


## ORIGINAL ARTICLE

# Parental gender differences in attitudes and willingness to vaccinate against COVID-19

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**Aims:** COVID-19 affects family life world-wide. Determinants of hesitancy around vaccinating children against COVID-19 are critical in guiding public health campaigns. Gender differences among parents may determine willingness to vaccinate children against COVID-19.

**Methods:** Secondary analysis of the COVID-19 Parental Attitude Study (COVIPAS) surveying care givers of children presenting for emergency care in 17 sites in 6 countries during peak pandemic (March–June, 2020). We assessed risk perceptions, vaccination history and plans to vaccinate children against COVID-19 once available. We compared responses given by father or mother and used multivariable logistic regression.

**Results:** A total of 2025 (75.4%) surveys were completed by mothers and 662 (24.6%) by fathers, 60 did not respond to question about future vaccination. Of 2627, 1721 (65.5%) were willing to vaccinate their children. In the multivariable analysis, both fathers and mothers were more willing to vaccinate their child if the parent was older and believed that social distancing is worthwhile, and if their child was up-to-date on childhood vaccines (odds ratio (OR) of 1.02, 3.90, 1.65 for mothers and 1.04, 4.76, 2.87 for fathers, respectively). Mothers (but not fathers) were more willing if they had more than a high school education (OR 1.38), and fathers (but not mothers) were more willing to vaccinate their male children (OR 1.62), compared to female children.

**Conclusion:** Unique differences between mothers and fathers underscore the need to view vaccine hesitancy as an acceptable parental response. Public health should plan targeted educational information for parents about a COVID-19 vaccine for children.

**Key words:** COVID-19; gender; vaccination.

## What is already known on this topic

- 1 The COVID-19 pandemic has impacted all aspects of family life and social controversy surrounds the acceptance of future vaccines.
- 2 Determinants of hesitancy around vaccinating children against COVID-19 are critical in guiding public health campaigns.
- 3 Gender differences among parents may determine willingness to vaccinate children against COVID-19.

## What this paper adds

- 1 Both fathers and mothers were more willing to vaccinate their child if the parent was older and believed that social distancing is worthwhile, as well as if their child was up-to-date on childhood vaccines.
- 2 Mothers (but not fathers) were more willing if they had more than a high school education, and fathers (but not mothers) were more willing to vaccinate their male children, compared to female children.
- 3 Differences between mothers and fathers highlight the need to proactively plan to provide targeted educational information about a COVID-19 vaccine for children.

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Illnesses caused by the coronavirus SARS-CoV-2 (COVID-19) affected millions of people with wide-ranging health consequences and is ongoing. Vaccines have been recently approved for adults and in many countries, for use in children 12 years and older. Not surprisingly, this global pandemic also impacted all aspects of family life. Following months of shut-downs and re-openings for day cares, schools and employment sites, administering the now approved vaccine remains one of the most effective strategies for curtailing the continued spread and contagion of this disease. Yet, social controversy surrounds the acceptance of future vaccines.<sup>1</sup> Mothers and fathers range from complete acceptance of vaccines to hesitancy and even rejection of vaccinating their children.

An array of complex, interacting factors influence parental attitudes about vaccines, including past experiences with inoculations, trust in medical professionals, societal norms promoting immunizations, parents' level of education and socio-economic status, broader sociocultural contexts, religious convictions and social narratives about specific vaccines (e.g. vaccine critical discourse linking vaccines and autism).<sup>1–4</sup> Notably, hesitancy about vaccines may be growing among many groups of people.<sup>5,6</sup>

This study was a secondary analysis of data from an international database that included surveys of parents in 17 paediatric emergency departments (PEDs). The objective of this analysis was to determine if there are significant differences between mothers and fathers of children coming to PEDs and to evaluate the association of parent's gender with their willingness to give a COVID-19 vaccine to their child.

It was recently shown that mothers, in comparison to fathers, were less likely to vaccinate their children against COVID-19 in our global survey.<sup>7</sup> Our null hypothesis was that vaccine safety considerations are affecting similarly mothers and fathers when they make a decision to vaccinate children against COVID-19. Now, looking specifically within the group of mothers and within the group of fathers, we evaluate possible predictors of willingness to vaccinate against COVID-19 once a vaccine is available for children. Our findings are important in guiding public health campaigns and the development of specific materials to encourage the vaccination of children in order to support the development of herd immunity.

## Methods

### Study cohort

This study is part of a larger international study, surveying care givers of children presenting for emergency care during COVID-19. Care givers who arrived to 17 PEDs in the USA (Seattle, Tacoma, Los Angeles, Dallas, Atlanta), Canada (Vancouver, Toronto, Saskatoon, Edmonton, Calgary), Israel (Shamir), Japan (Tokyo), Spain (Barcelona) and Switzerland (Zurich, Bern, Geneva, Bellinzona) were asked to participate, using posters in waiting areas and patient rooms. For infectious control purposes, respondents used their own smartphones to complete the survey by logging into a secured online platform based on REDCap metadata-driven software (Vanderbilt University). The study was approved by the Institutional Review Boards of participating sites and several Institutional Review Boards (in Switzerland and Spain) provided a waiver of consent such that responding to the survey was considered consent to participate. Parents who completed the survey about parental attitudes also provided their age and gender.

Languages available to complete the study were English, French, German, Italian, Spanish, Hebrew and Japanese. While sites joined recruitment in a staggered fashion, surveys were obtained between 27 March and 30 June 2020. Only one care giver per family was asked to complete the survey.

### Outcome measures

The study-specific survey was developed to include questions regarding demographic characteristics, information about the emergency department (ED) visit and risk perceptions around

COVID-19. Respondents were also asked about their child's vaccination history, and if they were planning to provide their child with a vaccine against COVID-19 once available. The survey also assessed opinions care givers may have or actions they may take during the pandemic. Literature related to reports from prior pandemics was reviewed and considerations regarding public health measures at the time of the peak COVID-19 pandemic (mid-March 2020) were reflected in the survey. All survey items were evaluated *a priori* by 10 individuals representing the target group and 10 health-care providers working in the ED environment.

### Statistical analysis

Basic descriptive statistics and frequencies were used to describe all variables. For these analyses, we excluded care givers who did not identify themselves as a father or a mother (e.g. siblings, grandparents). We compared survey data from care givers based on parents' gender. To determine which factors were significantly associated with care giver gender, we used bivariate analyses: Mann-Whitney test was used for comparing non-normal continuous variables, independent *t*-tests were used for comparing normally distributed continuous variables, and  $\chi^2$  or Fisher's exact tests were used for categorical variables. Multivariable logistic regression was used to estimate the adjusted odds ratio – especially the anticipation of willingness to vaccinate against COVID-19 when a vaccine becomes available. Variables included in the model were those that were shown to be significant in the univariate model ( $P < 0.1$ ).

All analyses were conducted with R version 3.5.1. A *P* value  $< 0.05$  in the multivariate analysis was considered statistically significant.

## Results

A total of 2687 surveys were completed online. Of this total, 2025 (75.4%) were completed by mothers and 662 (24.6%) by fathers, and 60 did not complete question about vaccination. Median age of children was 7.1 years (range 0–19) and 40 years for the care givers. A total of 1721 of 2627 (65.5%) parents suggested they would be willing to vaccinate their children against COVID-19.

Table 1 provides a comparison between mothers and fathers for questions asked in the survey. Fathers were older, and of interest, they brought more boys to the ED than mothers (0.047). Additionally, children coming with fathers were less likely to have COVID-19-related symptoms. Mothers were much more likely to come with children after a family decision was made to delay coming to the ED due to COVID-19 concerns. Whereas fathers were more likely to be willing to vaccinate their children against COVID-19, once a vaccine is available for children, mothers were themselves more frequently vaccinated against influenza the prior year, more likely to vaccinate their child against influenza in the coming season, and more likely to plan to vaccinate themselves against influenza in the coming year. Compared to mothers, fathers were also more concerned about the possibility of lost work due to the pandemic.

In the multivariable analysis for predictors of willingness to vaccinate against COVID-19 (Table 2), both fathers and mothers were more likely to vaccinate against COVID-19 if the parent was older and believed that social distancing is a worthwhile public

**Table 1** Comparison between mothers and fathers responding to our study

	Fathers (n = 662)	Mother (n = 2025)	P value
<b>Child</b>			
Child's age in years (SD)	7.5 (4.74)	7.46 (5.15)	0.789
Child gender, male, n (%)	<b>366 (55.4)</b>	<b>1019 (50.4)</b>	<b>0.047</b>
Child's immunisation up to date, n (%)	581 (89.1)	1772 (88.6)	0.334
Child exposed to someone with COVID-19, n (%)	34 (5.23)	115 (5.77)	0.675
<b>Parent</b>			
Child came to ED with COVID-19 symptoms, n (%)	<b>148 (22.4)</b>	<b>563 (27.8)</b>	<b>0.007</b>
Parent's age in years (SD)	<b>42.0 (6.93)</b>	<b>38.5 (7.45)</b>	<b>&lt;0.001</b>
Parent has higher than high school education, n (%)	517 (80.3)	1517 (76.5)	0.050
Parents delayed coming to ED due to COVID-19, n (%)	<b>49 (12.0)</b>	<b>311 (24.0)</b>	<b>&lt;0.001</b>
Child vaccinated last year for influenza, n (%)	220 (34.0)	746 (37.3)	0.145
Parent vaccinated last year for influenza, n (%)	<b>231 (35.3)</b>	<b>872 (43.5)</b>	<b>&lt;0.001</b>
Parents plan to vaccinate their child against influenza in coming year, n (%)	<b>340 (52.6)</b>	<b>1140 (57.2)</b>	<b>0.043</b>
Parents plan to vaccinate against influenza in coming year, n (%)	<b>357 (55.0)</b>	<b>1210 (60.4)</b>	<b>0.017</b>
Parents plan to vaccinate child against COVID-19 once available, n (%)	<b>468 (72.6)</b>	<b>1253 (63.2)</b>	<b>&lt;0.001</b>
<b>Parental reporting</b>			
Parent believe in social distancing as a good public health measure, n (%)	612 (93.4)	1870 (93.4)	1.000
Parent had lost income due to COVID-19, n (%)	263 (40.2)	778 (39.0)	0.638
<b>Level of concerns</b>			
Level of concern about child having COVID-19 in ED (Likert scale 0–10)	2.01 (2.72)	1.95 (2.95)	0.668
Level of concern about parent having COVID-19 in ED (Likert scale 0–10)	1.93 (2.56)	1.88 (2.82)	0.643
Level of concern about losing work (Likert scale 0–10)	<b>2.87 (3.36)</b>	<b>2.57 (3.49)</b>	<b>0.048</b>
Level of concern about child losing school (Likert scale 0–10)	3.00 (3.40)	2.70 (3.51)	0.058

Percentage calculated from the number of fathers or mothers that responded to the specific question. The bold values mean statistical significance. ED, emergency department; SD, standard deviation.

**Table 2** Factors determining plan to vaccinate against COVID-19 among mothers and fathers

	Mothers odds ratio	95% CI	P value	Fathers odds ratio	95% CI	P value
Child is a male	0.864	(0.707–1.06)	0.154	<b>1.62</b>	<b>(1.1–2.4)</b>	<b>0.016</b>
Child up-to-date on vaccines	<b>1.65</b>	<b>(1.21–2.25)</b>	<b>&lt;0.01</b>	<b>2.87</b>	<b>(1.6–5.15)</b>	<b>&lt;0.01</b>
Parent's age	<b>1.02</b>	<b>(1.01–1.03)</b>	<b>&lt;0.01</b>	<b>1.04</b>	<b>(1.01–1.07)</b>	<b>&lt;0.01</b>
Parent has more than high school education	<b>1.38</b>	<b>(1.07–1.77)</b>	<b>0.012</b>	0.728	(0.421–1.22)	0.242
Child has COVID-19 symptoms	0.893	(0.705–1.13)	0.348	1.03	(0.629–1.72)	0.906
Level of worry the child has COVID	1.04	(0.979–1.11)	0.196	1.06	(0.94–1.21)	0.333
Level of worry the parent has COVID	1.06	(0.988–1.13)	0.108	1.04	(0.916–1.19)	0.530
Level of worry about losing work	1.02	(0.987–1.06)	0.222	1	(0.938–1.08)	0.907
Level of worry about losing work?	1	(0.969–1.03)	0.971	0.984	(0.922–1.05)	0.638
Believe in social distancing	<b>3.9</b>	<b>(2.55–6.12)</b>	<b>&lt;0.01</b>	<b>4.76</b>	<b>(2.25–10.4)</b>	<b>&lt;0.01</b>
Lost income during peak of the pandemic	0.932	(0.755–1.15)	0.511	0.851	(0.561–1.29)	0.448

The bold values mean statistical significance. CI, confidence interval.

health measure, as well as if their child was up-to-date on childhood vaccines. Mothers (but not fathers) were more likely to want to vaccinate their child if they had more than a high school

education, and fathers (but not mothers) were more likely to want to vaccinate their male children, compared to female children.

## Discussion

In our sample of parents visiting 17 EDs in the peak of the COVID-19 pandemic, mothers reported more concerns about vaccinating their children against COVID-19 once a vaccine is offered to children, compared to fathers, despite being more willing to vaccinate themselves and their children against influenza in the coming year. In general, older parents who believed in the benefits of social distancing and who have vaccinated their children on schedule are more likely to vaccinate their children against COVID-19.

### Willingness to vaccinate

Women are disproportionately responsible for health-care decisions concerning children,<sup>8</sup> and in the US mothers who are white, college-educated, and have higher incomes are most likely to refuse or delay vaccines for their children.<sup>5</sup> In one study of 56 pregnant mothers residing in Quebec, Canada, about half of the mothers (25) were categorised as vaccine-hesitant. The six vaccine-unfavourable mothers displayed high levels of distrust in public health professionals and the role of pharmaceutical companies in vaccine research.<sup>9</sup> In two other surveys from Chapel Hill, NC<sup>10</sup> and France,<sup>11</sup> mothers were more vaccine-hesitant compared to fathers.

Qualitative analysis of a group of mothers from New Haven, Connecticut in the early 2000s revealed that factors associated with mothers' decision to vaccinate were trust in paediatricians, satisfaction with medical discussions about vaccines and vaccine-favourable cultural norms.<sup>2</sup>

Mothers were previously found to be less likely to vaccinate their children.<sup>12–14</sup> In Italy, a higher vaccine hesitancy was found among mothers/female guardians of children aged 6–10 years<sup>12</sup> and in Boston, USA, a major reason for mothers' refusal of a COVID-19 vaccination for their child was concerns about insufficient data collection during the approval process.<sup>13</sup> Social and contextual factors may explain gender pattern of vaccination intentions.<sup>14</sup>

Our findings of greater maternal hesitancy in accepting a future COVID-19 vaccine for children are similar to findings by Dubé *et al.*<sup>9</sup> who found that vaccine-hesitant mothers expressed doubt in medical and public health professionals, were ambivalent about the effectiveness of vaccines, and tended to view older vaccines as safer than newer vaccines. It is possible that mothers consider each specific vaccine individually<sup>9</sup> and while they may be comfortable with an available influenza vaccine, they are not willing to support an unknown vaccine. Thus, parents who are not willing to vaccinate their children for COVID-19 may be responding to the unknowns of a new vaccine and its development.

Indeed, vaccine hesitancy may be a more common stage of parenting than previously thought.<sup>9</sup> Some evidence indicates that vaccine hesitancy among both first time and experienced mothers declines over time,<sup>15</sup> likely similar to our findings that older mothers and fathers were more likely to want to vaccinate their children against COVID-19.

A 2020 survey from Penn State University of 141 parents who changed their decision on influenza immunisation from 1 year to the next reported that parents who decide to initiate influenza vaccines make choices to protect their child because they understood the risk of disease (45%,  $n = 64$ ). Those who stop yearly

influenza vaccinations for their children most commonly cite a perceived lack of effectiveness of the vaccine (29%,  $n = 41$ ).<sup>16</sup>

Our finding that greater education among mothers, but not among fathers, was associated with more willingness to vaccinate may be reflective of the fact that safety concerns, parental trust and sufficient knowledge about recommended vaccines, and the system for administering them, are important components of vaccine hesitancy.<sup>17</sup> Further, vaccine hesitancy may also coincide with medical consumerism, empowering women to play an active role in understanding and making health-care decisions for themselves and their children. Historically, mothers assumed the primary role of caretaker, for their own and others' health, with greater self-empowerment of that role emerging with feminist social movements.<sup>9,18</sup>

Two interesting observations will need further exploration in the future. First, fathers came with more boys who were less likely to have COVID-19 related symptoms, compared to boys and girls coming with mothers. This may be related to the substantial role mothers have in responsibility for health-care decisions concerning their children, and future studies may illuminate this finding further. Similarly, mothers were more likely to arrive with children when the family previously decided to delay care in the ED due to the COVID-19 pandemic. Once again, mothers are more likely to assume responsibility for health-care tasks once parents decide to seek medical help.

ED visits may be an opportune time to provide parents with supportive counsel and COVID-19 vaccination education. Vaccine risk perception of parents is often complicated by cognitive bias and personal experience, making it one of the most commonly cited determinants of vaccine hesitancy.<sup>19</sup> More qualitative evaluation is needed<sup>20</sup> to better understand gender differences in vaccine hesitancy.

Our study has limitations. The population interviewed is not a representative population of parents in those 17 centres or their countries. Furthermore, not all parents responded to all questions. These issues limit generalizability. Finally, the study was conducted at a time before a vaccine for adults received emergency authorization. Parental attitudes towards vaccines in children may be different after being vaccinated themselves. Nonetheless, the survey was conducted at a time where vaccines for children have not been available, and can help plan an approach for mothers and fathers once the vaccine is available for children under 12 years of age.

## Conclusion

In conclusion, Public health officials may leverage this information to provide more targeted campaigns for parents, addressing specific vaccination concerns that may be common. Our findings underscore the need to view vaccine hesitancy as an acceptable response to new vaccines and to proactively plan to provide more educational information about new vaccines, like a COVID-19 vaccine for children.

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Save the koalas! by Shanelle Wambeek (age 13) from “A Pop of Colour” competition, Children’s Hospital at Westmead Art Youth Program