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Acceptability and Accessibility of a Shigellosis Vaccine in Nha Trang City of Viet Nam

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ABSTRACT

The acceptability and accessibility of a hypothetical *Shigella* vaccination campaign was explored. A household survey was conducted with 539 randomly-selected residents of six communes in Nha Trang city of Viet Nam. Four categories of acceptability, such as refusers, low acceptors, acceptors, and high acceptors, were established, Refusers were significantly more likely to be elderly women and were less likely to know the purpose of vaccinations. Low acceptors tended to be male, elderly, and live in urban areas. Low acceptors perceived the disease as less serious and themselves as less vulnerable than acceptors and high acceptors. In terms of accessing vaccination, the commune health centre workers and commune leaders were the preferred sources of information and commune health centres the preferred location for vaccination. Direct verbal information from healthcare providers and audio-visual media were preferred to written information. The respondents expressed a desire for knowledge about the side-effects and efficacy of the vaccine. These findings are significant for targeting specific messages about shigellosis and vaccination to different populations and maximizing informed participation in public-health campaigns.

Key words: Dysentery, Bacillary; *Shigella*; Vaccination; Perceptions; Viet Nam

INTRODUCTION

While several candidate *Shigella* vaccines are at various stages of clinical testing, there is currently no viable vaccine available for introduction into a public-health programme. As vaccine development continues, there is also a need to understand the population demand for such a vaccine in those countries where a future vaccine would most likely be used. The Diseases of the Most Impoverished (DOMI) Programme of the International Vaccine Institute, Seoul, Korea, has implemented shigellosis disease-burden studies in Bangladesh, China, Indonesia, Pakistan, Thailand, and Viet Nam. As part of these projects, sociobehavioural research has been conducted to obtain data on perceptions and attitudes of healthcare providers, community leaders, and community residents towards shigellosis and other diarrhoeal diseases, healthcare use relating to diarrhoeal diseases, experience and attitudes towards vaccination, and logistical factors relating to delivery of vaccine.

The present paper uses the household survey data from the Nha Trang, Viet Nam, research site to explore the acceptability of a *Shigella* vaccine and logistical factors that would increase the accessibility of such a vaccine for this population.

Background and significance

Shigellosis is a disease characterized by diarrhoea, often containing blood and mucous, abdominal pain,

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and fever. *Shigella sonnei, S. flexneri,* and *S. dysenteriae* cause bacillary dysentery. *S. sonnei* is more common in developed countries, whereas the latter two are most common in developing countries. *S. dysenteriae* type 1 is the cause of epidemic dysentery. Annually, there are approximately 164 million cases of shigellosis with 163 million of those cases in developing countries. An estimated 1.1 million deaths occur every year worldwide. The majority (69%) of cases are children aged less than five years and, likewise, the majority (61%) of deaths occur in this population (1).

Strains of *Shigella* isolated in Viet Nam are increasingly resistant to the most affordable and widely-used antibiotics, such as trimethoprim-sulphamethoxazole and ampicillin (2,3). As these antimicrobial-resistant strains become more widespread, the need for public health-preventive measures, including vaccination, is increasingly important.

Attempts to develop a shigellosis vaccine have been underway for 50 years (4), with the more promising approaches, including live-attenuated vaccines, conjugate polysaccharide vaccines, and sub-cellular vaccines. The development of these vaccines has been complicated by the uncertainty regarding cross-protection of *Shigella* serotypes. At this time, a live-attenuated *Shigella* vaccine—the FS vaccine—remains globally the only licensed *Shigella* vaccine. Its protective efficacy against *S. flexneri* is 61-65% and against *S. sonnei* 50-72% (5). The FS vaccine can be purchased in China. Conjugates to protect against three *Shigella* serotypes have been developed by Robbins and coworkers: *S. dysenteriae* type 1 O-TT, *S. flexneri* 2a O-rEPA, and *S. sonnei* O-rEPA (6).

Results of a double-blind randomized controlled trial in the Israel Defense Forces showed that *S. sonnei* O-rEPA could provide a 74% protective efficacy which was statistically highly significant (7). Unfortunately, the manufacturing process of conjugate *Shigella* vaccines is not easily transferable, and the resulting product can be expected to be rather expensive. More recent alternative *Shigella* vaccine-development plans include sub-cellular vaccine candidates. The O-antigen of *Shigella* when associated with ribosomes and administered subcutaneously is highly immunogenic in mice, guinea pigs, and monkeys (8). A sub-cellular vaccine candidate may be protective and affordable. The ultimate hurdle for any *Shigella* vaccine probably remains a need to combine several antigens in a polyvalent vaccine candidate to achieve protection against shigellosis.

Social scientists have made significant contributions to understanding the perceived acceptability and accessibility of sectors of healthcare systems, including vaccination programmes. For example, Nichter discusses the implementation of childhood-vaccination programmes in Asia and considers such diverse variables as: (a) local demand as tempered by distrust between groups; (b) effectiveness and cost of campaign programmes; (c) organizational culture and infrastructure of national health services and influences on performance of local health workers; and (d) household dynamics, including decision-making in regard to cash expenditure and healthcare-seeking practices (9). Other factors that influence the acceptance of a vaccine include perceptions of the severity of and vulnerability to the disease (10,11). In addition, attributes of the vaccine, including actual or perceived side-effects, effectiveness of the vaccine in protecting against the disease, and vaccine characteristics (e.g. oral vs injection) can influence decisions regarding vaccination. Generally speaking, in industrialized countries, the fear that vaccines will cause long-term or permanent 'side-effects' (e.g. autism, arthritis) affects decision-making more than in developing countries, where fear of infection is still much higher (12). Other barriers to immunization can include a lack of information on vaccines and poor communication between healthcare providers and potential recipients (12,13).

MATERIALS AND METHODS

The general study design for the shigellosis sociobehavioural study included two phases. The first phase was qualitative, including case studies and open-ended semi-structured interviews with commune residents, commune leaders, and healthcare providers. The second phase was a quantitative household survey. The survey consisted of 94 items, including demographic information, general healthcare-seeking behaviour, definition of shigellosis, causes, prevalence, severity and vulnerability of shigellosis, and prevention and treatment of shigellosis. In addition, respondents were asked about their knowledge and perceptions regarding vaccination, acceptability of a hypothetical shigellosis vaccine, their willingness to pay for such a vaccine, and vaccine information and delivery logistics. The results presented in this paper are based on the findings from the household survey.

Research site

The Khanh Hoa province, located in south central coastal Viet Nam, has 132 communes, of which 107 (81.1%)

are characterized as rural. Nha Trang, the largest city and the provincial capital, has 26 communes and a population of approximately 327,000.

The shigellosis disease-burden study was conducted in 32 communes in the Khanh Hoa province—15 in Nha Trang city and 17 in Ninh Hoa district. The socio-behavioural study was conducted in six of the 15 study communes within Nha Trang city.

The healthcare system in Nha Trang is similar to that throughout Viet Nam and includes both public and private facilities. Each commune has a commune health centre (CHC), funded by the government. Members of staff at CHCs are practitioners with 2-3 years of training in biomedical sciences. Four government-funded 'polyclinics', larger than CHCs, provide more comprehensive services. Polyclinic staff includes medical school graduates. In addition to these health facilities, there are private physicians and pharmacists. Various generic and brand-name drugs are available in the study area. Antibiotics are freely available without a prescription. In addition to biomedical practitioners, there are traditional doctors engaged in 'thuoc dong y', a form of Chinese medicine.

The Expanded Programme on Immunization (EPI) of Viet Nam includes vaccinations against tuberculosis (BCG), diphtheria, pertussis, tetanus (DPT), polio, and measles for children aged less than one year and tetanus vaccine for pregnant women. These vaccines are provided free of charge at the government health facilities, primarily CHCs. Generally, rates of participation in EPI are high. In 2002, 89.5% and 77.1% of children aged less than one year in the Khanh Hoa province and in Nha Trang respectively were fully immunized.

In addition, Japanese encephalitis, hepatitis B, rabies, and tetanus vaccines are available through the government for the general population. These vaccines cost from 10,000 vnd (~US$ 0.6) for the Japanese encephalitis vaccine for children aged less than 36 months to 102,000 vnd (~US$ 6.8) for imported hepatitis B vaccine. The rates of participation vary for these paid vaccine programmes, and the majority of recipients are children.

Population and sampling

The household survey was administered to 539 randomly-selected residents aged 21 years and older living in the six study communes. The 2001 census conducted for the shigellosis disease-burden study was used as the population from which the sample was selected. To have a more equal representation of both men and women in a randomly-selected group of male-headed households, an adult female was selected as the respondent.

Data collection

During a cross-site meeting of 'in-country' social scientists and DOMI Social Science Task Force members, the original shigellosis instrument was developed from the qualitative data collected in the 6 participating countries. This instrument was piloted in Dhaka, Bangladesh, in March and April 2002. Further using the qualitative data from Viet Nam, this cross-site instrument was adapted to meet specific issues and needs at the Vietnamese site. Prior to implementation of the survey, two pilots of the Vietnamese version of the survey were conducted. In addition, an outside consultant reviewed the final translated instrument to ensure the accuracy of the translation.

Data were collected consecutively for approximately four days in each commune for about six weeks beginning on 31 May 2002. The survey was administered one-on-one, and the interviewer marked the answers of the respondents on the instrument. Community recruiters scheduled appointments for interview, and the interviews were conducted at the respondents' homes. Each interview lasted for 45-60 minutes. After the interview, the respondents were paid a small stipend (50,000 vnd; ~US$3) to compensate for their time.

Data entry

Interview forms were pre-coded. A shell for data entry was developed in SPSS (14), and data were entered into this shell. After the data were entered, the entire data set was reviewed for accuracy. In addition, a third round of review was conducted to ensure consistency in coding across items and as an extra check on accuracy. Finally, a fourth review included recoding some of the 'other' responses into specific categories.

Data analysis

Both SPSS and Stata (14,15) software were used in data analysis. Preliminary analysis included descriptive statistics of demographic characteristics and creation of variables for income level, education level, age quartiles, and residency. For analysis of vaccine acceptability, the respondents were grouped into four categories: refusers, low acceptors, acceptors, and high acceptors.

The refuser category included those individuals who stated that they would not take the vaccine. The other categories were created based on reported monthly income of the respondent and amount s/he would be willing to pay for the shigellosis vaccine. Crosstab and Pearson chi-square analyses were conducted to determine significant differences between categories of vaccine acceptability and other variables, including demographics, perceptions of vulnerability and severity, and the perceived availability of other preventive measures. For accessibility, frequencies were run on items relating to desired information regarding vaccines, household decision-making, and delivery of vaccine information. Using chi-square, these items were then analyzed for significant differences by demographic groups.

Ethics

The national ethics review board of the Government of Viet Nam in Ha Noi and the World Health Organization (Geneva, Switzerland) approved the shigellosis socio-behavioural research project. Interviewers were trained in ethical research and obtaining consent. Written consent was obtained from each participant.

RESULTS

Demographics

Of the 539 respondents, 299 (55.5%) were male and 466 (86.5%) were married. Their mean age was 50 years. For analysis, the respondents were divided into four age quartiles (Table 1).

The median household size was five (range 1-6). Of the respondent households, 449 (83%) had at least one child aged less than 19 years and 161 (30%) had at least one child aged less than five years.

Residents in six communes were invited to participate in the survey. Based on the population size and density, and predominate employment type, two communes (V. Phuong and V. Trung) were classified as 'rural', two communes (X. Huan and P. Long) were classified as 'urban', and two (V. Luong and V. Nguyen) as 'seaside'. There were 90 respondents from each commune with the exception of V. Trung with 89 respondents.

While 28 (5%) of the respondents never attended any school, 119 (22%) completed high school and 61 (11%) went to a vocational school or university. For the purposes of this study, we created five education groups (Table 1).

In total, 143 (26.5%) respondents were not employed, and 22 (4.1%) were 'retired'. Men were significantly more likely to be employed than women (223/299,78% vs 141/240, 58.8%) (p=0.000), and individuals with low education were significantly less likely to be employed than respondents with higher education (p=0.000). The mean monthly income of the respondent's household was 1,268,883 vnd (~US$ 85). For analytical purposes, the respondents were sub-divided into four equal income groups according to the stated monthly income of their household (Table 1). In the fourth income group, only four individuals reported an income over 5,000,000 vnd per month (US$ 335).

Table 1. Age, education, and income analysis groups

Group	Definition	No.	Percentage
Age			
Group 1	<40 years	135	25
Group 2	40-47 years	135	25
Group 3	48-61 years	134	25
Group 4	62-87 years	135	25
Education			
Group 1	<3 years of schooling	141	26
Group 2	4-6 years of schooling	133	25
Group 3	7-10 years of schooling	128	24
Group 4	10 years to completion of high school	105	19
Group 5	University education	32	6
Income (VND)			
Group 1	100,000-600,000 (US$ 6.67-40)	135	25
Group 2	600,001-1,000,000 (US$ 40-67)	135	25
Group 3	1,000,001-1,500,000 (US$ 67-100)	134	25
Group 4	1,500,500-15,000,000 (US$ 100-1,000)	135	25

Acceptability of vaccine

As noted above, for analysis of vaccine acceptability, the respondents were categorized into four groups. These groups were constructed based on two questions—one asking the individual if s/he would take the shigellosis vaccine, and the second question asking how much s/he would pay for the vaccine.

The 'refusers' included only those individuals who stated that they would not take a shigellosis vaccine (24/539, 4.5%). The remaining individuals were divided into three categories of 'low acceptors', 'acceptors', and 'high acceptors' (Table 2). Individuals categorized as 'low acceptors' included those who stated that they would take the vaccine, but would not pay and individuals in the highest two income groups who would pay 15,000 vnd (~US$1) or less (147/387, 38.0%). The 'high acceptors' category included those individuals in the lower two income groups who would pay more than 31,000 vnd (~US$2) and all individuals who stated that they would pay more than 50,000 vnd (~US$3.33) (18/387, 4.7%). The 'acceptor' group included those

Significantly more refusers (15/24, 62.5%) (p=0.000) were in the oldest age quartile (62-87 years) compared to the other three age groups. In this oldest age quartile, 18.5% (12/65) of women stated that they would not accept the vaccine compared to 4.3% (3/70) of men. Among those who stated that they would not accept a vaccine, 70% (17/24) stated that vaccines "are to prevent disease in all people" compared to 91.9% (467/508) of those accepting the vaccine (p=0.003).

The respondents who stated that they would refuse the vaccine were significantly more likely to say that *Shigella* is 'not a concern' in their commune (13/24, 54.2%) compared to the respondents accepting the vaccine (140/507, 27.6%) (p=0.000). In addition, the refusers significantly more often stated that it was 'unlikely' someone in their household would contract dysentery (8/24, 33.3%) compared to those respondents who would accept the vaccine (75/508, 14.8%) (p=0.005). The refusers also were generally less likely to state that shigellosis is 'very serious', however this trend was only significant for severity of disease for adults aged 9-50 years (1/24, 4.2% vs 77/508, 15.2%).

Table 2. Number and percentage of individuals in three categories of vaccine acceptability ('low acceptors', 'acceptors', 'high acceptors') (n=387)

	Amount would pay for shigellosis vaccine				
Income group	Would not pay	US$0.06-1.00	US$1.06-2.00	US$2.06-3.34	US$3.40-6.68
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Group 1 (US$ 6.67-40)	Low acceptor 8 (2.1)	Acceptor 72 (18.6)	Acceptor 10 (2.6)	High acceptor 5 (1.3)	High acceptor 1 (0.3)
Group 2 (US$ 40-67)	Low acceptor 7 (1.8)	Acceptor 67 (17.3)	Acceptor 20 (5.2)	High acceptor 5 (1.3)	High acceptor 1 (0.3)
Group 3 (US$ 67-100)	Low acceptor 11 (2.8)	Low acceptor 55 (14.2)	Acceptor 24 (6.2)	Acceptor 2 (0.5)	High acceptor 3 (0.8)
Group 4 (over US$ 100)	Low acceptor 8 (2.1)	Low acceptor 58 (15.0)	Acceptor 22 (5.7)	Acceptor 5 (1.3)	High acceptor 3 (0.8)

between 'low acceptors' and 'high acceptors' who would pay an amount deemed reasonable for their income group (222/387, 57.4%). Individuals who stated that they 'didn't know' if they would use the vaccine (148/535, 27.7%) were excluded from the analysis. These latter respondents were equally distributed across the four income groups.

The refusers were a distinctive group in terms of gender, age, knowledge of purpose of a vaccine, and perceived vulnerability. There were some trends among refusers in regard to perceived severity of disease for different age groups, but no differences on other items relating to severity of disease.

Among those respondents who would accept the vaccine, there were significant differences between low acceptors, and acceptors and high acceptors in relation to gender, income level and residency, and perceptions of vulnerability and severity. The low acceptors were more likely to be men (89/135, 65.9%) than women (46/135, 34.1%). This was particularly true for men in the oldest age quartile (62-87 years) with 58.6% (17/29) of low acceptors compared to 17.2% (5/29) of women (p=0.001). The low acceptors (61/135, 45.2% and 59/135, 43.7%) were more likely to be in the upper two income groups compared to both acceptors (25/212, 11.8% and 27/212, 12.7%) and high acceptors (3/18, 16.7%, and 3/18, 16.7%) (p=0.000). The low

acceptors also were significantly more likely to live in the urban communes. Thus, 49.2% (61/124) of urban residents were low acceptors compared to 31% (36/116) of rural residents and 30.4% (38/125) of seaside respondents (p=0.014).

While not significant, the low acceptors (13/135, 9.6%) were more likely to live in large households (9 or more members) than either acceptors (8/210, 3.8%) or high acceptors (1/18, 5.6%). The low acceptors (30/135, 22.2%) significantly more often stated that it was 'unlikely' that someone in their household would contract *Shigella* than acceptors (16/212, 7.5%) or high acceptors (3/18, 16.7%) (p=0.011). The high acceptors were less likely to state that community infrastructure was 'adequate'. Thus, only 33.6% of the high acceptors felt that the supply of clean water was adequate compared to 56.1% of the acceptors and 63.7% of the low acceptors (p=0.006). Likewise, only 33.3% of the high acceptors agreed that community sewage disposal was adequate compared to 49.5% of the acceptors and 51.9% of the low acceptors (p=0.000)

When asked about the severity of shigellosis for different age groups, the acceptors were more likely to state that the disease is 'very serious' than low acceptors and less likely to state that the disease was 'not serious'. These differences were significant for all age categories, except 'children aged 1-4 year(s)' and 'adolescents aged 11-18 years', and for these two age categories the general trend was consistent (Table 3).

The respondents were also asked how much of an economic effect they would anticipate if a household member contracted *Shigella*. The question was asked for different age categories and for adult men and women, and the respondents were only asked about categories relevant to their particular household membership. There were significant differences in perceptions of the economic effect of a case of *Shigella* among low acceptors, acceptors, and high acceptors for all categories, except 'adults aged over 50 years'. These differences show that the high acceptors are less likely to perceive 'no economic effect' on their household than either acceptors or low acceptors (Table 4).

Logistics and access for introduction of vaccine

One purpose of the household survey was to provide data on maximizing participation in either a future vaccine trial or public-health programme. The respondents were asked what types of information they would need to decide whether or not to take the vaccine, who should provide that information, and how to disseminate that information. In addition, they were asked where vaccine delivery should take place.

In regard to information about the vaccine, the respondents wanted to know about the level of protection (279/539, 51.8%), duration of protection (253/539, 46.9%), and adverse effects (248/539, 46.0%). Less important were cost (195/539, 35.6%), number of doses (136/539, 25.2%), and type of vaccine (oral or injection) (90/539, 16.7%). Among residents who stated that they would need 'no information' about the vaccine, age and education were significant variables. Individuals in the lowest education group (<3 years of schooling) (40/135, 29.6%) were significantly less likely to need information than individuals in the higher education groups (p=0.000). The respondents in the oldest quartile (62-87 years) (43/135, 31.9%) were also significantly less likely to state

Table 3. Perceived severity of shigellosis for five age categories by acceptability of vaccine

How serious is shigellosis for the following age groups?		Not serious		Very serious	
		No.	%	No.	%
Infants aged less than one year*	Low acceptors	8	5.9	67	49.5
	Acceptors	7	3.3	138	65.1
Children aged 1-4 year(s)	Low acceptors	4	3.0	56	41.5
	Acceptors	4	1.9	117	55.5
Children aged 5-10 years**	Low acceptors	5	3.7	44	32.6
	Acceptors	6	2.8	95	44.8
Adolescent aged 11-18 years	Low acceptors	18	13.3	25	18.5
	Acceptors	23	10.8	56	26.4
Adults aged 19-50 years*	Low acceptors	26	19.3	15	11.1
	Acceptors	27	12.7	49	23.1
Adults over 50 years**	Low acceptors	11	8.1	21	15.6
	Acceptors	12	5.7	66	31.1
*p<0.05, **p<0.01					

that they need information than younger respondents (p=0.000).

In terms of decision-making about receiving the vaccine, the majority of the respondents stated that they would make the decision themselves (261/533, 52.1%) or as a joint decision with a spouse (186/533, 37.1%). Women were less likely than men to state that they would make the decision themselves (84.4% vs 94.3%). The 21 respondents who stated that their spouse would be the primary decision-maker were approximately equally men (10/21, 47.6%) and women (11/21, 52.4%).

The majority of the residents stated they would prefer to receive information about the vaccine from the commune health centre staff (470/539, 90.7%). To a lesser extent, the Commune People Committee leaders (114/539, 22.9%) and mass organization leaders (e.g. Women's Unions) (92/539, 18.7%) were desired sources of information.

DISCUSSION

Initial analysis of the household survey suggested that over 95% of the respondents would participate in a *Shigella* vaccination programme. However, evidence in terms of both vaccine trials and non-EPI vaccine programmes suggest higher rates of non-participation. In a trial of a killed, oral cholera vaccine in Hue, Viet Nam, within the vaccine group, participation (two doses) was approximately 77% (16). In a trial for the same vaccine in Nha Trang in 1997, the coverage for two doses was approximately 83.4% (17).

Those respondents who stated that they would refuse the vaccine ('refusers') were primarily elderly women. This group also had less knowledge about the purpose of a vaccine. The 'refusers' seemed to perceive themselves as less vulnerable based on the responses to questions about 'concern' about shigellosis in the community

Table 4. Perception of 'no effect' on household economics for gender and age categories by vaccine acceptability

Gender and age category	Vaccine-acceptance category					
	Low acceptor		Acceptor		High acceptor	
	No.	%	No.	%	No.	%
Children aged 0-10 year(s)*	18	21.2	22	16.9	1	8.3
Adolescents aged 11-18 years***	23	28.4	23	18.7	1	10.0
Adult females aged 19 years and older**	27	21.1	38	18.7	1	5.9
Adult males aged 19 years and older*	24	18.8	37	19.0	1	5.9
*p<0.05, **p<0.01, ***p<0.001						

There were no significant differences by education, income, age, gender, or residency for sources of information.

The preferred media of information delivery was loud speakers (388/539, 72%), followed by information dissemination through home visits (269/539, 49.9%), commune meetings (201/539, 37.3%), television (129/539, 26.9%), and radio (129/539, 23.9%). Printed materials, such as posters (58/539, 10.8%), newspapers, (48/539, 8.9%), and leaflets (37/539, 6.9%) were less desired forms of communication. There were significant differences by education group in regard to media of information delivery. Individuals in the lower education group (<3 years of schooling) were less likely to want information through newspapers (p=0.004) and television (p=0.000) compared to individuals in the higher education group. Women also had different preferences and were significantly more likely than men to prefer information through radio (p=0.007), commune meetings (p=0.000), and home visits (p=0.000).

and 'likelihood' of a household member contracting the disease. Perceptions of severity of shigellosis, however, did not seem to be a primary factor associated with the decision to refuse the vaccine.

Those respondents categorized as 'low acceptors' were more likely to be from urban areas, men, and to be from higher-income groups. This is consistent with the findings of the qualitative sociobehavioural study for the oral cholera vaccine in Viet Nam in which both men and individuals from higher-income groups tended to feel less vulnerable to cholera and, therefore, did not want the vaccine. A decreased perception of vulnerability also appears to affect the acceptability of vaccine. The high acceptors were less likely to feel that current sanitation efforts, including clean water and sewage disposal, were 'adequate' and, thus, they may have perceived themselves as more vulnerable to disease. The elderly were also over-represented among the low acceptors. This could be attributable perceptions of being 'too old' to receive vaccination.

Perception of severity of disease appears to be a factor for vaccine acceptance. The low acceptors were less likely to perceive the seriousness of the disease and were more likely to perceive 'no economic effect' from a household member contracting shigellosis. In terms of the physical consequences of this disease, this is consistent with other research in which severity or fear of disease was a significant factor for decisions to vaccinate. An individual's perception of economic effects of disease may be particularly important if s/he must pay for vaccination for him/herself and other household members. If s/he does not anticipate the disease having an economic impact on the household, s/he may not be willing to pay money to prevent that disease. The respondents from larger households were more likely to be 'low acceptors', and this could also be a response to perceived inability to pay for a large number of vaccines.

These findings suggest the need for various public-health messages for either vaccine-demonstration projects or campaigns. Such messages would include: (i) information about the purpose of a vaccine, particularly that vaccines are not necessarily only for children; (ii) information which stresses that, while the disease is more prevalent among young children, it is not confined to that group. It may also be important to state that, while some people may not become sick, they can be carriers and others in their household and/or community can contract the disease; (iii) information regarding both immediate and longer-term physical effects of shigellosis in order for people to more accurately assess the importance of the vaccine for their health; and (iv) information which compares the cost of vaccine for the individual to costs of treatment for a case of shigellosis. This may be particularly important in Viet Nam and other places with a history of free vaccination services. Some of these messages may need to be targeted to specific groups, e.g. higher-economic classes, the elderly. Generally, working-age men are less engaged than women in routine medical care, and they feel less vulnerable to shigellosis. Therefore, some messages that are gender-specific could be more successful in informing this group. Also, the differences between areas within Nha Trang (urban, rural, seaside) suggest that information campaigns might better be developed at regional levels than citywide.

The respondents felt that, to make a decision regarding vaccination, they needed information about side-effects, duration and level of protection, and cost. The residents preferred to receive information from the CHC staff who are seen as the experts, are well-known in the community, and routinely provide health-education information. In a finding similar to those in the qualitative study, a significant number of individuals stated that they would need 'no information' regarding the vaccine, if the CHC staff told them to be vaccinated.

The commune leaders and the leaders of the Women's Union were also identified as key sources of information, particularly as they provide a link between higher levels of government and residents, and are perceived as knowledgeable about policy issues. Since the population clearly prefers to receive vaccine information from healthcare providers, and commune and mass organization leaders, a successful vaccination campaign should include targeted educational efforts for these three groups.

In terms of media, the preference was overwhelmingly for announcement over loudspeaker systems. Home visits, commune meetings, and television and radio were also preferred methods of disseminating information about the vaccine. Written information was generally perceived as less desirable. Finally, the respondents preferred that the delivery of vaccine should take place at CHCs, which are again local and accessible health facilities and are the sites for current EPI delivery.

Generally, the respondents were receptive to the idea of receiving a *Shigella* vaccine. During a demonstration project, the vaccine would be provided free of charge, and based on these data, we would expect to see similar participation rates as in the past trials, e.g. oral cholera vaccine. However, its implementation in a larger public-health initiative would most likely mean charging a fee. Therefore, we would anticipate lower participation rates both based on the existing vaccination programmes, e.g. hepatitis B, and on these data. We have, therefore, looked to identify different levels of acceptance of a vaccine and identify demographic and perceptions-based variables that could explain non-participation. These data can be used for providing information to targeted groups and enhance their ability to make an informed decision about vaccination.

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