

## Frequently asked questions - FAQ

### 1. What is the study about?

The study performs a benefit-cost analysis in favour of institutionalising a pandemic early warning system. The study calculates the costs of using wastewater and genomic decoding of clinical and wastewater samples to monitor five different pathogens with high pandemic potential. Secondly, the study compares the costs of operation with the losses prevented by such a system (i.e., its benefits).

### 2. Who conducted the study?

The study was conducted by the non-profit think tank Pour Demain with the collaboration of the research offices Eraneos and INFRAS.

### 3. What is meant by a "pandemic early warning system"?

An institutionalised early warning system for pandemics is understood as a system consisting of the following three components:

1. **Wastewater monitoring:** Systematic monitoring of pathogen load and variants in wastewater through pathogen or variant detection.
2. **Genomic sequencing of positive wastewater and patient samples from various sources (health practices, hospitals, wastewater):** Genetic surveillance of pathogens to observe mutations with epidemiological or clinical impact and derivation of transmission chains.
3. **Data processing, management, analysis and interpretation for imposing measures:** Establishment of a central platform for the data from the sequencing laboratories, as well as three to four additional federal office positions for rapid and accurate interpretation of data to support the specific government-imposed health measures.

### 4. What is the conclusion of the study?

The study concludes that investments in a pandemic early warning system are highly worthwhile and should therefore be implemented as soon as possible. The human and economic losses that can be avoided are significantly higher than the costs incurred to run such an early warning system.

Depending on how quickly the information accessible through the early warning system is processed by the government and translated into concrete measures, and on the severity of the pandemic (which can be similar to COVID-19, strong or extreme), each franc invested is

matched by benefits of 4–8, 53–94 or 106–188 francs, respectively. This ratio is almost certain to be underestimated, as the study does not mathematically depict numerous other beneficial aspects that a pandemic early warning system has during a pandemic as well as at other times (e.g., through ongoing monitoring of antibiotic resistance). The actual benefit-cost ratio is, therefore, likely to be many times higher.

## **5. What benefits does the study calculate?**

The study calculates human and economic losses that are avoided within a first pandemic wave. It is assumed that a government can impose a lockdown five to ten days earlier based on the information gained from the early warning system.

- Human losses are quantified as years of life lost, with an average monetary value assigned to one year of life for the purposes of cost calculations.
- Economic costs are understood as health costs (hospitalisations, costs for long-term health problems, hospitalisations in intensive care) and production losses due to work absences.

The benefit is primarily calculated via the time advantage that results from a pandemic early warning system. Numerous other benefits of a pandemic early warning system are not possible to calculate. These include, for example, the benefits for vaccine production, adaptation and purchasing, as well as the public health benefits of a surveillance system that remains in place outside of a pandemic condition (and provides ongoing health data, e.g., through monitoring of antibiotic resistance).

## **6. Which other pathogens should be continuously monitored according to the study?**

An early warning system for pandemics is particularly effective when pathogens with the highest pandemic potential are monitored. According to experts, ongoing monitoring of influenza viruses, corona viruses outside of SARS-19, smallpox and measles have the highest potential benefits. Precisely which pathogens should be integrated into a pandemic early warning system must be determined in a structured process and adapted to the epidemiological situation.

## **7. Why does the study assess the benefit of a pandemic early warning system only against the basis of the earlier introduction of a lockdown?**

In a recently published [study](#), researchers at ETH Zurich conclude that, in addition to the lockdown, border closures and contact tracing were also effective measures during the COVID-19 pandemic in Switzerland.

However, a lockdown is to be understood to be representative of non-pharmaceutical measures that have a similarly high effectiveness. In order to make quantitative statements

that are as accurate as possible, the study limits itself to the lockdown as the measure whose effectiveness has been measured and discussed most frequently in COVID-19 studies. Of course, the benefit of a pandemic early warning system lies precisely in avoiding national lockdowns as far as possible or reducing their duration. Due to a better basis of information about the epidemiological course of a pandemic (which, for example, differs regionally), targeted non-pharmaceutical measures can be taken at an early stage. Note the study was not able to depict this benefit aspect mathematically (cf. question 5).

### **8. Why does the study only look at the benefits of a pandemic early warning system within a first pandemic wave?**

It is true that the COVID-19 pandemic has shown that case numbers and mortality rates can differ significantly between waves, so a benefit-cost balance across an entire pandemic event would be particularly interesting and possibly different to that calculated for a first wave alone.

However, according to experts, the effect of an early warning system cannot be clearly defined over several waves due to a change in pandemic dynamics with new variants, a change in the immunity situation due to vaccinations, and so on. The effect of an early warning system cannot be clearly defined over several waves. A balance sheet covering an entire pandemic event would lose its quantitative significance and scientific value.

### **9. What other basic assumptions does the study rely on?**

The study makes a number of assumptions that allow quantitative statements on the benefits of a pandemic early warning system.

- For example, the costs are calculated in a time horizon of 37 years—the time span in which a pandemic occurs once. For these 37 years, a duration per situation (standard pre-pandemic, pandemic, standard post-pandemic) was defined: The study assumes that a standard pre-pandemic situation lasts 31 years and 11 months, a pandemic situation two years and one month, and a standard post-pandemic situation three years.
- Furthermore, the study assumes that in the future, other pathogens will be detected with similar accuracy to SARS-CoV-2 in wastewater, and that no additional investment costs for wastewater monitoring will be incurred if other pathogens are integrated.
- The extent of damage from future pandemics in the "strong" and "extreme" categories was estimated on the basis of COVID-19, whereby certain assumptions were made based on even more dangerous pathogens. For example, it is assumed that a future pathogen can be contained through a lockdown more or less as effectively as was COVID-19.

- Furthermore, in order to calculate the benefits of a pandemic early warning system for pandemics that are more severe than COVID-19, the study assumes the same quantity and value structure as was calculated for COVID-19. This makes the assumption, for example, that the hospital costs of a patient infected with a future pathogen will be the same as they were for a COVID-19 patient.

All these assumptions were made based on the experts' advice and tend to be rather conservative. Due to climate change, for example, the probability of pandemics is higher than in the past. Consequently, the time horizon of 37 years could be underestimated.

#### **10. Why should Switzerland invest in a pandemic early warning system, especially now, when inflation is rampant and federal debt is increasing?**

The next pandemic is only a matter of time. The likelihood of the next pandemic being more severe than COVID-19 is high. With annual expenditure of around CHF 5 million in a typical, non-pandemic situation, the investment costs are small compared to the far-reaching positive benefits—over CHF 1 billion in a pandemic case that is similar to COVID-19, up to CHF 15 for a strong scenario and 30 billion in an extreme case. Studies by Imperial College London and McKinsey also show that investments in pandemic preparedness and response are worthwhile.

#### **11. Wastewater monitoring is still in its scientific infancy and may be too imprecise to be used as a public health tool. It is further unclear how well signals for other pathogens can be detected in wastewater. Considering these limitations on wastewater monitoring, is the balance of the study not a little too optimistic?**

A pandemic early warning system, as defined in the study, consists not only of wastewater monitoring, but of three different components (cf. question 3), which only together make an effective system. Wastewater monitoring is to be understood as a complementary tool of surveillance and is particularly helpful in those contexts where clinical reporting systems function less well. This is the case, for example, when the willingness to test in the population is low or the analysis of clinical tests takes a relatively long time. Wastewater monitoring can also test potentially large geographic regions and can target resources for clinical PCR testing and sequencing towards where particularly high numbers of infections occur.

Wastewater monitoring already operated successfully during the COVID-19 pandemic and is becoming more accurate with ongoing deployment and associated experience and advances in technology and research. Already, samples are being tested for influenza and the RS virus in a pilot project at six different wastewater treatment plants, demonstrating the feasibility of expanding to other pathogens.

**12. To what extent does the study take into account the fact that an early warning system is of little use if a government does not act quickly enough – despite an excellent information base?**

The study takes into account various factors (such as the duration until appropriate measures are prescribed) that influence the implementation of measures and have a negative impact on the time advantage given by a pandemic early warning system. The benefit calculation was carried out under conservative assumptions. Instead of the possible lead time of up to fourteen days, a lead time of five to ten days is assumed. The main conclusions of the study are based on the lowest lead time of five days.

Furthermore, the cost calculation takes into account additional cost centres for employees at the federal administration level who have the necessary know-how to ensure that the data basis can be correctly evaluated and interpreted, then quickly translated into effective measures.