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Understanding the psychosocial determinants of Italian parents' intentions not to vaccinate their children: An extended Theory of Planned Behaviour model

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Abstract

Objective. This study aimed to identify the psychosocial factors involved in Italian parents' intention not to vaccinate their children. For this purpose, we used an extended version of the Theory of Planned Behaviour, which included both proximal and distal factors influencing intention not to vaccinate children.

Design. Participants included 447 Italian parents, each completed an online questionnaire, which measured intention not to vaccinate children, attitude toward not vaccinating, subjective norms, perceived behavioural control, anticipated regret, negative attitude toward vaccines, risk perception, trust in healthcare institutions, trust in science and religious morality.

Results. Results showed that attitude toward not vaccinating was strongly associated with intention not to vaccinate children. Furthermore, attitude toward not vaccinating was associated with negative attitude toward vaccines, which in turn was affected by all the distal factors considered (religious morality, trust in science, trust in healthcare institutions, risk perception). Finally, negative attitude toward vaccines fully mediated the effect of the distal factors on attitude toward not vaccinating children.

Conclusion. These findings provide support for the validity of the proposed extended TPB model in explaining parents' intention not to vaccinate children. Theoretical and practical implications, in terms of understanding and promoting vaccination behaviour, are discussed.

Keywords: vaccine hesitancy, intention not to vaccinate, attitude, decision making, Theory of Planned Behaviour

Introduction

Vaccines are one of the most important, cost-effective, and safe tools for preventing many harmful diseases (e.g., measles, meningitis, influenza, cervical cancer). Although the introduction of vaccinations has significantly reduced morbidity and mortality associated with the most common vaccine-preventable infectious diseases, they still cause millions of deaths worldwide (Guerra et al., 2017). In recent years, there has been an alarming decline in childhood vaccination coverage in European countries. For instance, starting from the 2000s, coverage for the measles, mumps, and rubella (MMR) vaccine decreased in 9 European countries, including Italy, where the coverage rate dropped to 85% in 2016 (Bechini et al., 2019). To counter such a dangerous trend, Italy approved in July 2017 the law 119/2017, which increased the number of mandatory vaccinations in childhood and adolescence up to the age of 16 years from four to ten (poliovirus, diphtheria, tetanus, hepatitis B, pertussis, Haemophilus influenzae type b, measles, rubella, mumps, and varicella). Although the approval of the mandatory vaccination law resulted in a considerable increase in vaccination rates (Italian Ministry of Health, 2019; WHO/Europe, 2019), vaccination coverage for some mandatory vaccinations and all recommended vaccinations remains below 95%, the necessary threshold for the virus to stop circulating. According to the latest available data (EpiCentro, 2019) relating to the 2017 cohort, the vaccine coverage at 24 months of age reached 95% only for poliovirus and tetanus, with the lowest coverage (91%) for vaccination against varicella. For the recommended vaccinations, the coverage was 79% for meningococcal B, 92% for pneumococcus conjugate, and only 40% for human papillomavirus.

A recent and detailed review (Brewer et al., 2017) analysed the perspectives that have been applied in psychology for understanding and promoting vaccination, identifying three main ones. The first perspective has explored how thoughts and feelings influence people's motivation to get vaccinated, considering the role of some psychological variables such as risk perception and trust (e.g., in the effectiveness of vaccines or in healthcare institutions and providers). The second has focused on social processes, exploring how members of the subject's social network (e.g., friends,

family, doctors) influence their vaccination attitudes and vaccine decision making. The last perspective has investigated the possible intervention strategies to promote vaccination without changing people's thoughts and feelings, for example, by working on pre-existing favourable intentions, reducing existing barriers to vaccination, or using specific behavioural change techniques (Brewer et al., 2017).

As part of the first perspective, many studies have focused on the concept of “vaccine hesitancy” (Giambi et al., 2018; Larson et al., 2014; MacDonald, 2015; McClure et al., 2017; Napolitano et al., 2018). In general, it refers to so-called “hesitant” individuals, i.e., those who delay in accepting the vaccination or reject it completely, despite the availability of vaccination services (Schmid et al., 2017). In order to understand the reasons why some parents refuse to vaccinate their children while others do not, most studies have analysed the impact of specific psychosocial variables on the intention to vaccinate, mainly among the general population (e.g., Dubé et al., 2012; Harmsen et al., 2012; Sales et al., 2011; van Lier et al., 2017). Such studies are undoubtedly useful in helping to understand the decision to vaccinate. However, they may not give the full picture, particularly in relation to individuals who define themselves as “anti-vaxxers”, who may have little intention to vaccinate themselves or their children. However, such groups may vary in the extent to which they intend not to vaccinate, and this may have important implications for understanding vaccination behaviour in this group. As far as we are aware, there are no previous studies on the factors that influence parents' intention *not* to vaccinate their children. This represents, in our opinion, an important line of research to explore, also considering that there is evidence (e.g., Richetin et al., 2012; Richetin, Conner & Perugini, 2011; Richetin, Osterini & Conner, 2020; Sandberg et al., 2016) that the processes underlying the intentions *to implement* or *not to implement* a given behaviour may not be necessarily the opposite of one another.

In order to fill the current research gap, the present study aimed to identify the psychosocial factors involved in Italian parents' intention not to vaccinate their children. For this purpose, constructs from an extended version of the Theory of Planned Behaviour (Ajzen, 1991) provided

the main theoretical framework. The additional included variables were: anticipated regret, attitude toward target, risk perception, trust in healthcare institutions, trust in science, and religious morality.

Theoretical framework

According to The Theory of Planned Behaviour (TPB; Ajzen, 1991), the most proximal antecedent of action is behavioural intention. In turn, the intention is predicted by three factors: attitude, that is the favourable or unfavourable evaluation of the behaviour in question; subjective norms, which refer to the expectations of significant or powerful others (such as family, friends, doctors) in relation to whether to perform or not to perform the behaviour; and perceived behavioural control, that is one's perceived ability to perform the behaviour. The TPB has been effectively used to predict and explain vaccination behaviour, although such studies have focused on the intention to vaccinate rather than the intention not to vaccinate (Askelson et al., 2010; Britt & Englebert, 2018; Caso et al., 2019; Catalano et al., 2017; Cha et al., 2019; Fielding et al., 2019; Ratanasiripong et al., 2013; Wang et al., 2017). Most of these studies found that positive attitude is the strongest predictor of the intention to vaccinate, followed by subjective norms (Askelson et al., 2010; Britt & Englebert, 2018; Cha & Kim, 2019; Dubé et al., 2018; Ratanasiripong et al., 2013). For example, Askelson et al. (2010) showed that attitudes were the strongest predictor of mothers' intentions to vaccinate their daughters against human papillomavirus (HPV), even if their intentions were not very high, suggesting that a useful strategy to increase HPV vaccine uptake could be strengthening mothers' positive attitudes toward vaccinating daughters. Similarly, Cha and Kim (2019) found that attitude toward hepatitis A (HA) vaccination and subjective norms were the main factors influencing mothers' intention to vaccinate their children against HA, accounting for 84% of its variance.

Despite the proven effectiveness of TPB in explaining vaccination behaviour, this theory is not without limits. As pointed out by Catalano et al. (2017), the TPB starts from the assumption that

human behaviours are the result of rational cognitive decisions, thus ignoring the role of the affective components (e.g., fear, threat, or mood). Furthermore, it includes only the most proximal determinants of behavioural intention and does not consider the impact of some distal factors (e.g., moral values).

About the first point, Sandberg and Conner (2008) showed that adding the affective component of anticipated regret significantly increases the variance explained in intention and behaviour in the context of other TPB variables. The anticipated regret refers to the negative feeling that one experiences when thinking about the possibility of not achieving an expected behaviour (Sandberg & Conner, 2008). If not vaccinating their children generates negative feelings (regrets) in parents, this could positively affect the implementation of this behaviour. In this regard, several studies highlighted that anticipated regret is a key factor in explaining vaccine acceptability both in parents and young adults (Caso et al., 2019; Hamama-Raz et al., 2016; Hofman et al., 2014; Pența et al., 2019), although to date no studies have explored the possible impact of anticipated regret *about vaccinating* on the intention *not* to vaccinate.

Regarding the role of distal factors, some studies showed that vaccine acceptability can be influenced, in addition to TPB variables, by factors such as risk perception, trust in healthcare institutions, trust in science, and religious morality.

Risk perception is one of the distal factors that influence the intention to carry out a behaviour or not through its effect on attitudes and beliefs (Schmiege et al., 2009). In a review of influenza vaccine hesitancy, Schmid et al. (2017) found that low risk perception related to the possibility of getting flu was one of the most significant barriers to influenza vaccination in 42 of the 470 studies analysed. Some studies also highlighted that low parental risk perception about the possibility that their children get sick of diseases from which vaccines protect is associated with higher vaccine rejection and hesitancy (Allison et al., 2010; Brabin et al., 2006; Dempsey et al., 2006; Flood et al., 2010; Offutt-Powell et al., 2014).

Regarding trust, research showed that a lack of trust in science and healthcare institutions is strongly related to parents' refusal to vaccinate their children (Dubé & Gagnon, 2018). As pointed out by Mesch and Schwirian (2015), trust in institutions is based on both the perception of the institutions' ability to perform the tasks to which they are assigned and that they work to maximise people's health. If the trust in healthcare institutions (e.g., the Ministry of Health) is lacking, hesitant attitudes to vaccination are stronger (Yaqub et al., 2014). On the other hand, trust in science refers to the perception that science represents a reliable source of knowledge about the world (Farias et al., 2013). Although many studies analysed the role of trust in institutions, the impact of trust in science on attitudes toward vaccines has been less explored. For example, in a study on healthcare workers, Lehmann et al. (2014) found that high levels of disbelief in science, operationalised as the belief that there is insufficient scientific evidence to support the efficacy of influenza vaccination, was associated with a less favourable attitude toward the aforementioned vaccination.

The last distal factor that we considered was religious morality. Religion, like science, represents an important source of knowledge on how the world works. Religious explanations appear to be simpler and more intuitive to understand than scientific ones and often interfere with the acceptance and understanding of scientific and technological advances (Rutjens et al., 2018). More specifically, it has been shown that religiosity widely influences the acceptability of some health behaviours, including vaccination (Benjamin & Brown, 2004; Rutjens et al., 2018; Shelton et al., 2013). Consequently, moral beliefs could represent an interesting source of negative attitudes toward vaccines to be explored, in parallel with the lack of trust (in science and institutions) and low risk perception.

Finally, given the importance of attitude in predicting vaccination intention and behaviour, we also drew on Eagly and Chaiken's (1993) composite model of attitude-behaviour relationships as it allows us to grasp the different facets of the attitude construct. Specifically, the distinction made between "attitudes toward target" and "attitudes toward behaviour" seems particularly

relevant and useful to clarify which beliefs may influence the intention not to vaccinate and how. Attitude toward behaviour is the same as defined by the TPB model, i.e., a favourable or unfavourable evaluation of behaviour that directly leads to the intention to implement it or not. In turn, attitude toward behaviour is predicted by attitude toward target, which is the evaluation of the target to which the behaviour is directed. In this perspective, the attitude toward vaccination behaviour (e.g., “Vaccinating my children is harmful”) would be primarily influenced by the more general attitude toward the topic of vaccines (e.g., “Vaccines cause autism”), which in turn could originate from the distal factors considered above. In the case of our study, the attitude toward behaviour, as well as the proximal predictors of intention, will refer to the non-implementation of the behaviour in question - not vaccinating rather than vaccinating - as the focus is on the intention not to vaccinate children. It is notable that few studies have employed the composite model.

According to the above discussion, the present study aims to explore the factors that can influence parents’ intention not to vaccinate their children in order to shed light on the “vaccine hesitancy” phenomenon. For this purpose, we used an extended TPB theoretical framework, which is shown in Figure 1. Specifically, we hypothesised that intention not to vaccinate children is positively predicted by attitude toward not vaccinating children (behaviour) (H1), subjective norms about doctors (H2), subjective norms about family (H3), perceived behavioural control (H4), and anticipated regret (H5). Moreover, we hypothesised that attitude toward not vaccinating children is positively predicted by negative attitude toward vaccines (target) (H6), which in turn is negatively predicted by risk perception (H7), trust in healthcare institutions (H8), and trust in science (H9). In contrast, we expected that negative attitude toward vaccines is positively predicted by religious morality (H10).

Insert Figure 1 here

Materials and methods

Participants

In 2018, 452 Italian parents were invited to participate in a study on vaccination behaviour. The only inclusion criterion was to have at least one child in the vaccination age range (0-16 years, in line with Italian regulations). Among the eligible participants, a convenience sample of 447 parents (72.5% females, 27.5% males; *Mean age* = 36.4; *SD* = 10.1) completed an online self-report questionnaire developed ad hoc for this study after being informed about the anonymity of data collection and signing the informed consent sheet. The questionnaire was circulated through Italian Facebook groups that explicitly defined themselves as “no-vax”. Before posting the questionnaire link, the Facebook group administrators were informed about the purpose of the study and gave approval for link sharing.

Among the respondents, 39.4% came from South Italy and Islands, 36.3% from Northern Italy, and 24.3% from Central Italy. Most of the participants were married (68.5%), 52% had one child, whereas 48% had two or more children. In relation to religion, 60.2% were catholic non-practising, 20.4% catholic practising, 15.7% atheists, and 3.7% answered “other”. In relation to political orientation, 31.5% said they were right-wing, 25.5% apolitical, 21.7% left-wing, 17.7% center, and 3.6% had "other" orientations.

The present study was implemented following receipt of ethical approval by the Department of Humanities of the University of Naples “Federico II”.

Measures

Demographic information, information-seeking, and past behaviour

Participants were asked to provide their age, sex, number of children, marital status, religion, political orientation, and home geographic area. Furthermore, parents were required to indicate their sources of information about vaccines (blogs/forums, word of mouth, paediatrician, institutional websites, no-vax movement, obstetrician, school) and their past behaviour about vaccinations (whether their children received mandatory vaccinations, booster shots of mandatory vaccinations, influenza vaccinations and not mandatory vaccinations).

Psychological variables

Parents' *intention not to vaccinate* children was assessed through with 3 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “I do not intend to vaccinate my son/daughter”; adapted from Askelson et al., 2010). Cronbach's $\alpha = .99$.

Parents' *attitude toward not vaccinating* children was assessed through 3 items on a semantic differential scale ranging from 1 to 5 (e.g., “Not vaccinating my son/daughter is *disadvantageous-advantageous; unpleasant-pleasant; not important-important*”; adapted from Askelson et al., 2010). Cronbach's $\alpha = .92$.

Parents' *subjective norms about family* were assessed through 3 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “My family think that I should not vaccinate my son/daughter”; adapted from Askelson et al., 2010). Cronbach's $\alpha = .97$.

Parents' *subjective norms about doctors* were assessed through 3 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “My doctors think that I should not vaccinate my son/daughter”; adapted from Askelson et al., 2010). Cronbach's $\alpha = .92$.

Parents' *perceived behavioural control* was assessed through 3 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “I have control over my son/daughter's vaccinations”; adapted from Askelson et al., 2010). Cronbach's $\alpha = .88$.

Anticipated regret about vaccinating children was assessed through 3 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “If I did vaccinate my son/daughter, I would regret it”; adapted from Conner et al., 2017). Cronbach's $\alpha = .97$.

Parent's *negative attitude toward vaccines* was assessed through 7 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “Some vaccines are more dangerous than the infections they prevent”; adapted from Giambi et al., 2018). Cronbach's $\alpha = .95$.

Risk perception was assessed through 11 items using a scale ranging from 1 “*not at all*” (1) to “*very much*” (5). The items evaluate parents' perception regarding their children's exposure to

the risk related to the main diseases prevented by vaccines (e.g., “I think my son/daughter may be exposed to the risk of contracting tetanus”); adapted from Caso, 2011). Cronbach’s $\alpha = .97$.

Trust in healthcare institutions was assessed through 3 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “If the Ministry of Health offers vaccines, I assume they are safe”); adapted from Giambi et al., 2018). Cronbach’s $\alpha = .99$.

Trust in science was assessed through 3 items using a Likert scale ranging from “*strongly disagree*” (1) to “*strongly agree*” (7) (e.g., “Science is the most effective way to reach the truth”); adapted from Farias et al., 2013). Cronbach’s $\alpha = .95$.

Religious morality was assessed through 7 items using a Likert scale ranging from “*completely disagree*” (1) to “*completely agree*” (5) (e.g., “Life only makes sense if you believe in religion”); adapted from Rutjens, Sutton, & van der Lee, 2018). Cronbach’s $\alpha = .94$.

It is worth noting that in this study the unidimensionality of the scales measuring the psychological variables was confirmed, according to the eigenvalue > 1 rule (Kaiser, 1960).

Statistical analyses

Statistical analyses were carried out using the R statistical software. Descriptive analyses were conducted to describe participants’ psychological characteristics and their information-seeking and past behaviour. Pearson’s correlations were calculated to evaluate the association among the variables. Additionally, a full structural equation model (SEM; Jöreskog, 1970) based on maximum likelihood estimation was fitted using the `lavaan` package (Rosseel, 2012) to test the hypothesised model. Finally, a mediation analysis was performed to test whether negative attitude toward vaccines fully mediates the effect of the distal factors on attitude toward not vaccinating.

Indirect effects were tested through the bootstrapping method: if the bootstrapped 95% confidence interval (CI) did not include zero, the indirect effect is considered significant. A nested model comparison using a chi-squared difference test ($\Delta\chi^2$) was conducted between our

hypothesised model (full mediation model) and the partial mediation model, including also the direct paths from distal factors to attitude toward not vaccinating children.

The following fit indices were used to evaluate the goodness of fit: the Chi-square, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardised Root Mean Square Residual (SRMR). Good model fit was defined by the following criteria (Hooper, Coughlan, & Mullen, 2008): RMSEA and SRMR values less than about .08, CFI and TLI values of about .90 or above. There were no missing values.

Results

Parents' information-seeking and past behaviour

Parents can use several sources of information about vaccines. As Figure 2 shows, in our study, the most reported sources of information were: blogs/forums (58%), word of mouth (48%), and paediatrician (42%). On the other hand, the least frequently reported sources were obstetricians (13%) and school (7%). Regarding past behaviour about vaccinations (see Figure 3), close to half of participants stated that they had refused the mandatory vaccinations for their children, and a higher percentage (61%) refused the booster shots of the mandatory vaccinations. Finally, almost all the participants rejected the administration of influenza vaccinations and not mandatory vaccinations for their children (92% and 82%, respectively).

Insert Figure 2 here

Insert Figure 3 here

Descriptive analyses

Descriptive analyses and Pearson's correlations among variables are displayed in Table 1. Results showed that, on average, parents reported moderate levels of intention not to vaccinate their children, subjective norms about family, and religious morality. Low levels of subjective norms about doctors, trust in science, trust in healthcare institutions and risk perception were found. On the other hand, parents reported a strongly positive attitude toward not vaccinating children, negative attitude toward vaccines, anticipated regret about vaccinating, and perceived behavioural control. All the correlations among the variables were significant, with a p -value $< .01$. The intention not to vaccinate was positively correlated with attitude toward not vaccinating children, negative attitude toward vaccines, subjective norms, perceived behavioural control, anticipated regret, and religious morality; by the contrary, negative correlations were found with risk perception, trust in healthcare institutions, and trust in science. The latter correlate positively with each other, while negative correlations were found between them and the other variables. All the other correlations among variables were positive.

Insert Table 1 here

Structural equation model

A full structural equation model tested the hypothesised extended TPB model in order to explore the factors influencing parents' intention not to vaccinate their children. Except for the Chi-square ($\chi^2 = 2795.05$, $p < .01$), all other indices pointed to a good fit of the global model: CFI = .94, TLI = .93, RMSEA = .069, SRMR = .069. The latent variables were standardised by fixing their variance equal to 1. Moreover, two correlations between residues were added for the risk perception measures, as suggested by the modification indexes, and all the exogenous variables in the model were allowed to correlate freely.

In relation to the measurement model, factor loadings showed that each manifest variable provides enough information to the model ($p < .001$). In particular, we were interested in further exploring the factor loadings of negative attitude toward vaccines. We found that the latent variable of negative attitude toward vaccines was reflected a great extent on the following three items: “Vaccination is not necessary if you follow healthy lifestyles or natural remedies” ($\lambda = .89$), “Some vaccines are more dangerous than the infections they prevent” ($\lambda = .89$), “I do not think vaccinations are useful: the diseases they prevent are not so serious” ($\lambda = .88$). In relation to the structural model (see Figure 4), almost all the hypothesised paths were significant. First, intention not to vaccinate was significantly and positively affected by the traditional TPB variables of attitude toward not vaccinating ($\beta = .55$; 95% CI = .43 to .60) and perceived behavioural control ($\beta = .20$; 95% CI = .12 to .28), supporting H1 and H4. On the other hand, the direct effects of subjective norms about both family and doctors on intentions were not significant, so that H2 and H3 were not supported. Moreover, the direct effect of the affective component of anticipated regret on the intention not to vaccinate (H5) was positively significant ($\beta = .24$; 95% CI = .12 to .33). Among the proximal determinants, attitude toward not vaccinating was the main factor influencing parents’ intention not to vaccinate their children. In turn, attitude toward not vaccinating was affected by negative attitude toward vaccines positively (H6; $\beta = .96$; 95% CI = .83 to .98). Furthermore, all distal factors were significantly and directly related to negative attitude toward vaccines. Trust in science ($\beta = -.19$; 95% CI = -.24 to -.10) and in healthcare institutions ($\beta = -.52$; 95% CI = -.60 to -.47) as well as risk perception ($\beta = -.17$; 95% CI = -.25 to -.13) affected it negatively, whereas religious morality had a positive effect ($\beta = .20$; 95% CI = .11 to .23). These findings were consistent with H7, H8, H9, and H10. Among the distal factors, the latent variable of trust in healthcare institutions represented the variable more strongly associated with parents’ negative attitude toward vaccines. Finally, negative attitude toward vaccines significantly fully mediates ($p < .001$) the effect of the distal factors on attitude toward not vaccinating. The chi-squared difference test showed that the addition of the direct paths from distal factors to attitude toward not vaccinating

children (partial mediation model) did not significantly increase the model fit: $\Delta\chi^2 = 9.69$, $\Delta df = 86$, $p > .05$. In particular, the standardised indirect effect coefficients were: $\beta = -.16$ (95% bootstrapped CI = $-.25$ to $-.10$) for risk perception, $\beta = -.50$ (95% bootstrapped CI = $-.61$ to $-.36$) for trust in healthcare institutions, $\beta = -.18$ (95% bootstrapped CI = $-.25$ to $-.05$) for trust in science, and $\beta = .19$ (95% bootstrapped CI = $.08$ to $.23$) for religious morality.

Insert Figure 4 here

Discussion and conclusion

The present study aimed to test the effectiveness of an extended TPB model in explaining parents' intention not to vaccinate their children. Although many studies have explored the factors that can affect the intention to vaccinate their children, no previous studies have investigated the factors influencing parents' intention *not to vaccinate* them. Despite the increase in vaccination rates that has concerned Italy in recent years (EpiCentro, 2019), there are still too many parents who refuse to vaccinate their children, in particular those who adhere to the so-called “no vax” groups. Since the no-vax group can be characterised by very specific psychological aspects, as well established in a recent Italian investigation (Cadeddu et al., 2020), we believe that studies focused on the intention to vaccinate do not exhaust the debate on which psychological factors – both proximal and distal – can influence the intention not to adhere to one of the most effective public health tools. Moreover, in light of the literature demonstrating that the processes underlying the intention to implement or not a given behaviour may not be simply the opposite of each other (Richetin et al., 2012; Richetin et al., 2011; Richetin et al., 2020; Sandberg et al., 2016), we believe that our study could represent the first step to explore, in future research, the possible differences between the two decision making processes, evaluating both *intention* and *intention not to* at the same time.

Regarding the parents who participated in our study, we found rather alarming data. Indeed, half of them said they had refused the mandatory vaccinations for their children, whereas more than half of the parents rejected the booster shots; also, the overwhelming majority said they had refused not mandatory vaccinations. About psychological variables, descriptive statistics showed that parents reported moderate to high levels of intention not to vaccinate their children, subjective norms about family, religious morality, attitude toward not vaccinating children (behaviour), negative attitude toward vaccines (target), anticipated regret about vaccinating, and perceived behavioural control. On the other hand, they reported low levels of subjective norms about doctors, trust in science, trust in healthcare institutions, and risk perception. The intention not to vaccinate children was positively correlated with all TPB variables plus anticipated regret, negative attitude toward vaccines, and religious morality. Also, the intention not to vaccinate children correlates negatively with distal factors of risk perception, trust in healthcare institutions, and trust in science.

Interestingly, negative attitude toward vaccines was reflected principally in items related to the belief that vaccines are useless or even dangerous. As pointed out by Schmid et al. (2017), the perception of the limited usefulness of vaccines (both in terms of individual and social benefits) represents one of the main psychological barriers to vaccination. Distorted beliefs about vaccines are strongly associated with misinformation about the risks posed by vaccination, which leads parents to believe that the disadvantages for their children are higher than the advantages. Furthermore, parental disinformation is also reflected in the sources of information about vaccines they used the most, i.e., forums and blogs on the Internet and word of mouth. In particular, using the Internet to search for health information can be particularly problematic since the sources of information on the web are rarely expert (especially when consulting forums and blogs) and, consequently, the risk of obtaining incorrect, incomplete and tendentious information is higher (Caso, 2011).

As hypothesised, intention not to vaccinate children was positively associated with attitude toward not vaccinating (H1) and perceived behavioural control (H4), but there was no significant

effect of subjective norms (about both family and doctors). That is, it appears that the intention not to vaccinate children is rooted in a strong positive attitude toward not vaccinating (which could be read as a strong negative attitude toward vaccinating) and in the perception of being able to control this behaviour. On the other hand, subjective norms seem not to be associated with the decision-making process leading parents not to vaccinate. As pointed out previously, the literature showed that, among traditional TPB variables, attitude and subjective norms are the strongest predictors of the intention to vaccinate children (Askelson et al., 2010; Britt & Englebert, 2018; Catalano et al., 2017), whereas in our case the variables most strongly associated with intention were attitude and perceived behavioural control. While the role of attitude appears to be particularly relevant in whether parents decide to vaccinate children or not, the association found between intention and PBC may be due to the fact that control over *not* doing a behaviour, compared to control over doing a behaviour, can be determined by fewer factors and generally requires less effort (Richetin et al., 2010), probably both in terms of cognitive resources and performing the behaviour - which, indeed, does not have to be implemented.

Regarding the non-significance of subjective norms, this result could be attributed to the fact that we have examined the decision-making process that leads to inaction (rather than to action), within which the variables involved could differ from those that instead leads to action (i.e., vaccinating children). Indeed, if on the one hand, the favourable opinion of significant others toward vaccines may prompt parents to decide to vaccinate their children (Caso et al., 2019), on the other hand, the negative view of others may not represent a key factor in explaining the decision-making process that leads parents not to vaccinate; choosing not to protect children is likely based on broader motivations that reflect a general low-trust attitude not only toward vaccines but also healthcare institutions and science, as will be discussed below. Another explanation could be that we focused on injunctive norms (what significant others think the person should do) rather than on descriptive norms (what significant others do themselves) (Rivis & Sheeran, 2003). In this regard, previous studies (e.g., Armitage & Conner, 2001) reported a weak association between injunctive

norms and intention, while descriptive norms played a decisive role in vaccination planning since parents appear to be affected more by the actual behaviour of their peers rather than from their opinions (which may not even be consistent with the behaviour) (Fielding et al., 2019).

Among the proximal factors considered, as hypothesised (H5), the anticipated regret about vaccinating was positively associated with the intention not to vaccinate, thus confirming that both cognitive and affective dimensions can influence the health decision-making about vaccination (Wang et al., 2017). Although numerous studies (e.g., Caso et al., 2019; Christy et al., 2016; Leder et al., 2015) showed that anticipating negative emotions – in particular regret – about not vaccinating strengthens the health decision of vaccinating, no study has focused on the feelings of regret associated with the possibility of vaccinating. In the case of our participants, the anticipated negative consequences associated with the possibility of vaccinating their children may have been strong enough to influence the intention not to vaccinate them, showing that anticipated affects play a role in explaining not only action but also inaction (Ajzen & Sheikh, 2013). These results underline the need for interventions that target not only parental attitudes but also the affective consequences (positive and negative) that they imagine will be associated with vaccination, starting from exploring in depth what negative consequences, specifically, they fear for their children.

Consistent with the composite model of the attitude-behaviour relation proposed by Eagly and Chaiken (1993), negative attitude toward vaccines (target) was positively associated with attitude toward not vaccinating children (behaviour) (confirming H6). It means that the more negative is parents' attitude toward the topic of vaccines, the more parents may favourably evaluate the possibility of not vaccinating their children, suggesting that intervening on attitudes toward vaccines could represent an effective strategy for changing attitudes toward the specific behaviour (vaccinating children or not) and, consequently, the intention.

The negative attitude toward vaccines was related, in turn, with all the distal factors considered, thus confirming H7, H8, H9, and H10. In particular, trust in healthcare institutions represented the factor most strongly associated with parents' negative attitude toward vaccines,

followed by religious morality, trust in science, and risk perception. As evidenced by Yaqub et al. (2014), trust is a key factor influencing attitudes toward vaccines since the credibility of information received on a specific health issue depends on trust in the source of this information. As a result, information on vaccines may not be rated by parents as unreliable in themselves, but because of a lack of trust in the source that disseminates it (Dubé & Gagnon, 2018). The fact that our participants prefer to rely on the Internet or word of mouth rather than official sources of information on vaccines could support this interpretation. In this regard, Jones et al. (2012) argued that a lack of trust in a particular source of information about vaccines (e.g., healthcare institutions, doctors) might strengthen parents' tendency to seek information from other sources (e.g., the Internet or other parents), especially when they already have hesitant attitudes toward vaccines. In light of these results, efforts to promote children's vaccination may be futile if parents lack confidence in health authorities (Caso et al., 2019; Yaqub et al., 2014).

Also, the negative attitude toward vaccines was positively associated with religious morality. In a series of studies on the factors influencing vaccine scepticism, Rutjens et al. (2018) found that the best predictor of hesitant attitude toward vaccines was religiosity, followed by moral concerns about naturalness and purity. Interestingly, the authors noted that although scepticism in vaccines increased as religiosity increased, this effect was reduced when trust in science was also included in the regression model, suggesting that religious respondents were sceptical about vaccines because of a lack of trust in science. On the other hand, Benjamins (2006) found that religiously active individuals reported higher levels of trust in physicians than those who never attended religious services, indicating that religiosity is not necessarily associated with low trust in science and healthcare institutions. However, religious influences can be of different types and have a distinct impact on health behaviours, depending on the level examined. Future researches could better explore if other aspects of religiosity (in addition to those related to moral beliefs) can influence attitude toward vaccines.

Consistent with the literature (Schmiege et al., 2009), the negative attitude toward vaccines was negatively associated with risk perception, suggesting that judging their children to be at low risk of contracting vaccine-preventable diseases can strengthen in some way parents' negative attitude toward vaccines. As highlighted by Askelson et al. (2010), as the concept of "risk" is socially and culturally constructed, parents may underestimate the risk of certain diseases in their children although adequately informed about the degree of spread of the diseases in question. Therefore, efforts are needed not only to improve parents' knowledge about vaccines and vaccinations but also to make them aware that vaccinations, as well as protecting their children, limit the spread of infectious diseases within the community, indirectly protecting even those who are not vaccinated / cannot be vaccinated.

Finally, negative attitude toward vaccines fully mediated the relationship between all distal factors and attitude toward not vaccinating, suggesting that these variables can have an impact on the attitude toward specific behaviour (vaccinating children or not) by influencing the more general attitude toward the topic of vaccines. In line with the composite model of the attitude-behaviour relation (Eagly & Chaiken, 1993), future studies could also examine the other factors included in this model (e.g., habit, utilitarian outcomes, regulatory outcomes, and self-identity outcomes), exploring their possible role in influencing the attitude toward vaccination behaviour.

The current study has some limitations. First, its cross-sectional design does not allow us to conclude that observed relationships are causal. For this reason, it is necessary to carry out further studies to replicate the results obtained, preferably adopting experimental research designs. Second, since we focused on intentions rather than behaviour, we cannot conclude that parents' intention not to vaccinate their children translates into non-implementation of vaccination behaviour. However, parents' past behaviour about vaccinations (half of the parents refused the mandatory vaccinations for their children) suggests a strong association between intention and behaviour. Furthermore, since we selected a convenience sample of Italian parents, our findings may not be generalisable. Finally, although we considered numerous factors influencing intention not to vaccinate, future

studies could include the role of additional variables that affect a mistrust in vaccines, for example, belief in conspiracy theories among the distal factors (Hornsey, Harris & Fielding, 2018; Lewandowsky, Gignac & Oberauer, 2013) and perceived vaccine safety and efficacy among the proximal ones (Haydarov & Gordon, 2015; Nan, Xie & Madden, 2012).

Despite the limitations, this study provides new useful information about the factors influencing parents' intention not to vaccinate children. So far, no studies have explored the decision-making process underlying the intention not to vaccinate, assuming that it may differ from the one that leads to the intention to vaccinate. It is clear that in order to demonstrate that the motivational processes underlying the two types of intention (vaccinate vs not vaccinate) are somehow different, further studies are needed to compare which factors influence doing and not doing intentions and to explore if and how both cognitions translate into actual behaviour. We believe that our study represents the first step for the exploration of these processes, whose thorough understanding is necessary to counter the increasingly widespread vaccine hesitancy phenomenon.

In conclusion, findings from this study hold theoretical and practical implications. In terms of theoretical implications, the study demonstrated the validity of the extended TPB model in explaining parents' intention not to vaccinate their children, suggesting that TPB can be effectively extended by including a number of distal factors, such as trust and religiosity. Practically, it sheds light on the factors that can be addressed in future health promotion programs to overcome barriers to vaccination, suggesting that it might be helpful to intervene on the parents' attitude (both toward vaccines and vaccination), taking into account the complex set of factors (both distal and proximal) that shape it and that interact with it in influencing the intention not to vaccinate.

Declaration of interests

The authors have no conflicts of interest to declare.

Funding

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Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Ethical Committee of Psychological Research of the Department of Humanities of the University of Naples Federico II and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Data statement

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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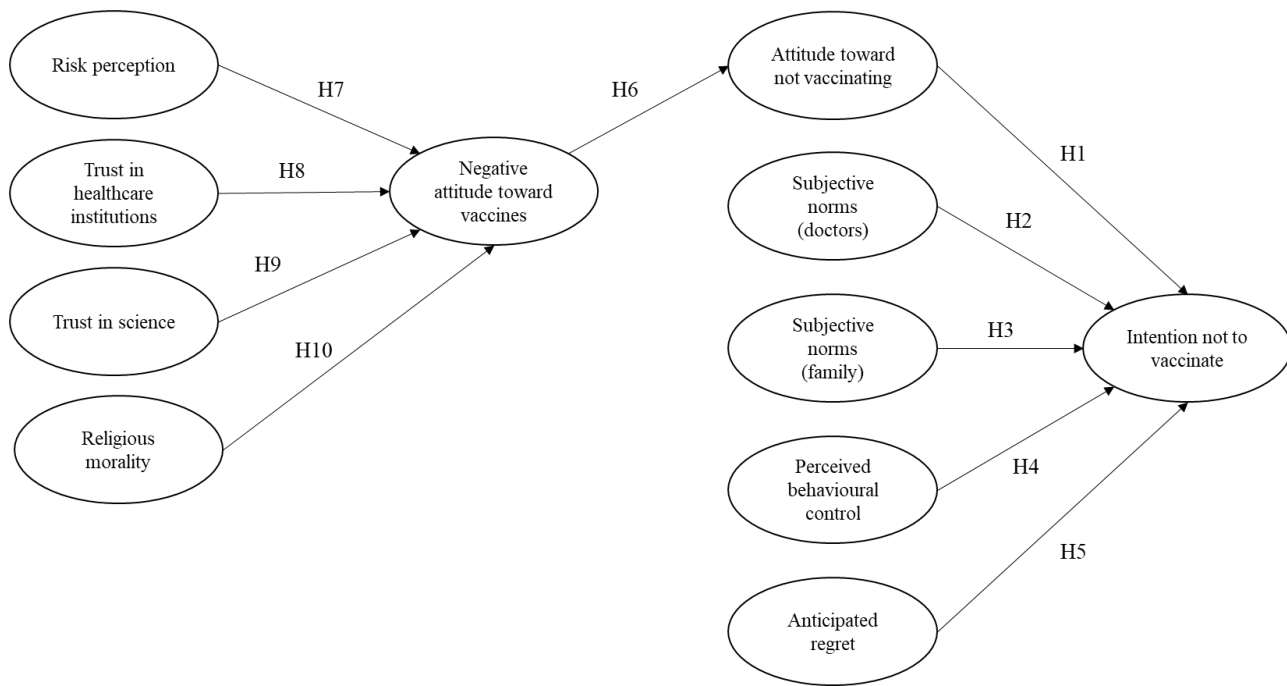
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1 **Table 1** – Descriptive statistics and Pearson’s correlations among the variables.

	M (SD)	Range	1	2	3	4	5	6	7	8	9	10	11
1 Intention not to vaccinate	3.41 (1.4)	1-5	1										
2 Attitude toward not vaccinating	3.65 (1.4)	1-5	.85**	1									
3 Subjective norms (doctors)	2.04 (1.1)	1-5	.45**	.46**	1								
4 Subjective norms (family)	3.34 (1.5)	1-5	.73**	.75**	.53**	1							
5 Perceived behavioural control	3.74 (1.0)	1-5	.63**	.57**	.35**	.54**	1						
6 Anticipated regret	3.70 (1.4)	1-5	.84**	.85**	.43**	.72**	.66**	1					
7 Negative attitude toward vaccines	3.73 (1.2)	1-5	.87**	.88**	.46**	.76**	.60**	.89**	1				
8 Risk perception	1.57 (0.7)	1-5	-.52**	-.51**	-.23**	-.47**	-.34**	-.52**	-.54**	1			
9 Trust in healthcare institutions	2.18 (1.3)	1-5	-.70**	-.71**	-.40**	-.58**	-.44**	-.74**	-.75**	.45**	1		
10 Trust in science	3.39 (1.6)	1-7	-.57**	-.60**	-.30**	-.53**	-.35**	-.58**	-.61**	.40**	.59**	1	
11 Religious morality	2.94 (1.2)	1-5	.45**	.44**	.14**	.40**	.36**	.44**	.49**	-.39**	-.38**	-.36**	1

2 ** $p < .01$

3

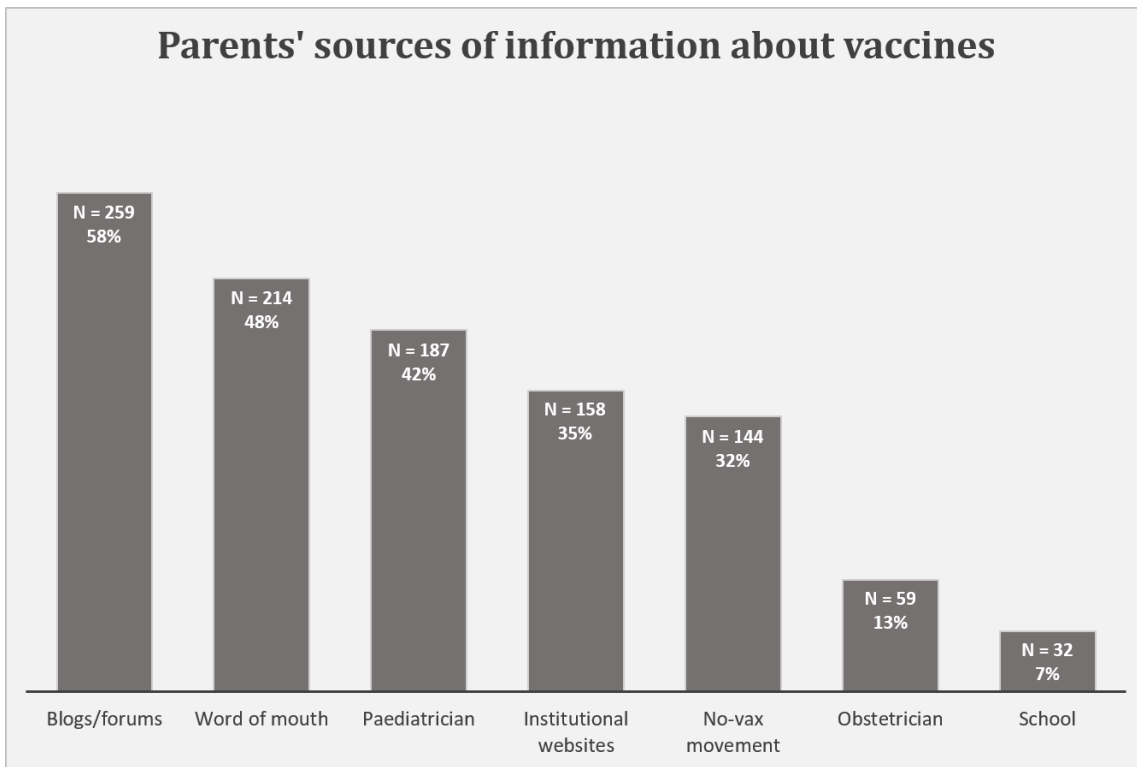


4

5 **Figure 1.**

6

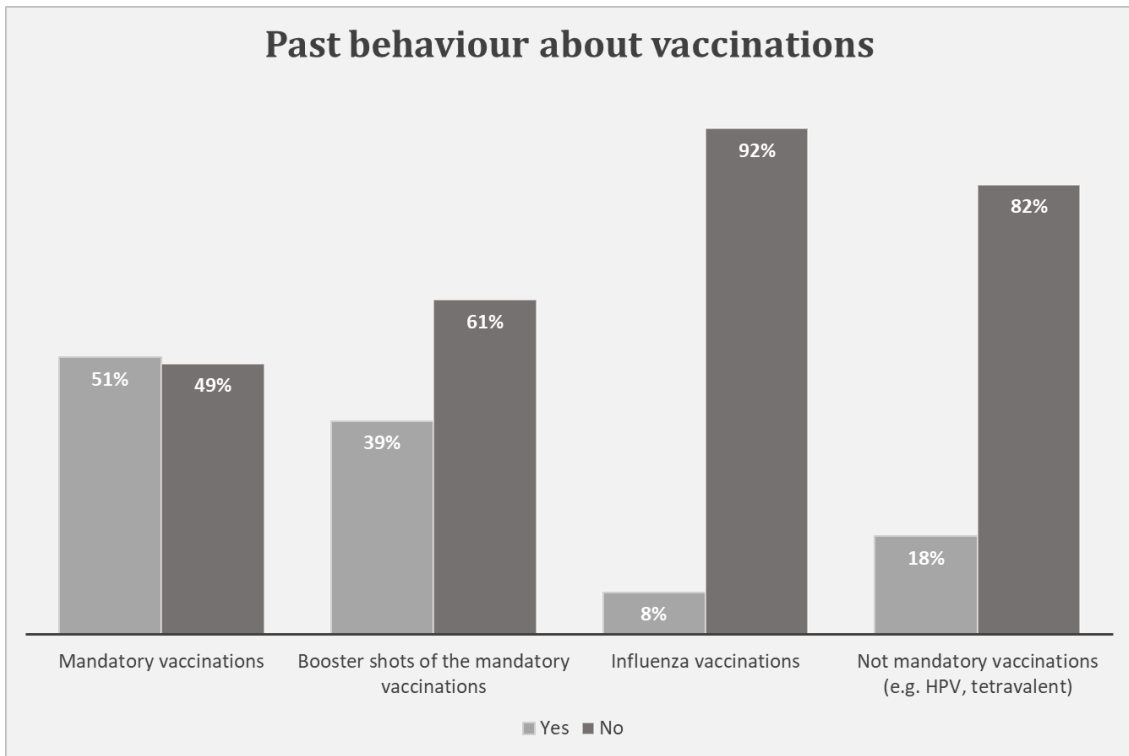
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8

9 **Figure 2.**

10

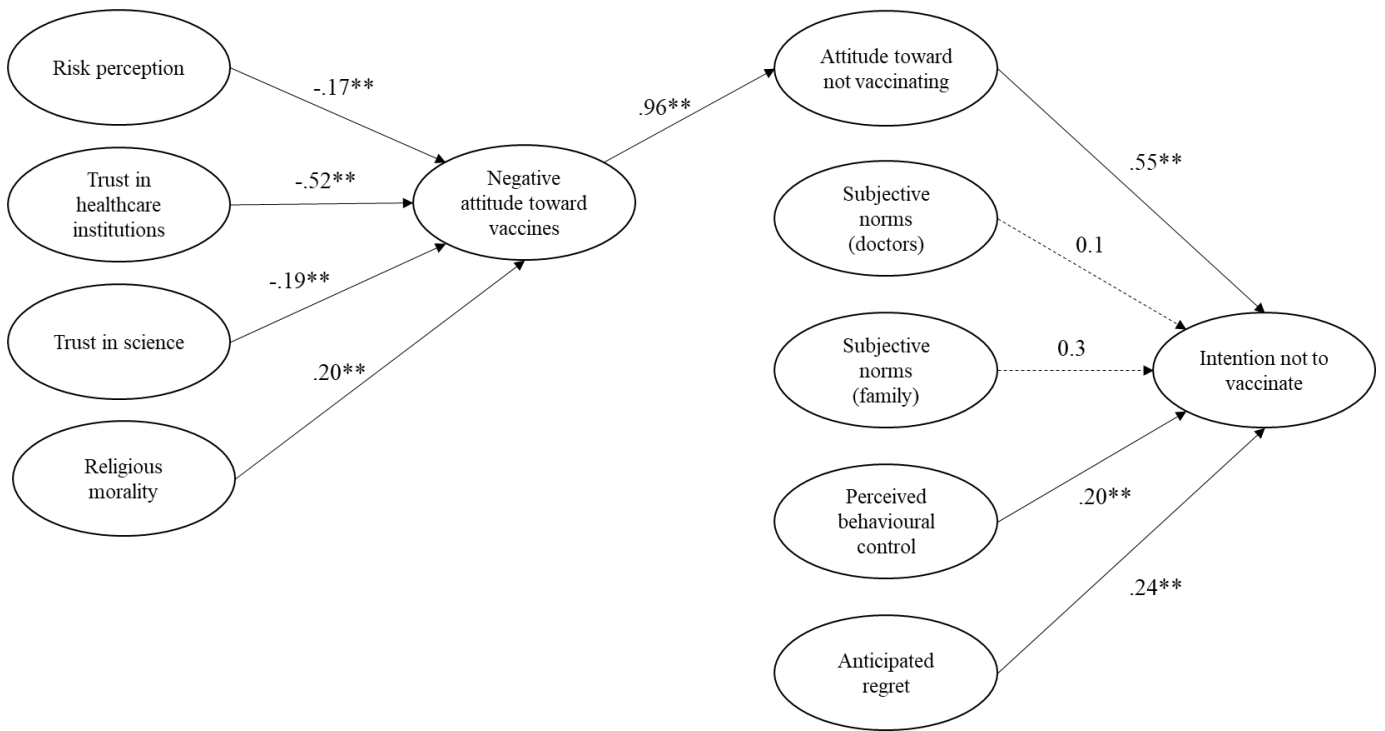


11

12 **Figure 3.**

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15

Note: All values indicate standardised regression coefficients. The dashed line indicates a not significant path. $^{**}p < .01$.

16

Figure 4.

17

18 **Figure 1** – Hypothesised extended TPB model to understand parents’ intention not to vaccinate
19 their children.

20 **Figure 2** – Reported sources of information about vaccines.

21 **Figure 3** – Parents’ past behaviour about vaccinations.

22 **Figure 4** – Structural model with standardised regression coefficients.

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