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Citation for published version:

Pagliari, C, Klafke, GF, Camelo, AP, da Silveira, VD & Evans, J 2023, 'The Covid-19 app that lasted two weeks: how technology may embody controversial public policies for health care and why we should worry about it', *Oxford Open Digital Health*, vol. 1, oqad004. <https://doi.org/10.1093/oodh/oqad004>

Digital Object Identifier (DOI):

[10.1093/oodh/oqad004](https://doi.org/10.1093/oodh/oqad004)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

Published In:

Oxford Open Digital Health

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The Covid-19 app that lasted two weeks: how technology may embody controversial public policies for health care and why we should worry about it

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Abstract

This paper describes the case of a Brazilian government app (TrateCov) that was deployed for only 2 weeks during the emergence of the SARS-CoV-2 Gamma variant. TrateCov was intended as a decision support tool to assist health care professionals with the diagnosis and treatment of COVID-19. After the tool was inadvertently released on a public Web site, it became accessible to anyone with an Internet connection, raising the risk of inappropriate self-management. Moreover, experts and journalists quickly spotted that almost all symptoms entered into the app resulted in a diagnosis of COVID-19, along with a recommendation to use the same 'Covid kit' of unproven drugs favored by leading politicians, and in the same doses for adults, children, and pregnant women. The institutional and social backlash was immediate, forcing the Brazilian Ministry of Health to take TrateCov offline. The case illustrates the potential for weak evidence and ideological bias to infiltrate digital health technologies, creating risks for patient safety and diversion of resources, thus emphasizing the importance of good governance at all stages of the innovation lifecycle. The speed of public health crises presents particular challenges for managing this phenomenon, calling for anticipatory steps to avoid such risk as part of responsible pandemic prevention strategies.

Keywords: clinical decision support tools, Covid-19, digital health, mHealth, medical populism, public health governance

Introduction

Information and communication technologies have featured heavily in the global response to Covid-19 but have also proven controversial. On the one hand, approaches such as the use of big data analytics, contact tracing apps, symptom trackers, and risk algorithms have helped with modelling the disease, developing vaccines, rationalizing treatments, guiding public health interventions and implementing policies such as physical isolation and mass testing [1, 2]. On the other hand, civil society organizations and academics have warned about their implications for citizens' privacy, rights, and freedom from discrimination, amongst other concerns [3–5]. Retrospective analyses of countries' responses to Covid-19 have also revealed the importance of following evidence-based approaches, involving stakeholders and citizens, ensuring the fair, proportionate and accountable exercise of state power, and avoiding conflicts of interest, amongst other aspects of good governance [3].

By describing the case of a Brazilian app (TrateCov) that was deployed for only 2 weeks, we add one more consideration to this list: how technology may itself come to embody controversial political views about health care, which if unchecked, could cascade into ineffective or unsafe interventions. Imagining that

applications will always be developed by highly qualified teams, based on solid scientific evidence and free of ideological biases can lead to techno-optimism that naively fails to consider the risks of using technology outside these conditions. TrateCov is a precise example of this.

The Brazilian context in the fight against Covid-19

Brazil's political and health crises have been well documented by both academics and the media. In 2018, the current President ran a victorious electoral campaign, fueled by anti-establishment rhetoric, rising far right conservatism, and a communication strategy focused on social media and instant messaging. Under his presidency, Brazilian society has become increasingly polarized and agitated [6]. Amidst this socio-political disruption, the country registered more than 29.8 million cases of Covid-19 and 659 000 deaths in March 2022 [7]. Only 12.8% of the population (26.95 million people) had been fully immunized as of July 1, 2021. After a successful vaccination campaign by all federal entities, this proportion rose to almost 75% by late March 2022 [7]. The campaign was highly contentious, however, as exemplified by the Federal Government's initial failure to put forward a timetable

Received: November 24, 2022. Revised: March 7, 2023. Accepted: March 31, 2023

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followed by disputes over mandatory vaccination, both of which led to challenges in the Supreme Court [8].

The first months of the fight against the pandemic in Brazil were notable for the clash of medical views, clinical strategies, and public policy proposals, as well as denialist criticism that Covid-19 would not affect the country significantly and that widespread transmission and infection would be necessary to build herd (or collective) immunity [9, 10]. Furthermore, misinformation and disinformation campaigns were widespread in Brazil on topics like the origins of the virus, the efficacy of physical isolation measures, the responsibilities of the Federal Government, the efficacy of early treatment, the data on cases and deaths, the efficacy of the use of masks, and the safety and efficacy of vaccines [10].

Against this backdrop, four main views regarding the timing of medical intervention emerged in the public debate. The first recommended that only patients with severe symptoms seek in-person medical care. This was adopted by the Health Ministry during the early stages of the pandemic, to avoid contamination in hospitals (pro-isolation view) [11]. The second advocated early symptoms management at health clinics as soon as the first signs of disease appeared (early care view) [11]. The third added early treatment with off-label drugs hypothesized to reduce viral replication and disease progression (early treatment view) [12]. The fourth argued that these off-label drugs should also be used to prevent individuals from developing the disease or at least the symptoms (prophylactic treatment view) [12].

The last two led to the popularization of a cocktail of drugs during 2020. It was called the 'Covid kit' and consisted mainly of chloroquine-, hydroxychloroquine-, ivermectin-, and azithromycin-based medicine—drugs with no proven efficacy against Covid-19 until March 2022 [13, 14]. In Brazil, a patient may buy these medicines only with a prescription, thus the medical autonomy became a contentious issue. On the one hand, doctors who willingly prescribed the 'Covid kit' did not want to be restricted; on the other hand, patients who believed in early or prophylactic treatments requested the drugs during the medical consultation and even threatened the doctors with denunciation before the professional council.

The dissemination of this solution resulted mainly from the favorable position of the President and his supporters, who publicly defended the use of these drugs as a valid alternative to physical isolation and advocated for the prophylactic view [15]. The defense or not of the 'Covid kit' was then associated with the President's political base, as evidenced by studies that associate the dissemination of this opinion in social networks with profiles aligned to his ideology [16]. The position echoed that of former US President Donald Trump, whose administration had even donated 2 million doses of hydroxychloroquine to Brazil.

The position of the Brazilian Ministry of Health regarding the 'Covid kit' during the early pandemic period may be split in two main phases. The first was from February to May 2020, when the Ministry was headed by two civilian and health care professionals who publicly avoided endorsing the President's policies and thus were sacked or resigned—the second after only 1 month in office [17]. During this phase, public health communications endorsed physical isolation and masks as effective measures to contain the disease, policies for contact tracing and mass testing were developed, and the use of unproven treatments like chloroquine and hydroxychloroquine was only authorized for experimental purposes [9, 18]. The Ministry's Technology Department also created a mobile phone app for raising citizens' awareness of symptoms, prevention, local health facilities, and self-care, known as *Coronavirus SUS*, which launched in the first week of

March 2020. They updated it to incorporate a contact tracing tool, through a partnership with Google and Apple in early July, but this functionality has not been widely advertised to Brazilian citizens [5].

The second period began in June 2020, with a career military officer, aligned with the President, being appointed as Minister for Health. Well-known defenders of early or prophylactic treatment views, as well as military and political allies, were assigned to key secretariats [9]. This phase was characterized by a policy preference for increasing the number of hospital beds, early treatment, production and distribution of drugs from the 'Covid kit', and a bet on a small number of emerging vaccines, mainly the Oxford-AstraZeneca vaccine. Doctors, researchers, and actors who had previously advised the President informally—a group that came to be called the 'parallel cabinet'—then began to influence the Ministry's decisions more directly [9, 10].

The development, rollout, and rapid demise of TrateCov

It was in this socio-political context that the Ministry of Health was called to act urgently in the crisis caused by the emergence of the Gamma variant (formerly P1) in Manaus, Amazonas, in the northern region of Brazil, during the last days of 2020 and the first week of 2021. The mutation had caused an explosion of cases of the disease, culminating in the collapse of the health care system, including a lack of oxygen cylinders for medical use. One of the main problems identified by the State and Municipality Health Secretariats and the Ministry of Health was the bottleneck in initial care for patients because there were not enough professionals and stations to quickly attend to those seeking medical services.

Ministry of Health officials, who had been promoting the use of the 'Covid kit' to treat the disease in the first days, then turned to technology. The Secretary for Labor-Management and Health Education, nicknamed 'Captain Chloroquine' by the press because of her endorsement of the drug, suggested that the Federal Government could offer an app to help medical teams deliver cheap, fast, and effective early care and treatment, thus relieving pressure on the primary health care system [10, 19]. Her department used the web-based REDCap survey platform to develop the app between January 4 and 8, 2021 [10, 19]. It was named TrateCov. An overview of the platform is currently possible only on the Internet Archive Wayback Machine web site [20].

The TrateCov app was designed to calculate whether a patient had Covid-19, based on answers to questions about symptoms, exposure, and other risk factors. Depending on the calculated risk, it recommended various actions, including requesting a Reverse transcription polymerase chain reaction (RT-PCT) test and starting early treatment with the 'Covid kit'. The methodology was said to have been based on a scientific paper published on January 7, 2021 [21]. Although the text focused on risk calculation and did not explicitly endorse the 'Covid kit' or suggested any kind of medical response based on the results [12, 21], a Parliamentary Committee of Inquiry later discovered that three of its authors had visited Manaus between January 10 and 13, 2021, at the invitation of the Secretary, to advocate for early treatment and the prescription of the 'Covid kit' [22].

TrateCov lasted only 2 weeks before it was taken down. Health care professionals began to use the tool on January 11, 2021, when it was publicly announced by the Minister [22]. However, after it was promoted on the Federal Government television station on January 19, 2021, journalists, health and data experts, investigative body officials, lay people, and others explored the

application and discovered major problems [23]. For one thing, this clinical decision support tool was available to anyone via the Internet, rather than only registered health professionals, as intended, presenting a risk of potential harm through inappropriate self-care. More significantly, 263 of the 268 million answer possibilities yielded a diagnosis (≥ 6 points) or likelihood diagnosis (4 or 5 points) of Covid-19 and recommended the same doses of the 'Covid kit' drugs, including for children and pregnant women, despite a lack of evidence on their efficacy and safety [24]. The institutional and social backlash against the application was immediate, forcing the Ministry to take TrateCov offline in January 21, 2021 [25]. The Federal Council of Medicine, for example, appointed five problems of the app, as follows: 1) flawed protection of personal data, 2) lack of transparency regarding the purposes of the personal data treatment, 3) possibility of use by non-professionals, 4) guarantee of scientific validation of drugs even against international recommendation, and 5) incentive for self-medication and violation of medical autonomy [26].

Discussion

Numerous commentators have noted similarities between the Covid-19 strategies of Brazil's President and those of his American counterpart, as well as other populist leaders [16]. However, the embodiment of these policies in a piece of software is a somewhat unique phenomenon. The TrateCov episode highlights five problems regarding governance of technology: 1) political biases, 2) fast innovation, 3) regulatory gray areas, 4) scientific disagreements, and 5) faulty norms and institutions.

The first is that digital health technology is not neutral and, in the case of applications developed by the State, can embed political biases as well as differences in medical opinion, particularly in circumstances where the data needed for evidence-based practice are unclear or evolving. In countries with well-developed public health structures, like Brazil and the UK, the potential of the government to rapidly implement top-down technology programs can also be a liability if these prove useless or dangerous [27]. In the case of TrateCov, it was planned that after testing in Manaus, the system would be made available to all professionals in the public health network in Brazil [19], covering >3.5 million people in July 2021 [28]. The effects of these programs may be amplified in unequal societies like the Brazilian one, where patients and medical staff might not have the digital skills or the training to use the government tools critically. Furthermore, during the Covid-19 crisis, the inequality played another role because some actors, like the President, blamed the physical isolation measures for the negative economic impacts and for the increasing poverty levels, and argued in favor of early treatment and fast solutions [29].

The second concerns the governance of innovation in the medical field. The combination of emergency circumstances, the power of certain political groups in the Ministry, and the adoption of controversial public policies favored an improvised and prototypical tool oriented to early treatment. The hasty repurposing of an open-access survey tool to rapidly offer a clinical support solution had the unintended effect of making it accessible to the public, creating risks of misuse and misinterpretation. By encouraging overdiagnosis and self-medication with unproven drugs, in an environment also rife with misinformation, such an app could have put lives in danger—although the stated objective of the app (to avoid overdose of the 'Covid 19 kit' medications) was exactly the opposite. For instance, the improvisation made it possible for a data expert to obtain the tool's source code by inspecting the web page where the form was hosted [30]. These unofficially obtained

insights informed the public debate about the functioning of TrateCov and its security and safety fragilities.

A third warning refers to the need for greater control over the creation of medical apps, especially government apps. The TrateCov case shows how public agents can take advantage of gray areas in regulation to escape accountability. For example, those responsible for the app tried to deflect blame by stating that it did not prescribe drugs, but only assisted physicians in doing so, according to their medical autonomy and conscience [19]. The medical device regulation in force at that time, although not explicitly covering software, demanded that medical devices aimed at 'prevention, diagnosis, treatment, rehabilitation, or contraception' had to be registered with the National Health Surveillance Agency (ANVISA). Recently, both the former Minister and the former Secretary were acquitted of misconduct charges in relation to the Manaus crisis, mainly due the lack of evidence of intent to cause harm, including the misplaced endorsement of the app.

A fourth warning is for scientific researchers and developers of digital health innovations. In polarizing contexts, managers and officials may only need a small set of studies, which support their political vision, to push forward controversial policies and programs. Those responsible for TrateCov claimed that it was based on a study published on January 7, 2021 [21], only 4 days before the tool was released online. This timeline suggests that the idea must have been known to them in advance of the publication.

Finally, the Brazilian case shows the importance of having appropriate institutional processes and norms in place to govern the actions of public agents. The internal control mechanisms of the Ministry of Health failed to prevent the mass availability of a prototype application. The Ministry's IT Department explained that it made the Research Electronic Data Capture (REDCap) tool available to the Secretariat for Labor-Management and Health Education initially for the creation of an 'assessment and monitoring project of community health agents' [31]. The Department mentioned that management and governance of the platform usually becomes the responsibility of the requester once the access to it is granted. The TrateCov app, however, was conceived as a clinical decision-support app [32]. The Secretariat claimed that the task was delegated to it by the Ministry as part of the 'Manaus Plan' to deal with the crisis [19]. The former Minister confirmed in his testimony before the Parliamentary Committee that he embraced the Secretary's idea and authorized her to create 'a calculator that could facilitate the disease diagnosis' [33]. As a result, the Secretariat became solely responsible for the platform's content. In contrast, the reaction of the press, political parties, civil society, the Federal Council of Medicine, and investigative bodies—mainly the Federal Police, the Federal Court of Accounts, and the Supreme Federal Court—was fundamental for the tool to be taken offline.

Conclusion

The TrateCov case is a warning against a techno-optimism that disregards biases, voluntarism, and political positions in the development of digital health applications and the public policies that may underpin them. It stresses the importance of appropriate checks and quality control, enabled by effective institutional governance mechanisms, as well as using open software code that can allow wider public scrutiny. It also demonstrates the risks of using technology for the covert and subtle enforcement of controversial public policies, driven by scientifically weak, premature, or selective evidence, which can be a particular risk in

times of crisis and uncertainty. These are important lessons for other countries, as well as an addition to the existing knowledge base on sociotechnical systems in times of crisis.

STUDY FUNDING

This study is one result of the cooperation between the São Paulo Law School of Fundação Getulio Vargas (FGV Direito SP) and the University of Edinburgh, under the project 'Law in the Digital Age', coordinated by Professor José Garcez Ghirardi, which is funded by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES)—Finance Code 001 (Grant 88881.310478/2018-01). Dr Claudia Pagliari holds a grant from the UK Arts and Humanities Research Council on 'The Role of Good Governance and the Rule of Law in Building Public Trust in Data-Driven Responses to Public Health Emergencies' (Grant number AH/V015214/1). Neither funding agency was involved in any part of the study.

CONFLICT OF INTEREST STATEMENT

The authors of this manuscript state that they have no conflict of interests to declare. The authors of this manuscript state that they do not have any relationship with people or organizations directly or indirectly related to the submitted work. G.K. and A.P work at the Center for Education and Research on Innovation (CEPI) at FGV Direito SP and are team members of the project 'Law in the Digital Age', under the Institutional Program for Internationalization (CAPES-PrInt) funded by the Coordination for the Improvement of Higher Education Personnel (CAPES) of the Brazilian Ministry of Education (MEC). V.S. is a former CEPI researcher and currently a Ph.D. candidate at University of São Paulo. J.E. is a Teaching Fellow with the University of Edinburgh.

DATA AVAILABILITY

The authors state that no individual data were collected or analysed for this research. All the documents from the Parliamentary Committee of Inquiry are publicly available at: <https://legis.senado.leg.br/comissoes/txtmat?codmat=148070> (in Portuguese). The final report of the Parliamentary Committee of Inquiry and the Dissenting Opinions are publicly available at: <https://legis.senado.leg.br/comissoes/mnas?codcol=2441&tp=4> (in Portuguese).

AUTHOR CONTRIBUTIONS

The authors also state that all the authors conceived the idea of the viewpoint paper. G.K., A.C., and V.S. selected the case for study after discussion rounds by all the authors on the Brazilian applications used against Covid-19. C.P. and J.E. encouraged the adoption of a theoretical framework or the reference to similar issues in other countries, such as the USA. A.C. and V.S. reviewed the literature on the matter. G.K. reviewed articles on major news sites and all the documents made public by the Parliamentary Committee of Inquiry on the investigation about the creation and offering of TrateCov app. G.K. wrote the manuscript with support of A.C. and V.S. C.P. and J.E. revised the draft to assess its arguments, references, and the English spelling. All the authors revised the paper searching for politically sensitive issues and unsupported statements. All the authors approved the final version of the paper.

ACKNOWLEDGEMENTS

The authors of the paper acknowledge the support of Giuliana Garcia Maruca and Laura Evans for its submission. They are also grateful for the reviewers' and associate editor's comments, which contributed to the paper's structure and content.

References

- Dieter M, Helmond A, Tkacz N et al. Pandemic platform governance: mapping the global ecosystem of COVID-19 response apps. *Internet Policy Rev* 2021;**10**: <https://policyreview.info/articles/analysis/pandemic-platform-governance-mapping-global-ecosystem-covid-19-response-apps> (17 October 21, date last accessed)
- Gasser U, Ienca M, Scheibner J et al. Digital tools against COVID-19: taxonomy, ethical challenges, and navigation aid. *Lancet Digit Health* 2020;**2**:e425–34 <https://www.sciencedirect.com/science/article/pii/S2589750020301370> (17 October 2021, date last accessed)
- Pagliari C. The ethics and value of contact tracing apps: international insights and implications for Scotland's COVID-19 response. *J Glob Health* 2020;**10**: <https://pubmed.ncbi.nlm.nih.gov/33110502/> (29 May 2022, date last accessed)
- Pagliari C. Digital health and primary care: past, pandemic and prospects. *J Global Health* 2021;**11**: <https://jogh.org/digital-health-and-primary-care-past-pandemic-and-prospects/> (29 May 2022, date last accessed)
- Awo Agency. Assessment of Covid-19 response in Brazil, Colombia, India, Iran, Lebanon and South Africa: efficacy and impact of contact tracing applications and alternative Covid-19 measures: *Insights and Recommendations*. 2022. <https://www.awo.agency/files/Assessment-of-Covid-19-Response.pdf> 01005 (29 May 2022, date last accessed).
- Brazil SM. Polarizing presidential leadership and the pandemic. In: Carothers T, O'Donohue A (eds.), *Polarization and the Pandemic*. Washington, DC: Carnegie Endowment for International Peace, 2020, <https://carnegieendowment.org/2020/04/28/polarization-and-pandemic-pub-81638> (17 October 2021, date last accessed)
- Ritchie H, Mathieu E, Rodés-Guirao L et al. Coronavirus pandemic (COVID-19). *Our World in Data* 2021; <https://ourworldindata.org/covid-cases> (17 October 2021, date last accessed)
- Bustamante T, Meyer E, Tirado F. Opposing an idle federal government. *Verfassungsblog* 2022; <https://verfassungsblog.de/opposing-an-idle-federal-government/> (29 May 2022, date last accessed)
- Ventura D, Aith F, Reis R. The timeline of the Federal Government's strategy to spread COVID-19. São Paulo: Centre for Studies and Research on Health Law (CEPEDISA) of the School of Public Health (FSP) of the University of São Paulo (USP) 2021; <https://cepedisa.org.br/wp-content/uploads/2021/08/LexAtlas-C19-Brazil-The-Timeline-of-the-Federal-Governments-Strategy-to-spread-Covid-19.pdf> (17 October 2021, date last accessed)
- Senado Federal. Comissão Parlamentar de Inquérito da Pandemia (Instituída pelos Requerimentos nos 1.371 e 1.372, de 2021). In: *Relatório final*. Brasília: Senado Federal, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/c3d1c0c3-41cc-472c-b500-636104715921> (29 May 2022, date last accessed)
- Lopes R. Brazil's Health Ministry changes strategy and recommends people seek doctor with first symptoms of Covid-19. *Folha de S Paulo* 2021; <https://www1.folha.uol.com>

- br/internacional/en/scienceandhealth/2020/07/brazils-health-ministry-changes-strategy-and-recommends-people-look-for-doctor-with-first-symptoms-of-covid-19.shtml (17 October 2021, date last accessed)
12. Senado Federal. Ata da 23ª Reunião da CPI da Pandemia da 3ª Sessão Legislativa Ordinária da 56ª Legislatura, realizada em 18 de junho de 2021. In: sexta-feira, no Senado Federal, Anexo II, Ala Senador Alexandre Costa, Plenário nº 3. Brasília:Senado Federal, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/c3d1c0c3-41cc-472c-b500-636104715921> (17 October 2021, date last accessed)
 13. World Health Organization. WHO living guideline: drugs to prevent COVID-19. *Who Int* 2021; <https://www.who.int/publications/i/item/WHO-2019-nCoV-prophylaxes-2021-1> (17 October 2021, date last accessed)
 14. World Health Organization. Therapeutics and COVID-19: living guideline. *Who Int* 2021; <https://www.who.int/publications/i/item/WHO-2019-nCoV-therapeutics-2021.3> (17 October 2021, date last accessed)
 15. Pontalti Monari A, Santos A, Sacramento I. Sacramento I. COVID-19 and (hydroxy)chloroquine: a dispute over scientific truth during Bolsonaro's weekly Facebook live streams. *JCOM J Sci Commun* 2020;19:A03 https://jcom.sissa.it/archive/19/07/JCOM_1907_2020_A03 (17 October 2021, date last accessed)
 16. Casarões G, Magalhães D. The hydroxychloroquine alliance: how far-right leaders and alt-science preachers came together to promote a miracle drug. *Rev Adm Pública* 2021;55:197-214 <https://www.scielo.br/j/rap/a/b3DhgtmpNW8FZMdsNqDY6Ht/?lang=em> (17 October 2021, date last accessed)
 17. Londoño E. Another Health Minister in Brazil Exits Amid Chaotic Coronavirus Response (Published 2020). 2022. <https://www.nytimes.com/2020/05/15/world/americas/brazil-health-minister-bolsonaro.html> (29 May 2022, date last accessed).
 18. Ministério da Saúde. Nota Informativa nº 6/2020-DAF/SCTIE/MS. Brasília:Departamento de Assistência Farmacêutica e Insumos Estratégicos, 2020, <https://www.mpma.mp.br/arquivos/CAOPSAUDE/MS---0014223901---Nota-Informativa-n--6-2020-DAF-SCTIE-MS.pdf> (17 October 2021, date last accessed)
 19. Ministério da Saúde. Nota técnica nº 90/2021-DEGES/SGTES/MS. Brasília:Departamento de Gestão da Educação na Saúde - DEGES, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/deccf229-34e7-459e-9fd9-c783e1f9a85e> (17 October 2021, date last accessed)
 20. Ministério da Saúde. TrateCov Brasil - Formulário Clínico. Wayback Machine 2021; <https://web.archive.org/web/20210120031248/https://redcap.saude.gov.br/surveys/index.php?s=7M3XF79KFL> (16 April 2023, date last accessed)
 21. Cadegiani F, Zimmerman R, Campello de Souza B et al. The AndroCoV clinical scoring for COVID-19 diagnosis: a prompt, feasible, costless, and highly sensitive diagnostic tool for COVID-19 based on a 1757-patient cohort. *Cureus* 2021;13:e12565 <https://www.cureus.com/articles/49445-the-androCoV-clinical-scoring-for-covid-19-diagnosis-a-prompt-feasible-costless-and-highly-sensitive-diagnostic-tool-for-covid-19-based-on-a-1757-patient-cohort> (17 October 2021, date last accessed)
 22. Senado Federal. Ofício nº 1129/2021 - CPIPANDEMIA (0020858007) SEI 25000.079649/2021-17. Brasília:Senado Federal, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/9b7574be-b468-4ca6-b917-037fdf004743> (17 October 2021, date last accessed)
 23. Lima VJM. Inação, omissão e não-decisão: os métodos e a política do governo sob Jair Bolsonaro na pandemia da COVID-19. São Paulo: Fundação Getulio Vargas, Escola de Políticas Públicas e Governo 2022; <https://bibliotecadigital.fgv.br/dspace/handle/10438/32180> (16 April 2023, date last accessed)
 24. Marcelino D. TrateCov indicava cloroquina e outros remédios sem eficácia a quase todos pacientes. *JOTA Info* 2021; <https://www.jota.info/dados/tratecov-indicava-cloroquina-e-outros-remedios-sem-eficacia-a-quase-todos-pacientes-22012021> (17 October 2021, date last accessed)
 25. Santino R. After disclosing app, Saúde says that TrateCov was aired due to hacker attack. *Olhar Digital* 2021;28 <https://olhardigital.com.br/en/2021/01/21/coronavirus/apos-divulgar-app-saude-diz-que-tratecov-foi-ao-ar-devido-a-ataque-hacker/> (17 October 2021, date last accessed)
 26. Conselho Federal de Medicina. Esclarecimento à Imprensa. PORTAL CFM 2021; <https://portal.cfm.org.br/wp-content/uploads/2021/01/Nota-aplicativo-TrateCov-21.01.2021-1.pdf> (17 February 2023, date last accessed)
 27. ICT&health. The risks of basing digital health strategy on industry hype and alluring prototypes. *ICT&Health* 2022; <https://ictandhealth.com/the-risks-of-basing-digital-health-strategy-on-industry-hype-and-alluring-prototypes/news/> (29 May 2022, date last accessed)
 28. Ministério da Saúde. Tabnet. Brasília:DATASUS, 2021, <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?cnes/cnv/prid02br.def> (17 October 2021, date last accessed)
 29. Gomes J, Álvaro F, Bentolila S. COVID-19 no Brasil: tragédia, desigualdade social, negação da ciência, sofrimento e mortes evitáveis. *Revista Psicologia, Diversidade e Saúde [Internet]* 2021;10:349-59 <https://www5.bahiana.edu.br/index.php/psicologia/article/view/3595> (16 April 2023, date last accessed)
 30. Menegat R. GitHub - RodrigoMenegat/autopsia-do-tratecov: Código fonte extraído da página do aplicativo TrateCov, publicado pelo Ministério da Saúde em janeiro de 2021. GitHub 2022; <https://github.com/RodrigoMenegat/autopsia-do-tratecov> (29 May 2022, date last accessed)
 31. Ministério da Saúde. Ofício nº 12/2021/DEGES/SGTES/MS - SEI 25000.012355/2021-13 (Ofício nº 4245/2021/ASPAR/GM/MS). Brasília:Ministério da Saúde, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/efabc1c4-1dd8-40e2-a3b9-b28b11fe0fa1> (17 February 2023, date last accessed)
 32. Tribunal de Contas da União. TC 015.749/2021-5 - Relatório de Inspeção - Fiscalização 119/2021. Acórdão 1.413/2021-TCU. Brasília:Tribunal de Contas da União, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/10466966-c42e-4aa8-a387-015b9a370d28> (17 February 2023, date last accessed)
 33. Senado Federal. Ata da 10ª Reunião da CPI da Pandemia da 3ª Sessão Legislativa Ordinária da 56ª Legislatura, realizada nos dias 19 e 20 de maio de 2021. In: no Senado Federal, Anexo II, Ala Senador Alexandre Costa, Plenário nº 3. Brasília:Senado Federal, 2021, <https://legis.senado.leg.br/sdleg-getter/documento/download/e2becad7-46d3-4123-a7a9-dc84ad591a8e> (17 February 2023, date last accessed)