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Environmental Sustainability and Perception of Safety of Vaccine in the COVID-19 Pandemic

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Abstract. The study on environmental sustainability and perception of safety of vaccination in the context of the COVID-19 pandemic has been relevant for a long time and has been caused by people's concerns and fears about the consequences of the vaccination procedure. This paper provides a detailed analysis of approaches to determining environmental sustainability and emphasises the urgent need to maintain human health in a pandemic. Thus, the purpose of this study is to empirically investigate the readiness for vaccination against COVID-19 as a condition of environmental sustainability. The subject of the study is the environmental factors of readiness for vaccination against COVID-19. A set of methods and techniques were used to achieve this purpose, namely theoretical research methods, surveys, associative method, content analysis, methods of mathematical statistics using SPSS 23.0 and ArcGis. The paper presents the results of an empirical study of environmental sustainability and perception of safety of vaccination during pandemic, such as a comparative analysis of the sense of security of supporters and opponents of vaccination. The results of an empirical study of environmental sustainability and perception of safety of vaccination in a pandemic is provided. It was established that there are age and gender differences between proponents and opponents of vaccination. It was determined that subjects who were wary of vaccination did not consider COVID-19 to be a source of personal threat. The results of associations for the word-stimulus "danger" were analysed. There were differences in deep subconscious beliefs of danger in those who plan to be vaccinated and those who question vaccination. It was determined that the proponents of vaccination consider the general unavoidable external circumstances as a danger, and its opponents consider the very COVID-19 vaccination as such. Statistically significant differences were found between the sense of security in different areas of life in those who consider COVID-19 a danger and those for whom COVID-19 is not a source of concern. A prognostic portrait of a resident of Ukraine who is ready and willing to be vaccinated is presented. The obtained empirical results are of scientific value for researching the psychological characteristics of individual attitudes towards safe environmental sustainability and can be used in the development and implementation of programmes to work with people suffering from internal feelings of danger for their health caused by external circumstances

Keywords: areas of life, health, readiness for vaccination, factors of readiness for vaccination, personality psychotype, the sense of security



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INTRODUCTION

With the current global pandemic, total uncertainty and exacerbation of the environmental crisis, the problem of environmental sustainability is most relevant. The study of sustainability is gaining wide research-to-practice application for the development of environmental sustainability and safety. Environmental sustainability is defined as the responsibility to conserve natural resources and protect global ecosystems to maintain health and well-being now and in the future (Corvalan *et al.*, 2005).

Since the key element of environmental sustainability is its long-term nature, environmental sustainability should be defined as meeting current needs without harming future generations, their ability to meet their needs as the US Environmental Protection Agency defines them. According to the UN World Commission on Environment and Development, the main point of environmental sustainability is to provide future generations with available natural resources, and their standard of living should not be lower than the current one (United Nations Environment Programme..., 2020). Along with this, according to International Union for Conservation of Nature, environmental sustainability is also defined as the ability to improve the quality of human life; stabilisation of the modern conflicting relationship between the two global systems of the Earth: human culture and the living world (International Union for Conservation of Nature, 2020).

Thus, the phenomenon of ecological sustainability is so relevant that it requires humanity to intervene at once to stabilise the destructive impact of humans on the environment and preserve, and even restore the current level of the Eco world. This view of the situation is supported by quantitative indicators of the level of environmental sustainability, namely the Environmental Performance Index (EPI) (Wendling *et al.*, 2020). Thus, the EPI score for Ukraine was 49.5 points in 2020, while the health score was 49 points, which ranked the country 60th and 69th out of 180 countries according to their environmental performance (Wendling *et al.*, 2020). The index of ecological efficiency is derived from the index of ecological sustainability and defines the main categories of national policy and ranks countries according to their ecological achievements (Wendling *et al.*, 2020). The EPI classifies 180 countries according to the impact of the environment on human health and ecosystem life using 32 performance indicators. The indicators defined by the Index of Ecological Groups, which reduce the burden of the environment on human health, are of priority scientific interest for this study (Wendling *et al.*, 2020) as a basic condition for ecological sustainability.

The World Health Organisation (WHO) defines health as a state of complete physical, spiritual, and social well-being, and not merely the absence of disease or infirmity (Preamble to the Constitution..., 1946). Mental health is a state of well-being in which everyone can best realise their potential, cope with life's stresses, work productively, and make an effective contribution to the life of their community (Ostafin *et al.*, 2021; Order of

the Cabinet of Ministers of Ukraine No. 1018-r..., 2017). Awareness and realisation of life self-determination, responsibility for one's life and health, being in a state of well-being, ability to adequately respond to uncertainty and threats, show empathy for oneself and the world (Zhuravlova & Chebykin, 2021), ability to overcome life stresses and post-traumatic growth (Jayawickreme *et al.*, 2021) are the main indicators of human health.

The era of the global COVID-19 pandemic has provoked a new wave of threats and worries, fears and expectations, anxiety and uncertainty, which is another damage caused by this virus. The situation of long-term and constant psychological stress and the decrease in psychological security are caused by the deterioration of key areas of human life (social, economic, communication) in its different age periods. It has been established that the COVID-19 pandemic has adversely affected the income of young people (including students) and their families (Guadalupe-Lanas *et al.*, 2021); increased feelings of danger, anxiety about personal health and poor communication among the elderly (Raycheva, 2021); the level of feeling of well-being, comfort, and stability of the environment among people aged 15 to 59 has considerably decreased (Wei *et al.*, 2021).

Instead, a positive attitude, adequate response, and the ability to timely receive qualified medical care is the key to preventing and overcoming COVID-19 in a mild form. Thus, a healthy lifestyle, an adequate attitude towards threats, and to COVID-19 vaccination against it are indicators of reducing the burden on the environment for human health and, consequently, environmental sustainability. The global pandemic, its consequences, and the situation of complete uncertainty have clearly indicated the importance and priority of developing the measures of environmental sustainability. The latter is catalysed by conditions endowed with environmental significance and preventing conscious inclusion in life (Rayne, 2013). Given the substantial amount of research on psychological safety (Bedny, 2021; Knowles & Olatunji, 2021; Ornell *et al.*, 2020), the effects of human exposure to COVID-19 (Ahorsu *et al.*, 2020; Ornell *et al.*, 2020; Palgi *et al.*, 2021), readiness of people for vaccination (Lackner & Wang, 2021; Paul *et al.*, 2021), the problem of environmental sustainability and safety in a pandemic remains unexplored.

Critical analysis of earlier research suggests that environmental sustainability is determined by the current state (psychological, physical) of the individual, followed by their readiness to act. Given the understanding of psychological attitude as a specific state of the person that expresses readiness to engage in certain activities aimed at meeting current needs and determines their psychophysiological organisation in a particular situation (Uznadze D.N., 1997), it can be said that readiness for vaccination is determined by a personal attitude towards vaccine against COVID-19. Accordingly, a realistic adequate response to a pandemic situation, an understanding of the likely consequences for human life and health and, as a result, an adequate response

and the possibility of obtaining qualified medical care in case of an illness is a constructive approach to vaccination. This understanding of readiness for vaccination against COVID-19 indicates the environmental sustainability of the individual. The latter is expressed by the individual's willingness to save their life and health through vaccination.

The purpose of the study was to empirically investigate the readiness for vaccination against COVID-19 as a condition for environmental sustainability. The subjects of the study are the environmental factors of readiness for vaccination against COVID-19. The main hypothesis of the study was the assumption that readiness to be vaccinated is influenced by subjective and objective factors.

MATERIALS AND METHODS

The empirical study involved 568 people aged 12 to 70 years old (112 men and 462 women). The average age of respondents was 32.0 years, including women – 32.3 years, men – 30.7 years. The study was conducted from the beginning of October 2020 to the end of January 2021. To conduct the study, authors used the social network Facebook, which is the first-ranking social network in terms of the number of users in Ukraine. Several theoretical (analysis of Ukrainian and English-written sources, generalisation of concepts and approaches, systematisation, comparison) and empirical (surveys, collection of related information, associative method, content analysis, methods of mathematical statistics using SPSS 23.0 and ArcGis) methods were used in this study. The former ones were used to analyse the psychological characteristics of environmental sustainability and perception of safety of vaccine in a pandemic. The empirical methods were utilised for the study of age, gender, and psychological differences in the context of such factors as environmental sustainability and safety. To investigate the above phenomena, the authors developed an online questionnaire, the purpose of which is the remote systematic study of the factors of readiness of Ukrainians to be vaccinated against COVID-19. The questionnaire comprises several content-related blocks:

- collection of general information: place of residence, age, and sex of respondents;
- study of security: self-assessment of personal security during the pandemic in various spheres of life (physical, sexual, gender, family, territorial, financial, religious, national, political, social, food, business);
- research of personal psychological constructs: psychodiagnostics of personal characteristics such as

tendency to sociopathy, Machiavellianism, and narcissism using the “Dark Core” method and semantic thesauri using the method of free associations;

- determine attitudes towards COVID-19: measures of awareness of the COVID-19 pandemic as a source of danger and readiness for vaccination.

The study was conducted via the distribution of the questionnaire on social networks, which are described by the diversity of users by gender, age, social status, and place of residence. The general information collection unit allowed determining the age, gender, and urban diversity of the respondents. The research unit about the feeling of security allowed establishing the level of subjective feeling of protection experienced by Ukrainians in the fight against a pandemic in every sphere of life by asking “Assess the level of your personal safety in the following spheres of life on a five-point scale” (1 – minimum security, 5 – maximum security).

Such scaling has demonstrated its effectiveness in the study of the attitude towards the vaccine and the readiness to get vaccinated (Palgi *et al.*, 2021). The unit of research of personal psychological constructs was realised through the use of the standardised and validated method called “Dark Core” (or “Dark Triad”, “Dark core of personality”), which allows establishing not only borderline variants of the norm, but also variants of the norm (Jones & Paulhus, 2011; Furnham *et al.*, 2013). The “Dark Triad” is a technique for measuring three psychological personality traits: non-clinical narcissism and non-clinical psychopathy and Machiavellianism as a single complex of personality traits. The questionnaire contained 12 questions, with each question evaluated on a five-point scale. The questionnaire involves the identification of one of the personality types or a tendency towards it. The block of attitudes towards COVID-19 allowed establishing the specific features of the subjects' behaviour (“If I have an important meeting, I will attend it, even with cold symptoms”), awareness of COVID-19 as a source of danger (“COVID-19 is a threat to me personally”), readiness for the vaccination procedure (“I must be vaccinated against COVID-19 when the vaccine is available”). Respondents' answers were evaluated on a five-point scale (disagree – 1 point, rather disagree – 2 points, partially agree – 3 points, rather agree – 4 points, completely agree – 5 points).

RESULTS AND DISCUSSION

It was found that there were gender, age, and demographic differences in the assessment of the level of threat caused by the COVID-19 pandemic (Fig. 1).

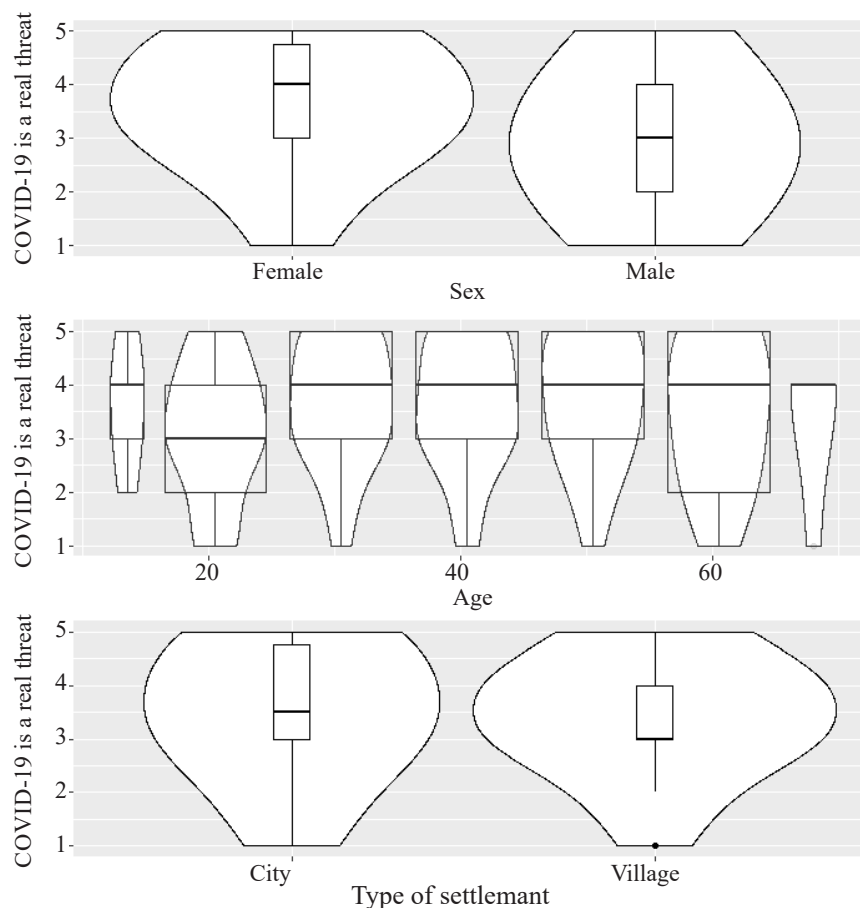


Figure 1. Dispersion of COVID-19 threat estimates according to gender, age, and demographics

Subjective factors such as the sense of imminent threat of COVID-19 and the assessment of personal safety in key areas of life (sexual, family, national, and food) determined the readiness for vaccination. Objective factors were gender, age, demographics. Men and young people in Ukraine expressed a higher level of readiness to be vaccinated compared to women, older adults, and the elderly, respectively. The elevated level of urbanisation also determined a person's readiness for vaccination.

Women were more likely than men to consider COVID-19 a personal threat. Men did commonly demonstrate the fear of the virus. Demographic features of the variance of pandemic threat estimates turned out to be gender equivalent. Respondents living in rural areas responded to the pandemic according to the "female" type, and those living in cities – according to the "male" type, but urban residents, compared to rural ones, more frequently understood the threat of COVID-19. Most of the subjects worried about COVID-19 were aged between 25 and 45. Younger and older respondents were less serious (more cynical) and did not consider COVID-19 a substantial threat. Between the ages of 45 and 55, the number of respondents considering COVID-19 a personal threat was low.

The influence of a person's subjective sense of security in various spheres of life on their fear of a pandemic was also investigated. Interesting results were found upon comparing the supporters and opponents

of vaccination against COVID-19. Positive links were found between respondents' perception of security in the family and religious spheres and the threat of a pandemic (respectively, $t\text{-value}=1,980$; $p\text{-value}\leq 0.05$ and $t\text{-value}=2,024$; $p\leq 0.03$). In the gender and business spheres, a negative correlation was found between the respondents' measures of security in these areas and the threat of a pandemic (respectively, $t\text{-value}= -3,426$; $p\leq 0.000$ and $t\text{-value}= -1,078$; $p\leq 0.03$). The safer respondents felt in family and religious life, the less likely they were to worry about COVID-19. And the more vulnerable they considered the sexual and business spheres of their lives to be, the more threatening COVID-19 was for them.

Interesting results were found upon comparing indicators of supporters and opponents of vaccination against COVID-19. Notably, a considerable part of the age groups under study did not trust vaccination and unequivocally refused it. 21.39% of respondents stated they would not be vaccinated and 17.74% – that they most likely would not be vaccinated. Only 18.43% of respondents said that they should and would be vaccinated, and 16.87% were likely to be vaccinated. There were no considerable gender differences among proponents and opponents of vaccination (variance is homogeneous): most people show moderate readiness for vaccination. However, there were more respondents among women who had not yet decided on vaccination than men. There were age-specific features in readiness for being vaccinated (Fig. 2).

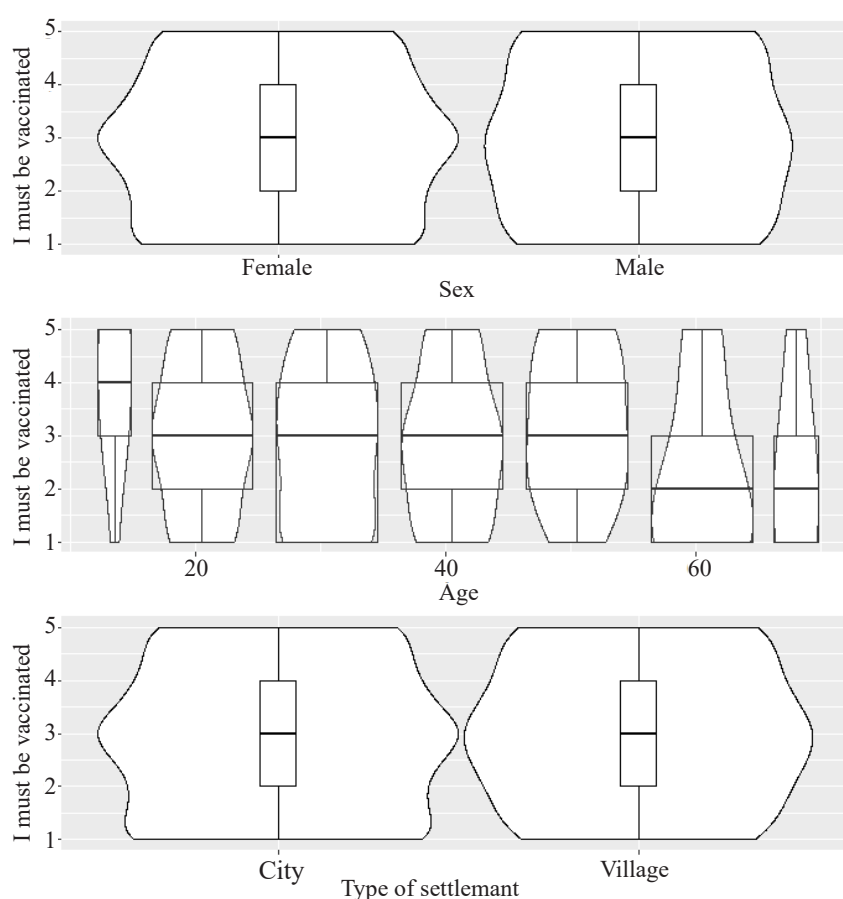


Figure 2. Dispersion of readiness for vaccination according to gender, age, and demographic characteristics

Young people were ready to be vaccinated, while people of older age and the elderly (55 years and older) were wary of vaccination.

Subjective and objective factors of readiness for vaccination were determined based on the results of the linear regression analysis. One of the dominant factors of such readiness was the feeling of imminent threat of being defeated by COVID-19 (t -value=8,617; $p \leq 0.000$), as well as the subjective assessment of safety in sexual (t -value= -2,096; $p \leq 0.04$), family (t -value=1,595; $p \leq 0.1$), national (t -value= -1,501; $p \leq 0.1$), and food (t -value=1,419; $p \leq 0.1$) spheres. Indicators of a sense of security in the physical, gender (sexual), territorial, financial, religious, political, social, and business spheres of life were not related to the fear of being vaccinated against COVID-19. To objectify the subjective factors of readiness for vaccination, the authors analysed the difference between assessments of feelings

of security in different areas of life by supporters (strongly agree – 5 points) and opponents (disagree – 1 point) of vaccination (Table 1). Proponents of vaccination included respondents who rated their readiness for vaccination with a maximum score (5), and opponents – those who rated their readiness very low (1). Subjects who did not want to be vaccinated considered themselves safe in the business sphere, and their sense of security in other areas of their lives did not affect their readiness for vaccination. Respondents who showed a clear willingness to be vaccinated felt insecure in sexual sphere and secure in sexual (gender) and national spheres of life. Similar to the study by C.A. Latkin, *et al.* (2021), the authors of this paper found that in Ukraine a considerable proportion of subjects did not trust the vaccination against COVID-19. This study also found that study participants who did not trust the vaccines had trust issues in certain areas of their lives.

Table 1. The influence of a sense of security in various spheres of life on the readiness to be vaccinated by supporters and opponents of vaccination

No. n/a	Areas of life	T-test (Do not want to be vaccinated)	T-test (Want to be vaccinated)
1	Physical	9,910e-01	8,800-02
2	Sexual	-1,393e+00	-1,716+00*
3	Gender	7,900e-01	1,515+00*
4	Family	4,300e-02	-1,319+00
5	Territorial	-7,790e-01	1,267+00

Continued, Table 1

No. n/a	Areas of life	T-test (Do not want to be vaccinated)	T-test (Want to be vaccinated)
6	Financial	3,500e-01	7,210-01
7	Religion	1,26e-01	-3,850-01
8	National	-6,010e-01	1,441+00*
9	Political	-8,940e-01	-3,660-01
10	Social	2,530e-01	-9,280-01
11	Food	-5,110e-01	3,430-01
12	Business	2,166e+00**	8,610-01

Note: **-0.05; *-0.1

The spheres of life under study represent an environmental sustainability for a modern resident of Ukraine. The results of the associative experiment determined that there were differences only in deep associations regarding the phenomenon of danger in respondents with different readiness for vaccination (Table 2). Unlike the study by S. Kreps, et al. (2020), which found distrust of the vaccine conditioned upon the activities of some politicians, the authors of this paper did not find such a correlation. For the tested adult Ukrainians, national and gender factors turned out to be important. Thus, for both groups of subjects (opponents and supporters of vaccination), the first (stereotypical) association to the word “danger” was the same. These were emotional experiences and states synonymous in meaning.

The dominant association was the trivial feeling of “fear”, the rest of the associations were often insignificant. Deep associations of opponents and proponents of vaccination showed some differences between their associative thesauri. For subjects who were not ready to be vaccinated, the word stimulus “danger” was primarily associated with COVID-19, emotional states, and experiences such as “anxiety” and “risk” were secondary. Opponents of vaccination had a generalised fear of a pandemic, and all phenomena associated with it. For respondents who were definitely ready to be vaccinated, COVID-19 was not the primary association with danger. Proponents of vaccination were dominated by such deep-seated external associations as natural disaster and war and emotional states of panic and pain.

Table 2. Matrix of associations for the word-stimulus “danger” of respondents who clearly wanted and did not want to be vaccinated

[illegible]

Analysis of the study of personality constructs revealed that only the correlation between the indicators of narcissism and readiness for vaccination was not statistically significant ($p \leq 0.01$), although both

“narcissists” and “Machiavellians” considered themselves to be personally threatened by COVID-19. Indicators of psychopathy had no reliable correlation with vaccination readiness and pandemic risk assessments. The results

of the study of objective factors of readiness for vaccination were ambiguous. Young people were ready to be vaccinated, unlike older people. There was an inversely proportional relationship between the age of the subjects and their desire to be vaccinated (t -value = -2.828 ; $p \leq 0.005$). On the other hand, the level of urbanisation did not affect the desire to be vaccinated. The generalisation of the research results allowed building a portrait of a resident of Ukraine who is ready and willing to be vaccinated ($R=0.165$; $p \leq 0.000$). This is a man under 45 ($p \leq 0.001$), who considers COVID-19 a personal threat ($p \leq 0.000$), is financially secure ($p \leq 0.05$), but feels vulnerable in the social sphere ($p \leq 0.1$). The research hypothesis was partially proved. The authors consider the prospects for further research in the investigation of the dynamics of psychological security under quarantine restrictions and the COVID-19 pandemic.

CONCLUSIONS

1. A healthy lifestyle and an adequate attitude towards situations of uncertainty form the basis for the development of environmental sustainability. Safety conditions endowed with ecological content are indicators of the level of this sustainability. Threats, namely the COVID-19 pandemic, the uncertainty of the vaccination situation are among the factors of physical and mental stress on human health and, consequently, its environmental sustainability.

2. There are gender and age characteristics of the subjective experience of feelings of danger and instability in the face of current threats to humanity (COVID-19). Women are more likely than men to consider COVID-19

a personal threat. However, both men and women are equally moderately sceptical of vaccination. Young and middle-aged adults are most concerned about COVID-19, and young people and the elderly are not inclined to consider COVID-19 as a primary threat. A subjective factor in an attitude towards COVID-19 is a sense of security in the family and religious spheres, and the perception of a pandemic as a personal threat depends on a sense of danger in the gender and business spheres.

3. Subjective factors of readiness for vaccination are the feeling of imminent threat of defeat by COVID-19, assessment of the degree of danger in the sexual, family, national, business, religious, food spheres, and propensity to narcissism. The objective factors of readiness for vaccination are the age and sex of the individual.

4. The semantic features of proponents and opponents of vaccination from COVID-19 represented a subjective-existential factor of readiness for vaccination such as dominance in the hierarchy of deep associations of objective global phenomena.

5. In Ukraine, financially well-off men under the age of 45 who consider COVID-19 a personal threat and feel vulnerable in the social sphere are most ready for vaccination.

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Екологічна стійкість та сприймання безпечності вакцини в умовах пандемії COVID-19

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Анотація. Дослідження екологічної стійкості та сприймання безпечності вакцини в умовах пандемії COVID-19 зберігає свою актуальність уже тривалий час і спричинене хвилюваннями та побоюваннями людей щодо наслідків процедури вакцинації. У статті здійснено детальний аналіз підходів до визначення екологічної стійкості та наголошується на нагальній потребі підтримувати здоров'я людини в умовах пандемії. Таким чином, метою дослідження є емпіричне вивчення готовності до вакцинації проти COVID-19 як умови екологічної стійкості. Предметом дослідження є екологічні фактори готовності до вакцинації проти COVID-19. Для реалізації поставленої мети було використано комплекс методів та методик, зокрема, теоретичні методи дослідження, опитування, асоціативний метод, контент-аналіз, методи математичної статистики з використанням SPSS 23.0 та ArcGis. Подано результати емпіричного дослідження екологічної стійкості та сприймання безпечності вакцинації в умовах пандемії. Встановлено, що існують вікові та статеві відмінності прихильників та противників вакцинації у почутті захищеності. Визначено, що досліджувані, які з обережністю ставляться до вакцинації не вважають COVID-19 джерелом особистої загрози. Проаналізовано результати асоціацій на слово-стимул «небезпека». Виявлені відмінності в підсвідомих уявленнях про небезпеку у тих хто планує вакцинуватися та тих, хто ставить вакцинацію під сумнів. Визначено, що прихильники вакцинації небезпекою вважають загальні неминучі зовнішні обставини, а її противники – COVID-19. Знайдено статистично значущі відмінності між почуттям захищеності в різних сферах життя в осіб, які вважають COVID-19 небезпекою, та тими для кого COVID-19 не є джерелом хвилювань. Подано прогностичний портрет жителя України, який готовий вакцинуватися. Отримані емпіричні результати складають наукову цінність у вивченні психологічних особливостей індивідуального ставлення до безпечної екологічної стійкості та можуть бути використані при розробці та впровадженні програм роботи з людьми, які потерпають від внутрішнього відчуття небезпеки щодо власного здоров'я, яке зумовлене зовнішніми обставинами

Ключові слова: сфери життя, здоров'я, готовність до вакцинації, фактори готовності до вакцинації, психотип особистості, почуття захищеності