debate: duration of vaccination protection	1.0
Legitimate debate: health effects of vaccination on children / youths	0.8
Misinformation "Vaccination long-term damage: severe disease"	0.7
Misinformation "mRNA damages / DNA changes after vaccination"	0.7
Misinformation "Alternative vaccination / therapy superior to deployed ones"	0.7
Misinformation "Vaccination: protection (much) shorter than indicated by proponents"	0.6
Misinformation "Vaccination: little / no protection against new virus variants"	0.6
Legitimate debate: motivation for vaccination of citizens	0.4
Misinformation "Immune system superior to vaccination"	0.4
Misinformation "Vaccination long-term damage: death"	0.3
Legitimate debate: vaccination health consequences at various specific groups	0.3
Legitimate debate: pro-vaccination despite legal reservations	0.3
Misinformation "Vaccination weakens immune system"	0.2
Misinformation "Vaccination causes infertility"	0.2
Legitimate debate: pro-vaccination despite health reservations	0.2

Note. Weighted index values, % of sample, n = 1,212 statements.

Efficacy and Side Effects of Vaccination. A very persistent issue is the false claim that the efficacy of vaccination is much smaller than the official sources (authorities), vaccine producers and vaccinated people claim ("Many got infected despite vaccination"). In October and November, as purported vaccination breakthroughs circulate in media, the issue gains prominence. Connected to strength of efficacy are flawed depictions of its duration, and of the vaccination's protection against new variants. Misinformation claiming that intensive care units (ICU) are filled by vaccinated patients accompanies the efficacy doubts. Other related issues are present as well: false claims of the vaccinated being more infectious than the unvaccinated ("They carry more of it and infect others") and of various alternative treatments ("X, Y, or Z protects one better against Corona").

A second cluster consists of misinformation on the side effects of vaccination, such as myocarditis, epilepsy, autism, asthma, cancer, immune system failure, changes in genetic makeup, and others, and falsely overstated deaths after inoculation. The few public statements on side effects by several medical practitioners are enthusiastically and frequently shared and commented.

A third cluster consists of the legitimate debate, the non-polemic, sincere questioning and critical discussion in the evolving crisis. Developments in late autumn led to insecurity on (the duration of) the vaccination efficacy, but more prominent are questions about inconclusive side effects, often for specific age groups, e.g. children (see Table 1).

Covid-19 Severity, Pandemic, Vaccine. Unsubstantiated information on the vaccine and the status quo of the Covid-19 pandemic is less present in the sample. Combined, the distorting belittling or outright denial of the disease and the pandemic, and the unwarranted comparisons

Table 2. Information Not Conducive to Pandemic Containment and/or Vaccination. Specific Issues: Pandemic, Vaccine, September 1 to December 31, 2021

Issues & Statements	%
Covid-19 pandemic	**7.5**
Misinformation trivialising Covid	2.1
Legitimate debate: balance of severity of Covid and necessity of measures	1.7
Misinformation "Covid is over / endemic, measures are redundant"	1.3
Misinformation "Vaccination strengthens / lengthens the pandemic"	1.0
Misinformation "Pandemic is inexistent"	0.8
Misinformation "Covid is similar to influenza"	0.4
Misinformation "Infection is superior to vaccination"	0.2
Vaccine	**2.8**
Misinformation "Vaccine (Pfizer, Moderna) is not tested"	1.4
Misinformation "Hidden / damaging ingredients of vaccine"	0.8
Misinformation "Poison in vaccine"	0.2
Legitimate debate: J&J vaccine is (sufficiently) tested	0.2
Misinformation "Vaccine hidden in nutrition"	0.2

Note. Weighted index values, % of sample, *n* = 1,212 statements.

to influenza epidemics have a moderate presence, followed by flawed depictions of the function of inoculation in containment of the pandemic ("It prolongs the plague"). Questions regarding the balancing act between the spread of the pandemic and containment measures are present in early autumn, as the numbers of infections are once more increasing ("Is measure X, Y, Z really necessary, despite all the costs?") See Table 2.

Containment Versus Freedom, Societal and Political Aspects. A prominent cluster of information issues depicts pandemic containment and vaccination as conflicting with, or threats to, political, collective or individual freedom of the inhabitants of Switzerland.

Containment of the pandemic, misleadingly portrayed as a tool or an element of political repression, is the most salient specific issue in the sample. Political repression was previously an argument regarding early non-pharmaceutical containment measures, and the campaign against the Covid law pushes this issue strongly to the foreground. It intertwines with depictions of democracy, constitution and freedom allegedly beset by measures like vaccination and a Covid-certificate. The allegation of 'mandatory vaccination' is a prominent issue, and contributors present it as a threat, or as a furtively implemented measure. In the final months of the year, users also portray it as a viable option.[19] Several posts depict a societal split between in- and outgroups: Users portray the 'discriminated' unvaccinated as a patriotic minority opposing a repressive elitist government and their many vaccinated 'serfs'.

Table 3. Information Not Conducive to Pandemic Containment and/or Vaccination. Specific Issues: Pandemic Containment Measures: Societal / Political Aspects, "Freedom," September 1 to December 31, 2021

Issues & Statements	%
Pandemic containment measures: societal / political aspects, "freedom"	**39.4**
Misinformation "Pandemic containment, vaccination are political repression"	8.7
Legitimate debate: containment measures are too little / weak / late	5.4
Misinformation "Containment, vaccination are threat to freedom of population"	4.8
Misinformation "Containment, vaccination are threat to democracy, unconstitutional"	4.5
Misinformation "Containment, vaccination are threat to personal freedom"	3.5
Legitimate debate: vaccination vs. self-determination	2.1
Misinformation "(Furtive) mandatory vaccination"	2.0
Misinformation regarding unvaccinated vs. vaccinated (in- vs. outgroup)	1.5
Legitimate debate: 'other' containment measures are more useful	1.4
Legitimate debate: Covid-certificate and discrimination	1.3
Misinformation "Containment, vaccination: comparisons to national socialism / fascism"	1.2
Legitimate debate: objectives, strategies of authorities	1.1
Legitimate debate: objectives, strategies of pharmaceutical industry	0.6
Insults of containment actors	0.5
Misinformation "Covid-certificate is useless"	0.4
Legitimate debate: booster vaccination process	0.4
Legitimate debate: pro-Covid-certificate despite legal reservations	0.1

Note. Weighted index values, % of sample, n = 1,212 statements.

In the realm considered legitimate, criticism of the marginal implementation and lack of effect of the containment measures is most present, and contributors propose stricter or alternative measures that have demonstrated effectiveness elsewhere. Present to some extent are other cogent discussions concerning the admissibility of discrimination exercised with the Covid-certificate, and the careful balancing of incentives to vaccinate versus principles of individual self-determination. In addition, users challenge the objectives of public (health) authorities and vaccine producers with various seemingly sensible arguments. This content, although understandable and not unreasonable, is from a vaccination-campaign point of view not regarded conducive to immediate goals (see Table 3).

Containment and Conspiracies. Notions of conspiracies have a moderate presence in the sample. Most prominent are false accusations against the national (political, economic, cultural) elite (of Switzerland, but also Germany, Austria) that conspires to reap benefits from the pandemic and its containment. Allegations of an international elite conducting a premeditated cleansing of the world population are present. In addition, the pharmaceutical industry conspires to maximally exploit the pandemic: false allegations range from manufacturing and spreading the virus and sustaining the pandemic, to producing overpriced, harmful or ineffective vaccines. Other alleged conspirators are in paranoid fantasies the World Economic Forum attendees ('Davos'), and various groups headed by Gates, Soros, and their ilk. In these flawed arguments, the virus is purposely spread, and the vaccine is developed and deployed for extermination, surveillance, enslavement, or profit. Falsely blaming the pandemic and containment on conspiring foreign powers is to a marginal extent present. A different form of conspiracy is driven by religious, naturopathic, or esoteric convictions: the 'others,' the non-believers, conspire to act against the intention of higher powers, fate, or nature (see Table 4).

Table 4. Information Not Conducive to Pandemic Containment and/or Vaccination. Specific Issues: Conspiracies, September 1 to December 31, 2021

Issues & Statements	%
Pandemic, containment, vaccination: conspiracy	**9.3**
Misinformation "Conspiracy by economic / political elite"	2.6
Misinformation "Conspiracy" (unspecified perpetrators)	1.9
Misinformation "Conspiracy by pharmaceutical industry"	1.3
Misinformation "Cleansing of world population with pandemic, containment and/or vaccination"	1.2
Misinformation "Conspiracy by WEF elite" (Schwaab etc.)	1.0
Misinformation "Conspiracy by international elite, VIPs" (Gates etc.)	0.7
Religious / sectarian / esoteric health convictions against containment, vaccination	0.5
Misinformation "China / Russia / USA / Israel conspiracy behind pandemic, containment"	0.1
Misinformation "Virus purposely produced by China / Russia / USA / Israel"	0.1

Note. Weighted index values, % of sample, *n* = 1,212 statements.

Containment and Communication. A prominent type of issues consists of false allegations of manipulation by authorities with dishonest information regarding the pandemic, containment, and vaccination. The public media are accused of the same practices. The legitimate debate has presence as well: the volatile course of the pandemic and the seemingly incomplete state of knowledge on the disease and its remedies lead to discussions on unfulfilled information needs at several points in time in the observation period (see Table 5).

Table 5. Information Not Conducive to Pandemic Containment and/or Vaccination. Specific Issues: Information, September 1 to December 31, 2021

Issues & Statements	%
Pandemic, containment, vaccination: communication of information	**7.3**
Misinformation "Authorities / political parties / politicians: manipulative information"	4.2
Legitimate debate: credibility of authorities' figures / recommendations – other	1.4
Legitimate debate: credibility of authorities' numbers of infections, hospitalizations	0.7
Misinformation "Public media: manipulative information"	0.6
Legitimate debate: credibility of authorities reg. vaccination rate	0.2
Legitimate debate: credibility of authorities reg. deployment of certificate	0.2

Note. Weighted index values, % of sample, *n* = 1,212 statements.

Discussion

The investigation of social media content provides relevant and, in this case, also disquieting findings. Several indicators (marginal adoption of the key messages of authorities that are also seldom a main source of information in social media contributions) do not point at a considerable influence of public health authorities on the public opinion disseminated on the platforms and blog sites. The lack of impact of the main pandemic containment institutions on users' content coincides with a negative reputation of the FOPH and other (public health) authorities. Hornmoen and McInnes (2018) observed that authorities traditionally pursue vertical crisis communication. Russell's (2016) "networked public sphere" (p. 159) singles out the characteristic that "stories and sources gain prominence based on relevance and credibility rather than their connection to the powers that be" (p. 159). Under the assumption that public authorities in health crisis situations for several reasons intend to act in the interest of at least large shares of the general population, the latter facet proves disadvantageous to pandemic containment in Switzerland.

Congruent to studies of social media in various countries, a substantial share of information not conducive to pandemic containment goals, including misinformation, is detected. Many studies focus on *Twitter*; the inclusion of other important platforms in the study at hand fills a research gap. Consistent with, for example, Staender et al. (2021) and Kessler et al. (2022), misinformation is (very) prominent in Covid / Switzerland-related social media content, and the term "infodemic" (Starbird, 2020), although to an extent misleading (Harper & Attwell, 2022), might apply.

A quick overview shows that, in line with Brennen et al. (2020), reconfigurations of information pertaining to health consequences of vaccination (efficacy and side effects) are more prominent than baseless fabrications. The former are often seen as more problematic in

health communication than the latter. Switzerland belongs to the countries that have introduced fewer and shorter non-pharmaceutical measures of pandemic control, and deployed non-compulsory vaccination policies (Coccia, 2023a). Consequently, regarding the arguments of freedom being under siege, repression and manipulation by public health authorities and the media, we find that fabrications are salient in Switzerland-related social media contributions. Liu et al. (2023) see the greatest barriers to the compliance with Covid-19 containment measures stemming (in the U.S. under Trump) from politically motivated and – regarding containment – flawed arguments. A fair number of posts report on or invite engagement in anti-containment activities like rejection of and demonstrations against containment measures such as vaccination. The study thus confirms findings of Das and Ahmed (2022): Although this content is not in itself misinformation, it is not conducive to containment and vaccination goals.

The main authority mandated with informing on pandemic containment has limited impact in the topical discussions in social media during the observation period. From a crisis communication campaign perspective, the adoption of key messages in the observation period is suboptimal, but that is not entirely unexpected considering the events in the period and the advanced stage of the pandemic. From a 'normal' strategic, corporate, organizational or public health communication perspective, the resonance of the most adopted key messages is not disappointing. Achieving pandemic containment through vaccination has a general nature, is a truism to many contributors, and is very often implied in vaccination-conducive statements in discussions. Protecting oneself against a severe course of Covid and freeing oneself from restrictions by inoculating are often adopted by users; messages that appeal to self-interest resonate well. Authorities often emphasized solidarity (with risk patients or the national health system) during the field time of the study, but the adoption of these messages is limited. These findings counter the claim of Chong et al. (2023) that, in order to strengthen agreement and compliance with Covid-19 containment measures, public health communication should provide prosocial arguments, as well as scientific evidence, social norms and consensus that enhance recipients' self-efficacy.

Topicality has a positive influence on acceptance of messages: contributors adopt the right time to vaccinate in discussions on the booster vaccination. Guidance, concrete advice, and information-sourcing messages are on occasion disseminated; the messages have little potential for controversy which may have reduced the uptake. Important messages regarding the vaccination of youth, the absence of effects of vaccination on fertility, and the J&J vaccine do not resonate. The ignoring of the latter is remarkable in the light of the often-alleged dangers of mRNA vaccines in social media and the FOPH campaign to promote this type of vaccination.

The findings of the study substantially deepen the categorizations of Covid misinformation (Song et al., 2021; Guan et al., 2021, Seo & Faris, 2021) – in particular regarding vaccination – and establish the relative importance of the various misinformation types. Expanding as well as detailing current findings (e.g. Grimes, 2021; Skafle et al., 2022; Zerback et al., 2020) pertaining to German-speaking Switzerland, the misinformation consists primarily of unsourced content generated by users and pertains firstly to unsubstantiated health consequences of the Covid-19 vaccination (efficacy, side effects) and the disease or pandemic itself (trivialization, denial). The salience of types of misinformation diverged from the initial impressions of stakeholders. Secondly, in Switzerland-related social media contributions, pandemic containment and vaccination are often instrumentalized for political point-scoring and inappropriately rendered as an undue, unconstitutional, or undemocratic and

discriminatory imposition on the individual and collective freedom of citizens and as an ingredient or a tool of political repression. Walter et al. (2023) find politicization of science concerning pandemic containment measures accelerating in a U.S. far-right platform during the pandemic. Containment and vaccination are at times embedded in various conspiracies supposedly conducted by the societal, political, and economic elite, the pharmaceutical industry, or foreign powers, and are rejected by users with religious or esoteric arguments. In line with Bolsen and Palm's (2022) findings for the U.S., a large share of the information not conducive to vaccination and containment is an element of, or is evoked by, political instrumentalization, which here becomes very prominent in the buildup to a referendum in the field time. Discussing the topic seems an effective device in the public arena for many actors with goals other than pandemic containment.

German-speaking Switzerland is geographically, lingually and, to an extent culturally close to Germany. Schwarzenegger and Wagner (2023) see in Germany 'resistance' movements deploying "commemorative populism" on *Telegram*. A degree of overlap with the arguments posed by the opposition to vaccination and containment in this study's sample emerges: comparisons to previous epidemics, the uniqueness of Switzerland, conspiracies by Swiss actors and media, and defamation of Swiss political, scientific and media elites emerged.

Implications and Limitations

Depending on one's perspective, the results of the study depict either a suboptimal situation or indeed an alarming state of public health communication in Switzerland in the observed stage of the pandemic. The salience of misinformation is regularly debated in the public arena and observers often single out the most outrageous misinforming contents. In this study, the misinformation is substantial but concerns often potentially debunkable issues – vaccination efficacy and side effects are (possibly) for larger groups of social media-using recipients of information not entirely beyond correction. Quantitative comparisons are not possible, but conspiracy theories surrounding Covid-19, containment, and vaccination seem less salient here than in other studies (e.g., Pummerer et al., 2022a; Schaefer et al., 2022; Ziegele et al., 2022).

At this point, an important limitation of the study must be noted: the investigation pertains to accessible, 'open' social media, where users conduct an extent of self-censoring. In addition, 53 contributions originally sampled for analysis were removed by the platform administrators. In closed platforms and messenger and chat apps, the misinformation might be of a different nature and even more prominent during the field time.

The societally undesirable results of the study evoke additional investigation, also of the effects of timing and accuracy of information (Memenga et al., 2022), and of interventions countering misinformation (Janmohamed et al., 2021; Kruijt et al., 2022, Pummerer et al., 2022). Research may consist of further probing and typologizing misinformation, providing, as Caulfield (2020), Harper et al. (2022), Thaker (2021), and Vivion et al. (2022) imply, a basis for evidential persuasive counter information.

Individuals and communities indicate a willingness to readily embrace and adhere to the communicated information regarding Covid-19 containment measures and to comply with the guidance of health authorities. Others indicate resistance to measures due to scepticism or perceived encroachments on personal freedoms, which will have behavioural consequences.

As may be inferred from data of 2H 2021, compliance may also have decreased over time, particularly during periods of low case numbers or when authorities ease restrictions.

The sheer volume of information about Covid-19 containment can induce anxiety (McLaughlin et al., 2023). The rapidly evolving state of research and disseminated information can contribute to confusion and uncertainty. In addition, individuals rely on sources that align with their salient beliefs, thereby yielding to confirmation bias (Malthouse, 2023). Trust in public health authorities plays a pivotal role in how information on Covid-19 containment is received (Petersen et al., 2021), and the room for improvement is shown as large in this study. Vaccinations are generally under siege in the German-speaking public arenas, and timely, serious debates on the pros and cons of inoculation may enhance trust, as Petersen et al. (2021) indicate. The public authorities' lack of impact on social media content, and their negative reputation indicate a strong call for action in the realm of trustworthiness and transparency of information and its sources.

The public media emerge as a prominent source of information. The media types, outlets, and platforms as well as the presentation of information can also exert a noteworthy influence on its reception. Sensationalised or misleading information may lead to the spread of misinterpretations and heightened emotional responses. Moreover, the affiliation with the medium or platform impacts the way information is received. The relevance of media relations efforts by public health institutions must thus once more be highlighted.

Prevailing community norms influence individuals' reception of Covid-19 containment information in addition. Cultural or social norms can affect adherence to specific containment measures. Social circles have the power to sway people toward adopting certain behaviours or beliefs that are common among their peers. The level of education may lead to different interpretations and responses to Covid-19 containment information, depending on individuals' understanding of scientific concepts (Paakkari & Okan, 2020; Seng et al., 2023). Political or ideological affiliations can shape the reception of information, with individuals aligning their views on containment with political beliefs.

Recognising diversity in reception is thus crucial for informing effective public health communication strategies. The reception of Covid-19 containment information can be highly variable among individuals and groups. This variance is also rooted in the complex interplay of cognitive, emotional and sociocultural factors (Barello et al., 2021; Leukert et al., 2022; Paakkari & Okan, 2020; Seng et al., 2023). It necessitates adapting the prioritisation and tailoring of messages to address specific concerns, nurturing trust in health authorities, and employing clear and consistent communication as vital components of successful containment efforts of a pandemic or other crisis (Kim et al., 2023; Koinig, 2023; McLaughlin et al., 2023; Petersen et al., 2021). Next to tailored communication of information and efforts that incite goal-conducive horizontal flows of information, the sheer volume of information circulating in a large public health crisis like the Covid-19 pandemic might require automation of tracing of online misinformation and responding to its most prominent forms (Hayawi et al., 2022).

Notes

1. The distinction between misperceptions, mal-, mid-, dis- and misinformation bases (usually, often) on the intent behind the dissemination of false information and / or on the extent of its inaccuracy. This distinction cannot be made in this study and is beyond its

aims. The various types of communicated, unsubstantiated information can invite conclusions or opinions, etc. that in turn may evoke behaviour not conducive to containment goals.

2. The analysed sample is representative of the total population of contributions mentioning the search terms published on *Twitter* and *Instagram*, as *YouTube* comments, or as blogs. Due to obstructions to data retrieval, *Facebook* posts represent less than 1% of the analysed sample.
3. Messages "that an organization desires to convey about […] its agenda, wishes its publics to know, accept, and/or take action on. They also reflect what organizations want third parties […] to relay to their audiences" (Carroll et al., 2014, p. 389).
4. Tone, attitude, emotion, as expressed in text (description based on Zhao et al., 2016).
5. Pummerer et al. (2022a, p. 49) deploy a definition of Goertzel (1994): "[C]onspiracy theories are explanations for events based on powerholders' secret, malevolent arrangements".
6. Debunking is "presenting a corrective message that establishes that the prior message was misinformation" (Chan et al., 2017, p. 1532). Caulfield (2020), Lewandowsky et al. (2020), and Memenga et al. (2022) list and describe debunking strategies and methods.
7. In short, if the accumulated positive assessments outweigh the negative statements on the subject, the index value is positive, and vice versa. Reputation value '0' indicates an equal weight of positive and negative assessments.
8. In rare cases of doubt on the conduciveness. the qualification was assigned after consulting authoritative reports and experts.
9. Ubermetrics Technologies GmbH (renamed Unicepta) is a spin-off of the Humboldt University of Berlin and is financed by the High-Tech Gründerfonds.
10. Mayring (2015) regards quantification of the salience of qualitative codes as an integral tool of qualitative content analysis.
11. Manual coding by culturally proximate and informed researchers enables correct and context-based interpretation of figurative language (irony, sarcasm, hyperbole) and vernacular texts, as well as emojis and figures.
12. Weighted index values: weight score 1 (no weight) indicates location of the statement in the lower and middle sections of text, weight score 2 indicates placement in the higher sections of text, and weight score 3 indicates that the statement is positioned at the top of the contribution (headlines, titles, first sentences, bold or larger font). The researchers only assigned weight 3 to statements in larger contributions (on occasion in blogs and on *Instagram*, but was not assigned for *Tweets*, and *YouTube* comments).
13. The intercoder reliability scores (percent agreement) for various random samples of a total of 190 contributions are 100% for first-level and exceed 90% for second-level categories. The scores are sufficient for the remaining levels of categories (exceeding 80%). The intracoder reliability (80 contributions) shows similar scores and is slightly higher for third- and fourth-level categories.

14. Petersen et al. (2021) find transparency regarding undesirable side effects of vaccination enhancing trust whilst reducing acceptance. Factual non-polemic or reasonable arguments pertaining to downsides of vaccination are in this study interpreted as colliding with the element of urgency included in the FOPH vaccination goals.
15. Conducive blogs often do not discuss the pandemic as a main topic but indicate compliance with containment measures and/or support for vaccination.
16. The point estimates in Figure 1 and subsequent bar charts and tables have a margin of error of magnitude $1.96 \times \sqrt{\frac{\hat{p}\ (1-\hat{p})}{n}}$ where $\hat{p}$ is the estimate of the proportion and n is the sample size. For example, for the adoption of the key message "Vaccination helps containing the pandemic", the margin of error is $1.96 \times \sqrt{\frac{0.443\ (1-0.443)}{688}} = 0.037$ or 3.7%.
17. All quoted statements were expressed in (Swiss-)German and were translated by the project coders.
18. As 'activists' are regarded those contributors that identify themselves in profile names, text, or images not as private individuals or profiles (name, nickname), but as members or supporters of groups, organizations, campaigns, goals, or actions, with names signifying opposition against containment, vaccination, Covid-certificate, other measures, or the Covid law that was the subject of a referendum in November 2021.
19. Propagating mandatory vaccination is not coded as misinformation, or as negative assessment of vaccination.

Data Availability Statement

The data that support the findings of this study are available at data repository Harvard Dataverse (https://doi.org/10.7910/DVN/IXN7A8).

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Conflict of Interest

No conflict of interest is reported by the authors.

Ethical Approval

This research project does not require formal ethical approval as per the requirements and guidelines of University of Applied Sciences and Arts Northwestern Switzerland, School of Business, as it does not involve human participants, animals, or sensitive data.

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