

## รายงานผลการปฏิบัติงาน

## Result of Operation

การระบาดของโรคโควิด-19 ในประเทศไทย : มาตรการการป้องกันและ  
ความท้าทายจากประเด็นทางจริยธรรมที่เกิดขึ้นCOVID-19 Pandemic in Thailand: Implementing containment measures  
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## บทคัดย่อ

มาตรการการกักกันตัวถูกนำมาใช้ในการป้องกันการแพร่ระบาดของโรคโควิด-19 ในประเทศไทย โดยคำนึงถึงการปกป้องการสูญเสียชีวิตของประชาชนเป็นหลักสำคัญ แต่ผลที่ตามมาจากมาตรการกักตัวหรือการปิดพื้นที่ดังกล่าว ส่งผลกระทบต่อรายได้ของประชาชนอย่างหลีกเลี่ยงไม่ได้ และยังมีผลกระทบอื่นๆ ที่ตามมา เช่น การเสียสิทธิความเป็นส่วนตัว ปัญหาเรื่องความเท่าเทียมและความเป็นธรรมต่อนโยบายสาธารณะ ที่เกิดขึ้นมาจากการระบาดในครั้งนี้ ได้กลายเป็นความท้าทายใหม่ในด้านจริยธรรมภายในประเทศ เพื่อเป็นจุดเริ่มต้นต่อการจัดการกับประเด็นความท้าทายดังกล่าว ฝ่ายส่งเสริมจริยธรรมการวิจัย สำนักงานพัฒนาวิทยาศาสตร์และเทคโนโลยีแห่งชาติ ได้มีการจัดประชุมผู้ทรงคุณวุฒิของประเทศในด้านต่างๆ ที่เกี่ยวข้องกับการแพร่ระบาดของโรคโควิด-19 เพื่อหารือ

ต่อสิ่งที่เกิดขึ้นในประเทศไทยและเสนอแนะต่อการบริหารจัดการในเรื่องดังกล่าวให้เหมาะสม โดยผลของการประชุมสามารถจัดประเด็นหลักออกเป็นสามกลุ่ม ได้แก่ ผลกระทบจากนโยบายสาธารณะต่อเศรษฐกิจและการดำรงชีวิตของประชาชน ผลกระทบในด้านความเท่าเทียมในการเข้ารับการรักษาบริการทางการแพทย์ ผลกระทบด้านความเชื่อมั่นในข้อมูลข่าวสารและงานวิจัยที่เผยแพร่ต่อสาธารณชน ซึ่งรายละเอียดของประเด็นปัญหาที่ส่งผลกระทบต่อจริยธรรมของมนุษย์ดังกล่าว ได้มีการเปิดเผยและนำเสนอแนวทางในการจัดการแก้ไขการประชุมครั้งนี้ บทความนี้ได้ทบทวนและสรุปประเด็นจริยธรรมที่เกี่ยวข้องกับการแพร่ระบาดของโรคโควิด-19 ในประเทศไทยที่ได้จากการประชุม เพื่อให้สามารถเข้าใจภาพรวมในประเด็นท้าทายด้านจริยธรรมที่เกิดขึ้น และใช้เป็นแนวทางในการบริหารจัดการทั้งในระดับนโยบายและการดำเนินงานต่อไป

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## Abstract

Containment measures have been implemented in Thailand after the country was hit by the COVID-19 pandemic with the top priority to save people's lives. Unavoidably, serious consequences of the pandemic that affected people's income, privacy rights, equality, and fairness have emerged as the new challenges. In order to begin to investigate these complex ethical aspects, the Office of Research Integrity of the National Science and Technology Development Agency organized a meeting to bring together key experts in various fields related to the COVID-19 pandemic to discuss what was going on in Thailand and how to manage it properly. Three key ethical subject matters were discussed in the meeting, namely economic effects, equality to access the healthcare system, and information reliability. Key ethical issues along with ideas about how best to address and manage them properly were raised during the meeting. This article reviewed the emerging ethical aspects related to the COVID-19 pandemic summarized from the forum to provide an understanding of the overview situation from multidisciplinary fields and to trigger policy setting and cooperative implementation in the next step.

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## คำสำคัญ

มาตรการการกักกัน, โรคติดเชื้อไวรัสโคโรนา-2019, ประเด็นท้าทายด้านจริยธรรม, นโยบายสาธารณะ

## Keywords

containment measures, COVID-19, ethical challenges, public policy, Thailand

## Introduction

After the coronavirus disease 2019 (COVID-19) was detected in Thailand, as part of the worldwide pandemic, Thailand had initially coped with this severe crisis effectively, and the country was ranked among the top with the highest COVID-19

recovery index issued by the Global COVID-19 Index<sup>(1)</sup>. The death toll still stood at around 58 (as of September 2020) since the first outbreak was detected in January 2020. Several measures, along with the country's healthcare system, had been strictly implemented in order to limit the number of infected

people and deaths. Social distancing, quarantine and isolation, maintaining standard hygiene, as well as lockdowns at different levels of stringency, were the main measures utilized to slow down the coronavirus spread in Thailand.

Such lockdown actions also generated a number of negative effects causing significant damage to the economy. Moreover, other ethical challenges had been exposed in this difficult time, such as inequality in access to healthcare services, public goods, and financial support for vulnerable people, balancing individual and public needs. These ethical issues could produce unintended consequences and negative impacts. Therefore, the key question was how to contain the coronavirus spread without locking down the communities too tightly or too long. For this purpose, the Office of Research Integrity (ORI), National Science and Technology Development Agency (NSTDA), convened a forum meeting of experts who played key roles in the COVID-19 pandemic under the topic of “COVID-19 Pandemic in Thailand: Implementing Containment Measures and Their Ethical Challenges”. The meeting was held at Thailand Science Park on 2 June 2020. The goals of the meeting were to

- update current situation about COVID-19 pandemic in Thailand,
- review the ethical issues emerging after using the strong measures, and
- provide suggestions for a further action plan.

The forum showed a heightened level of cooperation among several institutions in the country. The meeting was designed to convene in a panel discussion format and moderated by Prof. Dr. Prasert

Auewarakul, an expert in infectious diseases in Thailand. The panelists consisted of experts, scientists, and researchers from various fields of the healthcare system, including policy makers. These were Emeritus Prof. Dr. Yongyuth Yuthavong and Prof. Dr. Prasit Palittapongarnpim from NSTDA, Prof. Dr. Soraj Hongladarom and Prof. Dr. Yong Poovorawan from Chulalongkorn University, Dr. Somsak Chunharas from the National Health Foundation, Dr. Don Nakornthab from the Bank of Thailand, Prof. Dr. Somkiat Wattanasirichaigoon from Mahidol University as a representative of the National Research Council of Thailand (NRCT) and Dr. Tanarak Plipat from the Department of Disease Control. The meeting was attended by 67 representatives from various fields of organizations, representing Prince of Songkla University, Kasetsart University, Health Systems Research Institute, Khon Kaen University, Thailand Center of Excellence for Life Sciences, the Office of National Higher Education Science Research and Innovation Policy Council, including NSTDA staff and correspondents from Thai PBS World, Green Network and Engineering Today.

The outputs of the meeting were classified into three main areas:

- The situation of Thailand’s pandemic and its measures
- Ethical Challenges and their implications
- Suggestions for further action

This article aimed to review and summarize the ethical principles related to the COVID-19 illustrated in the forum in order to understand its overview situation in Thailand from multidisciplinary teamwork as well as to trigger policy setting and cooperative implementation in the next step.

### The COVID-19 situation in Thailand

According to the daily reports of the Department of Disease Control<sup>(2)</sup>, only one new locally transmitted case was recorded from May 26 to September 8, 2020, yielding the accumulated total at 3,490-3,325 of whom had recovered as of September 17, 2020. The case fatality rate in Thailand was about 1.66%. It was likely that the outbreak had already been contained in Thailand. Meanwhile, the number of COVID-19 tests per week, 45,000, was comparable to many other countries, although these have been considered rather low for a country of 69 million people. Moreover, the number of 100-1000 tests per confirmed case as performed in Thailand was higher than a general benchmark of adequate testing which was suggested by the World Health Organization (WHO)<sup>(3)</sup>.

In terms of scientific discovery, although the scientific community has already known about the coronavirus for more than 80 years, there have been very few studies on how coronavirus could exactly cause human infection. This limitation has caused difficulty in finding the best solution for policy makers. Apparently, Thailand was now at a crossroad whether it should (1) keep the current policy of locking down the nation in order to limit the newly infected cases to the lowest numbers or zero as quickly as possible, or (2) relax the lockdown policy to relieve the economy downturn.

Simulation of pandemic spread patterns was one of the effective tools to find a proper solution that fits well with available medical resources at a certain time. The simulation model of Ministry of Public Health illustrated three scenarios of how these measures could save lives. The results of the forecast simulation of the pandemic in Thailand<sup>(4)</sup> was presented in the

meeting as follows. According to a forecast done in June 2020, new infection number in Thailand would be about 15 cases/day by September 2020, on the condition that the containment measures were maintained, while the numbers would be increased to 144 and 398 cases/day if selective relaxing and most relaxing measures were used respectively. As it turned out, in early September 2020 there had still been consistently fewer than 10 cases/day, all but one was returning Thai citizens from overseas. In March 2020, with limited medical resources, the Thai government decided to use hard lockdown as the main measure at an early phase<sup>(4)</sup>. Since the first pandemic phase began, strong measures, namely, social distancing, working from home, locking down the whole country, state and local quarantine, isolation, mask-wearing, hand washing, hot-meal eating as well as hospital screening were used throughout the country in order to limit the number of new patients to the lowest level. The lockdown measures resulted in a 77% case reduction<sup>(4)</sup> compared to the initial situation before the lockdown. Quarantine and isolation methods were found to be the most effective tools for pandemic control.

Later, when the infection rate was less than 50% compared to the initial stage, containment measures were slightly relaxed in order to prevent a second wave of infection<sup>(4)</sup>. Nevertheless, the consequences of the measure along with shortage of medical devices on people's well-being and incomes as well as the shrinking economy presented new challenges. They also needed to be supported by the government thoroughly and fairly.

“This pandemic control is like a marathon that just got out of the start. There is still a long distance to reach the finish line. Therefore, adapting

to a particular situation continuously is required in this crisis.” Prof. Yong Poovorawan

The solutions for these incoming challenges, such as Thailand’s adaptation in a global context regarding investment and trading, restoration of tourism business as well as the strategic areas of the national development plan including food, healthcare, and digital sectors should be reviewed and promoted afterwards.

**COVID-19: Ethical challenges and their implications**

There was a consensus among the panelists that the main ethical challenges emerging in the Thai context during the COVID-19 pandemic are categorized into three domains as follows:

**1 ) Public Health Setting: the effect on the economy**

The COVID-19 pandemic has triggered the most severe economic recession in nearly a century and has caused enormous damage to the health, jobs, and well-being of the people<sup>(5)</sup>. The critical question is what the solutions are to secure businesses, maintain jobs, and stabilize financial markets and economies from now on.

In the case of Thailand, saving lives was the top policy priority in the early phase of the pandemic, while the impact on people’s well-being and the economy was also considered.

“By effective implementation of containment measures, the impact on the economy would be minimized and it will completely shorten the cycle of the pandemic spread” Dr. Tanarak Plipat.

Unavoidably, after the lockdown measures were implemented, several groups of people, especially vulnerable population, e.g. elderly, disabled, or low-income people, were severely affected from their inability to earn their living. In that case, the key

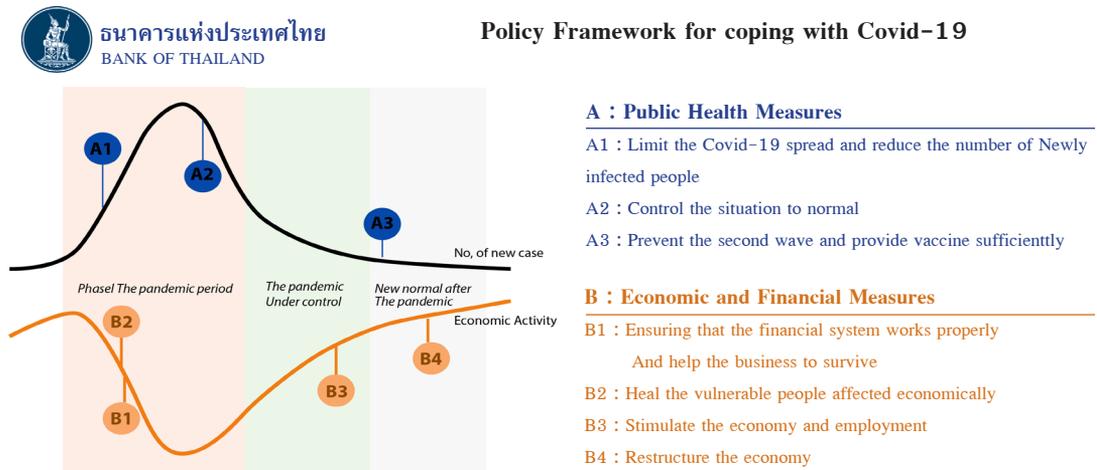
ethical challenge is to find a balance between economic well-being of people and respect of human rights on one hand, and control of the pandemic on the other. From the beginning of the pandemic, the Thai authorities had used a vast array of measures to support healthcare systems and maintain people’s earnings, as well as to help businesses and stabilize financial markets. A government subsidy program in the form of 5,000 baht payout for three months was one of the urgent actions designed to alleviate the hardship of the people caused by the crisis. Regarding the financial sector, the authorities took proactive steps through government interventions to stabilize the mutual fund and the bond markets to prevent meltdown and spillover to financial institutions. A major soft loan program for Small and Medium Enterprises (SMEs) customers of commercial banks had also been deployed to ensure that viable SMEs have access to liquidity<sup>(6)</sup> needed.

In particular, SMEs were found to be one of the most vulnerable groups. At least 1.3 million SMEs were affected by business closure and the decline of overall demand (as of 2 June 2020), according to the National Research Council of Thailand’s analysis of the COVID-19 effect on the Thai economy. The industrial sectors, including tourism, financial, commodity, and export businesses, were enormously damaged, requiring a massive amount of help from the government<sup>(7)</sup>. The establishment of new businesses tended to decrease. Nonetheless, there were some positive consequences, such as the markedly lower number of cases of respiratory tract infection in the country<sup>(8)</sup>, lower incidence of traffic accidents compared to the same period of the previous year<sup>(9)</sup>, and recovery of the environment and natural resources<sup>(10)</sup>. To address the effect on the economy, a policy

framework to deal with the situation was developed to help the vulnerable people associated with each phase of the outbreak as shown in Figure 1. The

framework illustrated the combination of the measures of public health and financial supports at each stage of the crisis.

**Figure 1.** Policy Framework for coping with COVID-19 Reproduced with permission from Nakornthab, 2020<sup>(11)</sup>



Another problem arising from the enforcement of social distancing measures was a threat to personal rights and privacy. Locking down the whole country resulted in the people's daily activities being suspended, including hanging out with friends, traveling with family, shopping outside, visiting parents, and many more. Many people were prevented from conducting their daily work, resulting in economic hardship. Thus, a balance needs to be found between alleviating these hardship and the threats to personal rights, as well as maintaining effective control of the pandemic.

## 2) Medical Service Setting: an equality to access the healthcare system

Fair allocation of scarce medical resources was raised as another significant ethical aspect in the meeting. Not only has Thailand, but also the world has been facing a shortage of medical supplies and services ranging from hand sanitizers, masks, drugs, personal protective equipment, ICU beds to ventilators.

Mechanical ventilation will be the most problematic issue if the pandemic reaches an uncontrollable level<sup>(12)</sup>. When the demand for ventilators and other respiratory devices outpaces the supply available to health care facilities, decisions would have to be made as to who will get to stay in the available hospital beds or to use the ventilators. Although Thailand has not yet come to that point, the triage decision needs to be set up beforehand with consideration of human rights and equality.

There are some relevant ethical principles as the choices for doctors to make the decision when the medical healthcare services are insufficient, including the approaches of utilitarianism, first-come-first-serve, autonomy, and respect for human dignity or justice<sup>(13)</sup>. Combining these approaches in order to find the best solution should be considered as another choice as suggested in the meeting. Recently, this ethical issue has still been argued widely all over the world to which approach could save lives most for the

COVID-19 pandemic. Ethical considerations to deal with this triage decision making have to be transparent and non-discriminatory. Many countries have bioethical committees or guidelines to support such triage decision making. For this reason, setting a national COVID-19 protocol in Thailand to have a practical guideline in advance would be needed. Available empirical data should be exploited to support guideline development.

### **3) Research and Clinical Trials Setting: information reliability**

Another ethical dilemma is that there is a high demand for medical devices and services, while these technologies have been still in the developing stage. The lengthy process of technology development would be problematic in this situation due to the fact that a full recovery of our economy would be impossible until the supply of the COVID-19 vaccine taking place. Besides the time-consuming technology development, we still need to shorten the process of research funding considerations in this rush period as well. Although there is plenty of research funding available from both domestic and international organizations, the world is still facing the shortage of medical goods, the COVID-19 vaccine and treatment in particular.

“Since there is tremendous pressure from all sides for achieving the vaccine development and production as quickly as possible, there is a question of whether the usual steps required in such development should be sidestepped or not. Is this justified?” Prof. Soraj Hongladarom.

Moreover, lacking a certification body for medical devices and treatment is another significant problem in Thailand, although such technologies are ready to be implemented locally.

Similarly, there is another issue about an ethical point about the accuracy of published data during this crisis time. There had been much information regarding COVID-19 published without reviewing or verification, giving and taking false information or unverified information will cause fear, confusion, and traumatic stress among people. On the other hand, it was crucial for the government to provide accurate and up-to-date information to their people, particularly during times of crisis. Disclosing necessary information to the public regarding the fact about the COVID-19 pandemic is one of the ethical considerations that is also influential in this situation. Juggling between obtaining precise information and quick communicating to people sufficiently during such a decisive period may need to be further managed systematically.

Moreover, technology exploitation to solve the ethical challenges mentioned above was recommended extensively in the meeting. Technology development associated with this situation was mentioned widely in various dimensions, such as data collection, digital divide, tracking people’s movement, evaluating economic impact, and using of digital currency, etc. Digital technologies have been adopted extensively to contain the COVID-19 pandemic in many countries<sup>(14)</sup>. For example, China uses the Alipay Health Code app to track its citizen’s travel history and current symptoms<sup>(15)</sup>. Similarly, Israel has been tracking people’s phones in order to track a suspected carrier movement and whom they contact. Through this tracking, the potential contacts will be ordered to self-quarantine through text messages in a timely manner. These measures need scrutiny and refinement in light of ethical implications. Furthermore, several organizations in academic,

public and private sectors in Thailand have adopted digital technologies widely for many activities such as remote learning, meeting and working, using mobile application named Thai Chana to track people's activities in this situation. The Thai government has further utilized social media platforms to connect with people. These ways of technology adoption could help relax the lockdown measure that would eventually lead to more alleviation of the subsequent effect on the economy<sup>(16)</sup>. Moreover, digital health technologies have been adopted in several hospitals in Thailand to increase the opportunities to get access to medical services for more patients.

After this forum, the chairman of the Ethics Promotion Committee on Science and Technology, Dr. Somsak Chunharas, issued a clear announcement about the application of ethical principles that would be used in policy formulation or even practice<sup>(17)</sup>. This would create balance and cooperation in a society that considers the benefits of the public over the personal ones. These principles are part of the Statement of UNESCO's International Bioethics Committee (IBC) and World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) on COVID-19: ethical considerations from a global perspective<sup>(18)</sup> as Thailand is a member state.

#### **Suggestion for Future Action and Conclusion**

In conclusion, finding a balance between keeping people's health and economic well-being is critical for policymakers while the containment measures are being implemented. Although there seems to be no fixed solution fitting all countries to cope with the outbreak, continuous analysis of the situation is needed for Thailand as well as other countries. This is of particular importance as the viruses keep mutating and permanent broad immunity to the SARS CoV2

virus appears unlikely. There are several consequences awaiting the country to deal with. This crisis also provides a lesson for discussions that lead up to the drafting and adoption of a guideline on ethical considerations. The national strategy on security, healthcare system, technology development, and utilization needs to be accorded high priority and thoroughly reviewed and adjusted in order to fit well with the global new normal way to cope with possible endemicity of covid-19.

Since the ethical issues are relevant to various people, including public health workers, researchers, businesspeople, policymakers, local administrators, and so on, there must be a multidisciplinary collaboration platform for related agencies to work together. As for the next step in the policy development and implementation processes, it is crucial to have mechanisms that enable wider participation from the various relevant sectors working on emerging ethical issues systematically. Technology also plays a crucial role in solving problems regarding pandemic restriction and lockdown implementation.

The key conclusion of the forum is that, in order to understand the overall situation and consequences of the coronavirus pandemic on Thai societies, the ethical dimensions need to be taken seriously. Bringing together the key players from various sectors, and different national authorities provides a variety of perspectives as well as comprehensive recommendations to all those involved. The forum also hopefully triggered the cooperative implementation of emerging ethical considerations among related authorities, which should be the next step forward.

Even though the situation in Thailand has

come to the new waves of the pandemic, the ethical issues raised in this forum are still crucial and arise among the increasing number of infected people. In particular, the issues of equal access to healthcare services, the financial problem of vulnerable people, the liquidity risk of the business, and the reliability of information released from social media about vaccines or treatment are even more needed strong collaboration from all stakeholders to handle together. Balancing between saving people's lives and keeping economic well-being is still essential to manage strategically. Technology exploitation would be helpful to mitigate the problems.

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## References

1. Pemandu Associates, GCI. The Global COVID-19 Index dashboard [Internet]. 2020. [cited 2020 Jul 12]. Available from: <https://covid19.pemandu.org>
2. Department of Disease Control (TH). COVID-19 situation daily reports [Internet]. 2020. [cited 2020 Sep 17]. Available from: <https://covid19.ddc.moph.go.th/en> (in Thai)
3. University of Oxford, Our World in Data. Statistics and research: coronavirus (COVID-19) testing [Internet]. 2020. [cited 2020 Sep 8]. Available from: <https://ourworldindata.org/coronavirus-testing>
4. Wattanasirichaigoon S. COVID-19 crisis: containment measures under ethical considerations. [Power Point presentation]. COVID-19 pandemic in Thailand: implementing containment measures and their ethical challenges. National Research Council of Thailand. [updated 2020 Jun 2; cited 2020 Aug 10].
5. Organisation for Economic Co-operation and Development. OECD Economic Outlook: the world economy on a tightrope [Internet]. 2020. [cited 2020 Jul 16]. Available from: <http://www.oecd.org/economic-outlook/june-2020>
6. Bank of Thailand. Additional measures to assist SMEs affected by COVID-19 and to stabilize corporate bond market [Internet]. 2020. [cited 2020 Jul 10]. Available from: <https://bot.or.th/English/PressandSpeeches/Press/2020/Pages/n2063.aspx>
7. Office of National Higher Education Science Research and Innovation Policy Council (TH). Measures of higher education, science, research and innovation for national economic and social restructuring [Internet]. 2020. [cited 2020 Jul 12]. Available from: [https://www.nxpo.or.th/wp-content/uploads/2020/06/V013\\_Covid\\_recovery-12062020-1.pdf](https://www.nxpo.or.th/wp-content/uploads/2020/06/V013_Covid_recovery-12062020-1.pdf) (in Thai)
8. Suntronwong N, Ilada T, Watchaporn C, Fajar BL, Preeyaporn V, Ritthideach Y, et al. Impact of COVID-19 public health interventions on influenza incidence in Thailand. *Pathog Glob Health* [Internet]. 2020. [cited 2020 Jul 21];114(5):225-7. Available from: <https://www.tandfonline.com/doi/full/10.1080/20477724.2020.1777803>
9. Department of Disease Control (TH). PHER: accident & emergency data [Internet]. 2020. [cited 2020 Aug 1]. Available from: <https://ddc.moph.go.th/odpc7/news.php?news=>

- 12446&deptcode=odpc7 (in Thai)
10. World Health Organization. Protecting nature protects health—lessons for the future from COVID-19 [Internet]. 2020. [cited 2020 Aug 10]. Available from: <https://www.euro.who.int/en/health-topics/environment-and-health/pages/news/news/2020/6/protecting-nature-protects-health-lessons-for-the-future-from-covid-19>
  11. Nakornthab D. Policy framework for coping with COVID-19 [Internet]. 2020. [cited 2020 Aug 2]. Available from: <https://thaipublica.org/2020/04/19-economists-with-covid-19-01> (in Thai)
  12. Truog RD, Christine M, George QD. The toughest triage allocating ventilators in a pandemic. *NEJM* [Internet]. 2020. [cited 2020 Jul 20];382(21):1973–5. Available from: <https://www.nejm.org/doi/full/10.1056/nejmp2005689>
  13. De Pergola PA. Ethical guidelines for the treatment of patients with suspected or confirmed novel coronavirus disease (COVID-19). *OJHE* [Internet]. 2020. [cited 2020 Sep 9];16(1). Available from: <http://dx.doi.org/10.18785/ojhe.1601.04>
  14. Dubov A, Steven S. The value and ethics of using technology to contain the COVID-19 epidemic. *AJOB* [Internet]. 2020. [cited 2020 Jul 11];20(7):W7–11. Available from: <https://www.tandfonline.com/doi/full/10.1080/15265161.2020.1764136>
  15. Tan S. China’s novel health tracker: green on public health, red on data surveillance [Internet]. 2020. [cited 2020 Jul 19]. Available from: <https://www.csis.org/blogs/trustee-china-hand/chinas-novel-health-tracker-green-public-health-red-data-surveillance>
  16. Chen R. Harnessing digital technologies to sustain the economy during the COVID-19 crisis [Internet]. 2020. [cited 2020 Aug 10]. Available from: <https://blogs.worldbank.org/developmenttalk/harnessing-digital-technologies-sustain-economy-during-covid-19-crisis>
  17. Office of National Higher Education Science Research and Innovation Policy Council (TH). Statement from the chairman of the Ethics of Science and Technology Committee of Thailand [Internet]. 2020. [cited 2021 Mar 27]. Available from: <https://www.nxpo.or.th/th/4562> (in Thai)
  18. The United Nations Educational, Scientific and Cultural Organization. Statement on COVID-19: ethical considerations from a global perspective statement of the UNESCO International Bioethics Committee (IBC) and the UNESCO World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) [Internet]. 2020. [cited 2021 Mar 27]. Available from: [https://unesdoc.unesco.org/ark:/48223/pf0000373115?fbclid=IwAR3CZBldVi\\_r--TUoNLs0qWHuwyN1-hZiBdK4z5LfdeZIZ9FBiw1EG0hf3JQ](https://unesdoc.unesco.org/ark:/48223/pf0000373115?fbclid=IwAR3CZBldVi_r--TUoNLs0qWHuwyN1-hZiBdK4z5LfdeZIZ9FBiw1EG0hf3JQ)