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Private-Public Collaboration in Iceland: Battling COVID-19 with deCODE Genetics

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Abstract

Iceland's 360,000-person population has been gradually rebuilding its trust in public institutions after the harsh financial crisis of 2008-2010. The country was once again shaken in 2020; this time by the arrival of COVID-19 with its extreme impact on the country, including its number one sector, tourism, which came to a grinding halt in March 2020. Iceland's swift response to battle the pandemic garnered headlines around the world for its public-private collaboration with deCODE genetics, which used their deep genetics experience to develop and roll-out screening services and extensive analysis of the virus, thereby changing the trajectory of COVID-19 and permitting an earlier re-opening than most European countries. This article shows how the public-private partnership boosted the nation's trust in institutions and bolstered the country's resilience in a time of crisis.

Keywords

Iceland • private company • public sector • resilience • trust

Introduction

On March 11, 2020, when the World Health Organization (WHO) declared COVID-19 as a pandemic, the virus was in the early stages of spreading in Iceland. Several countries around the world had already closed their borders to stop the transmission of the disease (Directorate of Health, 2021a or b?). The Government of Iceland and local authorities set about protecting the nation's health system through a series of actions. The country's institutions had all been on a long road of rebuilding trust after the financial crisis of 2008-2010, which had caused a collapse of the banking system, currency, and economy, resulting in a period of political turmoil. A decade later in 2020, Iceland had established more robust governance mechanisms in both public and private sectors. Additionally, the country had focused on the development of the tourism sector from 2010 to 2020, seen by many to be one of the key factors in reviving the economy.

The private company, deCODE Genetics, offered its services for free to the Government of Iceland to screen, test and further gain an understanding of the virus. This was done without any request from the Government and was estimated to cost the company 1,2 billion Icelandic Kronur (ISK) a month (Jonasson, 2020a). It was, as well, the only company with the knowledge and equipment to step in and provide aid of this sort. Kari Stefansson, the founder and CEO, was however known for his generosity but he, on behalf of deCODE had given the University Hospital the first Position Emission Tomography (PET/CT) in 2018 worth 800 million (Decode Genetics, 2017). Established in 1996 and later acquired by the U.S. biopharmaceutical company Amgen in 2012, deCODE had become well-known around the world for creating one of the first major human genetics databases for the purpose of studying the identification and prevention of diseases. On March 13, 2020, deCODE repurposed their genetics laboratory and took over most of the screening and testing from Iceland's University Hospital. As deCODE's founder and CEO, Kari Stefansson, said, "We just came to help the system; this was all hands-on deck moment. This is our contribution to the battle" (Kelly, 2020).

This article looks at and argues for how a public-private partnership between a government and a private company helped to develop a novel approach to screening, testing, and sequencing a virus to avoid a collapse in a healthcare system and permit a country to drop COVID-19 restrictions. Furthermore, the article explores how Iceland and deCODE's resources assisted in the country's preparedness, agility, and robustness in confronting the virus. Finally, the paper considers the societal impact of the Government of Iceland and deCODE's actions in combatting COVID-19 and being one of the first countries to open its borders to foreign travellers. The paper does so by applying indicators proposed in the introduction to this symposium (Gherghina, et al 2022).

The Development of COVID-19 in Iceland

As COVID-19 began spreading in March 2020, politicians allowed scientists and medical experts to take the lead; as Iceland's Prime Minister stated: "I think it's important for a politician to realize what is politics and what needs to be solved by scientific means. It's my firm belief that we need to listen more to the experts" (Mackenzie, 2021). As such, three governmental individuals became important public figures: Thorolfur Gudnason, Chief Epidemiologist; Alma Moller, Director of Health; and Vidir Reynisson, Chief of Civil Protection and Emergency Management. Thorolfur Gudnason explained the

overall approach, “We decided from the beginning we would use isolation, quarantine and contact tracing” (Scudellari, 2020). On March 15, 2020, gatherings were limited to a maximum of 100 people and international travel was discouraged. Despite these measures, the virus spread quickly and suddenly a worrisome trend emerged since Iceland was experiencing one of the highest infection rates in Europe. Stricter restrictions were implemented including a 14-day quarantine for foreign visitors (Directorate of Health, 2022).

The restrictions on international travel meant that Iceland’s largest industry – tourism – came to a standstill almost immediately. The blow was enormous. The government acted very quickly with a response plan to avoid many bankruptcies and high unemployment, launching several programs to help businesses and citizens cope with COVID-19. On March 15, 2020 – the same day the first restrictions were announced – the government postponed the due date for businesses on withholding tax and social security payments. A week later, on March 21, 2020, the government announced the first phase of the COVID-19 relief plan. First, the government set out to “bridge the gap” and ensure the income of people and companies: partial compensation for part-time workers, a state guarantee on bridging loans to companies and deferral of tax payments. Second, the government aimed to protect the most vulnerable in society: wages during quarantine, child benefit supplements and private pension savings assessments including withdrawals on private pension savings. Finally, to create strong resistance for the economy, the government put in resources to strengthen tourism, expanded the "Everyone Works" program, invested in companies, and facilitated easier imports (Government of Iceland, 2022).

The measures under Phase 1 amounted to ISK 230 billion, representing nearly 8% of national GDP. Iceland’s Tax Authority and the Directorate of Labour played major roles in assessing the eligibility for the programs and handled inquiries and applications for part-time work and for wages in quarantine (KPMG, 2021).

Subsequent phases were rolled out in April 2020 (Phase 2) and November 2020 (Phase 3). Phase 2 focused on more programs specifically in additional funds and assistance to businesses and individuals as well as mental health support. Phase 3 took the support further through more financing and tax relief mechanisms while expanding the social safety net for families with children and vulnerable groups. The specific initiatives under each phase aligned to the three-pronged approach to the COVID-19 relief plan as described in Table 1 below (Government of Iceland 2022; Icelandic Revenue and Customs 2021).

Table 1 about here

Research Method

Given the focus of the article, a qualitative method was used to gain an understanding of how a public-private partnership between the Government of Iceland and deCODE helped to develop the approach to combat COVID-19 and led the country towards preparedness, agility, and robustness in confronting the virus. A single-case-based approach was applied. Such a study can richly describe an existence of a phenomenon (Siggelkow, 2007). Qualitative data allows for exploring and theorizing by getting close to settings that are able to examine relationships. Multiple sources of data were collected for obtaining a thorough understanding of the partnership. Written documents were an important source of information. Archival data included primary and secondary data. Secondary data included, amongst others, information on deCODE as a case company, its partnership agreement and business strategy. Secondary data was accessible via the internet. Primary data included in-house data such as reports on the partnership with the Government, its implementation and on its process and progress. Data collection took place between March and September 2021.

Table 2 about here

Institutional Resilience in Times of Crisis

The resiliency scores of preparedness, agility, and robustness are provided below for the country overall, including all the departments and ministries under the Government of Iceland as well as deCODE Genetics.

Preparedness

In comparison to other European countries, Iceland's health care system was relatively well prepared earning a score of "4". Iceland follows the Nordic welfare state model whereby a large portion of taxes fund broad access to public health care. Total public and private health care expenditures represented 8.6% of GDP in 2019 and 83.4% of that spending was from public sources (Statistics Iceland, 2021a). The country has two main hospitals: the University Hospital in Reykjavik (Landspítali) and Akureyri Hospital in the second largest city. Other facilities include six regional hospitals and more than 60 primary health care centres and other health institutions. Most Icelandic doctors train for their specialization abroad for three to eight years before returning to the country. Iceland was ranked 19th in the world for having 4.1 physicians per 1,000 people but 88th in terms of hospital beds at 2.8 per 1,000 people (World Bank, 2021). Regardless of the relatively low hospital bed count, the country emphasized preventative health and well-being, which could be evidenced in its life expectancy since the country boasted one of the highest in the world with 84.2 years for women and 81 years for men (Statistics Iceland, 2021b).

While many observers recognized the country had modern and well-funded hospitals with highly trained staff, the public health care system did not have the equipment, software, data analytics

capabilities or know-how to develop a strong testing program. Furthermore, the Chief Epidemiologist worked under the Directorate of Health and there was no dedicated Icelandic Institute of Epidemiology.

Fortunately, the private company, deCODE Genetics, had been working for two decades on building the data analytics capabilities and had collected DNA on two-thirds of the Icelandic population, making it one of the most comprehensive databases in the world. The company had used the rich DNA data to discover genetic risk factors and had mapped genes to more than 25 common diseases, giving the company the capability to develop tests to identify diseases and predict the efficacy of drugs in fighting said disease. DeCODE Genetics employs 190 people at its state-of-the-art laboratory that has equipment and software to analyse genealogy, genotypes (hereditary genes) and phenotypes (all observable information about genes). In the words of deCODE's founder and CEO commenting on the company's preparedness, "*It almost looked like these 24 years preceding COVID-19 had just been a training session* (Scudellari, 2020)."

Agility

Iceland was exemplary on a global level for its agility, and we have given it a rating of "5" for adapting quickly to the situation. The two major reasons for the high agility score is a strong crisis management approach illustrated by frequent and clear communication as well as the collaboration between the government and deCODE Genetics.

As described in the first section of this article, the government took decisive action to "listen to the experts" and gave them the authority and platform to speak openly and honestly to the citizens about the virus and the actions to combat the spread. The Ministry of Health established guidelines such as restricting in-person gatherings, enforcing social distancing, limiting in-person education and workplaces, screening and testing as many individuals as possible and requiring 14-day quarantines for exposed individuals. Furthermore, communication and education were key pillars of the approach. The government and Ministry of Health developed the website "covid.is" in 11 languages to provide the country with up-to-date information on health and regulations as well as the mobile tracking app, Rakning C-19, to advise of infections and potential exposure to COVID-19 based on geo-location. The most visible communications in the first three months of the pandemic were the regular press conferences with the Chief Epidemiologist, Director of Health and Chief of Civil Protection and Emergency Management, broadcast live by the country's largest media outlet (The Office of the Medical Director of Health, 2021).

Perhaps most extraordinary was the offer by deCODE Genetics to immediately stop its regular genetics activities and utilize its laboratory, equipment, and human resources to dedicate towards fighting COVID-19. The company invited the University Hospital to jointly run its testing lab and then swiftly built software in-house allowing any Icelandic resident to sign-up for tests; the resident would present a barcode on their phone at any testing centre which would generate a printing label for the swab sample. The sample would then be sent to deCODE's laboratory (running from 6am to 10pm at the height of the pandemic) and would be processed within 24 hours, although frequently within 6 hours. The jointly run lab increased the capacity to around 5,000 samples per day and by the end of 2020, deCODE had screened more than half of Iceland's population (Scudellari, 2020). In addition to testing,

deCODE set to work on two other important tasks: screening for antibodies that indicated previous infections and sequencing the virus for other scientists to understand its exact genetic code (Highfield, 2020).

The CEO of deCODE summed up his company's contribution as: *"We are a very small country with a population of 360,000. There are not a lot of resources in the country to do work like this. But deCODE has the resources, so we have looked at this as our civic duty to do this testing"* (Amgen, 2020). This comment of the CEO might be regarded, in the light of the small population, as a double-edged sword. On the one hand, as the CEO states, resources might be scarce in smaller populations, but on the other hand, in tough times smaller populations and populations that score low on power distance are more likely to reach consensus sooner on necessary actions (Hofstede, 2001).

Robustness

Overall, the robustness score of "3" was determined for the country at large given that Iceland's economic condition was vulnerable to an external shock because of the reliance on tourism, which prior to COVID-19, was the largest industry representing 8% directly of GDP (Statistics Iceland, 2021c). While tourism's rapid growth over the last decade had been plateauing in 2018 and 2019, no one expected it to be shut down abruptly and practically "overnight".

At the same time, the country and its citizens were no strangers to major crises having lived through the financial crisis of 2008-2010, which saw the default of the country's three largest banks, a major devaluation of the currency, high unemployment and a 10% decline in GDP (Statistics Iceland, 2021d). As such, the country was able to develop plans to ensure the financial stability of the country such as the three-pronged strategy mentioned in the first section of this article: bridge the gap, protect the most vulnerable in society and create strong resistance for the economy.

When analysing the robustness of the Health Care system specifically, Kari Stefansson, deCODE's CEO, had strongly indicated to the Government of Iceland that it urgently needed to establish the Icelandic Institute of Epidemiology to develop further capabilities in molecular biology, statistics, mathematics, and infectious disease as one did not currently exist in the country. In July 2020, he sent an open letter to the government stating that deCODE would cease its involvement in testing stating, *"we can no longer do this much because we have other work to do"* (Jonasson 2020b).

Since deCODE set aside its regular operations and projects from March to July 2020, its activities did suffer because of the pandemic. The company was subsequently requested to help with screening throughout the latter half of 2020 and into 2021.

Societal Impact of Resilience in Iceland

The impact in society of both institutions was very strong and is assigned a "5" albeit for different reasons with both institutions.

Public: National Government

By the end of July 2021, 16 months after the initial outbreak of COVID-19, industry associations and the public lauded the government's response. The government had extended help for families and businesses, adapting the partial compensation route for salaries to expedite the return to work (National Radio, 2021a). As of mid-2021, vaccination was progressing rapidly, with more than one-third of the country having received at least one dose of vaccine. Economically, disposable income increased on average during the pandemic while domestic demand fell by only 1.9%, which is the lowest among European countries (Government of Iceland, 2021a or b?).

The national income tax and excise tax base increased by 5.7% from 2019 to 2020, despite a sharp economic contraction and a sudden rise in unemployment. According to Thorolfur Matthiasson, Professor of Economics at the University of Iceland, the increases show the unemployment benefits and special government measures such as accessing private pension savings have offset the decline in personal income from 2020. Unemployment benefits increased by ISK 46.5 billion from 2019 to ISK 65 billion in 2020 and the number of unemployment benefit recipients was 55,557 (approximately 15% of the population), which quadrupled from 2019. The individual tax results from 2020 indicate that 90% of the Icelandic economy fared better than expected at the outset of the pandemic (Arnason, 2021).

Private: deCODE Genetics

Icelanders were tested for COVID-19 more than any other nation in the world due to deCODE Genetics and Iceland's comprehensive testing program (Waldie, 2020). By testing large parts of the population early on, Iceland was able to diagnose the spread of the virus and place people with positive test outcomes in a 14-day quarantine of which 57% of those diagnosed with COVID-19 were quarantined immediately. Observers believed the strength of the Icelandic health system with well-educated staff, as well as a wealth of ideas, quick reactions, cooperation, and perseverance, led to the positive outcome (Magnússon 2021a). The testing and response by the government and deCODE helped control the virus and by summer 2020, infection rates had fallen to one of the lowest in Europe. By July 2020, the University Hospital took over the screening at the Icelandic border and deCODE assisted in implementing screening software to ensure a smooth transition for screening and testing (Magnússon, 2021b).

The positive results meant the country was able to open its borders to foreign tourists quicker than many other countries. By mid-June 2020, foreign tourists were allowed into the country and were given a choice of a test at a cost of ISK 15,000 (US\$110) or a two-week quarantine. After summer 2020, the government enforced stricter measures domestically and internationally as case numbers increased. However, as case numbers once again subsided, Iceland was one of the first countries to allow fully vaccinated travellers to enter with proof of vaccination in March 2021. Shortly thereafter, random screenings were resumed in the community with the help of Icelandic genetic analysis (Directorate of Health, 2021b) and in May 2021, the Chief Epidemiologist asked deCODE to resume testing as more tourists flocked to the country (National Radio, 2021b).

In addition to testing, deCODE's contribution was much greater to society beyond Iceland's borders as it worked to screen for antibodies and sequence the virus. Iceland was considered to be a

world leader since it sequenced every positive COVID-19 test in less than two days, per test, leading to a better understanding of the variants and permitting authorities to pinpoint the spread through contact tracing (France 24, 2021). In sequencing every positive test, the company revealed 409 sequence variants of which 70% had not been previously logged in the global database on influenza sharing (Amgen, 2020). The company's work resulted in a widely cited scientific paper in *The New England Journal of Medicine* contributing to the world's understanding on how the virus spread and mutated (deCODE Genetics, 2021).

Conclusion

In conclusion, the work of the two institutions provided a major boost to Iceland's ability to manage throughout a time of crisis by placing science and the scientific method at the forefront. The country's decision to screen and test large portions of the population early on and the utilization of all potential sources of information to build scientific knowledge was seen as the key to success. The authors believe Iceland has been a good example on a global level, especially for its agility and social impact because of its ability to adapt quickly to the situation. The ability can be framed as a strong crisis management approach. It is mainly illustrated by frequent and clear communication on a private-public-partnership level. The private company stepped in and tested very early on a large part of the population by leaving part of its own business aside. Hence it was able to diagnose the spread of the virus and the Government could take immediate economic action. The action taken led to an increase in disposable income on average during the pandemic and domestic demand fell by only 1.9%, the lowest in Europe. The swift decision of the private company led to the country being able to open its borders to foreign tourists more quickly than many other countries (Einarsdottir, 2021).

While the country and the public-private partnership was held up as an example throughout the world, it might be worth further investigating how both institutions were motivated to build trust to combat the virus. The Government of Iceland was motivated by the health and welfare of its citizenry, as well as the economy, given the recent history with the 2008-2010 financial crisis. For its part, deCODE was keen to show the applicability of its two-decade efforts to profoundly understand the genealogy of the country's inhabitants. For the most part, the country was able to communicate credibly and strategically in a non-ideological and non-partisan way (Khemani, 2020). The partnership was, however, not without its challenges, namely the disagreement on how to establish a National Institute of Epidemiology. However, both sides were able to bring skills and clout to the situation, the government with its swift decision-making, constant communication, and boldness to welcome foreign visitors when many other countries were closing borders and deCODE with its ability to harness its rich scientific knowledge through equipment, software, data analysis and human know-how.

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