

# ON ENHANCING AND AUTOMATING THE COVID-19 CASE REPORTING SYSTEM IN POLAND

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## Abstract

**Purpose of the study:** The paper aims to create a proposal to extend the functionality of the currently operating COVID-19 case reporting system in Poland.

**Methodology:** Empirical analysis of the current COVID-19 reporting system in Poland with three axes: (1) description of the system functionalities according to official (governmental) sources; (2) listing and characterization of the current system defects causing ineffectiveness of reporting; (3) proposition of systemic alterations to reduce the level of reporting inefficiency preparation and for possible future phenomena related to the pandemic evolution.

**Main Findings:** The reporting system is ineffective as the systems of local medical laboratories performing coronavirus tests are not fully integrated with the central system. Data transfer to the central repository is not executed automatically but relies on manual input by a laboratory technician. Thus, the data in the system are published with a certain delay.

**Applications of this study:** Improving the infection reporting system may prove useful for both legislators and local health regulatory authorities. This may translate into an improved case prediction model and thus greater objectivity in the case of the introduction of new restrictions.

**Novelty/Originality of this study:** The dynamic course of the coronavirus pandemic made it necessary to monitor the number of cases, deaths and, above all, to find outbreaks. The IT systems reporting SARS-CoV-2 cases were developed in a quick manner and solutions were advanced on an ongoing basis. Due to numerous modifications, these systems lack operational efficiency. This study discusses how the current Polish COVID-19 case reporting system works and presents proposals for its refinements which may contribute to ameliorations in many other national systems.

**Keywords:** COVID-19, Case Reporting System, Reporting Automation, Health Governance, Public Health Quality.

## INTRODUCTION

Infectious diseases, especially those with high infectivity and mortality, are a special area of threats to humanity (Bloom & Cadarette, 2019). Not only can they cause changes in medicine, but they could also drive social alterations (Geller *et al.*, 2014; Buckee, Noor, & Sattenspiel, 2021). The group of diseases that have drastically modified all daily life aspects should include the prevailing COVID-19 disease. In order to reduce the rapid spread of this affliction, legislators were forced to introduce universally applicable sanitary regimes, as well as nationwide restrictions regarding the closure of specific sectors of the economy (You, 2020). Such restrictive regulations covering hygienic and economic aspects are being implemented based on the fluctuation of the increment in new infections, deaths, and the number of hospitalized persons or people treated with ventilators. Apart from ensuring the comparability requirement, the data used in the analysis of the pandemic dynamics should also be of high quality (Kubiczek & Hadasik, 2021).

By watching the daily flux in infections, it is possible to note a visible unevenness in reporting the results in a weekly context (Kubiczek & Hadasik, 2021; Dong, Du, & Gardner, 2020). In many countries, it is common that immediately after weekends or holidays there is a substantial decrease in the number of coronavirus infections and, what is more, it is followed by the number of cases coming back to its previous level. Information and Communication Technology (ICT) is the basis for monitoring the course of the COVID-19 pandemic and significantly contributes to the coordination of international projects (Gawalko *et al.*, 2021; Kubiczek, 2021). A research gap that arises here can be defined as the need to optimize COVID-19 case reporting systems. The aim of the paper is to create a proposal to extend the functionality of the currently operating COVID-19 case reporting system in Poland. A properly designed and functioning reporting system is crucial not only for informing the public (in order to minimize the feeling of uncertainty) but also for the governors who establish a preventive policy in the field of protecting the population against COVID-19. The reason for this is the fact that data management is crucial in the efficient decision-making process (Shamim *et al.*, 2019). The following research questions arose from this observation:

- RQ1: How can the current COVID-19 reporting system in Poland be described and what are its functionalities?
- RQ2: What are the weaknesses of the system currently in operation?
- RQ3: What factors cause ineffectiveness in reporting the results of tests for the presence of coronavirus?

- *RQ4*: What actions can be taken to improve the efficiency of this system, therefore eliminating its current shortcomings and increasing the quality and, in consequence, the value of the reported data?

## METHODOLOGY

This paper is an empirical analysis of the system for reporting the results of coronavirus tests to the central database in Poland, along with a proposal to modify its architecture and functionality, to eliminate inaccuracies in publicly disclosed data.

The first stage of the study was to describe the current COVID-19 case reporting system in Poland based on government announcements (including the official websites of the Polish Ministry of Health and the Polish National Health Fund), as well as of technical documentation from official documents of Polish ministries: Health and Digitization and government agencies dependent on them. Then, the elements causing insufficient effectiveness of the system functioning were identified and characterized. The last phase of the analysis was the proposition of enhancements that may result in real changes in the functioning system not only at the Polish level but may also be an insight for other national governments to alter their reporting software.

## RESULTS / FINDINGS

### Current COVID-19 case reporting system in Poland

To report data on coronavirus infections, it is necessary to perform tests for its presence. In Poland, there is a referral system for the COVID-19 test which can be obtained directly from a primary/night care physician ([Serwis Ministerstwa Zdrowia i Narodowego Funduszu Zdrowia, 2020a](#); [Serwis Rzeczypospolitej Polskiej \[Koronawirus: informacje i zalecenia\], 2020a](#)), and recently also by filling out an online form ([Serwis Rzeczypospolitej Polskiej \[Koronawirus: informacje i zalecenia\], 2020a](#); [Serwis Ministerstwa Zdrowia i Narodowego Funduszu Zdrowia, 2020b](#)). This form collects patients' data, including a history of current symptoms and a history of contacts with infected people. The form is integrated with the Patient Internet Account (pol. Internetowe Konto Pacjenta, IKP),<sup>1</sup> operated by the Ministry of Health of Poland (and the Center of e-Health as a subordinate agenda),<sup>2</sup> as well as the Ministry of Digitization of Poland. In the event of a test referral, the patient is automatically quarantined. The laboratories are also obliged to transfer the data to the central system immediately, alternatively no later than 48 hours after the test has been performed ([Serwis Rzeczypospolitej Polskiej \[Mazowiecki Urząd Wojewódzki w Warszawie\], 2020](#)).

In Poland, the system responsible for reporting test results is called EWP (pol. Ewidencja Wjazdu do Polski, ang. Evidence of Entry to Poland). On September 30, 2020, the system gained an extended functionality (module) of reporting coronavirus cases. It was commissioned by the Ministry of Health and is currently managed and operated by its subordinate unit – Center of e-Health. The main functionality of the EWP module for handling coronavirus case reporting is test result transferring to the centrally-managed database which aggregates infections data that are made available to the public on a dedicated website ([Serwis Rzeczypospolitej Polskiej \[Koronawirus: informacje i zalecenia\], 2020b](#)). The system is also capable of sending information about test results to the personal IKP of an examined person ([E-zdrowie, 2020](#)). All the medical laboratories in Poland (state and commercial) that test swab samples for the presence of SARS-CoV-2 are legally obliged to use this system ([Serwis Rzeczypospolitej Polskiej \[Mazowiecki Urząd Wojewódzki w Warszawie\], 2020](#)). EWP system is integrated with the P1 production environment on the basis of which, among others, the IKP works. P1 is a kind of “sandbox” that medical service providers (such as medical laboratories) and software integrators can use to amalgamate with central databases and data repositories ([E-zdrowie, 2020](#)).

Nonetheless, the current system is not fully synchronized with the local research laboratories' software. Nowadays, synchronization happens as only partial integration. It means that laboratories are obliged to fill in the test execution form and send it electronically via the EWP system, however, it is done manually by a laboratory technician. Thereby, a patient accesses the information about test results earlier (e.g. through the IT platform of the local laboratory), but in the system managed by the Ministry of Health (and therefore a centrally managed database), it may appear with a delay. Thus, in the aforementioned IKP application, the information about the result of the performed COVID-19 test may also appear after some time. This is because the current reporting system is not automated and is mainly based on human work. It results directly from the announcements of the government side in Poland ([Serwis Rzeczypospolitej Polskiej \[Mazowiecki Urząd Wojewódzki w Warszawie\], 2020](#)), as well as from the official technical documentation of the system ([E-zdrowie, 2020](#)). Nonetheless, the EWP system allows the patient to be identified (using an official identification number, such as, for example, the Polish PESEL number), so sending the form at the same time sends the results both to the central repository and to the personal IKP.

<sup>1</sup>The Patient Internet Account (pol. Internetowe Konto Pacjenta) is an online platform that brings together all basic health services for a given patient, such as e-prescriptions, e-referrals and information on personal vaccinations.

<sup>2</sup>The Center of e-Health (pol. Centrum e-Zdrowia) is an agency subordinate to the Polish Ministry of Health, responsible for computerization and digitization of universal health services, as well as for the implementation and operation of ICT systems related to them.

The reporting system in its current form is not effective due to the presence of noticeable delays in the publication of infection statistics in a weekly reference. In addition, corrections were observed in the reports, resulting in abnormally high surges in the numbers of new cases. The reasons for these delays include the limited operational capabilities of a given laboratory. Oftentimes, coronavirus testing laboratories are opened shorter than test collection points. Therefore, it is important to increase the capability of laboratories by correlating their working hours with collection points in operation. As the test collection points also operate on non-working days (Saturdays, Sundays and public holidays), as well as at night, laboratories should also amplify their efficiency and therefore work also during these hours. In this case, also worth considering is increasing the frequency of sending samples from the testing point to the research laboratory. As the policy of sample transferring may be a government-regulated issue that may therewith augment the quality of information shared about the spread of COVID-19, it can be seen as a challenge for policymakers.

### **The proposition of enhancements**

The proposed changes to the currently operating EWP system would be to modify the functioning of the reporting process itself. The current integration is sufficient to identify a research facility (laboratory), however, as patient data and results are entered manually, there is a justified need to automate this process.

When improving the current COVID-19 case reporting module, the main focus should be on two-way and in-depth integration and synchronization of the reporting system with the local system operating in the laboratory. Research shows that the safe and complete integration of one healthcare system with other applications is key to health management and helps to fully utilize the application's potential ([Dawson et al., 2019](#)). EWP, after implementing such a solution, could focus on the automated collection of patients' personal data and test results through the bidirectional integration discussed in the previous section. After examining a sample it would not be necessary to manually enter the data both into the local database in the laboratory and then into the central repository via a separate form embedded from the external system (in this case: EWP). The EWP reporting module could open as an additional application window (acting as an applet, macro or similar type of application) immediately after entering the data into the local database. This additional window would open automatically (without additional interference from a laboratory employee) with the previously filled data form (with previously downloaded patient data and the test result). After checking the correctness of the automatically filled data, the form should only be confirmed by a lab technician. Then, the EWP system would perform the currently implemented activities, i.e. reporting to the central system and sending information about the test result to the IKP. After implementing such designed functionality, there would be no need to legally oblige laboratories to a maximum delay of 48 hours in reporting due to the discussed automation mechanisms.

The implementation of the proposed improvements in the reporting system may face many problems. Firstly, it is limited by implementation legal aspects. Along with technological changes, there must be changes in the law. These changes would define the conditions of implementation, as well as the obligations of institutions taking part in the entire process and the use of this system. On the other hand, the technological limitations include the potential obstacles encountered when bidirectionally integrating the local systems with the central one. Moreover, backward compatibility of newer versions of the system with older ones, as described in scientific literature ([Ponomarenko & Rubanov, 2012](#)), should be considered. It is also recommended to determine the frequency of software updates and their technical requirements because updates extending functionality and based on full system integration often require support by more modern hardware generations. System maintenance, including periodic updates and constant monitoring of technical requirements, should be performed in accordance with the latest standards in software life cycle management, as presented in articles by [Ruparelia \(2010\)](#) or [Saini and Kaur \(2014\)](#).

### **DISCUSSION**

The published data involving new cases of coronavirus infections and the number of deaths is the primary source of information for both policymakers and individuals. Therefore, the reporting system is expected to provide reliable information and to be highly efficient. In Poland, the current reporting module requires optimization because the data is published with a delay and this causes new cases to stack. Moreover, it causes unnatural surges and drops, and the need for corrections. Thus, it distorts the daily statements.

Among the elements requiring improvement in the conduct of tests for the presence of SARS-CoV-2 virus and the publication of data, two groups can be distinguished: physical and technological. The first aspect considers human-only reliance and the time it takes to manually enter data into the central system. The attention should be paid to laboratories that do not work all day, while some testing points collect samples 24 hours a day – this may remarkably affect the public disclosure process. The technological aspect is based mainly on the bilateral integration of the central system with the local systems and increasing centralization.

A significant advantage of these technological solutions is the possibility of their implementation in other countries, adapting them to local realities. In the proposed scheme of the reporting system activity, attention should be paid to increased automation and thus minimization of human interference which would be a notable improvement compared to the currently operating tool. Moreover, with the help of this scheme, it would be possible to avoid making errors in reporting and this would translate into the elimination of data corrections, resulting in a higher quality of published data and more reliable decision-making by legislators.

It is worth noting that a reporting system designed in such a way may not only be useful in the event of the COVID-19 pandemic but also constitute a kind of protection and preparation of the state for possible occurrences and monitoring of other infectious diseases. Improving the existing public technological solutions in terms of systemic preparation for unexpected health circumstances may translate into improved coping with the spread of the disease in the future, and therefore strengthen the health service and the state of public health. It can also help to inform the public more effectively and thus make more objective and responsible government decisions related to nationwide health-based restrictions.

## LIMITATION OF THE STUDY AND STUDY FORWARD

Limitations to development include the restriction of the analysis to merely one of the COVID-19 case reporting systems. On the one hand, the study allowed for an in-depth analysis of the illiteracy currently existing system in Poland, but on the other: it did not confront different systems. Therefore, a natural extension of the study beyond this limitation would be to compare systems from a larger number of countries and then evaluate their effectiveness. To reduce this restraint, more national (regional) reporting systems should be benchmarked, paying attention to the diversity of countries (regions) in terms of geopolitical location or noticeable trends in case reporting based on retrospective knowledge (i.e. whether the daily number of cases per week is variable or constant and whether there are surges – see [Kubiczek and Hadasik \(2021\)](#) for further explanation). It is also worth making a thorough analysis of the domestic environment (such as the complexity of governmental or local government institutions/agencies responsible for the functioning of the reporting system and information flow) which directly affects the efficiency of operation and system development opportunities.

## CONTRIBUTION

- Bartłomiej Hadasik: Conceptualization, Data curation, Investigation, Resources, Validation, Writing – original draft, Writing – review & editing.
- Jakub Kubiczek: Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing.

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