Using a Knowledge, Attitudes and Practices Survey to Supplement Findings of an Outbreak Investigation: Cholera Prevention Measures during the 1991 Epidemic in Peru

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Background. To assess the effectiveness of the cholera prevention activities of the Peruvian Ministry of Health, we conducted a knowledge, attitudes, and practices (KAP) survey in urban and rural Amazon communities during the cholera epidemic in 1991.

Methods. We surveyed heads of 67 urban and 61 rural households to determine diarrhoea rates, sources of cholera prevention information, and knowledge, attitudes, and practices regarding ten cholera prevention measures.

Results. Twenty-five per cent of 482 urban and 11% of 454 rural household members had diarrhoea during the first 3–4 months of the epidemic. Exposure to mass media education was greater in urban areas, and education through interpersonal communication was more prevalent in rural villages. Ninety-three per cent of rural and 67% of urban respondents believed they could prevent cholera. The mean numbers of correct responses to ten knowledge questions were 7.8 for urban and 8.2 for rural respondents. Practices lagged behind knowledge and attitudes (mean correct response to ten possible: urban 4.9, rural 4.6). Seventy-five per cent of respondents drank untreated water and 91% ate unwashed produce, both of which were identified as cholera risk factors in a concurrently conducted case-control study.

Conclusions. The cholera prevention campaign successfully educated respondents, but did not cause many to adopt preventive behaviours. Direct interpersonal education by community-based personnel may enhance the likelihood of translating education into changes in health behaviours. Knowledge, attitudes, and practices surveys conducted with case-control studies during an epidemic can be an effective method of refining education/control programmes.

Keywords: cholera, prevention, Amazon, health education, health behaviour, self-efficacy

The cholera epidemic that began explosively in coastal Peru in late January 1991 presented monumental challenges to the Peruvian public health infrastructure. The epidemic rapidly spread over the Andes and into the Amazon jungle.1 Over 230 000 cholera cases and 2300 deaths occurred during the first 6 months.2 In response, the Peruvian Ministry of Health initiated nationwide campaigns to control the epidemic. One important element of these campaigns was educating the population about cholera prevention measures via mass media and presentations by health personnel and community leaders. To better understand the extent of the epidemic in the Amazon region and the socio-behavioural aspects of cholera prevention measures, we conducted a survey of knowledge, attitudes, and practices (KAP) among urban and rural Amazonian populations 6 months after the beginning of the Peruvian cholera epidemic.
BACKGROUND
In the Amazon region, the first confirmed case of cholera was reported on 20 February 1991. By 1 June 1991, nearly 7000 cases had been reported; 2727 in Iquitos (population 280 000), the regional capital, and 3999 in the rural villages of Loreto Province (population 380 000).3

In Iquitos, approximately 50% of the cholera cases occurred among residents of the shanty town of Belen, where 18.5% of the population lived. The Iquitos cholera epidemic began during the annual rainy season which is between January and June. During this season the Amazon overflows its banks and forms stagnant canals in the streets of Belen. Although communal water taps are present, most Belen residents use river water for drinking, cooking, bathing, washing clothes, and eliminating human wastes. Sewage outlets empty raw sewage directly upstream from Belen. A case-control study conducted in Iquitos concurrently with this study identified drinking untreated water and eating unwashed produce as risk factors in cholera transmission.4

In rural Loreto Province, cholera cases were dispersed among hundreds of communities in the vast Amazon region,3 including the Napo River area where we conducted this study (Figure 1). However, none were reported in participating Napo River villages. The rural population living along the Napo river is of mixed indigenous-Hispanic heritage; all speak Spanish. Residents of Napo River villages rely on river water for drinking, cooking, bathing, and washing clothes. Human wastes are eliminated on open ground or in the river. None of the villages had health care facilities or traditional healers.

MATERIALS AND METHODS
Pueblo Libre
We conducted a survey in Pueblo Libre, the largest community in Belen, a shanty town in Iquitos, from 8 June to 12 June 1991, near the peak of the cholera epidemic, immediately after completing a case-control study in Iquitos. Eleven sectors containing a total of 500 households were selected for the study. In each sector we selected every eighth house, proceeding systematically from a random rotating start.

We asked adults present in the house at the time of our visit to identify the person with the greatest knowledge about health matters in each household. We interviewed this person, who was in most cases, the female head of household. We administered a pretested questionnaire with the following elements: occurrence of diarrhoea (more than three loose or watery stools in a 24-hour period) in family members since Carnaval, a major holiday in February 1991; use of health services; sources of information about cholera; respondents' perceived ability to prevent cholera; and their knowledge, attitudes, and practices (KAP) regarding ten specific cholera prevention behaviours. The KAP items on the


questionnaire were derived from cholera prevention recommendations disseminated widely by the Regional Health Administration of Loreto Department through mass media, pamphlets, and educational talks by health personnel and community authorities. Knowledge questions tested respondents' awareness of ten specific cholera prevention recommendations. Attitude questions determined whether respondents believed that following these recommendations was important to prevent cholera. Practice questions asked whether the respondent followed these recommendations always, almost always, sometimes, or never. In each of the three KAP sections of the questionnaire, five of the ten questions required a negative answer, to eliminate the possibility that a respondent who did not know the cholera prevention recommendations could correctly guess all ten items simply by answering 'yes' to all of them.

**Napo River Villages**

From 12 July to 18 July 1991, we surveyed a convenience sample of 14 Napo River villages (population 4500; range 79–650 people per village) accessible by a day's journey from Iquitos. We limited visits to daytime hours because of transportation difficulties. Some village residents were away from their homes attending their farm plots during our visits. Consequently, we obtained a convenience sample of residents, selecting male or female heads of household present in the village. The interview instrument and procedures were the same as for Pueblo Libre. All interviews were carried out by a single local health care worker, supervised by one author (EBS).

Data were analysed using Epi-Info Version 5.01B software (USD Universal, Inc., Stone Mountain, GA).

We calculated the means of correct responses to each KAP question and tested the statistical significance of differences in correct responses to KAP questions between age, sex, and educational strata with ANOVA.

**RESULTS**

We interviewed 67 heads of household in Pueblo Libre. The total number of household members was 482 (mean 7.2 people per household). The median age of respondents was 34 years (range 17–72 years); 46 (69%) of 67 were female. Eight (12%) of 67 had not received any education, 43 (64%) had <6 years of education and 16 (24%) had ≥6 years of education. No one refused to participate in the survey.

In 14 Napo River villages, we interviewed 65 heads of household. The total number of household members was 454 (mean 7.0 people per household). The median age of respondents was 42 (range 18–71 years); 13 (20%) of 65 were female. Eight (13%) of 63 had not received any education, 50 (77%) had <6 years of education, and five (8%) had ≥6 years of education; two (3%) did not respond to this question. No one refused to participate in the survey.

**Diarrheal Illness and Treatment**

In Pueblo Libre, 45 (67%) of 67 households had at least one member ill with diarrhoea between 20 February and 1 June 1991; overall, 25% of household members had had diarrhoea since the beginning of the cholera epidemic. Diarrhoea rates were highest among those <5 years old and ≥60 years old. Twenty-four (20%) of 124 patients were treated in a hospital (Table 1). There were no deaths. Of 24 hospital-treated patients, 22 (92%)
received oral rehydration salts (ORS), and 12 (50%) received intravenous rehydration. Forty-five (46%) of 98 non-hospital-treated patients also received ORS.

In Napo River villages, at least one person had diarrhoea in 32 (49%) of 65 households between 20 February and 18 July 1991. Overall, 11% of 454 household members had diarrhoea during this period. The highest age-specific diarrhoea attack rates were concentrated in the younger age groups (Table 1). Only three (6%) sick people were treated in a hospital or health centre; two received intravenous rehydration. There were no deaths. Of 46 patients with diarrhoea not treated in a hospital, 21 (45.7%) received ORS.

**Sources of Cholera Prevention Information**
The sources of cholera prevention information differed for urban and rural populations (Table 2). In Pueblo Libre, the sources of cholera information most commonly cited by respondents were radio (71%), television (64%), and group health talks (75%). Overall, 75% of Pueblo Libre respondents had received some cholera prevention education from health or government personnel, and 84% had received some by mass media. Eleven (25%) of 44 respondents received no education through interpersonal communication.

In Napo River villages, health workers (70%), government authorities (61%) and radio (58%), were the most commonly cited sources of cholera information (Table 2). Overall, 100% of those surveyed had received some education in person from health or governmental authorities, and 54% had received some through mass media, almost exclusively radio. Twenty-two (39%) of 57 received no education from mass media sources (Table 2).

**Perceived Ability to Prevent Cholera**
In Pueblo Libre 44 (67%) of 67 survey respondents, and in Napo River villages 57 (93%) of 61, claimed to know how to prevent cholera. There was no significant difference in perceived ability to prevent cholera by age group, sex, or educational level.

**Knowledge, Attitudes, and Practices**
The overall scores for knowledge of cholera prevention measures in Pueblo Libre and Napo River village respondents, as measured by the mean number of correct questionnaire responses, were 7.8 and 8.2, respectively, of a total of 10.0 (Table 3). The per cent of correct responses for knowledge of several specific preventive measures, however, was low. Of the Pueblo Libre respondents, 75% knew about the use of chlorine to treat drinking water compared with 37% of the Napo River respondents. A higher percentage of Napo River village respondents correctly identified the need to wash produce (45% versus 34%) and utensils (78% versus 52%) with treated water, than did respondents from Pueblo Libre.

Respondents’ perceptions of the importance of the preventive measures paralleled their knowledge of them (Table 3). There was no significant difference in knowledge and perceived importance of the preventive measures between respondents who claimed to know how to prevent cholera and those who claimed not to know.

Practice of cholera prevention measures among Pueblo Libre and Napo River village respondents lagged far behind their knowledge and perceived importance of the measures (Table 3). In particular, few Pueblo Libre and Napo River village respondents always treated their water with chlorine (Pueblo Libre 33%; Napo River 5%), an important preventive measure identified in the Iquitos case-control study. Treated water was rarely used for drinking (Pueblo Libre 25%; Napo River 23%), washing produce (Pueblo Libre 9%; Napo River 16%), preparing drinks (Pueblo Libre 31%; Napo River 21%) or cleaning utensils (Pueblo Libre 21%; Napo River 20%).

There was no significant difference in reported diarrhoea incidence between families that always practised each of the individual ten cholera preventive measures and those that did not. Practice of these preventive measures did not differ significantly by age group, sex, educational level, or perceived ability to prevent cholera.
Table 3. Per cent of survey respondents with correct knowledge, perception of importance, and actual use of preventive measures in urban Pueblo Libre and in rural Napo River villages, Peru, June–July 1991

<table>
<thead>
<tr>
<th>Preventive measures</th>
<th>Knowledge</th>
<th>Perceived importance</th>
<th>Always use measure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pueblo Libre</td>
<td>Napo River</td>
<td>( P )</td>
</tr>
<tr>
<td>Boil drinking water</td>
<td>94.0</td>
<td>98.6</td>
<td>NS</td>
</tr>
<tr>
<td>Treat water with chlorine</td>
<td>74.6</td>
<td>36.9</td>
<td>NS</td>
</tr>
<tr>
<td>Drink treated water</td>
<td>88.1</td>
<td>87.7</td>
<td>NS</td>
</tr>
<tr>
<td>Wash produce with treated water</td>
<td>34.3</td>
<td>44.6</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

DISCUSSION
This KAP survey, which to our knowledge is the only one that has been conducted during a cholera epidemic, rapidly evaluated the impact of the Peruvian cholera prevention campaign in two different settings: an urban community undergoing an epidemic of cholera, as demonstrated by high attack rates and high hospitalization-case rates, and in rural villages at risk but not yet affected by a cholera outbreak, as illustrated by low diarrhoea attack rates and less severe disease. This investigation supplemented information obtained in a case-control study that was conducted concurrently in Iquitos, Peru. Combined results of the two studies provide insight into what factors determine the effectiveness of disease control and prevention campaigns conducted under epidemic conditions.

The KAP survey found that cholera prevention information had penetrated well into communities that presumably had no prior knowledge of cholera because no known cases had occurred in South America in nearly a century. Groups of respondents from both the urban community of Pueblo Libre and from rural Napo River villages scored a mean of about eight correct responses out of ten knowledge questions from the survey. Respondents achieved a similar overall mean score for correct perceptions of the importance of these cholera prevention measures. A high percentage in both groups (93% of respondents from Napo River villages and 67% from Pueblo Libre) were also confident in their ability to prevent cholera.

The success of the cholera prevention campaign in educating Pueblo Libre and Napo River populations can be attributed to the use of multiple sources of information, which has been shown to be more effective than single source programmes. The apparently greater confidence of Napo River respondents in their ability to prevent cholera may have resulted from the more intense health education through interpersonal communication than was received by Pueblo Libre respondents, who had greater exposure to more superficial messages from mass media sources. Alternatively, Napo River village respondents had not directly experienced the epidemic, as evidenced by the near absence of severely ill patients and low rates of diarrhoea in adults. (In nearby rural communities affected by cholera, the mean attack rate of severe watery diarrhoea was 6.0%, the case-fatality rate was 13.5%, and most victims were adults.) In Pueblo Libre, the presence of the epidemic might have undermined some respondents' confidence in being able to prevent cholera.
High levels of knowledge and the perceived importance of specific prevention measures did not, however, translate to high levels of practice, a finding that is consistent with other studies.\(^7\)\(^8\) When viewed in the context of the results of the case-control study, this finding suggests that respondents were engaging in behaviors that put them at risk of cholera despite knowledge of preventive measures. For example, although 88% of Pueblo Libre and 92% of Napo River respondents believed that drinking treated water was important to prevent cholera, only 25% and 23%, respectively, always drank treated water. The case-control study conducted in Iquitos during this epidemic implicated drinking untreated water as a risk factor for cholera.\(^4\) Despite knowing that drinking treated water could prevent cholera, three-quarters of respondents put themselves at risk of contracting this potentially fatal disease.

Similarly, 39% of Pueblo Libre and 63% of Napo River respondents believed that washing produce with treated water was important to prevent cholera, but only 9% and 16% of respondents, respectively, engaged in this practice. In the Iquitos case control study, eating unwashed produce was also a risk factor for cholera.\(^4\)

For cholera prevention knowledge to be translated into preventive health behaviours, the means to accomplish those behaviours must be available. During the 1991 cholera epidemic in Amazonia, chlorine tablets were not available and in many villages bleach could not be obtained. Consequently, knowledge and perceived importance of water chlorination for cholera prevention were low in Napo River villages (36.9% and 47.7% of respondents, respectively), and fewer than 5% of respondents actually used chlorine. In contrast, in Pueblo Libre, where bleach was available and inexpensive, rates of knowledge and perceived importance were higher (74.6% and 80.6%, respectively) and nearly a third of the respondents used bleach. Other barriers may have further limited use of bleach. A study in Brazil documented that noticeable taste, fear of toxicity, and the belief that water treatment is not necessary can be impediments to treating water stored in the household with chlorine.\(^9\) Boiling, the only other available water treatment measure in Amazonia during this epidemic is an alternative that is expensive and time-consuming. Substantial barriers appeared to be hindering the successful adoption of cholera prevention practices in these communities during the epidemic.

For prevention programmes to result in sustained behaviour change, a sense of self-efficacy, defined as the conviction that one can successfully execute the behavior required to produce the desired outcome, must be instilled in the target population.\(^10\)\(^11\) According to some investigators, improved results could be obtained with the application of behavioural theory to control measures.\(^12\) Behavioural theory promotes the use of control measures that are consistent with local resources, beliefs, and cultural practices. Community-based personnel, such as local leaders and existing health personnel should be employed to demonstrate health practices, observe performance of practices, and provide support for sustaining practices within the community.

This study had several important limitations. First, the convenience sample of Napo River village residents and villages included in the study may not have been representative of the entire population of village residents, nor representative of villages in the Amazon region. Nevertheless, economic, social, and cultural similarities among villages in this region of Amazonia would justify using the results of this study to design prevention programmes in rural areas. Second, Pueblo Libre residents, because they lived over polluted water canals and had very high potential exposure to Vibrio cholerae O1, were not representative of the whole urban Iquitos population. However, the higher risk of cholera among Pueblo Libre residents justified focusing on their responses to the cholera prevention campaign. Findings from the study could be applied to future campaigns that would benefit the entire population. Third, statistical comparisons between Pueblo Libre and Napo River participants’ responses could be criticized because of the different sampling methods used. Whether or not statistical testing is used, the differences noted between the highlighted responses are substantial and we suspect would persist independently of sampling methodology because of similar exposures and common experiences that are typical of life in small Amazonian communities. Fourth, because of time constraints we were unable to verify by direct observation whether respondents were actually performing the preventive measures they claimed to use. It is probable, however, that respondents’ claims exceeded their actual practice of cholera prevention measures. If we were able to detect this difference, it would likely increase the gap between knowledge and practice and actually strengthen our findings. Finally, because this cross-sectional study obtained current information about cholera prevention practices and retrospective information about diarrhoea cases, we cannot interpret the lack of a significant difference in diarrhoea incidence between households that always practiced cholera prevention measures and those that did not. We do not know what cholera prevention practices were being used just prior to the occurrence of diarrhoea cases reported by the respondents. A prospective study in which prevention practices
were determined prior to data collection about diarrhoea incidence would be better able to detect differences in diarrhoeal disease rates. The purpose of this study was to describe the extent to which the population had learned and adopted cholera prevention measures.

Results of this KAP investigation, when considered in the context of the case-control study that was conducted concurrently, reveal potential limitations of recommended outbreak control measures and show the importance of obtaining behavioural information for designing disease control strategies in an epidemic setting. In an acute outbreak, rapid implementation of control measures is imperative. A case-control study that determines routes of disease transmission permits a timely assessment of the appropriateness of control measures, which then, if necessary, may be refined. Outbreak control measures often require changes in hygienic behaviours, which can be difficult to accomplish. Furthermore, outbreak investigations do not usually focus on whether the population is adopting the recommended disease prevention behaviours, which is particularly important for preventing recurrences of outbreaks. Knowledge, attitudes, and practices studies can provide this information and can suggest potential barriers to the adoption of disease control measures, and be used to refine and focus health education interventions. This investigation demonstrated that a KAP survey can be rapidly conducted in a randomly selected population to supplement the results of a case-control study. Similar information could also be obtained by incorporating KAP questions into instruments developed for outbreak investigations. This combined methodology can be a timely, effective, and low cost epidemic control tool and deserves further evaluation.

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