

2020-21 Influenza vaccination campaign strategy as a model for the third COVID-19 vaccine dose?

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Abstract. *Background and aim:* Seasonal influenza exerts a deep and multi-level impact on population and public health systems. Among at risk groups, healthcare workers (HCWs) represent a crucial one due to the threat of absenteeism and consequent disruption of healthcare services (and economic losses). Also in this group vaccine hesitancy is a well known issue, therefore innovative and 360-degree strategies are urgently needed to overcome the problem. *Methods:* in the 2020-21 influenza vaccination campaign in a research and teaching hospital in Milan, Italy, the working group implemented three different strategies: the offer of vaccination through both an *ad hoc* ambulatory and several itinerant (*on site*) vaccinating teams, a promotional and educational communication campaign, a *gaming* strategy. *Results:* vaccinated employees nearly doubled (2103 vs 1153 in 2019-20 flu vaccination campaign), reaching a comprehensive vaccination coverage rate (VCR) of 43,1%. A highly significant increase in the 40-59 age group was registered. While physicians and nursing staff confirmed to be the most represented categories among vaccinated subjects, administrative and auxiliary staffs performed the greatest increase compared to the previous campaign. The *on site* vaccination was clearly preferred than the *ad hoc* one (1693 HCWs, 80,5% vs 410, 19,5%). Vaccinated for the first time registered a significant increase (40,2% vs 36,2% in 2019-20 campaign). *Conclusions:* such meaningful results confirm the effectiveness of the strategies implemented in the present campaign, suggesting their possible application in the debated COVID19-third-dose vaccination campaign. (www.actabiomedica.it)

Key words: Influenza vaccine, Vaccination Strategy, HCW vaccination

Introduction

Seasonal influenza is an infectious disease that impacts the public health system not only in terms of incidence of infection but also socio-economically (1). This is particularly relevant among high-risk groups, such as the HealthCare Workers (HCWs), in which influenza infection results in increase of absenteeism and, consequently, economic losses (2).

One of the most important issues about influenza vaccination in HCWs is vaccine hesitancy. To tackle

this issue the WHO's Strategic Advisory Group of Experts (SAGE) on Immunization organized a targeted working group (SAGE Working Group on Vaccine Hesitancy) (3). The working group developed a theoretical model based on 3 C parameters: Confidence, Complacency and Convenience (4). The "3 C" model was subsequently extended by Betsch *et al* including Calculation as a fourth C (5). Vaccine hesitant due to lack of Confidence don't trust vaccination in terms of safety and/or effectiveness of the vaccine, as their knowledge is often distorted by misinformation or be-

longing to social contexts with *a priori* strong negative attitude towards vaccination (5,6). Individuals who delay/refuse vaccination because of Complacency erroneously perceive the risks related to vaccine-preventable diseases as low, thereby do not consider vaccination as a choice they will benefit from (5,6). For vaccine hesitants due to Convenience issues, vaccination is not appealing from several viewpoints, but in particular in terms of easy accessibility to the vaccination services (5,6). Lastly, Calculation refers to individuals who engage in an extensive information search about pros and cons of a given vaccination, with the selfish aim to maximize utility for themselves: this could lead to refuse vaccination when risks related to the disease seem to be lower than risks related to vaccination, or when they face too many controversial information (so they are not able to decide) (5).

Many studies have analyzed the efficacy of different strategies, alone or combined, to increase vaccination coverage among the HealthCare Workers. The most effective strategies are pro-vaccination campaigns through mail or intranet, or through posters, and those that involve a challenge between different hospitals or different wards of the same hospital (7-9).

The aim of this paper is to describe the experience of a large research and teaching hospital in Milan, Italy (Fondazione IRCCS Ca' Granda OMP), which adopted a structured influenza vaccination advertising campaign and the effect of this campaign in increasing the vaccination coverage.

Materials and Methods

Several recent studies in scientific literature suggest that an optimal vaccination coverage rate (VCR) among HCWs can be reached through the implementation of multiple combined strategies rather than a single approach (10,11). Thus, we deployed three different levels of interventions: a promoting and educational communication campaign, a *gaming* strategy, and the delivery of flu vaccines through both an *ad hoc* ambulatory and several on site vaccination teams. The latter intervention is mainly an operative approach that was implemented also in the previous influenza vaccination campaign. Instead, the first and the sec-

ond interventions were introduced for the first time in the 2020-21 campaign and are part of communication strategies and solutions. For this reason they were only made possible thanks to a close cooperation between the Communication & Customer Care Unit of Fondazione-OMP and the Hygiene and Preventive Medicine Postgraduate School of University of Milan (12).

The promoting and educational campaign was conducted on the intranet platform of the hospital, an online environment accessible by every HCW through private credentials. Since the beginning of October 2020, the intranet homepage had a direct link to the dedicated page of the influenza vaccination campaign. This page was designed with a graphically attractive layout. In foreground, every HCW could view updated operative information about times and locations of both the *ad hoc* ambulatory and the on site vaccination schedule. The promoting section consisted of six claims, conceptualized following the principles of the *4 C model* of vaccine hesitancy firstly theorized by the WHO Strategic Advisory Group of Experts on Vaccine Hesitancy (13) and subsequently extended by C. Betsch *et al.* (14). Each claim was accompanied by a picture of a member of the vaccinating team, with the aim to make the claim a "peer to peer" advise by a colleague. The first, second and third claims referred to the dimension of *complacency* in the *4 C model*. They highlighted the severity of influenza infection – hence the importance of getting vaccinated – particularly for HCWs and different subjects with whom they come in contact, such as patients – frail subjects by definition – but also colleagues and relatives [fig. 2]. The fourth claim focused on the component of *convenience*, sponsoring the on site vaccine delivery as a mean to simplify HCWs' access to vaccination [fig. 2]. The fifth claim stressed the *calculation* dimension as it encouraged HCWs to get vaccinated to reduce their chances to develop flu-like symptoms, then to be suspected COVID-19 cases with the need of further microbiological investigation and self-isolation [fig. 3]. The last claim invited vaccinated HCWs to share their experience on social networks, to increase awareness on the issue and lead hesitant colleagues to follow their example [fig. 3].

The educational section of the intranet page was

based on a so-called *myth debunking* intervention. According to a questionnaire administered to HCWs on the reasons for vaccination refusal in the previous flu vaccination campaign, the most frequently reported false myths were addressed to be debunked and corrected through scientific and evidence-based arguments. We focused specifically on four false myths: “Young people don’t catch the flu”, “Flu is not a severe disease”, “I am worried about vaccine’s side effects”, “You can get the flu even if you are vaccinated” [fig. 5]. Each myth can be traced back to one of the 4 C of the theoretic model: the first and the second one to the *complacency* dimension, while the third and the fourth one to the *confidence* dimension.

The *gaming* strategy is the second communication-based intervention in the current campaign. Since it was considered an innovative and promising tool, which, however, was not fully studied previously [15,16], energies and efforts were invested in its implementation. This strategy consisted in a competition between the eight departments of the hospital: Woman-Child-Newborn, Neurosciences and Mental Health, Intensive Care and Emergency, General Medicine, Surgery, Clinical Services and Preventive Medicine, Presidency-Management-Administration, Technical and Technology department. Each HCW was assigned to one department and by getting his flu shot he/she contributed in increasing the department’s VCR. The underlying principle is known in communication and social sciences as *win-win* strategy: HCWs involved in the competition, get vaccinated to make their own department win, starting a virtuous cycle that brings to maximize the VCR of the entire hospital, which is a public health objective. The operative tool for this intervention was the hospital intranet. The main claim on the top of the page dedicated to the campaign recited: “Against flu every vaccination is a great victory – make your team win to make Fondazione-OMP a safer place” [fig. 3]. Below this statement, a rank of the eight departments was displayed and daily updated, showing the related VCR in absolute figures and percentage. Moreover, this rank was interactive, so that every HCW could see his department’s placement accompanied by customized messages of either congratulations or encouragement, strengthening a game/competition nudge [fig. 4]. The effectiveness

of the gaming section, both from a communication and graphic viewpoint, was developed entirely by the Communication & Customer Care Unit.

At the same time, an email was sent to all employees with a link to the intranet page with a call to action to the contest.

The vaccination campaign took place from 26 November to 22 December 2020. HCWs who received vaccination had to fill in informed consent and a questionnaire on the following items: gender, age, professional category, area of activity, vaccination at ad hoc ambulatory versus on site, vaccination received for the first time versus already received in the past.

Results

In the 2020-2021 influenza vaccination campaign for HCWs at Fondazione-OMP, 2103 healthcare workers were vaccinated, reaching a comprehensive vaccination coverage of 43.1%. This compared to 1153 vaccinated HCWs (VCR 21.5%, +82,4%) in the 2019-2020 campaign (17) and 759 vaccinated HCWs (VCR 14.5%, +165,2%) in the 2018-2019 campaign.

In Table 1 features of vaccinated HCWs both in the present campaign and in the 2019-2020 campaign are shown as comparison. In the present campaign, of 2103 vaccinated HCWs 1418 (67.5%) were female and 685 (32.5%) were male. The gender distribution observed in the previous campaign was substantially overlapping (64.2% female and 35.8% male). Regarding age, the median of vaccinated HCWs in the present campaign was 43 and interquartile range was 23, while the population of vaccinated HCWs in the 2019-2020 was substantially younger (median of age 36, interquartile range 25). Consistently, the most represented age group in the present campaign was the 18-39 y.o. one (n = 938, 44.6%), immediately followed by the 40-59 y.o. age group (n = 925, 44.0%), while in the previous campaign a much greater difference in prevalence ratio between these two age groups occurred (55.7% vs 32.4%). In other words, this difference has been flattened in the present campaign by a greater increase of vaccinated subjects in the 40-59 y.o. age group. Regarding professional category, the most represented group in this campaign were physicians (n

Table 1. Comparison between vaccinated populations, 2020–2021 and 2019–2020 seasons.

Heading	Variation	2020–2021		2019–2020	
Total population vaccinated	+82.4%	2103	(100%)	1153	(100%)
Gender N (%)					
F	+91.6%	1418	(67.5%)	740	(64.2%)
M	+65.9%	685	(32.5%)	413	(35.8%)
Age					
Median, IQR		43.23		36.25	
18–39	+46.1%	938	(44.6%)	642	(55.7%)
40–59	+147.3%	925	(44.0%)	374	(32.4%)
60–80	+75.2%	240	(11.4%)	137	(11.9%)
Occupation					
Physician	+112.0%	600	(28.5%)	283	(24.5%)
Resident	–8.0%	219	(10.4%)	238	(20.6%)
Student	–4.8%	158	(7.5%)	166	(14.4%)
Nurse	+164.3%	452	(21.5%)	171	(14.8%)
Other	+103.0%	203	(9.7%)	100	(8.7%)
Technician	+61.5%	155	(7.4%)	96	(8.3%)
Administrative	+308.3%	196	(9.3%)	48	(4.2%)
Auxiliary staff	+252.9%	120	(5.7%)	34	(2.9%)
Volunteer	/	/	/	16	(1.4%)
NA	/	/	/	1	(0.1%)
Area of Activity					
Administrative	+918.5%	275	(13.1%)	27	(2.3%)
Newborn Area	+78.4%	173	(8.2%)	97	(8.4%)
Pediatric Area	+109.4%	245	(11.7%)	117	(10.1%)
General Surgery	–15.9%	37	(1.8%)	44	(3.8%)
Specs Surgery	+68.2%	286	(13.6%)	170	(14.7%)
General Medicine	–17.7%	186	(8.8%)	226	(19.6%)
Specs Medicine	+91.4%	716	(34.0%)	374	(32.4%)
Intensive Care Unit	+154.2%	183	(8.7%)	72	(6.2%)
Other	/	/	/	15	(1.3%)
NA	–81.8%	2	(0.1%)	11	(1.0%)

= 600, 28.5%), followed by nursing staff (452, 21.5%). In comparison with the previous campaign, vaccinated physicians showed a more than two-fold increase (600 vs 283, +112.0%), but professional categories which had the greatest increase are administrative staff (196 vs 48, +308.3%) and auxiliary staff (120 vs 34, 252.9%).

Focusing on HCWs' choice to receive vaccination at the *ad hoc* ambulatory or at the on site vaccinating sessions, a noteworthy observation is that, while in the previous campaign 639 HCWs (55.4%) chose the *ad*

hoc ambulatory and 514 (44.6%) the on site vaccination, in the present campaign percentages surprisingly reversed, as only 410 (19.5%) opted for the *ad hoc* ambulatory while 1693 HCWs (80.5%) chose to be vaccinated on site.

Table 2 shows the results of the logistic regression model, with prevalence ratios between on site vs *ad hoc* ambulatory (95% confidence interval) and likelihood ratio test.

Regarding professional category, choosing physi-

cians as reference, residents (PR 1.06; CI 0.99-1.13) and administrative staff (PR 1.03; CI 0.96-1.11) were the professions with greatest propensity to be vaccinated at the on site sessions. Concerning the area of activity, specialist medicine (PR 1.26; CI 1.16-1.37) and newborn area (PR 1.24; CI 1.12-1.37) showed the highest likeliness to be vaccinated on site. No significant differences were observed regarding gender ($p = 0.76641$) and age ($p = 0.08331$).

Investigating whether vaccinated HCWs received vaccination for the first time or already got vaccinated in the past, we registered a significant increase in the percentage of fist-time vaccinated HCWs in the present campaign ($n = 845/2103$, 40.2%) vs in the 2019-2020 campaign ($376/1153$, 32.6%).

Table 2. Prevalent ratio of on-site vs ad hoc ambulatory

Variable	PR (95% C.I)	X ² Test (Likelihood)
Gender		
Female	Reference	0.76641
Male	0.99 (0.95–1.04)	
Age		
18–39	Reference	0.08831
40–59	1.03 (0.99–1.08)	
60–80	1.07 (1.01–1.15)	
Profession		
Physician	Reference	<0.0001
Resident	1.06 (0.99–1.13)	
Student	0.81 (0.72–0.91)	
Nurse	0.94 (0.88–1.00)	
Other	0.99 (0.66–1.17)	
Technician	0.99 (0.91–1.07)	
Administrative	1.03 (0.96–1.11)	
Auxiliary staff	1.01 (0.92–1.10)	
Area of activity		
Administrative Area	Reference	<0.0001
General Medicine	0.97 (0.85–1.10)	
Newborn Area	1.24 (1.12–1.37)	
Pediatric Area	1.17 (1.06–1.29)	
General Surgery	1.01 (0.81–1.27)	
Specs Surgery	1.21 (1.10–1.33)	
Specs Medicine	1.26 (1.16–1.37)	
Intensive Care Unit	0.91 (1.07–1.81)	
NA	1.44 (1.33–1.56)	

Table 3 shows the results of the logistic regression model, namely prevalence ratios between fist-time vaccinated HCWs vs HCWs already vaccinated in the past, with 95% interval confidence and likelihood ratio test.

Focusing on professional category, residents showed the highest likeliness to be vaccinated for the first time (PR 1.12; CI 1.04-1.20) compared to physicians as reference category, while intensive care unit (PR 1.44; CI 1.24-1.69) and newborn area (PR 1.41; CI 1.20-1.65) represented areas of activities with the greatest propensity to receive vaccination for the first time. Interestingly, the model also showed grater likeliness for male HCWs to be vaccinated for the first

Table 3. Prevalence ratio of never vaccinated before versus vaccinated before 2020.

Variable	PR (95% C.I)	X ² Test (Likelihood)
Gender		
Female	Reference	0.00168
Male	1.12 (1.05–1.21)	
Age		
19–39	Reference	0.20001
40–59	0.96 (0.89–1.04)	
60–80	1.07 (0.96–1.19)	
Profession		
Physician	Reference	<0.000001
Resident	1.12 (1.04–1.20)	
Student	0.59 (0.49–0.70)	
Nurse	0.78 (0.72–0.86)	
Other	0.55 (0.46–0.65)	
Technician	0.59 (0.49–0.71)	
Administrative	0.58 (0.49–0.69)	
Auxiliary staff	0.73 (0.61–0.86)	
Area of activity		
Administrative Area	Reference	<0.000001
General Medicine	1.18 (0.99–1.40)	
Newborn Area	1.41 (1.20–1.65)	
Pediatric Area	1.25 (1.07–1.46)	
General Surgery	1.33 (1.02–1.74)	
Specs Surgery	1.35 (1.16–1.56)	
Specs Medicine	1.18 (1.03–1.35)	
Intensive Care Unit	1.44 (1.24–1.69)	
Other	1.03 (0.25–4.12)	

time (PR 1.12; CI 1.05-1.21) compared with female. No significant differences were observed between age groups ($p = 0.20001$).

Figure 1. Vaccination campaign intranet page, promoting section: **(Left figure)** Not being vaccinated is like not wearing a mask: some influenza virus might induce the expression of ACE-receptor used by Sars-CoV2 to infect human cells; vaccination make human infection harder for coronavirus. **(Right figure)** To

HCWs vaccination is not a personal choice but a commitment for patients' health: HCWs play an active role in transmitting influenza to their patients. Avoiding vaccination you are jeopardizing your patient's health. Protect yourself to protect others.

Figure 2. Vaccination campaign intranet page, promoting section: **(Left figure)** I get vaccinated to protect colleagues, patients, and my relatives when I come back home: to every HCW influenza vaccina-



Figure 1.



Figure 2.



Figure 3.

tion is a duty; vaccinate yourself and encourage your colleagues to follow suit.

(Right figure) 5 minutes are enough to protect yourself against influenza (and we come to you): we will pass repeatedly during shift time to allow everyone to get vaccinated.

Figure 3. Vaccination campaign intranet page, promoting section: **(Left figure)** Make diagnosis of your flu-like symptoms faster: if you get infected, in addition to jeopardize your patients and increase working absenteeism you will become a COVID-19 suspected case, needing isolation and nasal swab; if you get vaccinated, you will minimize the risk of developing flu-like symptoms.

(Right figure) Help us to make only the vaccine go viral: get immunized and promote vaccination to

your colleagues sharing on social network a photo with hashtag #Vinciamolainsieme.

False myths to dispel: **(Left figure)** Young people don't get ill? **(Right figure)** Influenza is not a severe disease? **(Left figure)** Should I be frightened by vaccine adverse effects? **(Right figure)** Might I get influenza even though being vaccinated?

Discussion

Despite several logistic difficulties due to vaccine shortage and a different organization of vaccination sites caused by COVID-19 prevention measures, our 2020-2021 vaccination campaign has shown an increase of



Figure 4. Vaccination campaign intranet page, educational section, *mith debunking* intervention



Figure 5. Vaccination campaign intranet page, educational section, *mith debunking* intervention



Figure 6. Vaccination campaign intranet page, main claim: Against flu every vaccination is a great victory: make your team win to make Fondazione-OMP a safer place.

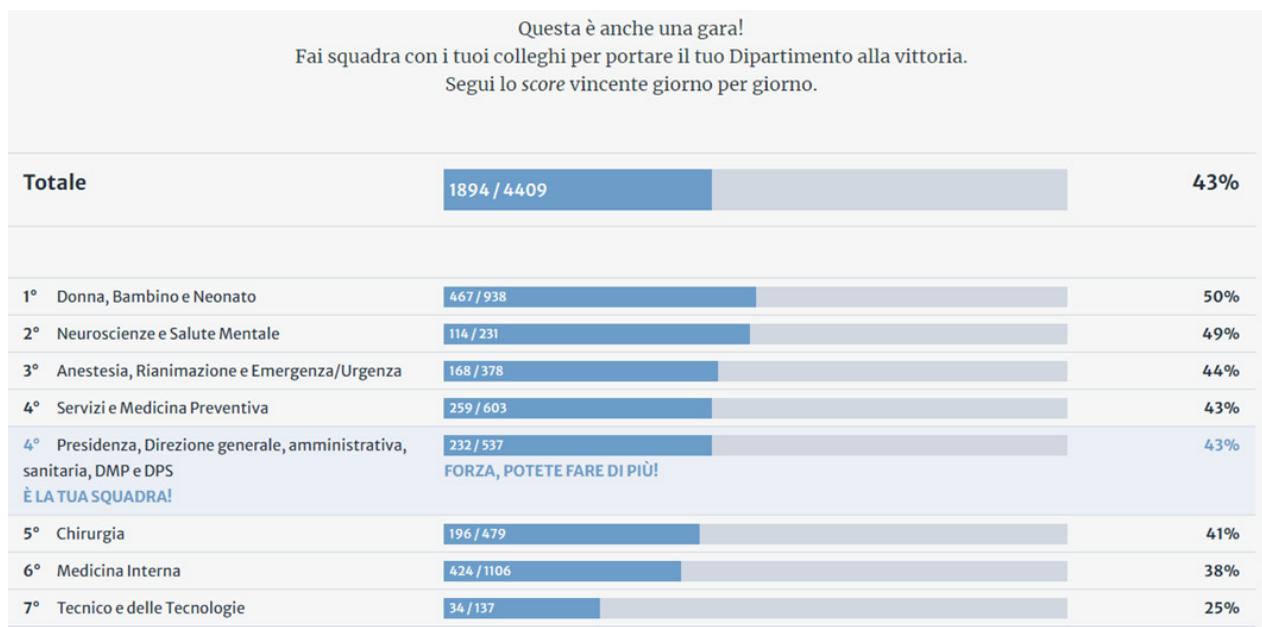


Figure 7. Vaccination campaign intranet page, example of ranking among departments. This is also a competition! Team up with your colleagues and lead your Department to victory. Follow the competition score day-by-day.

vaccination coverage close to 100% (43,1% vs 21,5%) compared to 2019-2020 campaign, with a positive trend observable throughout the last three campaigns. Considering the introduction of on site and *ad hoc* vaccination ambulatory already during previous campaign, the major campaign-specific difference that could explain the high increase observed this year is the advertising campaign structured in the previous months.

Obviously, we are fully aware that the current influenza vaccination campaign was the first in the “COVID-19 era”, therefore it is undisputable that COVID-19 itself might have played as at least a highly significant co-factor in leading such a larger proportion of HCWs to accept influenza vaccination. However, a systematic tool to assess how deeply COVID-19 affected vaccinees’ willingness was lacking in this study and should

hopefully be implemented in the next-year campaign. Despite these considerations, the validity of the current advertising campaign should not be diminished, but rather it is our task to further strengthen it in the future. Analyzing the HCWs vaccinated this year we have observed that close to half wasn't vaccinated before against influenza, with specific categories characterized by high percentages, far exceeding 50%. Considering the three most representative categories of never vaccinated before, meaning students, technician and administrative staff, we could observe as two of them are not associated to direct care of frail or infectious patients; this might represent one more significant element in order to consider the importance of our campaign and experience. The increasing of vaccination coverage in a population without deep personal experience of influenza's typical symptoms and complications could show the importance of a proper information about a complex but fundamental topic.

Despite this it's interesting to note that in a small survey conducted through the HCWs vaccinated, the advertising campaign was chosen as the main reason to get vaccinated only by a small population, close to 4,5%. It's possible to assume that several issues are linked to this response: advertising and promoting campaign was viewable through the hospital intranet, but a large share of HCWs might not be able to access it every day or maybe use the hospital intranet by a business point of view, without taking advantage from this advertising in a training view. During our experience of vaccine providers on the field, our vaccination teams have gathered feedbacks and information suggesting that a high number of HCWs at vaccination sites hadn't viewed the vaccination campaign intranet page but otherwise were informed by colleagues through buzz. Speaking about this, many HCWs have submitted questions already explained in the intranet advising page or simply many of them came with a wrong informed consent, evidence of a no observation or reading of informative intranet page. Another point of view could be the typical unresponsiveness of HCWs towards education programs, perhaps seen as something close to a lesson for an occupational group that, directly involved in taking care of infectious patients, feels no need for specific training about this. Moreover, several studies show that promoting and teaching measures through HCWs have proven

to be barely effective to establish a high increase of vaccine coverage rate, especially when not combined with other different intervention strategies (11, 18-21).

Conclusion

The importance of influenza vaccination is underscored by several documents from the most important international health organizations such as WHO, CDC etc. Influenza vaccination is also shrouded by fake information that could influence negatively the vaccine uptake, even between HCWs. Our 2020-2021 vaccination campaign made efforts to apply several strategies cited in scientific literature. Despite the importance of extensive vaccination campaigns for a potentially pandemic virus and the subsequent high interest of scientific community on every strategy that could increase vaccination coverage rate, no study still focused on the application of these strategies through COVID vaccination. Nonetheless in literature several studies could be found designed to examine the efficacy of different strategies, single or combined, to increase influenza vaccination coverage. During the analysis of the vaccination campaign and its efficacy, our group has speculated the possibility to expand the model in order to persuade reluctant and not compliant individuals and increase their vaccine acceptance, then reaching even less the fundamental herd's immunity. Considering the 2020-2021 campaign as the first of COVID era, an analysis of the reasons of vaccine hesitancy becomes even more important in order to enhance prevention and control of influenza and other preventable diseases, not only in a taking care view but also in a public health and economic view. In conclusion this study represents not only an interesting description of a well-structured and capillary vaccination strategy that, despite severe logistical problems concerning vaccine supply, has reached the ambitious goal of doubling the vaccination coverage of previous year, but also might represent a window on future strategies to control the current COVID pandemic.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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