

# Risks assessment of Adherence to non-pharmaceutical measures towards COVID-19 among residents of Mashhad in the North-East of Iran during the awful wave of the epidemic

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## ABSTRACT

**Background:** Since the Coronavirus disease 19 (Covid-19) rampaged in Iran, three waves of the epidemic occurred. **Objective:** In the present study, two issues are considered. First: What proportion of the people adhere to the mitigation approaches towards the disease? Second: Which are the reasons to disobey these rules? **Methods:** A cross-sectional, population-based phone survey was applied among the population aged over 16 years in Mashhad between November 5 and December 1, 2020. A valid and reliable knowledge, attitude, and performance (KAP) (designed questionnaire was used and logistic regression was performed with STATA 14. **Results:** The final sample size was 776; 90.59, 89.8 and 48.1% of the participants had sufficient reliable knowledge, attitude, and practice, respectively; 20.1% of the participants did not wear masks; nearly half of them visited traditional healers for the prevention and cure; 97.8% of them believed the efficiency of the vaccine and stated that they will consume it if it is distributed. Among the sociodemographic factors, only the unemployed had low adherence to the preventive approach; 51.7% of the main worry was the weak economic situation and 69% of jobs and expenditures were poorly affected. The odds ratio (OR) for optimising attitude reduced from 4.64 to 3.22, and for good performance from 5.64 to 5.43 after adjusting for the economic, knowledge and perception factors. **Conclusion:** Despite all the health rules and probably COVID-19 vaccines global access (COVAX), it seems that the most effective way to reverse this horrific wave and its economic consequences is the improvement of the economy and livelihood of the society.

**Keywords:** Adherence, COVID-19, mitigation, sanction, vaccination refusal

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## Introduction

Coronavirus disease 2019 (COVID-19) is caused by a virus that belongs to the larger family of ribonucleic acid (RNA) viruses which cause various types of illness.<sup>[1]</sup> The main symptoms of the patients affected with COVID-19 have been reported as fever, dry cough, fatigue, myalgia, shortness of breath and dyspnoea.<sup>[2,3]</sup> Rapid transmission is the character of COVID-19; close contact with an infected person is the commonest way of infection transition.<sup>[4-6]</sup> However, the facts on the disease are evolving.<sup>[7]</sup> WHO has established uniform guidelines in tackling the pandemic.<sup>[8]</sup> The non-pharmaceutical interventions (NPI) to control COVID-19 are personal hygiene, public health measures such as promoting and facilitating physical distancing, advising the population to voluntarily self-isolate if infected by COVID-19, limiting the size of indoor and outdoor gatherings, promoting teleworking where possible, school closure and environmental measures.<sup>[9]</sup> Public adherence in adopting healthy practices and responsive behavior is different around the world. The disease was controlled very well in the initially reported city of China (Wuhan) and some countries, but in most countries such as Iran, the third or fourth wave is going on.<sup>[9,10]</sup>

On Apr 15, 2021, when the present manuscript was being written, we found out that the first report of confirmed cases was announced on 20th February 2020 in Iran, and then three waves of confirmed cases happened and the fourth peak was ongoing.<sup>[10]</sup> The first peak appeared at the end of March 2020, when our country passed the holy days of the new solar year. The second wave appeared after Ramadan (the holy month in Islam) at the beginning of June,<sup>[11]</sup> the third peak was the biggest and longest than the two former peaks that started following the summer vacation and was concurrent with the start of the school opening season in the last days of September.<sup>[10]</sup> After a three-month epidemic relaxation, the fourth peak has been rising again after the holidays of the new solar year.<sup>[10,12]</sup>

However, during these third and fourth peaks, several COVID-19 vaccines were introduced and promised global access. It is taking too much time to access vaccines globally. So, the best way to protect against this infection is through preventive efforts. The conclusions of these efforts can be largely related to public behaviours. The public's knowledge and attitude toward COVID-19 are important in tackling this pandemic.<sup>[13,14]</sup> In addition to the socioeconomic factors, several factors such as the underlying disease, major concerns, job or economic issues, awareness and perspectives regarding COVID-19 prevention can impede public health responses. After more than 10 months of the epidemic at the beginning of the third wave, it was an essential need to investigate adherence to the preventive measures of COVID-19. In this study, we aimed to describe knowledge, attitudes, practices (KAP), and some related factors of adherence regarding COVID-19 among residents of Mashhad during the third wave of this epidemic.

## Subjects and Methods

This cross-sectional study was conducted in the capital of Razavi Khorasan Province (Mashhad), a pilgrimage city, located in the Northeastern part of Iran in the vicinity of Afghanistan and Turkmenistan from November 5 to December 1, 2020. Mashhad's population is 3,001,184 (2016 census), so it is the second-most-populous city in Iran. The Mashhad University of Medical Sciences (MUMS) has an integrated information system to provide health services to cover households. This system has demographic information and phone numbers of households. Therefore, the feasibility of a population-based survey was available. We examined the KAP, and risk assessment of a simple randomised sample of adults (16 years or more) regarding COVID-19. The total sample size was calculated from 800 persons with a 95% confidence level, 5% margin of error and 18.8% good adherence toward COVID-19 according to a related KAP study.<sup>[15]</sup> For this sample size, we added an 80% sample size for the assessment of eight main confounders and 46% for contribution to the household telephone survey.<sup>[16]</sup> This KAP survey instrument was based on three studies on KAP COVID-19.<sup>[15,17,18]</sup> This questionnaire was translated and back-translated from English to Persian and vice versa to ensure the meaning of the content. The content validity of the questionnaire was assessed by 15 expert panellists. Two questions with less than 0.49 of the content validity ratios (CVR) were eliminated.<sup>[19]</sup> In a pilot study, the reliability of the knowledge of 45 of our participants toward COVID-19 represented that the value of Cronbach's alpha is an acceptable level of internal consistency ( $\alpha = 0.91$ ).<sup>[16]</sup> Four parts of the final questionnaire had 40 items. The sociodemographic characteristics were at the beginning of the interview with six items. The KAP questions consisted of modes of transmission, clinical symptoms, treatment, risk groups, isolation, prevention and control. Each part of these had 14, 9 and 11 questions, respectively. The responses to these questions were Yes/No/I don't know basis. The point for correct responses was assigned 1, and incorrect or unknown responses were considered 0. The minimum score parts of the KAP scores were 0, and the maximum of them was 14, 9 and 11, respectively. We considered more than 80% of participants' total score toward COVID-19 as a sufficient knowledge, attitude and practice. These values were  $\geq 12$ ,  $\geq 6$  and  $\geq 9$ , respectively.<sup>[20]</sup>

This household survey was done by telephonic interviews after given informed consent for the recruitment of the study. The length of the interview was approximately 10–15 min. The follow-up was done thrice if the selected participants were not available. In order to increase the study power, random samples were substituted for unanswered cases.

Univariable and multivariable logistic regression analyses were applied to determine the adherence towards COVID-19. In the final model, statistically significant factors ( $P$  value  $< 0.05$ ) were maintained. Data were analysed by STATA 14.

### Ethical considerations

This research was approved by the Mashhad University of Medical Sciences, Mashhad, Iran (Identified No: IR.MUMS.REC.1399.284).

### Results

In this investigation, 773 questionnaires were completed, and the response rate was 40.6% [Diagram 1].

Table 1 represents the knowledge assessment regarding COVID-19 prevention. In 90.59% of the participants, the score of knowledge was in the range of sufficient knowledge to manage the prevention of the disease. The majority of the participants had correct awareness of clinical features and modes of spread of the infection, but more than half of them (61.9%) mistook in the incubation period, and 38.6% of the answers were incorrect about the treatment of COVID-19, respectively.

About 89.8% of the responders had a positive attitude toward mitigation approaches against COVID-19. More than 95% of the participants agreed that handwashing, wearing face masks, and disinfection of vegetables and fruits must be done to prevent the disease. The proportion of agreement to the closure of public places such as parks, gym, salons, mosques and others was somewhat high (85%). The participants' viewpoint toward the usefulness of herbal prevention or treatment for the disease was about fifty-fifty. About 75.4% of our samples impinged that the community had sufficient knowledge of mitigation measures, and about 50% of them announced that the preventive approach of the government and community was insufficient. Only 2.2% of the participants disagreed with the preventive effect of the vaccine against COVID-19 and doubted to use it if it is distributed [Table 2].

According to Table 3, handwashing was adopted by 99.5% of the participants as a common approach to prevent the disease.

The proportion of practising other preventive approaches such as the disinfection of vegetables and fruits, avoiding public transport without face masks, travelling and going to crowded places and parties were noticeable. Vitamin supplements and traditional medicines were reported as preventive consumption by 57.9% and 46.7% of the responders, respectively. However, 41.1% of the participants visited traditional healers or used herbal medicines; 95.8% of them visited physicians if they had suspicious symptoms of the disease.

In addition, two independent questions were asked to shed light on the cases for better adherence to guard against the disease.

1. What is your main concern recently? About 368 (47.4%) of the responses were COVID-19, 401 (51.7%) were economic status and only 7 (0.9%) of the responses were neutral.
2. What happened to your job and which are the economic issues following the pandemic? Reduced working hours (*n*: 160 [%20.6]), salary reduction or dismissed jobs (*n*: 74 [%9.9]), exponentially increasing economic inflation (*n*:

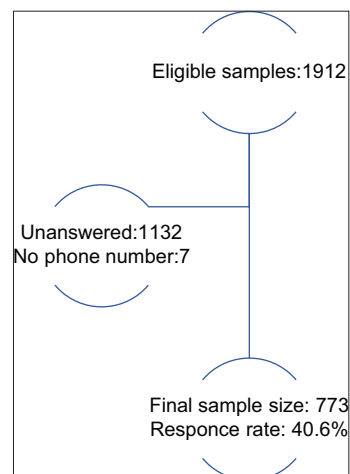


Diagram 1: Data collection algorithm of the telephone household survey

Table 1: Knowledge assessment questions regarding COVID-19

Characteristics	Correct (%)	Incorrect (%)	Do not know (%)
Clinical symptoms			
High fever	759 (97.6)	3 (.4)	3 (.4)
Sore throat	759 (97.6)	2 (.3)	3 (.4)
Dry cough	759 (97.6)	2 (.3)	3 (.4)
Muscle pain	751 (96.5)	7 (.9)	6 (.8)
Diarrhoea or constipation	734 (94.3)	8 (1.0)	23 (3.0)
nausea and vomiting	724 (93.1)	10 (1.3)	25 (3.2)
Headache	742 (95.4)	10 (1.3)	11 (1.4)
Modes of transmission			
Air droplets (from patient sneezing/coughing)	748 (96.1)	13 (1.7)	5 (.6)
Contact with contaminated surfaces	728 (93.6)	32 (4.1)	6 (.8)
Raw and uncooked foods	726 (93.3)	33 (4.2)	7 (.9)
Incubation period	296 (38.1)	132 (29.4)	252 (32.5)
Treatment	465 (59.8)	17 (2.2)	283 (36.4)
Risk groups	744 (95.6)	17 (2.2)	3 (.4)
Length of Isolation	743 (97.0)	20 (2.6)	2 (.4)

**Table 2: Perception of participants towards individual/national/community response of COVID-19**

Characteristics	Agree (%)	Disagree (%)	No idea (%)
Handwashing	762 (97.9)	3 (.4)	0 (.0)
Wearing a face mask	751 (96.5)	13 (1.7)	2 (.3)
Fruits and vegetables disinfection	745 (95.8)	17 (2.2)	2 (.3)
Closing public places	661 (85.0)	101 (13.0)	2 (.3)
Use of traditional medicine for prevention and treatment	360 (46.3)	362 (46.5)	37 (4.8)
Sufficient public awareness	587 (75.4)	175 (22.5)	5 (.6)
Sufficient control measure	432 (55.5)	329 (42.3)	6 (.8)
Use vaccine	750 (97.8)	17 (2.2)	0 (.0)

**Table 3: Practices towards individual/national/community response of COVID-19**

Characteristics	Yes (%)	No (%)
Handwashing	760 (99.5)	4 (.5)
Wearing a face mask	612 (79.9)	154 (20.1)
Vegetable disinfection	751 (98.0)	15 (2.0)
Fruit disinfection	744 (97.1)	22 (2.9)
Avoid public transport without face mask	750 (98.0)	15 (2.0)
Avoid going to public places and parties	730 (95.5)	34 (4.5)
Travelling	741 (97.2)	21 (2.8)
Use of traditional medicine for prevention	364 (47.6)	401 (52.4)
Use of traditional medicine for treatment	315 (41.1)	451 (58.9)
Use vitamins for prevention	442 (57.9)	322 (42.1)
Visit a doctor	732 (95.8)	32 (4.2)

298 [38.4]) and 245 (31.5%) participants expressed not much job difference than before.

Sociodemographic factors, history of the underlying disease, infection history of COVID-19, major current anxiety, job or economic issues and awareness level toward mitigation approaches were considered to introduce univariate and then multivariate logistic regression to determine the risk assessments of the gap perception among the population [Table 4]. In the same way, we modelled these determinates to find the factors associated with good practice against the disease, but the attitude score was replaced with the knowledge score [Table 5]. The attitude level toward the non-pharmaceutical approaches was approximately equal among age, gender, education, nationality and the relative experience of COVID-19. The unemployed and soldiers had more negative perception against the preventive approach than others; the participants who emphasised that the economic status was a major current worry had a lower positive attitude than those who replied that COVID-19 was the main problem, and the people who reduced work time, decreased salary or dismissed jobs had more negative attitude than the participants who said the pandemic did not affect their jobs ( $P < 0.00$ ). But the participants with a background underlying disease had adequate knowledge and those who complained about the increase in prices had a significantly positive attitude toward battling the disease. In the final model, the adjusted OR of soldiers, unemployment, economic concern, reduced work time and decreased salary or dismissed jobs is .05 (.005–.58), .09 (.01–.98) and .37 (.21–.67), .37 (.17–.78) and .18 (.08–.42), respectively, and

the adjusted OR of sufficient knowledge of preventive approach is 3.89 (2.01–7.51) [Table 4].

Univariate logistic regression represented that there was no significant gap of adherence levels toward COVID-19 among the sociodemographic factors and infection history of COVID-19, but the participants with the underlying disease and positive attitude against non-pharmaceutical measures of the disease had significantly odds to good adherence toward COVID-19. The participants with the economic concerns and reduced salary or dismissed jobs had the inversion effect against utilization of these preventive measures. However, only the attitude level remained as an effective factor in the final model (OR = 5.43 [2.73–10.77]) [Table 5].

## Discussion

During the outbreak of COVID-19 in Iran, two waves of the epidemic occurred with about 3,000 cases per day and less than 2-week long. But the third wave outbreak of COVID-19 has two awful characters. It has begun in September and is going on until the start of this study (November) with more than 14,000 cases per day.<sup>[10]</sup> This condition can be largely related to the ignorance of the preventive protocols of the disease.<sup>[13]</sup> This study was conducted in Mashhad, a pilgrimage city, with the potential to increase the incidence of this disease.

How much proportion of the people adhere to the mitigation approaches toward the disease? And, which are the reasons to disobey the rules of these preventive protocols? These are the two issues we seek in this investigation. The epidemic course of the disease has become long and it can adversely affect the dimensions of people's lives. So, socioeconomic factors, underlying disease, major concern, job or economic issues, awareness and perspective regarding COVID-19 prevention were investigated for obeying preventive measures toward COVID-19 among residents of Mashhad between November 5 and December 1, 2020.

The samples of the household phone survey were randomly extracted from an integrated information system, the copyright of MUMS. The minimum information of this database is demographic and contact information. This information is scarcely available, so in similar studies, it is said that the



**Table 4: Multiple logistic regression analysis of factors associated with personal hygiene attitude**

Characteristics	Mitigation approaches attitude		OR	
	Mean	SD	a COR (%95 CI)	b AOR (%95 CI)
Age			1.016 (.998-1.03)	
16-24	7.30	1.05		
25-44	7.06	1.22		
45-64	7.05	1.19		
>65	7.22	1.03		
Gender				
Male	7.08	1.17	1	
Female	7.12	1.22	0.953 (.586-1.876)	
Education				
Elementary or below	7.08	1.08	1	
Primary education	7.14	1.23	0.61 (.34-1.09)	
Secondary education	7.11	1.27	0.52 (.23-1.18)	
Post-secondary education	6.78	1.09	0.54 (.22-1.32)	
Occupation				
White collar	7.42	0.94	1	1
Blue collar	7.06	1.17	0.18 (.025-1.41)	0.20 (.02-1.60)
Unemployed	6.69	1.25	0.08 (.01-.75)	0.08 (.00-.83)
Housewife, retired	7.08	1.86	0.19 (.02-1.52)	0.14 (.01-1.18)
Solider/student	7.00	1.86	0.068 (.01-.66)	0.04 (.00-.48)
Nationality				
Iranian	7.10	1.18	1	
Others	6.87	1.16	0.92 (.38-2.24)	
History of underlying disease				
No	7.04	1.22	1	1
Yes	7.15	1.11	1.82 (1.08-3.06)	1.79 (.96-3.32)
Someone infected by COVID-19				
Yes, close relatives	6.97	1.21	1	
Yes, far relatives	7.12	1.11	1.16 (.39-3.46)	
No one	7.11	1.20	1.32 (.53-3.28)	
Major issue				
COVID-19	7.23	1.07	1	1
Economy	6.95	1.26	0.39 (.23-.66)	0.39 (.21-.73)
Economic issue				
No change	7.21	0.07	1	1
Exponentially increasing economic inflation	7.22	0.06	1.67 (.79-3.52)	1.44 (.63-3.28)
Reduce working hours	6.94	0.10	0.36 (.19-.69)	0.37 (.17-.78)
Reduced salary or dismissal	6.38	0.15	0.19 (.09-.38)	0.18 (.08-.42)
Knowledge score				
Insufficient	6.37	1.31	1	1
Sufficient	7.16	1.15	4.64 (2.60-8.27)	3.22 (1.61-6.43)

a COR, crude odd ratio in the univariate analysis b AOR, Adjusted odd ratio in the multivariable analysis

feasible way of data collection during the pandemic is web based or through virtual networks.<sup>[9,15,18-22]</sup> The distribution of these possibilities is varying among the population, and the generalizability of results is doubtful. In our study, only 7 out of 1,912 subjects did not have a contact number. So, we can claim that this study is a population-based investigation. However, less than half of the total contacts contributed to the investigation. So, the results of this study should be explained with thriftiness.

As we expected, after 10 months of the spreading epidemic, the results of adherence to the individual response of COVID-19 represent that the participants were at a good level of knowledge (90.5%) and attitude (89.8%), but 48.1% of them had

a good level of performance; 20% of the participants refused to wear masks regularly.

The sections of attitude and practice of our questionnaire consisted of individual, national and community responses to COVID-19. There are conflicting views in the scientific and general community about traditional healing. Many people, particularly in developing countries, prefer traditional medicines.<sup>[23]</sup>

The benefits of these traditional medicines are without scientific evidence. There are even many profit motives, and sometimes, they lead to false certainty and increasing the spread or severity of

**Table 5: Multiple logistic regression analysis associated with personal hygiene practice**

Characteristics	Mitigation approaches practice		a COR (95% CI)	b AOR (95% CI)
	Mean	SD		
Age			1.00 (.99-1.01)	
16-24	8.10	0.31		
25-44	8.16	0.94		
45-64	8.22	0.88		
>65	8.31	0.72		
Gender				
Male	8.22	0.89	1	
Female	8.15	0.84	0.79 (.55-1.14)	
Education				
Elementary or below	8.23	0.80	1	
Primary education	8.26	0.83	1.07 (.77-1.48)	
Secondary education	7.82	1.27	0.75 (.44-1.26)	
Post-secondary education	8.28	0.72	1.04 (.59- 1.83)	
Occupation				
White collar	8.30	1.03	1	
Blue collar	8.18	0.85	0.61 (.32-1.14)	
Housewife, retired	8.14	0.91	0.63 (.32-1.24)	
Unemployed	8.20	0.76	0.63 (.23-1.72)	
Solider/Student	8.37	0.80	1.22 (.38-3.89)	
Nationality				
Iranian	8.20	0.89	1	
Others	8.30	0.73	1.21 (.70-2.09)	
History of underlying disease				
No	8.11	0.97	1	1
Yes	8.33	0.73	1.36 (1.02-1.82)	1.32 (.97-1.78)
Someone infected by COVID19				
Yes, close relatives	8.04	1.02	1	
Yes, far relatives	8.31	0.931	0.81 (.42-1.56)	
No	8.21	0.78	1.00 (.59- 1.71)	
Major issue				
COVID-19	8.22	0.89	1	1
Economy	8.19	0.89	0.86 (.64-1.14)	0.97 (.72-1.31)
No idea	7.85	0.69	0.21 (.63-.96)	0.17 (.02-1.45)
Economic issue				
No change	8.27	0.08	1	1
Exponentially increasing economic inflation	8.33	0.04	1.22 (.87-1.72)	1.24 (.87-1.77)
Reduce working hours	8.03	0.08	0.83 (.55-1.25)	0.99 (.64-1.52)
Reduced salary or dismissal	7.78	0.14	0.55 (.31-.98)	0.73 (.40-1.33)
Attitude score				
Negative	7.52	1.04	1	1
Positive	8.28	0.84	5.64 (2.85-11.15)	5.43 (2.73-10.77)

a COR, crude odds ratio in the univariate analysis b AOR, Adjusted odds ratio in the multivariable analysis

the disease.<sup>[23]</sup> In our study, about half of the participants believed and visited traditional healers for the prevention and cure of the disease. A web-based survey was carried out in Iran during the first week of March 2020. It indicated that 40% of the participants used herbal products to guard against the infection<sup>[18]</sup> although the time lag existing between the two results was very close to our outcomes. Another finding of this study is less verifying and obeying of the precautions toward the COVID-19 among the people who had the disease in close relatives. In a detailed analysis, this group of participants more accepted and used traditional medicine in the treatment of COVID 19 than those who hadn't the disease in close relatives. However, 95.8% of the participants

visited doctors when suspecting this illness and considered them as a reliable source of information. In comparison with the study of Kakemam *et al.*,<sup>[22]</sup> this correct perception is growing (65.4% vs. 95.8%). It seems that people are hesitant in decision-making, and to get rid of this problem, they used both scientific and traditional approaches.

About 97.8% of the participants believed in the efficiency of the vaccine, and they would consume it if it is distributed. Contradictory news about the effect and structure of the vaccine has been published in the media, but the participants of our sample had good literacy about it (97.8%). This

optimistic perception is higher than the number of conducted studies at the beginning of the epidemic in Iran.<sup>[18,22]</sup> On the other hand, this increased vaccine acceptance perception may be due to concerns about the growing incidence of the disease. Also, the participants may be tired of the prolongation and limitations caused by the outbreak.

The WHO has established uniform guidelines for national or community response to COVID-19 and are updating them for tackling the pandemic;<sup>[8]</sup> although, each country has obeyed them according to its feasibilities. The policymakers of Iran decided to implement smart distancing for starting economic activities.<sup>[11]</sup> About 51.7% of the participants had no positive perception to reduce public transportations for the mitigation of the infection, and 98% of the participants wore face masks in these places. These findings show that more than 50% of our samples needed these community facilities, and they often tried to compensate for the risk of the infection by observing individual precautions.

The main worry of more than half of the participants (51.7%) was the weak economic situation, and 69% of them were poorly affected by their jobs and expenditures. The socioeconomic factors, unemployment, and soldiers had a significantly lower optimistic perspective to guard against this infection. Economic concern and job issues led to negative attitudes and risky behaviour toward precautions of the infection. The economic harm is obvious and indicates that the world has experienced a huge economic shock. In addition, the United States has imposed unfirm sanctions on Iran. This human crime caused the escalation of economic woes by the COVID-19 outbreak.

However, the underlying disease, sufficient knowledge and positive attitude in the univariate model enhanced the perception and obeying of mitigation approaches. After adjusting to the job and economic anxieties and its issues, these positive effects of the underlying disease diminished and had no significant gap in attitude and action to the ways of prevention against the infection between those who had chronic diseases or not. In the same studies, the effects of work status and monthly income on the changing attitudes and behaviour have been addressed.<sup>[9,20]</sup> These studies are in line with our findings.

The main feature of this study was done a long time after the start of the epidemic. Thus, it is more likely to identify the true impact of the determinants of adherence to the principles of disease prevention, and the immediate effects of the intervention are reduced. Despite good knowledge and an optimised attitude, less than 50% of the participants had a good response to the disease. Despite all health rules and probably COVID-19 vaccines global access (COVAX), loss of livelihoods under the pressure of deficiency caused by the COVID-19 epidemic and the cruel foreign sanctions led to an increased risk of the disease. It seems that the most effective way to reverse an unprecedented and horrific wave of the disease and its economic consequences is to improve the economic and living conditions of society.

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## Conflicts of interest

There are no conflicts of interest.

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