

Article

Does Sustainable Consumption Matter? The Influence of the COVID-19 Pandemic on Medication Use in Brasov, Romania

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Citation: Coman, E.; Coman, C.; Repanovici, A.; Baritz, M.; Kovacs, A.; Tomozeiu, A.M.; Barbu, S.; Toderici, O. Does Sustainable Consumption Matter? The Influence of the COVID-19 Pandemic on Medication Use in Brasov, Romania. *Sustainability* **2022**, *14*, 8017. <https://doi.org/10.3390/su14138017>

Academic Editor: Lester Johnson

Received: 12 April 2022

Accepted: 26 June 2022

Published: 30 June 2022

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Abstract: Sustainable consumption refers to the choice, purchase, use, and disposal of goods so as to enable all people to meet their present and future objective needs. However, panic caused by the gradual onset of the pandemic had a considerable impact on the behavior of consumption and purchase of medication, and the question remains whether sustainable consumption still matters during a crisis or not. The present study aims to analyze whether the pandemic has influenced the behavior of medication use among residents of Brasov County amid panic caused by the virus and to determine the primary sources of information on methods of the prevention and treatment of health conditions. The study focusses on the differences between the two target groups, young people, and adults, considering three socio-demographic factors, such as age, gender, and background. The present research uses two methods of data collection: an interview with 5 doctors and a questionnaire with 543 respondents. This research draws attention to the fact that the behaviors of purchasing and consuming medication during the COVID-19 pandemic has changed due to the spreading of the new virus and the state of emergency, as well as with medication use becoming less sustainable. The results showed that adults were more engaged in the panic buying of medication compared to young people during the pandemic; however, in normal times, young people use more medication. Our study shows that females tend to consume more medicines than males. Moreover, they are more susceptible for seeking media guidance and following advice from the digital realm, because they avoid going to the doctor, especially during the COVID-19 period. Depending on the environment of residence, it was found that people in rural areas generally tend to consume more medication than those in urban areas. However, during the pandemic, the drug use of this category of population has decreased because they do not tend to self-medicate and avoid visiting the doctor because of the fear of becoming contaminated. The results of the research could help to establish measures in order to prevent the panic buying of self-medication and pharmaceuticals, both during pandemics and in normal times, because such behaviors can have negative effects on both health and the environment.

Keywords: COVID-19 pandemic; medication use; pills use during the COVID-19 pandemic; impacts; panic buying; self-diagnosis; self-medication

1. Introduction

Medical waste is constantly growing and has harmful effects on the environment [1]. In order to limit the negative effects, the sustainable management of medical waste is no longer enough. It is important that people do not waste medicines and have an individual sustainable consumption of pharmaceuticals. Research has shown that many people do not use all the medicines they buy [2] and, unfortunately, many medicines end up in the garbage, with some being completely unused and even non-expired [3].

The “sustainable consumption” concept has been proposed via many definitions [4]; however, there is still no standardized definition that most researchers agree with [5]. The most well-known definition is that offered by the participants in the Oslo symposium: “use of goods and services that respond to basic needs and bring a better quality of life, while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations” [6]. Therefore, sustainable consumption refers to the selection, acquisition, use, and disposal of goods in a way that allows all people to meet their objective needs both now and in the future [5]. From this point of view, stockpiling medication at home, without necessarily needing them, is also an unsustainable consumption. If the main causes of drug accumulation at home were non-adherence, death, and medication modification before the pandemic [3], it seems that medication use behavior has changed under the impetus of the new virus during the COVID-19 period. People started shopping more frequently and make stocks at home of products that will be useful in the case of a crisis, including pharmaceuticals. Does sustainable consumption still matter during a crisis or not?

Coronavirus, a positive single-strand RNA virus [7], has caused a crisis which is very difficult to manage because of the novelty of the virus and the rapid spread of infection among people [8]. Thus, on 11 March, COVID-19 officially become a global pandemic and a number of restrictions on social and economic behavior were introduced [9]. By March 17, all 50 states reported at least one person with the virus [10]. This new virus, which an entire planet had to face for the first time, completely challenged people’s ability to adapt to crisis situations.

Following the analysis of research based on the effects of COVID-19, it seems that at the behavioral level, in some areas, the behavioral response of the population to the coronavirus was one manifested against the background of anxiety, panic, and survival instinct [11,12]. In survival psychology, it is widely recognized that major events, such as natural disasters or health crises, can cause behavioral changes, as they can disrupt social lives or even threaten the health and life of individuals [13]. Thus, people panicked in most countries since the beginning of the pandemic [11], partly following the movement restrictions imposed by the government [11], amplified by the way the media reported pandemic news and events [12].

An important phenomenon caused by panic and influencing medication use is panic buying, which is one of the top headlines of the COVID-19 pandemic. The term “panic buying” is defined by Cambridge Dictionary as “a situation in which many people suddenly buy as much food, fuel, etc., as they can because they are worried about something bad that may happen” [14]. In common language, panic buying refers to “the action of buying large quantities of a particular product or commodity due to sudden fears of a forthcoming shortage or price increase” [15]. Hence, in situations where the likelihood of infection is perceived by individuals as high, they will be more likely to panic and buy more medication than they would need to minimize the risk of infection. From this point of view, panic buying can be considered a self-protection mechanism that aims to satisfy the needs of personal safety. [16]. It is a rational reaction because people acted thinking of possible supply disruptions, movement restrictions, and the risk of disease transmission during frequent store visits [17].

Panic buying episodes last about a week and are initiated by very scared people, but the fear is contagious, already amplified by the media and social media. Pictures shared on social media featuring empty shelves and others’ panic buying intensify fear among

users [18]. Thus, fear of scarcity causes a real scarcity [19]. The perceived scarcity theory says that negative perception of the availability of products or services leads to an evaluation of limited stocks, thus causing panic buying [20], which is a symptom of crowd psychology [21]. Studies show that panic buying is directly influenced by perceived scarcity and anticipated regret of a missed opportunity [22].

In general, during a disease outbreak, individuals may be overwhelmed by fear and anxiety, and their actions to buy more than usual can be explained as a remedial response to reduce these negative emotions [20] and as an attempt to obtain a sense of control over the insecure situation created by the crisis [23]. This distress is mainly caused by the perceived feeling of instability and insecurity of the situation [24], as well as the inability of humans to make certain predictions about the evolution of the outbreak [25]. Consequently, during crises, people think only of their short-term safety, not of long-term safety or the safety of future generations, thus affecting the sustainability of consumption acts.

Several research studies on panic buying have been carried out during the COVID-19 pandemic [26–33], but little is known about panic buying of pharmaceuticals, and empirical studies in this space are limited. Some studies point out that medication purchases increased significantly shortly before the COVID-19 lockdown. In March 2020, the number of medical prescriptions dispensed in the US exploded [34], and in Australia there were 35% more prescriptions than in March 2019 [35]. An increase in demand for medicines on the global pharmaceutical market was estimated at + 8.9%, by March 2020, especially due to the “panic buying” phenomenon [36]. However, pharmaceutical and wholesale companies did not supply medicines above normal demand [37,38] and more patients discontinued their treatments [39,40] due to medication supply problems. Some studies have tried to estimate the magnitude of panic buying of different medication categories. It was found that there was a temporary increase in purchases of most categories of pharmaceuticals [17], including those for those chronic diseases [41] and anxiety [42], due to fear of running out of access to them.

Most empirical research on the purchase of medication during the pandemic has been carried out at the macro level or as part of other research which aimed to study the phenomenon of panic buying as a whole, without focusing on pharmaceuticals. Research on medication used during the pandemic mainly focuses on self-medication [43–45], i.e., the use of medication, herbs, or home remedies without medical advice [46]. The drugs used for self-medication are those for which no prescription is needed to buy them [45]. The practice of self-medication can also affect panic and fear. People avoid going to consultations because they are afraid that they could become infected with the new virus. This behavior is confirmed by the fact that the use of outpatient medical services decreased considerably during the pandemic [47,48]. People are spending more and more time on the Internet in order to find an explanation for their symptoms, a diagnosis, or a treatment for the self-diagnosed disease [49]. In Romania, the searches on Google for the word “simptome” (the Romanian equivalent of the word “symptoms”) suddenly increased between 23 February and 4 April 2020, as compared to the preceding 5 years [50]. The same trend on Google searches for the last 5 years is registered for the expression “medicament coronavirus”—the Romanian equivalent of “coronavirus medications” [51]. Therefore, people tried to make a diagnosis based on the symptoms they had and to find a treatment with the help of Dr. Google. It is possible that people who are used to treating themselves are more likely to engage in pharmaceutical panic buying and make larger stocks than those who do not use medication without the guidance of a doctor.

Kostev and Lauterbach [37] mention in their study that further studies are needed to investigate the differences in panic buying in terms of age and sex. To the best of our knowledge, there are no other studies on the comparison between groups in terms of panic buying of medication during the pandemic. It is important to understand consumer behavior regarding the purchase and consumption of medicines both during pandemics and in normal times to prevent panic buying and to promote the sustainable use of medicines.

The aim of this research is to determine how the drug consumption of the population of Braşov has changed due to the crisis and panic caused by the introduction of the emergency state, followed by limited external access and restricting the access to shopping centers. At the same time, it is interesting to investigate the differences in the panic buying of pharmaceuticals using some sociodemographic factors, because individual consumption is composed of a series of behavioral routines, which are influenced by social, cultural, and structural contexts [5]. We also want to determine the main sources of information on methods of prevention and treatment of health conditions.

The research questions of the study are as follows:

1. Are there significant differences between young people and adults in medication-taking behavior during the pandemic?
2. Are there significant differences between women and men in medication use behavior during the pandemic?
3. Are there significant differences between rural and urban people in terms of medication use behavior during the pandemic?
4. Are there differences between young people and adults when it comes to diagnosing and treating various health conditions?

2. Materials and Methods

A mixed research design was preferred to investigate whether a change in medication use may be present among the population as a result of the crisis and panic caused by the introduction of the state of emergency, using a questionnaire survey and a semi-structured interview as research methods.

This study was intended to be an exploratory one, with an inter-subject model that is based on comparing several groups of different subjects. We chose a limited number of conditions comparison to avoid physical and mental wear and tear of the subjects. To lessen the effects of individual differences and the lack of equivalence of groups, we used the mixed model of research. The use of the mixed research method aimed to provide a more comprehensive understanding of the behavior of medication use during the COVID-19 pandemic.

2.1. Data Collection and Participants

For qualitative research, data were collected through interviews conducted with five doctors with different specialties: a radiology doctor, a primary epidemiology doctor, an infectious diseases specialist, a COVID-19 doctor, and a pediatrician. Of the interview participants, four of them were female and one male, and all of them resided in urban areas with expertise in the medical field.

The reason why only five participants were chosen for the study is based on the context created by the pandemic. Due to the busy period, panic generated by the COVID-19 virus, and the constant changes, the availability of doctors has decreased. Furthermore, as the situation could become so easily controversial, there has been an understandable reluctance of the medical staff to share their opinion about the pandemic and its effects.

The participants on the interview were chosen by two criteria. First, it was recommended that some of them would be in direct contact with the students; thus, three of the respondents were doctors who also teach courses at the Transilvania University of Braşov. It is advantageous that the participants were in direct contact with students daily and interacted with them during the pandemic, as we assumed that they would have a wider openness to the way young people relate to the pandemic. The second criterion refers to the interaction of doctors with patients with COVID-19. Therefore, one of the respondents is a doctor on the COVID department, thus improving the chances that the results would consist of relevant information about population behavior and changes within the pandemic situation. The study was approved by the Council of Sociology and communication faculty, HCF 159/29.12.2020.

The participants were approached by telephone, and their consent, with regards to taking part in the study, was obtained. Interview data were collected during January/April 2021 by telephone. The duration of the interviews ranged between 30 and 40 min. With the consent of the participants, the interviews were recorded, transcribed, and subsequently analyzed. For quantitative research, data were collected online by means of Google Forms during February/April 2021. The questionnaire was auto-administered and took between 7 and 10 min to complete. The research was conducted under the auspices of Transilvania University of Brasov, and participation in the study was voluntary.

When applying this questionnaire, a simple randomized sampling was used, targeting students from the Facebook groups of the University of Transilvania Brasov and the adult population from Brasov Facebook groups, while the respondents deliberately chose to complete it. Moreover, from the total number of people enrolled in groups, we randomly selected students from various specializations and random adults whom we asked to provide an answer for the questionnaire. To collect as many responses as possible, we targeted groups with health-related topics on the one hand, i.e., predominantly adults, and groups of interest to young people on the other hand, such as those related to college, leisure, or socializing and entertainment.

The sample for the quantitative part of the research consisted of 543 participants, all of whom lived in Brasov County. The majority of participants were women (76.2%), were up to 25 years old (63.2%), had completed high school as their last schooling (41.4%), and resided in an urban area (79%) (Table 1).

Table 1. Sociodemographic characteristic of respondents.

Characteristic	Category	Percentage
Gender	Female	76.1%
	Male	23.8%
Education	Elementary school	0.7%
	High school	41.4%
	Higher education	39.6%
	Postgraduate studies	18.2%
Age	<25 years	63.2%
	>25 years	36.8%
Residence	Urban areas	79%
	Rural areas	21%

2.2. The Research Instruments

The qualitative method of collecting information provides a deep and nuanced understanding of individuals or subjects, their relationships with the world, and a more complex and structured awareness of the chosen themes.

We applied a semi-structured interview with 25 questions which were formulated around the following topics of discussion: justification of the consumption of pandemic medication, reasons for using over-the-counter medication, the behavior of making supplies of medicines, and the main sources of information people use when diagnosing and treating different health problems. The interviewees had sufficient freedom of expression as long as the information provided was focused on the central topic of discussion. However, they focused mainly on the questions received, without moving away from the topic or asking for clarification or additional information.

For quantitative data collection, a standardized questionnaire was used. The questionnaire was based on 46 questions, 21 of which dealt with medication use before the COVID-19 pandemic and 21 of which dealt with medication use during the pandemic, in order to compare how the new coronavirus influenced medication use behavior due to external and internal factors. Finally, 4 questions referred to the sociodemographic aspects

of the respondents, targeting gender, age, background, and education, in order to identify differences in behavior between each category. Apart from the sociodemographic questions, 9 of the 42 questions were based on scale ranging from 1 to 7, 8 questions were dichotomous, and the rest were constructed as multiple choice. We pretested the questionnaire on 20 students and adults, and rephrased some items identified as too difficult to follow.

Seven questions that were analyzed in this paper were measured on a 7-point Likert scale, where 1 means “not at all” and 7 means “very much”: “Please indicate, on a scale of 1 to 7, the extent to which you consider it necessary to administer the medicines at the first signs of a health condition”; “Please indicate, on a scale of 1 to 7, the extent to which you consider it necessary to administer the medicinal product when the patient has severe health symptoms.”; “Please indicate, on a scale of 1 to 7, to what extent do you consider that medicines should not be administered because they are not beneficial to the body?”; “Please indicate, on a scale of 1 to 7, the extent to which you consider it sufficient that the medicines be administered according to the sources and advice found on the internet.”; “Please indicate, on a scale of 1 to 7, the extent to which you consider it necessary to prescribe medicinal products only by a specialist.”; “Please indicate, on a scale of 1 to 7, the extent to which you consider it sufficient for medicines to be recommended by a pharmacist”; and “Please indicate, on a scale of 1 to 7, the extent to which you consider it necessary for the medicinal product to be administered according to your own medical knowledge, without a doctors prescription.”. Another question was measured on a 7-point scale, where 1 means “not at all” and 7 means “very useful”: “On a scale of 1 to 7, what do you think about the usefulness of natural medicines in immunizing against COVID-19?”. The question “How often do you take medication?” was measured using a 7-point scale, where 1 means “never” and 7 means “daily”.

Other eight questions analyzed had only two possible answers: “yes” and “no”. The questions were as follows: “Do you take medication in general?”; “During the pandemic, did you buy more medicines than usual?”; “In the context of COVID-19 and the cold season, do you take more medicines and vitamins to prevent colds and flu?”; “During the COVID period, were you afraid that your stockpile would run out due to increased demand?”; “If so, have you been forced to stock up on crisis medicines?”; “During COVID-19, did you take more medicines than usual?”; “Do you usually avoid going to a specialist?”; and “In the context of COVID-19, has the desire to avoid doctor visits increased for fear of getting infected?”.

2.3. Data Analysis

We used thematic analysis for the data obtained by applying the interviews. Two of the authors coded and grouped the categories, and a third author reviewed the obtained analysis. The main categories we focused on were: justification of the consumption of pandemic medication, reasons for using over-the-counter medication, the behavior of making supplies of medicines, and the main sources of information people use when diagnosing and treating different health problems.

The quantitative data were analyzed using IBM SPSS Statistics. We applied the *t* test for independent samples to compare the averages obtained on the attributes of the independent variable to see if there were statistically significant differences. The *t* test assumes equality of means [52] so a significant result ($p < 0.05$) indicates that the means are not equivalent, implying a difference between the observed means.

3. Results

3.1. Qualitative Analysis

3.1.1. The Increased Use of Over-the-Counter Medicines in Recent Times: Whether It Is Justified or Unjustified

Among the participants in the study, most of the interviewees consider that the consumption of various medicines increased recently, which is often unjustified due to the tendency of patients to purchase medicines without a doctor's prescription. The main associated reasons are a fear of doctors, a lack of trust in the family doctor, poor access to doctors, appointments taking too long in the private system, and a fear of getting sick in the hospital.

3.1.2. The Most Common Medicines Purchased and Taken without a Doctor's Prescription

Among the most common medicines purchased and administered without a doctor's prescription are symptomatic medicines for allergies, respiratory, gastric, pain, anxiolytic antibiotics, vitamins, antithermics, oral disinfectants, antispasmodics, antidiarrheals, and non-steroidal anti-inflammatory medication (ibuprofen, diclofenac, etc.). The interviewees consider that such behavior can have negative effects on patients, exposing themselves to risks that may arise over time.

3.1.3. Increased Consumption of Medicines during the COVID-19 Pandemic

Five out of five doctors interviewed confirmed an increase in the consumption of medicines during the COVID-19 pandemic, especially in medicines that increase immunity, as well as symptomatic and antibiotic medicines, anticoagulants, and vitamins that are stored at home for the treatment of SARS-CoV-2 (such as vitamin C, vitamin D, zinc, melatonin, and azithromycin). Finally, an increase in medication use was observed for isoprinosine, quercetin, paracetamol, algocalmin, and antibiotics.

3.1.4. The Reason for the Increase in Medication Use during the COVID-19 Pandemic

The main reason for this phenomenon was the disappearance of some medication from the market, such as Euthyrox, useful for patients who had to remove the thyroid gland, or because of malfunctioning. Other reasons are based on ignorance, manipulation of the masses through social media, fear of disease, distrust of simple preventive measures, decreasing production of various medication, decreasing supply of pharmacies, and decreasing purchasing power based on the economic crisis. Another reason given was to avoid having to go to hospital, as there was a collective belief that hospitalization would make them worse and more likely to die.

3.1.5. Increased Consumption of Medicines during the Cold Season and the Link to the COVID-19 Pandemic

Three out of five doctors interviewed believe that the onset of the cold season and the increased risk of infection with colds and flu will lead to an increase in the use of medicines to prevent infection with various viruses. Therefore, out of a desire to immunize themselves, to avoid contamination, and not to confuse symptoms with each other, patients are turning to preventive medicine consumption, particularly immunization medicines.

3.1.6. Main Sources of Information on the Use of Medicines

Among the masses, there is a trend of informing patients about various medical conditions and treatments mainly from social media, the Internet, Google, forums, and the television, but also from advice from friends and family, as well as patients purchasing and administering various medicines without a doctor's prescription. The most common

medicines purchased in an unjustified way are dietary supplements, antioxidants, and sleeping pills.

3.1.7. Patient Administration of Old Antibiotics and Associated Effects

Regarding antibiotic consumption, the study participants believe that there is a habit among patients to consume older antibiotics for various health conditions without a doctor's prescription and advice. In the long term, they believe that such behavior can have harmful effects on the body, including antibiotic resistance and loss of efficacy in conditions where antibiotics are vital, side effects such as diarrhea and fungal infections, and the reversal of the effects of other associated medication for another disease.

3.2. Quantitative Analysis

After applying the statistical T-test for independent groups (young/adult, male/female, and urban/rural) (Table 2), we obtained the following results.

There is a significant difference between young and adult participants in terms of overall medication use. Thus, young participants tend to consume more medicines than adults ($t(541) = 3.87, p < 0.05$). Furthermore, as a significant difference, it is observed that in the context of the pandemic and cold season, unlike young people, adults are still the category that administered more medication and vitamins to prevent the flu and colds ($t(541) = 2.64, p < 0.05$).

Another significant difference between young people and adults is that young people, unlike adults, usually avoid going to a specialist consultation, even though they usually purchase more medicines ($t(541) = 3.06, p < 0.05$). It appears that young people are more likely to believe that it is necessary to administer medication when the patient is experiencing serious health symptoms, as opposed to before ($t(541) = 1.97, p < 0.05$). Complementing the first difference is the way in which adults believe that, in general, medication should not be taken because it does not benefit the body ($t(541) = 2.82, p < 0.05$).

A significant difference is evident between young and adult participants in terms of the main source of information in purchasing and taking various medicines. Thus, adult participants consider that it is sufficient to obtain information from sources and advice found on the Internet, unlike young people, who mainly rely on medical advice ($t(541) = 2.32, p < 0.05$). Moreover, a large proportion of adults, unlike young people, consider that, in terms of purchasing and taking medicines, it is sufficient for medicines to be prescribed by pharmacists ($t(541) = 2.42, p < 0.05$). In addition to the previous difference, it is observed that young people, unlike adults, believe that medicines should only be taken on the advice of a doctor ($t(541) = 2.59, p < 0.05$).

A final significant difference between young people and adults is that adults are more likely to consider that it is sufficient for medicines to be purchased and administered according to their own medical knowledge, without a doctor's prescription ($t(541) = 3.39, p < 0.05$).

Table 2. T-test for independent groups young/adult, male/female and urban/rural.

Criteria	Variables/Parameters					
	Age		Gender		Origin	
	Young	Adult	Male	Female	Rural	Urban
1. General medication consumption						
Mean	1.315	1.480	1.574	1.314	1.396	1.298
t-value, p-value	-3.87; 0.00 *		5.45; 0.00 *		1.92; 0.05 *	
2. Frequency of medication use						
Mean	3.659	3.720	4.109	3.548	3.695	3.632
t-value, p-value	-0.52; 0.60		4.31; 0.00 *		0.46; 0.65	
3. During the pandemic, did you buy more medicines than usual?						

Mean	1.781	1.725	1.837	1.737	1.769	1.728
t-value, p-value	1.48; 0.13		2.34; 0.01 *		0.91; 0.36	
4. Consumption of more medicines and vitamins to prevent colds and flu during pandemic						
Mean	1.612	1.495	1.620	1.553	1.576	1.544
t-value, p-value	2.67; 0.00 *		1.34; 0.18		0.61; 0.54	
5. During the COVID period, were you worried about running out of stock?						
Mean	1.796	1.745	1.845	1.756	1.776	1.781
t-value, p-value	1.37; 0.17		2.12; 0.03 *		-0.10; 0.91	
6. Has the pandemic prompted you to stock up on medicines?						
Mean	1.630	1.622	1.750	1.593	1.642	1.565
t-value, p-value	0.11; 0.90		2.00; 0.04 *		0.96; 0.33	
7. Medication consumption in the pandemic						
Mean	1.827	1.770	1.837	1.797	1.794	1.851
t-value, p-value	1.63; 0.10		1.01; 0.30		-1.35; 0.17	
8. Avoiding medical consultation						
Mean	1.601	1.464	1.721	1.626	1.674	1.553
t-value, p-value	-3.06; 0.00 *		1.98; 0.04 *		2.41; 0.01 *	
9. In the context of COVID19 increasing willingness to avoid medical visits						
Mean	1.464	1.480	1.581	1.435	1.494	1.377
t-value, p-value	-0.37; 0.71		2.93; 0.00 *		2.23; 0.02 *	
10. The usefulness of natural medicines in immunizing against COVID-19						
Mean	3.98	3.91	3.60	4.06	3.93	4.02
t-value, p-value	0.43; 0.43		-2.53; 0.01 *		-0.48; 0.63	
11. It is necessary to administer the medicines at the first signs of a health condition.						
Mean	5.292	5.050	4.946	5.283	5.145	5.421
t-value, p-value	1.62; 0.10		-2.00; 0.04 *		-1.57; 0.11	
12. The need to administer medication when the patient shows serious health symptoms						
Mean	6.204	6.455	6.155	6.341	6.345	6.114
t-value, p-value	-1.97; 0.04 *		-1.28; 0.19		1.53; 0.12	
13. Non-administration of medicines because they are not beneficial to the body						
Mean	3.029	2.575	3.023	2.812	2.890	2.754
t-value, p-value	2.82; 0.00 *		1.15; 0.24		0.70; 0.47	
14. Administration of medicines according to sources and advice found on the internet.						
Mean	2.195	1.905	2.388	1.995	2.072	2.149
t-value, p-value	2.32; 0.02 *		2.78; 0.07		-0.51; 0.60	
15. Medicines should only be prescribed by specialists						
Mean	5.778	6.065	5.891	5.882	5.911	5.781
t-value, p-value	-2.59; 0.01 *		0.07; 0.93		0.99; 0.32	
16. It is sufficient for medicines to be recommended by a pharmacist						
Mean	4.554	4.255	4.496	4.428	4.408	4.579
t-value, p-value	2.42; 0.01 *		0.48; 0.62		-1.16; 0.24	
17. It is sufficient for medicines to be administered according to one's own medical knowledge						
Mean	2.875	2.425	3.054	2.601	2.634	2.991
t-value, p-value	3.39; 0.00 *		3.00; 0.00 *		-2.26; 0.02 *	

Note: n = 543, df = 541, * significant at $p < 0.05$.

Regarding the differences between the consumption behavior of women and men, we can see that there is a significant difference between female and male participants in terms of overall medication use. Thus, it is observed that females tend to consume more medicines than males ($t(541) = 5.45, p < 0.05$). There is also a significant difference between

female and male participants in terms of the frequency with which they use medication. Thus, it appears that there is a higher consumption of medication among females as opposed to males, who consume medication less frequently ($t(541) = 4.32, p < 0.05$).

There is a significant difference between women and men in the purchase of medicines since the COVID-19 pandemic. According to the data, women purchased more medication from pharmacies than before due to the emergence of the new virus ($t(541) = 2.34, p < 0.05$). Moreover, as a significant difference, it is observed that women had a much greater fear than men during the COVID-19 period compared to the end of the stock of medicines, thus explaining the link with the increased consumption of medicines in pharmacies among women ($t(541) = 2.12, p < 0.05$). Moreover, due to a fear of running out of medication, women, unlike men, created their own stock of crisis medication ($t(541) = 2.00, p < 0.05$).

A significant difference between male and female participants is the tendency to avoid doctor's visits. Thus, females are more likely to avoid going to a specialist check-up, whereas males are more likely to go to the doctor when they identify signs of a condition ($t(541) = 1.98, p < 0.05$). Even though women tend to consume more pills and stock up on medication for various conditions and ailments, it seems that they are more inclined not to go to the doctor and to treat themselves at home, relying on their own knowledge of various conditions and treatments, as well as advice from acquaintances or pharmacists. Again, as a significant difference, it is observed that women avoid more doctor's visits following the COVID-19 pandemic out of fear of not contaminating themselves with the virus in the hospital in contact with other people ($t(541) = 2.93, p < 0.05$). Another significant difference between men and women lies in the sources of information used when it comes to taking medication. Thus, it seems that women find it sufficient to rely on sources and advice found on the Internet about various conditions when taking medication ($t(541) = 2.78, p < 0.05$). However, there is a significant difference between women and men in the usefulness of herbal medicines in immunization against COVID-19. It seems that men have a much more positive opinion about the effect of these medicines in immunization against the virus ($t(541) = 2.53, p < 0.05$).

Moreover, as a significant difference, it appears that male respondents are more likely to administer medication at the first signs of a condition, as opposed to female respondents, who delay administering medication due to a greater resistance to pain and various symptoms associated with each condition ($t(541) = 2.00, p < 0.05$).

After applying the statistical T-test for urban and rural participants, we can see that participants from rural areas tend to consume more medicines than urban participants ($t(541) = 1.92, p < 0.05$). However, there is no significant difference between urban and rural participants in terms of medication consumption during the pandemic ($t(541) = -1.35, p > 0.05$).

There is also a significant difference in respondents' habit of going to a specialist consultation, with rural participants tending to avoid going to a doctor's consultation to a greater extent than urban respondents ($t(541) = 2.414, p < 0.05$).

Another significant difference is observed in the tendency of rural participants to avoid visits to the doctor for fear of being infected with the new virus. Thus, it is observed that the fear of going to the doctor and the avoidance of consultations was higher in rural areas compared to urban areas ($t(541) = 2.231, p < 0.05$). When asked about the tendency of rural and urban respondents to treat themselves with medicines administered according to their own knowledge, without a doctor's prescription, it can be observed that urban participants opt for this option more often than rural participants this time ($t(541) = -2.261, p < 0.05$).

4. Discussion

The present research draws attention to the fact that, due to the outbreak of the new virus and the state of emergency, the consumption of medication during the pandemic has changed. Romanians have stored medicines at home, especially medication that can

increase immunity, symptomatic medicines, and those used to treat SARS-CoV-2 (such as vitamin C, vitamin D, zinc, melatonin, azithromycin, antibiotics, and anticoagulants). This behavior is similar to that observed during the Spanish flu in 1918 [53] and during the SARS epidemic [54]. The statement mentioned by the doctors participating in the study is confirmed by the results of the questionnaire, meaning that medication use increased because of the pandemic, the desire for increased immunization and protection, or the fear of people not to be left without access to medication. However, this behavior negatively influenced access to medication. A study conducted in UK among pharmacists shows that 99% of respondents reported medication shortages, 38% reported significant medication shortages, and 26% reported critical medication shortages [55]. People suffering from diabetes or other chronic medical conditions have been affected by panic buying among the public because it has threatened their medical routines [41]. To solve the problem of access to certain pharmaceuticals, at the beginning of the pandemic, Romanian pharmacists provided antiseptic solutions to the population by preparing them in community pharmacies [40]. Some countries imposed a one-month stockpile regulation for dispensing of prescription medication to somehow manage the panic buying situation [56] and to promote the sustainable consumption of medicines.

Although drug use during the pandemic changed, it was different depending on certain socio-demographic characteristics. Comparisons between the two groups participating in the study suggest that during the pandemic, adults were part of the category of people who changed their medication use behavior and purchased various medication due to the desire to immunize and the worry not to be left without access to medicines due to a possible disruption of the supply chain. However, many of the stored drugs were not used and were discarded. Thus, we can say that the consumption of medication during the COVID-19 pandemic was less sustainable than before.

This study found that young people generally use more medication than adult people and usually avoid going to a specialist consultation. Similar results have been reported by other studies conducted before the pandemic [57–59]. However, it is interesting that during the COVID-19 period, adults were more likely to change their behavior of medication acquisition and consumption. It is possible that this difference in the consumption behavior of young people and adults during the pandemic will be influenced by their financial stability. Adults are more financially stable than young people, and thus have the financial ability to make stocks during the pandemic. Other studies show that there is a significant positive correlation between income and panic buying [60], and people with a higher income are more likely to engage in stockpiling [19]. Thus, more pharmaceutical purchases were made in the richer geographical areas compared to the poorer areas [17]. A study conducted in Hungary [17] concluded that the income gradient in pharmaceutical panic buying can be determined by the following mechanisms: direct income effects (people with lower incomes do not have enough money to make stocks); easier access to doctors and pharmacies in richer areas; and better access to COVID-19-related information. It is important that this segment of the population is made aware that medication storage can lead to stock depletion, which can have devastating consequences for other patients [61], and it can also lead to an increase in medical waste. Moreover, these actions can lead to speculative buying [62] and people with lower incomes will not be able to afford to buy medicines that may be vital. This is the case, for example, with medical supplies, which, at the beginning of the pandemic, saw very high price increases [63].

Our study shows that females tend to consume more medicines than males, synonymous with the results of other studies conducted before the pandemic [57,64,65]. At the same time, among the women and men participating in the study, it was found that women were much more prone to changes in medication use behavior, as part of the category of people who stockpiled medication preventively for emergencies, and they purchased and administered several types of medication during the COVID period out of a desire to remain immunized and protected against the virus. It is interesting to note that among women and men, the first category of respondents avoids going to the doctor,

especially during the COVID period, due to fear of becoming infected with the virus or a lack of trust in doctors. The preference of this category is to be treated at home according to their own medical knowledge or by using Internet sources, such as blogs, forums, news, etc. These results are consistent with those of the study conducted in Togo, which highlights the fact that women are more prone to self-medication than men [43]. Instead, it is observed that men prefer to go to the doctor at the first signs of a disease, choosing to seek the opinion of a specialist, rather than turning to Internet sources. A study carried out in Poland on a sample of 1013 people pointed out that almost half of the respondents (45.6%) had engaged in behaviors associated with self-medication during the COVID-19 lockdown, but some of them had never engaged in such behaviors prior to the pandemic, and no gender or age differences were identified in self-medication behavior. However, the study indicates that the families with children are more willing to self-medicate [44]. Given that women are usually the ones who take care of sick children, they are more informed about various diseases than men and, because of this, they may be more prone to self-medication and stockpile medicines.

According to the interviewees, a phenomenon of social media information is observed among patients, who are more inclined to diagnose or treat themselves according to the advice taken from the Internet, and thus postponing the visit at the doctor, as much as possible. These statements are reinforced by the results of the questionnaire, according to which adult people, especially women, tend to treat themselves at home, according to their own acquaintances or various information found on the Internet. Still, can Google make a diagnosis similar to that made by a doctor? Sometimes searching for one or more relatively common symptoms can lead to unjustified alarming individuals given the possibility of suffering from serious illness [66], the unjustified use of medication, and some potential adverse effects on people's health [67–69]. These are unsustainable consumption practices for which preventive measures should be taken.

On the other hand, when it comes to establishing a diagnosis and applying a treatment, young people have more trust in doctors and less trust in the sources identified on the Internet. The results of this research are similar to the results of recent studies [70–72], which highlight the middle-aged and older adult population's distrust of healthcare professionals and current medical practices, the avoidance of procedures prior to clinical consultation, and the current tendencies to reject treatments considered invasive.

Additionally, between the participants in the study, a difference was observed in terms of medication use based on the environment they come from, i.e., an urban or rural environment. Therefore, it has been found that people in rural areas generally tend to consume more medication than those in urban areas. However, there is no significant difference between rural and urban participants in terms of medication consumption during the pandemic. This can be explained by the fact that people in rural areas have avoided visiting the doctor because of the fear of becoming contaminated and the absence of any tendency to treat themselves with medicines administered according to their own knowledge without a doctor's prescription. As reported by other studies conducted before the pandemic [59,73], people in urban areas are more likely to self-medicate than those in rural areas.

It is difficult to say whether certain cultural aspects influenced medication use behavior in some way during the pandemic, as there are no similar studies conducted in other countries during the pandemic. Romanians may have been more afraid than the people of other countries following medicine shortages, as most vital medicines are imported, and the pandemic has severely affected supply chains.

5. Conclusions

The findings from this study lead to important implications for health care communication policies, clinical practice, and policymakers. First, to the best of our knowledge, this study is the first piece of academic research which compares groups in terms of panic buying of medication during the pandemic and usual medication use. The main

contribution of this paper is to show that the behavior of purchasing and consuming medication has changed among the young and adult population of Brasov during the pandemic. The behavior of making stockpiles of medication is influenced by media consumption and how the population uses information sources, considering several socio-demographic factors. Enhanced attention should be paid to the behavior of adults, as they were more engaged in the panic buying of medication during the COVID-19 pandemic than young people, due to the fear of running out of medication or wanting to be immunized. However, in normal times, young people use more medication. Another noteworthy result is that women are more prone to such behavior, while men maintained their old habits. Moreover, when it comes to sources of information concerning various health conditions and the establishment of a treatment, women are more likely to turn to their own knowledge, social media, and advice and opinions from various forums and blogs, and are more opposed to doctor visits, while men prefer to go to specialist consultation. Likewise, people in urban areas are more likely to self-medicate than those in rural areas. On the other hand, young people have more trust in doctors and less trust in the sources identified on the Internet.

Therefore, this paper can trigger an alarm signal on how people can change their old consumption habits by being faced with crisis situations, as well as the need to educate the public about only using credible sources of information when it comes to various health conditions. The results of the research could help establish measures to prevent the panic buying of self-medication and pharmaceuticals both during pandemics and in normal times and to encourage the sustainable consumption of medication. Due to the multiple causes of drug waste, supply chain and hospital measures are not enough to overcome the problem of medication waste; therefore, a joint responsibility of all stakeholders is necessary.

This study has several limitations. A first limitation of this research relates to the data collection period, January–April 2021, which implies that the data collected did not cover the entire period of the COVID-19 pandemic, which was triggered in early 2020. Second, given the conditions imposed by the pandemic, sampling using probabilistic methods was not possible. Thus, the research results cannot be generalized but allow for the formulation of a research hypotheses that will be verified in future studies. Some limitations may be due to the method used to collect the data. We used a self-made questionnaire to collect data. It was applied online; thus, the study participants were Internet users, and the probability of being frequently informed on the Internet about diseases and medication was higher than those who do not usually use the Internet. An additional study should be conducted using offline methods, and should aim to include respondents who do not have access to the Internet or use it very rarely. Furthermore, we focused only on young people and adults. It would be interesting to analyze the panic buying behavior of pharmaceuticals among the elderly, although they are less willing to participate in studies. Another aspect that we should consider in the next study is to ensure that the groups we are comparing are more equal in size, because there are more young respondents in this study than adults. Finally, due to the limited number of respondents, further research is needed to reinforce and support the results obtained in this paper.

Studies on sustainable medication consumption and panic buying of pharmaceuticals are far from advanced because the pandemic is a recent and ongoing event. Existing research on this issue is relatively limited. It would be interesting to analyze how the behavior has changed in terms of medication buying and use after the end of the pandemic.

Author Contributions: Conceptualization, C.C. and A.M.T.; methodology, C.C. and A.M.T.; software, M.B.; validation, S.B., O.T., and M.B.; formal analysis, C.C., A.M.T., E.C., and A.K.; investigation, A.M.T.; resources, C.C. and A.R.; data curation, A.M.T. and E.C.; writing—original draft preparation, A.M.T. and E.C.; writing—review and editing, A.R. and E.C.; visualization, E.C.; supervision, C.C. and A.R.; project administration, C.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflicts of Interest: The authors declare no conflict of interest.

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