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SHORT REPORT

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Acceptance of childhood and adolescent vaccination against COVID-19 in France: a national cross-sectional study in May 2021

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ABSTRACT

The French health authorities extended vaccination against COVID-19 to adolescents in June 2021, during the epidemic resurgence linked to the delta variant and because of insufficient vaccination coverage to ensure collective protection. In May 2021, we conducted a national online cross-sectional survey of 2533 adults in France to study their attitudes toward COVID-19 vaccines and their acceptance of child/adolescent vaccination according to targeted age groups (<6 years; 6–11; 12–17) and its determinants. We applied a multi-model averaged logistic regression for each of these age groups to study the determinants of favorability to vaccination. Among the respondents, 62.7% (1597) accepted COVID-19 vaccination for adolescents, 48.3% (1223) for children aged 6–11 years, and only 31% (783) for children under 6 years. Acceptance increased with fear of contracting COVID-19 and trust in institutions and decreased as the COVID-19 vaccine risk perception score increased. People favorable to vaccination in general and those sensitive to social pressure were also more often favorable to vaccinating children/adolescents than those who were not. Drivers of acceptance were ranked differently for the different age groups. Understanding these differences is essential to anticipating obstacles to vaccination of these age groups and designing appropriate information and motivational strategies to support it.

Introduction

Given the progress against the COVID-19 pandemic since April 2021, French authorities, like those elsewhere, have progressively lifted restrictive measures.[1] However, the more contagious SARS-CoV-2 delta variant has now settled in France and spread rapidly, leading to a fourth wave. This situation makes it more necessary than ever to achieve high vaccination rates against COVID-19. As of 7 July, 2021, the percentage of the population fully vaccinated against COVID-19 in France was close to 40% while more than 80% would be necessary to provide collective protection against spread of the delta variant.[2,3] More than three month later (13 October, 2021), the percentage of the French population fully vaccinated had reached 67% (64% for the European Union and 35% for the world population).[4] A recently published systematic literature review of studies published until July 2021 indicated that the most frequent barriers to COVID-19 vaccine acceptance were fear of their safety and side effects, fear of their lack of effectiveness, and the very fast pace of their development. COVID-19 vaccine acceptance was mostly associated with trust in health authorities and physicians, peoples' desire to

return to normal life and to protect themselves, their children and others and perceiving themselves to be at high risk of severe COVID-19.[5]

To accelerate the vaccination of the population and in view of the epidemic's acceleration, the French government decided to introduce a health passport as of 21 July.[6] But vaccination of adolescents aged 12–17 years, who are as likely as adults to transmit SARS-CoV-2, particularly older adolescents, could also help achieve the objective of collective protection.[7] Since Cominarty (BNT162b2 mRNA, BioNTech-Pfizer) was approved for children aged 12 to 15 years in Europe and North America in May, 2021, the French government launched vaccination of 12 to 17-year-olds on 15 June.[8–10]

But the question of vaccination of children aged younger than 12 years has also arisen. Several trials are underway for different vaccines, but mass vaccination of children younger than 12 years has not yet been approved in Europe or North America.[11,12] It is also still being debated: while probably useful in reducing variant development and protecting the children at highest risk, its justification among children without comorbidities raises ethical questions because COVID-19 is rarely severe in this age category.[7,13,14]

Knowledge and understanding of how the general population accepts vaccination of children and adolescents against COVID-19 (even if the question is currently hypothetical for children) are essential elements for guiding public authorities in their decisions on vaccination strategy and its implementation. We surveyed a cross-section of the French adult population (aged 18 years and older) to study their attitudes toward COVID-19 vaccines. This article seeks to (i) describe their acceptance of this vaccine for children and adolescents; and (ii) explore its determinants according to the age range considered.

Methods

The survey took place from 10 to 23 May, 2021. Among an online national panel of 750,000 members of the general population, developed and maintained by Bilendi (a company specialized in data collection, established in 12 European countries, bilendi.fr), 55,900 participants were randomly selected. They were invited to complete an online questionnaire accessible through a secure link. As we used the quota method to match French official census statistics, these people were solicited in successive batches according to the completion rate of strata defined according to gender, age, occupational category, region and size of the municipality of residence.[15] Participation in the survey was voluntary; people received incentives in the form of points toward a 20-euro voucher. We then weighted the data to obtain a sample representative for these variables. The ethics committee of the University Hospital Institute Méditerranée Infection approved the study (#2021–001).

The questionnaire, which included 99 items on various aspect of COVID-19 vaccination, asked participants how they felt about vaccinating adolescents (12 to 17-year-olds) on a 5-point Likert-like scale (strongly favorable to not at all favorable, no opinion). The question was also asked separately for schoolchildren aged 6–11 and preschoolers (younger than 6 years). We recoded the answers into two categories (favorable/unfavorable-no opinion). In addition to socio-economic variables (gender, age, educational level and has children under 18 (yes/no)), we collected the following information: intention or history of COVID-19 vaccination; worry about contracting (or recontracting) COVID-19 (scale from 0, not at all worried, to 10, very worried); favorability toward vaccination in general (5-point Likert-like scale); and perception of the safety of each of the BNT/Pfizer, Moderna, AstraZeneca and Janssen vaccines (5-point Likert-like scale from very safe to not at all safe, 4 items). Responses to these four items were summed to construct a vaccine risk perception score (Cronbach's alpha = 0.89), which was then recoded into terciles (given its distribution). We also asked about trust in the Ministry of Health, government, and state health agencies to inform the population about COVID-19 vaccines and in the government to fight the epidemic effectively (5-point Likert-like scales from none to strong trust). We constructed a trust score and then recoded it into quartiles given its distribution (Cronbach's alpha = 0.91). Finally, we wanted to capture the influence of social pressure on vaccination behaviours/attitudes. While there are items centered on sensitivity to social pressure in general, there are very specific social norms surrounding vaccination in general and each vaccine in particular.[16,17] In the absence of a standard validated item to capture this dimension in reference to Covid-19 vaccination, we designed the following item: "If someone close to you asked you to be vaccinated to protect her/him, would you do so? (Yes/No/No opinion)".

To correct for non-response we weighted the sample for age, gender, occupational category, and area of residence. We performed descriptive analyses of the sample's characteristics and bivariate analyses to study the associations between these and favorability to vaccination (versus lack of favorability or no opinion), separately for the three age groups considered (<6 years, 6–11 years and 12–17 years, Table 1). Associations were tested by Chi2 tests. We then applied a multi-model averaged logistic regression for each of the three age categories to study the characteristics (explanatory variables) associated with favorability to vaccination (one dependent variable for each of the age categories). Multi-model averaging computes a weighted average of the estimates of all models possible from the explanatory variables introduced, to consider the uncertainty linked with selecting a final model and to rank the relative importance of the explanatory variables.[18] We computed partial Nagelkerke's pseudo-R^2 to measure the contribution of each explanatory variable to the dependent variable.[19] Table 2 presents all the explanatory variables entered in the three models. We tested for multicollinearity with the variance inflation factor (VIF), and interpreted VIF values <5 as presenting no multicollinearity issue. All analyses used two-sided p-values, defined statistical significance as $p < 0 \cdot 05$, and were performed with Stata 14, R 4.0.1, and SAS 9.4.

Results

Of the 55,900 panel members contacted, 2,533 (4.53%) participated. Among them, 52% were women; 39% were 18–44 years old (yo), 32% 45–64 yo, and 29% were aged 65 years or more. Among the participants, 77% were favorable to vaccination in general, 62.7% were favorable to COVID-19 vaccination for adolescents (strongly favorable: 34.2%; somewhat favorable: 28.5%), 48.3% for school children (strongly: 20.6%; somewhat: 27.7%) and 30.9% for preschoolers (strongly: 13.7%; somewhat: 17.2%). Older respondents were more likely to support vaccination for each target category, and women and parents of children less so (Table 1). Acceptance was higher among participants planning to be or already vaccinated against COVID-19 than among the others; it increased with fear of contracting COVID-19 and trust in institutions and decreased as the COVID-19 vaccine risk perception score increased. People favorable to vaccination in general and those sensitive to social pressure were also more often favorable to vaccinating youth than those who were not.

Multi-model averaged logistic regressions run for each target age category confirmed most of the associations above (Table 2), although age was no longer significant for the children, nor gender for the schoolchildren. The ranking of the factors associated with acceptance of child/adolescent vaccination varied by target category however (Table 3). For adolescent vaccination, the top three factors in descending order of importance were trust in institutions, sensitivity to social

Table 1. Characteristics, attitudes and perceptions of participants according to their acceptance of COVID-19 vaccination of children and adolescents.

| | Total Nb: 2.533 (100%) | | Favorable to vaccination against COVID-19 of | | | | | | | | |
| | | | Children < 6 y[a] | | | Children 6–11 y[b] | | | Adolescents 12–17 y[c] | | |
Explanatory variables	Nb[d]	%	Yes %	No %	P[e]	Yes %	No %	P	Yes %	No %	p
Age (years)											
18–44	982	38.78	26.29	73.71	0.04	38.84	61.16	<0.01	52.29	47.71	<0.01
45–64	815	32.19	34.59	65.41		49.15	50.85		60.15	39.85	
65 +	735	29.03	33.02	66.98		60.02	39.98		79.36	20.64	
Gender											
Men	1206	47.61	37.03	62.97	<0.01	54.15	45.85	<0.01	69.82	30.18	<0.01
Women	1327	52.39	25.36	74.64		43.00	57.00		56.19	43.81	
Parent of children or adolescents <18 years											
No	1739	68.65	33.54	66.46	0.01	52.53	47.47	<0.01	65.84	34.16	0.04
Yes	794	31.35	25.17	74.83		39.07	60.93		55.76	44.24	
Education level											
< Bac (High school leaving exam)	684	27.00	31.89	68.11	0.70	47.06	52.94	0.13	58.44	41.56	0.08
Bac to Bac+2 y	1004	39.64	29.36	70.64		45.37	54.63		61.60	38.40	
Bac+3 or more	845	33.36	31.97	68.03		52.81	47.19		67.39	32.61	
Fear of contracting COVID-19											
Very low (Q1)[f]	744	29.37	22.66	77.34	<0.01	41.01	58.99	<0.01	52.57	47.43	<0.01
Low (Q2)[f]	648	25.58	31.36	68.64		46.74	53.26		57.91	42.09	
Moderate (Q3)[f]	648	25.58	33.03	66.97		50.43	49.57		71.27	28.73	
High (Q4)[f]	492	19.42	40.02	59.98		58.61	41.39		72.93	27.07	
COVID-19 vaccines risk perception score											
Low (T1)[g]	1006	39.72	45.79	54.21	<0.01	71.79	28.21	<0.01	87.95	12.05	<0.01
Moderate (T2)[g]	757	29.89	24.36	75.64		37.26	62.74		51.23	48.77	
High (T3)[g]	770	30.40	17.91	82.09		28.47	71.53		40.91	59.09	
Intention to get vaccinated											
Already vaccinated	979	38.65	42.06	57.94	<0.01	68.79	31.21	<0.01	88.01	11.99	<0.01
Yes	947	37.39	32.57	67.43		50.28	49.72		68.52	31.48	
No	607	23.96	10.34	89.66		12.15	87.85		12.66	87.34	
Trust in institutions											
Very low (Q1)	525	20.73	18.09	81.91	<0.01	27.21	72.79	<0.01	29.23	70.77	<0.01
Low (Q2)	657	25.94	21.01	78.99		37.74	62.26		50.82	49.18	
Moderate (Q3)	406	16.03	31.67	68.33		53.87	46.13		76.56	23.44	
High (Q4)	945	37.31	44.59	55.41		64.98	35.02		83.53	16.47	
Sensitivity to social pressure/norm											
Yes	1138	44.93	40.81	59.19	<0.01	67.76	32.24	<0.01	87.10	12.90	<0.01
No	507	20.02	17.89	82.11		22.27	77.73		30.90	69.10	
Don't know/it depends	887	35.02	25.66	74.34		38.23	61.77		49.52	50.48	
Favorable to vaccination in general											
Yes	1948	76.9	37.14	62.86	<0.01	57.60	42.40	<0.01	74.18	25.82	<0.01
No or don't know	585	23.1	10.18	89.82		17.35	82.65		24.39	7.,61	

[a]Yes: 30.9%; No (or don't know): 69.1%. [b] Yes: 48.3%; No (or don't know): 51.7%. [c] Yes: 62.7%; No (or don't know): 37.3%. [d] Nb = number. [e] P: *p*-value. [f] Q1 = first quartile; Q2 = second quartile; Q3 = third quartile; Q4 = fourth quartile. [g] T1 = first tercile; T2 = Second tercile; T3 = third tercile.

pressure and general favorability to vaccination. For vaccination of schoolchildren, the corresponding factors were low perception of the risks of COVID-19 vaccines, general favorability to vaccination and sensitivity to social pressure, and for preschoolers, general favorability to vaccination, fear of contracting COVID-19 and trust in institutions.

Discussion

Few studies have addressed the general population's acceptance of child/adolescent vaccination against COVID-19 since the vaccines became available. An online study of parents/caregivers of children and adolescents (<18 years) in Bologna (Italy) took place in December 2020 and January 2021: 60% of the parents/caregivers were inclined to vaccinate, 30% were still considering it, and 10% hesitated. The latter were over-represented among mothers/female guardians of children aged 6–10 years, respondents aged younger than 29 years, and those with a low educational level.[20] On 10 May, 2021,

the US Food and Drug Administration (FDA) expanded its Emergency Use Authorization for the Pfizer-BioNTech COVID-19 vaccine to include adolescents aged 12–15 years. An April 2021 online survey of two independent samples of adolescents aged 12–17 years and of parents of adolescents aged 12–17 years in the USA found, among unvaccinated adolescents (those 16–17 years were already eligible for COVID-19 vaccination) that 55% of parents would have their adolescents vaccinated against COVID-19 and 52% of adolescents would accept this vaccination. Better information on the efficacy and safety of COVID-19 vaccines was one of the most important factors reported to be likely to increase acceptance of this vaccination.[21] A questionnaire survey in May–June 2021 among adolescents aged 10–18 years and parents of children and adolescents (aged <18 years) consulting at two pediatric hospitals in Korea found that 64% of parents intended to have their children vaccinated against COVID-19. The authors found no significant difference in parents' willingness to vaccinate their children by the children's age subgroups (<7 years,

Table 2. Drivers of acceptance of COVID-19 vaccination of children and adolescents (Multi-Model averaged logistic regression)[a].

	Favorable to vaccination against COVID-19 of					
	Children < 6 years		Children 6–11 years		Adolescents 12–17 years	
Variables (N = 2533)	aOR[b]	95% CI[b]	aOR	95% CI	aOR	95% CI
Age (year)						
45–64	Ref.[c]	Ref.	Ref.	Ref.	Ref.	Ref.
18–44	0.92	0.67–1.27	0.99	0.92–1.08	1,03	0,66–1,62
65+	0.88	0.6–1.3	1.00	0.94–1.06	**2,51**	**1,75–3,61**
Gender						
Women	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Men	**1.51**	**1.14–2.01**	1.21	0.87–1.68	**1.72**	**1.17–2.51**
Parent of children or adolescents <18 years						
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Yes	**0,69**	**0,47–1**	**0,64**	**0,46–0,9**	1.00	0,91–1,09
Education level						
< Bac (High school leaving exam)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Bac to Bac + 2	1.00	0.93–1.08	1.00	0.96–1.04	1.00	0.92–1.08
Bac + 3 or more	1.00	0.95–1.06	1.00	0.96–1.04	1.00	0.93–1.09
Fear of contracting COVID-19						
Very low	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Low	**1.75**	**1.18–2.58**	1.43	0.97–2.10	1.52	0.95–2.44
Moderate	**1.65**	**1.13–2.41**	1.33	0.90–1.96	**2.15**	**1.32–3.51**
High	**2.48**	**1.64–3.77**	**1.92**	**1.20–3.07**	**2.20**	**1.21–4.00**
COVID-19 vaccine risk perception score						
Low (T1 = 0.33)[d]	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Moderate (T2 = 0.67)[d]	**0.58**	**0.4–0.82**	**0.42**	**0.29–0.59**	**0.35**	**0.22–0.54**
High (T3 = 1)[d]	**0.46**	**0.29–0.7**	**0.36**	**0.24–0.54**	**0.36**	**0.22–0.58**
Trust in institutions						
High(Q1 = 0.25)[e]	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Moderate (Q2 = 0.5)[e]	0.67	0.44–1.01	0.78	0.51–1.2	0.91	0.5–1.69
Low (Q3 = 0.75)[e]	**0.48**	**0.32–0.7**	**0.6**	**0.41–0.9**	**0.37**	**0.23–0.6**
Very low (Q4 = 1.0)[e]	**0.53**	**0.33–0.86**	**0.56**	**0.35–0.88**	**0.2**	**0.12–0.33**
Sensitivity to social pressure/norm						
Yes	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
No	1	0.93–1.07	**0.35**	**0.21–0.56**	**0.25**	**0.15–0.43**
Don't know/It depends	1	0.95–1.05	**0.52**	**0.38–0.72**	**0.31**	**0.2–0.47**
Favorable to vaccination in general						
Yes	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
No/Don't know	**0.31**	**0.19–0.51**	**0.32**	**0.22–0.48**	**0.27**	**0.18–0.39**

[a]We excluded the explanatory variable "already vaccinated or intending to do so" to avoid multicollinearity.
[b]aOR: adjusted Odds Ratios and their 95% confidence interval. Values in bold indicate statistical significance at $p < 0.05$.
[c]Ref.: Reference. [d] T1 = first tercile; T2 = Second tercile; T3 = third tercile. [e] Q1 = first quartile; Q2 = second quartile; Q3 = third quartile; Q4 = fourth quartile.

7–12, 13–18). In child/adolescent participants, 50% responded they would get vaccinated against COVID-19. Again, no significant difference in acceptance rates was found by age subgroups.[22]

COVID-19 vaccination of adolescents in France has started slowly, in contrast to its rather good acceptance by adults and parents. But by 15 October, 2021, more than three in four adolescents had received a first dose, probably thanks to the announcement by the French government during the summer that the health pass was going to become mandatory for this age category by September 30, 2021.[23] Simultaneously, acceptance of this vaccination for those under 12 is much poorer, especially for the youngest children. Recommending vaccination of children under 12 against COVID-19 – assuming that drug agencies authorize it – or even extending the health passport to this age group would therefore be likely to meet great reluctance from parents and might not be an effective strategy.

Factors associated with acceptance of COVID-19 vaccination of children and adolescents were similar to those observed for adult vaccination.[24,25] However, the ranking of the main drivers of its acceptability varied by the target age group considered. Should an extension of vaccination to young children

be decided, this result suggests that information and motivation strategies should be tailored to each specific age group and would be a challenge, given the low trust in the government.

Our results suggest that the population favorable to adolescent vaccination overlaps to some extent with the population generally favorable to the COVID-19 vaccination campaign (people who trust institutions and vaccination in general, only slightly concerned about vaccine risks). Agreeing to get vaccinated at the request of a relative was the factor second most strongly associated with acceptance of adolescent vaccination (Table 3). This can be interpreted as sensitivity to social pressure, as well as willingness to be vaccinated to protect one's relatives, an intermediate motivation between engaging in vaccination for one's own benefit and doing it for others.[17] The impact of this kind of motivation, which could be viewed as "proximity altruism" (agreement to be vaccinated to protect the people around you and not only to protect yourself), might be a lever – at least for parents – to motivate adolescent COVID-19 vaccination in a sociological context where information about its personal benefits – such as accessing various activities highly valued by adolescents – reduces COVID-19 vaccine hesitancy more than information about only its

Table 3. Rank, importance weights, and partial Nagelkerke R2 of the drivers of acceptance of vaccination of children and adolescents (Multi-Model averaged logistic regression).

Regression Variables	For 12–18 years			For 6–12 years			For < 6 years		
	Rank[a]	Importance weight[b]	Partial R² (%)[c]	Rank	Importance weight	Partial R² (%)	Rank	Importance weight	Partial R² (%)
Trust in institutions	**1**	**1.00**	**8.0**	4	0.99	1.0	**3**	**1.00**	**2.0**
Sensitivity to social norm	**2**	**1.00**	**7.0**	**3**	**1.00**	**4.0**	8	0.50	0.0
Favorable to vaccination in general	**3**	**1.00**	**7.0**	**2**	**1.00**	**4.0**	**1**	**1.00**	**4.0**
COVID-19 vaccine risk perception score	4	1.00	4.0	**1**	**1.00**	**5.0**	4	1.00	2.0
Age (18–44, 45–64 and 65 or more)	5	1.00	5.0	8	0.39	0.0	7	0.92	1.0
Fear of contracting COVID-19	6	0.99	2.0	5	0.99	1.0	**2**	**1.00**	**2.0**
Gender	7	0.99	2.0	7	0.93	0.0	5	0.99	1.0
Education level	8	0.36	0.0	9	0.15	0.0	9	0.21	0.0
Parents of children or adolescents <18 years	9	0.27	0.0	6	0.99	1.0	6	0.99	1.0
Total Nagelkerke pseudo-R²	0.35			0.16			0.13		

[a]The ranking of the explanatory variables according to their importance in the model, in terms of strength of association, can be derived from the values of the importance weights: 0.00 to <0.50, no association; 0.50 to <0.75, weak association; 0.75 to <0.95, positive association; 0.95 to <0.99, strong association; 0.99 to ≤1.00, very strong association.
[b]Importance of the explanatory variables in the model.
[c]Part of the dependent variable variance explained by the explanatory variable: the sum of all partial R² gives the Nagelkerke Pseudo-R² (a statistic comparable to R² in linear regressions).

collective benefits.[26] Nonetheless, the weight of our proxy variable capturing sensitivity to social pressure decreased with children's age (Table 3).

In contrast, trust in vaccination in general was the predominant driver of COVID-19 vaccination for the youngest, probably because this group is already targeted for childhood vaccines; childhood vaccination is a social norm.[27] In France, since January 2018, 11 vaccines are required for children for entry in daycare nursery or nursery schools. One year after the entry into force of this obligation, coverage rates had increased for several of these vaccines (e.g., hepatitis B, at least 1 dose: +6 percentage points (pp); Meningococcal C, first dose: + 36 pp; MMR first dose: + 3 pp) in the cohorts of infants eligible for this new measure, without a backlash in terms of loss of parental vaccine confidence.[28] In our study, the impact of trust in vaccination in general was nonetheless low, given the very low acceptance of COVID-19 vaccination for those under 6.

Regardless of age group, the weights of gender, parenthood and education level were low, contrasting with previous results on attitudes toward COVID-19 vaccination and childhood vaccines more generally.[20,25,29] Inclusion in the regression models of other variables, notably confidence in vaccines in general, highly correlated with these sociodemographic factors, might have captured their effects. Further research is needed to better understand the nature of the links between sociodemographic variables and those measuring the population's perceptions, opinions, and confidence in vaccinating children against COVID-19, as well as the psychological and social mechanisms behind these links.[23]

From a public health perspective however, the fact that parents, and particularly mothers, are a group particularly reluctant to vaccinate young children against COVID-19 underscores again the need for tailored informational and, above all, motivational strategies targeting this group. This should be anticipated before the health authorities decide, should the evolution of the COVID-19 epidemic require it and with the objective of maintaining school activities, to vaccinate children under 12 years of age.

Limitations

This sample is representative of the French adult population for age, gender, occupational category and area of residence, but, due to the very low response rate inherent to this type of online survey, representativity might be less good for variables unobserved in this survey. However, it is comforting that the proportion of parents of children under 18 years in the sample was close to that of the general population, despite the absence of weighting on this variable. As with most studies of this type (questionnaire, design) and in the context of the current health crisis, social desirability bias cannot be excluded. In particular, it is possible that the prevalence of opinions against vaccination of children and adolescents has been underestimated in a context where vaccination in general is promoted as a social norm and that against COVID-19 has been the object of media campaigns and statements to justify and defend it by many political and medical figures. However, there have also been voices defending the freedom not to vaccinate and questioning the efficacy and/or safety of COVID vaccines throughout the campaign.[25] The cross-sectional study design prevents us from interpreting the relations found in this study in a causal way.

Conclusion

The general population accepts COVID-19 vaccination for adolescents better than for younger children. Drivers of acceptance differed by the age group considered. Understanding these differences better is a current research priority in the field of vaccine hesitancy to optimize anticipation of this strategy's obstacles, given the prospects of extending this vaccination to children. Adolescent views and representations of COVID-19 vaccination should also be better understood. Qualitative approaches using semi-directed interviews or focus groups are essential in addition to surveys using quantitative questionnaires. This is essential for designing information and motivational strategies to support the vaccination campaigns that have started in secondary schools at the beginning of the next school year in France. Finally, regular

monitoring of changes in the attitudes of parents of children and adolescents and, if possible, of the adolescents themselves is necessary to guide the evolution of the vaccination strategy and intervention research in the area of vaccine hesitancy toward COVID-19, in France and elsewhere.

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