



Short communication

## COVID-19 collaborative screening: An action-research project for large scale contact tracing in Northern Portugal

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### ABSTRACT

In late November 2020, when Europe reached the highest 14-day incidence of COVID-19 cases, the resource-intensive and time-consuming traditional contact tracing performed by Public Health was challenged. In this context, innovative approaches were necessary to guarantee a timely interruption of disease transmission.

“COVID-19 Collaborative Screening” Project was developed as a faster solution, not only because the contact tracing process is simpler for the operator, but mainly because it is possible to quickly scale up the number of operators involved. It was designed to interrupt family and social transmission chains, in a partnership with the Local Public Health Services – allowing these services to dedicate to scenarios of more complex risk assessment, using the traditional contact tracing. To perform contact tracing, this method involves Public Servants, Armed Forces and Medical Dentists. The Project also promotes participatory citizenship, by delegating to the citizen the responsibility of registering his/hers contacts with high-risk exposure in an online form, in contrast to the traditional contact tracing method which is more health professional-dependent.

Until the end of January 2021, the Project has trained eight teams, enrolling a total of 213 professionals, and was implemented in eight Health Regions (with an estimated population of 1,346,150 inhabitants).

The Project was successful at facing the delays in case interview and contact tracing. The strategy implemented by ColabCOVID is assembled as a sustainable, reproducible and scalable platform and is ready to be re-implemented to face the emergence of more contagious variants, as well as an eventual forthcoming health threat.

### 1. Background

In late November 2020, health systems have struggled to control the COVID-19 pandemic, as the infection continues to spread globally.

When Europe reached the highest 14-day incidence of COVID-19 cases in 2020, 32 European countries had over 480 cases per 100,000 inhabitants (Centre, 2020). This high incidence challenges the traditional contact tracing performed by Public Health, which is resource-

intensive and time-consuming. When the balance between incidence and resources is compromised, innovative approaches are necessary to guarantee a timely interruption of disease transmission (United States Army, 2020; United States Army, 2020; Government of Canada, 2020; Gobierno de España - Ministerio de Defensa, 2020, 2020; Höchstadt, 2020; Government of the United Kingdom, 2020).

Portugal reached a maximum 14-day incidence in late November 2020, with 792 COVID-19 cases per 100,000 inhabitants (Centre, 2020).

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At this time, there were 50 counties with the highest level of transmission (over 960 new cases per 100,000 inhabitants), 80 % of them were located in the Northern region (Direção-Geral da Saúde, 2020a). This high incidence caused an increased burden on the health system, leading to more than 25,000 delayed epidemiological surveys.

In this context, the “COVID-19 Collaborative Screening” Project (ColabCOVID) was designed to ensure the timely interruption of family and social transmission chains, in a partnership with the Local Public Health Services (LPHS). Thanks to this collaboration, the LPHS can dedicate to scenarios that require a more complex risk assessment, such as outbreaks, cases occurring in schools, health facilities or nursing homes, using the traditional contact tracing. Therefore, ColabCOVID aims to increase the scale and speed of contact tracing, assisting LPHS in the control of disease transmission.

In Portugal, on average, it is expected that a COVID-19 laboratory result and subsequent notification are recorded between 48 and 72 h after the laboratory test has been taken. The Project only intervenes after the notification, conducting the case interview within 24 h. After this first step, there is another 24 h period until the contacts are reached and the intervention is applied (e.g.: quarantine). ColabCOVID is able to shorten the time frame to reach the case and the contacts once the positive result is known, potentially avoiding secondary cases.

## 2. The “Covid-19 Collaborative Screening” Project

ColabCOVID involves Public Servants, Armed Forces and Medical Dentists to perform the contact tracing of COVID-19 cases. These professionals receive an intensive three-day course conducted by the Management Team (Fig. 1), in which trainees acquire knowledge on: i) data protection; ii) basic COVID-19 epidemiology; iii) how to interview COVID-19 cases and contacts with high-risk exposure following a detailed step-by-step interview script. Additionally, ColabCOVID trainees simulate telephone calls (role-playing) to practice

communication skills and to promptly correct any possible errors. After this exercise, trainees begin to work with real individuals under the instructor’s close supervision (Fig. 2).

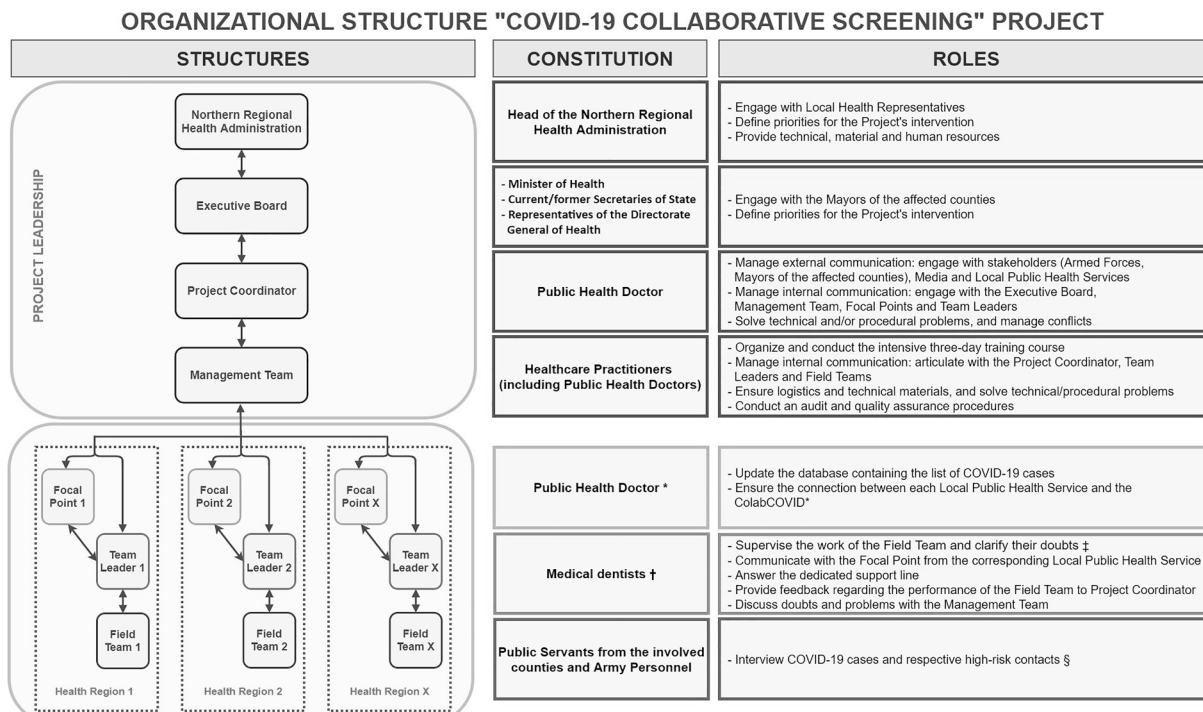
Within this group of trainees (preferably the Medical Dentists), those who score highest on the *Implementation Leadership Scale* (Aarons et al., 2014) are selected to become Team Leaders, who are responsible for their respective teams (Fig. 1).

After the course, the remaining trainees – the Field Team (Fig. 1) – return to their regular workplaces (i.e., city halls, army headquarters), where they continue to perform their tasks. If any doubts arise, the Field Team discusses them with the Team Leader, who, in turn, reports these questions to the Management Team, whenever they are unable to answer them. The Team Leaders are responsible for supervising the Field Team’s work and guaranteeing their commitment to daily work. Additionally, Team Leaders maintain a close contact with the Focal Point of each LPHS (Fig. 1).

The Project follows a three-phase approach (Fig. 3), which is briefly described below:

### 2.1. Phase 1

The Focal Point of each LPHS updates the database with the new COVID-19 cases (Fig. 1). Then, the Field Team contacts the COVID-19 case by phone within 24 h, to inform the patient regarding the duty to self-isolate at home and to obtain his/her personal e-mail address. If a personal e-mail address is available and the individual possesses the digital literacy to access it and to complete an online form, the Field Team sends a predefined e-mail containing: a) information regarding precautions to take during self-isolation; b) an online form to identify his/her possible contacts with high-risk exposure, including their personal data, such as telephone number, e-mail address and national health service number, as well as the date and description of the context of their last interaction. If the COVID-19 case has no e-mail address/ no



\* The Focal Point and Team Leaders communicate daily to ensure a fluid exchange of information, the normal course of operations and the clarification of operational doubts.  
 † Within the group of trainees (preferably within the ones who are Medical Dentists), those who score higher in the *Implementation Leadership Scale* are selected to become responsible for their respective teams – the Team Leaders.  
 ‡ The Team Leaders clarify the doubts reported by the Field Team, through a written communication channel. This communication channel is reviewed daily by the Management Team, in order to assess the quality of the technical clarifications provided by the Team Leaders, ensuring the adjustment of the answers given to the Field Team.  
 § Each operator of the Field Team works independently and remotely, under supervision by the Team Leaders. The internal audit system identifies non-conformities in the work of each operator, produces individual error reports and provides feedback, suggesting corrective actions that operators must undertake.

Fig. 1. Organizational Structure “COVID-19 Collaborative Screening” Project.

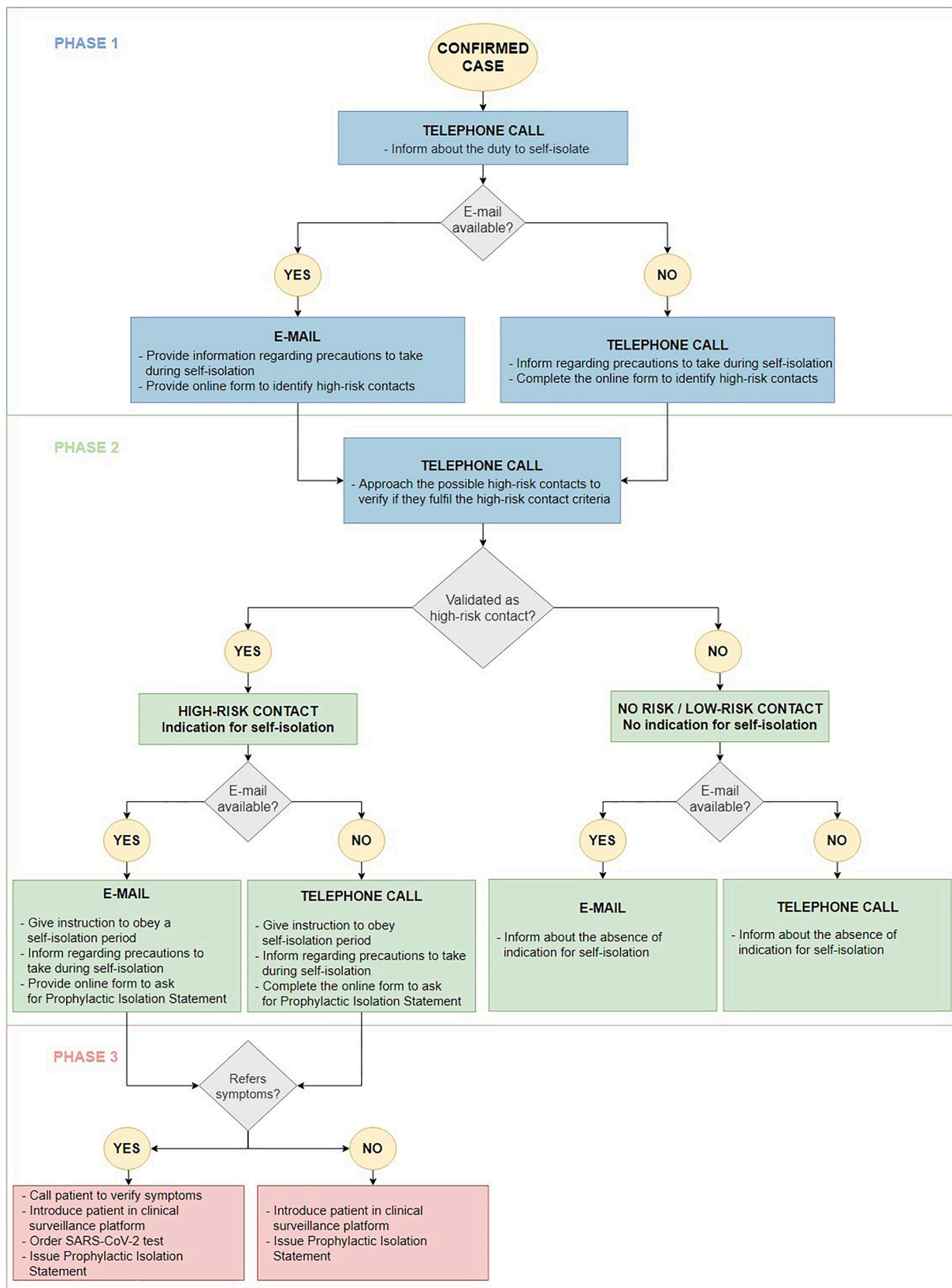


Fig. 3. Three-phase approach of “COVID-19 Collaborative Screening” Project.

digital literacy/ unwilling to complete the online form, the Field Team enquires about the necessary information and completes the online form during the telephone call.

### 2.2. Phase 2

The Field Team calls all possible contacts with high-risk exposure (identified by the COVID-19 case) by phone to verify if they fulfil the

criteria for contacts with high-risk exposure. A high-risk exposure corresponds, in general terms, to 1) a contact with a COVID-19 case at a distance of less than 2 m and for at least 15 min 2) to an indoor contact (e.g. cohabitation, classroom, meeting room, waiting room) without facial masks for at least 15 min. On the other hand, a low-risk exposure consists of 1) a face-to-face contact with a case of COVID-19 at a distance of less than 2 m and for less than 15 min or 2) to an indoor contact (e.g. cohabitation, classroom, meeting room, waiting room) without facial masks for less than 15 min, or if with facial masks for at least 15 min (Direção-Geral da Saúde, 2020b).

According to these criteria, the Field Team informs the validated contacts with high-risk exposure about the duty to self-isolate at home and sends them an e-mail providing: 1) information regarding the precautions to take during self-isolation; 2) an online form to evaluate the presence of COVID-19 symptoms and to request the Prophylactic Isolation Statement (a document that justifies an absence from work and grants the respective Social Security payment). If an e-mail address is not available, steps 1) and 2) are completed during this telephone call.

Individuals who are considered to be contacts with low-risk exposure are informed that they do not have to self-isolate and that they should self-monitor for symptoms (and call the National Medical Help Line if they develop any symptoms).

### 2.3. Phase 3

The COVID-19 confirmed cases and contacts with high-risk exposure are registered in a national surveillance system (TraceCOVID-19). Additionally, the Prophylactic Isolation Statement for contacts with high-risk exposure is issued, and a SARS-CoV-2 polymerase chain reaction (PCR) test is prescribed for symptomatic contacts with high-risk exposure.

Auditing procedures are simultaneously performed with the implementation of the Project, aiming to analyse: a) if the COVID-19 case/contact with high-risk exposure is in self-isolation after being contacted; b) if the COVID-19 case/contact with high-risk exposure implements the recommendations for prevention of disease transmission; c) if the contacts with high-risk exposure identified by ColabCOVID are in agreement with the contacts with high-risk exposure identified by a conventional epidemiological survey.

This assessment was performed by three external evaluators, who were blinded to the previously collected data. To select the sample, all the COVID-19 cases detected in a week were listed and a random sample was obtained using *SPSS IBM Statistics*. The same procedure was repeated for the contacts with high-risk exposure.

To increase citizen collaboration, it was essential that ColabCOVID was trustworthy and socially impactful. Therefore, media coverage was promoted in television and newspapers. To inform health professionals regarding ColabCOVID, institutional e-mails were sent, and the Project was advertised in the official Health Ministry website. Finally, to ensure accessibility to Health Services and to overcome strained telephone lines, a dedicated support line is available to clarify the doubts of COVID-19 cases/contacts, and for reporting the presence of new symptoms.

Until the end of January 2021, the Project has trained eight teams, enrolling a total of 213 professionals (165 militaries, 39 Public Servants from city halls, nine Medical Dentists), and was implemented in eight Health Regions (corresponding to 30 counties, with an estimated population of 1,346,150 inhabitants). During the temporal period of the article (11/2020–01/2021), the highest number of daily new confirmed cases per 100,000 inhabitants registered in the counties involved in the Project was 224 cases per 100,000 inhabitants and our strategy, in collaboration with the LPHS, was able to provide a timely response. Between November 2020 and January 2021, 56,386 COVID-19 cases and over 60,000 contacts with high-risk exposure were screened (Fig. 4) (Lash et al., 2021). However, this number does not configure a true ceiling. Since the screening process used by the Project is standardised

and simplified, it can be carried out by professionals other than Public Health Doctors. This in turn increases the pool of potentially recruitable professionals, facilitating the recruitment process when the need for manpower increases.

### 3. Strengths and limitations

ColabCOVID is expected to underreport the contacts with high-risk exposure, when compared to conventional contact tracing, since the Field Team has less technical knowledge and experience than a Public Health professional. To address this issue: a step-by-step interview script is provided to increase the interview's quality; the facial validity of the e-mails/ forms is tested (McClain and Rainie, 2020; Protheroe et al., 2009); auditing procedures are carried out daily, as quality improvement tools.

The Project's strategy promotes participatory citizenship, by delegating the responsibility to complete the online form to the citizen.

The availability of support lines increases accessibility to Health Services, avoiding missed or lost calls and, consequently, missed opportunities to stop transmission chains.

ColabCOVID operates according to a sustainable, reproducible and scalable strategy. The course is always ministered by the same instructors, ensuring its consistency/ quality. Moreover, the trained Field Teams/ Team Leaders can be recruited again, and more professionals can be trained quickly, as soon as the number of COVID-19 cases justifies it. Finally, the digital systems developed for this Project can be re-implemented in the future (Fig. 5).

### 4. Final considerations

When Portugal faced a high number of delayed epidemiological surveys, ColabCOVID contributed to solve this problem in the counties covered by the Project. It was developed as a faster solution (especially in high incidence settings), not only because its execution is more simplified for the operator but mainly because it is possible to quickly scale up the amount of operators that can perform it. Undoubtedly, the traditional method performed by Public Health Doctors is the gold standard and should be preferred. However, when the incidence manageable by the traditional method is exceeded, the ideal timing for the COVID-19 case interview is not accomplished, leading to a backlog of cases. In this scenario, our Project was useful to face the delays in case interview and contact tracing.

In future scenarios of health system overload, ColabCOVID is a possible strategy to deal with the pandemic. The emergence of more contagious variants, such as the recent Omicron variant, has reinforced the importance of this Project. Additionally, in an era characterized by the growing phenomenon of globalization, pandemics are expected to become a more frequent occurrence (Joi, 2020), challenging the Public Health systems worldwide.

The strategy implemented by ColabCOVID is sustainable, reproducible and scalable and, therefore, it can be adopted to face these future health threats. The platform was put to the test in this challenging context and is assembled and ready to be re-implemented when it is required.

### 5. Ethical Compliance, funding

The present study has obtained approval by the Health Ethics Committee of the Northern Regional Health Administration.

This study does not benefit from external funding to Northern Regional Health Administration. All human resources involved are professionals who work at Northern Regional Health Administration. Thus, carrying out this study does not imply additional costs for Northern Regional Health Administration, in addition to the usual pay. This research Project does not involve costs with technical means or materials for its implementation.

## CRedit authorship contribution statement

**Francisca Vilas-Boas:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Sofia Lopes:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Margarida Teixeira:** Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. **Catarina Rodrigues:** Investigation, Validation. **Marta Teixeira:** Validation. **José Frias-Bulhosa:** Validation. **Sara Teixeira:** Validation. **Marta Pinto:** Investigation. **Tiago Carvalho:** Software. **Eduardo Pinheiro:** Project administration, Resources. **Carlos Nunes:** Project administration, Resources. **Rui Portugal:** Project administration, Resources. **Raquel Duarte:** Supervision. **João Firmino-Machado:** Conceptualization, Methodology, Project administration, Supervision, Visualization.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

The data that has been used is confidential.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2022.101926>.

## References

- Aarons, G.A., Ehrhart, M.G., Farahnak, L.R., 2014. The implementation leadership scale (ILS): development of a brief measure of unit level implementation leadership. *Implement. Sci.* 9 (1), 45.
- European Centre for Disease Prevention and Control. *Data on 14-day notification rate of new COVID-19 cases and deaths*. 2020 12/30/2020]; Available from: <https://www.ecdc.europa.eu/en/publications-data/data-national-14-day-notification-rate-covid-19>.
- Direção-Geral da Saúde. *Ponto de Situação Atual em Portugal*. 2020 11/26/2020]; Available from: <https://covid19.min-saude.pt/ponto-de-situacao-atual-em-portugal/>.
- Direção-Geral da Saúde. *COVID-19: Rastreamento de Contactos*. [Lisbon]: DGS; 2020 [cited 2022 Apr 27]. (Clinical Guideline [Norma 015/2020]). Available from: <https://www.dgs.pt/normas-orientacoes-e-informacoes/normas-e-circulares-normativas>.
- Gobierno de España - Ministerio de Defensa. *Las Comunidades Autónomas han solicitado ya más de 1.700 rastreadores militares*. 2020 12/10/2020]; Available from: <https://www.defensa.gob.es/gabinete/notasPrensa/2020/10/DCG-201001-mops.html>.
- Government of the United Kingdom. *COVID Support Force: the MOD's continued contribution to the coronavirus response*. 2020 12/10/2020]; Available from: <https://www.gov.uk/guidance/covid-support-force-the-mods-continued-contribution-to-the-coronavirus-response>.
- Landratsamt Erlangen Höchststadt. *Bundeswehr für Kontaktnachverfolgung im Einsatz*. 2020 12/10/2020]; Available from: <https://www.erlangen-hoechststadt.de/aktuelles/meldungen/bundeswehr-fuer-kontaktnachverfolgung-im-einsatz/>.
- Joi P. *5 reasons why pandemics like COVID-19 are becoming more likely*. Gavi. 2020. Available from: <https://www.gavi.org/vaccineswork/5-reasons-why-pandemics-like-covid-19-are-becoming-more-likely>.
- Lash, R.R., Moonan, P.K., Byers, B.L., 2021. COVID-19 case investigation and contact tracing in the US, 2020. *JAMA Netw Open* 4 (6), e2115850. <https://doi.org/10.1001/jamanetworkopen.2021.15850>.
- McClain, C. and L. Rainie. *The Challenges of Contact Tracing as U.S. Battles COVID-19*. 2020 11/30/2020]; Available from: <https://www.pewresearch.org/internet/2020/10/30/the-challenges-of-contact-tracing-as-u-s-battles-covid-19/>.
- Government of Canada, *Contact tracing in the Canadian Armed Forces during the COVID-19 pandemic*. 2020.
- Protheroe, J., D. Nutbeam, and G. Rowlands, *Health literacy: a necessity for increasing participation in health care*. 2009.
- United States Army. *Oklahoma Guard supports statewide COVID-19 contact tracing*. 2020 12/08/2020]; Available from: <https://www.army.mil/article/236024/oklahoma-guard-supports-statewide-covid-19-contact-tracing>.
- United States Army. *Team Trace tracks down all COVID-19 positive contacts*. 2020 12/08/2020]; Available from: [https://www.army.mil/article/234127/team\\_trace\\_tracks\\_down\\_all\\_covid\\_19\\_positive\\_contacts](https://www.army.mil/article/234127/team_trace_tracks_down_all_covid_19_positive_contacts).