Sharp rise in vaccine hesitancy in a large and representative sample of the French population: reasons for vaccine hesitancy.

Anne-Sophie Hacquin*, Sacha Altay*, Emma de Araujo*, Coralie Chevallier & Hugo Mercier

*These authors contributed equally to this work.

Abstract

A safe and effective COVID-19 vaccine is our only hope to decisively stop the spread of the SARS-CoV-2. But a vaccine will only be fully effective if a significant share of the population agrees to get it. Six consecutive surveys of a large, nationally representative sample (total N = 6032) surveyed attitudes towards a future COVID-19 vaccine in France from May 2020 to November 2020. We found that COVID-19 vaccine refusal has steadily increased, reaching an all-time high with only 23% of participants willing to probably or certainly take a future COVID-19 vaccine in September 2020. Vaccine hesitant individuals are more likely to be women, young, less educated, to vote at the political extremes, to be dissatisfied with the government's response to the COVID-19 crisis, and to feel less at risk of COVID-19. The reasons why French people would refuse to take the COVID-19 vaccine are similar to those offered for other vaccines, and these reasons are strikingly stable across gender, age and educational level. Finally, most French people declare they would not take the vaccine as soon as possible but would instead rather wait or not take it at all. The plummeting rates of vaccination intentions, including among vulnerable populations, raise the possibility that, just as a COVID-19 vaccine might be available, many people might refuse to take it.

Keywords: *Vaccine Hesitancy; COVID-19; Vaccine Acceptance*

As of November 2020, countries across Europe have witnessed a resurgence in COVID-19 cases after having successfully slowed outbreaks earlier in the year. More cases are declared each day, and intensive care wards are filling up. Unfortunately, behavioral interventions such as mandatory mask usage, social distancing, and handwashing have not proven sufficient, and lockdowns have been implemented across the world. Much hope for a return to normalcy rests with the promise of a COVID-19 vaccine.

Short of making vaccination mandatory (which, to the best of our knowledge, few countries have considered so far), we must rely on the population being willing to vaccinate. Worryingly, vaccine hesitancy has been growing in many countries. In 2016, 41% of the French population reported doubting vaccines were safe, which placed France in the number one position of vaccine-defiant countries [1]. It is hardly surprising, then, that a survey conducted on COVID-19 vaccination intentions in April 2020 shows that France has the lowest rate of vaccination intention in Europe compared to its number of deaths, hospitalizations, and reanimations [2]. Vaccination intentions topped 62% in April and have been dropping since, down to 45% in September. A similar decrease in vaccination intentions has been observed in other countries [3], [4], such as the United States [5], Italy [6], and the United Kingdom [7].

At the beginning of the pandemic, the Coconel group conducted online surveys in representative samples of the French population to study the acceptance of future COVID-19 vaccines, and its correlates [8]. They found that, in April 2020, almost a quarter of respondents would not take the vaccine if it became available, and that these attitudes correlated with political affiliations. The goal of the present study was to (i) document the evolution of attitudes towards the COVID-19 vaccine in France; (ii) investigate the main demographic determinants of these attitudes; and (iii) measure potential variations between

subgroups of the population (e.g. based on age, sex, and political affiliation). In addition, to properly fight COVID-19 vaccine hesitancy, it is essential to understand the reasons behind not only vaccine hesitancy but also vaccine acceptance. The last goal of the present study was thus to (iv) explore the reasons behind COVID-19 vaccine hesitancy and acceptance.

The present work is in line with past studies investigating the reason behind vaccine hesitancy [9], [10], and the growing body of research on COVID-19 vaccine hesitancy in particular [2], [3], [11], [12].

Methods

Design and sample

From May 2020 to September 2020, data were collected by the French authorities via the polling firm IPSOS. The interviews were conducted by phone, among a sample representative of the French population aged 18 and over (May 15th and 16th, N = 1003; July 24th and 25th, N = 1004; August 28th and 29th, N = 1017; September 11th and 12th, N = 1003; October 9th and 10th, N = 1001; November 10th to 12th, N = 1004; total sample, N = 6032). Participants were randomly selected from a panel of nationally representative households of the French general population. Random sampling was stratified such that the final sample was nationally representative of the French population distribution using the quota method on age, sex, location, and occupation. The study design and data collection were conducted according to the ICC - ESOMAR international code for market research, social and opinion studies and data analytics. In addition, data collection, storage and analysis respected applicable data protection laws and all the new rules related to the European GDPR regulations. All participants had to give their informed consent to be surveyed. The data was made publicly available under condition of anonymity. The geographical information included in our study is coarse enough to prevent the identification of individual participants.

Data

In addition to background socio-economic variables (gender, age, educational level), participants were asked questions about the French government and its management of the pandemic. To study participants' trust in the Government, we retained one question common to all studies, which is "In general, are you satisfied with the Government's handling of the Coronavirus?".

Participants were asked to what extent they were worried about the COVID-19 pandemic for themselves and their relatives on a 4-points Likert scale ranging from "Not worried at all" to "Very worried". We created a perceived risk measure by re-coding their answers into a binary outcome: 'high subjective risk' for participants answering "very worried" or "quite worried" and 'low subjective risk' for participants answering "not really worried" or "not worried at all".

Regarding political affiliation, respondents were asked which French political party they felt the closest to (among a list of 12 parties), and responses were encoded into a five-item outcome: Far-Left, Green party, Left/Center/Right governmental parties, Far-Right, and None. For those who answered they felt close to no party, following Ward et al [8], we aimed to assess their degree of distance toward the political system. We therefore considered their voting behavior at the first round of the 2017 presidential election, forming three categories: participants with no current preference and who voted in 2017, participants with no current preference and who abstained in 2017, and other—i.e. those who did not respond to the question related to the 2017 election or were too young to vote.

To create an objective measure of exposure to Covid-19, participants were asked their French department of residence[1]. We created an Objective risk measure by dividing the cumulative number of deaths due to Covid-19 in their department of residence (at the time of the survey) by the number of inhabitants of this department, and scaling the variable. We created a binary outcome: 'low objective risk' for participants in departments below the mean of cumulative number of deaths due to Covid-19 in their department of residence divided by the number of inhabitants of this department and 'high objective risk' for participants above the mean.

Regarding vaccination, respondents were asked whether they would agree to get vaccinated if a vaccine against the COVID-19 were available: 'certainly', 'probably', 'probably not', 'certainly not'. Responses were merged into a binary outcome: 'COVID-19 vaccine refusal' equaled 1 if participants answered 'probably not' or 'certainly not', otherwise the value was 0.

Finally, in July only, participants had to indicate their reasons for getting vaccinated ("probably" and "certainly") or for not getting vaccinated ("probably not" and "certainly not"). Participants' answers were manually coded by the polling firm IPSOS, into 17 main reasons for getting vaccinated and 17 main reasons against getting vaccinated (see Table 1 in Electronic Supplementary Materials (ESM)). Each participant could give several reasons. We sorted these reasons into four categories of reasons for getting vaccinated: personal protection, collective protection, to resume normal activities, and trust in the medical institutions. And four categories of reasons against getting vaccinated: personal situation, lack of effectiveness of the vaccine, lack of trust in the institutions, and being opposed to vaccination in general. Data and the scripts used to analyze the data are available on the Open Science Framework at https://osf.io/je9pd/.

[1] A department in France is a territorial unit. There are a total of 100 departments in France. French departments are similar in size although they differ in population size. A French department is about 2.5 times the median land area of English counties and slightly more than 3.5 times the median land area of a county in the United States.

Results

The results section is organized into four parts. First, we report the predictors of COVID-19 vaccine refusal and document its increase between May 2020 and September 2020 ("What predicts COVID-19 vaccine refusal?"). Second, we report the reasons that participants provided in favor and against taking the COVID-19 vaccines during the July 2020 wave ("Reasons given in favor of vaccination" and "Reasons given against vaccination"). Third, we document that in November and October 2020 half of the population would rather wait a certain amount of time before getting the vaccine ("To vaccinate now or later?").

What predicts COVID-19 vaccine refusal?

In this section, we report the results of a logistic regression with gender, age, educational level, political affiliation, trust in the government, subjective risk, and objective risk as predictor of COVID-19 vaccine refusal across all four waves (see Table 2). Vaccine refusal is defined as participants who reported being "probably not" or "certainly not" willing to get vaccinated.

Gender. Women (39.4%) were more likely than men (34.4%, $p < .001$) to refuse the vaccine.

Age. Younger participants were more likely to refuse the vaccine ($p < .001$). Participants under 35 years of age (45.8%) were more likely than participants between 35 and 64 years of age (38.8%, $p = .003$) and than participants over 64 years of age to refuse the vaccine (23.7%, $p < .001$).

Education. More educated participants were less likely to refuse the vaccine ($p < .001$). Participants with more than a bachelor (33.2%) were less likely than participants with a high school degree to refuse the vaccine (42.1%, $p < 0.001$). On the other hand, participants with

no educational degree were not significantly more likely to refuse the vaccine (40.2%) than participants with a high school degree ($p = .32$).

Political affiliation. Political affiliation was a significant predictor of vaccine refusal ($p < .001$). Compared to participants close to governing parties (Right, Centre, and Left, 27.5%), all other political preferences predicted higher vaccine refusal: green party (37.5%, $p = .006$), far left (42.9%, $p = .006$), and far right (56.1%, $p < .001$). In addition, no current preference but voted in 2017 (40.7%, $p = .005$) and participants no current preference and abstained in 2017 (50.5%, $p < .001$) were more likely to refuse the vaccine than participants close to governing parties. Participants with no preference were marginally more likely to refuse the vaccine (36.3%, $p = .027$).

Trust in government. Participants who were not satisfied with the way the government handled the COVID-19 crisis (46.2%) were more likely to refuse the vaccine compared to participants who reported being satisfied (28.1%, $p < .001$).

Perceived risk. Participants who were not worried about the COVID-19 pandemic were more likely to refuse the vaccine (49.3%) than participants who were worried about the pandemic (28.3%, $p < .001$).

Objective risk. The cumulative number of deaths and hospitalizations in the participants' residence county was not a significant predictor of vaccine refusal ($p = 0.251$).

Time. Vaccine refusal greatly increased over time ($p < .001$; see Figure 1). Compared to the first wave in May (28.5%), vaccine hesitancy increased month after month: July (32.8%, $p = 0.023$), August (39.0%, $p < .001$), and September (47.9%, $p < .001$).

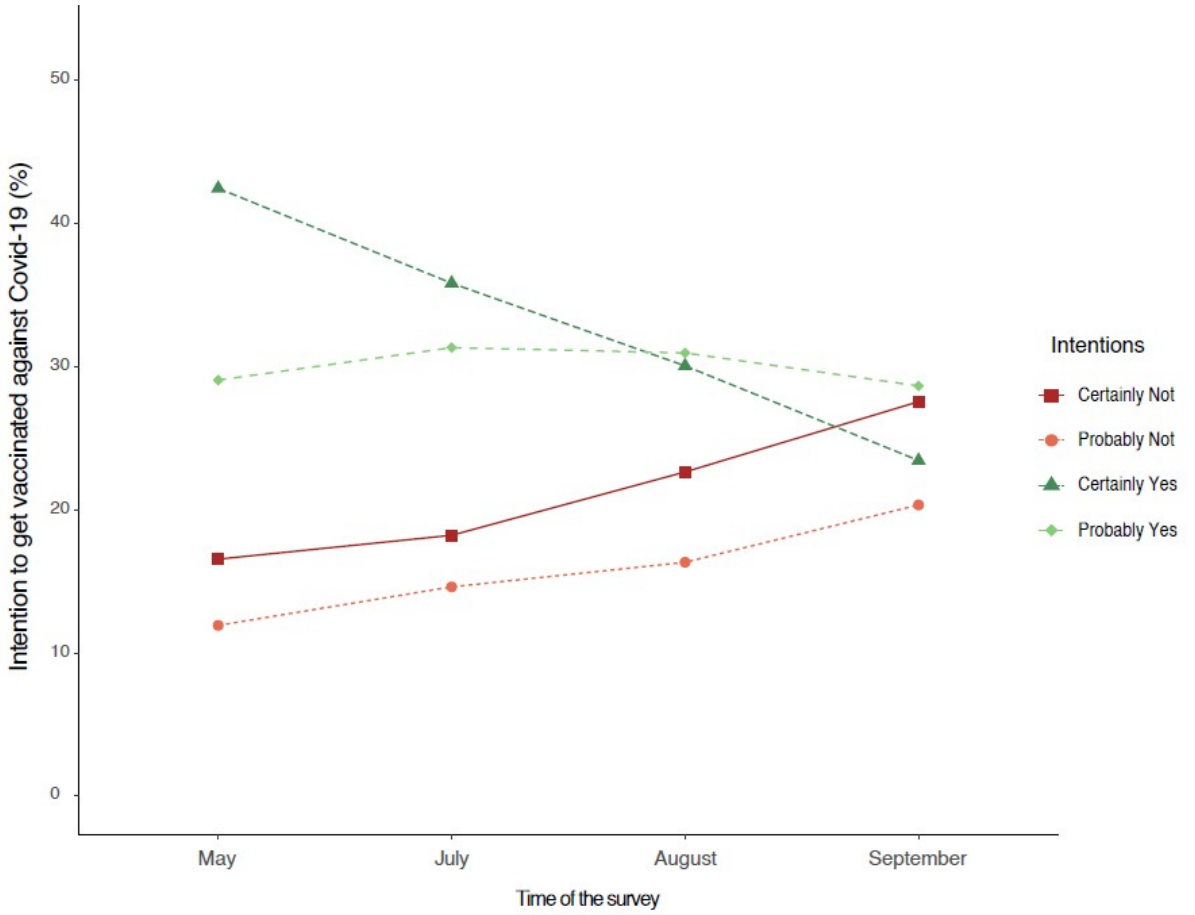

Figure 1. Participants' intention to get vaccinated against COVID-19, when a vaccine will be available, in four surveys conducted in May, July, August and September 2020.

	Coronavirus vaccine refusal ("probably not" and "certainly not" get vaccinated answers)	
	Raw (%)	Adjusted OR [95% CI]
All	36.9	
Gender	***	
Men (n=1911)	34.4	0.63 [0.54-0.72]***
Women (n=2116)	39.4	-1-

Age	***	
<35 y.o (n=1068)	45.8	1.25 [1.05-1.48]*
35-64 y.o (n=1983)	38.8	-1-
>64 y.o (n=976)	23.7	0.48 [0.40-0.59]***
Educational level	***	
Less than High School degree(n=1120)	40.2	1.11[0.90-1.37]
High School degree (n=777)	42.1	-1-
Higher than high School degree (n=2025)	33.2	0.69[0.57-0.83]***
Political affiliation	***	
Far Left (n=408)	42.9	1.43[1.11-1.83]**
Green party (n=703)	37.5	1.33 [1.08-1.63]**
Left/Center/Right party (n=1611)	27.5	-1-
Far Right (n=330)	56.1	2.53 [1.93-3.34]***
No current preference and abstained in 2017 (n=397)	50.5	1.86[1.45-2.39]***
No current preference but voted in 2017 (n=313)	40.7	1.49[1.13-1.96]**
no preference and other (n= 265)	36.3	1.42[1.04-1.93]*
Trust in government	***	
Trust (n=2030)	28.1	-1-
Don't trust (n=1972)	46.2	1.81 [1.56-2.10]***
Perceived Risk	***	
High (n=2375)	28.3	-1-
Low (n=1640)	49.3	2.47[2.13-2.85]***
Objective Risk		
Low (n=2463)	36.9	0.92[0.79-1.06]
High (n=1438)	37.4	-1-

Survey wave	***	
May (n=1017)	28.5	-1-
July (n=1004)	32.8	1.27[1.03-1.56]*
August (n=1003)	39.0	1.47 [1.20-1.81]***
September (n=1003)	47.9	2.17 [1.78-2.65]***

Table 2. Logistic regression with predictors of vaccine refusal. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Reasons given in favor of vaccination

In the July 2020 survey, participants who intended to get vaccinated against COVID-19 were asked the reasons why they intended to get vaccinated (see Figure 2), and participants who did not intend to get vaccinated were asked the reasons why they did not want to get vaccinated (see Figure 3). We report the results of logistic regressions comparing the prevalence of these reasons across demographic groups[2].

To protect myself

Men (83.4%, $N = 277$) were not more likely than women (82.0%, $N = 278$) to say that they would take the vaccine to protect themselves ($b = 0.02$, ± 0.03, $p = .31$).

Participants under 35 years-old (70.4%, $N = 100$) were less likely than participants between 35 and 65 years-old (82.8%, $N = 270$) to say that they would take the vaccine to protect themselves ($b = -0.11$, ± 0.04, $p = .003$). On the other hand, participants over 65 years-old

[2] Note that we did not have enough statistical power to analyze the "To resume normal activities" and "Trust in the medical authorities" reasons.

(91.1%, $N = 185$), were more likely than participants between 35 and 65 years-old to say that they would take the vaccine to protect themselves ($b = 0.07, \pm 0.03, p = .026$).

Participants with less than a high school degree (90.5%, $N = 181$), or more than a high school degree (79.3%, $N = 280$), were not more likely to say that they would take the vaccine to protect themselves than participants with just a high school degree (79.7%, $N = 94$) ($b = 0.07, \pm 0.04, p = .11$; $b = -0.01, \pm 0.04, p = .77$).

Participants satisfied with the way the government handled the COVID-19 crisis (83.5%, $N = 416$) were not more likely to say that they would take the vaccine to protect themselves compared to participants who were not satisfied (80.3%, $N = 139$) ($b = 0.04, \pm 0.03, p = .26$).

To protect others

Men (64.2%, $N = 213$) were less likely than women (70.8%, $N = 240$) to say that they would take the vaccine to protect others ($b = -0.08, \pm 0.04, p = .031$).

Participants over 65 years-old (71.2%, $N = 111$) were less likely than participants between 35 and 65 years-old (54.7%, $N = 232$) to say that they would take the vaccine to protect others ($b = -0.16, \pm 0.04, p < .001$). On the other hand, participants under 35 years-old (77.5%, $N = 110$) were not more likely to say that they would take the vaccine to protect themselves than participants between 35 and 65 years-old ($b = 0.06, \pm 0.05, p = .24$).

Participants with less than a high school degree (59.5%, $N = 119$) were less likely to say that they would take the vaccine to protect themselves than participants with just a high school degree (73.7%, $N = 87$) ($b = -0.11, \pm 0.05, p = .049$). On the other hand, participants with more than a high school degree (70.0%, $N = 247$), were not more likely to say that they

would take the vaccine to protect themselves than participants with just a high school degree (b = -0.04, ± 0.05, p = .40).

Participants satisfied with the way the government handled the COVID-19 crisis (67.9%, N = 338) were not more likely to say that they would take the vaccine to protect themselves compared to participants who were not satisfied (66.5%, N = 115) (b = -0.008, ± 0.04, p = 0.84).

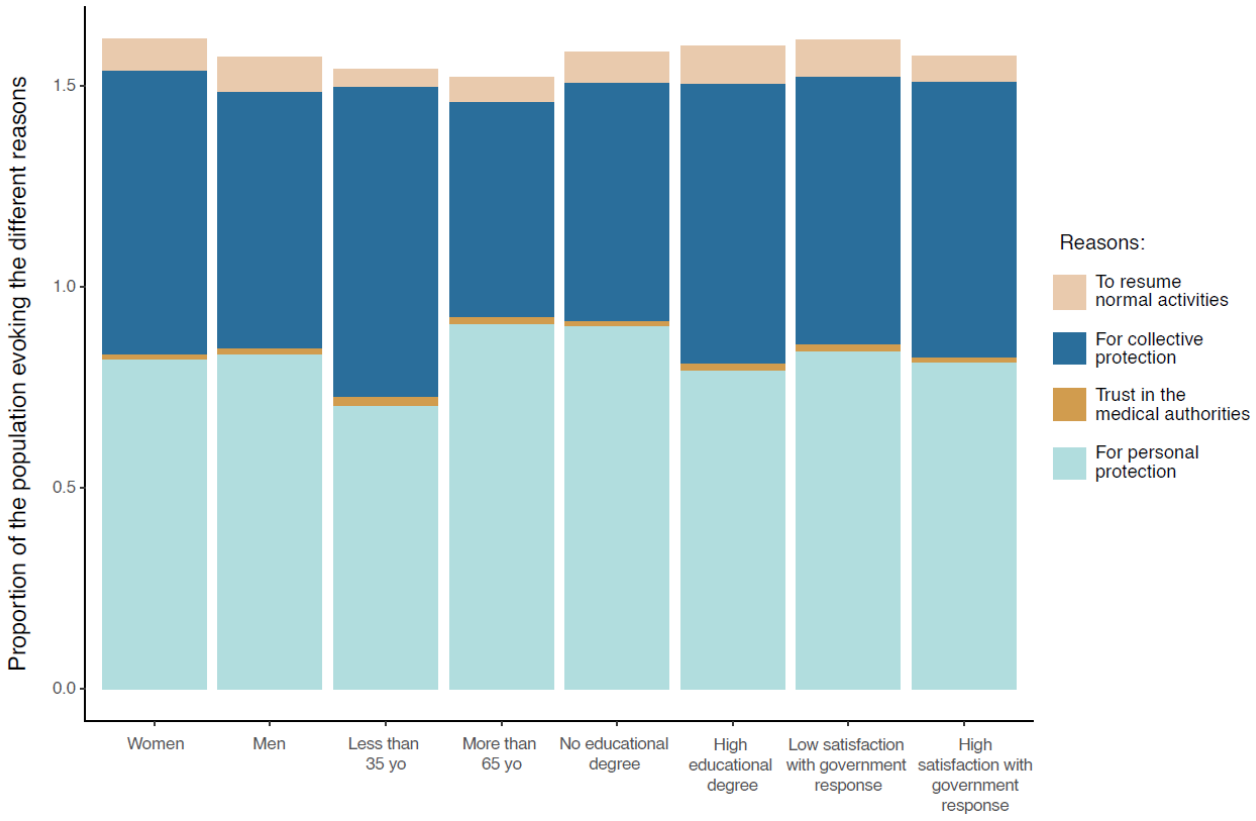

Figure 2. Reasons given by participants who declared that they intend to get vaccinated against COVID-19. Reasons were coded into four main categories: (i) for

personal protection, (ii) trust in the medical authorities, (iii) for collective protection, to protect others, and (iv) to resume normal activities. Participants could give several reasons. The percentages of the population who gave the different reasons are represented, for eight groups: women, men, people under 35 years old, people older than 65 years old, people with no educational degree, people with an educational degree higher than High School, people who are not satisfied with the way the government handled the COVID-19 crisis and people who are satisfied with the way the government handled the COVID-19 crisis.

Reasons given against vaccination

The reasons given against vaccination were similar across demographic groups (see Figure 3). Most statistical comparisons (20/24) were not statistically significant. We report in ESM all the statistical comparisons between demographic groups, and report below the few notable statistically significant differences[3].

Participants under 35 years-old (36.0%, $N = 36$) were more likely than participants between 35 and 65 years-old (20.2%, $N = 36$) to say that they would refuse to vaccinate because they didn't require it personally ($b = 0.16, \pm 0.06, p = .005$).

Participants with more than a high school degree (29.9%, $N = 43$) were more likely to say that they would refuse to vaccinate because they didn't require it personally than participants with just a high school degree (19.4%, $N = 12$) ($b = 0.13, \pm 0.07, p = .049$).

[3] In this section the small number of participants per group greatly limits the strength of the statistical analyses.

Participants satisfied with the way the government handled the COVID-19 crisis (46.1%, N = 83) were less likely to say that would refuse to vaccinate because they doubted the vaccine's efficacy than participants who were not satisfied (30.4%, N = 45) (b = -0.16, ± 0.05, p = .004).

Participants over 65 years-old (42.0%, N = 21) were more likely than participants between 35 and 65 years-old (26.4%, N = 47) to say that they would refuse to vaccinate because of a general vaccine refusal (b = 0.17, ± 0.08, p = .03).

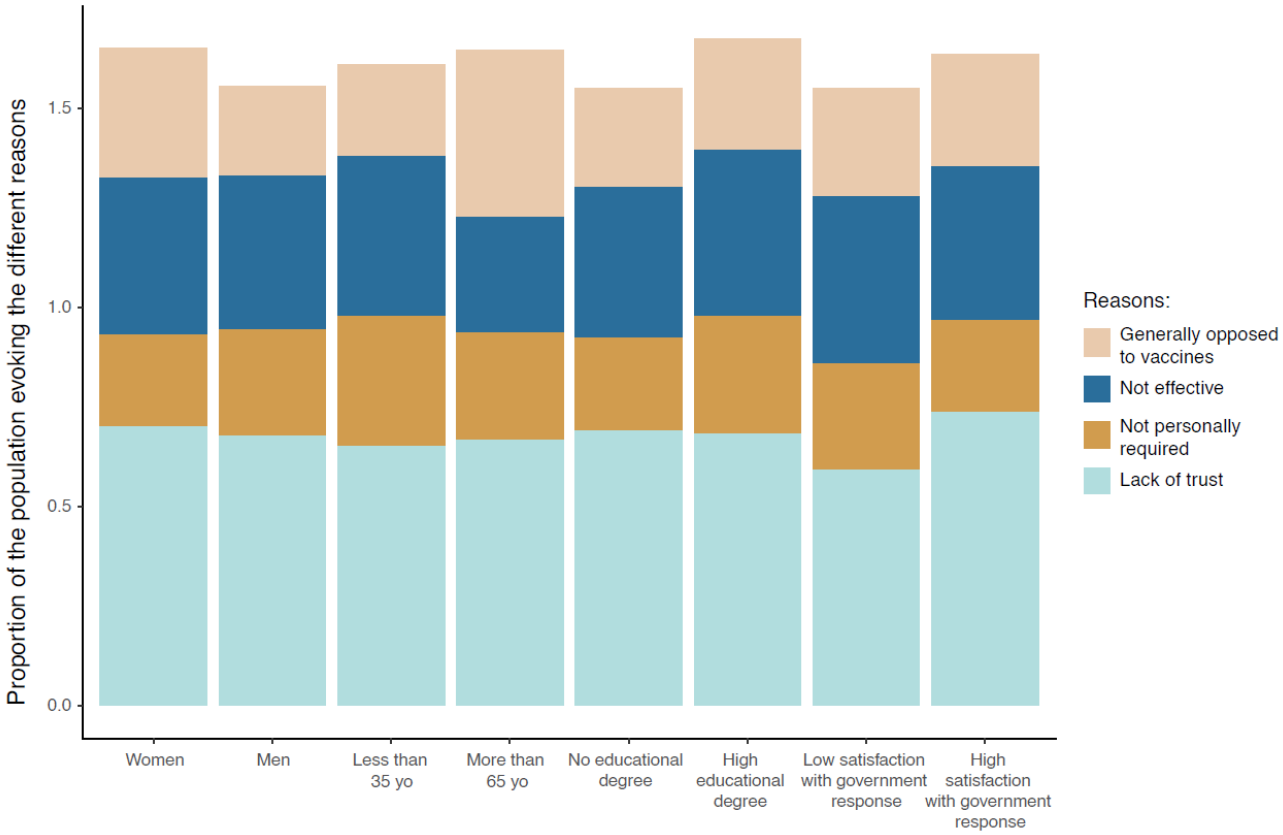

Figure 3. Reasons given by participants who declared that they do not intend to get vaccinated against COVID-19. Reasons were recoded into four main categories: (i) because of a lack of trust in the government and the pharmaceutical industries, (ii) because they thought they don't need to get vaccinated, (iii) because they thought the vaccine will be ineffective, (iv) because they were generally opposed to vaccines.

Participants could give several reasons. The percentages of the population who gave the different reasons are represented, for eight groups: women, men, people under 35 years old, people older than 65 years old, people with no educational degree, people with no educational degree, people with an educational degree higher than High School, people who are not satisfied with the way the government handled the COVID-19 crisis and people who are satisfied with the way the government handled the COVID-19 crisis.

To vaccinate now or later?

In the last two waves of the survey (October and November), we asked participants whether, if a vaccine were available, they would either (i) be vaccinated right away, (ii) after waiting a certain amount of time, or (iii) not at all. We found that half of participants (48.8% in October, 52.5% in November) indicated a preference for getting vaccinated later. A third of the sample would refuse to get vaccinated against the virus (31.9% in October, 29.4% in November), and one fifth (19.3% in October, 18.1% in November) who would like to get vaccinated as soon as possible. Figure 4 provides a visual representation of participants' responses by demographics, trust in government, perceived risk, and objective risk.

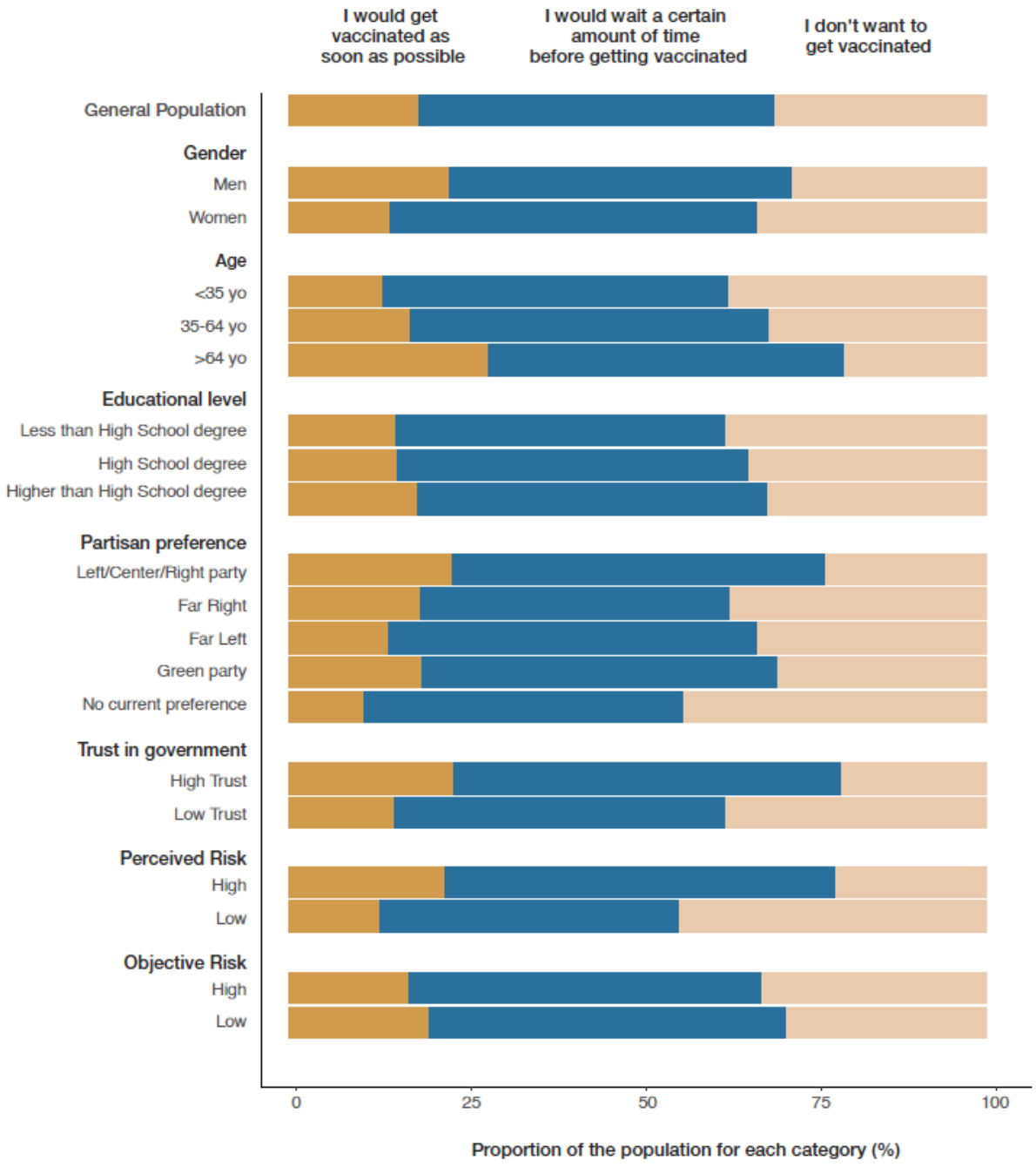

Figure 4. Proportion of the population saying that they would get vaccinated as soon as possible, that they intend to get vaccinated but would wait a certain amount of time, or that they don't intend to get vaccinated against COVID-19, for the general population and for specific populations: men, women, people under 35 years old, people older than 65 years old, people between 35 and 65 years old, people with no educational degree, people with a High School diploma, people with an educational

degree higher than High School, the different political affiliation, people who are satisfied with the way the government handled the COVID-19 crisis and people who are not satisfied with the way the government handled the COVID-19 crisis, people who perceived the risk of COVID-19 for them and their relatives to be high, or low, and people with a high/low objective risk (who live in a department with a high/low number of hospitalizations and deaths). The data represents the mean of the October and November data.

Conclusion

French people's attitudes toward the future COVID-19 vaccine were surveyed in six survey waves from May 2020 to November 2020, for a total N of 6032.

The worrying evolution of COVID-19 vaccine refusal in France. Since May 2020, COVID-19 vaccine refusal in the French population has steadily grown, reaching a worrying point: in September 2020 only 23% of participants say they would certainly get vaccinated again COVID-19 compared to 42% in May 2020.

Who are the French COVID-19 vaccine refusers? COVID-19 vaccine refusal is more prevalent among women, young people, the least educated, voters at the political extremes, people who are not satisfied with the government's response to the COVID-19 crisis, and people who feel less at risk of COVID-19.

Why are French people refusing the COVID-19 vaccine? Overall, participants refuse the COVID-19 for similar reasons as previous vaccines: they don't trust the institutions creating or delivering the vaccines, they think it won't be effective, that it is not useful for them, or they oppose vaccination in general. These reasons are strikingly stable across genders, ages, and educational levels.

Why are some French people willing to take COVID-19 vaccine? The reasons why participants were willing to take the COVID-19 vaccine are similar to the reasons given for other vaccines: mainly for personal and collective protection.

Would French people be willing to take the COVID-19 vaccine as soon as possible? No. Half of the French people surveyed would prefer waiting a certain amount of time before getting vaccinated, one third would not take it at all, and only one fifth would get the vaccine as soon as possible.

The plummeting rates of vaccination intention, including among vulnerable populations such as older individuals, raise the possibility that, in France and other countries, just as a COVID-19 vaccine might be available, many people might refuse to take it.

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Declaration of Interest Statement

The authors declare no competing interest.

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