

PERCEPTIONS OF SHIGELLA AND OF SHIGELLA VACCINE AMONG RURAL CHINESE: COMPATIBILITY WITH WESTERN MODELS OF BEHAVIORAL CHANGE

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Abstract. Shigella remain a major source of morbidity and mortality in developing countries, including China. In response, national and international researchers are actively working to develop vaccines that will be effective against dysentery and diarrhea caused by shigella dysenteriae. With the growing recognition of the problems associated with sustained vaccine acceptance and usage, researchers and policy makers recognize the importance of conducting theory-based qualitative research to inform vaccine development program efforts. Accordingly we undertook this qualitative study involving 81 residents of one of China's rural communities with high rates of dysentery. The semi-structured interviews suggest that a Western model of behavioral change offered a useful research construct. Consistent with the model is the community's strong perception of 'response efficacy' of vaccines, particularly in comparison with water and sanitation and disease treatment. Residents were eager to vaccinate their children despite variable perception of disease severity, while they were less consistent in their interest in vaccinating adults; this enthusiasm for vaccinating children was attributed to China's 'one child per couple' policy. Intervention implications are discussed.

INTRODUCTION

Shigella dysenteriae remains a major source of morbidity and mortality globally, accounting for an estimated 1.1 million deaths per year among children aged under five years (Kotloff *et al*, 1999). Countries, including China, where vast proportions of the population do not have access to piped water and/or modern toilets, host particularly high rates of this disease (Chen *et al*, 1991; Ming *et al*, 1991; Cui, 1992, Zhang *et al*, 1995; Shen *et al*, 1996; Zhang, 1999). At the same time that efforts are being undertaken to improve the economic situation to allow widespread upgrading of sanitation and hygiene facilities, there is considerable interest internationally and in China to explore the development and introduction of a vaccine against shigella (Tu *et al*, 1995; 1999).

Since the widespread expansion of childhood immunizations during the Expanded Primary Immunization (EPI) campaigns of the 1980s some

countries have enjoyed continued high rates of vaccine coverage of infants and children, while many others have experienced disappointing declines in coverage rates (Keja *et al*, 1988; Kim-Farley, 1992; Wang and Zhang, 1997; Cutts, 1998; England *et al*, 2001; Streefland, 2001). To date, few countries have sustained high rates of vaccine coverage among individuals above the age ranges targeted by the EPI program (Isahak, 2000). As governments contemplate new vaccine initiatives, it is appropriate to assess perceptions of vaccine candidates and the targeted disease in an attempt to select vaccines and target promotion efforts to achieve high rates of vaccine coverage.

Such assessments of perceptions of diseases and vaccines among a population need not be done blindly. A substantial literature exists regarding health care and prevention behavior in both developed and developing countries (Becker *et al*, 1977; Cummings *et al*, 1980; Kendall, 1983; Commission on Health Research for Development, 1990). The past decade has witnessed the growing realization that these efforts should be guided by models of behavioral change (Stanton *et al*, 1992) and in turn, a vast research experience now supports the use of models to design

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health prevention strategies (Keane *et al*, 1993). However, to date, few vaccine strategies, particularly in developing countries, have utilized this approach, and the appropriateness of western-based models of behavioral change to guide vaccination efforts in developing countries have not been assessed.

As part of the shigella vaccine development program for China, guided by a social cognitive model of behavior, we undertook a qualitative evaluation of a rural population regarding dysentery and a hypothetical 'dysentery' vaccine.

MATERIALS AND METHODS

Description of the study area

Hebei Province, located in the north, is one of China's 34 provinces. Zhengdin County, one of 149 counties in Hebei Province, consists of 9 townships with a population of 456,826, with approximately 80% of the population residing in rural areas and employed in farming. The average annual per capita income is 859 RMB (2001 Local Government Statistic) (8 RMB US\$ 1.00). Residents report that 100% of homes have piped water, compared to a national average of 57% (Ministry of Health People's Republic of China, 1999), although water is not available 24 hours a day, but only during times of pumping (usually about 16 hours per day). Approximately 10% of households have in-house flush toilets, while the remainder have latrines, frequently attached to pig-sties. Nightsoil is routinely used as a fertilizer.

Among the 9 townships in Zhengdin, a convenience sample of four were selected with a population of approximately 80,000. Available data at the time of selection indicated that the annual incidence rate of shigellosis was 2.82/1,000 children at 0-4 years; 0.37/1,000 among those 5 to 14 years and 0.23/1,000 among subjects over age 15 (Harrison, 1994). More recent pilot data obtained in 2001 suggests that current rates are much higher, at 73/1,000 per year for children under 5 years of age and 11/1,000 per year for individuals 5 years or older (IVI, personnel communication). Every township has 6 to 10 villages, each village has 1 to 10 village clinics, with 1 to 10 doctors each. Almost all of the village doctors received two or three years of

training (Stanton *et al*, 1985). Each township has one township hospital and Zhengding County has 4 county hospitals. Nationally, approximately one-half of the population seeks outpatient care from the village clinics, 35% from the township hospitals, and 14% from the county hospital or higher level. Vaccines are provided to the township hospitals through the Anti-epidemic Center in Zhengdin. As is the case throughout China, BCG, measles, polio, tetanus and diphtheria vaccines are provided free to all infants and children and use of hepatitis A and B vaccines is widespread (Harrison, 1994).

Description of the underlying theory of behavior, protection motivation theory

Protection Motivation Theory (PMT), a social cognitive theory (Prentice-Dunn and Rogers, 1986), has been used as the guiding theoretic model for risk prevention efforts in Western countries and in Africa. (Stanton *et al*, 1999). As noted below, the interview guide for this study was organized around the constructs of this theory. PMT envisions environmental and personal factors combining to pose a potential threat, in this case, dysentery. In addition to general *knowledge*, consideration of the potential personal threat posed by a maladaptive response is mediated by a balance between *rewards* accompanying the behavior (such as 'cold food tastes good'), and the perceived *severity* of and personal *vulnerability* to the threat (dysentery). An adaptive response is mediated by balancing the *response efficacy* (perceived likelihood that the action, in this case vaccination, will reduce the threat) and *self-efficacy* (belief that the individual can complete the adaptive response, in this case, become vaccinated, only drink boiled water, eat hot, cooked food, etc) with the *response cost* (barriers or inconveniences) of completing the adaptive response (s). These two appraisal pathways combine to form *protection motivation*, the intention to respond to a potential threat in either an adaptive (protective behavior) or maladaptive (risk behavior) manner. (Prentice-Dunn and Rogers, 1986). Relevant 'constructs' appear in the parenthesis in sub-headings under 'Results'.

Identification of subjects and data gathering

The four study townships were selected by the investigators in collaboration with officials

from the Zhendhig Health Authority. From among the four study townships, two villages from two of the townships were selected for participation in the qualitative study. The villages were selected to show a range of socioeconomic status (*eg* Shangshuitum had a higher per capita income at 4,900 RMB per year and Nangang a lower one at 2,400) and health indicators (*eg*, Sanjiao had a mortality rate of 10.37% and Xixingjia of 6.67 compared to a county average of 5.97).

Subjects for the study were selected using a convenience sample. Four categories of respondents were identified: Key Informants (defined as people who knew what was going on in the village), Community Leaders (elected and official leaders of the party and health system), community residents, and 'case studies' (families in which there had been an index case of shigella in the past three months).

The eight 'Key Informants' included three women, ranging in age from 31 to 75 years, and included a wide range of professions (housewife, farmer, head of the street cleaners, Chairman of the Town People's Congress, etc). The 20 Community Leaders included eight women, ranging in age from 24 to 60 years, and included Party Leaders, Township Leaders, and Village Committee Leaders. The 30 community residents included 18 women, ranging in age from 22 to 63 years, and included farmers, laborers, accountants and one doctor. The 23 respondents for the Case Studies represented patients ranging in age from eight months to 79 years, including 12 females, all but five of whom were from farming families.

Each respondent gave written, informed consent. Interviews were conducted in Chinese, and all respondents were interviewed individually in a setting of their choice. Interviews were audiotaped. None of the identified respondents declined to participate in the study. Interviews generally lasted approximately 45 minutes. Respondents were paid 20 RMB as a gesture of thanks, after completing their interview. The research protocol received clearance from the Fudan University Institutional Review Board and the Secretariat Committee for Research Involving Human Subjects, World Health Organization, Geneva, Switzerland.

Interview guides

Interviews employed an open-ended, semi-structured format. Questions were organized around the constructs of PMT and were designed to assess beliefs of causality, perceptions of severity and vulnerability, reasons for engaging in 'risk' behaviors, perceptions of vaccine efficacy, safety, cost and side effects, and perceptions of the health care system, including accessibility and ease of use. The interview guide was designed in English, translated into Chinese, and back-translated to English.

Training of the interviewers occurred at the research site and took place over 10 days. Training involved practice with the survey instruments, quality control, and data management.

Analysis

Audiotapes were transcribed in Chinese and then translated into English. Passages relevant to the main constructs of PMT were jointly identified by Chinese investigators and foreign consultants offering technical assistance. The full range of responses on any given subject were selected and analyzed both with respect to each other and in the context of the interview.

RESULTS

Beliefs, perceptions regarding the disease, its causes and sources (Knowledge)

There was considerable heterogeneity in understanding of the pathogenesis of dysentery depending on the category of respondents. The Case Study and Community Resident interviews reflect much misinformation regarding the etiology of dysentery. Frequently mentioned are exposure to cold/catching a cold and eating cold food. '(I developed dysentery) because I washed my feet with cold water the day before, and I caught a cold'; 'I think I possibly caught a chill'; 'I think I possibly caught a chill when enjoying the cool.... in the evening'. Only the occasional respondent mentions hygiene/poor sanitation as a cause: '(I acquired dysentery because) I did not pay attention to hygiene habit, but I do not know what kind of feculent food I had eaten'; and '(He developed dysentery because) he ate some unclean food or caught a cold'.

By contrast, most Community Leaders showed evidence of a clear understanding that dysentery resulted from eating unclean foods and other unhygienic behaviors and were aware of the seasonality of the disease (summer); 'These diseases result from poor sanitation conditions in the community and bad individual hygienic habit, for instance, drinking unboiled water in summer'; and 'People eat more fruits in summer because fruits are abundant at that time. If they don't care much for the cleanness of the fruits, it would be very easy to suffer such a disease'.

Some Community Leaders demonstrated awareness of the concept of acquired immunity: 'Children have less resistance to this disease and they are vulnerable. Adults have strong resistance to it and are not so susceptible'.

Prevailing beliefs regarding how to prevent dysentery/shigellosis (Response efficacy, self-efficacy and rewards)

Perceptions regarding preventive measures for shigella mirrored perceptions of disease transmission. Therefore, people advised avoidance potentially contaminated foods and water ('Eat clean food, drink boiled water, fresh food, never eat the food sold on the street...'), cool air or cold, ('Be careful not to catch cold at night'), and flies ('Avoid flies sting on dishware'). In addition, a few home remedies were proposed: 'To drink a little wine and garlic every day'. 'We should eat more garlic and shallot in autumn'; 'The best measure to prevent the dysentery is to eat more garlic and shallot'; 'Some people eat deep-fried twisted dough sticks with garlic'; and 'soup of the root of onion can prevent dysentery'.

Opinions varied regarding the difficulty in avoiding dysentery. Many respondents expressed the belief that avoiding dysentery would not be difficult: 'No difficulty. It is convenient to do those matters (eat clean food, not to catch cold, not eat dirty food which haven't washed, sting over by flies or mice and drink raw water)'; 'It is not difficult to avoid it if we pay attention to diet habit and diet hygiene' and 'It is not difficult but simple to avoid it because the patients with dysentery are less in recent years'. At the same time, several believed that it would be difficult to prevent: 'It is difficult to prevent dysentery. Because

in rural areas dysentery is contracted through stools. Now there are no sewers existing in our village and only five houses have latrines with attached pig-sties'.

People readily admit that in many cases although they know how to avoid infection, their practice differs. Many admit to having raw and reheated foods ('We eat raw vegetables, and reheat the dishes food left over the next day'); and others wash their hands before meals but not after using the toilet ('We do wash hands before meals every time, but don't wash hands after we use the toilet'). Several respondents made reference to eating garlic ('We also have garlic'; 'First, we often eat garlic'). A few respondents claimed to consistently follow good hygienic practices.

Perceptions of severity and vulnerability (Severity and vulnerability)

Opinions among Community Respondents ranged widely, as to the severity of the disease, with some viewing it as severe and others as relatively inconsequential, and as to its perceived prevalence, with some believing it to be very common and others never having witnessed a case. Community Respondents indicated a belief that shigella is a serious disorder: 'It's serious. When I was young, this disease could cause death'; 'Severe. If this disease weren't treated on time, it would lead to death'. 'More severe than enteritis'; 'It is severe and can be cured by transfusing'; and 'In general it is not easy to cure. It could be cured by taking injection or taking medicines for several days'.

At the same time, many Community Respondents did not consider dysentery to be a serious disorder: 'It seems nobody has a bad case of the disease, neither my family nor I'; 'Not serious. Taking some medicines can cure it'; 'The illness can't develop into anything very serious'; 'I also have dysentery in hot seasons, but it isn't serious'; and, 'The cases of dysentery are few. Sometimes it is seasonal. I think it is not serious. People often catch mild ailments. It can heal soon by medication'.

Among Community Leaders and Key Informants, dysentery was generally not perceived to be especially serious, both because it is uncommon and easily treated: 'No. (It isn't a serious

problem) because few people suffer from it and they only suffer it in summer. Patients can take some medicine to cure it. Compared with other concerns, residents pay less attention to diarrheal diseases'; 'Now they have more hygiene knowledge and suffer it less...Dysentery is now very rare'; 'People are less concerned about diarrheal diseases, which is the same as catching a cold. Usually people don't go to hospital and just buy some medicine by themselves'; 'This disease is curable. Patients will be OK after they take some medicine. Because this disease can't lead to death, people pay little attention to it'; and 'People don't pay much attention to it. No one dies from dysentery as long as they get treatment in time'. Several respondents attributed the decline in dysentery among children to the one-child-per-couple policy: 'The health of children is taken seriously because of the one-child-per-family policy at present'. Another Community Leader observed that while dysentery is recognized to be a 'problem among infants, people are still more concerned about other diseases of adulthood, such as neurological disorders: 'One respondent did recognize the potential seriousness of dysentery compared to (simple) diarrhea: 'But up to now, it is not very severe and never epidemic in one village or town. I think we should pay attention to patients, who have loose bowels, otherwise they would have dysentery, which is more severe. There were people who died of it in our village. So villagers pay more attention to this diseases'.

Dysentery was not spontaneously listed by any respondent as a disease of high priority; rather traditional diseases of adulthood were noted, including cancer, heart attacks, and strokes.

Opinions varied widely among all categories of respondents as to whom was most vulnerable to dysentery: some people believed children, others adults, some both. Several suggested that persons with underlying illnesses were particularly vulnerable, while a few offered that healthy adults were susceptible because they were not careful with their diets, and still others proffered that anyone could acquire dysentery.

Perceptions about costliness of treatment for shigellosis (Severity and response cost)

Perceptions of cost varied considerably. Case

Study and Community Respondents had a variable response to questions regarding the economic impact of the episode of dysentery which brought them into contact with the medical system. While some indicated that it had no impact, others felt that it had substantial implications in their household incomes. Examples of ways in which it did impact their economic status include: 'My shigellosis disease influenced my income. It took about twelve/thirteen working days to treat my shigellosis disease, which make me lose about twenty-Yuan every day'; 'We had medical expenses on credit in village health station because there was a financial problem when my father was ill. Later the expense had been paid back'. and 'My shigellosis influenced my husband's income. He had to accompany me to go to the clinic every day'.

Estimations by Community Residents as to the cost of an episode of dysentery ranged considerably, with price estimates of two to three RMB for treatment that does not require intravenous infusions and from 15 to 16 RMB to several hundred RMB, if intravenous therapy is required. Likewise, acceptable price ranges also varied considerably from three RMB to a few hundred RMB. These variations did not vary in any obvious pattern by occupation of the respondent.

Key Informants and Community Leaders in general felt that allopathic medicines were available, are acceptable to the population and are affordable to most people; 'Most people will see doctors promptly'; 'Now people can all get medical service promptly when they are ill. Seeing the doctor will not cost a lot. Now there are fewer people in difficult situations'. 'These medications are not expensive. They are very cheap'; 'Now all people can get medical service promptly when they are ill. Moreover, now the doctors' service is very good'; and 'Few families can't afford the medical expenses, maybe just one or two'. A few informants clarified that if the dysentery responds to oral medications (costing less than 10 or 20 Yuan per day), the cost of this treatment can be afforded by most everyone; if intravenous infusions are required (costing approximately 100 Yuan per day), this treatment may not be affordable to some: 'We take norfloxacin for stomach and intestinal problems. ...It only costs 20 Yuan

in total. However, infusions are more expensive... It costs about 20 Yuan a day'. Opinions regarding the use of herbal, traditional or home remedies varied, with two persons commenting that such remedies were no longer used ('Now no one will use folk remedies' and 'There are no (traditional) medications or herbs at home'), but one person observed 'At home there are some 'common' medications for children and Chinese medicine'.

Level of interest in vaccines against dysentery

General. Despite varying perceptions of the importance of dysentery as a community problem, most respondents were enthusiastic about the possibility of a vaccine to prevent dysentery. Even among Community Leaders and Key Informants, despite the perception that dysentery is not prevalent, that it is curable and that the treatment is generally not expensive, there was considerable interest in a vaccine.

For example, a man who earlier had described dysentery as 'it is usually cured promptly before it becomes serious' said 'my family members will take the vaccine...all of them will accept it'. A woman who earlier had stated 'dysentery is not severe', offered that 'If the vaccine is available, I will take it,' while another woman who said 'The illness can't develop to anything serious' stated 'Yes, I will use it'.

Still, some concerns were expressed regarding vaccines. One individual feared being experimented upon: 'To some extent, my family members and I would (like to take the vaccine), but to another extent we would not. We would like to take the vaccine because the vaccine is available for preventing disease. We would not like to take it because we are afraid that we are regarded as experimental things by the national government'. As noted later in the discussion, other concerns were expressed regarding the possibility of a fraudulent vaccine (substituted for the real one). Finally, one individual commented that dysentery is of such low importance relative to other concerns that she would not accept a vaccine under any conditions: 'No, I wouldn't take the vaccine even if it were proved to be effective. What I am more concerned about is cardiovascular disease

and hepatitis'.

Age. Despite the wide variation in populations perceived to be vulnerable to dysentery, all respondents seemed more inclined to vaccinate and to pay more for the vaccine for children: 'If it is too expensive, only kids will take the vaccine'; 'I would let my child take it if it were effective. The vaccine could reduce the child's pain'; 'It is necessary for children to take this vaccine'; 'I wouldn't take it because only a few people caught this disease. My children would take it because they... have more chances to touch bacteria. Adults may not take it. If the vaccine were very effective, children would surely take it and I am not sure whether adults would take it'. The effect of the one-child-per-family policy on vaccine interest is well recognized: 'Vaccines are welcomed here. Each family has just one child. All people want healthy children, so they pay more attention to them'; 'Now people all pay attention to children's health. They all concern children's health, so they will let children take it', and 'Nowadays every family has only one child, so people are concerned lest their children suffer diseases. They will surely have their children vaccinated'.

People were not wary of vaccinating young children/infants. To the contrary, there was considerable enthusiasm for vaccinating this age group: 'These (vaccines) are for children less than 6 years old, especially the babies less than 1 year old'; 'Immunizations were mainly for children from birth to 7 years of age'; 'There should be more children under one year to take it, but the children over five or six years should not'; and, 'The objects of immunization are children under ten weeks'.

In general respondents felt that parents and the elderly would be disinclined to take the vaccine both because of the belief that they are not vulnerable and because of the cultural orientation to provide for their children: 'My parents wouldn't take it, because they haven't suffered this disease and ignore this disease'; 'The elderly will not accept this vaccine easily because they believe there is less chance of suffering from this disease and this disease is not serious. The young

children will accept this vaccine easily because their parents pay much attention to their health. The effect of age is obvious'; 'I wouldn't take the (dysentery) vaccine, because I am old and rarely concern myself about my health, and I have never caught this disease. But my wife and grandson will take the vaccine, because my wife's health is in a bad condition and I care about my grandson's health. The elderly people may be less likely to accept the vaccine. They pay less attention to the disease and think it is unnecessary to be immunized'. If it were very effective, there was interest expressed by some respondents in vaccinating adults as well: 'Adults would also like to take it because it could reduce pain and couldn't affect work. People would pay for it'; and, 'It's different for adults to take this vaccine. Whether adults take this vaccine depends on its effect and period of validity. If the period of validity were more than one year and price were less than 20 to 30 Yuan, adults would take it. The effect is most important'.

Previous experience with dysentery (Severity and vulnerability). All categories of respondents observed that those who had experienced dysentery would be more interested in receiving the vaccine (*eg*, would perceive greater benefit from vaccination): 'Generally, people can accept it, especially people who have suffered this disease. People who haven't suffered this disease might not accept it easily because they pay less attention to this disease'; 'If some members had suffered from dysentery before in their family, all family members would take the vaccine'; and, 'Other members of my family are in good health and seldom suffer dysentery. Maybe they will not take it. Yet I often suffer dysentery. If the vaccine is available, I will take it. Then I can prevent it and won't suffer a lot'.

Vaccine cost (Response cost). All categories of respondents generally indicated a willingness to pay, although the amount varied considerably from 3 to 100 or 200 Yuan. The acceptable range did not vary in any obvious pattern by occupation of the respondent. Indicative of the trust in the health care system, some respondents indicate that they 'would pay whatever the doctor asked'. There was a general

willingness to pay more for vaccines for children: 'If it is expensive, only kids will take the vaccine'; 'If the price were not more than 10 Yuan, elderly would take it. If it were not more than 20 Yuan, children would take it'. Several respondents indicated willingness to pay according to duration of protection: 'The price should depend on period of validity. If the period of validity were one year, one hundred were suitable. If the period of validity were three or five years, 300 or 400 is suitable'; and 'The vaccine should be very effective and cost no more than 20 Yuan. Longer term protection could cost higher. For instance, if a vaccine can protect 10 years, 50 Yuan is also acceptable'.

A few respondents recognized that the decision to be vaccinated represented a 'cost-benefit' analysis: 'Vaccinations usually cost 20 Yuan. I think people will accept the vaccine if the price is about 20 Yuan or so. But if the price rises to 80-100 Yuan, I think it is too high to accept. The incidence rate of the disease is not high and it is not a deadly illness. If the price is too expensive, people can't accept it. People think that dysentery is not a severe disease. When ill, treatment costs 40 or 50 Yuan'; 'Yes, we would (take the vaccine). It does not harm your health and could improve your immunity. Without disease, you can save money. A vaccination costs 10 Yuan, but, if you have loose bowels perhaps 100 is not enough. It will waste your more money. Prevention is priority'; and 'If you have this vaccine I will take it. Since I think that now I only spend 3-5 Yuan on immunization, but once I get diarrhea, perhaps I will pay much money for disease treatment. Moreover it will affect my work, and I must spend time on rest'.

Vaccine efficacy/duration of effectiveness (Response efficacy). Although the general concept of 'vaccine efficacy' was important to individuals in all respondent categories, no one commented regarding what constituted an adequate level of protection: 'I would like to receive this vaccine but it must be proven to be effective. People would take this vaccine for their health. People will need time to learn about the vaccine before they accept it'; and 'Yes, I would like to pay for it to keep my health if the vaccine were proved to be effective'.

People's perceptions of adequate duration of effect ranged from two months ('This vaccine must be effective and its valid period in which the vaccine can prevent from diarrhea should be more than two months') to a lifetime ('Its period of validity has better than the whole life'). Several respondents indicated that there was a 'minimum' duration of protection below which they would not use a vaccine: 'If its period of validity were one year, a little more than 10 Yuan is acceptable'. However, as noted above, respondents often considered duration of protection as an economic consideration rather than a fixed or absolute quality of a vaccine. (However, one individual did suggest that people would be suspicious of a vaccine whose duration of protection was 'too long'; 'I think that if they said the validity term was 10 years, I would doubt that a vaccine could exist in the body for 10 years. I think if the term is too long people would not believe it').

Side effects (Response cost). Only a few respondents from any category alluded to the possibility of 'side effects'; 'I would want to know whether it has side effect?'; and 'I want to know about the side effects of the vaccine and the functional period of the vaccine'.

Preferred route of administration (oral, injectable) (Response efficacy and response cost). Although many people indicated a modest preference for oral vaccines; few people indicated that they would find an injection unacceptable. Some respondents felt that children would prefer injections and others oral vaccines. Examples of comments include: 'I would probably prefer oral one, as an injection is not convenient'; 'I would prefer an oral vaccine for it is convenient and I am afraid of injections. Kids would prefer an injection if they don't like oral vaccines...none of the kids likes oral vaccines. If there's a difference between effects, I would prefer the more effective way'; and, 'Adults would prefer an oral vaccine because they feel sting is better than bitter in mouth. Adults would be less likely to take sweet oral vaccine because they don't like sweet. Children would prefer an oral vaccine because they are all afraid of pain. If they take an injection, they would cry for more time than taking an oral vaccine'.

Summary. One woman attempted to synthesize this array of considerations in decision-making: 'I have heard of dysentery, but haven't seen such a patient. I worry about it because it hasn't spread widely. Injection brings much pain. If an oral vaccine is provided, I would choose this kind.... Besides that, we don't know if it has side effects. We are all afraid of its potential harmfulness. If the vaccine is effective, the price is affordable and the period of validity is lifetime, I would pay for it. If the period of validity is short, I would rethink about it. If I hear of patients with dysentery in the township, I would take it because this disease is very contagious'.

Perceptions of adequacy of prevention programs (Response efficacy and self-efficacy)

Respondents generally express a high level of satisfaction with the services offered at the clinics. Vaccines and drugs are available and the location of the village clinics is convenient. While rarely necessary to travel to the township hospital for medications or treatment, even this travel is not portrayed as burdensome. There is some perception that the clinics are especially well situated to care for children and that in addition to providing services for those who seek them, the clinics are actively involved in outreach efforts. There were a few comments raising some concerns about the quality of medical care provided by the village clinics, especially for serious illnesses.

Typical comments regarding the ready availability of vaccines and medications include: 'All these vaccines are given at the village clinics' and 'Medical care and medications are available in time when people need. People can receive medical care at clinics on credit when they can't afford it'.

Indicative of the many comments supporting the accessibility and affordability of health services are: 'Villagers can be treated timely, transportation is also convenient'; 'People in the community can see a doctor and buy drugs on time. There have personnel on duty in the clinic everyday. If someone gets a serious illness, he can call 120 for a doctor or provide an ambulance service. If he occasionally has no money to pay, he can buy drugs on credit'; 'Generally speak-

ing, when they are ill the villagers can see doctors and buy drugs on time and if they get worse the doctors will have home visit and serve them. The clinic location is not too far and about 5-6 minutes by walking'; and 'All the patients can be examined in time and can afford the medicine fee. Doctors would provide home visit if the patient's illness is serious. There are about 5% of people in this village that cannot afford the medical fee, such as handicapped, childless elders, and some of the people who make their living by cultivating farmland. If they had no money at that time, they can go to see the doctor on credit'.

Several comments suggested that while services were available for all ages, children received a particular focus, especially with regard to vaccines: 'Yes, there are immunization programs. But most target children 0-7 years old'; 'Yes, there are vaccinations for adults. But only for hemorrhagic fever and iodine deficient disease'; 'Yes, these efforts were done mainly for children from birth to 7 years of age, *eg* measles vaccine, encephalitis vaccine and hepatitis B vaccine'; 'Most of the immunizations are aimed at children under 7 years old, for example measles vaccine, Japanese type-B encephalitis vaccine, hepatitis B vaccine and chicken pox vaccine'; and, 'There is a county-township-village three tiers network for preventing care. But they mainly provide service for children under 14 years old'.

Some respondents provided examples of the extensive outreach provided by the clinics to assure that patients received the services that they require: 'Here all of children should take the vaccine. No child will be missed because in the clinic there have records about which children have been injected and who have not. Today you should take and tomorrow he should do. So if some people forget it, the doctor will inform you by broadcast. So we can reach 100% injection'.

There were only two comments that raised any concerns about the quality of services. One comment suggested that serious illnesses might not be treated on a timely basis: 'People can seek medical care and buy drugs for common diseases in time. But some emergency or serious diseases cannot be cured in time'. Another comment suggested that doctors in rural areas might not be well trained: 'You can see that the clinics with good

doctors are located in central places, and the clinics with poor doctors were located outside of the center, while they were not very far from the center, when people want to buy some medicines they only chose the nearest clinics'.

Opinions on how should information be conveyed (Response efficacy)

Respondents from all categories felt that the information could be conveyed by the staff in the Prevention Centers, the prevention doctors and the doctors in the village health stations. Mass media, including the local broadcast system (loud speakers in each home) and television could be used to transmit the message. 'Information can be provided by the doctor'; 'It is okay through oral communication or by broadcast'; 'The doctors in the village health station should provide information'; 'It is enough for us to broadcast the effect about the vaccine or to simply introduce the vaccine by the doctors in the village health station'; 'The doctors in the village health station or township health center should provide information' and 'It is enough for us that the doctors simply introduce the vaccine'.

Several respondents indicated the potential strength of a collaborative effort on the part of public health agencies and the mass media; 'I think that the department of public health should issue a document about the vaccine to hospitals and then be delivered to clinics whose practitioners are familiar with this case and can make feedback quickly. They should spread the information through broadcast, blackboard bulletins and leaflets or handbills'.

A few respondents suggested that the schools might be a good vehicle for vaccine promotion and a few others suggested that a 'half-price sale' might stimulate interest: 'At first, if people can get the half-price or free charge vaccine, this will help the vaccine to be accepted. In addition, susceptible population take the vaccine firstly, and if it has a good effect they will tell others, which is helpful'; and, 'The price for these people who first want to be vaccinated should be free of charge, or the fee should be reduced by 50%, which can be taken as an advertising function. These people who can easily accept the vaccine can be vaccinated first, then they can spread the information, maybe the effect will be better'.

Opinions on types of information/messages that should be part of vaccination promotional activities (Response efficacy and response cost)

Information perceived to be important about vaccines includes issues identified earlier regarding vaccine effectiveness, duration of protection, vaccine cost, and mode of administration. In addition, respondents indicated that they wished to know about vaccine safety, side effects and contraindications. The occasional respondent was content to know that the vaccine had been approved by the government and therefore felt that no further information was required. Concerns were also expressed regarding the authenticity of the product.

Examples of comments reflecting the need to know information about vaccine effectiveness, duration of protection, vaccine cost, mode of administration, vaccine safety and side effects include: 'I want to know what happens after receiving the vaccine and what's the benefit'; 'What disease it can prevent? How long is its period of effectiveness? Whether it has side effects. I haven't thought about price'; 'I am concerned about the security, side effect, target disease to prevent, effectiveness, price, oral administration or not'; 'Effect? Period of validity? If it proved to be effective, I would have no concern because experts manufacture it'; 'Yes, I need information about its effect'; 'Effect, period of validity, side effect and price'; and 'I want to know what kind of disease it could prevent from and the period of validity'. An example of someone who was content to know that it had been approved by the government was: 'I needn't have any information (so long as the) government desires the vaccine'. One respondent was interested in contra indications: 'I want to know about the side effects of the vaccine, the functional period of the vaccine, the situations for using it, for instance, if it can be used at a time one catches a cold or has a fever'. Examples of concerns about vaccine authenticity include: '...I want to know...whether it is fake or not'; 'It should be provided by the government, not by a private source. It mustn't be a fake vaccine'; 'Apply a laser anti-bogus label. People can easily find out whether the vaccine is a real one'; and 'It must be authentic and not a false one'.

Other respondents asked for assurance that the vaccine has not exceeded its shelf-life ('It is not easy to preserve vaccinations and we are concerned about whether it has lost its efficacy'). One respondent wanted to know if the vaccine were still on trial or had it been demonstrated to be effective while another would want to know if it were a traditional Chinese vaccine or a modern Western vaccine.

DISCUSSION

General

These findings suggest that Protection Motivation Theory offers a reasonable, albeit imperfect, model on which to develop an understanding of vaccine utilization in China. Consistent with this model, is the community's strong perception of 'Response Efficacy' of vaccines, particularly in comparison with other preventive maneuvers (*eg*, the vaccine works while other preventive measures are less certain) and a high interest in vaccines. While the disease was variably perceived as 'severe' in the general population, the high value placed on children as a result of the 'one-child-per-couple' policy renders any disease among children as a significant threat. People were accounting for potential 'Response Costs' in that most were interested in the price of the vaccine, side effects and trade-offs (*eg*, should their money be spent on other vaccines against diseases which were more important). A few individuals commented on the difficulty in avoiding cool fruits and fresh water in the summer suggesting that there are 'rewards' to be gained from the behaviors that place them at risk.

Somewhat paradoxically however, given the constructs of this model, most individuals did not consider themselves or their family members to be particularly susceptible to the disease ('vulnerability') although they were still interested in receiving the vaccine. The perception of a relatively low prevalence of the disease is surprising as higher shigellosis rates were observed in this site compared to sites in Vietnam, Thailand, Bangladesh, Pakistan, and Indonesia (unpublished data). The prevalence of the disease may well be related to the sanitation available in the region. Virtually all latrines inspected were directly con-

nected to pig pens, where pigs are raised on human excrement and other waste products (unpublished observations). While sanitation was not directly referred to by many responsible as a risk factor, a misperception that cooling the body through a drop in ambient temperature, particularly through a cold wind, can cause shigellosis, was frequently repeated. In general, there were not substantial differences in perceptions between respondents of different categories. One exception to this similarity was a somewhat higher perception of severity among Community Residents and Case Study respondents compared to Key Informants and Community Leaders. Virtually all respondents spoke highly of the health care facilities in general and of the prevention program in particular. Several respondents expressed a fear of being sold fake vaccines through the private sector, there was a sense of confidence that the official health care providers would provide the genuine article. While no reports of fake vaccines have been published, the distribution of fake drugs without biological activity has been well documented in Southeast Asia. (Newton *et al*, 2001). All respondents reflected sentiments indicative of the high value of children in society and attributed it to China's policy on child bearing. There seemed to be a consensus to prioritize vaccinations for younger children, but there was also an interest in being vaccinated by some of the adults.

Potential limitations

As with all qualitative studies, these results should be taken as hypothesis generating rather than confirmatory. The respondents were not randomly selected but rather by convenience sampling, and therefore may or may not be representative of the views of the society at large. However, the deliberate attempt to include different categories of individuals covering a wide age range and professional range and both genders should mitigate against over-representation of a single perspective. The finding that in general views were consistent across all these factors provide additional evidence that these views are representative of the local society. Finally, China is a large country and thus these views may or may not be representative of perspectives from other parts of the nation.

Implications of the findings

These data suggest that vaccine-seeking behavior in China can be understood from the perspective of Protection Motivation Theory, although quantitative confirmation of this hypothesis would be useful. Given these findings, a vaccine promotion campaign could be designed around the constructs of PMT. The respondents indicate that any such campaign should involve the health professionals as they are highly regarded and trusted by society.

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REFERENCES

- Becker MH, Nathanson CA, Drachman RH, Kinscht JP. Mother's health beliefs and children's clinic visits: a prospective study. *J Commun Health* 1977; 3: 125.
- Chen KC, Lin CH, Qiao QX, *et al*. The epidemiology of diarrhoeal diseases in southeastern China. *J Diarrhoeal Dis Res* 1991; 9: 94-9.
- Commission on Health Research for Development. Health research: essential link to equity in development. New York: Oxford University Press, 1990.
- Cui F. Epidemiological investigation on pathogens of acute infectious diarrhea in Ning Xia. *Zhonghua Liu Xing Bing Xue Za Zhi* 1992; 13: 85-8.
- Cummings KM, Becker MH, Maile MC. Bring the models together: an empirical approach to combining variables used to explain health actions. *J Behav Med* 1980; 3: 123.
- Cutts FT. Advances and challenges for the expanded programme on immunization. *Br Med Bull* 1998; 54: 445-61.
- England S, Loevinson B, Melgaard B, Kou U, Jha P. The evidence base for interventions to reduce mortality from vaccine-preventable diseases in low and middle-income countries. Geneva: Commission on Macroeconomics and Health, 2001.

- Harrison F. Racial and gender inequalities in health and health care. *Med Anthropol Qtr* 1994; 8: 90.
- Isahak I. Adult immunization—a neglected issue in Southeast Asia. *Southeast Asian J Trop Med Public Health* 2000; 31: 173-84.
- Keane V, Stanton B, Horton L, Aronson R, Galbraith J, Hughart N. Perceptions of vaccine efficacy, illness, and health among inner city parents. *Clin Pediatr* 1993; 32: 2-7.
- Keja K, Chan C, Hayden G, Henderson RH. Expanded programme on immunization. *World Health Stat Q* 1998; 41: 59-63.
- Kendall C. Anthropology, communications and health: the mass media and health practices program in Honduras. *Hum Org* 1983; 42: 353.
- Kim-Farley RJ. EPI for the 1990s. The Expanded Programme on Immunization Team. *Vaccine* 1992; 10: 940-8.
- Kotloff KL, Winickoff JP, Ivanoff B, *et al.* Global burden of Shigella infections: implications for vaccine development and implementation of control strategies. *Bull WHO* 1999; 77: 651-66.
- Ming ZF, Xi ZD, Dong CS, *et al.* Diarrhoeal disease in children less than one year of age at a children's hospital in Guangzhou, People's Republic of China. *Trans R Soc Trop Med Hyg* 1991; 85: 667-9.
- Ministry of Health People's Republic of China. Research on National Health Services—An Analysis Report of the Second National Health Sectors Survey in 1998. 1999.
- Newton P, Proux S, Green M, *et al.* Fake artesunate in Southeast Asia. *Lancet* 2001; 357: 1948-50.
- Prentice-Dunn S, Rogers RW. Protection motivation theory and preventive health: beyond the health belief model. *Health Educ Res* 1986; 1: 153-63.
- Shen GJ, Shen XS, Lu H. Etiological investigation on diarrhoeal diseases in the rural area of Suixian county, Yu Dong plain in China. *Zhonghua Liu Xing Bing Xue Za Zhi* 1996; 17: 275-7.
- Stanton B, Clemens J, Koblinsky M, Kahair T. The urban volunteer program: a community based primary health care and research initiative. *Trop Geogr Med* 1985; 37: 183-9.
- Stanton B, Black R, Engle P, Pelto A. A framework for theory-driven behavioral intervention research for the control of diarrheal disease. *Soc Sci Med* 1992; 35: 1045-420.
- Stanton B, Fitzgerald A, Li X, *et al.* HIV risk behaviors, intentions and perceptions among Namibian youth as assessed by a theory-based questionnaire. *AIDS Educ Prevent* 1999; 11: 132-49.
- Streefland PH. Public doubts about vaccination safety and resistance against vaccination. *Health Policy* 2001; 55: 159-72.
- Tu G, Wan J, Zhou G, Xie G, Shong S, Bin-Rui W. Study on safety and protective effect of an oral bivalent live vaccine against *S. flexneri* 2a and *S. sonnei* in a double-blind control field trial. *J Chin Epidemiol* 1995; 1: 33-6.
- Tu G, Cui C, Wang J, *et al.* Double-blind field trial of oral live F2a-sonnei (FS) dysentery vaccine. *J Biol Products* 1999; 12: 178-80.
- Wang XJ, Zhang RZ. Study on the immunization status of children and risk factors in floating population. *Zhonghua Liu Xing Bing Xue Za Zhi*, 1997; 8: 300-2.
- Zhang DM, Peng Z, Tian Z. Epidemiologic studies on three episodes of acute bacillary dysentery outbreak. *Zhonghua Yu Fang Yi Xue Za Zhi* 1995; 29: 147-8.
- Zhang X. Epidemiologic study and prevention and control of communicable diseases in army in China: experiences and successes. *Zhonghua Liu Xing Bing Xue Za Zhi* 1999; 20: 196-9.