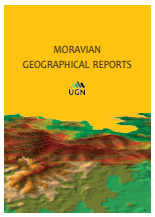

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General population perceptions of risk in the Covid-19 pandemic: A Romanian case study

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Abstract:

The COVID-19 pandemic has created complex socio-political situations, as the health crisis was paralleled by the reshaping of lifestyle patterns and induced severe economic changes. By means of an online survey, this study aims to investigate the population perceptions of risk in Romania: it examines important psychological and social factors related to risk perception and behaviours, as well as attitudes toward quarantine and physical distancing. By means of statistical analysis, the data were analysed and a GIS environment was used to visualise data distributions. Our findings indicate that if the perceived risk associated to the epidemic is high, people will change their normal behaviours, adopt preventative measures, adhere to strict hygiene practices and are willing to self-isolate for the benefit of their peers, which they tend to see as running a greater risk than themselves. Women and people with higher educational status tend to be more worried about the current situation, but regarding the severity, almost all men believe they would risk a severe state if infected. In conclusion, the perception of high risk associated with COVID-19 can lead not only to positive behavioural changes (mainly physical distancing and improved hygiene), but also to a rapid mobilisation and active involvement of communities, which are vital for stopping transmission of the virus.

Key words: *risk perceptions, online survey, public health, hot spot areas, Romania*

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1. Introduction

Throughout the centuries, humankind has experienced numerous major virus outbreaks, yet none has had such a thorough documented evolution and media focus as the Covid-19 pandemic. As the number of infected persons grew exponentially and new cases spread throughout the world at a fast pace, governments of more and more countries responded to the pandemic by initially implementing travel restrictions for non-citizens and non-residents, then urging the population to respect social distancing, which is also geographic (Klapka et al., 2020), and subsequently imposing drastic lockdowns.

To control the spread of COVID-19 in Romania, public health officials urged physical distancing and strict hygiene practices. Consequently, on February 26th, the same day the first case was confirmed in Romania, the Ministry of Health issued an order enforcing the quarantine for persons that returned from areas with a large community spread of the virus. The reaction of the Romanian government was very early, quick and extremely cautious, with numerous preventive measures at the very beginning of the epidemics in Europe (see Fig. 1). At the beginning of March, the same day Italy declared lockdown, Romania shut down schools and kindergartens, although having registered only 10 confirmed cases of COVID-19, and then followed only two weeks later, on March 25th, by the country lockdown (903 confirmed cases). Similar actions were taken throughout Eastern Europe as fear of underfunded and struggling healthcare systems being quickly overwhelmed, helped with decisiveness (Walker and Smith, 2020; Popescu, 2020). Hence, Poland, Hungary, the Czech Republic and Slovakia have drawn praise for taking swift action (Bostock, 2020) and largely avoided the coronavirus first wave (Guenfoud, 2020). Although Romania is not ranked among the countries with a serious crisis generated by the pandemic, it is important to highlight the fact that during the early phases of the outburst in Europe, there were several hundred thousand people[1], mainly

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[1] In just 2 days, 11–12 March 2020, there were 107,000 persons that entered Romania, coming mainly from Western Europe, and more than 40,600 returning during February 26th – March 10th, 2020 (Romanian Border Police 2020).

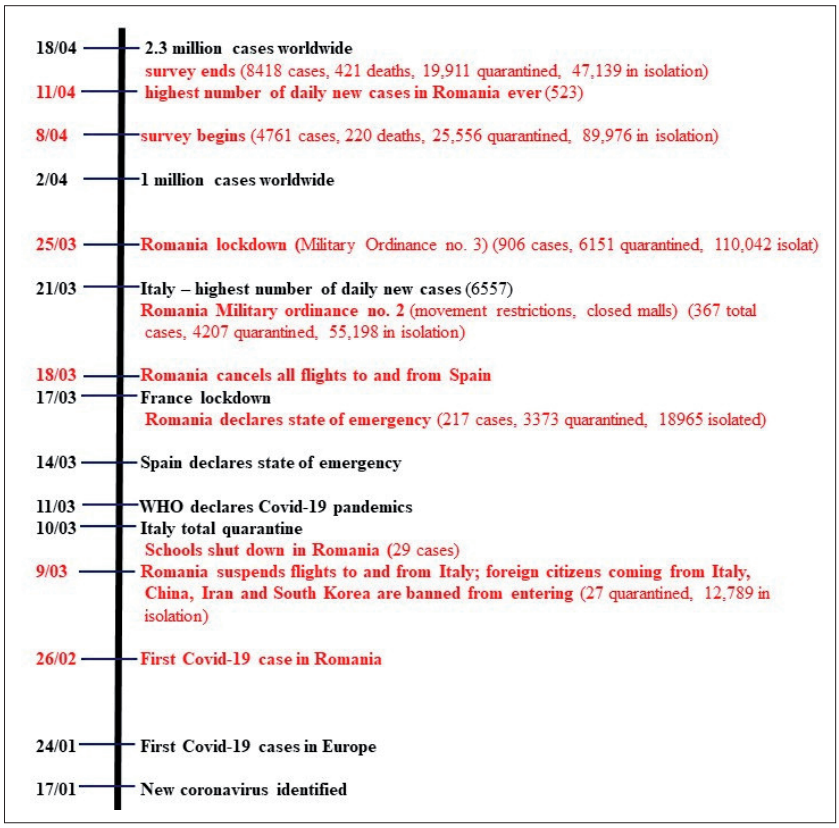

Fig. 1: Timeline of COVID-19 related events in Europe and Romania (January–April 2020)
Source: authors' elaboration

Romanian nationals that fled to their origin places from the severe situation in Italy and Spain. The countries facing the most severe situation in Europe in the spring of 2020, also host the largest communities of Romanians abroad (1.2 million Romanians in Italy and 1 million in Spain with residence permits, which makes them the largest ethnic minorities in both countries). Thus, the number of quarantined persons increased considerably, and media reports presented almost daily the situation at the western border crossing points, the influx of people and, most importantly the conflicts that arose due to the enforced quarantine. Meantime, the government agreed to an exemption for several thousand Romanians, most of them from the poorer regions that were already affected by COVID-19, but who were "needed" abroad for agricultural work, to board crammed flights to Germany and other EU member states (Creţan and Light, 2020).

2. Theoretical background

Health is influenced not only by genetics and medical care, but also by social circumstances and behavioural patterns, and as difficult as it is to change individual behaviours, there is an undeniable need to do so from a medical and societal perspective (Kahan et al., 2014), all the more considering the present context of the COVID-19 pandemic. For the last decades, organisations, researchers and professionals throughout the world have been increasingly interested in behavioural change, many of them focusing on health behaviours, since many problematic behavioural patterns may be automatic or habitual in particular contexts, so changing the context may be crucial to changing the behaviour, while changes in the physical, commercial and social environment can prompt widespread behavioural change without attempts to persuade or change individuals (Abraham and Denford, 2017).

One of the classic models of intervention for behavioural change is the "antecedent-behaviour-consequence" (A-B-C) model, which emphasises causal relationships between the three elements, according to which, in order to change behaviours, interventions are possible on the antecedents (that precede a specified behaviour and serve as triggers for that particular behaviour) and consequences (follow a behaviour and serve as a reinforcement, which increases or maintains the behaviour) (Osborn et al., 2014). Using mathematic modelling to study a disease break out in a human population, Funk et al. (2009) found that changes in behaviour can alter the progression of the infectious agent, which in a well-mixed population can result in a reduced size of the outbreak. This is also in line with the results obtained by other researchers, specifically that spontaneous behavioural changes (if the perceived risk associated with an epidemic is sufficiently large) which are fast enough, can have a remarkable effect in reducing the daily prevalence of infection and the final epidemic size (Poletti et al., 2012).

The capability to undertake personal protective behaviours requires people to understand what needs to be done, under what precise circumstances it needs to be done, how to do it and why it is important (West et al., 2020). In this situation, that is why the messages of policy makers and leaders during the various stages of the pandemic is most effective when they:

i. Emphasize benefits to the recipient;
ii. Focus on protecting others;
iii. Align with the recipient's moral values;
iv. Appeal to social consensus or scientific norms; and/or
v. Highlight the prospect of social group approval, and thus tend to be persuasive (Bavel et al., 2020).

People are essentially rational actors working on a "stage" based largely on their perceptions; however, even if these perceptions toward a particular health outcome are not to be neglected, the specific perceptions regarding the severity of the outcome or perceived susceptibility are paramount. According to "value-expectancy" models, which are focused on decision making and cognitive processes, perceptions can be modified by health promoting activities. Increased relevant information leads to improved behavioural skills, which, in turn, may promote increased odds of actually performing the behaviour. Sometimes, no skill is needed and behaviour is dependent mainly on information and motivation (DiClemente et al., 2013).

On the eve of the current epidemic outbreak, Taylor (2019) argued that during the next pandemic, many people would become fearful, some intensely so, such that the psychological effects of the next pandemic would likely be more pronounced, more widespread and longer-lasting than the purely somatic effects of infection. Indeed, people around the world have been responding strongly to the COVID-19 pandemic in terms of preventative behaviours and beliefs (mainly that taking health precautions is effective, voluntary compliance behaviours and prioritising one's health) as documented by an accumulation of qualitative and quantitative research (Clark et al., 2020; Fetzer et al., 2020; Pfattheicher et al., 2020; Zajenkowski et al., 2020).

Public perceptions of risk are an important consideration in public health and risk management decision-making (Krewski et al., 2006), and an understanding of how psychological factors influence behaviours in global pandemics such as COVID-19, facilitates disease minimisation strategies. As behavioural changes and psychological perceptions of risk are often culturally specific (Wise et al., 2020), and understanding and changing health behaviour is the first step to effecting change in a positive direction (Crosby et al., 2013), more researchers recognise the value of studies focusing on risk perception across nations and across cultures.

Over the last decades, risk perception research has gained momentum and not only did it focus on the factors and predictors of risk responses, but it also shifted from dealing with a single culture, mainly American, to a cross-cultural perspective. Moreover, this last year witnessed a surge in research on understanding coronavirus disease risk perception among the public throughout the world (Atchison et al., 2020; Cori et al., 2020; Dryhurst et al., 2020; Geldsetzer, 2020; Hou et al., 2020; Kwok et al., 2020; Lohiniva et al., 2020; Manderson and Levine, 2020; Motta Zanin et al., 2020; Ruiu, 2020; Wise et al., 2020). All of these recent studies point to several general conclusions:

i. Wherever the health risk perception is high, people engage in protective behaviour;
ii. The risk can be greatly influenced by media messages and sometimes political orientation;
iii. There is a disruption of daily routines due to the epidemic; and
iv. The uncertainty and low predictability of the disease affect people's emotions, cognition and behaviours.

Building on these notions – the psychological motivations related to behaviour, risk perception and behavioural responses in an epidemic – the present study aims to document public perceptions of risk in Romania and to investigate psychological and social factors related to risk perceptions and behaviours, as well as the attitudes toward quarantine and physical distancing during the early stages of the COVID-19 pandemic.

Since the experience of Romania regarding a thorough procedure for massive quarantine and measures to prevent the community spread of contagious diseases, does not rival that of Western states, and the country did not face any real international epidemic threat[2] during the last decades, there are significant differences in the timing and motivation of preventive measures, the economic context and the cultural and political milieux.

3. Data and methods

3.1 Survey design

We used an open-source online survey application to develop a 'risk perception-knowledge-behavioural implication' questionnaire for online use. Core questions were developed using the Health Belief Model (HBM), which has been used continuously in the development of behaviour change interventions for 40 years (Jones et al., 2014), and which is one of the most popular frameworks for explaining various health behaviours (Sulat et al., 2018), including people's behaviours and reactions regarding COVID-19 (Clark et al., 2020). We prepared a draft that was reviewed by a panel of experts to determine face validity, then pretested the instrument with fifteen respondents with various educational backgrounds, age and health conditions, who were questioned on length, item comprehensibility and relevance, to ensure that the study objectives were being met. Participant comments were largely positive regarding presentation and ease of completion, but to a lesser extent regarding the time taken to complete it. The survey was described as a research project about risk perceptions of COVID-19 carried out by researchers from the University of Craiova; hence, the questionnaire was posted on the web page of the university Geography Department, distributed and shared online using social media. A few social media influencers located in various regions of the country helped us to raise awareness about this study, particularly in three focus areas, where the research was advertised more: Suceava (as it was the first national hotspot declared due to the large number of infections among doctors and the population); Bucharest (the capital city and the second place in number of cases); and Oltenia (which was among the regions with a low number of cases). For purposes of comparison, the research also covered all other regions in Romania, as much as possible. As the questionnaire was publicly available, everyone had access to it. The data were collected from the 8th to the 18th of April, i.e. during the third and partially fourth week of country lockdown. All questions were mandatory. Within this time frame, the number of COVID-19 infections worldwide grew from 1.5 million cases to almost 2.3 million, and deaths surpassed 160,000, while in Romania the number of cases

[2] There were no cases of SARS, MERS or Ebola in Romania, and the media only briefly mentioned the outbreak of the epidemics worldwide. The most severe infectious diseases in the history of the country that affected the population was typhus, which happened more than 100 years ago.

almost doubled (08.04.2020: 4,761 confirmed cases, 261 deaths; 18.04.2020: 8,418 confirmed cases, 469 deaths (source: www.datelazi.ro; www.covid19.geo-spatial.org).

3.2 Participants

There were 734 persons, 18 to 88 years of age, who completed the online questionnaire and who were not infected by COVID-19, as far as they were aware. Respondents came from all over the country (every region is covered), with a higher concentration in the South-Western Development Region (which had the lowest number of infections), the northern part of the country – mainly Suceava (with the highest number of cases by far), and Bucharest, the capital city. In each county and region, participants were invited to respond by means of social and mass media (Marsden and Wright, 2010). After data cleansing, 716 respondents remained in the data set, 245 men and 471 women. Most (86%) respondents lived in urban areas, with 14% from rural areas. Also, seven out of ten (70%) declared to have higher education, the rest (19%) having some form of intermediate education.

3.3 Survey content

Section 1 of the instrument focussed on risk perception using the core HBM measures, consisting of Likert scale items assessing perceived susceptibility (asking respondents about the sensed likelihood of being infected with Covid-19, considering the government's measures), ascertained severity (awareness of symptoms if they would be infected with COVID-19), realised/noticed benefits, barriers and self-efficacy. In Section 2, knowledge about COVID-19 was assessed regarding five potential transmission routes, with response options being true, false and I don't know. Respondents were also asked to rate the information about COVID-19 epidemics presented by media, social media and authorities. To assess behavioural implications, in section 3 respondents expressed agreement or disagreement with 21 statements addressing the causes for a different behaviour, behaviour changes, consequences, induced stress, as well as three questions focusing on emergency food preparedness. The last section consisted of six items concerning demographic information.

3.4 Data analysis and representation

Before analysis of the survey data, additional processing was needed (Fowler, 2013). All responses were saved in a Comma Separated Values (CSV) file and before the analysis of data, we ran a script in Jupyter notebook for primary processing and data visualisation of the survey results. For statistical analysis, R functions and packages were used, all computations being performed in RStudio Cloud. Raw data was standardised by calculating the coefficient of variation and z-scores and by examining their values (Sauro, 2010).

Survey data and GIS were linked using spatial analysis with georeferenced data. GIS methods were used as a visualisation tool to depict spatial relationships (concentration of responses; evolution of cases and deaths; location of persons in urban or rural settlements). Moreover, survey data is better explained by using visual displays. Mapping spatial coverage of responses across the country was provided by geocoding, namely linking the individual-level survey data to the specific location on the map that corresponds with the name and location of the settlement provided by each respondent (see Fig. 2).

Statistical data about confirmed cases and deaths were taken from governmental sites (www.mai.gov.ro) and other open-source sites that present trends in the statistics from the mentioned official sources (www.covid19.geo-spatial.org; www.datelazi.ro).

As noted above, 734 questionnaires were completed on-line, out of which 716 were validated. With a response rate of 97.54% and a confidence level of 95%, the confidence interval calculated was ± 3.62%. For the relevance of the study at national level, the authors tried to cover all regions, with respondents coming from 150 urban and rural settlements, excepting Tulcea and Covasna counties, where no case of Coronavirus had been confirmed by the end of the study.

The spatial distribution of responses (Fig. 3) indicate high levels of contraction in three regions: Oltenia, Suceava and Bucharest. As a result of the high concentration of responses and the different characteristics of the three regions, the three areas were selected in conducting a comparative analysis regarding risk perceptions (see Tab. 1).

The following criteria were also considered: (i) the region with the smallest number of confirmed cases and a subsequent slow evolution of the epidemic (Oltenia); this region also had the first confirmed case of COVID-19 in Romania, registered in Bâlteni (Gorj county) on 26th of February 2020, and the first death caused by the COVID-19, declared in Craiova (Dolj county) on the 22nd of March 2020. Both patients were males. The other regions were selected because (ii) Suceava county was declared the hot spot of the pandemic, while Bucharest is the largest city (2.1 million inhabitants and the capital of the country) and (iii) was the second area regarding confirmed cases of Coronavirus. The

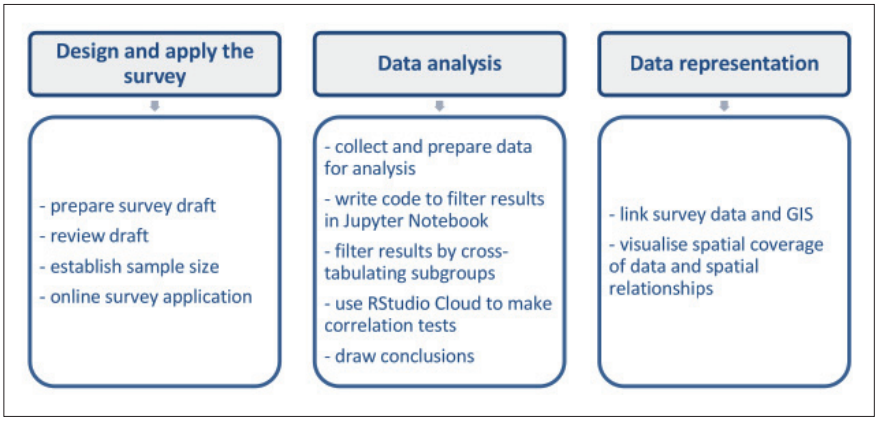

Fig: 2: Workflow of the research
Source: authors' elaboration

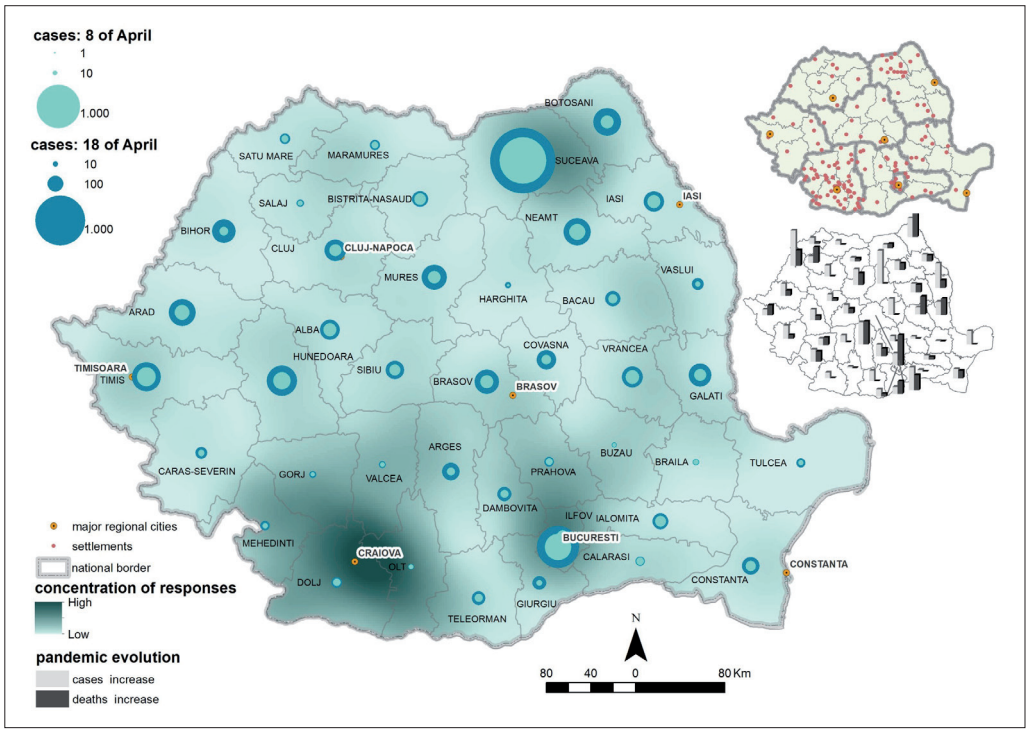

Fig. 3: Case evolution during 8–18 April, 2020, and location of respondents
Source: authors' elaboration

Region		Romania	Oltenia	Suceava county	Bucharest city
Population	Total	19,317,984	1,909,752	622,533	1,832,883
	%		9.88	3.22	9.48
Area km^2	Total	238.390,71	2,921,169	855,350	23,787
	%		12.25	2.92	0.09
Number of cases	Total	8,418	72	663	378
	%		0.85	7.87	4.49
Number of responses	Total	716	329	58	121
	%		45.94	8.10	16.89
COVID-19 incidence (18.04.2020)	No of cases/1,000 inhabitants	0.38	0.06	2.64	0.45
Health infrastructure	No of doctors/10,000 inhabitants	28.5	28.2	12.4	65.6
	Hospital bedplaces/10,000 inhabitants	60.4	60.2	39.9	103
GDP/capita	€/capita*	9,122	6,788	5,729	21,145

*Tab. 1: Basic characteristics of the three analysed areas (Note: * data refer to the Development regions)*
Source: authors' calculation using statistical data from the National Institute of Statistics

three selected regions concentrate 80% of the responses from persons located in 76 settlements (about 51% of those covered by the study).

4. Results

The questions concentrating on the determination of the risk perception were included in the first section of the questionnaire (Couper et al., 2019). The participants were asked first about perceived susceptibility and severity (see Tab. 2). We found that risk perceptions of COVID-19 are relatively high among the population (more than one third were concerned, 22% of respondents were very concerned about the national situation, and just 8% declared they were not worried). The analysis of the results shows that women tend to be more worried about the current situation (62.8%), than men do (49.7%); however, regarding the severity, almost all men (95.1%) believe that in case of an infection their state would be severe. By cross-referencing the responses with the degree of education, we found that people with higher education tend to be more concerned about the situation (60.8%), than those with intermediate education (47.1%). As closed-ended rating scale data are easy to summarise, but hard to interpret, we compared the responses to a benchmark used to compute the z-score values.

Z-scores values calculated are negative, indicating that they fall below the mean (Tab. 3). The most distanced values from the mean in standard deviation (SD) units are those registered for the stress induced by the restrictions imposed

during the quarantine period (– 40.7672). Other high values below the mean for the z-scores have been calculated for behavioural changes (– 31.7679), increased measured taken to prevent infection (– 14.3192), and for the three most common transmission routes (direct contact with an infected person – 18.5771; air borne – 17.7374; contaminated surfaces – 15.6194).

Although the standard deviation is commonly used to express variability, it is difficult to interpret its values, especially in this case, when a mixed scale of points is being used. Therefore, the authors used, in addition, the coefficient of variation to identify more easily the values that indicate a higher variability, as in the case of concerns of being infected (84.49%) and impulsive shopping (83.27%). The highest value

Characteristics	Perceived susceptibility/ Worried of being infected		Confidence that they can protect themselves against infection	Perceived severity/Severe state in case of infection
	YES	NO		
Women	62.8%	36.7%	52.6%	84.5%
Men	49.7%	50.2%	23.3%	95.1%
urban	59.0%	41.0%	49.2%	19.8%
rural	58.0%	42.0%	54.7%	23.1%
intermediate education	47.1%	52.9%	57.2%	18.8%
higher education	60.8%	39.2%	48.3%	20.4%
Bucharest	62.0%	38.0%	39.6%	23.9%
Suceava county	60.0%	40.0%	37.9%	25.8%
Oltenia region	57.0%	43.0%	53.3%	18.1%
Total	**59.0%**	**41.0%**	**50.0%**	**20.0%**

*Tab. 2: Percent of perceived susceptibility/severity (Note: *calculations resulted after processing survey data)*
Source: authors' calculation based on the survey data

Risk perception	SD	mean	coefficient of variation (%)	Z-score
Perceived susceptibility/Worried of being infected	0.4933	0.5838	84.49	– 6.9256
Confidence that they can protect themselves against infection	0.9896	3.4372	28.79	– 0.5688
Perceived severity/Severe state in case of infection	1.0869	2.7123	40.07	– 1.1847
Concern about the infection of a:				
family member	1.0376	2.7514	37.71	– 1.2034
friend	0.9785	2.7622	35.42	– 1.2650
Knowledge about COVID-19				
Transmission routes:				
direct contact with an infected person	0.1630	0.9727	16.75	– 18.5771
air borne, if someone infected coughs/sneezes	0.1708	0.9700	17.61	– 17.7374
contaminated surfaces	0.1946	0.9606	20.26	– 15.6194
water	0.3991	0.3991	201.33	– 9.5255
contaminated aliments	0.4756	0.4756	72.55	– 7.0313
Confidence in the utility of information transmitted by:				
mass-media	1.1542	3.1369	36.80	– 0.7478
social media	1.1950	2.8979	41.24	– 0.9223
authorities	1.1093	3.8042	29.16	– 0.1765
Behavioural implications				
Measures taken to prevent infection	0.2128	0.9525	22.34	– 14.3192
Behavioural changes	0.0982	0.8818	11.13	– 31.7679
Stress generated by the pandemic	0.0894	0.3549	25.19	– 40.7672
Impulsive shopping	0.4989	0.5992	83.27	– 6.8168

Tab. 3: Coefficient of variation for level of risk perception, knowledge about COVID-19 and behavioural change for sampled Romanian population
Source: authors' calculation based on the survey data

of the coefficient of variation (201.33%) was calculated for the responses given when participants were asked if they considered water as a transmission route. Responses with similar means but with noticeably different coefficients of variation indicate that the respondents have inconsistent attitudes, as in the case of behavioural changes declared (mean = 0.9525 and coefficient of variation of 22.34%) and measures taken to prevent infection (0.8818 and coefficient of variation 11.13%). An extreme difference in the value of the coefficient of variation (201.33% and 72.55%) was noted for the close mean values calculated for two of the transmission routes: water (0.3991) and contaminated aliments (0.4756).

For further analysis, from our entire data, we created a dataset composed of socio-demographic variables and variables regarding the degree of concern and belief about one's own health condition in case of infection. Using RStudio, we calculated a correlation matrix between five variables to examine the level of correlation between sociodemographic features (age, sex, living environment and education) and the level of concern regarding the possibility to become infected (see Fig. 4). A correlation was also computed with a person's belief regarding the severity of the state it may develop, using Spearman's rank correlation (Rübsamen et al., 2015).

The correlation matrix shows that the highest positive correlation (0.25) of risk perception is with age and education, while a negative correlation is with sex (– 0.21). But a correlation coefficient different from 0 does not mean that the correlation is significantly different from a null value. This needs to be tested with a correlation test. Using the *rcorr()* function in R from the Hmisc package applied to our dataset, we computed the p-values of the correlation test for several pairs of variables at the same time (Tab. 4).

P-values smaller than the significance level ($\alpha = 0.05$) indicate that there is a strong correlation between sex (0.001) and the level of concern regarding the risk to get infected, while age is not correlated with the concern about the situation (0.205). As for one's belief to be in a critical shape in case of an infection, we find a strong correlation with age (0.0001), but not with the sex variable (0.538). To obtain more information for the associations between sociodemographic factors and risk perceptions about COVID-19 manifested by the participants in the study, we used the *correlation()* function from the easystats correlation package to combine correlation coefficients and correlation tests (see Fig. 5). The correlogram adapted from the *corrplot()* function represents a more concise overview of correlations between all possible pairs of variables present in a dataset with intense colours for high correlations, while the correlations not significantly different from 0 are represented by a white box.

5. Discussion

This research assesses risk perceptions determined for the Romanian population in regard to the current Covid-19 pandemic. The preliminary results indicate that, although people are aware of the infection risk, they tend to see their

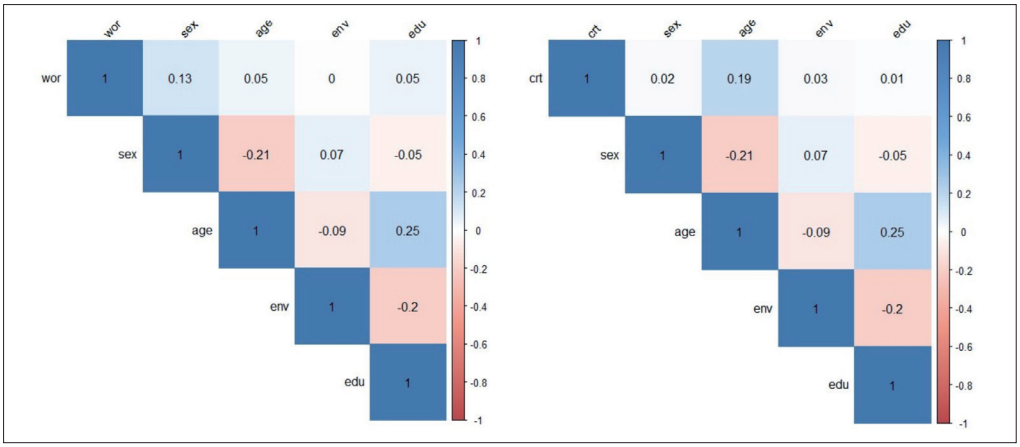

Fig. 4: Correlation between perceived risk (left) and critical state (right)
Source: authors' calculation based on the survey data

	wor	crt	sex	age	env	edu
wor	NA	0.000	0.001	0.205	0.918	0.149
crt	0.000	NA	0.538	0.000	0.458	0.788
sex	0.001	0.538	NA	0.000	0.082	0.179
age	0.205	0.000	0.000	NA	0.013	0.000
env	0.918	0.458	0.082	0.013	NA	0.000
edu	0.149	0.788	0.179	0.000	0.000	NA

Tab. 4: Correlation matrix for dataset containing several pairs of variables
Source: authors' calculation based on the survey data
(Legend: wor = level of concern regarding the risk of getting infected, crt = ones belief to be in a critical shape in case of an infection, env = urban or rural environment, edu = level of education)

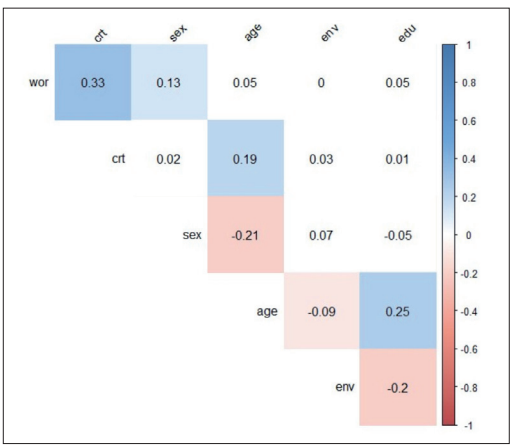

Fig. 5: View of correlation coefficients
Source: authors' calculation based on the survey data

friends at a greater risk compared to a family member and mostly themselves, which is a typical instance of optimism bias (Sharot, 2011).

Interestingly, among the predictors of risk perception, trust in government was very significant. The majority of the participants (54%) trusted the measures taken by the authorities, unlike other nations (Fetzer et al., 2020), but manifested a lower confidence in the capacity and preparation of the medical staff to manage the current situation (69%). The current mistrust of the population in the professionalism of the medical staff can be explained by the general lack of confidence in the outdated Romanian medical system (Haivas, 2010; Popa et al., 2017; Scintee and Vlădescu, 2006; Spiru et al., 2011). This was exacerbated by the present situation when faulty management caused the infection of a high number of medical personnel, which subsequently passed the virus to their patients (68% of the respondents declared that visits to a doctor have an increased level of infection risk). Authorities declared Suceava a red zone because of the high number of cases registered, many of them being among doctors.[3]

Given the fact that a large number of questionnaires were concentrated in three areas (Oltenia, Bucharest and Suceava), the authors paid additional attention to these regions to see if there are any variations as compared to national general values, or between them. It must be noted that respondents from Suceava, the county with the highest incidence by far at that time (2.64 cases/1,000 inhabitants compared to only 0.38 in Romania: Tab. 1), and one with the poorest medical system in the country, ranking among the last counties with regard to the number of doctors/10,000 inhabitants, number of hospitals and hospital beds, not to mention the media coverage of the protocol breaking by the medical personnel in the county, did not see themselves as facing a much greater risk of being infected as compared to other people living in other parts of the country. Interestingly, the highest perceived susceptibility was claimed by people living in Bucharest, the capital city, having the best medical infrastructure in the country and better access to health care, despite a low incidence of COVID-19 cases. It is a kind of paradox.

The analysis of the results coming from the three areas showed a slightly different situation in the case of peoples' confidence in their own protection capabilities. For example, more than one half of the people residing in Oltenia region (53.3%), the region with the smallest number of cases (hence the lowest incidence: 0.06 cases/1,000 inhabitants at the end of the survey period), are more confident that they can protect themselves against a possible infection, than those living in Bucharest city (39.6%) or Suceava county (37.9%), which represented the red zones of the country at the time of the study. Also, 18.1% of the respondents located in Oltenia believe that they might be in a severe state in the case of an infection. This proportion slightly increases in the case of Suceava (25.8%) or Bucharest (23.9%). Although most of the people considered the information released by the authorities as useful and trust in the measures taken by the government, only 39% believe that the general public respected the legal provisions.

Public transport and shopping (68%) were the most frequent responses to questions concerning the infection risk in different situations, followed by public places (65%), and visits to a doctor (62%). As expected, people in Suceava and Bucharest perceived a much higher risk of being infected following a visit to the doctor (85% and 73%, respectively), compared to those in Oltenia (only 55%). As a matter of fact, a visit to the doctor ranks highest among the places where one could get infected, according to the responses provided by residents in Suceava and second for those living in Bucharest, no matter the gender or education level. Also, 74% of the participants manifested their concern generated by the large number of persons returning from countries strongly affected by the Coronavirus pandemic. All three focus areas scored higher values than average, with Bucharest ranking first (89%), while both Suceava and Oltenia are closer to the average, despite being important emigration areas for temporary low-skilled workers.

In Section 2 of the questionnaire, the authors intended to rate the knowledge levels of people about COVID-19 in terms of transmission routes and possible places where one could be infected. Participants were also asked to say if they considered useful the information presented by mass media, social media and authorities, and if they obtained additional information from other official or international sources. To analyse the relations between the responses, correlations were carried out between the degree of education of the respondents, their stated knowledge about the virus and the confidence in the sources of information.

Regardless of their education, most of the respondents correctly indicated the transmission routes of the virus as per the information and studies available at the respective moment (CDC, 2020; Morawska et al., 2020; Peng et al., 2020; Zhang et al., 2020). So, over 90% mentioned as sources of infection the direct contact with contaminated surfaces or infected persons or transmitted through the air exhaled by an infected person when coughing or sneezing. Only half of the respondents considered that the virus can be spread by water or goods imported from affected countries. Regarding the importance of the information publicly transmitted, a majority of the respondents (no matter of their level of education) incline to trust more the information shared by the authorities (about 65%), while mass media and social media have almost equal shares (see Fig. 6).

The assessment of behavioural changes was quantified by processing the responses expressed by participants as an agreement or disagreement to 21 statements addressing the causes for a different behaviour, behaviour changes, consequences, induced stress and emergency food preparedness. The analysis of the processed data indicated that most of the participants had similar attitudes toward specific measures taken to prevent the spread of Coronavirus (over 95%), the same as their friends (56%) and employers (70%).

Quite interestingly, most of the respondents adopted preventive behaviour and were willing to self-isolate mainly for the protection of the family/friends and colleagues, and to a lesser extent to reduce the risk of self-infection, while the threat of sanctions was deemed the least important.

[3] The number of infected medical personnel throughout the country grew rapidly, peaking at 1,031 persons on April 18th, accounting for 12% of the infections at that time, almost half of the cases being registered in Suceava and a significant number in the capital city. Moreover, several days before the survey started, there was a massive media coverage of the situation from Suceava, where the government sent a military doctor to run the hospital, as well as from Arad County Hospital, in the western part of the country, where 40 persons from the medical staff (out of which 19 were doctors) resigned and 127 applied for sick leave.

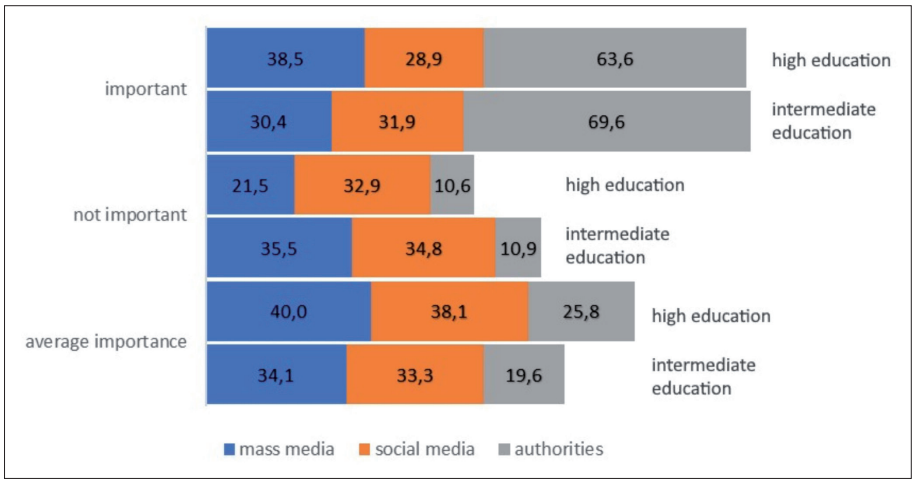

Fig. 6: Share of the people trusting in different information sources according to their education
Source: authors' calculation based on the survey data

The participants declared they have changed their normal behaviour when it comes to meeting with friends and other family members (94.5%), reasons to get out of the house (93.2%), keeping the recommended distance (92.5%), avoiding persons returned from red zones (97.6%) and crowded places (88.8%), but more than half of them (56.8%) stated that they did not make food stocks. The changes also occurred in terms of a stricter hygiene and use of disinfectants (89.3%).

Although a majority of the respondents in this study declared they felt an increased stress during the lockdown because of their family (69.9%) and for financial reasons (59.2%), most of them stated that their health was not affected. Thus, 80.4% said that did not have trouble sleeping, 87% declared that they did not increase the consumption of alcohol, as a result of stress, and only 35% of the participants felt more nervous than usual. Women also reported being more stressed than men.

Although risk perceptions differ considerably among social and cultural groups, the results of our study are in accordance with those of researchers around the world, mainly showing that: (i) women perceive a higher risk than men do (Atchison et al., 2020; Szabo et al., 2020); and (ii) risk perception correlates positively and significantly with preventive behaviour (Atchison et al., 2020; Clark et al., 2020; Dryhurst et al., 2020; Harper et al., 2020; Hou et al., 2020; Kwok et al., 2020; Pfattheicher et al., 2020; Wise et al., 2020; Zajenkowski et al., 2020).

As a result, Romanians concerned about COVID-19 quickly adopted public-health compliant behaviours, just as other nations (Harper et al., 2020). Overall, these results suggest that currently, the higher the perceived risk, the higher the compliance with preventive measures and behavioural change. Consequently, in times of health crisis, authorities should consider strategies that target raising awareness regarding the need for preventive behaviour, as well as on the efficacy of health behaviour in pandemics. It should be noted once more, however, that people living in areas with higher COVID-19 incidence and high infection rates of the medical staff (at least during the first wave of the epidemics) avoid paying a visit to the doctor for fear they may get infected, not to mention that they believe that the medical staff lack the capacity and preparation to manage the current situation. This may partly explain why, beginning in July, following the decision of the Constitutional Court, COVID-19 patients with no or mild symptoms could no longer be hospitalized against their will. Consequently, increasingly more persons that tested positive have discharged themselves from hospital, despite still being sick and going home, thus increasing the risk of infecting their family members and friends.

The lack of trust in the medical system and medical care avoidance should be a wake-up call for the government and health officials alike, which should seek to understand behavioural responses as they provide valuable insight into the processes of decision-making surrounding avoidance. The results of this study might also be used to inform intervention development, which is critical to extending the reach and effectiveness of patient care.

Limitations

There are several limitations to our work.

Due to the online approach, which was the single feasible means of collecting data during the epidemic, people lacking internet access, mainly from the rural areas and the oldest age groups, might be under-represented. Furthermore, the education level of the participants was also higher than that of the general population (70% had a bachelor's degree, compared to only 14% of the national average for Romania), and the median age of the respondents is relatively young (48% are in the rage of 18 to 34 years). Younger people, however, are typically the primary target of efforts to encourage physical distancing (Wise et al., 2020).

The use of a spatial statistical methods to measure variability has its limitations (Netrdová and Nosek, 2017), as the standard deviation quantifies only absolute levels, therefore the authors used in their study the coefficient of variation. Also, correlations were made between variables like age, education, living environment to establish the level of risk perception (Husnayain et al., 2019; Komperda, 2017).

The analysis of responses from three different heterogenous areas revealed that despite their differences in social and economic areas, or the extent in the covered area, the results were quite similar compared those reflected by the rest of the respondents coming from other parts of the country. The conclusion was that risk perceptions of COVID-19 are relatively high among the population, no matter the region they are located in. The reported risk perceptions and attitudes are conditional for the situation in Romania as of April 2020.

6. Conclusions

Against the background of a rapidly evolving pandemic, the Romanian government took what might appear to be drastic preventive measures at a very early stage, by closing schools and universities, then public places, restricting movement and urging people to work from home when possible. Authorities aimed to avoid a peak in COVID-19 cases that would exceed hospital capacity, one of the main reasons for increasing these preventive measures being the rapidly growing and mobile diaspora that decided to return home, following the severe situation in Italy and Spain, the worst affected countries at that time.

Public perceptions of risk can change with the passage of time and the unfolding of new events (Krewski et al., 2006). The statistical analysis of data indicated an average level of concern, as only 56% of the participants stated that they feel worried about the situation in Romania at the time of the survey, with a similar proportion (58%) for the acknowledged possibility of being infected. The study did not indicate a link between the number of cases registered in one county and a high level of public perception risk. So, at the national level, as well as in all three selected areas, there were no major differences regarding the level of population concern or fear manifested toward the risk of being infected. Despite the fear of getting infected, expressed by 58% of the respondents, half of the participants claimed that they trusted their own measures of protection taken against a possible infection, with women showing a higher degree of confidence (35% as compared to only 15% of men).

We found that risk perceptions correlated positively and significantly with preventive health behaviour, such as hygiene practices, physical distancing and travel avoidance. Among the psychological predictors, personal knowledge, the social amplification (frequent information about COVID-19), trust in government and personal efficacy, rank as the most important factors for Romanians' risk perception.

This survey provides useful insights on how the public perceived the health-risk associated with the COVID-19 pandemic, which was considerably influenced by risk communication transparency by government and official health agencies. The degree people understand this threat and media coverage point to timely and consistent behavioural responses of the community, in compliance with the national strategies for the control of the crisis.

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