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# ENVIRONMENTAL HEALTH IN RURAL AND URBAN DEVELOPMENT AND HOUSING

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## A CASE STUDY OF HEALTH IN HOUSING

Environmental Health and Housing  
in the Huaycan Area of Lima, Peru



WORLD HEALTH ORGANIZATION  
1987

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A CASE STUDY OF HEALTH IN HOUSING

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## A. INTRODUCTION

### 1. Name and duration of the Programme

Environmental Health of Human Settlements in Low-Income Urban Areas. PAHO/HPE-CEPIS. Huaycan Project, Lima, Peru. 1985-1987.

### 2. Contact person

Eng. Alberto Florez Munoz, CEPIS, Casilla Postal 4337, Lima 100, Peru.

### 3. General objectives of the programme

a. To apply a basic sanitation programme at the Huaycan Human Settlement that will permit adaptation to other similar populous urban areas, if the results are favourable when evaluated. This basic sanitation pilot programme consists of:

- Improvement of the water quality supplied to the community by water trucks through disinfection, control by the community itself and permanent monitoring by the health sector. This is the only effective measure to reduce diarrhoeas and other waterborne diseases caused by poor water quality.

- Adjustment of ventilated dry latrines for excreta disposal, within a framework of appropriate methodologies, comparing them with several existing systems in other places, using building materials of the area, that are easy to purchase and are of low cost. This is another efficient way to decrease diarrhoea and parasitic diseases.

- Alternatives to handle and dispose of solid waste (refuse) by establishing an appropriate waste collection system, after selecting a sanitary refuse fill for its final disposal.

b. To develop a strategy based on the cultural, economic and social characteristics of the local population to obtain their active participation in the sanitation programmes in order to improve the health conditions of their dwellings. To identify leaders within the community who will later be the promoters of the programme in other populous areas, thus developing a cooperation among communities.

c. To prepare teaching material related to environmental and personal hygiene to improve the sanitary education of the inhabitants taking into account their own characteristics.

d. To seek the participation of universities and technical schools through their students who will act as technology transmitters and as agents to change attitudes. In this way, students will also face the severe problems of the society to which they belong.

e. To disseminate the methodology developed to other areas.

f. To train technical personnel in the basic sanitation activities.

### 4. Main health problem(s) tackled

Acute diarrhoeal diseases.

### 5. Programme area

Huaycan human settlement, 17th km of the Central Road, left border of the Rimac River, Lima, Peru.

### 6. Characteristics of the area

Huaycan consists of 461.6 hectares. It is located in an uncultivated gorge with a high, a middle and a low part. The settlement is located in the upper and middle parts where 18,000 permanent inhabitants and 20,000 inhabitants on weekends are estimated to dwell at present. It is foreseen that Huaycan will be able to shelter 120,700 inhabitants following the Municipality of Lima development guidelines.

The health conditions of the population are very poor. Huaycan does not have the minimum essential services like drinking water, excreta and solid waste disposal systems or electricity. This is aggravated by a poor economic situation and high level of unemployment.

The main diseases observed in this population are acute and chronic diarrhoeas resulting in malnutrition, acute respiratory diseases and dermatological infections.

35.39% of the population earns between  
250 and 500 Intis = US\$15-30  
17.77% of the population earns between  
0 and 250 Intis = US\$ 0-15  
11.30% of the populations earns between  
1,000 and 7,250 Intis = US\$57-414

Thus, approximately 53.16% earn below the minimum salary.

The average salary in Huaycan is 478 Intis, with an annual income of approximately 5,732 Intis per family.

60% of the dwellings are made of matting (plaited reed). 64% of them have hygienic/sanitary conditions considered between fair and poor. Drinking water is stored in cylinders at home. 30% of these are in very poor condition and only 70% are somehow covered. Disinfection or rechlorination of water at home (although 77% of the population considered it an essential need and only 0.7% had an opposite opinion) is not yet within expectations. Only 20% of the population treats water regularly. The latrine programme only covers a small demand at present. 75% of the inhabitants defecate in open places. 90% of them suggested the use of single family latrines and 11% wanted a collective solution.

There is no regular municipal programme for the collection of solid waste. 83% of the population throws solid waste in places near dwellings without any sanitary control.

#### 7. Target coverage and actual coverage

(Data obtained from survey on 428 families with children under 5 years old. Huaycan, May, 1986)

	<u>Inhabitants</u>	<u>Dwellings</u>
Present coverage	21,000	4,800
Projected coverage		
First stage	39,600	7,200
Second stage	64,700	11,760

#### 8. List of agencies/ministries involved

- Ministry of Public Health, Lima, National Coordinating Group
- Ministry of Public Health, Lima Health Area
- Municipality of Metropolitan Lima and Municipality of the Ate-Vitare District
- Ministry of Housing, Water and Sanitation Public Services - SEDAPAL, SENAPA and Materials Bank
- Industries: Quimica del Pacifico and Sociedad Paramonga Technical
- Cooperation from PAHO/HPE-CEPIS

## B. MANPOWER

Full time manpower assigned by CEPIS to the programme:

- 1 Social Assistant (with a university degree)
- 6 Sanitation Technicians (students from a school of technical level)

Part-time manpower assigned to the programme:

- 1 Environmental Epidemiology Physician (CEPIS Young Professional)
- 1 Sanitary Engineer (CEPIS Young Professional)
- 1 Engineering Assistant (student)

Manpower assigned by the Ministry of Health:

- 3 laboratory technicians

Manpower assigned by the community:

- 26 volunteers

Personnel from the Medical Post, which belongs to the Ministry of Health:

- |                        |                           |
|------------------------|---------------------------|
| - 1 Administrator      | - 1 Statistics specialist |
| - 1 Pharmacy Assistant | - 1 Janitor               |
| - 1 General Physician  | - 1 Obstetrician          |

These work at the Medical Post from Monday to Saturday, from 9:00 to 14:00 hours. They rarely make home visits.

## C. COMMUNITY PARTICIPATION

### 1. Programme of activities and problems encountered

Building knowledge within the community. The population is grouped according to the physical location of their dwellings, in Community Housing Units (CHUs), which are numbered, and have 60 lots of 90 m<sup>2</sup> each. The human settlement is divided into seven large zones. The dwellings in each CHU are distributed around a central area where a community place, a library, a kitchen-living room, and possibly showers and community latrines, may be built according to the community's decision. Each family has an individually owned lot of 90 m<sup>2</sup> and shares recreational areas and community services.

The knowledge to build houses, latrines and other installations is progressively being given. The community is being trained in the construction of ventilated dry latrines using the resources of the locality.

The community participates by building its own latrines and by manufacturing, in small community workshops, the parts needed for them.

Organisation of the community. The same political/administrative structure was used for the development of the community work. It is a participating type of organisation, with a tripartite system comprised of the Municipality of Lima, the District Municipality and the organised population. It is based on the formation of community housing units which group approximately 60 families that commit themselves to work together in construction of their houses and in the development of their neighbourhood.

Mobilisation of the community. This programme could not be developed without the active mobilisation of the community. The "health promoters" are volunteers trained in basic sanitation and work in the CHUs. The community is also mobilised through other programmes such as the government's Temporary Income Program, the glass of milk programme, etc., that have a social effect.

## 2. List of activities in which the community was involved

Planning. Huaycan has 26 volunteers for health promotion (21 women and 5 men). CEPIS sanitation technicians train and orient them for the control and surveillance of drinking water quality. Health promoters need to be able to evaluate the domiciliary water containers' hygiene and to measure the residual chlorine in the water trucks and in the domiciliary water cylinders. They receive a chlorine comparator (of simple construction and low cost) to measure chlorination in their area.

Disposal of human excreta and solid waste is another aspect of this training. The construction of ventilated dry latrines is suggested as a short-term solution. With this in mind, speeches, training and audiovisuals, etc. have been given.

Implementation. Each CHU independently nominates its representatives, who are in charge of solving the problems of their group, coordinating activities and controlling the fulfilment of the agreements.

Evaluation. Inhabitants establish immediate and short-term priorities as well as implementing the work to be done, evaluating the results and selecting the different alternatives, taking into account the economic resources and available materials.

## 3. Main problems encountered in the development of these basic activities

The population's low sanitary education level leads to a misunderstanding of some of the solutions mentioned such as water disinfection, use of latrines, etc. The misuse of sanitary installations and, in other cases, the lack of maintenance and cleanliness, cause problems. Some health promoters abandon their activities if they are offered another job with a salary or any other compensation. The basic environmental sanitation programmes have not had support from the Lima Health Area (Ministry of Health) which gives priority to selective primary health care.

## D. INTERSECTORAL LINKAGES

1. Hostile
2. Tolerates the activities of the programme but does not participate
3. Allows the programme to use its sources of materials
4. Occasionally participates in some of the programme's activities
5. Completely support the programme's activities

	1	2	3	4	5
Ministry of Health, Lima (National Coordinating Group)	-	X	-	-	-
Ministry of Health, Lima (Health Area)	-	X	-	-	-
Central Government	-	-	-	X	-
Public Service for Water and Sanitation	-	-	-	X	-
Technical Cooperation PAHO/HPE-CEPIS	-	-	-	X	-
Ministry of Education	-	-	-	-	X
Ministry of Housing	-	-	-	X	-
Directive Council of the Community	-	-	-	-	X
Bank of Materials	-	-	-	X	-
Municipality of Metropolitan Lima	-	-	-	-	X
Municipality of the Ate-Vitarte District	-	-	-	X	-

E. COSTS

Disinfection per cubic meter of water (in Intis):

Chlorine comparator	0.02
Chlorinated compound	0.12
Water quality surveillance	0.08
Chemical for the analysis	<u>0.02</u>
	<u>0.24</u>

Cost of disinfected water per cubic meter:  $I/.0.24 = US\$0.014$

Family consumption:  $3.0 \text{ m}^3/\text{month}$ , considering 5 inhabitants per dwelling and 20 litres per inhabitant per day.

Monthly family cost:  $0.24 \times 3.00 = I/.0.72/\text{family}/\text{month}$  for disinfection.

Water costs: 2.5 Intis x 200 litres (cylinder)

Cost per cubic meter: 12.50 Intis

Monthly cost  $3 \times 12.50$  Intis =  $I/.37.50 = US\$2.14$

Monthly cost of water plus disinfection per family:  $I/.38.22 = US\$2.18$

Programme costs:

For the first year: Population of 18,000 inhabitants (60 CHUs)

$$\frac{18,000 \text{ inh} \times 0.72/\text{month}}{5 \text{ inh}/\text{dwelling}} = I/.2,592.00/\text{month}$$

For the first stage: Population of 24,000 inhabitants (80) CHUs

$$\frac{24,000 \text{ inh} \times 0.72/\text{dwelling}/\text{month}}{5 \text{ inh}/\text{dwelling}} = I/.3,456.00/\text{month}$$

Excreta disposal

Unit cost of labour:	I/. 420.00
Cost of materials (estimated):	<u>1,440.00</u>
	I/.1,860.00

As the latrine programme should work approximately for two years, each unit can be used by 10 families:

$$\text{Cost/family} = \frac{1,860}{10} = I/. 186.00$$

Family cost per latrine:  $I/. 186.00$

Programme costs:

For the first year: 60 latrines - Population: 18,000 inhabitants  
 $60 \times 1,860 = I/. 111,600.00$

For the first stage: 480 latrines - Population: 24,000 inhabitants  
 $240 \times 1,860 = I/. 892,800.00$

F. ACTIVITIES

1. Water disinfection. Two stages: disinfecting water by chlorination (using chlorinated lime) at the fountain or at the water truck spout; the second one consists of a second chlorination or rechlorination at the dwellings applying enough chlorine to their storage cylinders.
2. Chlorination control of the water trucks by the daily determination of residual chlorine in an entrance to the community. This task is to be performed by trained health promoters.
3. Supply health promoters with residual chlorine comparators designed and built at CEPIS with community support, in order that they may perform, at a low cost, the activities under item 2.
4. Weekly control of the bacteriological water quality by the determination of faecal coliforms and the presence of residual chlorine in the water supplied to the community.
5. Promote the creation of community workshops for the construction of the elementary parts to build latrines, and provide the workers with patterns and new building techniques, with more acceptable sanitary latrine designs.
6. Sanitary education to the community by means of lectures, audiovisuals, etc. to increase sanitary knowledge.
7. Evaluate the sanitary impact in the community through epidemiological studies.

G. ORGANISATION

1. Structure

The Huaycan human settlement was established on 2 May 1984, as a first planned intervention of the Metropolitan Municipality of Lima regarding human settlements. The Work Plan proposed by the Rural Basic Sanitation Office for basic sanitation of marginal urban areas was prepared in June 1985, with PAHO/CEPIS technical support. The Ministry of Health has basically developed the following programmes of medical attention:

- Oral rehydration programme
- Family planning programme
- Epidemiological surveillance of malaria
- Tuberculosis control programmes
- Nutritional programmes
- Vaccination programmes (through campaigns)

Personnel involved in the development of these programmes is mentioned in Section B.2.

2. Problems

The sanitation programme has been proposed and developed with the direct participation of PAHO/CEPIS. Difficulties were encountered in the development of this programme, such as the population misunderstanding some of the sanitary measures, for example, chlorination. These difficulties have already been overcome through sanitary education.

The lack of participation by the Ministry of Health in basic sanitation problems has limited its role in the prevention and control of the principal diseases in this area.

The low educational level of this population does not allow a simultaneous development of all the programme. In the same community there are areas with an acceptable sanitary development and others which are really precarious.



## H. OUTPUTS AND IMPLICATIONS

### 1. Health effects empirically evaluated

An epidemiological evaluation started in March 1986. A morbidity/epidemiological survey on acute diarrhoeal diseases associated with basic sanitation conditions in each area has been carried out in more affected groups. Drinking water quality has also been evaluated from a bacteriological viewpoint together with disinfection by chlorination. (No data are available.)

### 2. Health problems solved or avoided

Difficulties have been encountered during the epidemiological study because there are no previous statistical reports of acute diarrhoeal diseases in the community. Since January 1986, in coordination with the Health Centre physician, a form was designed to register diarrhoeal cases that are treated. Approximately 25% of the monthly diarrhoea cases are registered.

The data gathered in these first six months are not enough to prepare a comparative statistical analysis of water quality and of reported acute diarrhoeal cases. Nevertheless, it has been possible to establish the population groups that are generally treated for diarrhoeas and to identify the areas of greater incidence rates (i.e. 'at-risk' populations).

Drinking water quality has been related to chlorination. Figures show a direct relation between the presence of residual chlorine and water quality.

Primary health care programmes are developed by the Health Centre staff and are principally oriented to cure and assist people having difficulties with the prevention and control activities. According to their survey data 44% of the population goes to the Health Centre, 21% goes directly to the hospital and 10% to other places.

Within the sanitation programme, latrines are being progressively developed. A total of 17 community ventilated dry latrines have been built, 18 family ventilated latrines have been completed, and 38 are in the process of construction. The use of local construction materials is contemplated, which will lower the price of the installations. Latrines built by the inhabitants themselves, without sanitary parameters, which total 22 family latrines and 6 community latrines, are not included in the former figures.

Zones with a higher number of latrines are: Zone A, that has 15 constructed latrines, followed by Zones C and E, with 5 latrines. These areas have better sanitation and their morbidity rates due to acute diarrhoeal diseases are similarly low. This situation does not occur in the other zones where there are no latrines or where they are in the process of construction.

### 3. Lessons

The educational activity, the speeches about health, and the training of promoters in each area, have allowed the community to understand that it is important for health to improve drinking water quality by means of disinfection with chlorination.

The community health promoters have learned techniques for residual chlorine determination and chlorination control in the water trucks and domiciliary rechlorination.

Latrines have been accepted by the community as the most convenient way for excreta disposal in the first step of this programme, and the inhabitants are building latrines in the different CHUs using the materials and resources of the area.

The community has understood the necessity to solve the most severe problems of water supply and latrine construction. With this in mind, community workshops have been installed to manufacture needed parts like bricks, planchas vacinetes, latrine rings, etc. The community collaborates in the refuse collection in each CHU, recycling what can be used and burying what cannot be reused.

The Ministry of Health has the direct responsibility over the control and orientation of the basic sanitation programmes, using the potential manpower of the communities.

I. EVALUATION

This case study is a good example of:

- |                                |     |
|--------------------------------|-----|
| a) community involvement       | yes |
| b) intersectorial coordination | yes |
| c) sustainability              | yes |
| d) transferability             | yes |
| e) cost-effectiveness          | yes |
| f) appropriate technology      | yes |

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