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Public-private partnership role during the pandemic: A case of COVID-19 testing in the Republic of Latvia 2020

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ABSTRACT

The novelty of this research includes public-private partnerships (PPP) in emergency situations, especially during a pandemic, where there are only a few researched topics. The **goal** of this study is to answer the following research question: What is the role of PPP in achieving quick and effective COVID-19 testing during a new pandemic in a small country?

The **methods** of this paper are based on a case study approach. In the beginning, a related literature review was done (keywords: public-private partnerships in COVID-19, testing of the COVID-19, health systems during the pandemic). The second step contains data collection about COVID19 in Latvia (2020). Finally, an analysis of the case and data was performed with the conclusion in the result.

Results: The average number of tests in 2020 was 2355.99 (interval: 4.00–12,091.00) per day and 2141.73 (interval: 7.67–7365.77) per month. The private sector conducted around 95.78% per month to check COVID19 infection.

Conclusion: The PPP role of COVID-19 testing during a pandemic in small countries contains extra resources for rapid and previously not established process organization that allows governments and the public sector to pay attention to other important questions. As a result, collaboration can decrease infection prevalence and mortality.

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COVID19; management of
pandemic

Introduction

The often used approach in which a government can raise its functions is a public-private partnership. It involves the private sector with its multidisciplinary assets to help develop the infrastructure of the public sector. This type of solution is popular in fields, such as education, transportation infrastructure, services, and healthcare [1,2]. From a different point of view, the PPP model in healthcare can also be effective. This model shows a good effect on the public sector and different health care systems [3,4]. Public collaboration with the private sector can be beneficial in different world crises, such as a pandemic [5,6]. The need to seek new solutions is also associated with discontinuation and inaccessibility of universal health coverage during the decline of the pandemic. There is one more important reason to seek new solutions how to solve crises in health care. Even high-income countries are unable to provide the best universal health coverage during a pandemic [7,8].

The Latvia health system

In 1991 Latvia regained independence and became a parliamentary, democratic republic and a part of the European Union in 2004, major changes were made in the health system during these years. After independence, in the middle of the 1990s the health system was partly privatized (especially polyclinics). Now, most of the Latvia health system is built on general tax money and a small part is taken from social tax. Providers are in contract with the National Health Service about the supply of services. They can be with private and public or mixed capital backgrounds. However, primary care typically is predominantly done by the private sector. Private and public sectors cover secondary care and the public sector is key for tertiary care level [9].

The Ministry of Health and National Health Service is responsible for planning national health resources. The latter reports to the ministry and is following its guidelines and policies. The National Health Services select and contract providers through a public procurement process. The selection process always

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happens if new services or new areas of services are added or included [10].

Latvia realizes health policy through public hospitals and institutions or contracting the private sector for some health services. One of the main examples of public-private partnership in Latvia is government collaboration with laboratories through the National Health Service [10].

Latvia has public and private laboratories for health care needs. The majority of them are private. Public laboratories like the Laboratory in the Latvian Centre of Infectious Diseases provide and take functions of the National Reference Laboratory for Microbiology. For instance, State Scientific's 'Institute of food safety, animal health and environment BIOR' laboratory of Microbiology and Pathology is also a National Reference Laboratory; however, they focus on food, materials, and articles in contact with food, feed, residues, including pesticide residues and antimicrobial resistance to pathogens and animal health and the diagnosis of infectious or contagious animal diseases and the control and monitoring. Public laboratories ensure environmental and emergency monitoring and take care of biosafety. These laboratories oversee all communicable infectious diseases [9].

A collaboration between the public and private sectors in Latvia is a quite new and undeveloped area. The Law on Public-Private Partnership was adopted in late 2009 by the Latvian Saeima [11]. In the Latvian health care system public-private partnership occurs at the level of primary health care. For instance, the National Health Service has selected private family doctors' offices that will carry out government contracts [12]. However, all planned collaborations take time. According to Public Procurement Law, the choice of the service provider can take two months [13].

Private laboratories in Latvia perform a diagnostic service role and tend to do routine health care tests. The largest private laboratories are Central Laboratory, E. Gulbja Laboratory, MFD Laboratory, and NMS Laboratory. According to website data Central Laboratory and E. Gulbja Laboratory are the biggest ones. Each of them has 63 branches throughout Latvia [14,15]. NMS Laboratory has 24 branches in different regions of Latvia. MFD Laboratory has 15 branches in Riga [16,17].

Laboratories get paid according to the fee-for-service principle, accordingly for each intervention government-approved tariffs. The laboratories that have a contract with the National Health Service can examine. The tariffs for each intervention are equal for public and private providers [9].

Latvia during the pandemic of COVID-19

The first COVID-19 case in Latvia was confirmed on 29 February 2020. After the first confirmed case in Europe on 25 January 2020, in France, the Latvian

government had approximately one month to prepare for this new virus. Latvian government actively involved in the limitation of COVID-19 spreading, set aside extra money in the budget for health financing, and announced national quarantine.

At a beginning of COVID-19 spreading in Latvia the Prime Minister managed the national crisis at the national level of the Crisis Management Council for the Spread of Coronavirus. National Commission for Operational Medicine that makes decisions about emergency medicine was involved. This commission is made up of delegates from the Ministry of Health, National Health Service, State Agency of Medicines, National Blood Donor Center, Health Inspectorate, National Forensic Medicine Expertise Center and Children's Clinical University Hospitals, Emergency Medical Service, Riga Eastern Clinical University Hospital, Center for Disease Prevention and Control, P.S. Clinical University Hospital. Government after the previously mentioned group recommendations intensified hand hygiene, use of personal protective equipment, and made guidelines for slowing down infection spreading [9].

To slow down COVID-19 spreading, the government granted extra 2.6 million euros to the health sector on March 3, 2020. The money was intended to cover the outlay that will make after epidemiological measures (personal protective equipment, laboratory diagnostics, medical equipment, medical treatment, etc.). During the first wave of COVID-19 on 9 April 2020 the government of Latvia issued, additional 14 million euros to cover all needs of Riga East University Hospital, P.S. Clinical University Hospital, and Children's Clinical Hospital) to fight the pandemic [9].

National quarantine was announced on 13 March 2020. It included a 'stay at home' approach – employers and employees should organize their work in a way that allows do it remotely from the workplace. The inhabitants should reduce direct contact with other persons. After 30 March 2020, restrictions became stricter – no more than 2 persons can be together in public places, and they must keep a 2-m distance. Latvian education authorities were closed on 13 March 2020 and must continue the study process in remotely. Epidemiological measures and health screening, incl., testing should have been provided by those employers and institutions to enable remote work [9].

Previously mentioned protocols and some others, such as economic stimulation, restriction to go abroad and quarantine for those who arrived from other countries helped Latvia to save low levels of COVID-19 infection spread during the first infection wave. However, one of the main methods of slowing down COVID-19 spreading was wide testing [9].

According to World Health Organization the world has been challenged by different wide-spreading infections (e.g. HIV). Not all of them reach pandemic status; however, they cause the additional disabilities

and deaths thus negatively affect the county's economy [18].

It is important to find new ways how to fight and more effectively achieve a fast reduction in the incidence and prevalence of the infection and its negative consequences. PPP is one of the least researched resources for an innovative approach, especially during an emergency situation like a pandemic.

The novelty of this research includes PPP in emergency situations, especially during a pandemic, where there are only a few researched topics. The testing in Latvia during the pandemic showed a wide collaboration between the public and private sectors. The goal of this study is to answer the following research question:

RQ: What is the role of PPP in achieving quick and effective COVID-19 testing during a new pandemic in a small country?

To answer the research question, the article will attend to the small European country in Northern Europe – Latvia. The testing of COVID-19 during the pandemic in Latvia is described as a good experience involving the private sector in this emergency situation (COVID-10 testing during the pandemic).

Public-private partnership during the pandemic of COVID-19

Health care policy is realized by different mechanisms that can only include public sector providers or also involve the private sector. One of the well-known and practical working approaches is a public-private partnership or PPP. Collaboration like PPP is regarded as one of the most effective models because it brings benefits for both partners and offers better solutions for health care needs [19]. The World Bank defines PPP as 'a mechanism for government to procure and implement public infrastructure and/or services using the resources and expertise of the private sector' [20]. Overall, PPP is a way how the public sector can increase the effectiveness of infrastructure services and can be an engine of economic growth. The public sector can take experience and financial resources and hand them out to the private sector contributing to domestic resource development [21]. Historically, governments involve the private sector to delegate functions such as financing, design, building, maintaining, operating, and delivering. The Global Health Group grouped it into three models: 1) infrastructure-based model, 2) discrete clinical service model, and 3) integrated PPP model [22].

In December 2019 a new virus was explored in Wuhan, China and it was named Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) or COVID-19 [23]. Two months after an official statement from the World Health Organization about COVID 19 virus, its spread reached a pandemic in January 2020. It happened because of the virus's most efficient spreading form – human-to-human transmission [24].

After the rapid spread in 2020, COVID-19 had killed approximately 2.1 million people in the world by January 2021 [25]. At the time of the first wave of the COVID-19 pandemic, governments worldwide implemented COVID-19 restriction policies. The majority of these policies were related to human mobility and personal contact limitation. A lot of countries followed the 'lockdown' policy [26]. In order to restrict COVID-19 spread countries also implemented person-centered activities, such as covering coughs and sneezes with disposable tissues, wearing masks, social distancing, temperature measurements, testing for COVID-19, and others [25,27,28]. World Health organization (WHO) highlighted the importance of population testing during COVID-19 infection and invited to increase testing capacity [29].

The main principle of testing is based on the reverse transcriptase–polymerase chain reaction (RT–PCR) test. Material can be explored to the virus from different materials [30]. Testing material is mainly taken from oropharyngeal and nasopharyngeal regions with swabs or through saliva. After the material has been collected, the virus is analyzed and inactivated [31].

However, the high demand for RT–PCR tests and testing infrastructure creates an overload on the health system in different countries. As a result, epidemiological investigations could take a longer time for one person and, therefore, cannot slow down the spreading of infection [29,32]. The COVID19 test production and laboratory capacity were challenging for every country [33]. The United States of America encountered a deficiency of materials for test kits (e.g. reagents). After that, when USA laboratories encountered large amounts of tests to analyze, it showed the inability of laboratories to switch to quick analyses in large quantities [34]. In contrast to the United States, many European countries, for instance, Germany started widespread testing in the whole country [35]. Testing and lockdown policies allowed to reduce hospitalization from COVID-19 in Germany compared to France and Italy [34,36].

Hence, it is crucial to assess solutions and actions that allowed to mobilize the infrastructure that reduced the number of COVID19 cases and its impact on the pandemic worldwide. As mentioned before, one critical point during the COVID-19 pandemic is regular and wide testing. In Latvia, the government had involved the private sector in the testing processes at the beginning of a pandemic, and it helped to become the leader of countries that have lower COVID-19 cases than European and other World countries.

Method

This paper is based on a case study approach. This approach affords for the researchers to focus on an in-depth view of specific questions in a certain context

[37]. The case study method allows understanding and seeing in detail causal links, pathways, and results from new actions or reforms in policies [38]. In specific, the research develops a case study on the Latvian PPP testing performed during the COVID-19 pandemic.

There are four main reasons to focus on Latvia as a good PPP COVID19 testing example. First, Latvia had one of the lowest numbers of infected citizens among European countries during the first pandemic wave [39] and one of the lowest mortality rates among selected countries [40]. Second, at the beginning of the COVID19 infection spreading in Europe, the Latvian private sector had involved in the testing process, and it had the fifth highest testing coverage among 36 selected OECD countries in 2020 [40]. Third, in Latvia, at the beginning of 2020, the permanent country population accounted for 1 million 908 thousand people. That is why Latvia can be attributed to small countries [41]. Finally, successful cooperation between the public and private sectors in testing created new collaboration opportunities.

The research was done in three consecutive steps. A related literature review about the proposed topic was performed. The following keywords were used to select articles: public-private partnerships in COVID-19, testing of the COVID-19, and health systems during the pandemic. The second step contains data collection from government reports, official websites, and databases as well as official documentation (period 2020). To acquire the necessary data, a request was submitted to Latvian National Health Services. The National Health Service data are compiled from information received from laboratories. Acquired data were about the total number of examinations per day, the total number of patients per day, and the number of examinations performed by each laboratory per day. Finally, an analysis of the case and data was done with the conclusion in the result. The findings and results are presented in the discussion part of this paper.

The limitation of this paper is that no available data disaggregated by gender, age, location/region, occupation, and other variables. This limitation is due to the fact that the information is not collected by a state institution. It is assumed that the absence of these data does not alter the result [7].

Results of public-private partnership performance during the pandemic in Latvia

COVID-19 testing in Latvia 2020

COVID-19 testing in Latvia started on 26 February 2020, just with the first 4 tests. Tests were indicated for patients with symptoms such as fever, cough, fatigue, etc. This process happened in people's homes, and they were asked not to leave their homes. The first tests were made by the Emergency medical service

and then other institutions were involved. Testing capacity during the first months increased and, at the beginning, involved only the private sector. After that, it also started to involve the public sector. Capacity slowly increased and reached the entire Latvia [42].

The first COVID-19 tests in Latvia were made on 26 February 2020 by Emergency medical services that performed tests arriving at the patient's home. After the first positive cases in Latvia on 11 March 2020, it was clear that testing cannot be made by just Emergency medical services. On 13 March 2020, the first mobile testing point was built near the Latvian Centre of Infections. After that, the trend continued and similar mobile testing points were set up in other cities. Testing was organized in a way that everyone who had a referral from a doctor could do a test after pre-registering or those who had a private car. After 23 March 2020, testing for COVID-19 was made available in 7 cities and 13 test delivery points. Tests were made by Central Laboratory and E. Gulbis Laboratory, and they were state-funded. The tests were made by medical professionals from laboratories, mainly medical nurses. However, according to the World Bank data, Latvia has one of the lowest numbers of nurses per 1000 inhabitants (4.8 nurses/1000 inhabitants, conversely European Union 9.3 nurses/1000 inhabitants) and potentially they should have been involved in patient care, but it was decided to involve medical students in the testing process. After 18 May 2020, the Emergency medical service stopped testing and only laboratories continued to perform tests [42].

On 14th April 2020, employers could invite employees for COVID-19 testing. The testing increased in sectors such as pre-school workers and international transportation providers. Since 14th April around 1500 tests had been made every day. From 14 April 2020, it was possible to perform tests and receive results within 48 h in 22 locations in Latvia [42]. If at the beginning of the pandemic period Latvia did a few dozen of tests per day, then by the end of 2020 they managed to perform more than 10 000 tests per day. According to the Latvian National Health services, [Figure 1](#), the number of COVID-19 tests performed and the number of new COVID-19 cases per month in Latvia are displayed. The average number of tests in 2020 was 2355.99 (interval: 4.00 – 12,091.00) per day and 2141.73 (interval: 7.67–7365.77) per month.

At the beginning of COVID-19 spreading, there was a big necessity for quick and wide virus testing in Latvia. The Government of Latvia decided to involve private laboratories to organize this process. According to the Latvian National Health services, [Figure 2](#) shows average private tests per month (%).

The private sector (Central Laboratory, E. Gulbja Laboratory, MFD Laboratory, and NMS Laboratory)

Average number of tests and new COVID-19 cases per month in Latvia, 2020

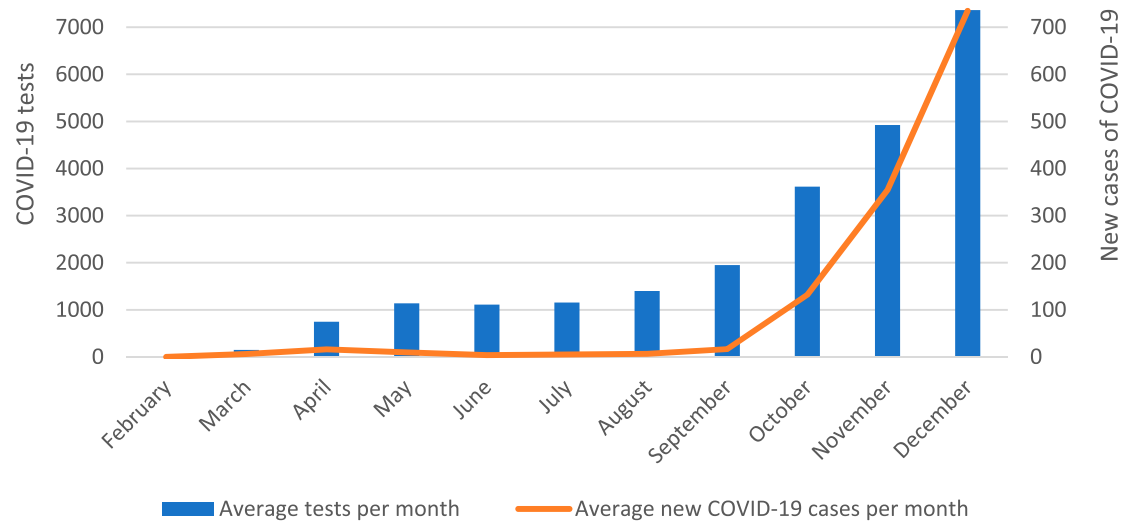


Figure 1. The average number of COVID-19 tests and new COVID-19 per month in Latvia.

did around 95.78% of monthly tests. On the contrary, the public sector performed (Latvian Centre of Infectious Diseases and State Scientific 'Institute of food safety, animal health, and environment BIOR' laboratory of Microbiology and Pathology) 4.24% monthly tests altogether. Central Laboratory also was contracted to operate a customer testing helpline for all testing performed in Latvia from April 2020 to August 2020 and then it was handed over to RAKUS.

In the middle of 2020, the tests could be performed in 109 testing points in all regions of Latvia. Altogether COVID-19 tests could be made in 109 testing points of which the public sector operated a few points in Riga, Rezekne, and Daugavpils; however, the private sector operated points in Riga and other cities (regional cities and towns) [43].

Discussion

Latvia's experience in a COVID-19 testing organization involving the private sector is a valuable case study to explore. The process of quick reaction and results during the beginning of virus spreading is a good example of public-private partnership in small countries. This collaboration allows for immediately reacting to new needs in the health system and potentially slowing down virus spreading, increasing countries cover in the testing process and making a new partnership.

As the previous experience of the public-private partnership, collaboration in the Latvian healthcare sector has shown – it takes time. According to the Public Procurement Law, there are at least two months to sign the contract and start performing the service.

After COVID-19 started to spread in December 2019, it reached Europe in a month. In this situation rapid planning and reaction are crucial. Data from Latvia's experience show that a small country does not have enough public laboratory capacity to make around 2355 tests per day (in the public sector it was just 4.24% of all tests). At the same time, the public sector started testing just two months after and the capacity of this testing was low. However, it should be highlighted that both are National Reference Laboratories, which means that they should carry out their main functions of monitoring the infectious disease situation. The most important factor related to infectious disease is time. According to the emergency situation in Latvia, the government asked private laboratories to start testing immediately without any public procurement process under the Public Procurement Law. Cooperating with earlier collaborators was unprecedentedly quick. The private sector found an opportunity to reschedule laboratory works to perform the necessary tests per day. One more positive aspect of this collaboration is that the private sector is engaged in extra medical stuff for works in laboratories, inc., medical students, thereby ensuring a continuous testing process.

An analysis by Wei et al. shows that Latvia was one of the fifth highest testing coverage among 36 selected OECD countries in 2020. According Zrelavs et al. and Wei et al. Latvia had the lowest number of infected citizens in European countries and a lower mortality rate in the first wave. Quick testing allows the rapid isolation of person with positive COVID-19 (those who are infected without symptoms or those to whom symptoms have not developed yet) and protect people around them. As follows, if a person without symptoms

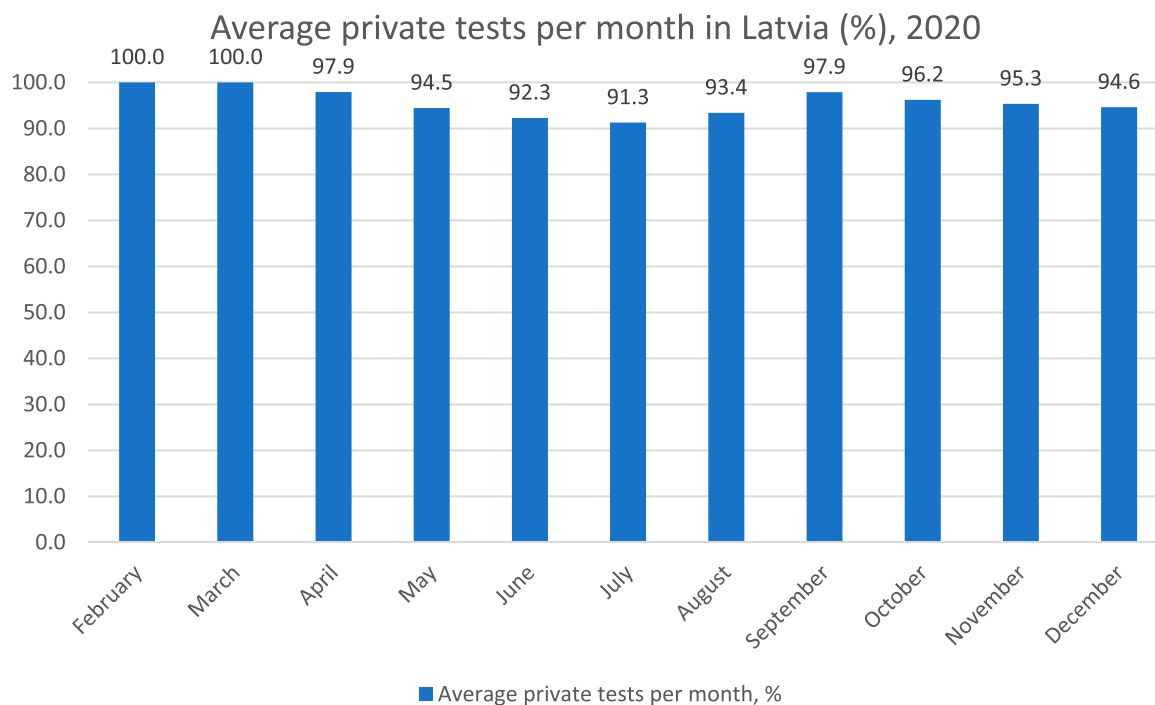


Figure 2. Average private tests per month.

can be isolated, it decreases mortality as it is characteristic for an old person or person with chronic disease. The data of this case show that around 96% of all tests were made by the private sector directly by the private sector covers wide testing in Latvia.

Lastly, successful collaboration will develop new opportunities for beneficial projects in the future. Latvia realized PPP extensively at the primary level of the health system and in some individual projects such as mobile mammography and nuclear medicine. However, the pandemic shows that collaboration can be useful for the public and private sectors. As a result, the government of Latvia started a new partnership with the private sector during the pandemic of COVID-19. For instance, coordination of the vaccination process is the responsibility of the public sector (Vaccination Office under the National Health Service) but the practical part, which included infrastructure, and transportation of mass vaccination is the private sector's responsibility.

Conclusion

Conforming to the authors' point of view, the case study of Latvia shows how PPP during a pandemic or other similar emergency can be useful to resolve what kind of condition. PPP shows a successful case where the need for public health was fulfilled by successful collaboration.

The PPP role of COVID-19 testing during a pandemic in small countries contains extra resources for rapid and previously not established process

organization that allows governments and the public sector to pay attention to other important questions. In some cases, for example, laboratories' territorial covering, it helps to be involved in the process regions and make these tests in cities and towns. As a result, collaboration can decrease infection prevalence and mortality.

The private sector has shown to be more effective in its ability to increase total capacities of testing and also geographic access. The public sector benefits from this collaboration since its resource could be released to perform other tasks.

Another lesson learned is that systematically procuring services from private providers during 'normal times' creates a strong and effective partner in the case of an emergency.

Interestingly, part of the success in the PPP collaboration was brought by time pressure – partnership decisions and contracting took much less time and paperwork without any detriment to quality and cost.

The main limitation of this paper is a single-country experience given that it was a case study. However, observation of this collaboration can be useful for a wider analysis in smaller countries. PPP very often is isolated collaboration in some fields in the health system. However, this case shows and calls for further exploring the possibilities for cooperation in such a model.

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Notes on contributors

A. Kalva contribute to the research data collection, analysis and publication.

G. Brigis contributes to the methods and planning of the research.

S. Kruks contribute to the literature selection and discussion part.

D. Smits contribute to the research data collection and conclusion part.

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References

- Al-Hanawi MK, Almubark S, Qattan AMN, et al. Barriers to the implementation of public-private partnerships in the healthcare sector in the Kingdom of Saudi Arabia. *PLoS one*. 2020;15(6):e0233802. doi:10.1371/journal.pone.0233802.
- Tang Y, Liu M, Zhang B. Can public-private partnerships (PPPs) improve the environmental performance of urban sewage treatment? *J Environ Manag*. 2021;291:112660. doi:10.1016/j.jenvman.2021.112660.
- Joudyian N, Doshmangir L, Mahdavi M, et al. Public-private partnerships in primary health care: a scoping review. *BMC Health Serv Res*. 2021;21(1):4. doi:10.1186/s12913-020-05979-9.
- Cappellaro G, Longo F. Institutional public private partnerships for core health services: evidence from Italy. *BMC Health Serv Res*. 2011;11(1):82–90.
- Reeves E, Palcic D. Getting back on track: the expanded use of PPPs in Ireland since the global financial crisis. *Policy Stud*. 2017;38(4):339–355.
- Davalbhakta S, Sharma S, Gupta S, et al. Private health sector in India-ready and willing, yet underutilized in the Covid-19 pandemic: a cross-sectional study. *Front Public Health*. 2020;8:571419. doi:10.3389/fpubh.2020.571419.
- Yates R. In the COVID-19 Era, Healthcare should be universal and free. 11 May 2020 [cited 2021 Jun 14]. Available from: <https://www.chathamhouse.org/2020/05/covid-19-era-healthcare-should-be-universal-and-free>
- Hussain R, Arif S. Universal health coverage and COVID-19: recent developments and implications. *J Pharm Policy Pract*. 2021;14(1):23. doi:10.1186/s40545-021-00306-x.
- Behmane D, Misiņš J. Information on health system responses and other public health initiatives related to the COVID-19 crisis; 2021. Available from: <https://www.covid19healthsystem.org/countries/latvia/countrypage.aspx>
- Daiga B, Alina D, Anita V, et al. Latvia health system review. WHO; 2019;21:196.
- Saeima. Law on public-private partnership. *Latvijas Vēstnesis*, 107; 09.07.2009; *Latvijas Republikas Saeimas un Ministru Kabineta Ziņotājs*, 16, 27.08.2009.
- Latvia NHSRo. General practitioners according to territories (Ģimenes ārsti atbilstoši teritorijām) [cited 2022 Apr 17]; 2022. Available from: <https://www.vmnvd.gov.lv/lv/gimenes-arsti-atbilstosi-teritorijam>
- Saeima. Public procurement law. *Latvijas Vēstnesis* 254; 2016.
- Laboratory C. Branches of the Central Laboratory. [cited 2021 Jul]; 2021. Available from: <https://www.laboratorija.lv/filiales.html>
- Laboratory EG. Branches of the E. Gulbja Laboratory. [cited 2021 Jul]; 2021. Available from: <https://www.egl.lv/par-mums/filiales-un-darba-laiki/>
- Laboratory N. Branches of the NMS Laboratory. [cited 2021 Jul]; 2021. Available from: <http://www.nms-laboratorija.lv/lv/filiales/>
- Laboratory M. Branches of the MFD Laboratory. [cited 2021 Jul]; 2021. Available from: <http://www.mfd.lv/laboratory-working-time>
- World Health O. Advancing the right to health: the vital role of law.
- Tabrizi JS, Azami-Aghdash S, Gharaee H. Public-private partnership policy in primary health care: a scoping review. *J Prim Care Community Health*. 2020 Jan–Dec;11:2150132720943769. doi:10.1177/2150132720943769.
- The World Bank Group, About Public-Private Partnerships, The World Bank Group. [cited 2021 Jun]; 2021. Available from: <https://ppp.worldbank.org/public-private-partnership/about-public-private-partnerships>
- Penny D. The role of the private sector in the context of aid effectiveness: consultative findings document. Vol. Final Report. 2011.
- Abuzaineh N, Brashers E, Foong S, et al. PPPs in healthcare: models, lessons and trends for the future. healthcare public-private partnership series, No. 4. San Francisco, CA: The Global Health Group, Institute for Global Health Sciences, University of California, San Francisco and PwC. Produced in the United States of America; 2018.
- Gorbalenya AE, Baker SC, Baric RS, et al. The species severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Na Microbiol*. 2020;5(4):536–544. doi:10.1038/s41564-020-0695-z.
- Aldila D, Samiadji BM, Simorangkir GM, et al. Impact of early detection and vaccination strategy in COVID-19 eradication program in Jakarta, Indonesia. *BMC Res Notes*. 2021;14(1):132. doi:10.1186/s13104-021-05540-9.
- Savaris RF, Pumi G, Dalzochio J, et al. Stay-at-home policy is a case of exception fallacy: an internet-based ecological study. *Sci Rep*. 2021;11(1). doi:10.1038/s41598-021-84092-1
- Schlosser F, Maier BF, Jack O, et al. COVID-19 lockdown induces disease-mitigating structural changes in mobility networks. *Proc Natl Acad Sci USA*. 2021;117(52):32883–32890. doi:10.1073/PNAS.2012326117.
- Wu E, Qi D. Masks and thermometers: paramount measures to stop the rapid spread of SARS-CoV-2 in the United States. *Genes Dis*. 2020;7(4):487–490. doi:10.1016/j.gendis.2020.04.011.

- [28] Lai C-C, Shih T-P, Ko W-C, et al. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. *Int J Antimicrob Agents*. 2020;55(3):105924. doi:10.1016/j.ijantimicag.2020.105924.
- [29] Torres I, Sippy R, Sacoto F. Assessing critical gaps in COVID-19 testing capacity: the case of delayed results in Ecuador. *BMC Public Health*. 2021;21(1). doi:10.1186/s12889-021-10715-x
- [30] Sharfstein JM, Becker SJ, Mello MM. Diagnostic testing for the novel coronavirus. *JAMA*. 2020 Apr 21;323(15):1437–1438. doi:10.1001/jama.2020.3864.
- [31] Žilinskas J, Lančinskas A, Guarracino MR. Pooled testing with replication as a mass testing strategy for the COVID-19 pandemics. *Sci Rep*. 2021;11(1):3459. doi:10.1038/s41598-021-83104-4.
- [32] Yousman LC, Khunte A, Hsiang W, et al. Urgent care center wait times increase for COVID-19 results in August 2020, with rapid testing availability limited. *BMC Health Serv Res*. 2021;21(1):318. doi:10.1186/s12913-021-06338-y.
- [33] Fink S, Baker M. It's just everywhere already: How delays in testing set back the U.S. coronavirus response. *The New York Times*; 2020. March 10, 2020. [cited 2021 Jun 7]. Available from: <https://www.nytimes.com/2020/03/10/us/coronavirus-testing-delays.html>
- [34] Soneji S, Beltrán-Sánchez H, Yang JW, et al. Population-level mortality burden from novel coronavirus (COVID-19) in Europe and North America. *Genus*. 2021;77(1):7. doi:10.1186/s41118-021-00115-9.
- [35] Beaumont. Coronavirus testing: How some countries got ahead of the rest. *The Guardian*. April 2, 2020. [cited 2021 Jun 7]; 2021. Available from: <https://www.theguardian.com/world/2020/apr/02/coronavir>
[us-testing-how-some-countries-germany-south-korea-got-ahead-of-the-rest](https://www.theguardian.com/world/2020/apr/02/coronavir-us-testing-how-some-countries-germany-south-korea-got-ahead-of-the-rest)
- [36] Robert Y. In the COVID-19 Era, Healthcare should be universal and free. 11 May 2020. [cited 2021 Jun 14]; 2020. Available from: <https://www.chathamhouse.org/2020/05/covid-19-era-healthcare-should-be-universal-and-free>
- [37] Rashid Y, Rashid A, Warraich MA, et al. Case study method: a step-by-step guide for business researchers. *Int J Qual Methods*. 2019; 18. doi:10.1177/1609406919862424.
- [38] Crowe S, Cresswell K, Robertson A, et al. The case study approach. *BMC Med Res Methodol*. Jun 27 2011;11:100. doi:10.1186/1471-2288-11-100.
- [39] Zrelavs N, Ustinova M, Silamikelis I, et al. First report on the Latvian SARS-CoV-2 isolate genetic diversity. *Front Med (Lausanne)*. 2021; 8. doi:10.3389/fmed.2021.626000.
- [40] Wei C, Lee CC, Hsu TC, et al. Correlation of population mortality of COVID-19 and testing coverage: a comparison among 36 OECD countries. *Epidemiol Infect*. 2021; 149. doi:10.1017/S0950268820003076.
- [41] Latvia CSBo. Demography 2020. [cited 2021 Aug]; 2020. Available from: <https://www.csb.gov.lv/en/statistics/statistics-by-theme/population/number-and-change/search-in-theme/417-demography-2020>
- [42] Law on the Management of the Spread of COVID-19 Infection. In: Saeima, editor. *Latvijas Vēstnesis*, 110A, 09.06.2020; 2020.
- [43] Map of the COVID-19 testing points. [cited 2021 Jul]; 2021. Available from: <https://www.zeemaps.com/mobile?group=3746536>