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MONIKA CZERWONKA

monika.czerwonka@sgh.waw.pl
SGH Warsaw School of Economics
162 Niepodległości Av., 02-554 Warsaw, Poland
ORCID ID: <https://orcid.org/0000-0002-3496-492X>

JOANNA SIEMBIDA

636105js@eur.nl
Erasmus School of Social and Behavioural Sciences
P.O box 1738 | 3000 DR Rotterdam, Netherlands
ORCID ID: <https://orcid.org/0000-0002-0689-3036>

*Usage of Behavioural Innovation in the Context
of the COVID-19 Crisis*

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Abstract

Theoretical background: The theoretical basis for this paper are issues of behavioural economics that question a standard assumption of *homo oeconomicus* and provide knowledge on the way people make decisions. It refers mainly to extraordinary situations such as, e.g. the COVID-19 pandemic. The article draws also on Thaler's nudge theory, which claims that some aspects of behavioural theory might be successfully used to shape public policies using appropriate tools (simplicities, default options, framing, approximation of consequences, design, or reference to social norms).

Purpose of the article: The article aims to overview the use of tools of behavioural economics to fight the COVID-19 pandemic and to popularize these solutions. There were presented examples of how behavioural innovations are used in various contexts by state authorities from different parts of the world. The overview may provide inspiration for implementing new solutions based on nudge theory that ultimately would contribute both to more effective and higher-rated actions undertaken by governments as well as to faster combat against the pandemic.

Research methods: The article refers to theories from behavioural economics (prospect theory, nudge theory) and media reports on methods of fighting and mitigating negative effects of the COVID-19 pandemic in various countries, also those with different cultural backgrounds. The article provides an overview of such methods and presents mechanisms of behavioural economics that underlie them, along with positive results of these very methods, thereby proving their effectiveness.

Main findings: The mechanisms presented, and the examples of their consecutive appliance prove the effectiveness of behavioural economics as a tool in the combat against the COVID-19 pandemic. Despite potential cultural differences, the effectiveness of behavioural tools across countries with different cultural backgrounds was presented. It was suggested that applying choice architecture on a larger scale in public policies may bring about positive effects, especially in crisis situations such as, e.g. a pandemic on a global scale.

Introduction

Infectious diseases have been historically the cause of the highest number of deaths among humans. The plague killed about one-third of the population of 14th-century Europe, while it is estimated that due to the so-called “Spanish flu” app. 100 million people died (Daniszewski, 2013; Zahorski & Zendran, 2018). In December 2019, SARS-CoV-2 appeared in Wuhan (China) which triggered the epidemic of acute respiratory syndrome (COVID-19). In April 2020, the virus spread to more than 118,000 cases and caused the death of 4,291 persons in 114 countries, which made the World Health Organization declared a global pandemic. Until June 2022, the virus has contributed to 6.3 million deaths worldwide (Worldometer, 2022).

The pandemic became an unprecedented threat to global public health. A lot of unusual and uneasy decisions had to be taken. Social sciences, including behavioural economics, may appear as an invaluable source of knowledge that explains the irrationality of decision-makers, who led by their own emotions and analyses, often ignored the facts and actual conditions. The achievements of behavioural economics allow explaining the causes for erroneous reasoning of individual units during the COVID-19 crisis. Identifications of problems as well as knowledge of theories and assumptions allow taking extensive countermeasures, particularly at a time of the debate on the need for greater state involvement in solving ongoing economic and social problems.

The state as a choice architect in the context of Thaler's nudge theory

A person often deviates with behaviour from a model *homo oeconomicus*, not always taking rational decisions. Yet, there are methods providing support in this process such as choice architecture with libertarian paternalism and nudge theory at its core. As Thaler and Sunstein (2017) define, choice architecture is designing a user-friendly environment for taking decisions that lead to improvements in human life. A key role in this process is played by a choice architect whose task is to send certain impulses to the environment as stimuli ultimately making people take particular decisions. At the same time, there is no order or ban on taking another decision due to the aforementioned libertarian paternalism. This term, introduced by Thaler and Sunstein (2017), combines two contradictory concepts into a whole (paternalism – as restricting the freedom of another person motivated by the need for their protection, and libertarianism – as a philosophy of personal and economic freedom). Thaler, as a representative of behavioural economists, understands the limited reasonableness of individuals, acting on emotions and cognitive bias, and that is why he introduces the paternalistic aspect where choice architects make a conscious effort to influence people's behaviour so that they make better decisions. The role of a choice architect may be taken by the state, public institutions (e.g. NGOs) or legal entities. However, the pandemic showed that in some issues and areas, the state is the only entity able to effectively influence reality, e.g. through relevant legislation. Which solutions and regulations would allow the reduction of potential negative effects of the pandemic or could contribute to improving the present situation? Examples of solutions based on Thaler's theory will be presented further in the article.

The basics of choice architecture say how one can influence decision processes of persons without violating their freedoms. The aim is to induce individuals to take proper decisions (giving a *nudge*) but not to impose orders or prohibitions, for instance, through creating such an environment where the freedom of choice is maintained or increased, e.g. by increasing completeness of information or cognitive skills of individuals (Thaler & Sunstein, 2017). This approach stems from the assumption that humans often take improper decisions that they would never take, should they have complete information. Underlying this statement is the assumption that every human makes mistakes (e.g. making unfavourable decisions or behaviours) and appropriate choice architecture should predict their occurrence and be likely to prevent them. One of the best methods of real impact on human behaviour is information feedback on whether the current *status quo* falls within broadly understood standards, or whether specific issues should be subject to improvement. One such example of good feedback is all sorts of warning messages. It is essential, however, that the number of warnings will not be too high as it might bring an adverse effect; with time recipients would start ignoring irrelevant alerts.

A good and effective example of decision architecture during the COVID-19 pandemic was the Singapore government's policy on foreign travel. Despite the es-

calation of the pandemic in the neighbouring countries, it was decided not to close the borders completely, but to oblige persons leaving the country to cover medical expenses in case the disease is diagnosed on arrival from abroad (Aravindan & Geddie, 2020). In this way, without imposing bans, people were effectively discouraged from unnecessary foreign travels. In turn, a reverse type of choice architecture – that encouraged visitors – was applied by tourist countries. For example, during 2020 vacations, the government of Malta offered EUR 200 extra to encourage as many tourists as possible to arrive and prevent or reduce the scale of recession in the economy where nearly one-third of revenues come from tourism (Sciicluna, 2021).

Choice architecture has also played an important role in interventionist policies of states, e.g. by conditioning financial aid for companies on maintaining employment at current levels for a defined period. For instance, in financial shields offered by the Polish government, there was no requirement for returning this support provided the employment is maintained at the same level for a specific time (Czerkawski, 2021). This provision was intended to prevent mass redundancies and, consequently, reduce the risk of economic recession and financial crisis.

Choice architecture has also been used in programmes popularizing vaccination. Some widespread actions were undertaken in Serbia. In this country, with a seven-million population, each citizen was guaranteed a cash prize of EUR 25 for getting vaccinated (Rynek Zdrowia, 2021). Likewise, smaller administrative units or private entities applied similar incentives. For instance, in Ohio there was a lottery where five persons who got vaccinated with min. 1 doze were awarded USD 1 million (Bellon, 2021). In turn, such companies as Maspex in Poland or Lidl and Aldi in the US offered vaccinated persons remuneration with a cash bonus of PLN 500 and USD 200, respectively, while stores of the German chain Edeka Nord provided their vaccinated employees with shopping vouchers.

Behavioural innovation in the context of the COVID-19 crisis

Simplifications

Over the years, humans have experienced many difficult choices. These are often decisions on complicated matters which makes it difficult to work out the best solution. Many choices entail a deferred reward. Costs are incurred here and now, while real benefits arrive only with time. When combined with the lack of self-control, such an arrangement fosters inappropriate decisions. With help come simplifications – modifications of the decision environment reducing cognitive load, thus, facilitating perception of reality. One of the foundation stones of simplifications is keeping the psychological principle *cohesion – stimulus – response* the purpose of which is the compatibility of a given communication with the expected response. Therefore, it is essential to maintain cohesion between a stimulus and an expected response while

introducing simplifications. In the context of the COVID-19 pandemic, a model example of simplifications appears to be the principle of DDM (distance, distance, mask), extended later into DDMA + W (DDM, Application STOP COVID – ProteGO Safe and Airing), promoted by the Chancellery of the Prime Minister (Kancelaria Premiera, 2021). The message delivered as a simple slogan was meant to be remembered as quickly as possible and to get people used to new behaviours in the days of the pandemic. Another example of the usage of simplifications was the possibility to report symptoms and be qualified for the test on the presence of coronavirus via an online form. A lot of people were discouraged by the necessity to call a hotline or visit the doctor in person. To avoid the risk of meeting an infected person and further spread of the pathogen, the Polish Ministry of Health allowed for reporting symptoms via a simple online form. It took only a few minutes to fill it in, and in the case of suspected COVID-19 infection, quarantine was imposed automatically after completing a questionnaire (gov.pl, 2021). Thanks to such actions, it was easier to be qualified for a test and it could mitigate the risk of further transmission of virus (to which automatic quarantine also contributed).

Default option

According to prospect theory developed by Kahneman and Tversky (1979), people show extreme loss aversion which results in a general tendency to preserve the *status quo*, then followed by inertia, i.e. a strong willingness to preserve current resources (Thaler & Sunstein, 2017). One such well-known method of choice architecture which may effectively overcome these dependencies is a default option. It is an initial standard range of settings or choices, the same for everyone, with the possibility to change it for another one. Two schemes of default option may be distinguished: *opt-in* (active participation) and *opt-out* (voluntary resignation).

The application of the default option worked also for the solutions related to the pandemic. For example, in the vaccination enrolment system of the Polish Ministry of Health, it was possible to change the place and/or the date of vaccination; first, one had to cancel the assigned date of vaccination, and only then search for a new one (Huczko, 2021). Consequently, after signing up, there was no possibility to overview new dates. Despite the initial criticism of the above solution, as a result, people were less willing to take the risk and cancel their vaccination to look for a better term or vaccine. This, in turn, brought less variability in terms.

Another example of a default option used during the pandemic was automatic quarantine for persons coming from abroad who did not have a negative test. Although there was a widespread call to reduce personal contacts and travelling, in practice, a lot of people ignored the recommendations of the government and doctors. Travelling abroad increased the risk of the emergence of, e.g. a new virus mutation, and so, in the early stages of the pandemic, to reduce such risk, many countries introduced a default quarantine for everyone arriving from abroad. As

research shows, most people are not willing to change the default option and they rather opt to stay with the current *status quo*. Thus, a default option is particularly useful where decision-makers lack experience (e.g. dealing with a pandemic), or where the assessment of the impact of certain decisions would be difficult. A default option is, therefore, a simple and acceptable solution for most persons, especially in emergencies, when taking decisions overwhelms policymakers who might fail to take any actions or make wrong decisions.

Framing

Framing (also referred to as “isolation effect”) leads to inconsistent preferences when the same choice is presented in different forms (Kahneman & Tversky, 1981, pp. 453–458). Classical theory of economics and finances assumes that following the invariance axiom, the preferences of reasonable individuals should be invariable regardless of the way or form in which output data are presented (Czerwonka, 2019b). It turns out, however, that the same information may be given in a different context and a different point of view may be presented to consumers or investors.

Framing may be successfully used in choice architecture. For years, this behavioural tool as a conscious influence on the way reality is presented, has been commonly used in business, politics or marketing. Regarding the pandemic, the way of presenting information, e.g. via media, might be crucial in manipulating people’s emotions. Research reveals that negative framing draws attention, especially in the case of less mathematically skilled persons (Peters et al., 2006, pp. 407–413). In general, media informed about COVID-19 in a negative perspective, e.g. giving only the number of infected persons or deaths, and rather avoiding information on those who recovered. Giving only negative information (e.g. solely from the perspective of losses) might escalate negative emotions and intentionally create fear or panic. In this context, one should consider how to communicate so that it does not provoke extreme emotions and, at the same time, educate society on how to observe the requirements of public health (Bavel et al., 2020).

Another example of framing used in the COVID-19 pandemic was the proper use of language – characterised either as negative or positive. For example, the term “social distance” could mean the necessity to distance oneself from any people-to-people interactions. A preferred substitute might mean “physical distance” because such wording points out the fact that social contact is possible (e.g. by online) even when people are physically separated.

Approximation of consequences

As proved in prospect theory by Kahneman and Tversky (1979), an individual’s fear of losses is greater than their joy of gains. Losses hurt us two or three times more than gains of the same size. And so, a more effective incentive to save money

would be information on how much money is lost due to, e.g. leaking taps, than how much will be saved on repairs of installations. Therefore, the information given in terms of loss is more persuasive than ordinary information, which stems from a widespread aversion to loss (Thaler & Sunstein, 2017). The above reliance may be used effectively in decision architecture, and in the context of the COVID-19 pandemic.

Approximation of the consequences played a special role in inhibiting the spread of the COVID-19 pandemic. The key fact was that the virus was invisible, and, in many cases, disease symptoms might indicate a harmless cold. It was thus essential to raise awareness of the risk of infection or a severe course of the disease. One good example of how to popularize information on the risk of disease in particular situations and conditions was the study entitled *Covid Airborne Transmission Estimator*, which allowed to assess the chances of contracting the infection under specific circumstances, e.g. with the open/closed room, (non)airing, (not) wearing a mask, etc. (Salas & Almodovar, 2020). The results of such research provided scientific justification for imposing restrictions and enabled governments to match them with the expected results.

To encourage people to stay at home and to ensure a proper level of social isolation, it was commonplace to inform society about the likelihood of severe course of the disease or death in different ethnic and age groups, or with coexisting diseases. An example of this is the QCovid, prediction model created by the University of Oxford and applied by the National Health Service, which allowed an assessment of the risk connected with coronavirus (NHS Digital, 2021).

Design

Design means creating social environments so that they facilitate taking proper decisions and at the same time discourage those improper ones. Clear marking black spots (places where many car accidents occurred in the past) along with the information on the number of victims, make drivers reduce speed and drive more carefully. A good example of designing in the context of the COVID-19 pandemic were recommendations by an American government agency of the US Department of Health and the Centers for Disease Control and Prevention regarding workplace adjustments meant to favour social distance. Recommendations such as covering or removing chairs excluded from use (so that no one could sit down), installation of transparent shields, or stickers and colour warning tapes (indicating where to stand) were meant to keep the required social distance and to slow down the spread of the pandemic (CDC, 2021).

Social norms

Human as social being, is susceptible to stimuli from other humans, following their behaviours (Thaler & Sunstein, 2017). This is due to the social nature of man which allows us to learn from others, and through imitating behaviours of persons in

our surroundings to acquire certain social norms. Add to this the strong need for affiliation and acceptance, and the majority of people feel an inner compulsion to imitate the behaviours of others to avoid criticism and ostracism from those around them. In the context of choice architecture, this tendency may be used effectively to promote behaviours that are beneficial and socially desirable but discouraging those detrimental.

Thaler argues that social influence falls into two categories and may refer to information or pressure that equals each other. Concerning information impact, if the community around behaves similarly or shares the same views, their activities and beliefs show us which activities or beliefs would be viewed as the most appropriate. As for equal pressures, since we, as social creatures, care more about what others think about us (holding this misconception based, among others, on the spotlight effect¹), we are also more likely to follow the crowd in belief that it ensures their favour and acceptance.

The change in the behaviours of individuals may be achieved via public communications enhancing positive social norms (e.g. promoting healthy lifestyle). The perception of such norms is most impacting when addressed by persons with whom we share similar values (Abrams et al., 1990, pp. 97–119). That is why, during the pandemic, social media might have increased the spread of behaviours – both harmful and favourable – and their outcomes might be further spread through networks of friends and acquaintances (Christakis & Fowler, 2013, pp. 556–577).

Likewise, during the pandemic, the phenomenon of following others was used to fight the pandemic. Social campaigns such as “stay at home” or public vaccination of prominent persons and great authorities, e.g. the US president Joe Biden (Higgins, 2020) or the Polish prime minister Mateusz Morawiecki (2021), were aimed at encouraging societies to adopt such attitudes which would increase chances to suppress the pandemic, e.g. through social isolation or getting vaccinated. In the context of social norms, the pandemic enhanced also herd behaviours such as panic shopping for specific products (e.g. pasta or toilet paper) to build up stocks. Based on the analysis of the above-mentioned behaviours, there are given a few reasons why such behaviours occur. One of these theories says that impulse purchases stemmed from a common fear of the need for long and total isolation, and, therefore, a risk of the lack of such goods. Consequently, a likely threat of not having a certain good made consumers act more emotionally and reactively (Kirk & Rifkin, 2020, pp. 124–131). The research conducted by Sim et al. (2020) proves the reason for these herd behaviours was the conflict between a wish to maintain regular activities and uncertainty as to limited access to everyday needs caused by the pandemic, a necessity to cope with the stressful situation and a response to the loss of control over the future, or even social pressure to adapt to the situation and similar behaviours (Sim et al., 2020).

¹ The spotlight effect is cognitive bias causing people to overestimate the extension to which they are observed and perceived by others.

The COVID-19 pandemic – cultural perspective

As experience of fighting with the COVID-19 pandemic showed, different countries around the world applied different strategies to combat the pandemic depending on the cultural context. Globalization has contributed to the increasing interdependence, integration and homogenization of the world financial markets. It turned out, however, all investors cannot be schematized and thought to behave in the same manner. Research discovered that both consumers and investors (individual and institutional alike), from different geographical areas and with various cultural backgrounds, take different economic and financial decisions; they differ in their approaches to, e.g. budget policy or investment risk (Czerwonka, 2019a). Cultural finance assumes that individuals living in different regions of the world vary in dimensions of culture which affects the way they perceive the world which, as a result, is translated into different behaviours in the context of taking economic decisions (Czerwonka, 2019b). The cultures of Western Europe and North America are characterized by individualism which is reflected in care for one's own needs and those of immediate family when one puts their own well-being above the good community. Personal achievements and rights as well as independence are more important. In opposition to them are collective cultures (e.g. China) where individuals work hard together for shared prosperity, as members of united and cooperating social organisms. People have big, multi-generation families who are their source of security.

Although healthcare systems vary from country to country, some differences are noticed in responses to the pandemic, depending on cultural conditions. Firstly, it was observed that restrictions imposed on Asian societies motivated individuals to adhere to social norms while, at the same time, suppressing their personal needs. Such behaviour might result from higher interdependence of collective cultures and being more inclined to comply with rules and orders than is the case with independent, individualistic cultures (Kitayama et al., 2018, pp. 809–822). Secondly, Asians may note easier recognizing the unobservable situational impact of virus infection, e.g. herd immunity (Betsch et al., 2017). Thirdly, usually, norms and social conventions in North America and large parts of Western Europe positively assess themselves (e.g. kissing, hugging, straightforward argumentation) compared to Far East countries (Kraus & Kitayama, 2019), which might increase the likelihood of transmitting the virus in independent cultures.

Conclusions

The mechanisms and behavioural tools presented (simplicities, default options, framing, approximation of consequences, design, social norms), as well as the examples of their successive use, confirm the effectiveness of behavioural economics both as a tool for general shaping public policies and an effective way to combat

the global pandemic like COVID-19. In the days of a global crisis caused by the pandemic, behavioural innovations may serve to foster rational decisions and attitudes, as well as to raise social awareness in key aspects. Despite potential cultural differences, the effectiveness of behavioural solutions has been proved in countries with various cultural backgrounds. On the basis of the above examples, it may be concluded that the use of choice architecture on a larger scale in public policies may bring positive effects in emergencies such as a global pandemic.

References

- Abrams, D., Wetherell, M., Cochrane, S., Hogg, M.A., & Turner, J.C. (1990). Knowing what to think by knowing who you are: Self-categorization and the nature of norm formation, conformity, and group polarization. *British Journal of Social Psychology*, 29(2), 97–119. doi:10.1111/j.2044-8309.1990.tb00892.x
- Aravindan, A., & Geddie, J. (2020). *Singapore charges visitors for coronavirus treatment after imported Indonesian cases*. Retrieved from <https://www.reuters.com/article/us-health-coronavirus-singapore-idUSKBN20X0EW>
- Bavel, J.J.V., Baicker, K., Boggio, P.S., Capraro, V., Cichocka, A., Cikara, M., & Willer, R. (2020). Using social and behavioural science to support COVID-19 pandemic response. *Nature Human Behaviour*, 4(5), 460–471.
- Bellon, M. (2021). *Milion dolarów za zaszczepienie się przeciw COVID-19. Takie rzeczy w USA*. Retrieved from <https://businessinsider.com.pl/wiadomosci/zachety-do-szczepien-w-usa-milion-dolarow-zaszczepienie-sie-przeciw-covid-19/zgeppj5>
- Betsch, C., Böhm, R., Korn, L., & Holtmann C. (2017). On the benefits of explaining herd immunity in vaccine advocacy. *Nature Human Behavior*, 1(3), Article no. 56. doi:10.1038/s41562-017-0056
- CDC (Centers for Disease Control and Prevention). (2021). *COVID-19 Employer Information for Office Buildings*. Retrieved from <https://www.cdc.gov/coronavirus/2019-ncov/community/office-buildings.html>
- Christakis, N.A., & Fowler, J.H. (2013). Social contagion theory: Examining dynamic social networks and human behavior. *Statistics in Medicine*, 32(4), 556–577. doi:10.1002/sim.5408
- Czerkawski, R. (2021). *Kompendium wiedzy o tarczy finansowej 2.0. Co trzeba zrobić, by zdobyć finansowanie?* Retrieved from <https://mycompanypolka.pl/artukul/kompedium-wiedzy-o-tarczy-finansowej-20-co-trzeba-zrobic-by-zdobyc-finansowanie/6001>
- Czerwonka, M. (2019a). Cultural, cognitive and personality traits in risk-taking behaviour: Evidence from Poland and the United States of America. *Economic Research – Ekonomska Istraživanja*, 32(1), 894–908. doi:10.1080/1331677X.2019.1588766
- Czerwonka, M. (2019b). *Behawioralne, kulturowe i etyczne uwarunkowania podejmowania decyzji inwestycyjnych*. Warszawa: Oficyna Wydawnicza SGH.
- Daniszewski, P. (2013). Dżuma (*Yersinia pestis*) – jako broń biologiczna. *International Letters of Social and Humanistic Sciences*, 9, 84–94.
- Gov.pl. (2021). *Zapisz się na test na koronawirusa (SARS-CoV-2)*. Retrieved from <https://www.gov.pl/web/gov/zapisz-sie-na-test-na-koronawirusa>
- Higgins, T. (2020). *Joe Biden receives Covid vaccine on live television, encourages Americans to get inoculated*. Retrieved from <https://www.cnn.com/2020/12/21/joe-biden-receives-covid-vaccine-on-live-television.html>
- Huczko, P. (2021). *Zmiana terminu szczepienia przeciw COVID-19*. Retrieved from <https://samorzad.infor.pl/wiadomosci/5238815,Zmiana-terminu-szczepienia-przeciw-COVID19.html>

- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. *Econometrica*, 47(2), 263–292.
- Kahneman, D., & Tversky, A. (1981). The framing of decisions and psychology of choice. *Science*, 211(4481), 453–458. doi:10.1126/science.7455683
- Kancelaria Premiera. (2021). [Twitter, May 16]. Retrieved from <https://twitter.com/PremierRP/status/1372191378755743750?s=20>
- Kirk, C.P., & Rifkin, L.S. (2020). I'll trade you diamonds for toilet paper: Consumer reacting, coping and adapting behaviors in the COVID-19 pandemic. *Journal of Business Research*, 117, 124–131. doi:10.1016/j.jbusres.2020.05.028
- Kitayama, S., Park, J., Miyamoto Y., Date, H., Morozink Boylan, J., Markus, H.R., Karasawa, M., Kawakami, N., Coe, Ch.L., Love, G.D., & Ryff, C.D. (2018). Behavioral adjustment moderates the link between neuroticism and biological health risk: A U.S. – Japan comparison study. *Personality and Social Psychology Bulletin*, 44(6), 809–822. doi:10.1177/0146167217748603
- Kraus, B., & Kitayama, S. (2019). Interdependent self-construal predicts emotion suppression in Asian Americans: An electro-cortical investigation. *Biological Psychology*, 146, 107733. doi:10.1016/j.biopsycho.2019.107733
- Morawiecki, M. (2021). [Twitter, April 24]. Retrieved from <https://twitter.com/MorawieckiM/status/1385896456469483523?s=20&t=D1qmPPoxQmvzqrAyd8I6lg>
- NHS Digital. (2021). *Coronavirus (COVID-19) risk assessment*. Retrieved from <https://digital.nhs.uk/coronavirus/risk-assessment>
- Peters, E., Västfjäll, D., Slovic, P., Mertz, C.K., Mazzocco, K., & Dickert, S. (2006). Numeracy and decision making. *Psychological Science*, 17(5), 407–413. doi:10.1111/j.1467-9280.2006.01720.x
- Rynek Zdrowia. (2021). *25 euro dla obywatela za zaszczepienie się – pierwsza taka decyzja na świecie*. Retrieved from <https://www.rynekzdrowia.pl/Serwis-Szczepienia/25-euro-dla-obywatela-za-zaszczepienie-sie-pierwsza-taka-decyzja-na-swiecie,221435,1018.html>
- Salas, J., & Almodovar, L. (2020). *A room, a bar and a classroom: How the coronavirus is spread through the air*. Retrieved from <https://english.elpais.com/society/2020-10-28/a-room-a-bar-and-a-class-how-the-coronavirus-is-spread-through-the-air.html>
- Sciicluna, Ch. (2021). *COVID-battered Malta to pay tourists who visit this summer*. Retrieved from <https://www.reuters.com/world/europe/covid-battered-malta-pay-tourists-who-visit-this-summer-2021-04-09/>
- Sim, K., Chua, H.Ch., Vieta, E., & Fernandez, G. (2020). The anatomy of panic buying related to the current COVID-19 pandemic. *Psychiatry Research*, 288. doi:10.1016/j.psychres.2020.113015
- Thaler, R., & Sustein, C.R. (2017). *Impuls. Jak podejmować właściwe decyzje dotyczące zdrowia, dobrobytu i szczęścia*. Poznań: Zys i S-ka.
- Worldometer. (2022). *COVID Live Update: 179,260,962 Cases and 3,882,169 Deaths from the Coronavirus*. Retrieved from worldometers.info
- Zahorski, T., & Zendran, I. (2018). Złoty wiek grypy. Krótka historia pandemii. *Acta Uroboroi – w kręgu epidemii*, 91–101.