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## **Impact of a COVID-19 certificate requirement on vaccine uptake pattern and intention for future vaccination. A cross-sectional study among French adults**

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1 **Impact of a COVID-19 certificate requirement on vaccine uptake**  
2 **pattern and intention for future vaccination. A cross-sectional**  
3 **study among French adults**  
4

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38 Data availability statement

39 Data available from the authors upon reasonable request.

40

## 41 **Abstract**

### 42 **Background**

43 In August 2021, France enacted a COVID-19 certificate requirement (vaccination/recovery/test) to  
44 access specific services, with mandates for professional groups. We evaluated the impact of this  
45 incentive-coercive policy in terms of vaccine uptake equality, future vaccine intention and confidence  
46 in authorities' crisis management.

### 47 **Methods**

48 In late August 2021, a representative sample of adults (18-75 years) completed an internet-based  
49 questionnaire. We classified vaccinated participants by stated reasons for vaccination and estimated  
50 adjusted prevalence ratios (aPR) using multivariable Poisson regression. Counterfactual vaccine status  
51 assumed non-vaccination of those vaccinated for the certificate. We analysed the association of free-  
52 text testimonial themes with level of confidence in authorities.

### 53 **Results**

54 Among 972 participants, 85.7% were vaccinated or intended vaccination: 3.6% only for  
55 certificate/mandate, 17.7% mainly for certificate/mandate plus other reasons, and 64.4% mainly for  
56 other reasons. In the counterfactual situation, vaccine uptake would have been significantly more  
57 likely among older vs. younger participants (aPR=1.35) and among those with moderate-high vs. low  
58 levels of confidence in authorities for COVID-19 crisis management (aPR=2.04). In the observed  
59 situation, confidence was the only significant determinant of vaccine status (moderate-high vs. low,  
60 aPR=1.39). Among those without genuine motivation for vaccination, professionally active persons  
61 were more likely to have ceded to the certificate requirement (aPR=3.76). Those vaccinated only for  
62 the certificate were more likely to express future COVID-19 vaccine intention than unvaccinated  
63 persons (aPR=6.41). Themes significantly associated with lower confidence were criticism of morality  
64 (aPR=1.76) and poor communication by the authorities (aPR=1.66).

### 65 **Conclusion**

66 The incentive-coercive policy has reduced the negative association of vaccine status with younger age  
67 and low confidence in authorities, but may have reinforced isolation of professionally inactive  
68 persons. The requirement did not negatively impact future COVID-19 vaccine intention. Future

69 vaccine-incentive policies should pay special attention to populations with low levels of confidence in  
70 authorities.

71

72 Key words: vaccine hesitancy, benefit-risk balance, COVID-19 certificate, level of confidence, health  
73 inequalities

74

75 1. Introduction

76 The rapid roll-out of COVID-19 vaccination in Europe during 2021 has substantially reduced COVID-  
77 19-related morbidity and mortality(1,2). To avoid the outright restriction of citizens' liberty that a  
78 vaccine mandate would represent, several countries adopted policies requiring COVID-19 vaccination  
79 or negative testing for accessing certain public places and services(3,4). These policies in general lead  
80 to increased, albeit not complete vaccine uptake(5–7).

81 Vaccine mandates and requirements are referred to as incentive policies(8,9). These can be placed on a  
82 gradient of incentivisation according to the degree of consequence for non-compliance. This ranges  
83 from punctual non-access to services, to permanent exclusion and isolation , financial fines, and even  
84 punishment(10). Such measures can be perceived as more or less coercive by the individual. Incentive-  
85 coercive policies can have a positive impact on preventative interventions, especially when individual  
86 decisions are difficult to make, e.g., when facing complex and uncertain long-term consequences(11–  
87 14). However, ethical concerns are raised(13,15) about the thin line between encouragement and  
88 coercion (11,16,17). An important criterion for evaluating public health policies is whether they foster  
89 equal uptake of interventions(18). For example, a vaccine requirement for accessing employment acts  
90 only on professionally active persons, thus, strengthening the healthy worker effect(19). Paternalistic  
91 policies may reduce confidence in authorities and disengage the population from future governmental  
92 actions(20–22).

93 Policies for vaccine requirements therefore should be evaluated for effects on inequalities of vaccine  
94 uptake, long-term effects on vaccine intention and trust in the wider system. These elements can  
95 inform decision making in future vaccination campaigns in public-health emergencies.

96 In France, COVID-19 vaccination became accessible to the general adult population starting May  
97 2021. Given stagnating uptake, the French government announced mid-July a COVID-19 certificate -  
98 which included vaccination, recovery or recent negative test - were required to attend specific services  
99 and gatherings (e.g., trains, restaurants, hospitals) and was enacted for adults on August 9(3). In  
100 addition, vaccination became mandatory for healthcare and welfare workers(4). Age-specific one-dose  
101 vaccine coverage increased between July 16 and August 27, 2021 from 54.6% to 84.6% (18-24 years)  
102 59.1% to 82.3% (25-49 years), 74.6% to 88.7% (50-59 years), 81.1% to 89.0% (60-69 years), 91.8%

103 to 96.6% (70-79 years) and from 81.6% to 85.4% (80+ years)(23). In a series of population-based  
104 surveys in France during the implementation of the COVID-19 certificate(24), vaccination steadily  
105 increased among those reluctant to get vaccinated.

106 This context in France provided the opportunity to evaluate, by the end of August 2021, how the  
107 COVID-19 certificate requirement impacted individual vaccine motivations and the equity of vaccine  
108 experience (defined as a combination of vaccine status and stated motivations for vaccination). Our  
109 objectives are thus to assess, first, socio-economic determinants of observed and expected vaccine  
110 status, second, socio-economic determinants of having ceded to vaccination despite no genuine  
111 motivation for it; third, the association of vaccine experience with intention for further COVID-19  
112 vaccination, and fourth, the association of vaccine experience with confidence in authorities for  
113 managing the COVID-19 crisis. As a complement to the latter objective, we used free-text testimonials  
114 left by participants to explore themes that were associated with low confidence in authorities.

## 115 2. Methods

### 116 2.1 Study design and participant inclusion

117 Any 18- to 75-year-old resident of mainland France (excluding Corsica and overseas territories) was  
118 eligible for participation. We recruited participants through a representative online-panel using quotas  
119 according to age, gender, geographical location, and socio-economic groups. Study invitations were  
120 sent until completion of the expected sample size. Invited respondents completed the anonymous  
121 online questionnaire between August 23 and September 1, 2021. The differences in representation of  
122 gender, age group, region of residence and socio-professional category between our sample and quotas  
123 reported by the National Institute of Statistics and Economic Studies 2016 census(25) were at  
124 maximum 0.3%.

125 The planning, conduct and reporting of the study was in line with the Declaration of Helsinki (2013)  
126 and the GDPR regulation. Because the data collection was anonymous (without risk of indirect  
127 identification), observational and collected no sensitive and only self-declared biomedical information,  
128 no informed consent or ethical approval was required according to French regulation. Participants  
129 visiting the study website saw the complete study information and had to consent to accept  
130 participation before starting the questionnaire.

131 2.2 Data collection

132 The questionnaire contained four parts: part 1 collected socio-demographic characteristics and part 2  
133 investigated perceived health status, preventive behaviour and perceptions related to the COVID-19  
134 epidemic. Participants were also invited to leave an anonymous free-text testimonial commenting the  
135 measures taken against the COVID-19 epidemic since March 2020 – which consisted of three periods  
136 of lock-down with and without school closure, without and with curfews. Parts 3-4 explored  
137 teleworking habits and decisions involving financial amounts, which will be reported elsewhere.

138 *Socio-demographic and economic* information comprised gender, age, annual income, region of  
139 residence, locality size, educational level, area of professional training, occupational status (active:  
140 self-employed, employed/student; inactive: retired, unemployed, housekeeper), taking care of children,  
141 multilingualism (speaking another language other than French in the household).

142 *Characteristics related to the COVID-19 pandemic* included COVID-19 diagnosis for oneself or  
143 relatives, and declaration of risk factors for severe COVID-19. A scale-based score was recorded for  
144 the level of confidence in authorities to manage the health and economic crisis caused by COVID-19  
145 (0-3, low confidence; 4-10, moderate-high confidence).

146 *Perception of the individual vaccine benefit-risk balance (BRB)* was assessed as “Do you think that  
147 vaccination against COVID-19 has more benefits than risks for you?” (Yes/No/Do-not-know (DNK)).  
148 Vaccination status was evaluated as “Today, what is your situation regarding vaccination against  
149 COVID-19?” with following modalities: vaccinated with at least one-dose/with appointment for first  
150 injection/history of SARS-CoV-2 infection and have to wait to get the vaccine/ vaccination planned/  
151 unsure if concerned/ do not want to be vaccinated/ do not want to answer.

152 The motivations for observed or intended COVID-19 vaccination were explored through seven  
153 proposed personal reasons that participants placed in decreasing order of relevance: “to protect me”,  
154 “to help control the epidemic”, “to avoid transmitting the virus to my relatives”, “to follow  
155 recommendations”, “to obtain the health certificate”, “because of professional obligation”, “because  
156 the emergence of viral variants makes vaccination necessary”. Reasons for remaining unvaccinated  
157 were also explored through eleven proposed personal reasons. Participants were able to select one out



158 of eleven reasons: “unknown serious side effects”, “not having enough perspective”, “usefulness of  
159 vaccines”, “recommendations are influenced by pharmaceutical companies”, “afraid of injections”,  
160 “state of health does not allow vaccination”, “not a disease serious enough”, “not exposed to the risk  
161 of contamination”, “already immunised”, “feeling of indirect protection by vaccinated people”,  
162 “relatives advise against it”.

163 An additional question explored future intention to get COVID-19 vaccine “Would you accept  
164 COVID-19 vaccination today, if recommended by your referring physician (regardless of whether you  
165 already are vaccinated)?”.

166 Testimonials were evaluated by three researchers who identified recurrent themes (e.g., poor  
167 communication by authorities, decisions focussing too much on biomedical arguments). Then, two  
168 reviewers coded individual observations with regarding the presence or absence of themes in the  
169 testimonial. The database subsequently created was merged into the survey database.

### 170 2.3 Statistical analyses

171 We defined the vaccine experience as a combination of vaccine status (unvaccinated; vaccinated or  
172 with appointment) and motivation for vaccination (COVID-19 certificate or mandate because of  
173 professional obligation (CM) as sole, primary or additional reasons). Participants were classified as  
174 unvaccinated; vaccinated indicating CM as sole reason (CM-only); vaccinated indicating CM as first  
175 reason among others (CM+other); and vaccinated indicating CM not as first reason or not at all (CM-  
176 not-main). We excluded participants who reported to “have been infected with SARS-CoV-2,  
177 therefore not being concerned by vaccination”, according to the vaccine recommendation at the time  
178 of the survey (N=13, 1.3%). Future vaccination intention was classified as Yes vs. No/DNK.

179 We used robust-variance Poisson regression models to estimate the unadjusted and adjusted  
180 prevalence ratios (aPR) for the different outcomes(26). Independent variables that had a p-value<0.20  
181 in bivariable models or essential potential confounders (age, gender) were introduced into a full  
182 multivariable model. The resulting narrative assumes statistical significance at p<0.05. Models were  
183 analysed with and without the perception of the individual BRB, to explore and control for the specific  
184 contribution of vaccine perception. Statistical analyses were performed using RStudio software  
185 version 4.1.1(2021-08-10).

186 Main analyses had four objectives (**supplementary Table1**). First, we explored if the constraint of the  
187 certificate requirement had increased inequalities in vaccine uptake. Equality of vaccine status was  
188 explored, first, by comparing the determinants of observed vs. counterfactual vaccine status using a Z-  
189 test. “Counterfactual vaccine status” assumed that those who indicated CM as main reason for  
190 vaccination would not have been vaccinated in the absence of the COVID-19 certificate or mandate.  
191 The second approach consisted in evaluating the determinants of those who got vaccinated only to  
192 obtain the certificate among all persons without genuine motivation for vaccination (CM-only vs.  
193 unvaccinated). In addition, we evaluated the determinants of indicating the certificate as main  
194 motivation vs. declaring other primary motivations. We also analysed the frequency of reasons  
195 (among three mentioned) for remaining unvaccinated.

196 The third objective was to analyse the association of reported vaccine experience with intention of  
197 future COVID-19 vaccination (intention for future COVID-19 vaccination: yes vs. no/do not know).  
198 We hypothesized that having ceded to the certificate constraint (getting vaccinated only to obtain the  
199 certificate, CM-only) could have reduced the acceptance of future vaccination if recommended by the  
200 referring physician.

201 The fourth objective was to evaluate the association of reported vaccine experience with low  
202 confidence in authorities to manage the health and economic crisis caused by COVID-19 (low  
203 confidence in authorities vs. moderate-high confidence in authorities), hypothesising that having ceded  
204 to the certificate constraint could be associated with lower confidence.

205 In addition, we analysed the association of themes expressed in testimonials with confidence in  
206 authorities and vaccine experience levels. Finally, to explore potential mediation, the perception of the  
207 individual benefit-risk balance (BRB) and the testimonial theme of emotion was included in specific  
208 models.

209           3. Results

210 After excluding 13 participants who reported previous SARS-CoV-2 infection and thus were not  
211 eligible for vaccination, we included 972 participants, 51.5% of which were women (**Table 1**). Age  
212 groups 18-39 years, 40-59 years and 60-75 years contributed 36.7%, 36.9% and 26.4%, respectively,  
213 of participants. One-third (30.6%) were occupationally inactive and 14.3% declared having poor  
214 financial income. Overall, 9.4% participants worked in the health or welfare sector and thus were  
215 subject to the vaccine mandate.

216 COVID-19 vaccination was reported by 778 participants (80.0%), 55 (5.7%) had intention to do so,  
217 (subsequently combined into “vaccinated”), while 11.5% remained unvaccinated and 1.4% declared  
218 not knowing if they were concerned by vaccination. Overall, 714 (73.5%) declared they would accept  
219 COVID-19 vaccination in the future if recommended by their referring physician. Two-thirds (62.4%)  
220 of participants had a favourable perception of their individual BRB with COVID-19 vaccine and one  
221 fourth (231, 23.8%) contributed a free-text testimonial with a maximum of 377 letters.

222 **Table 1.** Description of the study population according to the importance given to COVID-19 certificate or mandate (CM) (Vaccine experience) (N=972).

223 Adults in France, August 2021. Adjusted Prevalence Ratio (aPR), *p*-value obtained with multivariable robust-variance Poisson regression model.

		Unvaccinated			Vaccinated			NA**	
		N (%)	(N=112, <b>11.5%</b> )	CM-only (exclusively for requirement or professional mandate) (N=35, <b>3.6%</b> )	CM+other (first reason among others) (N=172, <b>17.7%</b> )	CM-not-main (not mentioned as first reason) (N=626, <b>64.4%</b> )	(N=27, <b>2.8%</b> )		
			N (%)	N (%)	N (%)	N (%)	N (%)		
Demographic and socio-economic characteristics									
Gender									
	Man	471 (48.5)	49 (10.4)	13 (2.8)	78 (16.6)	320 (67.9)	11 (2.3)		
	Woman	501 (51.5)	63 (12.6)	22 (4.4)	94 (18.8)	306 (61.1)	16 (3.2)		
Age (in years)									
	Between 18 and 39	357 (36.7)	44 (12.3)	14 (3.9)	99 (27.7)	180 (50.4)	20 (5.6)		
	Between 40 and 59	359 (36.9)	42 (11.7)	14 (3.9)	53 (14.8)	245 (68.2)	5 (1.4)		
	Between 60 and 75	256 (26.4)	26 (10.2)	7 (2.7)	20 (7.8)	201 (78.5)	2 (0.8)		
Region of residence									
	Paris Region	184 (18.9)	19 (10.3)	4 (2.2)	36 (19.6)	116 (63.0)	9 (4.9)		
	North East	212 (21.8)	24 (11.3)	6 (2.8)	30 (14.2)	148 (69.8)	4 (1.9)		
	North West	222 (22.8)	23 (10.4)	8 (3.6)	41 (18.5)	143 (64.4)	7 (3.2)		
	South East	245 (25.2)	36 (14.7)	12 (4.9)	46 (18.8)	147 (60.0)	4 (1.6)		
	South West	109 (11.2)	10 (9.2)	5 (4.6)	19 (17.4)	72 (66.1)	3 (2.8)		
Type of locality									
	Big town (more than 100.000 inhabitants)	199 (20.5)	22 (11.1)	6 (3.0)	35 (17.6)	129 (64.8)	7 (3.5)		
	Medium-size town (between 20.000 and 100.000 inhabitants)	254 (26.1)	29 (11.4)	5 (2.0)	50 (19.7)	163 (64.2)	7 (2.8)		
	Small town (between 2.000 and 20.000 inhabitants)	292 (30.0)	34 (11.6)	13 (4.5)	52 (17.8)	188 (64.4)	5 (1.7)		
	Village (less than 2.000 inhabitants)	227 (23.4)	27 (11.9)	11 (4.8)	35 (15.4)	146 (64.3)	8 (3.5)		
Educational level									
	Lower than secondary school diploma	209 (21.5)	23 (11.0)	5 (2.4)	33 (15.8)	141 (67.5)	7 (3.3)		

	Equal to secondary school diploma	240 (24.7)	34 (14.2)	7 (2.9)	41 (17.1)	154 (64.2)	4 (1.7)
	2-5 years beyond secondary school diploma	383 (39.4)	42 (11.0)	19 (5.0)	68 (17.8)	244 (63.7)	10 (2.6)
	5-7 years beyond secondary school diploma	140 (14.4)	13 (9.3)	4 (2.9)	30 (21.4)	87 (62.1)	6 (4.3)
Professional training							
	Outside health care	881 (90.6)	102 (11.6)	29 (3.3)	151 (17.1)	574 (65.2)	25 (2.8)
	Health care	91 (9.4)	10 (11.0)	6 (6.6)	21 (23.1)	52 (57.1)	2 (2.2)
Occupational status							
	Active	675 (69.4)	67 (10.5)	29 (4.3)	136 (20.1)	390 (57.8)	18 (2.7)
	Inactive	297 (30.6)	38 (12.8)	4 (1.3)	29 (9.8)	218 (73.4)	8 (2.7)
Annual income							
	> 26.700 euros	257 (26.4)	24 (9.3)	10 (3.9)	36 (14.0)	184 (71.6)	3 (1.2)
	Between 9.300 and 26.700 euros	461 (47.4)	48 (10.4)	19 (4.1)	86 (18.7)	302 (65.5)	6 (1.3)
	Between 0 and 9.300 euros	139 (14.3)	20 (14.4)	3 (2.2)	30 (21.6)	82 (59.0)	4 (2.9)
	Does not want to answer	115 (11.8)	20 (17.4)	3 (2.6)	20 (17.4)	58 (50.4)	14 (12.2)
Minor or dependent child(ren)							
	No	632 (65.0)	66 (10.4)	23 (3.6)	110 (17.4)	412 (65.2)	21 (3.3)
	Yes	340 (35.0)	46 (13.5)	12 (3.5)	62 (18.2)	214 (62.9)	6 (1.8)
Speaking other language than French							
	No	802 (82.5)	88 (11.0)	32 (4.0)	142 (17.7)	519 (64.7)	21 (2.6)
	Yes	170 (17.5)	24 (14.1)	3 (1.8)	30 (17.6)	107 (62.9)	6 (3.5)
COVID-19-related characteristics							
Previously infected by SARS-CoV-2							
	No	885 (91.0)	103 (11.6)	32 (3.6)	151 (17.1)	575 (65.0)	24 (2.7)
	Yes	87 (9.0)	9 (10.3)	3 (3.4)	21 (24.1)	51 (58.6)	3 (3.4)
Relatives previously ill with COVID-19							
	No	585 (60.2)	79 (13.5)	25 (4.3)	99 (16.9)	366 (62.6)	16 (2.7)
	Yes	387 (39.8)	33 (8.5)	10 (2.6)	73 (18.9)	260 (67.2)	11 (2.8)
Self-reported risk factor for severe COVID-19							
	No	727 (74.8)	88 (12.1)	28 (3.9)	149 (20.5)	439 (60.4)	23 (3.2)
	Yes	245 (25.2)	24 (9.8)	7 (2.9)	23 (9.4)	187 (76.3)	4 (1.6)
Level of confidence in authorities in the management of the COVID-19 crisis							
	Low	231 (23.8)	72 (31.2)	26 (11.3)	40 (17.3)	85 (36.8)	8 (3.5)
	Moderate/High	741 (76.2)	40 (5.4)	9 (1.2)	132 (17.8)	541 (73.0)	19 (2.6)
Perception of Benefit-Risk Balance (BRB)							
	More risks than benefits	193 (19.9)	79 (40.9)	18 (9.3)	45 (23.3)	43 (22.3)	8 (4.1)

	More benefits than risks	607 (62.4)	9 (1.5)	4 (0.7)	75 (12.4)	510 (84.0)	9 (1.5)
	Does not know	172 (17.7)	24 (14.0)	13 (7.6)	52 (30.2)	73 (42.4)	10 (5.8)
Free-text testimonial							
	No	741 (76.2)	77 (10.4)	25 (3.4)	133 (17.9)	485 (65.5)	21 (2.8)
	Yes	231 (23.8)	35 (15.2)	10 (4.3)	39 (16.9)	141 (61.0)	6 (2.6)
Vaccine Status							
	Vaccinated	778 (80.0)	-	30 (3.9)	151 (19.4)	597 (76.7)	-
	Booked an appointment for 1st injection or with Intention to get appointment	55 (5.7)	-	5 (9.1)	21 (38.2)	29 (52.7)	-
	Unvaccinated without intention	112 (11.5)	112 (100.0)	-	-	-	-
	Not sure whether concerned	14 (1.4)	-	-	-	-	14 (100.0)
	Does not want to answer	13 (1.3)	-	-	-	-	13 (100.0)
Future intention to accept COVID-19 vaccine given medical recommendation							
	No	170 (17.5)	104 (61.2)	21 (12.4)	27 (15.9)	11 (6.5)	7 (4.1)
	Yes	714 (73.5)	4 (0.6)	8 (1.1)	112 (15.7)	586 (82.1)	4 (0.6)
	Does not know	88 (9.1)	4 (4.5)	6 (6.8)	33 (37.5)	29 (33.0)	16 (18.2)

224 CM, Requirement of COVID-19 certificate or professional mandate (CM). We classified vaccinated participants by reasons for COVID-19 vaccination:  
225 exclusively for requirement or professional mandate (CM-only); CM as first reason among others (CM+other); CM not mentioned as first reason (CM-not-  
226 main).

227 \*\* “Not sure whether concerned or does not want to answer”. NA, not applicable to vaccine experience (recently infected)

228 *Socio-economic determinants of observed and expected vaccine status,*  
229 In the absence of certificate (“counterfactual” vaccine status), vaccine uptake would have been more  
230 likely among participants aged 60-75 years compared to younger groups (vs. 18-39 years, aPR=1.35,  
231  $p$ -value=0.032), while this effect did not appear in the “observed” vaccine status (aPR=1.03,  $p$ -  
232 value=0.364) (**Table 2**). Furthermore, in the absence of certificate, vaccine uptake would have been  
233 more likely among those with moderate-high compared to low level of confidence in authorities in the  
234 management of the COVID-19 crisis (aPR=2.04,  $p$ -value<0.001). This effect of confidence was  
235 significantly weaker ( $p$ -value<0.001) for the “observed” vaccine status (aPR=1.39,  $p$ -value<0.001).  
236 Excluding confidence from the model did not change the contribution of socio-demographic and  
237 economic variables to the explanation of any vaccine status.

238 *Socio-economic determinants of having ceded to vaccination despite no genuine motivation for it*  
239 Among persons without genuine motivation for vaccination (CM-only and unvaccinated),  
240 professionally active participants were significantly more likely to have ceded to the certificate  
241 requirement in comparison to those professionally inactive (aPR=3.46), without any contribution or  
242 mediation by the individual BRB perception (**Table 3**). Among 112 unvaccinated participants, the  
243 most frequently cited reasons for not getting vaccinated (first three items) were fear of unknown  
244 serious side effects (32.5%), belief that there was not yet enough experience with the new vaccines  
245 (25.2%) and that the usefulness of the vaccines was not yet sufficiently documented (17.0%)  
246 (**supplementary Figure1**).

247 **Table 2.** Determinants of counterfactual and observed COVID-19 vaccination status among adults in  
 248 France (N=945), August 2021. Adjusted Prevalence Ratio (aPR), *p*-value obtained with multivariable  
 249 robust-variance Poisson regression model.

		Counterfactual vaccine status: Vaccinated (N=626) vs. Unvaccinated, CM-only or CM+other* (N=319)		Observed vaccine status: Vaccinated (N=833) vs. Unvaccinated (N=112)	
		aPR	<i>p</i> -value	aPR	<i>p</i> -value
Demographic and socio-economic characteristics					
Gender					
	Man	1.09	0.277	1.02	0.317
	Woman	1		1	
Age (in years)					
	Between 18 and 39	1		1	
	Between 40 and 59	1.28	0.014	1.03	0.358
	Between 60 and 75	1.35	0.032	1.03	0.364
Annual income					
	> 26.700 euros	1.08	0.576	1.05	0.178
	Between 9.300 and 26.700 euros	1.03	0.838	1.04	0.352
	Between 0 and 9.300 euros	1		1	
	Does not want to answer	0.96	0.793	0.95	0.364
Professional training					
	Outside health care	1			
	Health care	0.89	0.449		
Occupational status					
	Active	1			
	Inactive	1.07	0.557		
Minor or dependent child(ren)					
	No			1	
	Yes			0.96	0.107
COVID-19 related characteristics					
Relatives previously ill with COVID-19					
	No	1		1	
	Yes	1.02	0.806	1.04	0.098
Self-reported risk factor for severe COVID-19					
	No	1			
	Yes	1.17	0.088		
Level of confidence in authorities in the management of the COVID-19 crisis					
	Low	1		1	
	Moderate/High	2.04	<0.001	1.39	<0.001

250 CM, Requirement of COVID-19 certificate or professional mandate (CM). We classified vaccinated  
 251 participants by reasons for COVID-19 vaccination: exclusively for requirement or professional



252 mandate (CM-only); requirement of certificate or professional mandate as first reason among others  
253 (CM+other).

254 **Table 3.** Determinants of vaccine experience (vaccine uptake and motivation) among participants without genuine motivation for vaccination (N=147) and  
 255 among vaccinated participants (N=833). Adults in France, August 2021. Adjusted Prevalence Ratio (aPR), *p*-value obtained with multivariable robust-  
 256 variance Poisson regression model.

		Among persons without genuine motivation for vaccination; CM-only (N=35) vs. Unvaccinated (N=112)			
		aPR	<i>p</i> -value	aPR with BRB	<i>p</i> -value
Demographic and socio-economic characteristics					
Gender					
	Man	1		1	
	Woman	1.22	0.528	1.23	0.515
Age (in years)					
	Between 18 and 39	0.58	0.188	0.72	0.458
	Between 40 and 59	0.56	0.181	0.67	0.382
	Between 60 and 75	1		1	
Region of residence					
	Paris Region				
	North East				
	North West				
	South East				
	South West				
Educational level					
	Lower than secondary school diploma				
	Equal to secondary school diploma				
	2-5 years beyond secondary school diploma				
	5-7 years beyond secondary school diploma				
Professional training					
	Outside health care	1		1	
	Health care	1.38	0.382	1.45	0.345

Occupational status					
	Active	3.76	0.013	3.46	0.020
	Inactive	1		1	
Annual income					
	> 26.700 euros	1		1	
	Between 9.300 and 26.700 euros	0.84	0.648	0.78	0.504
	Between 0 and 9.300 euros	0.60	0.376	0.58	0.321
	Does not want to answer	0.44	0.136	0.41	0.113
Speaking other language than French					
	No	1		1	
	Yes	0.45	0.157	0.46	0.167
COVID-19 related characteristics					
Previously infected by SARS-CoV-2					
	No				
	Yes				
Self-reported risk factor for severe COVID-19					
	No				
	Yes				
Level of confidence in authorities in the management of the COVID-19 crisis					
	Low				
	Moderate/High				
Perception of Benefit-Risk Balance (BRB)					
	More risks than benefits			0.70	0.449
	More benefits than risks			1	
	Does not know			1.42	0.487

257 CM, Requirement of COVID-19 certificate or professional mandate (CM). We classified vaccinated participants by reasons for COVID-19 vaccination:  
258 exclusively for requirement or professional mandate (CM-only).

259

260 *Association of vaccine experience with intention for further COVID-19 vaccination*

261 Vaccinated persons in all vaccine experience groups, including those vaccinated only due to the  
262 requirement, were more likely to express intention of future COVID-19 vaccination than unvaccinated  
263 persons: CM-only (aPR=6.00), CM+others (aPR=13.71) and CM-not-main groups (aPR=16.50)  
264 (**Table 4**). Negative individual BRB perception significantly decreased intention for future COVID-19  
265 vaccination (negative vs. positive, aPR=0.55), but did not substantially mediate the effect of vaccine  
266 experience on this intention.

267 *Association of vaccine experience with confidence in authorities for managing the COVID-19 crisis*

268 Levels of confidence were comparable between unvaccinated persons and those vaccinated only due to  
269 constraint (CM-only vs. unvaccinated, aPR=1.18, non-significant) (**Table 4**). Negative individual  
270 BRB perception was significantly associated with low confidence (aPR=2.02) but did not substantially  
271 mediate the association between vaccine experience and low confidence.

272 Testimonials were represented through eleven themes: emotional expression, criticism about  
273 amorality, infantilisation, contradiction in decisions or poor communication; positive or negative  
274 comments on epidemic response strategy, scientific reasoning, biomedical vs. societal trade-offs, rigor  
275 vs. authoritarianism, organisation of pandemic management and hidden vaccine requirement.

276 Testimonials were left by 31.3% of unvaccinated and 22.8% of vaccinated participants. Participants  
277 with low level of confidence in the authorities (231, 23.8%) were significantly more likely to leave a  
278 testimonial (PR 2.09) compared to those with moderate-high level of confidence (**Table 5**). Themes  
279 significantly associated with lower confidence were criticism of morality (PR=1.76; an association  
280 that was fully mediated by expression of emotion) and poor communication (PR=1.66; an association  
281 that was fully mediated by expression of emotion). Because of negativity bias(27), expression of  
282 emotion was analysed as negative vs. no emotion reported. No association between vaccine experience  
283 and testimonial themes were found (**Table 5**).

284 **Table 4.** Association of vaccine experience with intention for future vaccine, and with and level of confidence in the authorities' management of the COVID-  
 285 19 crisis among adults in France (N=972), August 2021. Adjusted Prevalence Ratio (aPR), *p*-value obtained with multivariable robust-variance Poisson  
 286 regression model.

		Intention (N=714) vs. No intention /do not know (N=258)				Low (N=231) vs. Moderate-high level of confidence (N=741)			
		aPR	<i>p</i> -value	aPR with BRB	<i>p</i> -value	aPR	<i>p</i> -value	aPR with BRB	<i>p</i> -value
Demographic and socio-economic characteristics									
Gender									
	Man	1.05	0.054	1.03	0.209	1.22	0.058	1.26	0.028
	Woman	1		1		1		1	
Age (in years)									
	Between 18 and 39	1		1		0.85	0.371	0.85	0.350
	Between 40 and 59	1.02	0.505	0.99	0.781	1.09	0.617	1.10	0.565
	Between 60 and 75	1.04	0.487	1.00	0.965	1		1	
Type of locality									
	Big town (more than 100.000 inhabitants)					1		1	
	Medium-size town (between 20.000 and 100.000 inhabitants)					0.99	0.937	0.99	0.972
	Small town (between 2.000 and 20.000 inhabitants)					1.06	0.719	1.07	0.647
	Village (less than 2.000 inhabitants)					1.23	0.206	1.22	0.214
Educational level									
	Lower than secondary school diploma					1		1	
	Equal to secondary school diploma					0.71	0.037	0.72	0.053
	2-5 years beyond secondary school diploma					0.98	0.874	1.00	0.988

Professional training	5-7 years beyond secondary school diploma					0.88	0.513	0.90	0.571
Occupational status	Outside health care					1		1	
	Health care					0.70	0.107	0.69	0.079
Annual income	Active	1		1		1		1	
	Inactive	1.01	0.752	1.00	0.907	1.12	0.475	1.13	0.440
Speaking other language than French	> 26.700 euros	1		1					
	Between 9.300 and 26.700 euros	0.99	0.714	0.98	0.502				
	Between 0 and 9.300 euros	0.91	0.066	0.93	0.170				
	Does not want to answer	0.92	0.114	0.92	0.084				
COVID-19 related characteristics	No	1		1					
	Yes	0.96	0.318	0.98	0.673				
Relatives previously ill with COVID-19	No	1		1		1		1	
	Yes	0.99	0.725	1.00	0.886	0.87	0.226	0.87	0.199
Self-reported risk factor for severe COVID-19	No	1		1		1		1	
	Yes	1.04	0.174	1.02	0.532	1.44	0.003	1.45	0.002
Level of confidence in the authorities' management of the COVID-19 crisis	Low	1		1					
	Moderate/High	1.17	0.002	1.08	0.093				
Vaccine experience	Unvaccinated	1		1		5.02	<0.001	3.08	<0.001
	CM-only	6.41	0.001	6.00	0.002	5.94	<0.001	3.81	<0.001
	CM+others	17.20	<0.001	13.71	<0.001	2.04	<0.001	1.63	0.021
	CM-not-main	23.72	<0.001	16.50	<0.001	1		1	
	NA	4.10	0.037	3.38	0.068	2.53	0.014	2.01	0.072
Perception of Benefit-Risk Balance (BRB)									
	More risks than benefits			0.55	<0.001			2.02	<0.001

More benefits than risks	1		1	
Does not know	0.71	<0.001	1.58	0.010

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287

288 CM, Requirement of COVID-19 certificate or professional mandate (CM). We classified vaccinated participants by reasons for COVID-19 vaccination:

289 exclusively for requirement or professional mandate (CM-only); CM as first reason among others (CM+other); CM not mentioned as first reason (CM-not-

290 main).NA, not applicable to vaccine experience (recently infected).

291

292 **Table 5.** Association of testimonial themes with the level of confidence in authorities in the management of the COVID-19 pandemic (N=231)  
 293 and with vaccine experience among participants without genuine motivation for vaccination (N=45). Crude Prevalence Ratio (PR) and Adjusted  
 294 Prevalence Ratio (aPR) with having reported a negative emotional expression, *p*-value obtained with bivariable robust-variance Poisson  
 295 regression model.

		Low (N=231) vs. Moderate-high level of confidence (N=741)				Among participants without genuine motivation for vaccination; CM-only (N=35) vs. Unvaccinated (N=112)		
		N (%)	Low level of confidence N (%)	Crude PR	<i>p</i> -value	CM-only N (%)	Crude PR	<i>p</i> -value
Having reported a free-text testimonial								
	No	741 (76.2)	140 (60.6)	1		25 (71.4)	1	
	Yes	231 (23.8)	91 (39.4)	2.09	< 0.001	10 (28.6)	0.91	0.793
Low (N=91) vs. Moderate-high level of confidence (N=140)								
		N (%)	Low level of confidence N (%)	Crude PR	<i>p</i> -value	aPR with Negative emotional expression	<i>p</i> -value	
Criticism about amorality								
	Not mentioned	192 (83.1)	67 (73.6)	1		1		
	Mentioned “ <i>a series of lies</i> ”	39 (16.9)	24 (26.4)	1.76	0.017	1.24	0.403	
Emotional expression*								



	Not reported	157 (68.0)	44 (48.4)	1	
	Negative <i>"I'm furious because of liberticide measures"</i>	68 (29.4)	46 (50.6)	2.41	<0.001
	Mixed <i>"Exhausting but necessary"</i>	2 (0.9)	1 (1.1)		
	Positive <i>"They are proportionate to this very serious situation"</i>	4 (1.7)	0 (0.0)		
Authoritarianism perception					
	Not mentioned	204 (88.3)	80 (87.9)	1	
	Not enough authoritarianism <i>"Not strict enough to enforce the laws"</i>	15 (6.5)	3 (3.3)	0.51	0.252
	Too much authoritarianism <i>"Dictatorship, rule by terror"</i>	12 (5.2)	8 (8.8)	1.70	0.152
Obligation					
	Not mentioned	210 (90.9)	85 (93.4)	1	
	Not restrictive enough <i>"I don't understand why vaccination it is not mandatory"</i>	10 (4.3)	2 (2.2)	0.45	0.263
	Too restrictive <i>"Make vaccination compulsory with a pass it's inhuman"</i>	11 (4.8)	4 (4.4)	0.99	0.982
Organisation of pandemic management					
	Not mentioned	84 (36.4)	22 (24.2)		
	Negative perception <i>"Everything is done too slowly"</i>	131 (56.7)	69 (75.8)		
	Positive perception <i>"Government did what should be done"</i>	16 (6.9)	0 (0.0)		
Epidemic response strategy					
	Not mentioned	167 (72.3)	74 (81.3)		
	Negative comment <i>"Not useful to close so-called non-essential businesses"</i>	56 (24.3)	17 (18.7)		
	Positive comment <i>"Tenacity about vaccination has paid off"</i>	8 (3.5)	0 (0.0)		
Scientific reasoning					
	Absent	224 (97.0)	89 (97.8)	1	
	Present <i>"The so-called scientific opinions are far from being consistent and sow doubt"</i>	7 (3.0)	2 (2.2)	0.72	0.645
Biomedical vs. societal trade-off					
	Absent	226 (97.8)	88 (96.7)	1	
	Present <i>"The economic and the health crisis are not easy to manage"</i>	5 (2.2)	3 (3.3)	1.54	0.461
Contradiction in decisions					
	Not mentioned	185 (80.1)	73 (80.2)	1	

	Mentioned	<i>"It's a nonsense, one day no mask the next day it's mandatory"</i>	46 (19.9)	18 (19.8)	0.99	0.975		
Poor communication	Not mentioned		172 (74.5)	58 (63.7)	1		1	
	Mentioned	<i>"Confusion and lack of transparency..."</i>	59 (25.5)	33 (36.3)	1.66	0.020	1.41	0.125
Hidden vaccine requirement	Not mentioned		219 (94.8)	89 (97.8)				
	Negative	<i>"I don't like the hidden obligation at all"</i>	5 (2.2)	2 (2.2)				
	Positive	<i>"Vaccination is finally accelerating"</i>	7 (3.0)	0 (0.0)				
Infantilisation	Not mentioned		227 (98.3)	87 (95.6)	1			
	Mentioned	<i>"They imagine that the population is incapable of acting correctly on its own"</i>	4 (1.7)	4 (4.4)	2.61	0.061		

^ COVID-19 Certificate for requirement or professional mandate (CM). We classified vaccinated participants by reasons for COVID-19 vaccination: exclusively for requirement and professional mandate (CM-only); CM as first reason among others (CM+other); and no CM as first reason (CM-not-main)

\*Positive and mixed emotional expressions not included in analysis (N=225)

PR is only calculated if  $\geq 2$  observations per group.

297 4. Discussion

298 In this cross-sectional study including a representative sample of adults living in France in August  
299 2021, we estimated that the COVID-19 certificate requirement increased vaccine uptake among  
300 younger persons and persons with low levels of confidence in authorities, without creating substantial  
301 social inequalities. Compared to unvaccinated persons, declaring vaccination only to obtain the  
302 certificate was associated with active occupational status, but also with higher intention for future  
303 vaccination. Confidence in authorities for managing the health and economic crisis caused by COVID-  
304 19 was strongly associated with vaccine uptake. However, adjusted confidence levels were similar  
305 between unvaccinated persons and those reporting vaccination only to obtain the certificate, although  
306 this finding is limited by small sample size.

307 Beyond individual protection against COVID-19, increasing COVID-19 vaccine uptake among the  
308 younger population can be considered a public health achievement under the assumption that this  
309 reduced the viral transmission and thus slowed the epidemic progress in 2021. On the other hand,  
310 substantial evidence now suggests that the indirect protection effect from COVID-19 vaccination is  
311 short-lived and the impact beyond three months primarily consists of protection against severe  
312 disease(28,29). In contrast, in France, the age group >80 years has remained the group with the lowest  
313 vaccine coverage (89.20% as of April 1,2022)(23). A stronger incentive for vaccination or even a  
314 mandate in this group may have further reduced COVID-19 mortality. The COVID-19 certificate  
315 requirement was tailored to a young active population and counter-intuitively less targeted to those  
316 with the greatest potential benefit from vaccination. This increases health inequalities between  
317 professionally active and inactive population. This illustrates that incentive-coercive policies should be  
318 adapted to the target population for optimal impact and such elements should be considered in future  
319 vaccine requirements and mandates.

320 Vaccine programs need to monitor for any inadvertent creation of inequalities in uptake and counteract  
321 them. An important inconvenience of soft requirements compared to mandates is that they may  
322 increase social inequalities of vaccine uptake, as specific groups may refrain from services and social  
323 participation rather than accept vaccination. Several studies have reported that isolated or

324 professionally inactive persons remained unvaccinated during the COVID-19 pandemic(30–32), as  
325 they perceived to be at lower risk of infection due to low social interactions(30). In this sense, our  
326 results are reassuring, as they suggest that the COVID-19 certificate requirement for public spaces and  
327 services access did not create substantial social inequalities and reduced inequalities related to  
328 confidence in authorities. However, among persons without genuine motivation for vaccination, the  
329 requirement acted only on professionally active persons but had no impact on unemployed and retired  
330 persons, people living with disability, and homemakers, probably as their need to attend services and  
331 public places was lower. At the population level, this effect may be negligible, but a clear vaccine  
332 mandate may have avoided such a trend and protected persons in marginalised groups from severe  
333 disease related to COVID-19. Such effects must be carefully considered during policy development, to  
334 avoid the creation of inequalities of opportunity.

335 One concern about incentive-coercive policies is that constraining people to vaccination could lead to  
336 a reduced acceptance of following vaccinations(6,33). Thus, a feeling of constraint could emerge from  
337 the belief that negative outcomes occurred because they ceded to vaccination(22). However, in our  
338 study, ceding to the constraint does not appear to have decreased future COVID-19 vaccine intention,  
339 rather, it was associated with higher intention compared to those remaining unvaccinated. We cannot  
340 conclude whether this was a specific positive psychological effect or whether those ceding had weaker  
341 initial opposition. However, the fact that the perception of benefits and risks did not explain the  
342 association suggests that no rationalised consideration was involved in this difference in intention for  
343 future vaccination. Interestingly, as the certificate requirement or professional mandate was the only  
344 vaccination motivation for just 4% of the population, suggesting that the policy in France acted as an  
345 incentive rather than a coercion.

346 A large body of literature has documented the association between the level of confidence in  
347 authorities and vaccine intention, prior(34,35) and during the COVID-19 pandemic(36,37). This is  
348 reflected in our finding that even under the certificate requirement and even in multiply adjusted  
349 analyses, confidence in authorities remained an important determinant of vaccine uptake. The level of  
350 confidence in authorities appeared similar among those ceding to the requirement or remaining

351 unvaccinated, which suggests that the low confidence pre-existed and in fact was not further impacted  
352 by the incentive-coercive policy. In France, several governmental decisions and management practices  
353 during the COVID-19 pandemic were criticized(38), such as the delayed recommendation of facial  
354 masks and the implementation of a strict lockdown during spring 2020. Such decisions in the context  
355 of scientific uncertainty could have impacted the participants' confidence in authorities. This aligns  
356 with testimonials criticising the poor communication regarding the organisation of epidemic measures,  
357 which was associated with low confidence in authorities. Low confidence in authorities was also  
358 associated with criticism about their morality (i.e., lies or corruption). However, both associations  
359 were fully explained by expression of emotion as the latter mediated the relation of these testimonials  
360 with confidence in authorities. These observations suggest that lower confidence – at least in the  
361 context of August 2021 when the pandemic thread started to resolve – depended not only on specific  
362 decisions made by authorities, but also underlying resentment. This joins reports relating COVID-19  
363 vaccine intention and uptake to voting behaviours at the extremes of the political spectrum (22,39).  
364 The conclusions on pre-existing resentments would also be congruent with the finding that the level of  
365 confidence in August 2021 was similar to that observed in November 2020 using a similar survey  
366 methodology(40). Overall, this illustrates that building and maintaining trustful relations between  
367 different population groups and decision makers is an essential component of pandemic preparedness.

## 368 5. Limitations

369 Our study has several limitations. The cross-sectional design of this study did not allow any  
370 conclusion on the direction of association between vaccine experience and confidence in authorities.  
371 The self-administered questionnaire may have led to misunderstanding, while reducing social-  
372 desirability bias. Reporting constraint as the sole motivation for vaccination might have been a way to  
373 express criticism with such decisions, while other persons may have given post-hoc sense to “forced”  
374 vaccination. The generalizability of our results is naturally limited by several factors: our results apply  
375 specifically to the initial vaccination campaign against COVID-19 in France: a passive campaign with  
376 large sub-regional vaccine centres and little vaccine promotion apart from governmental  
377 announcements. Participants were members of an online-panel, therefore -despite quota sampling-

378 people living in poverty, low health literacy and possibly high-risk behaviour were likely  
379 underrepresented. Our study found that age and confidence in authorities were the only determinant of  
380 counterfactual vaccine uptake in the French adult population, while an ecological analysis(39) and a  
381 large-scale survey described economic inequalities in July 2021(36). Despite using a quota for socio-  
382 economic status, our study participant selection required access to an electronic device, possibly  
383 excluding the most deprived population groups with lower vaccine uptake. We also cannot infer our  
384 results to persons aged  $\geq 76$ , who had relatively low coverage in France despite being at highest risk of  
385 severe COVID-19 infections, and French citizens from overseas departments where inequalities tend  
386 to be higher than in mainland France(36,41).

## 387 6. Conclusions

388 In summary, our study provides evidence that the requirement of a COVID-19 certificate in France  
389 during the initial vaccination campaign has neutralized the impact of younger age and reduced the one  
390 of the low confidence in authorities as negative determinants of vaccine uptake. Of concern is the fact  
391 that, specifically among those genuinely refusing vaccination, the requirement could have further  
392 isolated professionally inactive persons. However, the vaccination certificate requirement was not  
393 related to lower intention for future vaccination. Our analysis helps refine our understanding of the  
394 impact that vaccine requirements can have on vaccine programmes and will guide decision-makers in  
395 tailoring vaccine mandates and requirements for vaccine response to future epidemics. Future  
396 incentive-coercive policies on vaccination should specifically address population groups with low  
397 levels of confidence in authorities.

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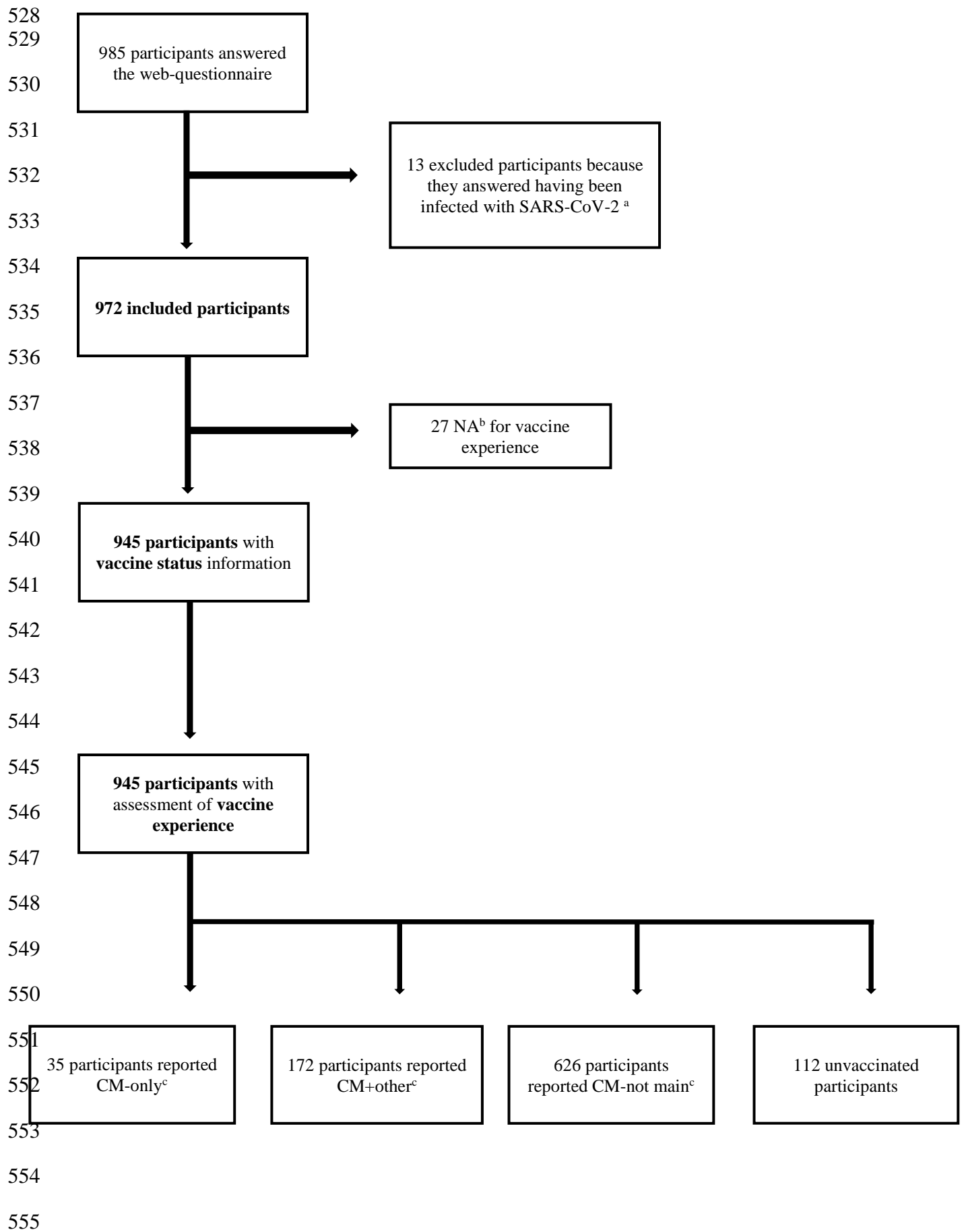
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556 **Figure 1.**

557 Flow chart of inclusion participants. <sup>a</sup> We excluded participants who reported to “have been infected with SARS-  
558 CoV-2, therefore not being concerned by vaccination”, according to the vaccine recommendation at the time of  
559 the survey. <sup>b</sup> NA not applicable to vaccine experience, participant was not sure whether concerned by vaccination  
560 or does not want to answer. <sup>c</sup> CM, Requirement of COVID-19 certificate or professional mandate (CM). We  
561 classified vaccinated participants by reasons for COVID-19 vaccination: exclusively for requirement or  
562 professional mandate (CM-only); CM as first reason among others (CM+other); CM not mentioned as first  
563 reason (CM-not-main).

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