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ORIGINAL ARTICLE

Predictors of influenza vaccination among elderly: a cross-sectional survey in Greece

Ioannis Dardalas[1] · Chryssa Pourzitaki[1] · Georgios Manomenidis[2] · Faye Malliou[1] · Petros Galanis[3] · Georgios Papazisis[1] · Dimitrios Kouvelas[1] · Thalia Bellali[4]

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Abstract

Background Senior individuals are particularly vulnerable to influenza. Research suggests that protection against the virus and its transmission in this high-risk group of the population can be achieved by active immunization against the pathogen.
Aims To explore and analyze the attitudes, knowledge and behavior of people over the age of 60 on influenza vaccination.
Population and methods This cross-sectional survey included people over the age of 60 who were eligible candidates for the influenza vaccine from 3 regions from Northern and 1 region from Southern Greece. A self-completed questionnaire based upon the Theory of Planned Behaviour, the Motivation for Vaccination (MoVac-flu) and the Vaccination Advocacy Scale (MovAd) was administered to the participants. Demographic characteristics and information about health status were also obtained.
Results The final sample included 318 participants with mean age of 70.7 years. More than half of the participants (56.6%) had received a flu vaccine in 2018 while 50.8% received it annually in previous years. Behavioral ($p<0.001$), normative ($p<0.001$), and control beliefs ($p<0.001$), promoted the uptake of the vaccine and the increased intention score ($p<0.001$) was associated with increased probability of vaccination. Greater age ($p=0.001$) and frequent visits to the doctors ($p=0.003$) had a positive influence upon the uptake of the vaccine.
Conclusions Only a small proportion of those over the age of 60 had received the influenza vaccine. This finding is worrying, as it indicates the impact that a future outbreak of seasonal influenza could exert upon vulnerable groups. There is an urgent need for further, better and more evidence-based information from healthcare professionals to achieve greater vaccination coverage in the community.

Keywords Influenza vaccination · Influenza vaccine · Elderly · Theory of planned behavior

Introduction

Influenza has been a global health concern, with 9 pandemic outbreaks over the last 300 years. The deadliest epidemic occurred in 1918, with an estimated 50–100 million victims. In more recent years, the (H1N1)pdm09 virus was responsible for between 151,700 and 575,400 deaths globally in 2009 [1]. The symptoms of influenza range from mild to severe and in some cases, the disease can be fatal. The elderly represent 70–90% of seasonal influenza-related deaths as well as 50–70% of related hospitalizations with serious complications such as primary or secondary bacterial pneumonia, myocarditis and encephalitis [2–4].

Our limited arsenal against this health threat exhibits the need to focus upon the prevention rather than the treatment of the condition. Apart from the clinical

✉ Chryssa Pourzitaki
chpour@gmail.com

1 Department of Clinical Pharmacology, Faculty of Medicine, School of Health Sciences, Aristotle University of Thessaloniki, University Campus, 54124 Thessaloníki, Greece

2 General Hospital of Ptolemaida, 50200 Ptolemaida, Kozani, Greece

3 Center for Health Services Management and Evaluation, Faculty of Nursing, Kapodistrian University of Athens, Athens, Greece

4 Faculty of Nursing, "Alexander" Technological Educational Institute of Thessaloniki, Thessaloníki, Greece

considerations, it is also important to account for the economic benefits of immunization against influenza. In the Netherlands, the cost-effectiveness ratio was estimated at 6900€ per life-year gained. In England, Wales, France and Germany, this figure stands at 5600€ [5]. For those over 60 years old, most published studies have found that vaccination offers cost savings by reducing treatment costs that outweigh the cost of vaccination [6].

The national guidelines for vaccination against influenza vary considerably among the EU member states in terms of target populations. For example, while the majority of nations recommend that citizens aged 65 and above should be immunized, some states suggest that members of the public should receive the vaccine if they are aged 60 or above. Austria, Belgium and Ireland have an even lower age threshold and offer the vaccine to people aged 50 or above. Differences with respect to the sources of funding are also evident. In 16 out of 30 European Member States, the influenza vaccine costs are covered by the national health services while in 11 member states, citizens are expected to purchase the vaccines themselves [7].

In an attempt to tackle the issue of influenza among the elderly community, the European Council has set a 75% vaccination coverage target for senior citizens. Yet, only three member states (The Netherlands, Northern Ireland and Scotland) managed to achieve this goal, followed by Spain, Italy, France and Germany, while Poland, Latvia and Estonia showed the lowest rate [7, 8]. The median coverage rate of all EU states being 47.6% for seasons 2007–2008 to 2014–2015. Interestingly, data regarding the seasonal influenza vaccination coverage among the elderly is not available for Greece.

Over the last decades, a considerable body of literature has aimed to identify factors that might influence the uptake of the influenza vaccine. Hesitancy and opposition to vaccinations can be measured by models such the Theory of Planned Behavior (TPB), a model introduced by Icek Ajzen as a consequence of the Theory of Reasoned Action (TRA) [9].

Emotional parameters of risk perception such as low disease concerns, the perceived risk of adverse events, reduced repentance in non-vaccination and cognitive or emotional perceptions about the vaccine were reported as barriers [10, 11]. The lack of general knowledge, the misunderstandings and misbelieves about the influenza vaccine were identified by the majority of articles as a major obstacle [10]. Several studies have found that unhealthy lifestyle choices such as excessive alcohol consumption or smoking have a negative impact upon the uptake of the vaccine intake [12]. People who interact less with the health system and make fewer visits to the doctors are less likely to get vaccinated while general access to influenza vaccines due to political, geographical or financial issues were not recognized as barriers to vaccination [10, 13, 14].

Recent studies have indicated the importance of societal influences as a significant uptake factor, with higher degrees of pressure from significant others resulting in increased uptake [10]. Higher vaccination rates were observed in people who get immunized annually, suggesting that past behavior is a strong predictor of acceptance while the unvaccinated proportion of the population was less likely to receive the vaccine in following years [15, 16].

Originally developed for healthcare professionals (HCPs), the MoVac-flu and the MovAd scales aim to quantify the extent of hesitancy or motivation towards vaccination by examining perceptions and decisions based on four dimensions, namely value effectiveness, knowledge and choice [17, 18]. A study showed that reluctance is mainly driven by neutral empowerment to vaccinate and defense against the influenza vaccination [17].

Greece, a member state of South Europe, provides free immunization against influenza to all citizens aged 60 or above; however, it has yet to achieve the vaccination target rates set by the European Union. The financial crisis that has been unfolding for the past decade, as well as Greek ethics and views on the healthcare system have had an enormous impact upon the Greek population's attitudes towards vaccinating against the seasonal flu [19]. Although there has been an abundance of studies regarding the vaccination coverage among high-risk groups (including the elderly) across Europe, no such research has been conducted on Greek grounds to date. The purpose of this study is to explore and summarize the attitudes, knowledge and behavior of people over the age of 60 on the influenza vaccination in Greece.

Methods

Study setting and participants

Our team conducted a cross-sectional study which took place from February 2018 to September 2018 in various parts of north and south Greece. Participants were recruited through local pharmacies and The Center for the Open Care for the Elderly via the convenience sampling method and all subjects over the age of 60 had an equal chance to be selected for the study. The study took place overall in four places: in Thessaloniki, Drama and Chalkidiki (three different regions in the North of Greece) and Crete island (in the South of Greece). All participants were recruited in pharmacies. Moreover, our sample represents results from both urban (Thessaloniki, Drama) and rural areas (Chalkidiki, Crete) of Greece.

Every patient over the age of 60 was given a questionnaire with no exclusion criteria set from the outset, except for a lack of willingness to take part in the study.

Questionnaire

A custom questionnaire was designed for the purposes of this study, which included three sections. The first section was designed to acquire demographic and behavioral information. Demographic data included gender, age, marital status, level of education, occupational status, smoking and health status. Participants were also asked to state if they had received the influenza vaccine in 2018 and if they received the influenza vaccine were receiving the vaccine annually in previous years.

The second section contained 16 items and was designed in accordance with Ajzen's TPB model [9]. The use of the questionnaire is free for research purposes by the author, as well as its adaptation to the subject of vaccination, for the purposes of this study. The translation into the Greek language was performed according to a standard procedure for intercultural adaptation of self-referencing questionnaires [20]. The questionnaire consists of four parts measuring intentions, attitudes, subjective behavioral rules and the subjective perception of behavioral control. The answers are marked on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Participants were to state the degree of their agreement or disagreement with the following statement; "Being vaccinated each year for the influenza virus is beneficial to protect my health from influenza". Participants were also asked to rate the extent to which their doctors, pharmacists, family members and friends encouraged getting the vaccine. Furthermore, responders were asked whether they agreed or disagreed with the claim "I plan to vaccinate against the influenza virus every year".

The third section included two subscales, namely the MoVac-flu (9 items) and the MovAd scale (11 items) [18, 19]. The purpose of this section was to evaluate the mobilization of individuals with regards to the influenza vaccination and its defense. Responses were marked on a 7-level Likert scale. The rights for the MoVac-flu scale and MovAd scale questionnaire were obtained from their authors for this study. The translation into Greek was performed again in accordance with a standardized procedure [20]. The questions were adapted so that the questionnaire was comprehensive to people with no medical background or technical knowledge. At the beginning of this section, the participants were asked to rate how confident they felt about their knowledge on how the vaccination can protect them against influenza. The responders were then asked to express how confident they felt regarding holding a conversation about the vaccine and whether or not it was their decision to hold this discussion.

Statistical analysis

Categorical variables are presented as numbers (percentages), while continuous variables are presented as mean (standard deviation). The Kolmogorov–Smirnov test and normal Q–Q plots indicating the normality of the distribution of the continuous variables and parametric methods were used. Bivariate analysis between independent variables and vaccination status included Chi-square test, Chi-square trend test and independent samples *t* test. Independent variables that were significantly different ($p < 0.20$) in bivariate analysis were entered into the backward stepwise multivariate logistic regression models with vaccination status (during this year and each year) as the dependent variable. Criteria for the entry and removal of variables were based on the likelihood ratio test, with enter and remove limits set at $p < 0.05$ and $p > 0.10$. Multivariate logistic regression analysis was applied for the control of each potentially confounding of each statistically significant predictive factor to the others. We estimated adjusted odds ratios with 95% confidence intervals, *p* values and coefficients of determination. In multivariate logistic regression analysis, *p* values of less than 0.05 were considered significant. Statistical analysis was performed with the IBM SPSS (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.).

Results

Three hundred and sixty (360) questionnaires were distributed and three-hundred and eighteen (318) questionnaires were returned (88.3% response rate). The mean age of the responders was 70.7 years. Individuals not willing to participate or complete the questionnaire were counted 42 or as a refusal rate of 11.7%.

The demographic characteristics of the participants are presented in Table 1. Most participants were married (74.1%), had children (93.6%), were retired (84.6%) and had an annual family income > 10,000€ (66.4%). In addition, 27% of the participants suffered from chronic disease and 17.7% were smokers.

With respect to the vaccination status, more than half of the participants stated that they received the influenza vaccine for 2018 (56.6%, $n = 180$), while 50.8% ($n = 153$) stated that they were immunized each year.

Descriptive statistics and Cronbach's alpha for the scales of the Planned Behavior model and MoVac-flu and MovAd scales are summarized in Table 2. Cronbach's alpha for the Planned Behavior model was 0.93 and ranged from 0.63 to 0.94 for the sub-scales (behavioral beliefs, normative beliefs, control beliefs and intention), indicating acceptable to very good reliability. Also, Cronbach's alpha for MoVac-flu scale

Table 1 Socio-demographic and behavioral characteristics of the participants

Characteristic	*N*	%
Gender		
Males	150	47.2
Females	168	52.8
Age	70.7[a]	8.2[b]
Marital status		
Singles	12	3.8
Married	232	74.1
Divorced	10	3.2
Widows	59	18.8
Children		
No	20	6.4
Yes	291	93.6
Working status		
Employees	46	15.4
Retired	252	84.6
Educational level		
Elementary	61	20.3
High school	120	40.0
University degree	119	39.7
Annual family income (€)		
< 5000	21	7.2
5000 to 10,000	77	26.4
> 10,000	194	66.4
Chronic disease		
Yes	86	27.0
No	232	73.0
Frequent visits to doctor		
No	122	44.7
Yes	151	55.3
Smoking		
No	261	82.3
Yes	56	17.7

[a]Mean

[b]Standard deviation

and MovAd scale was 0.94 and 0.92, respectively, indicating excellent reliability.

Mean scores for scales of Planned Behavior model were above the mid-point (=3) suggesting positive beliefs and intention against vaccination. In addition, mean scores on MoVac-flu scale, MovAd scale and sub-scales were above the mid-point (=4) showing motivation and advocate against vaccination.

Bivariate analyses between independent variables and vaccination status are presented in Table 3, while multivariate logistic regression models are summarized in Table 4. According to multivariate analysis, participants with frequent visits to the doctors were vaccinated more frequently ($p=0.001$ for 2018 and $p=0.003$ for past years). Also, an increased intention score was associated with increased probability of vaccination ($p<0.001$ in both cases). Increased score on normative beliefs was associated with increased probability of vaccination during the year ($p=0.024$), while increased age was associated with increased probability of vaccination every year ($p=0.001$).

Discussion

To the best of our knowledge, this is the first study exploring the influenza vaccination attitudes among the elderly population in Greece. According to the results derived from our sample of 318 individuals, only 56.6% received the influenza vaccine in 2018, while only 50.8% claimed that they became immunized against the influenza virus annually. A study conducted in the UK revealed that the elderly vaccination rate (65 years and over) at 72.1%, which is higher than the vaccination rate we found in Greece despite the fact that the vaccine costs are fully covered by the state [21]. Our findings could be explained by the low knowledge and health education of the elderly in Greece along with low promotion of the influenza vaccine's importance and benefits by health care workers and the media. The impact of the anti-vaccination movement should also be considered as a major barrier affecting this rate, which is far below the guidelines set in Europe and America. The herd immunity rate in Europe was set at 75% for the elderly, while in America at 80% for the general population and 90% for the vulnerable groups [22].

The mean scores of the TPB questionnaire reflected behavioral, normative and control beliefs, as well as the participants' intention of getting vaccinated. Behavioral beliefs include individuals' beliefs regarding the importance, necessity and safety of the influenza vaccination upon their health, as well as their family's health. The majority of the elderly appreciated that they are a vulnerable group where influenza vaccination coverage is deemed necessary. The 4 out of 5 mean score found in the present study indicates positive beliefs and intention towards immunization, which is in line with findings from other studies [23–25].

Normative beliefs refer to the influence of significant others on an individual's behavior and acts. Our mean score of 3.9 indicates positive beliefs and intention towards becoming immunized are affected by the recommendations of doctors, pharmacists, family, friends and society's significant other members. This correlation was expected, considering the structure of the Greek Health system where family doctors and pharmacists have the most significant personal interaction with the elderly. In most studies, the perceived pressure of significant others is proportional to the uptake of the vaccine [10, 26]. The mean score on control beliefs (4.3) suggests that most participants appear to think that they retain

Table 2 Descriptive statistics and Cronbach's alpha for scales of Planned Behavior model and MoVac-flu and MovAd scales

Scale	Mean	Standard deviation	Median	Minimum value	Maximum value	Cronbach's alpha
Behavioral beliefs	4.0	0.8	4	1.5	5	0.93
Normative beliefs	3.9	0.7	4	1	5	0.88
Control beliefs	4.3	0.6	4	2.3	5	0.63
Intention	3.9	0.9	4	1	5	0.91
MoVac-flu scale	5.4	1.3	5.7	1	7	0.94
Value	5.5	1.4	5.7	1	7	
Impact	4.8	1.7	5	1	7	
Knowledge	5.5	1.5	6	1	7	
Autonomy	6.0	1.2	6	1	7	
MovAd scale	4.7	1.2	4.6	1	7	0.92
Value	4.8	1.6	4.8	1	7	
Impact	4.5	1.3	4.3	1	7	
Knowledge	4.4	1.6	4	1	7	
Autonomy	5.5	1.4	6	1	7	

control over the vaccination regardless of economical or practical barriers affecting the supply of the vaccines. This finding is in accordance with results from other studies [27]. A positive mean score of 3.9 was also found in this study regarding the intention of receiving the vaccination, which is in line with the actual vaccination rates obtained from our sample. The likelihood of repentance was also found to be strong among participants who did not receive the vaccine. This reveals positive beliefs around immunization among the population and highlights the prognostic meaning of anticipated regret [28].

Mean scores were also calculated for the MoVac-flu and MoVad sections of the questionnaire involved with the hesitancy to get vaccinated based on four dimensions (value, effectiveness, knowledge and choice). With regards to the dimension of value, which included parameters such as the importance of the vaccine for the individuals' health and euphoria but also for the individuals' milieu, the mean scores of 5.5 and 4.8, respectively, indicate a strong correlation with the intention for receiving the vaccine. Positive mean scores were also obtained for the knowledge about how the vaccine protects against the influenza virus, how it helps the body fight the pathogen but also the degree of the self-confidence to hold conversations over the influenza vaccination. According to Schmid's et al. [10] systematic review, a lack of general knowledge about the influenza virus and its vaccine appeared to act as obstacles on vaccination. Believing in false statements about the vaccine was also identified as a barrier towards immunizing against influenza in most studies [13]. The misconception that the vaccine can cause the flu was identified as the most important barrier [10]. In addition, one study reported an increase in the intake of the vaccine when people held the falsified belief that the vaccine offers protection against the common cold [29]. The highest mean scores obtained in this study were concerned with individuals' autonomy. This included two items- the extent to which the decision to hold conversations about the vaccination was made by the participant (6.0) and the extent of control they had over the decision to get vaccinated (5.5).

The present study also examined whether or not certain demographic characteristics were associated with the rates of vaccination for 2018, as well as past years. Our results suggest that gender, marital status, educational level and having children neither promoted nor discouraged the decision to become immunized. However, some studies indicated that gender can act as a barrier [23] or as a promoter for vaccination [23, 25]. Other studies have also found marital status to exert an influence, with unmarried individuals being less likely to become vaccinated [30]. The reasons these parameters influence the uptake of vaccines are rarely explained, although the influence of family towards the elderly could be important due to their confidant relationship.

Deteriorating health and the existence of health conditions did not appear to influence the willingness to get vaccinated both in 2018 and in past years. However, some studies identified a relationship between these variables [31, 32]. The positive correlation between the frequency of interactions with HCPs and the uptake of vaccines found in this study shows the ability of HCPs to influence the perceptions of the public and promote immunization against influenza. People who are less likely to interact with the healthcare system, those performing fewer doctor visits or those who weren't admitted in hospitals were less likely to be vaccinated according to Schmid's systematic review [10].

According to our results, advanced age was associated with increased probability of receiving the vaccination.

Table 3 Bivariate analyses between independent variables and vaccination status

Independent variable	Vaccination this year				*p* value	Vaccination every year				*p* value
	No		Yes			No		Yes		
	N	%	*N*	%		*N*	%	*N*	%	
Gender					0.3[a]					0.8[a]
Males	65	45.8	77	54.2		66	44.0	84	56.0	
Females	83	52.2	76	47.8		72	42.9	96	57.1	
Age	68.7[b]	8.2[c]	72.6[b]	7.8[c]	< 0.001[d]	69.4[b]	8.5[c]	71.7[b]	7.9[c]	0.01[d]
Marital status					0.7[a]					0.8[a]
Singles/divorced/widows	40	51.9	37	48.1		34	42.0	47	58.0	
Married	107	48.9	112	51.1		102	44.0	130	56.0	
Children					0.9[a]					0.8[a]
No	9	50.0	9	50.0		8	40.0	12	60.0	
Yes	136	49.3	140	50.7		127	43.6	164	56.4	
Working status					0.005[a]					0.01[a]
Employees	30	68.2	14	31.8		28	60.9	18	39.1	
Retired	107	45.0	131	55.0		102	40.5	150	59.5	
Educational level					0.16[e]					0.6[e]
Elementary	19	35.8	34	64.2		24	39.3	37	60.7	
High school	63	55.3	51	44.7		54	45.0	66	55.0	
University degree	59	50.9	57	49.1		53	44.5	66	55.5	
Annual family income (€)					0.1[e]					0.3[e]
< 5000	5	29.4	12	70.6		7	33.3	14	66.7	
5000 to 10,000	32	45.1	39	54.9		29	37.7	48	62.3	
> 10,000	95	50.8	92	49.2		84	43.3	110	56.7	
Chronic disease					0.17[a]					0.9[a]
No	113	51.6	106	48.4		101	43.5	131	56.5	
Yes	35	42.7	47	57.3		37	43.0	49	57.0	
Frequent visits to doctor					< 0.001[a]					< 0.001[a]
No	79	69.3	35	30.7		79	64.8	43	35.2	
Yes	56	38.1	91	61.9		47	31.1	104	68.9	
Smoking					0.5[a]					0.5[a]
No	119	48.2	128	51.8		115	44.1	146	55.9	
Yes	29	53.7	25	46.3		22	39.3	34	60.7	
Behavioral beliefs	3.6[b]	0.7[c]	4.4[b]	0.6[c]	< 0.001[d]	3.6[b]	0.8[c]	4.3[b]	0.6[c]	< 0.001[d]
Normative beliefs	3.5[b]	0.7[c]	4.2[b]	0.6[c]	< 0.001[d]	3.5[b]	0.8[c]	4.2[b]	0.5[c]	< 0.001[d]
Control beliefs	4.1[b]	0.6[c]	4.4[b]	0.6[c]	< 0.001[d]	4.1[b]	0.6[c]	4.4[b]	0.6[c]	< 0.001[d]
Intention score	3.4[b]	0.9[c]	4.3[b]	0.6[c]	< 0.001[d]	3.4[b]	0.9[c]	4.4[b]	0.6[c]	< 0.001[d]
MoVac-flu scale	5.4[b]	1.3[c]	5.4[b]	1.2[c]	0.6[d]	5.4[b]	1.3[c]	5.3[b]	1.3[c]	0.8[d]
MovAd scale	4.7[b]	1.3[c]	4.7[b]	1.2[c]	0.7[d]	4.7[b]	1.2[c]	4.7[b]	1.2[c]	0.9[d]

[a]Chi-square test

[b]Mean

[c]Standard deviation

[d]Independent samples *t* test

[e]Chi-square trend test

This is consistent with findings from the literature although certain studies did not identify a relationship between these variables [33]. With regards to the level of income, our findings suggest that there is no correlation between financial status and vaccination rates. However, a study in an Italian elderly community identified higher immunization rates among less wealthy individuals [30]. Most studies conclude that unhealthy lifestyles like smoking or alcohol consumption have a negative impact on the vaccine uptake [30, 34, 35]. On the contrary, there is one

Table 4 Multivariate logistic regression models with vaccination status as the dependent variable (no vaccination: reference category)

Dependent variable *Independent variable*	Odds ratio	95% confidence interval for odds ratio	*p* value
Vaccination this year[a]			
Frequent visits to doctor vs. non frequent visits	2.99	1.55–5.76	0.001
Normative beliefs	2.18	1.11–4.28	0.024
Intention score	3.57	2.09–6.09	< 0.001
Vaccination every year[b]			
Age	1.09	1.04–1.15	0.001
Frequent visits to doctor vs. non frequent visits	3.02	1.46–6.25	0.003
Intention score	9.46	4.96–18.03	< 0.001

[a]Adjusted $R^2 = 47\%$ for model

[b]Adjusted $R^2 = 57\%$ for model

study suggesting that smoking acts as a promoter to the influenza vaccine uptake [36].

There are certain limitations in the design of this study. Our cross-sectional design carries a certain risk of bias such as the misunderstanding of questions on behalf of the participant. Additionally, our study was conducted in only a few cities of south and north Greece which may have compromised our results. Moreover, the data included in this study were limited by their reliance on information collected by the responders. Finally, data from non-responders were not collected or validated. Future studies are needed in order to collect further from more parts of Greece and provide more conclusive results for the attitudes and behaviors of the elderly towards the influenza vaccination in Greece.

Conclusion

The benefits of the influenza vaccine are widely evident. However, a considerable proportion of the population appears to hold negative views and refrain from becoming immunized against influenza. This is phenomenon is particularly worrisome for the elderly, considering the high mortality rates and complications occurring in this group. Thorough information support and education are key factors towards achieving higher rates of immunization in the community, as they can help eliminate misconceptions that discourage people from receiving the vaccine. HCPs can play a central role in this endeavor by providing clear and comprehensive information to patients and the general public. This could potentially result in greater vaccination coverage, which can in turn help to achieve the rate that can ultimately lead to overall immunity in the community.

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Compliance with ethical standards

Conflict of interest The authors declare that there are no conflicts of interest.

Ethical approval Ethical approval was granted by the Bioethics Committee for the Faculty of Medicine of the Aristotle University of Thessaloniki (decision number1.56 21/11/18).

Statement of human rights All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (include name of committee + reference number) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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