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Preferences for Vaccination: Does Health Literacy Make a Difference?

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ABSTRACT

Purpose. The purpose of this study is to examine to what extent health literacy is associated with parental preferences concerning childhood vaccination. Methods. A cross-sectional study was conducted among 467 Dutch parents of newborns aged 6 weeks (response rate of 37%). A self-reported questionnaire was used to measure health literacy by means of Chew's Set of Brief Screening Questions, as well as parental preferences for rotavirus vaccination by means of a discrete choice experiment. Five rotavirus-related characteristics were included (i.e., vaccine effectiveness, frequency of severe side effects, location of vaccination, protection duration, and out-of-pocket costs). Panel latent class models were conducted, and health literacy and educational level were added to the class probability model to determine the association between health literacy and study outcomes. Results. Lower educated and lower health literate respondents considered protection duration to be more important and vaccine effectiveness and frequency of severe side effects to be less important compared with higher educated and higher health literate respondents. While all respondents were willing to vaccinate against rotavirus when the vaccine was offered as part of the National Immunization Program, only lower educated and lower health literate parents were willing to vaccinate when the vaccine was offered on the free market. Conclusion: Health literacy is associated with parents' preferences for rotavirus vaccination. Whether differences in vaccination decisions are actually due to varying preferences or might be better explained by varying levels of understanding should be further investigated. To contribute to more accurate interpretation of study results, it may be advisable that researchers measure and report health literacy when they study vaccination decision behavior.

Two developments in the public domain appear to affect acceptance of vaccines in Western societies. First, there is a tendency to stimulate citizens to exert autonomy and to make well-considered decisions with respect to their health,[1] such as vaccination decisions. At the same time, the necessity of vaccination has become a more prominent part of the public discourse in Western countries, including the Netherlands.[2–6] However, for the prevention of most infectious diseases, including

rotavirus, vaccination of the majority of the population is essential to reach herd immunity.[7,8] The Netherlands has had a highly efficient National Immunization Program (NIP), with vaccination coverage rates of about 96% among young children aged 0 to 9 years.[9] To keep Dutch childhood vaccination rates high, insight into factors that determine parents' decisions about childhood vaccination is crucial to develop or revise vaccination education strategies.

Several studies have already investigated the influence of psychosocial determinants (e.g., attitude toward vaccination and perceived severity of the disease at hand) on vaccination decisions.[10–14] There is also a growing body of literature describing the effect of specific vaccine aspects such as vaccine safety and efficacy on parental preferences for vaccination and ultimately also their willingness to vaccinate.[14–22] Parental preferences are increasingly being elicited in order to guide policy measures such as the introduction of new vaccines and may serve as a starting point for communication strategies when the vaccine is introduced.[23]

Parental characteristics such as educational attainment is associated with the valuation of vaccine characteristics.[13,15–18] A concept that is related to educational attainment and has received increasing attention in the field of prevention is health literacy.[24] Health literacy reflects the ability to access, understand, appraise, and apply health-related information. Health literacy is highly relevant in the light of measuring vaccination preferences, since measuring preferences usually requires respondents to interpret and value risk information (e.g., risk of side effects). Previous research shows that, specifically, individuals with a lower educational level and lower health literacy have difficulties processing such information.[25–27] Misinterpreting information or being unable to understand information probably affects parental preferences for vaccination and thereby their willingness to vaccinate their newborn.[28] However, studies on the influence of health literacy on parents' preferences for vaccination are lacking in general.

Therefore, the current study aims to determine to what extent health literacy is associated with parental preferences for vaccination. Rotavirus vaccination served as a case for this study since this vaccine is currently considered for inclusion in the Dutch NIP. Rotavirus is the most common cause of severe acute gastroenteritis in infants and young children worldwide.[29] It can be prevented by vaccination of 6- to 10-week-old infants, as is recommended by the World Health Organization, as described in the publication of Patel and colleagues.[30]

METHODS

Sample Selection

This study is part of a larger study investigating parental preferences for rotavirus vaccination.[14] The target population was identified via Praeventis, which is a national register that registers the vaccination status of all Dutch newborns. A random selection of the parents of 1250 newborn babies aged 6 weeks received a questionnaire, to end up with a minimum of 250 completed questionnaires, based on a 20% to 30% response rate. Due to confidentiality agreements with Praeventis, no reminder letters could be sent. Hence, we were unable to monitor whether response was selective (selection bias), and no nonresponse information could be gathered. The Institutional Review Board of the University Medical Centre Utrecht advised that formal testing by a medical ethical committee was not necessary, as parents were

required to complete an anonymous questionnaire only once, which is in accordance with the guidelines laid down in the Declaration of Helsinki.[31]

Assessment of Demographic Characteristics and Attitude

The questionnaire was administered in Dutch. Different demographic factors were included in the questionnaire, among which were parents' age in years, gender, ethnicity (Dutch versus non-Dutch), and highest attained level of education. Self-reported highest attained level of education was categorized into 4 categories: no or primary education, lower secondary education, upper secondary or vocational education, or tertiary education (bachelor's degree or higher). Parental attitude toward vaccination and their intention to vaccinate their newborn were measured using statements. Parents could rate these statements on a 5-point Likert scale ranging from totally agree to totally disagree. Attitude was measured by 2 items: "I think vaccination is a good way to protect my child against rotavirus" and "For me it is obvious that I would vaccinate my child against rotavirus." Intention to vaccinate was used as a proxy for health action and was measured by one item, "I would vaccinate my child against the rotavirus when a vaccine would become available."

Assessment of Health Literacy

Health literacy was assessed by Chew's Set of Brief Screening Questions (SBSQ), which is a validated subjective measure of health literacy containing 3 items.[32–34] The SBSQ provides a feasible and reliable indication of those who are likely to have lower health literacy skills based on 3 questions.[34] Responses were scored on a 5-point Likert scale ranging from 0 to 4. Respondents' sum scores and mean scores over the 3 included items were calculated. An average score of ≤2 indicates inadequate health literacy, while an average score >2 indicates adequate health literacy.

Assessment of Parental Preferences

A discrete choice experiment (DCE) was used to measure the preferences of parents for specific characteristics of rotavirus vaccination. DCEs are increasingly being used to determine the relative importance of different intervention characteristics.[23,35,36] The random utility theory is the basis of this method, which assumes that any intervention can be described by its characteristics or "attributes" (such as vaccine effectiveness). The individual's preference for an intervention is determined based on the levels (e.g., effectiveness of 50% versus 80% versus 95%) of those attributes.[23,35,36] For this DCE, 5 attributes were selected with 2 or 3 levels each (Table 1; for a detailed description of the selection process, see the supplemental technical appendix). The first attribute is vaccine effectiveness, including the levels 55%, 75%, and 95%.[37,38] The second attribute was the frequency of severe side effects, which describes the number of vaccinated children who will suffer from intussusception due to vaccination.[39] The included levels were 1 in 10 000 children, 1 in 100 000 children, and 1 in 1 000 000 children.[40,41] The third attribute was the protection duration of the vaccine, which describes the number of years that the vaccine protects against a rotavirus infection. The levels were 1 y, 3 y, or 6 y.[37,38] The fourth attribute was health care facility. Within the Netherlands, all vaccines in the NIP are administered at a child welfare center (first level), but the general practitioner (GP) office (second level) was included because the rotavirus vaccine may not become part of the NIP; in that case, it is likely that this vaccine is administered here. The final attribute was out-of-pocket costs, including the levels

€0, €30, and €140 for complete vaccination.[42] Scenarios are constructed by varying the levels of the attributes. Respondents are provided with a series of choice tasks that consist of at least 2 scenarios. They have to choose the scenario they prefer most within every choice task. The supplemental technical appendix provides detailed information on the development of the DCE.

[TABLE 1]

Statistical Analyses

Data were analyzed using panel latent class (logit) models.[43⇓–45] Such models take into account the multilevel structure of our data (i.e., every respondent answered 9 choice sets). By means of this latent class model, it can be determined whether different preferences exist across unobserved subgroups of the population. Class membership is not assigned by researchers but is latent, so each respondent has a certain probability to belong to a class. However, demographic measures can be incorporated into the modeling procedure, which provides some insights about which respondents belong to what class.

Respondents with >10% missing answers on their choice tasks were excluded from the analysis (n = 12). All attributes were tested for linearity. All nonlinear attributes were recoded using effect codes.[46] This coding procedure codes the reference category as −1, and the sum of the effect coded attribute levels is always 0.[46,47] Based on model fit tests (Akaike information criterion, log likelihood), it was tested which model was most suitable for our data and how many classes could be identified within the data (models ranging from 1 to 5 classes were tested). This resulted in a 2-class model based on the utility equation (assuming the Von Neumann–Morgenstern utility) displayed below.

[BOX 1]

The systematic utility component (V) describes the measurable utility that respondent r belonging to class c reported for alternative a in choice task t.

The β_0 represents the alternative specific constant, and β_1–β_8 are the attribute-level estimates that indicate the relative importance of each attribute level. A significant attribute estimate within a certain class indicates that this attribute contributes to the decision-making procedure of respondents who belong to that class. The utility for the opt-out option was modeled as zero. In addition to the above-specified utility function, a class assignment model was fitted. All demographic measures were tested for a significant contribution to the class assignment mode, and the final class assignment utility function was

[BOX 2]

A significant demographic variable indicates that this variable contributes to the class assignment (e.g., if the β of the health literacy mean score variable is positive and significant for class 1, respondents with a higher health literacy mean score are more likely to belong to class 1).

Because of the unidentifiable scaling factor that is always present in DCE data,[47,48] the attribute-level estimates cannot be compared directly between the 2 classes. Therefore, importance weights were calculated based on the results of the panel latent class models, separately for both classes. Per attribute, the difference between

the highest and lowest attribute-level estimate was calculated. The largest difference value received an importance score of 1, representing the attribute that was deemed most important by respondents; the other difference values were divided by the largest difference value, resulting in a relative distance of all attributes to the most important attribute. Since these values can be interpreted only relatively to each other, the recoded values cannot be tested for statistical differences.
Situation-specific utility scores were calculated for both classes separately. A realistic vaccine situation was used in which the vaccine was expected to have a 95% effectiveness, a 1 in 100 000 frequency of severe side effects, and a protection duration of 3 years. Scores were calculated separately for a scenario in which the vaccine would be implemented within an NIP (i.e., free of charge and administered at a child welfare center) or on the free market (i.e., €140 out-of-pocket costs and administered at the GP). A positive utility score that is larger than 0 implies that respondents prefer vaccination over no vaccination, while a utility below 0 implies that respondents prefer not to vaccinate their newborn.

RESULTS

Sample Characteristics

In total, 467 of 1250 questionnaires were returned and included in the analyses (response rate of 37.4%). The mean age of the respondents was 31 years, and most respondents were female (82%; Table 2). The majority of the responders had a Dutch origin (92%) and attained a tertiary educational level (58%). On average, respondents reported a positive attitude toward rotavirus vaccination, since 77% reported that they thought vaccination is a good way to protect their child against rotavirus and 90% thought it was obvious to vaccinate their newborn against rotavirus (Table 2). In addition, about 79% of the parents intended to vaccinate their child against rotavirus if this vaccine became available (Table 2).
[TABLE 2]

Health Literacy

The majority of the respondents indicated that they never need any help reading letters and leaflets from their GP or the hospital (84%), they are very/fairly certain that they fill in medical forms correctly (93%), and they never find it difficult to learn more about their health because they do not understand written information (64%; Table 3). The internal consistency of the SBSQ (Cronbach's $\alpha = 0.61$) was comparable with that found in the validating study of Fransen and others.[34] The mean sum score of the respondents over these 3 items was 10.7 (min = 0, max = 12), resulting in a mean score of 3.6 (min = 0, max = 4). Lower-educated respondents had a significantly lower mean health literacy score compared with higher-educated respondents (3.4 [SD 0.55] and 3.7 [SD 0.37], respectively, $t = 8.16$, $P < 0.05$).

[TABLE 3]

Parental Preferences

Two classes were identified in the panel latent class model (Table 4). All attributes were significant and influenced parental preferences for rotavirus vaccination as expected. In both classes, parents were more willing to vaccinate if vaccine effectiveness increased. Moreover, parents preferred the lowest frequency of severe

side effects, a protection duration of 3 y, vaccine administration via a child welfare center, and lowest out-of-pocket costs.

[TABLE 4]

The average class probabilities were 0.58 and 0.42 for class 1 and 2, respectively. The probability of belonging to either class 1 or 2 was also dependent on health literacy score and educational level (Table 5). The model that included health literacy in addition to educational level significantly improved the model fit (log likelihood = −3062 and −3065, respectively, $P < 0.05$).

[TABLE 5]

Probabilities of Respondents Belonging to Either Class 1 or 2 of the Latent Class Model Based on Their Educational Level and Health Literacy Score[a]

Respondents with a higher educational level or a higher health literacy score were more likely to belong to class 2, while the probability of belonging to class 1 increased when the health literacy score or educational level decreased. Therefore, respondents with a lower health literacy score or educational level were more likely to belong to class 1. The probability of respondents with a lower health literacy level of belonging to class 1 increased if those respondents also attained a lower educational level and decreased if those respondents attained a higher educational level.

Respondents who belong to either class 1 or 2 reported different preferences with respect to rotavirus vaccination, indicating considerable preference heterogeneity (Figure 1). Respondents in both class 1 and 2 value out-of-pocket costs as most important (importance weight of 1) and health care facility as least important (lowest importance weight). Respondents in class 1 value protection duration as relatively more important compared with respondents belonging to class 2, while respondents in class 2 value vaccine effectiveness and frequency of severe side effects to be more important compared with respondents in class 1. Thus, respondents with a lower educational level and respondents with lower health literacy skills considered protection duration to be more important and vaccine effectiveness and frequency of severe side effects to be less important compared with respondents with a high education level and respondents with higher health literacy skills.

[FIGURE 1]

Vaccine-Specific Utility Scores

The utility scores for a realistic rotavirus vaccine (i.e., a 95% effectiveness, a frequency of severe side effects of 1 in 100 000, and a protection duration of 3 y) implemented within an NIP (i.e., free of charge and administered at the child welfare center) were 4.1 for class 1 (lower educated and lower health literacy skills) and 0.1 for class 2 (high educated and higher health literacy skills). These scores imply that respondents in both classes would vaccinate their newborn against the rotavirus in this particular scenario (i.e., utility scores are larger than 0). However, if the same vaccine would be implemented on the free market (i.e., €140 out-of-pocket costs and administered at the GP), the utility scores of class 1 (lower educated and lower health literacy skills) and class 2 (high educated and higher health literacy skills) would be 2.3 and −2.6, respectively. In this situation, respondents belonging to class 1 (lower

educated and lower health literacy skills) would still prefer to vaccinate their newborn against rotavirus, while respondents in class 2 (high educated and higher health literacy skills) would not.

DISCUSSION

Health literacy is associated with parental preferences concerning rotavirus vaccination. The current study results indicate that parents with lower health literacy skills and parents with a lower educational level value the protection duration of a vaccine as more important compared with parents with higher health literacy skills and parents with a higher education. Moreover, vaccine effectiveness and the frequency of severe side effects were perceived as more important by parents with higher health literacy skills and educational level compared with parents with lower health literacy skills and educational level.

Of particular interest is the finding that parents with lower health literacy valued vaccine effectiveness and the frequency of severe side effects as less important compared with parents with higher health literacy when deciding about vaccinating their newborn against rotavirus. Both of these vaccine characteristics were included in the DCE as a numerical value and depicted as a percentage and absolute frequency, respectively. Such information is difficult to interpret, especially for parents with lower health literacy skills.[26,27,49–51] If parents had difficulties interpreting and understanding these risk attributes, they might deem those attributes as less important. This is in line with previous research indicating that if information is less well understood, it is more likely to be neglected[28] or otherwise undervalued. Therefore, the difference in preference concerning vaccine effectiveness and the frequency of severe side effects between respondents with lower and higher health literacy skills might not be caused by actual differences in preference structures but rather reflect a lack of understanding. This is of particular importance for all future vaccine-related DCE studies, since they are likely to include attributes such as vaccine effectiveness and frequency of side effects. It should be explored whether preferences of respondents with lower and higher health literacy skills still differ if respondents interpret the numerical value of risks as similar as possible. Such research will reveal to what extent a decision-making process is influenced by understanding certain vaccine characteristics. In addition, future research is required to explore whether DCEs that are conducted online with the use of verbal support or in face-to-face settings might overcome issues with the understanding of vaccine characteristics.

Our findings showed that parents with higher health literacy were less likely to participate in any of the tested vaccination scenarios. This was mostly due to the large negative constant that was found for this class. The limited knowledge base with respect to health literacy and participation in vaccination programs suggests the opposite.[52–54] Besides differences in preferences for or understanding of vaccine characteristics, a possible interpretation of this finding may be derived from literature on the association between socioeconomic position and vaccination participation. Although the concept of health literacy is not equal to socioeconomic position, they are closely related. Literature suggests that individuals with a higher socioeconomic position are more critical toward childhood vaccination, which could lead to higher vaccination hesitance and lower participation rates.[1,55] It might therefore be that

parents with higher health literacy are less likely to vaccinate their newborn against rotavirus because of more critical thoughts about rotavirus vaccination.

The present study showed that health literacy influenced study outcomes irrespective of educational level. Both factors influenced the results in a similar direction, and they independently contributed to the class assignment models and all subsequent results. Moreover, health literacy significantly improved the model fit when added to the class assignment model. Health literacy can therefore not be adjusted for by only including educational level in future research on vaccination decisions. Health literacy should be measured and reported as a sample characteristic in all future research investigating vaccination decisions. This will lead to a more accurate interpretation of study results.

This study is subject to some limitations. First, although a response rate of 37.4% is relatively high for a postal questionnaire without reminders,[56⇓⇓–59] selective nonresponse seems plausible. Our sample shows a relatively large number of many highly educated parents compared with the Dutch general population.[60] Also, the scores on the SBSQ indicate that few respondents have poor health literacy in comparison to measures of health literacy in the general population.[61] It is likely that those with lower health literacy are underrepresented in the present study. This underrepresentation may be explained by the fact that if one perceives difficulties with reading, it seems likely that one will not participate in questionnaire-based research. The underrepresentation of lower health literate individuals implies that in real life, the associations between lower health literacy and preferences for vaccination characteristic may be stronger.

Second, the number of non-Dutch parents in our study population is relatively low compared with the general population of the Netherlands.[60] Generalizability of our results to preferences of non-Dutch parents may therefore be limited.

Third, although the applied measure of health literacy, the SBSQ, currently is the only short questionnaire validated in Dutch that can be assessed in writing, it provides a limited and subjective measure of functional health literacy. Compared with other (objective) measures of health literacy, the SBSQ may lead to an underestimation of the number of parents with lower health literacy.[34] Moreover, using a more comprehensive measure of health literacy and assessing the ability to critically judge information and apply it in various circumstances may help explain differences in preferences based on difficulty with judging information.

Fourth, a DCE can provide insight into conditions under which people are likely to choose for rotavirus vaccination, but in real life, decisions are being affected by factors such as previous experiences and social influences as well.[2,3,56,62,63] Although DCEs provide an indication under what conditions people are likely to choose for a certain product, in this case vaccination, it remains unsure what decisions are made in real life.

CONCLUSION

This study shows that health literacy is associated with parents' preferences for rotavirus vaccination. When vaccines are offered on the free market, parents with higher health literacy may be less likely to vaccinate their newborn against rotavirus than parents with lower health literacy. The results of this study call for health literacy as an important factor to take into account when studying vaccination behavior. Whether differences in vaccination decisions are actually due to varying

preference structures or might be better explained by varying levels of understanding should be further investigated. Altogether, it may be advisable that researchers should measure and report health literacy when they study vaccination decision behavior.

ARTICLE NOTES

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TABLES AND FIGURES

Table 1 Attributes and Levels That Were Included in the Discrete Choice Experiment

Attribute	Level 1	Level 2	Level 3
Vaccine effectiveness			
The percentage of children who will be protected against a rotavirus infection when vaccinated			
	55%	75%	95%
Frequency of severe side effects			
The number of vaccinated children who will suffer from intussusception due to vaccination. Intussusception is an acute condition in which part of the bowel telescopes into another adjacent part of the bowel, resulting in obstruction.			
	1 in 10 000	1 in 100 000	1 in 1 000 000
Protection duration			
The number of years that the vaccine protects against a rotavirus infection			
	1 y	3 y	6 y
Health care facility of vaccine administration			
Within the Netherlands, all vaccines in the National Immunization Program (NIP) are administrated at a child welfare center, The general practitioner (GP) office was included because the rotavirus vaccine may not become part of the NIP; in that case, it is likely that this vaccine is administrated at the GP.			
	Child welfare center	General practitioner	
Out-of-pocket costs			
Parents may have to pay (part) of the vaccine costs out of pocket			
	€0	€30	€140

Box 1

$$
\begin{aligned}
V_{rta|c} = {} & \beta 0_{|c} + \beta 1_{|c}\text{vaccine effectiveness}_{rta|c} \\
& + \beta 2_{|c}\text{severe side effects}_{1\text{ in }100,000\ rta|c} \\
& + \beta 3_{|c}\text{severe side effects}_{1\text{ in }10,000\ rta|c} \\
& + \beta 4_{|c}\text{protection}_{3\text{ years }rta|c} \\
& + \beta 5_{|c}\text{protection}_{6\text{ years }rta|c} \\
& + \beta 6_{|c}\text{location}_{\text{Child Welfare Center }rta|c} \\
& + \beta 7_{|c}\text{out-of-pocket costs}_{€30\ rta|c} \\
& + \beta 8_{|c}\text{out-of-pocket costs}_{€140\ rta|c}
\end{aligned}
$$

Box 2

$$
\begin{aligned}
V_{rc} = {} & \beta 0_{|c} + \beta 1_{|c}\text{health literacy mean score}_{r} \\
& + \beta 2_{|c}\text{high educational level}_{r}.
\end{aligned}
$$

Table 2 Sample Characteristics

		Mean (SD)	Percentage
Demographics			
Age, y (n = 466)		31.2 (5.1)	
Gender (n = 466)	Female		81.5
Ethnicity (n = 466)	Dutch		91.8
Educational level (n = 460)	No or primary		0.4
	Lower secondary		7.8
	Upper secondary or vocational education		33.7
	High tertiary		58.0
Statements[a]			
Attitude	I think vaccination is a good way to protect my child against rotavirus (n = 465)		76.6
	For me it is obvious that I would vaccinate my child against rotavirus (n = 467)		89.5
Intention	I would vaccinate my child against the rotavirus when a vaccine would become available (n = 466)		79.4

a. Proportion of respondents who (totally) agreed with these statements.

Table 3 Health Literacy Scores, Both Combined and Separate per Item of the Chew's Set of Brief Screening Questions[a]

	Health Literacy Scores Mean (SD)	Range			
Sum score over 3 items	10.7 (1.5)	3–12			
Mean score of 3 items	3.6 (0.5)	1–4			
Distributions of Respondents' Answers to the 3 Items Separately (%)					
	Never	**Now and Then**	**Sometimes**	**Often**	**Always**
How often does someone help you to read letters and leaflets from your general practitioner or the hospital?	83.9	9.4	4.9	1.7	0.0
How often is it difficult for you to learn more about your health because you do not understand written information?	64.2	26.6	8.8	0.4	0.0
	Very Much	**Fairly**	**A Bit**	**A Little Bit**	**Not at All**
How certain are you that you fill in medical forms correctly?	46.7	46.7	5.6	0.9	0.2

a. Chew's Set of Brief Screening Questions measures health literacy.

Table 4 Association between Health Literacy and Parental Preferences for Rotavirus Vaccination Based on the Panel Latent Class Analysis[a]

		Class 1		Class 2	
		Estimate	SE	Estimate	SE
Constant		−1.91***	0.26	−6.02***	0.36
Vaccine effectiveness		0.53***	0.03	0.54***	0.04
Frequency of severe side effects	1 in 1 000 000 (ref)	0.42***	0.08	0.80***	0.09
	1 in 100 000	−0.08	0.06	−0.16*	0.09
	1 in 10 000	−0.34***	0.09	−0.64***	0.11
Protection duration	1 y (ref)	−0.83***	0.06	−0.64***	0.09
	3 y	0.72***	0.09	0.40***	0.09
	6 y	0.11	0.07	0.24**	0.11
Healthcare facility	General practitioner (ref)	−0.05	0.04	−0.12**	0.06
	Child welfare center	0.05	0.04	0.12**	0.06
Out-of-pocket costs	€0 (ref)	0.59***	0.06	1.12***	0.10
	€30	0.53***	0.07	0.18*	0.11
	€140	−1.12***	0.06	−1.30***	0.10
Class probability model					
Constant		2.82***	0.95	—	—
Health literacy score		−0.57**	0.28	—	—
Higher education		−0.76***	0.26	—	—
Average class probability		0.58		0.42	

a. Two-class model fit Akaike information criterion (AIC) = 6166; log likelihood = −3062, 1-class model fit AIC = 7930 and log likelihood = −3956. Because of the effects of the coding procedure, the estimate of the reference category can be calculated as −1 × (the sum of the other betas within the same attribute). The standard error was calculated using the delta method. Estimates can be compared only within the classes and not between classes because of differences in scale between the classes.[47,48]
* $P < 0.10$; ** $P < 0.05$; *** $P < 0.01$.

Table 5 Probabilities of Respondents Belonging to Either Class 1 or 2 of the Latent Class Model Based on Their Educational Level and Health Literacy Score[a]

	Probability of Belonging to Class 1	Probability of Belonging to Class 2
High educational level		
Health literacy score = 4	0.45	0.55
Health literacy score = 3	0.58	0.41
Health literacy score = 2	0.71	0.28
Health literacy score = 1	0.81	0.18
Health literacy score = 0	0.88	0.11
Lower educational level		
Health literacy score = 4	0.63	0.37
Health literacy score = 3	0.75	0.24
Health literacy score = 2	0.84	0.16
Health literacy score = 1	0.90	0.10
Health literacy score = 0	0.94	0.06

a. High education was defined as tertiary education, while all other educational levels were conceptualized as lower educational level. Health literacy mean scores range from 0 to 4. A score between 0 and 2 indicates poor health literacy, whereas a score ≥2 indicates adequate health literacy.

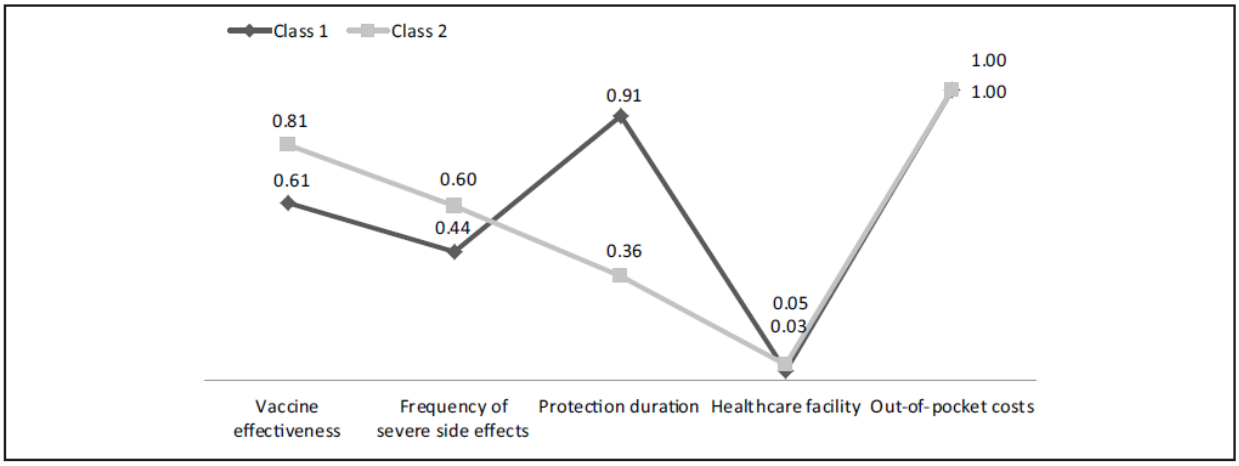

Figure 1 Importance weights of the attributes stratified by class. Importance weights reflect the relative distance of all attributes to the most important attribute on a scale from 0 to 1 (1 indicating the most important attribute).