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Social and cultural factors affecting infantile diarrhea in Lima, Peru

Gabriel J. Escobar
Yale University

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SOCIAL AND CULTURAL FACTORS AFFECTING INFANTILE DIARRHEA IN LIMA, PERU

A Thesis Submitted to the
Yale University School of Medicine
in Partial Fulfillment of the Requirement
for the degree of Doctor of Medicine

by

Gabriel J. Escobar

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ABSTRACT

This study is a preliminary survey focusing on beliefs regarding infantile diarrhea among populations at risk in Lima, Peru. The study consisted of structured interviews of mothers of children under the age of two and clinical and cultural observations by the investigator. Ninety-one mothers of children under the age of two were interviewed by the investigator regarding their beliefs on the etiology of infantile diarrhea. Interviews took place in Lima's Area Hospitalaria N° 1 (Hospital Area No. 1) at two locations: the Pediatric Emergency Service at the Hospital General Base "Cayetano Heredia" (HGBCH) and the Centro de Salud Canto Grande (Canto Grande Health Center, CSCG); the latter is a health center located in one of the rapidly growing shanty-towns surrounding the city of Lima.

Results of the study show that diarrhea is not seen as an infectious disease but rather as part of a disease theory system with a hot-cold dichotomy as its fundamental basis. Within this framework, diarrhea is seen primarily as a disease caused by "cold," although emotional factors are also believed to be important. Prevention of illness focuses on impeding cold and emotional forces from invading a child's body. Fluid balance and fecal-oral contamination are concepts without great importance in the disease theory system of the population studied and no correlation was found between beliefs about etiology of diarrhea and the degree of dehydration of children on presentation at the HGBCH and the CSCG.

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INTRODUCTION

This study is a preliminary survey focusing on beliefs regarding infantile diarrhea among populations at risk in Lima, Peru. It is based on the following hypotheses:

1. Characteristic beliefs regarding etiology of infantile diarrhea, not necessarily in agreement with Western conceptions, exist among populations at risk.
2. These beliefs can affect the clinical condition on entry into the health care system.

This study also suggests ways in which knowledge of these beliefs can be used to reduce mortality and morbidity of diarrhea. Although it concentrates on factors prior to a child's entry into Peru's health care system, other clinical and cultural observations made by the investigator during his stay in Peru are included in the appendices.

INFANTILE DIARRHEA IN DEVELOPING NATIONS

Infantile diarrhea is one of the major health problems in developing nations[1]. Data from some studies show that when overall mortality in infants is greater than 60 to 80 per thousand live births (as is the case in Peru[2]) more than 30% of all deaths are due to diarrhea[3]. There is a close link between malnutrition, unsanitary conditions, unregulated fertility, and the infectious diseases. Many of the survivors of diarrheal episodes go on to develop malnutrition[4].

From an economic standpoint, the burden to developing nations of having a substantial proportion of hospital beds devoted to children with diarrhea cannot be ignored. While the cost of diarrhea to developing nations cannot be estimated, some idea of the economic importance of diarrhea can be obtained

by looking at the United States. In 1971, in the United States, there were 681,000 admissions among all ages for diarrhea, which cost about 700 million dollars. In children less than one year of age, there were 113,000 admissions, or about 16% of all admissions at that age[5].

At the Hospital General Base "Cayetano Heredia" (henceforth, HGBCH), one of the study sites (see Appendix 5), diarrhea accounted for 7.8% of all emergency room visits and 12.9% of all pediatric outpatient visits in 1978. That year, diarrhea accounted for 4.3% of all hospitalizations, 16.7% of all pediatric hospitalizations, and 29.9% of all hospitalizations of children under one year of age. 9.3% of all deaths at the HGBCH in 1978 were from diarrhea; in the pediatric population, diarrhea accounted for 23.6% of all deaths; only respiratory infections have a higher mortality in the pediatric population.

In addition to social and economic factors, infantile diarrhea also involves deep-seated cultural and behavioral patterns. Since the major cause of death in diarrhea is dehydration, beliefs on hydration and breast-feeding are important.

One important group of people at risk for infantile diarrhea is the population residing in the shantytowns that surround major Latin American cities (see Appendix 2). These people live in conditions of poor housing, sanitation, education, and nutrition. In spite of varying lengths of time spent in an urban or semi-urban environment, they retain many beliefs about health from their sites of origin. In Peru, these beliefs are an amalgam of Western medicine, traditional Inca and non-Inca medicine, and 16th and 17th century Spanish medicine and witchcraft.

MATERIALS AND METHODS

Beliefs about infantile diarrhea were recorded on a questionnaire described in Appendix 1; detailed descriptions of the interview sites are given in Appendices 4 and 5. Data from the questionnaire were transferred to punch cards and analysed on an IBM 370/158 computer using the SAS statistical analysis package.

Interviewing was done during regular operating hours, Monday through Saturday, beginning at around 8:30 A.M.: interviewing was not done on Saturdays at the Centro de Salud Canto Grande (henceforth, CSCG). Interviewing was done at the CSCG from January 31 through February 28, 1980, and from March 14 through March 26, 1980, at the HGBCH. Summer in Peru, the peak season for infantile diarrhea, is from December to March.

At the HGBCH Pediatric Emergency Service, the investigator simply saw the first five cases of diarrhea each day. Sampling was limited by ethical considerations described below.

At the CSCG, the auxiliares (nurse's aides) who assigned patients to the medical staff were asked to assign to the investigator, who worked at the center, all mothers who came with a child under two years of age whose chief complaint was diarrhea. During the summer months, 4-6 cases of diarrhea per day arrive at the center. Since on some mornings there were few cases of diarrhea and since sometimes the patient load on other staff members was heavy, the auxiliares also assigned some well-babies to the investigator; these were newborns who needed to be checked for the possibility of tetanus since they were born at home. Thus, 13 mothers of well-babies were also interviewed by the investigator. It should be remembered that the level of disorganization at the center is high and that three auxiliares have to receive all patients, weigh them, and take their temperature. On some days up to 80 patients have to be seen in the morning and the bulk of them

arrive early. Because of this, a few mothers were assigned to other staff members and were not interviewed. If a mother did not list diarrhea as the chief complaint, her child was assigned to another staff member; at the end of the working day, the investigator checked daily records in order to determine the actual number of children with diarrhea.

The procedure employed for the interviews was as follows. Mothers were first asked to participate in the study and its purpose was explained to them; they were informed that participation was completely voluntary and that they could suspend the interview at any point. If a mother agreed, she was interviewed and the clinical history was obtained at the same time. This procedure took about 20 minutes. Following this, the child was examined and an appropriate course of action taken. After the child was examined, the investigator also answered any specific questions mothers had (these were usually on infant feeding). The investigator instructed all mothers of children that he treated, not just those that he interviewed. The investigator never hesitated to ask for help from the senior staff if the clinical situation was beyond his ability to handle; diagnoses were verified with them as well.

Ethical considerations limited interviewing. Children with severe dehydration cannot be treated at the CSCG (see Appendix 7), so no attempt was made to interview their mothers and the investigator made sure that such children went to the HGBCH immediately. A mother was not interviewed if doing so meant jeopardizing the health of her child or causing her to lose working time beyond what she would normally spend in a hospital visit. In addition, some interviews were aborted due to the demands of the clinical situation--if another child arrived with septic shock, as occurred on several occasions during the interviews (see Appendix 6, Section C), the investigator

felt ethically bound to assist the staff and forgo an interview. For these reasons, some bias is present: children with severe dehydration and those with other severe illnesses in addition to diarrhea tended to be excluded from the sample.

The breakdown of interviews and refusals is given on the following page.

CSCG:

Mothers of diarrheic children	interviewed	36
	refused	7
Mothers with children who had to be sent to the HGBCH immediately		3
Mothers mistakenly assigned to another staff member		4
Subtotal, presenting cases with diarrhea		50
Mothers whose children presented with another illness as chief complaint, thus not assigned to the investigator		13
Total number of children with diarrhea during interview period		63
Response rate, mothers of diarrheic children		57%
Mothers of well-babies	interviewed	13
	refused	2
Response rate, mothers of well-babies		87%

HGBCH:

Mothers of diarrheic children	interviewed	42
	refused	6
Mothers who could not be interviewed due to severity of case or pressure of the clinical situation		6
Response rate		78%

At the HGBCH, there was a total of 172 cases of diarrhea (including times when the investigator was not present, since the emergency room is open 24 hours a day) with 9 hospitalizations during the interview period.

RESULTS

The characteristics of the group of mothers interviewed are given below. These data are consistent with Peruvian migration patterns[2,6]:

Age: mean 26.7 ± 4.9 years; no difference between those at the CSCG and those at the HGBCH. Range: 15-39 years (N = 91)

Number of children: 3.2 ± 1.8; no difference between those at the CSCG and those at the HGBCH. Range: 1-9 children (N = 91)

Distance from the hospital in mothers at the HGBCH: (N = 42)

30 minutes or less	57.2%
31-60 minutes	31.0%
more than one hour	11.9%

Literacy: (N = 91)

	CSCG	HGBCH
Able to read	61.2%	88.1%
Unable to read	38.8%	11.9%

Difference was significant ($p < 0.01$).

Education:

	CSCG (N=49)	HGBCH (N=42)	Overall (N=91)
None	30.6%	9.5%	20.9%
Up to primary school	55.1%	50.0%	52.8%
Up to secondary school	10.2%	23.8%	16.5%
Secondary school completed	4.1%	16.7%	9.9%

Has mother had another child with diarrhea that has died or been hospitalized?

(N = 91)	Yes	15.4%
	No	84.6%

Length of residence in Lima:

(N = 91)

	%
Gave no answer	5.5
Less than 2 years	3.3
2-5 years	13.2
More than 5 years	78.0

Place of origin:

(N = 91)

	%
Gave no answer	5.5
Lima	19.8
Outside Lima	74.7

Use of antibiotics for afflicted child:

(N = 91)

	%
Gave no answer	14.3
Don't know	1.1
Used	28.6
Did not use	56.0

Characteristics of the children involved are given below. Clinical criteria are given in Appendix 5. The preponderance of male children ($p < 0.02$) cannot be explained. It is conceivable that parents see their male children as being more important and do not bring in their daughters as frequently.

Sex of child:

(N = 91)

	%
Male	62.6
Female	37.4

Age of child:

(N = 91)	%
Less than one month	12.1
1-6 months	30.8
7-11 months	22.0
1-2 years	35.2

Nutritional status of child:

(N = 91)	%
No malnutrition present	68.1
1st degree malnutrition	16.5
2nd degree malnutrition	13.2
3rd degree malnutrition	2.2

Length of illness: Average length of illness of children was 6.4 ± 6.7 days No significant difference between dehydrated (6.6) and non-dehydrated (6.2) children was found but a slight difference between children at the CSCG (5.7) and the HGBCH (7.0) was found. Range: 0-30 days (N = 78).

Child feeding

(N = 91)	%
Breastfed exclusively	22.0
Canned or powdered milk	37.4
Mixed	38.5
No milk of any kind	2.2

Has child had diarrhea before?

(N = 91)	%
Yes	52.8
No	37.4
Yes, and child was hospitalized	9.9

% Dehydration in children with diarrhea

(N = 78)	%
None	44.9
3%	30.8
5%	15.4
8%	9.0

Final diagnosis

(N = 91)	%
Well child	14.3
Chronic diarrhea	6.6
Subclinical dehydration	24.2
Moderate (5-10%) dehydration	17.6
Diarrhea with no dehydration	33.0
Other illness predominant	4.4

The slight difference in the number of days a child was ill before being brought in for treatment is probably due to the greater accessibility of the CSCG as well as its more relaxed atmosphere; mothers were undoubtedly less likely to feel threatened at the CSCG than at the HGBCH. Eutrophic children were less likely to be dehydrated and also less likely to be significantly (5-8% weight loss) dehydrated than children in whom malnutrition was present ($p < 0.01$). There was no relationship between dehydration and education or literacy. No relationship was found between breastfeeding and malnutrition or dehydration; this latter finding probably reflects the small sample size and the exclusion of severely dehydrated children for ethical reasons.

Respondents' answers indicate that several types of diarrhea are known (Table 1) and are thought to affect children (Table 2) without preference to either sex (Table 3). Dysenteriform diarrhea is perceived as being most dangerous (Table 4). Among non-dysenteriform kinds of diarrhea, green stools are considered dangerous (Table 5).

TABLE 1

Do you know these kinds of diarrhea?

(N = 91)

% answering "Yes"

Watery	100.0
With mucus	96.7
With pus	20.9
With blood	57.1
Green	96.7
Yellow, with clumps, like curdled milk	86.8
Other*	4.4

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* "Foamy" diarrhea was mentioned by respondents

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TABLE 2

At what age is diarrhea most common?

(N = 91)	%
Newborns	1.1
Less than one month	1.1
1-24 months	59.3
2-5 years	17.6
More than 14 years	1.1
No answer	19.8

TABLE 3

Diarrhea is most common in--

(N = 91)	%
Males	16.5
Females	14.3
Same in both sexes	50.6
Don't know	17.6

TABLE 4

Which of these diarrheas is most dangerous?

(N = 91)	%
Watery	13.2
With mucus	5.5
With blood and mucus	28.6
With blood	27.5
Yellow, with clumps, like curdled milk	2.2
Green	6.6

TABLE 5

Which of these diarrheas is most dangerous?

(N = 91)

Question was limited to the four types of diarrhea listed

	%
Yellow, with clumps, like curdled milk	7.7
Yellow	9.9
Dark, brown	12.1
Green	46.2
Don't know	22.0

Responses to an open question, "What causes diarrhea?" are given in Table 6.

TABLE 6

What causes diarrhea?

(N = 91) Numbers are percentages

	CSCG	HGBCH	Overall
COLD	69.4	19.0	46.2
INGESTA	14.3	31.0	22.0
MILK	6.1	23.8	14.3
FOOD	20.4	16.7	18.7
INFECTION	2.0	9.5	5.5
OTHER	8.2	21.4	14.3
MORE THAN 2 CAUSES, INCLUDING COLD	22.4	2.4	13.2

Answers given require further explanation.

COLD: in Peruvian folk medicine, "cold" describes an intrinsic quality as well as physical temperature. Items such as tomatoes and certain fruits, for example, are designated as "cold" while other items, such as some spices and legumes, are designated as "hot." A mother who washes clothes, for example, is engaged in a "cold" activity, irrespective of the water temperature (see Discussion, below). Answers included here were such things as the baby being left in the cold, cold foods (both in the physical and intrinsic sense), the baby wearing a piece of clothing that had been allowed to stay in the cold, breastfeeding under "cold" conditions (see Tables 15-17), and so forth.

INGESTA: answers that had as common denominator the baby's ingestion of "dirtiness" (suciedad), or, more commonly, paper or fruit peels that are believed to get stuck in the stomach, causing diarrhea, were included here.

MILK: answers that had a factor related to milk were grouped here. These included changes in milk (from breast to canned milk, for example, or from one brand of milk to another) and spoiled milk. It is believed that such changes "clash" with the baby's stomach "le choca al niño"); since the baby is little, his stomach and digestive tract are considered more delicate and thus highly sensitive to any changes.

FOOD: answers with some aspect related to food (with the exception of "cold" foods) are grouped here. These include poorly washed or dirty foods, spoiled foods, "heavy" foods (lentils, beans), and other foods that "clash" with a baby's stomach.

INFECTION: mothers often answered that the baby had an "infection" or that "microbes" had caused the illness. When questioned, however, extremely

few knew what an infection actually was. This is a case of a term used in Western medicine that has been adopted by a traditional culture.

Answers that could not be classified into the above categories were coded as "other." Coding permitted recording of multiple answers. CSCG respondents were more likely to answer that "cold" was a cause of diarrhea ($p < 0.01$), as were those with primary school education or less ($p < 0.05$). Mothers who answered that "cold" was a cause of diarrhea were also more likely to breastfeed ($p < 0.01$). Breastfeeding in underdeveloped nations is a complex subject and is treated in the Discussion.

Diarrhea is seen as a dangerous illness (Table 7) but not necessarily as an emergency (Table 8).

TABLE 7

Can a child die from diarrhea?

(N = 91)	%
Yes	85.7
No	3.3
Don't know	5.5

TABLE 8

After how many days of diarrhea can a child die?

(N = 91)	%
Don't know	20.0
1 day or less	5.5
1-3 days	14.3
4-7 days	15.4
More than 7 days	27.5

Sequelae of diarrhea are also known (Table 9) but not necessarily understood (Table 10). Only 15 mothers (16.5%) could show the investigator

that they could recognize dehydration; most were in the HGBCH ($p < 0.02$) and a slight association with literacy ($p < 0.08$) was found but no association with the degree of dehydration in affected children was found. Tables 11 and 12 show that other terms and techniques used by Western medical practitioners can be interpreted in different ways.

TABLE 9

What happens after a child has diarrhea?

(N = 91)	%
A. Child loses weight	70.3
B. Child dehydrates	23.1
A + B	11.0
Don't know	2.2
Other	9.9

TABLE 10

What is dehydration?

(N = 91)	%
Don't know	42.9
Loss of fluid	39.6
"Infection"	1.1
Other	12.1

TABLE 11

What is an infection?

(N = 91)	%
Don't know	23.1
Lack of fluids	1.1
Food-related factor	17.6
Cold-related factor	6.6
Ingesta-related factor	35.2
Ascription*	12.1
Other	11.0

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* simple description of symptoms and signs given as answer

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TABLE 12

What is the (IV) fluid that is put into a child's vein in the hospital?

(N = 91)	%
Don't know	55.0
"Vitamins"	11.0
"Food"	8.8
"Medicine"	6.6
Water with salt and sugar	8.8
Other	4.4

Although the study focuses on beliefs about the etiology of diarrhea, some questions regarding treatment were asked. Answers to an open question, "What should one do when a child has diarrhea?" are given in Table 13 (many respondents could not answer this question). A list of possible treatments was also given (table 14).

TABLE 13

What should one do when a child has diarrhea?

(N = 91) Numbers are percentages

Milk	Suspend feeding milk	60.4
	Continue giving milk	28.6
Liquids	Give liquids *ad lib*	47.2
	Measure liquids	22.0
Food	Suspend food	31.9
	Continue feeding	28.6

TABLE 14

Would you Give _____ to a child with diarrhea?

(N = 91) % answering "Yes" to item	
Cold (unboiled) water	6.6
Tap or tank water	6.6
Boiled water allowed to cool	91.2
Water with sugar	79.1
Water with salt	25.3
Water with salt and sugar	30.8
Avocado seed infusion	52.8
Anis or *manzanilla* (local herb) infusion	87.9
Panetela*	94.5
Orange juice	7.7
Bananas	11.0
Other fruits	29.7
Strong tea	91.2
Carbonated drinks	44.0
Charcoal**	40.7
Commercial electrolyte fluid	67.0

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* a recipe for *panetela*, a low sodium broth, is given in Appendix 7

** this refers to burnt toast, an ingredient of *panetela*

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A series of questions regarding breastfeeding were asked; results are given in Tables 15 through 17. It is interesting to note that mothers saw anger as more transmissible via breastmilk than happiness or diarrhea. Mothers who believed that "cold" was a cause of diarrhea and who also thought that "cold" could be passed via their breastmilk were more likely to have dehydrated children ($p < 0.03$) but not necessarily severely dehydrated children.

TABLE 15

What happens to the baby when the mother breastfeeds when she has tuberculosis?

(N = 91)	% responding
Baby gets tuberculosis	82.4

TABLE 16

What happens to the baby when the mother breastfeeds?

(N = 91)	% responding
Baby is happy	16.5
Nothing happens	73.6
Don't know	4.4
Other	1.1

TABLE 17

Does baby get diarrhea if mother breastfeeds the baby when--

(N = 91) Numbers are percentages believing breastfeeding causes diarrhea under conditions listed.

She is angry	74.7
She has diarrhea	44.0
She is nervous	19.8
She is sad	4.4
She has to wash clothes	58.2
She has to be in the cold	47.2

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Note: question phrasing was "What happens to the baby when the mother breastfeeds when_____?" The table is a composite of 6 questions

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Additional factors believed to cause diarrhea are given in Table 18, which gives replies to an open question. A list of possible etiological agents was given as well (Table 19). Responses to an open question about the disease mechanism of diarrhea are given in Table 20. Not all mothers answered these questions and some gave multiple answers.

TABLE 18

What other things can cause diarrhea?

(N = 91) Numbers are percentages

	CSCG	HGBCH	Overall
Child begins teething	81.6	78.6	80.2
Child begins walking	71.4	50.0	61.5
Child begins talking	67.3	42.9	56.0
Susto (fright) and mal de ojo (evil eye)	87.8	64.3	76.9

TABLE 19

Can _____cause diarrhea?

(N = 91)	% answering "Yes"
Breastfeeding	56.0
Dust	62.6
Dirtiness	89.0
Dampness	80.2
Cold air	72.5
Cold water	90.1
Cold foods	86.8
Tap or tank water	92.3
Cold air currents	53.8
Air currents, though not cold	8.8
Hot air	12.1
Hot water	12.1
Boiled tap or tank water	2.2
Hot foods	20.9
Oregano	11.0
Powdered milk	46.2
Fruit	62.6

TABLE 20

What happens to a child's stomach when he has--

(N = 91) Numbers are percentages

	Diarrhea?	Bloody Diarrhea?
DON'T KNOW	25.3	30.8
COLD	7.7	6.6
PAPER	23.1	3.3
FOOD	9.9	---
SORE	3.3	4.4
WOUND	3.3	20.9
DIRTINESS	22.0	1.1
INFECTION	2.2	8.8
ASCRIPTION	11.0	---
PROLONGATION	---	3.3
OTHER	7.7	2.2

Responses in Table 20 require further explanation.

COLD: see p. 13, ff, and Discussion, below.

PAPER: paper or fruit peels stuck in the stomach.

FOOD: food or spoiled food stuck in the stomach.

WOUND: presence of a bleeding wound inside the stomach.

SORE: presence of an ulcer or sore (non-bleeding wound) inside the stomach. Llaga (literally, sore) has the connotation of suffering.

DIRTINESS: "dirtiness" stuck in the stomach; dirty foods stuck in the stomach; dirt that a child ate.

INFECTION: see p. 14.

ASCRIPTION: when a mother merely repeated symptoms and signs.

PROLONGATION: it is believed by some that, if diarrhea is allowed to continue without being "cut" (sin cortar) because of, say, a mother's carelessness, prolongation of the illness will result in bleeding from "over work" (this is supported by the empiric observation that Shigella often produces cramping). The concept that over work of organs leads to illness is common in the Andes[7].

No further correlations were found between specific beliefs regarding the etiology of diarrhea, e.g., susto (fright, discussed below), or specific agents that could be given to a sick child, e.g., commercial electrolyte solutions purchased at a pharmacy, and the presence or degree of dehydration.

DISCUSSION

In order to interpret this study's findings, the concept of a disease theory system will be employed. For the purposes of this discussion, a disease theory system is a body of knowledge (empiric and traditional) that explains or purports to explain disease. Foster[8], stressing that medical

systems have multiple functions, lists six functions of a medical system:

1. A disease theory system provides a rationale for treatment.

2. A disease theory system explains "Why."

3. Disease theory systems often play a powerful role in sanctioning and supporting social and moral cultural norms.

4. A disease theory system may provide the rationale for conservation practices.

5. A disease theory system may serve to control aggression.

6. Traditional medicine often plays an important role in the development of nationalistic pride.

Western medicine, as taught in United States medical schools, for example, is a disease theory system. Most health practitioners in the developed nations tend to focus on the first two functions listed by Foster. Shigellosis can be used as an example of how the Western disease theory system operates. A child with dehydration and bloody stools is diagnosed as having a Shigella infection ("Why") and is treated with fluids and ampicillin ("rationale for treatment"). The disease theory system is supported (but not always) by empirical observations.

Traditional disease theory systems operate side by side with Western medicine in Latin America. In the traditional systems, illness is ascribed to invasion by excessive heat or cold. Sometimes actual temperature is involved, as when a woman attributes hand and arm cramps to her carelessness in washing them in cold water when they were temporarily heated from ironing clothing. More often heat and cold are viewed metaphorically; cold may enter the body in the form of "air," from the ingestion of "cold" foods, from stepping on a floor barefoot and the like. Medical anthropologists believe this disease theory system to be a modification of the ancient Greek doctrine of the four humors (blood, phlegm, black bile, and yellow bile). The doctrine, after

passing through Arab translators and Spanish and Portuguese conquerors, became fused with local beliefs in Latin America, eventually becoming reduced to a hot-cold dichotomy[8].

The importance of the metaphoric nature of "hot" and "cold" cannot be overemphasized. Virtually all foods are designated as "hot" or "cold," depending on the locale. In Lima, cinnamon, oregano, boiled water, and pork are designated as being "hot" while tomatoes, unboiled water, and some types of bananas are designated as being "cold." Certain activities, such as washing clothes by hand (even if done with warm water) are "cold" activities.

In addition to assigning intrinsic qualities of "hot" or "cold," the hot-cold system is accompanied by a concept which Harwood calls "neutralization": If an illness is perceived as "hot," it can be cured by a substance that is "cold" and vice versa. Harwood describes patients who readily take penicillin for rheumatic fever because the drug is classed as "hot" whereas rheumatic fever, involving joint pains, is considered a "cold" illness[9]. This illustrates how traditional disease theory systems accomodate modern ideas, encasing them within their framework. It helps explain dual use of health facilities by Latin Americans: some diseases are seen to be treatable by traditional medicine, others by Western medicine, and others by both systems[10,11]. The importance of considering such beliefs in public health planning is detailed by Foster[8,12]. One well known Peruvian example is Wellin's description of how some people agreed to boil their drinking water, not because of a belief in germs (whose very existence was considered absurd) but because boiling eliminated the "cold" quality of "raw" water[13]. One mother told the investigator that she gave her child bananas (considered "cold") after cooking them; cooking them eliminated the danger of causing illness due to "cold" entering her child's body.

Traditional disease theory systems also include what are called "folk illnesses." Two well documented illnesses are susto (fright; the investigator was diagnosed and treated for this illness and his experience is described in Appendix 6), in which the soul is believed to have left the body, and mal de ojo (evil eye; the illness is not always eye related), in which some individuals are held to have exceptionally "strong" eyesight that can harm individuals or objects[8,14,15]. Other folk illnesses have been described in Peru, particularly strong psychosomatic reactions to embarrassment[7].

Many illnesses, particularly respiratory and gastrointestinal tract infections, are believed to have "cold" as the main cause (see Results, above). There is a strong tendency to overdress infants; this tendency is not limited to people of low socioeconomic status. In winter, for example, people are often afraid to drink chilled soft drinks or cold liquids, especially if they have respiratory tract infections. Attitudes to cold are of clinical importance. Children with fever are bundled up with several blankets and sweaters. Indeed, on many occasions the investigator had to convince mothers that it was necessary to undress a child for a physical examination and that no harm would come to the child due to a "cold air current" that would "grab" (agarrar) the baby. Children with dangerous (40° C and higher) fevers were bathed by the staff at the HGBCH: this was extremely traumatic to parents and many mothers burst into tears at the mere mention of this procedure.

The data from this study show that infantile diarrhea is perceived as a "cold" disease. For example, 80 to 90% of those interviewed thought that cold water or cold foods cause diarrhea. In contrast, only 11% thought that oregano, a "hot" substance, could do so. At no point did respondents mention anything approaching the germ theory of disease. Dirtiness, for example, is believed to cause diarrhea. However, it is the intrinsic and emotional

quality of dirtiness that is invoked, not its physical or microbiologic quality.

Three other findings of this study must be stressed. First, traditional concepts of emotion as a cause for many illnesses, including diarrhea, remain. Susto is believed to be a possible cause for diarrhea (see Table 18, above) as is breastfeeding when a mother is angry. The persistence of such beliefs is important in a context in which Western style advertising, with its emphasis on women's breasts as sex symbols, and aggressive marketing of infant formulas exert tremendous pressure on mothers to cease breastfeeding. Second, the data show evidence that some Western medical terms are assigned different meanings in traditional disease theory systems. "Infection," for example, does not mean the presence of bacteria or parasites in the body but something resulting from foreign bodies a child may have eaten (such as paper) or because the child ate "cold" foods (see Table 11, above). Finally, the data show that there is a cultural tendency towards hypokalemia and hyponatremia in children with diarrhea. Two important natural sources of potassium (bananas and oranges) are not felt to be safe to give to children with diarrhea (see Table 20, above). The most common treatment for diarrhea is panetela (a recipe is given in Appendix 7), a broth which has no salt.

Peak incidence of diarrhea in Lima is from December to March (summer). A question that comes to mind is how people can designate "cold" as an etiological agent for an illness most prevalent when temperatures are highest.

It must be remembered that the bulk of the settlers of Lima's shanty-towns have a rural background[6]. Historically, the urban experience is a new phenomenon for this population. Disease theory systems must be interpreted in a rural context where, in addition to providing a quasi-medical theory,

belief systems would also provide some of the cultural benefits listed by Foster (p. 23).

The investigator visited several high altitude rural areas in the Andes, where most migrants to Lima originate. Significant factors in those communities include:

1. Low temperatures early in the morning and at night (often below freezing); very low humidity.
2. Breastfeeding until as late as 2 years of age; virtual absence of bottle feeding.
3. Low infant mortality due to diarrhea.
4. High infant mortality due to respiratory infections and accidents.
5. Cultural patterns centering on small villages in relative isolation.

It is possible that, in such settings, associating "cold" with illness could offer significant biologic adaptive value. Cold injury to small children, particularly neonates, is a well described clinical entity[16,17]. Cold stress could also increase caloric requirements and this could, in the presence of limited nutrients, increase susceptibility to illness in general, particularly in children. Since diarrheal incidence is low in such settings, contradictions to this disease theory system could be explained with greater ease. Empiric observations could thus support the concept that "cold" was the cause for many illnesses. It is important to note in this context that people from tropical or semi-tropical climates like Puerto Rico or Central America see diarrhea as a "hot" disease[8,9,10].

A disease theory system's validity in one location does not guarantee its validity in another, and advantages in a rural setting could vanish in an urban environment. The results of this study are consistent with such a concept: the degree of dehydration in affected children, for example, was

unrelated to what mothers believed to be the cause of illness. The disease theory system based on a hot-cold dichotomy may have had adaptive value in its original setting but, at least with respect to infantile diarrhea, it has little, if any, adaptive value in a shantytown where nutrition is poor and breast-feeding is decreasing. Prevention of cold injury and of emotional upsets is a logical consequence of believing in a system that includes susto, while attention to fecal-oral contamination or to fluid balance is not.

It should be stressed that the above arguments cannot completely explain the persistence of cultural patterns or the modifications that occur in them when they come into contact with modern ideas. Urban populations in Latin America are in a period of tremendous cultural change, a process beyond the scope of this paper.

CONCLUSIONS AND RECOMMENDATIONS

This study provides evidence of the persistence of characteristic beliefs regarding disease in urban Peru. The principal conclusions are as follows:

1. Diarrhea is not seen as an infectious disease but rather as part of a disease theory system with a hot-cold dichotomy as its fundamental basis.

2. Within this framework, diarrhea is seen primarily as a disease caused by "cold," although emotional factors are also believed important. The conceptual approach to illness is similar throughout Latin America but it differs in details from population to population (e.g., Puerto Ricans consider diarrhea "hot").

3. Since beliefs about etiology can influence preventive and therapeutic measures, these beliefs about diarrhea are not beneficial to children. Within the framework of the system, prevention focuses on impeding "cold" and emotional forces from invading a child's body. Fluid balance and fecal-oral contamination are concepts without great importance in the disease theory system of the population studied.

This study's findings also emphasize the need for specific information when implementing public health measures aimed at prevention of major diseases in underdeveloped nations: while general adherence to the hot-cold dichotomy will be found throughout Latin America, specific elements will vary according to the locale.

Harwood's approach has been advocated by many health workers involved in oral rehydration programs; it is more important to get mothers to get their children to drink than to try for quick changes in their conception of disease[9]:

> From the standpoint of behavioral science, the most effective approach would be to work within the system, using notions like neutralization or other features of the classification to achieve the therapeutic goal. The probability of changing an individual patient's conception of disease etiology in a few encounters is small indeed---particularly with the hot-cold theory, which not only orders a great deal of health behavior but is also supported by prestige, developed through generations of use, as well as, in many instances, by empirical validation. Respect for the patient's tradition and an ability to work within the therapeutic choices inherent in it allow for development of a treatment regimen with the patient which does not contravene his deeply held ideas about illness and will therefore stand a much greater chance of success.

Findings from this study can be of specific use in Peru and, with modifications appropriate to the locale, elsewhere in underdeveloped nations. The investigator considers the following recommendations to be important:

1. Instruction in the hot-cold system to medical students and primary care personnel. These individuals are routinely trained to foresee problems in patient compliance. Teaching of local disease theory systems is a logical extension of such training. Formal instruction is important, as informal teaching will tend to keep knowledge on an anecdotal level.

2. Use of local terms in labeling. Health agencies should employ local names for remedies, for example. Oral rehydration packets can be labeled taking account the beliefs of the locale. In Lima, the most common substance given for diarrhea is panetela; the name can be employed with oral rehydration solutions.

3. Assimilation of local remedies. Many curative practices, such as giving infusions of anis seeds, are probably innocuous. They offer excellent opportunities for improving compliance; for example, oral rehydration solutions with aromatic herbs might find greater acceptance.

4. Use of neutralization concepts. Mothers can be convinced to administer breastmilk and fluids by emphasizing neutralization rather than sterility: a mother can be told to drink a hot tea before she breastfeeds, so as to pass warmth to her child.

Control of diarrheal disease involves long term considerations; it is not only a medical problem but is closely tied to development of countries as a whole. Medical personnel must view themselves in this context. However, it is also important to attend to immediate health problems such as diarrheal dehydration. It is the investigator's hope that information from this study can become part of the working knowledge of health workers in Latin America.

APPENDIX 1

TRANSCRIPT OF QUESTIONNAIRE EMPLOYED

A. Preparation of Data Recording Instruments

The questionnaire and clinical data form were designed on the basis of approximately one hundred informal interviews during the investigator's work as a medical student in Lima's Hospital Area Number 1. A trial run of twenty formal interviews was conducted as well. In addition, another hundred or so conversations about infantile diarrhea were held with people outside the hospital; these included people in the cities of Cuzco, Ayacucho, Piura, Castrovirreyna, Cajamarca, and Lima.

Recording instruments were prepared with the assistance of Drs. Ellen Messer (Yale University Department of Anthropology), Luis Millones (Pontificia Universidad Católica, Lima), William Frazier (Yale University School of Medicine), Daniel Freeman (Yale University School of Medicine), Mario Chuy (head of the CSCG, Universidad Peruana "Cayetano Heredia"), and Eduardo Salazar (chief of the rehydration unit, HGBCH, Universidad Peruana "Cayetano Heredia").

B. Questionnaire Employed

B. 1

Data recording

Interview data were recorded on a form for clinical data and a questionnaire. Two forms were used because other investigators in Lima were interested in the clinical data.

Data on sanitation facilities were not sought because the relationship of home sanitation facilities to the incidence of diarrhea has been amply studied[1,3,4,5,18]. Moreover, the reliability of such data is difficult to determine if one does not actually see people's homes; some medical student surveys where homes were seen are listed in the bibliography[19,20,21,22]. Income data were not sought for similar reasons. People with higher incomes

tend not to use public facilities such as the CSCG or the HGBCH when their children are sick (such people usually go to private doctors) and their children are not as susceptible to infantile diarrhea. Another factor is that many families, especially those earning their income selling wares on the streets, do not know their income. Examination of clinical histories in the HGBCH rehydration unit showed income to be in the range of 300 to 1,500 soles per day (U.S. $1-5), not always related to the number of children in a family. Incomes at Canto Grande are lower.

Quantitative data on feeding practices were desired but the investigator's experiences with mothers prior to the interviews indicated that such data would not be reliable if obtained in an interview. There are some quantitative questions (see below) in the questionnaire and clinical data form but their reliability is acceptable for the purposes of this study.

After the first interviews with these instruments, some questions were added; these are indicated below. Some questions were discarded; for example, since little variation was found in the answers to question 1 of the questionnaire, it was often not asked to save time.

Not all answers were coded on the two instruments; this is the case with open questions (e.g., "What causes diarrhea?"). All possible responses could not be foreseen so as to make a pre-coded questionnaire within the time available for this study. On completion of all interviews, the investigator grouped the answers into different classes which could be coded in a form suitable for computer analysis. This also permitted the investigator to go through the questionnaires and check other comments recorded during the interviews.

B. 2

Form used to record background and clinical data

Question 1:

Number of interview

Question 2:

Date of interview

Question 3:

Site

Two choices (CSCG or HGBCH) were coded.

Question 4:

Sex (of child)

Question 5:

Age (of child)

Coded as follows--

1. less than one month of age
2. 1-6 months
3. 7-11 months
4. 1-2 years

Mothers of children over two were not included in the study.

Question 6:

Where child was born

Answers were coded as follows--

1. Canto Grande
2. elsewhere in greater Lima
3. outside greater Lima

Question 7:

Where child lives

Coded as follows--

1. both parents
2. mother only
3. father only
4. person other than parents

Question 11:

Literacy

Coded as follows--

1. mother literate
2. mother illiterate

Question 12:

Mother's education

Coded as follows--

1. primary school or less (but some formal schooling received)
2. part of secondary school
3. secondary school completed (or greater)
4. no formal schooling of any kind

Question 13:

¿Ha tenido diarrea antes el niño?
Has the child had diarrhea before?
Coded as follows--

1. yes
2. no
3. yes, and child was hospitalized

Question 14:

¿La diarrea es crónica?

Is the diarrhea chronic?

Mothers were not asked whether this was the case; chronicity was determined from the history according to the criteria listed in Appendix 7.

Question 15:

¿Ha tenido otro niño con diarrea que ha muerto o ha sido hospitalizado?

Have you had another child with diarrhea that died or was hospitalized?

Two answers--yes or no--were coded.

Question 16:

Number of days child has had diarrhea

Question 17:

Alimentación actual del niño

Feeding of child

This question refers to feeding of the child prior to the diarrheal episode and focuses on the type of milk given.

Answers were coded as follows--

1. child breastfed
2. child receives only canned or powdered milk
3. mixed diet--both breastmilk and canned or powdered milk
4. no milk of any kind

Question 18:

Deposiciones--

(color of) stools--

Coded as follows--

1. green
2. yellow (like curdled milk)
3. yellow (other)
4. other

See following section for explanation of code 2.

Question 19:

Deposiciones--

(Consistency of) stools--

Coded as follows--

1. liquid
2. semi-liquid
3. solid

Question 20:

Number of stools per day

Question 21:

Nutritional state of child

Coded as follows--

1. 1st degree malnutrition
2. 2nd degree malnutrition
3. 3rd degree malnutrition
4. eutrophic child

For clinical criteria, see Appendix 7.

Questions 22 through 33 and question 41

Presence of various clinical signs (coded as yes or no)

Question 22: fever

23: vomiting

24: stools with mucus

25: stools with pus

26: stools with blood

27: sunken eyes

28: tenting of the skin

29: dry mucous membranes

30: absence of tears

31: urine production

32: sunken fontanel

33: abdominal distension

41: relaxed anal sphincter

Questions 34 through 37:

Vaccinations (collected for another investigator)

Question 38:

Degree of dehydration (%)

This was determined according to criteria specified in Appendix 7; diagnoses were confirmed with staff.

Question 39:

Impresión diagnóstica

Final diagnosis

Coded as follows--

1. mild or subclinical dehydration (less than 5%)
2. moderate (5-8%) dehydration
3. no dehydration (but diarrhea present)
4. other illness (e.g., meningitis) predominant
5. well-child
6. chronic diarrhea

Question 40:

Use of antibiotics

Coded as follows--

1. did use antibiotics
2. did not use antibiotics
3. antibiotics + antidiarrheics
4. antidiarrheics only
5. don't know
6. other

Question 42:

Number of children in family and position of ill child.

B. 3

Questionnaire employed

B. 3a

Questions with fixed answers

Questions 2 through 8

¿Qué variedades de diarrea conoce?

What kinds of diarrhea do you know?

A list of different kinds of diarrhea was given; two answers (yes and no) were coded.

Question 2: acuosa/watery

3: con moco/with mucus

4: con pus/with pus

5: con sangre/with blood

6: verde/green

7: deposiciones amarillas con grumos (leche cortada)/yellow stools with clots (like curdled milk)

8: otra/other

Note: yellow stools with white clots, common in babies, are believed to be due to milk curdling inside the stomach.

Question 9:

¿Cuál de estas diarreas es la más peligrosa?

Which of these diarrheas is the most dangerous?

9 answers were coded--

1. acuosa/watery
2. con moco/with mucus
3. con moco y sangre/with mucus and blood
4. con pus/with pus
5. con sangre/with blood
6. deposiciones amarillas con grumos (leche cortada)/yellow stools with clots (like curdled milk)
7. verde/green
8. otra/other
9. no sabe/don't know

Question 10:

Entre las siguientes diarreas, señale la más peligrosa--

Among the following diarrheas, point out the most dangerous--

6 answers were coded--

1. deposiciones amarillas con grumos (leche cortada)/yellow stools with clots (like curdled milk)
2. deposiciones amarillas/yellow stools
3. deposiciones verdes/green stools
4. deposiciones marrones, oscuras/dark, brown stools
5. no sabe/don't know
6. otra/other

Question 11:

¿A qué edad da más la diarrea?

At what age is diarrhea most common?

8 answers were coded--

1. newborns
2. less than one month
3. 1 month-two years
4. 2-5 years
5. 5-14 years
6. more than 14 years
7. no sabe/don't know
8. other

Question 12:

La diarrea da más a--

Diarrhea is most common in--

4 answers were coded--

1. hombres/men
2. mujeres/women
3. igual ambos sexos/same both sexes
4. no sabe/don't know

Question 13:

Dar pecho, ¿puede producir diarrea?

Can breastfeeding cause diarrhea?

Three answers (yes, no, don't know) were coded.

Questions 23 through 39

¿Cuáles de estas cosas pueden producir diarrea?

Which of these things can cause diarrhea?

Three answers (yes, no, don't know) were coded for each item.

Question 23: polvo/dust

24: suciedad/dirtiness

25: humedad/dampness

26: aire frío/cold air

27: agua fría/cold water

28: comidas frías/cold foods

29: agua de tanque o caño/tank or tap water

30: una corriente de aire frío/a cold air current

31: corrientes de aire, aunque no frías/air currents, even though not cold

32: aire caliente/warm air

33: agua caliente/hot water

34: agua de tanque o caño, hervida/boiled tap or tank water

35. comidas calidas/hot foods

36: comidas pesadas/heavy foods

37: leche en polvo/powdered milk

39: fruta/fruit

The meaning of terms such as "cold," "hot" and "heavy" is discussed above (pp. 13-31). Tank water refers to water sold by entrepreneurs who transport

it in tank trucks (most shantytown homes lack running water); such water is then stored in cement containers (also called tanks).

Questions 42 through 57

¿Cuáles de estas cosas daría Usted a un niño con diarrea?

Which of these things would you give to a child with diarrhea?

Three answers (yes, no, don't know) were coded for each item.

Question 42: agua fría/cold water

43: agua de caño o tanque/tap or tank water

44: agua hervida que enfrió/boiled water that was allowed to cool

45: agua con azúcar/water with sugar

46: agua con sal/water with salt

47: agua con sal y azúcar/water with salt and sugar

48: agua de pepa de palta/an infusion prepared with avocado seeds

49: agua de anís o manzanilla/anis or manzanilla (a local herb) infusions

50: panetela (see Appendix 7)

51: jugo de naranja/orange juice

52: plátano/bananas

53: otra fruta/other fruit

54: té cargado/strong tea

55: gaseosas/soft drink

56: carbón en polvo/powdered charcoal

57: suero de farmacia/commercial electrolyte mixture

Question 59:

¿Puede morir un niño de diarrea?

Can a child die from diarrhea?

Three answers (yes, no, don't know) were coded.

Question 60:

¿A los cuántos días?

After how many days (of diarrhea can a child die)?

Answers were grouped into five codes--

1. no sabe/don't know
2. 1 day or less
3. up to 3 days
4. 4-7 days
5. more than 7 days

Question 62:

¿Sabe reconocerla? (la deshidratación)

Do you know how to recognize it? (dehydration)

Question 61 (below) was an open question ("What is dehydration?") and mothers were then asked if they knew how to recognize it; the investigator asked the mother to name some signs of dehydration to check that she really knew.

B. 3b

Questions with open answers

Question 1:

¿Qué es la diarrea?

What is diarrhea?

This question was not always asked in order to save time; many mothers had trouble with it. The number coded here was the number of bowel movements per day above which a child was considered to be having diarrhea.

Questions 14 through 21

¿Qué efecto se produce en el bebe cuando la madre le da pecho y tiene_____?

What happens to the baby when the mother breastfeeds and she_____?

Question 14: tuberculosis/has tuberculosis

15: cólera/is angry

16: diarrea/has diarrhea

17: nervios/is nervous

18: tristeza/is sad

19: alegría/is happy

20: que lavar ropa/has to wash clothes

21: que estar en el frío/has to be out in the cold

Answers were coded as follows--

Question 14:

1. "le contagia," "le pasa"/baby gets tuberculosis
2. nada/nothing happens to the baby
3. no sabe/don't know
4. otro/other

Question 15:

1. le da cólicos, diarrea/baby gets colics and diarrhea
2. nada/nothing happens to the baby
3. no sabe/don't know
4. otro/other

Question 16:

1. le da diarrea/baby gets diarrhea
2. nada/nothing happens to the baby
3. no sabe/don't know
4. otro/other

Question 17:

1. le da nervios/baby gets nervous
2. nada/nothing
3. no sabe/don't know
4. le da cólicos, diarrea/baby gets colics and diarrhea
5. 1 + 4
6. otro/other

Question 18:

1. le da pena, suspira/baby becomes sad, sighs
2. nada/nothing happens to the baby
3. no sabe/don't know
4. le da cólicos, diarrea/baby gets colics and diarrhea
5. otro/other

Question 19:

1. el bebe se pone contento/baby becomes happy
2. nada/nothing happens
3. no sabe/don't know
4. otro/other

Questions 20 and 21:

1. le pasa el frío, se resfría/baby catches a cold
2. nada/nothing happens to the baby
3. no sabe/don't know
4. 1 + le da cólicos, diarrea/1 + baby gets colics, diarrhea
5. le da cólicos, diarrea/baby gets colics, diarrhea
6. otro/other

Question 22:

¿Qué causa la diarrea?

What causes diarrhea?

Answers were grouped into 7 codes--

1. COLD
2. INGESTA
3. MILK
4. FOOD
5. INFECTION
6. OTHER
7. no sabe/don't know

These codes are explained beginning on page 13.

Question 40:

¿Qué otras cosas pueden producir diarrea?

What other things can cause diarrhea?

This question followed a list of items (questions 23-39) that a mother was asked to see if she thought they could cause diarrhea. Answers were coded as follows (multiple answers could be coded)--

1. child begins teething
2. child begins walking
3. child begins talking
4. susto (fright) or mal de ojo (evil eye)
5. other
6. don't know

Question 41:

¿Qué se debe hacer cuando un nino tiene diarrea?

What should one do when a child has diarrhea?

Answers to this question were grouped according to three criteria and three choices (yes, no, don't know) were coded for each. The criteria were:

1. Should one discontinue milk if a child has diarrhea?
2. Should one restrict fluids if a child has diarrhea?
3. Should one suspend solid foods if a child has diarrhea?

Not all mothers answered this question.

Question 58:

Después de la diarrea, ¿qué da?

What happens after a child has diarrhea?

Coded as follows--

1. no sabe/don't know
2. bebe se debilita, adelgaza, pierde peso, pierde apetito/baby weakens, becomes thin, loses weight, loses appetite
3. bebe se deshidrate/baby dehydrates
4. 2 + 3
5. otro/other

Question 61:

¿Qué es la deshidratación?

What is dehydration?

Coded as follows--

1. no sabe/don't know
2. falta de líquido/lack of fluids
3. FOOD
4. INGESTA
5. COLD
6. INFECTION
7. otro/other

Codes 3-6 are described beginning on page 13.

Question 63:

¿Qué es una infección?

What is an infection?

Answers were grouped into 7 codes. 1 and 3-7 were the same as in question 61; code 2 was when a mother merely described the clinical signs, e.g.: "What is an infection?" "An advanced illness," or, "Very high fever."

Question 64:

¿Qué es el suero que se le pone a la vena del niño en el hospital?

What is the "serum" (IV fluid) that goes into a child's vein in the hospital? The Spanish word for serum is suero. However, the Spanish word is used for all IV fluids, anti-sera (especially those used for treatment of snake bites), and serum itself. The word has a greater magical content than its English equivalent. Answers were grouped into 6 codes--

1. don't know
2. agua con sal y azucar/water with salt and sugar
3. vitamina/a vitamin
4. alimento/nutrition
5. medicina/medicine
6. other

Terms like "vitamin" or "medicine" do not, of course, refer to the terms as they are employed in Western medicine. When asked what a "vitamin" was, mothers invariably replied, "You know, doctor, a vitamin." The investigator found that most mothers he spoke with did not know the relationship between different classes of nutrients; many mothers seemed to believe that vitamins are magical substances that can sustain a child.

Questions 65 and 66:

¿Qué pasa al estómago del niño cuando tiene diarrea con sangre?

¿Qué pasa al estómago del niño cuando está con diarrea?

What happens to the child's stomach when he has diarrhea with blood in it?

What happens to a child's stomach when he has diarrhea?

Diarrhea is believed to affect the stomach, hence the phrasing of the questions. Answers were grouped into 11 codes--

1. no sabe/don't know
2. COLD
3. PAPER
4. FOOD
5. WOUND
6. SORE
7. DIRTINESS
8. INFECTION
9. ASCRIPTION
10. PROLONGATION
11. otro/other

Codes are described beginning on page 13.

Questions 67 through 69

These were not asked due to lack of time.

Question 70:

Procedencia y tiempo de residencia en Lima

Place of origin and length of residence in Lima

Answers were coded as to whether the mother was born in the city of Lima or else migrated to the city. If the person was from outside Lima, the length of residence was coded as follows--

1. less than two years
2. two to five years
3. more than five years

APPENDIX 2

BACKGROUND INFORMATION ON THE CITY OF LIMA

A. Brief Outline of the History of Peru

The rise of civilization in Peru goes back to pre-Inca cultures. The most important of these were Chavin, Chimu, and Tiahuanaco; the nature of their organization is such that one can categorically describe them as states. The rise of the Inca empire resulted in their being absorbed into a more organized state. In 1932, the conflict between Huascar and Atahualpa, heirs of the last Inca, permitted a small band of Spaniards led by Francisco Pizarro to conquer Peru. The vast riches found by the new conquerors led to struggles among themselves with the consequence that for the next three hundred years a representative of the Spanish crown, the viceroy, ruled Peru. During the period of the viceroys the population which, according to early chronicles, had reached twelve million indians, was reduced to a million and a half due to poor health and nutrition. Because of these conditions, and because of the desire for independence generated by the American and French revolutions, Peru obtained its independence from Spain in 1821-24. Since that time a series of civilian and military governments have alternated in power.

The last military government assumed power in 1968. Ten years later, this government began the process of returning power to civilians. In 1978, elections for a constituent assembly were held. This assembly prepared a new constitution which was finished in mid-1979. On May 18, 1980, elections were held in Peru and Fernando Belaunde Terry was elected president. Belaunde assumed power on July 28, 1980, the day the new constitution went into effect. One of the first official acts of the new government was to declare a state of emergency in the Ministry of Health.

In 1977 a serious economic crisis, which continues to date, began in Peru. This crisis has had a tremendous effect on the health and nutrition of Peru's population. The most significant problem to be faced by Peru's new constitutional government is this economic crisis, which is linked to a crisis in health and nutrition. Peru's health problems are in many ways typical of those of underdeveloped nations in general.

The reader interested in Peru's history is referred to the bibliography[24,25].

B. Brief Description of the City of Lima

Lima was founded by the Spanish in 1535 with all the characteristics of a European city of the 16th century. Because of this, people still speak of "square Lima" (la Lima cuadrada), alluding to the urban layout of the city. When it was founded, its population was 70 people; by 1571, it had reached 2,000. Despite the fact that Lima was the capital of the Viceroyalty of Peru and also the most important city in Spanish South America, its annual growth rate did not reach 1%; this sam growth rate was maintained until 1876. From that year on, Lima began to have clear advantages over other Peruvian cities. It began to grow faster and a centralization process began which, in addition to including government offices, also included the communication network of the young nation as well as the best opportunities for employment. This manifested itself as an increase in population, primarily due to migration from the rest of Peru. Lima's growth rate thus climbed to 2%, staying at that rate until 1920, when the growth rate reached 5% per year. This increased growth rate was due to the great demand for workers generated by the Leguía government's undertaking massive public projects in the city and to the lack of attention paid to the agricultural sector. Because of this, Lima's economically active

population since 1920 is made up mainly of migrants, many of whom are peasants from Peru's Andean regions. Nevertheless, the city retained acceptable urban characteristics; the literature of the early 20th century refers to it as la ciudad jardín-- the garden city. However, the massive migration of the 1950's changed Lima's aspect dramatically. The number of migrants became unmanageable and the urban characteristics changed drastically. In the 1960's a well known Peruvian writer, Sebastian Salazar Bondy, wrote a book about the capital called Lima, la horrible, alluding to these changes.

The concentration of industry and government in Lima has resulted in a continuous migration to the city where the demand for employment and housing remains unsatisfied. It is this phenomenon which resulted in the appearance of the shantytowns which ring Lima (as they do in most major cities in Latin America). These shantytowns, officially referred to as "Young Towns" (Pueblos Jóvenes), are called barriadas in Peru, callampas in Chile, and favelas in Brazil. Their population, which in 1940 was less than 5,000, is now over a million--more than a quarter of Lima's total population. Hence, Lima's situation is typical of Latin America. Table 1 illustrates Peru's employment situation in recent years, while Table 2 illustrates the drop in purchasing power in the wages of Peru's working population.

At present, Lima's five million inhabitants make up about 25% of Peru's total population but consume 50% of Peru's food production. The rapid growth of the city and the phenomenon of migration have been studied by many social scientists from Peru and elsewhere[6,23]. One of these, Dr. José Matos Mar, of the Instituto de Estudios Peruanos, prepared some maps which show both the growth of Lima and of its shantytowns (Maps 1-3). Despite the growth of industry in other Peruvian cities, no real process

of decentralization has occurred in Peru and there is no reason to believe the rate of migration will decrease, even though living conditions in Lima may well be worse than in the place of origin. There are some signs of return migration (from Lima to the countryside) and emigration (from Lima to previously uninhabited regions of Peru's jungle) according to some social scientists. While return migration and emigration are not quantitatively significant, they are of considerable scientific interest. In addition, conversations with shantytown dwellers indicate that a significant rate of travel to the countryside from the shantytowns exists.

TABLE 1

Peru: Unemployment and underemployment rates, 1973-1978[15]

Unemployment:

Year	Total	Agriculture	All other
1973	4.2	0.3	7.1
1974	4.0	0.3	6.6
1975	4.9	0.3	8.1
1976	5.2	0.3	8.4
1977	5.8	0.3	9.4
1978	6.5	0.3	10.4

Underemployment:

Year	Total	Agriculture	All other
1973	41.3	65.4	23.3
1974	41.8	65.4	25.0
1975	42.4	68.2	24.8
1976	44.3	61.8	32.7
1977	48.1	62.1	39.2
1978	52.0	65.4	43.7

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Underemployment is defined as those cases where a person in the labor force earns less than the minimum wage (in 1979-80, about U.S. $1.00 per day).

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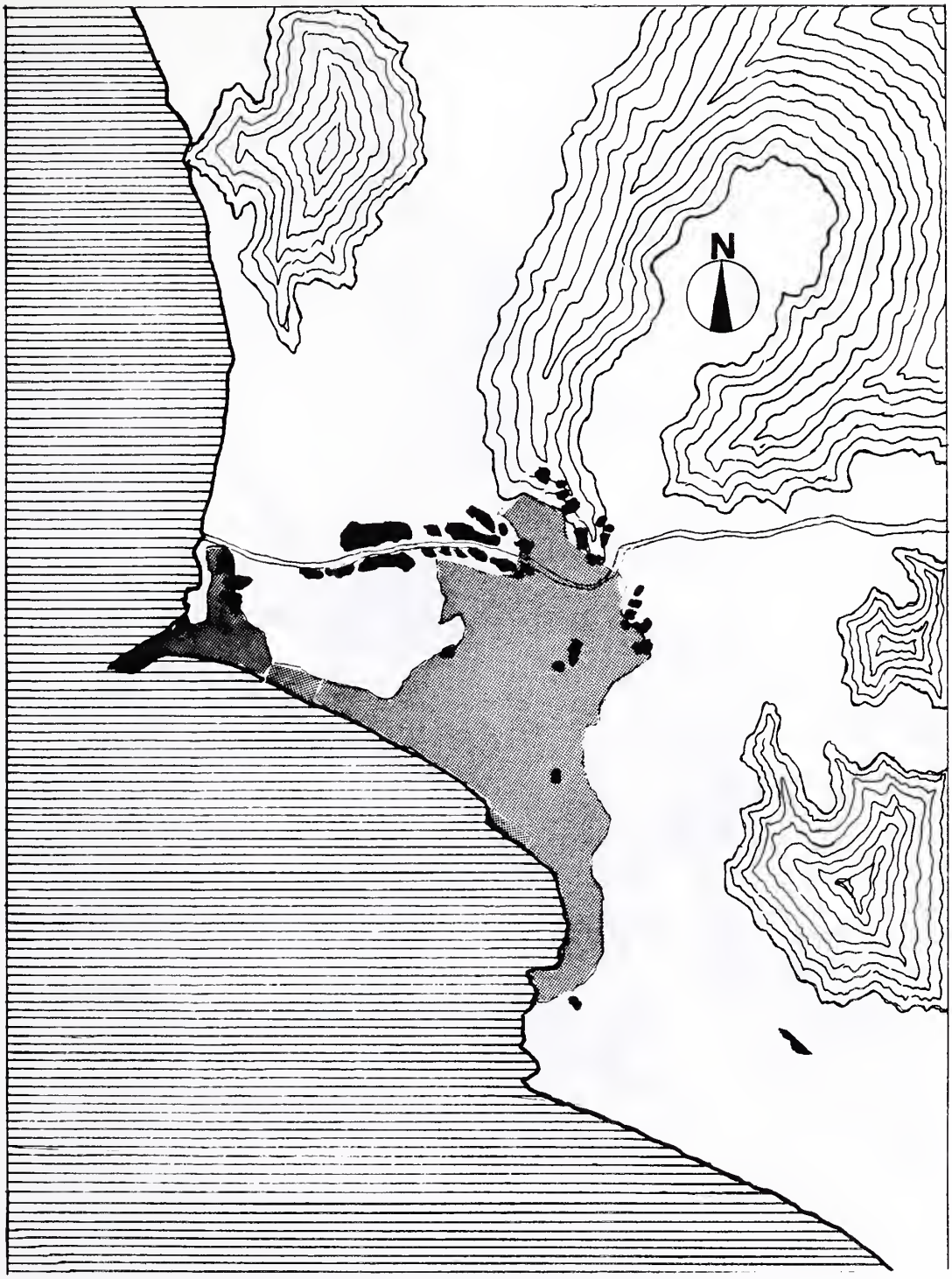
TABLE 2

Monthly Income in Greater Lima, 1977 and 1978[15]

By occupational groups; figures are in 1971 U.S. dollars

Occupational group:	March, 1977	July, 1978	% change
Overall average	83.86	59.59	-28.9
Professional and technical	113.18	92.14	-18.6
Executives and administrators	155.77	127.23	-18.3
Clerical	89.02	64.66	-27.4
Salesmen, street-sellers	59.79	40.57	-32.2
Service occupations	77.86	58.61	-24.7
Factory workers, artisans	72.34	51.14	-29.3



LIMA'S SHANTYTOWNS

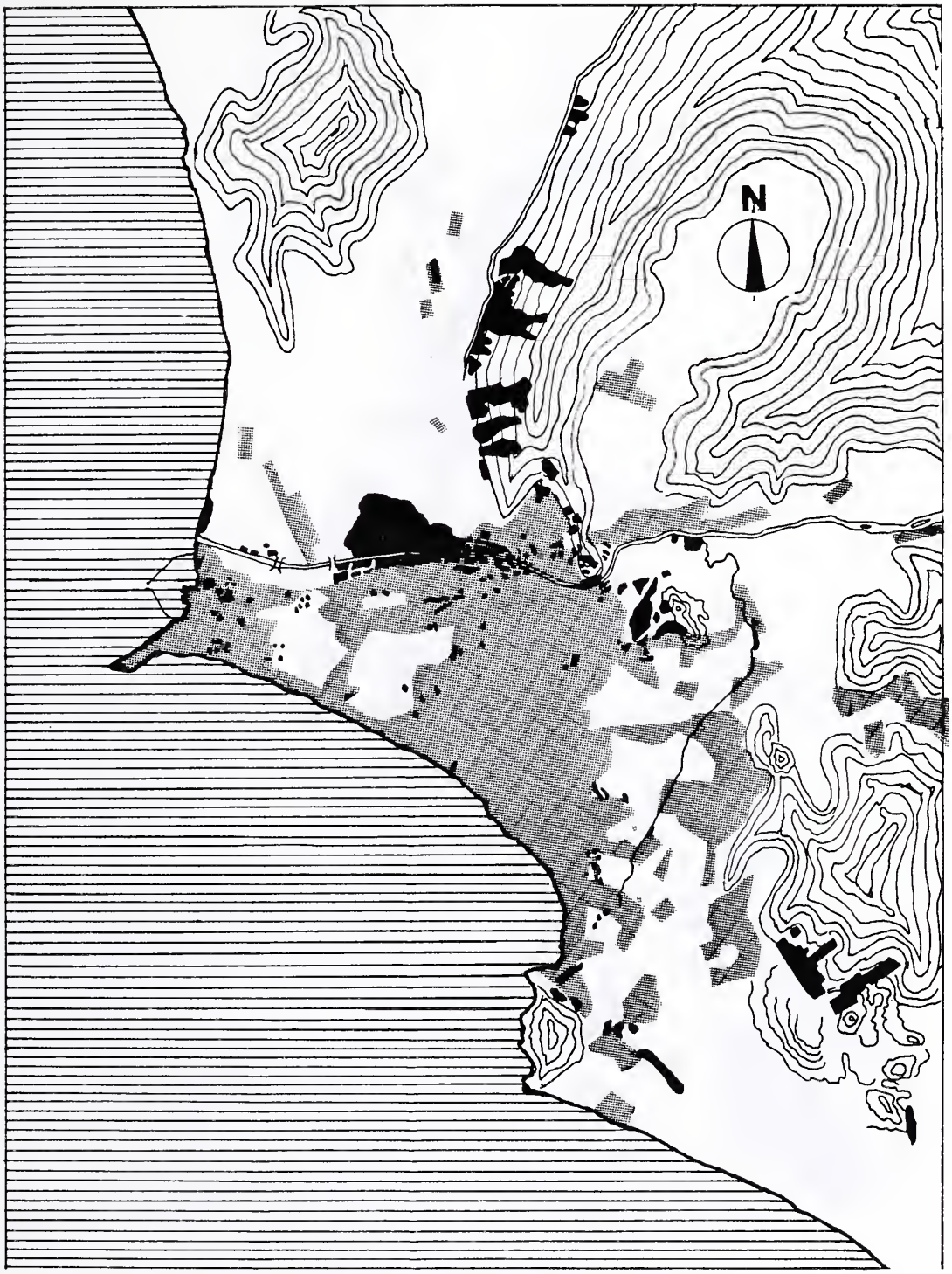
1957

Shantytowns

Urban areas

Scale: 1/150,000

1 km



LIMA'S SHANTYTOWNS

1967

Shantytowns

Urban areas

Scale: 1/150,000

1 km

LIMA'S SHANTYTOWNS

1977

Shantytowns

Urban areas

Scale: 1/150,000

1 km

APPENDIX 3

BACKGROUND INFORMATION ON CHILD HEALTH IN PERU

A. Child Health in Peru, 1979-80

The reader interested in greater detail or in adult health in Peru is referred to the bibliography and to appropriate reference works. Appendix 5 also has some data on adult health in Peru.

Data in the tables below should be treated with caution due to the problem of compiling valid statistics in underdeveloped nations. The investigator saw frequent cases of infant deaths that went unreported and his observations on record-keeping in many locations led him to conclude that under-reporting of deaths, births, and illnesses is common, and that considerable distortion of data takes place because of inadequate preparation in epidemiology.

Peru's health situation is quite bad, and it has taken a significant downturn with the latest economic crisis. Life expectancy at birth is low (55.2 years) and infant mortality is high. Over 50% of all deaths in Peru are in the under-5 age group; the mortality rate per thousand live births was 142 in 1968, with a range of 68 to 276 depending on the location (see references 2 and 28).

Like most underdeveloped nations, Peru has a high birth rate and its population is young. Relevant data are shown in Table 1.

Table 2 lists the 10 principal causes of death in children under age 14. Many of these deaths are related to poor living conditions (Table 3), poor nutrition (Table 4), and limited access to medical care.

Measles incidence, shown on Table 5, is a good indicator of some aspects of access to medical care and of the effectiveness of public health programs. Official statistics give a mortality rate of 2.3% for measles in children in Peru but, like other such data, the figures are probably low. During his stay in Lima, the investigator was present during a measles epidemic in

Canto Grande and he saw many cases of severe complicated measles. Similarly, in a trip to Cajamaraca, the author learned that,in the isolated community he had visited, a whooping cough epidemic had just caused 50 deaths: such data do not find their way into official statistics.

Availability of medical personnel (who are concentrated in greater Lima) is discussed below (Section B). A related problem is illustrated in Table 6, which shows the institutions that handle health care in Peru. At least nine major public entities or ministries maintain separate health facilities in Peru and this does not take into account cases where health centers may fall into double, triple, or even quadruple jurisdictions. The tangled nature of health administration in Peru results in diminished effectiveness and difficulty in planning and in data collection.

Cost of medical facilities and treatment is exceedingly important. The cost of a private visit to a physician in Peru ranged from 300 to 6000 or more soles (the sol went from 240 to the dollar to 300 to the dollar during the investigator's stay), depending on the reputation of the doctor and where the visit took place. The most significant factors affecting this facet of medical care in Peru have been decreased health expenditures by Peru's military government (less than 4% of the 1979 budget was for health) and an inflation rate estimated at 70-80% in recent years. A partial illustration of this can be obtained from Table 7, which lists costs of important medicines in pediatric practice.

TABLE 1

Peru: Demographic Indicators, 1970-2000[2c]

Years	Crude Birth Rate (per 1000)	Crude Death Rate (per 1000)	Annual Growth Rate (per 1000)
1970-75	42	13	28
1976-80	39	12	28
1981-85	38	10	27
1986-90	36	9	27
1991-95	33	8	25
1996-2000	31	7	24

Age distribution (%):

Years	0-14 years	15-64 years	65+ years
1970-75	45	52	3.5
1976-80	44	53	3.5
1981-85	43	54	3.4
1986-90	42	54	3.5
1991-95	41	56	3.6
1996-2000	40	57	3.7

TABLE 2

Peru: Ten Principal Causes of Death in Children Under 14[2c]

1973

Total deaths in age group: 42,935

	Number of deaths	%
Ten principal causes	36,584	85
Respiratory tract infections	17,045	40
Diarrhea	6,198	14
Undefined states	3,822	9
Certain causes of neonatal morbidity and mortality	2,815	7
Nutritional deficiencies, all kinds	2,001	5
All other GI illnesses	1,497	4
Whooping cough	1,250	3
All other infections and parasitic diseases	842	2
Congenital anomalies	565	1
Inmaturity	549	1

TABLE 3

Essential Services in Peruvian Workers' Homes, 1972[2c]

	%
Running water:	
Homes without running water	43.2
Running water outside or inside home	56.8
Sewage disposal:	
None	69.0
WC, silo, or latrine	31.0
Energy:	
With electricity	43.1
Without electricity	56.9

TABLE 4

Peru: Deterioration of Pre-School Children's Weights, 1965-68[2c]

Classification of malnutrition is according to the scheme of Ramos-Galvan (references 26 and 27).

Location of Survey	Sample Size (# children)	% With Malnutrition, by Degree			
		None	I	II	III
Lima & Callao, by districts:					
Barrios Altos	24,000	69.7	25.0	5.0	0.3
Ventanilla	1,200	94.1	3.4	2.3	0.2
Reinoso	705	88.2	6.4	5.3	0.1
Totorita	162	60.5	31.5	8.0	0.0
Rest of Peru:					
City of Puno	381	81.1	14.2	3.7	1.0
Rural areas in Junin	2,343	19.6	47.5	27.2	5.7
Tarapoto	205	19.0	50.7	25.5	4.8

TABLE 5

Measles Incidence in Peru, 1970-75[2c]

Year	Population Under Five Years	Total Cases	Cases in Children Under 5		
			Number	%	I
1970	2,611,500	28,780	22,976	80	880
1971	2,690,300	3,977	3,234	77	120
1972	2,771,800	9,292	7,669	83	277
1973	2,855,400	15,144	11,938	79	418
1974	2,942,800	7,687	5,570	72	189
1975	3,032,400	6,749	5,227	77	172

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I = incidence per 100,000 in children under 5

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TABLE 6

Institutions Involved in Health Care in Peru[2c]

Institution:	Who is eligible:
Ministry of Health and decentralized public organizations	Everyone
Private charities	Indigent population
SSP (Seguro Social del Perú--social security system)	Insured individual paying premiums; spouse (if registered); healthy newborn (offspring of above)
Police and military (4 separate ministries)	Members of institution and their families
Public company health departments	"
Private company health departments	"
CAP and SAIS health departments	"
Private practitioners and clinics	Persons who can afford services

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CAP: Cooperativa Agraria de Producción

SAIS: Sociedad Agrícola de Interés Social

These are agrarian cooperatives that fall under the jurisdiction of the Ministry of Agriculture

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TABLE 7

Peru: Cost of Some Drugs of Importance in Pediatrics, 1977-78[2c]

Upper price is in soles; lower price in parentheses is in dollars

Drug	Price 8/77	Price 6/78	% Change
Trimethoprim-sulfamethoxazole (Bactrim), 60 cc syrup	147.10 (1.82)	367.90 (2.65)	+ 150
Vitamin C, 500 mg, 100 capsules (Redoxon)	300.50 (3.73)	700.00 (5.04)	+ 133
Isoniazid + B_6, 50 mg, 100 capsules (Rimifon)	62.40 (0.77)	89.30 (0.64)	+ 43
Ampicillin, 1 amp, 500 mg (Bisolvon Ampicilina)	150.20 (1.86)	446.80 (3.21)	+ 198
Erythromycin, 30 cc syrup (Pantomicina)	184.70 (2.29)	373.00 (2.68)	+ 102
Tetracycline, 250 mg, 8 capsules (Aureomicina)	172.40 (2.14)	246.50 (1.77)	+ 43
Ethambutol, 200 mg, 50 capsules (Myambutol)	197.00 (2.44)	282.90 (2.04)	+ 44

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% Change is based on change in price in soles; wages and salaries in Peru have not kept up with either inflation or the loss of the sol's value with respect to the U.S. dollar.

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B. Medical Personnel in Peru

B. 1

Relevant statistics

The latest figures available on health personnel in Peru are from 1976 and are given in Table 8. Data from Table 8 should be interpreted keeping in mind that the city of Lima (with about 25% of Peru's total population) has 66% of all physicians and 65% of all dentists in Peru. Table 9 gives some idea of the distribution of physicians by institution. However, virtually all of Peru's physicians have a private practice, even if employed by a ministry.

As can be seen, in addition to a relative shortage of doctors (when compared to more developed nations) there is also a problem of distribution: most doctors and dentists in Peru are either in Lima or in another large city. There is a serious shortage of auxiliary personnel, such as midwives. Few practitioners go to areas of great demand, so the increase in enrollment in the health professions that has taken place since the early 1970's will not alter the picture. Most pediatricians reside in Lima; care of children outside Lima is done primarily by general practitioners (when a physician is available at all) who did not do residencies (a relatively new phenomenon in Peru: see below) and whose training in pediatrics is limited.

Table 10 shows the distribution of students in Peru's universities. The low numbers devoted to nursing and midwifery is significant.

TABLE 8

Peru: Physicians and Related Personnel, 1976[2c]

	Number	#Health Professionals/ #Physicians	Rate Per 100,000 Population
Physicians	10,008	1.00	6.2
Dentists	3,139	0.31	1.9
Midwives	1,876	0.19	1.2
Pharmacists	3,000	0.30	1.9
Nurses	6,670	0.67	4.1

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For comparison, physicians per 100,000 population:

U.S.	15.0
Sweden	13.9
Cuba	8.7
Bolivia	4.3

Institutional Distribution of Physicians in Peru, 1976[2c]

Institutions:	Number of Physicians	%
Public sector (total)	7,226	72.2
Ministry of Health and allied agencies	3,051	30.5
Social Security Administration	1,666	16.6
Armed and police forces	1,677	16.8
Public companies	162	1.6
Other	670	6.7
Private sector (total)	2,782	27.8
Agrarian cooperatives	111	1.1
Private and group practice	2,671*	26.7
Total	10,008	100

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* This refers to those who have only a private or group practice, as virtually all physicians in Peru have a private practice.

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TABLE 10

Distribution of Peruvian Students in Universities, 1974[2c]

Field	Number of Students	%
Medicine	9,554	5.6
Dentistry	1,718	1.0
Midwifery	412	0.2
Pharmacy	1,396	0.8
Nursing	3,531	2.3
Sanitary engineering	131	0.1
Social work	4,508	2.6
Other (unrelated to medicine)	149,198	87.5
Total	170,448	100

B. 2

Training of physicians in Peru

Students of medicine in Peru enter directly into medical school after an entrance exam. Peru's six medical schools (there are three in Lima and one each in Arequipa, Ica, and Trujillo) are restrictive (not everyone who applies is admitted, as is the case elsewhere in Latin America) and the attrition rate is fairly low and is probably a reflection of economic rather than academic difficulties. Nevertheless, the attrition rate is higher than in United States medical schools. One of the six medical schools, the Universidad Peruana "Cayetano Heredia" (henceforth, UPCH), which is affiliated with the CSCG and HGBCH, where this study was carried out, is private; the rest are public. As happens in the United States, however, the UPCH receives much funding from the government.

The UPCH was founded in 1961 and is considered one of the best of the Peruvian medical schools. It maintains many contacts with foreign institutions and has greater financial resources than the other Peruvian medical schools.

The basic curriculum is similar in all Peruvian medical schools. Most teaching is done by graduates of the Universidad Nacional Mayor de San Marcos, since the other schools are fairly new. Until about 1930, French medicine was most influential. In the 1930's and 40's the United States began to displace France in the eyes of the profession. British medicine has always been respected but there has never been a British "school" as has been the case with France or the United States. Of the United States medical schools, the two most influential have been Harvard and Johns Hopkins (the latter was instrumental in the founding of the UPCH).

Entering students are usually 17 years old. The first three years of medical school are called pre-médicas and are roughly equivalent to the basic science preparation given in United States schools, plus some courses in the humanities and the social sciences. During the fourth year, the student is taught the basics of physical diagnosis (some of this is also done in the third year) as well as the management of patients. Fourth year students usually spend the entire day in various hospitals. At the UPCH, fourth year students read all of Harrison's Principles of Internal Medicine (some will have done this in an English edition).

The fifth year student is called an externo and is engaged in roughly the same activities as a third year student in a United States medical school (the investigator worked as an externo during his stay). Generally, they are not expected to spend the entire night when they are on call, and are not expected to be present on Sundays if not on call. They do, however, have greater responsibilities than a third year student in the United States. They are expected to do minor suturing, lumbar punctures, and prescribing. As a rule, they are closely supervised and are not required to be autonomous, although there are many occasions when an externo will be the only person in an emergency room or rural health center. All externos are required to do a rotation in a rural setting, which is usually done in the jungle regions of Peru. Other rotations done in the fifth year are: surgery, pediatrics, obstetrics, gynecology, and medicine. There is no psychiatry rotation.

The sixth year student is an interno and performs the same duties that were performed by the intern in the United States when rotating internships were in existence. They are paid (about U.S. $80 per month) and their schedules are by far the most grueling of all medical personnel

in Peru. The sixth year is 52 weeks long and the interno is expected to be at the hospital every day, although internos stay only until noon on weekends (unless on call). They spend the entire night when on call, which may be every other to every sixth night. They do the same rotations that the externos do except that the rural one is done in one of the postas (primary care centers) in Peru's shantytowns. Internos are expected to be autonomous, performing virtually every procedure required save certain surgical ones. The staff does not hesitate to leave an interno alone in the emergency room. Internos get much less supervision and teaching than a first year resident (PGY-1) in the United States. Prior to 1975, a student received his degree at the end of the sixth year, after presenting a thesis.

In 1975, the Peruvian government instituted the Servicio Civil de Graduandos del Sector Salud (SECIGRA-Salud). Under this program, which in effect added a seventh year to the medical curriculum, students are sent to a health center to work as doctors for a year; such centers are in rural areas or in shantytowns. SECIGRA's are paid about $120 per month. Many students, though, elect to take a major cut in pay and do their SECIGRA somewhere in Lima. At the end of the year, students are expected to present a report of their activities (instead of a thesis), following which they receive their degree.

The SECRIGRA program has been highly controversial and there have been many reports of abuses. Students are opposed to the program because it is a year spent in circumstances where there is very little instruction and even fewer facilities. The pay is low and the conditions are difficult--in many places, the SECIGRA will only have a stethoscope in addition to what she or he has learned in the course of training.

Residencies in Peru are similar to those in the United States except

that they tend to be shorter, averaging three years. Significantly, residents are only supervised by the teaching staff from 8:00 A.M. to 2:00 P.M. Teaching staff (and the permanent staff of many non-teaching hospitals in Peru) go to their private practices after 2:00 P.M. Full-time teaching personnel are uncommon in Peru, particularly since the economic crisis of the 1970's began. At the HGBCH, the residents run the show. a resident in Peru is paid about $200 per month; many moonlight.

Unlike the United States, not all physicians who finish medical school do residencies: there are not enough residency positions available. The situation of the young doctor who cannot obtain a residency in Peru is very difficult and this problem is aggravated by the fact that many graduates elect to stay in Lima. Starting a private practice is hard in Lima (experienced older physicians told the investigator that the days of the solo practitioner were numbered in Lima). Graduates thus have to seek work in private clinics or (more difficult if they did not do a residency) government hospitals or health centers. Starting salaries in such settings are very low and the hours very long; the situation is similar in other large Peruvian cities. It is difficult working in rural areas--facilities are usually non-existent--and, understandably, few physicians choose this option.

Although the doctor who has finished a residency is in a somewhat better position, his or her situation is still far more difficult than that of a North American or European physician. The problems of the young physician are linked to the general problems of health in Peru. The investigator, who spent a substantial amount of his time with young doctors, perceived a great sense of frustration among them. To date, no comprehensive study of manpower problems in Peruvian medicine has been made.

APPENDIX 4

CANTO GRANDE AND ITS HEALTH CENTER

A. Canto Grande

Canto Grande and its health center (Centro de salud Canto Grande or CSCG) illustrate many of the problems of urban migration in Latin America.

In 1973, approximately 400 families in Lima formed an association and petitioned the Peruvian government for land in which to build their homes. The results were negative and shortly thereafter these families invaded the sides of one of the hills in Lima (Cerro Caja de Agua) but were soon dislodged from that site. The association invaded a new site on January 19, 1976, 221 families participated in the initial invasion day. The site chosen was on the left bank of the river Rimac, along the Via de Evitamiento, Km. 6.5. The government did not approve of the site, as it was felt to be unfit for human occupancy. On February 22 of the same year, the inhabitants of this settlement were moved by the Army and SINAMOS (Sistema Nacional de Movilización Social, or National System of Social Mobilization, an agency no longer in existence) to the present site. A total of 4,712 families was moved. Each family was given a site ranging from 90 to 140 square meters, depending on the size of the family. In this way the Asentamiento "Inca Huascar" of Canto Grande (District of San Juan de Lurigancho), known more commonly simply as Canto Grande, was formed. It has no independent municipal government, as it is under the district's jurisdiction. The population has increased since 1976, when it was about 20,000; at present, it is about 200,000 (although official statistics list it as having a population of 78,000[29]). Canto Grande has received little attention from the military government since its formation. It was the site of one of the first public ceremonies attended by the Minister of Health of the civilian government elected in 1980, when an addition to the CSCG was dedicated by him.

Canto Grande is approximately 600 meters above sea level. It is bounded on the north by several mountains. Its other borders are other shantytowns--it is difficult to see where Canto Grande begins or ends, as it is part of the belt of shantytowns that surround Lima. The climate is warm and dry, with strong winds that often form small dust "tornadoes." In winter there are light rains in the mornings and evenings. Canto Grande lacks natural resources. The soil is extremely dry and salty, and is unsuitable for agriculture.

Most of the population lives in one story homes. The majority of these were made of straw matting when the settlement was formed; at present, homes built of brick alternate with those of straw. Few of the streets are paved and dust is a serious problem. Inhabitants obtain water from tank trucks, making hygiene difficult (few homes have running water or sewage systems)[13,18]. Electricity is provided by the city of Lima but service is often interrupted; not all have access to this service and rely on candles and lanterns for illumination, resulting in an increased risk of fire.

There are two primary schools in Canto Grande and one movie theater. Aside from a small amusement park, no other major recreational facilities exist. Several religious groups are active in the community.

Three bus lines connect the site with the rest of Lima. Taxis are seldom seen. When traffic is not heavy, it takes about 40 minutes by bus from the center of Lima to Canto Grande. If traffic is heavy, the trip can last over an hour and a half. Significantly, in order to reach the HGBCH (the chief hospital for Lima's Hospital Area Number 1, to which Canto Grande belongs), two buses are required, which means that over one hour is required to reach the hospital under the best of conditions. In 1979-80 the cost of a bus trip was 25 soles (U.S. $0.10), making the

minimum round trip cost for a mother to reach the hospital 100 soles. Given the poverty of the majority of the inhabitants (over 70% have earnings below Peru's minimum salary, which was about U.S. $80 in 1979-80), the cost of transportation is a deterrent for using the hospital.

Most of the population speak Spanish, although a substantial proportion also speaks Quechua (the major native Peruvian language). All of Peru's regions are represented but most of the inhabitants originate from the mountains around Lima and the center of Peru.

More than half of Canto Grande's inhabitants are 18 or younger. The unemployment rate is around 10%; reliable estimates of underemployment do not exist. Most people dispose of their garbage by burning since no facilities for garbage disposal exist. This situation is typical of shantytowns elsewhere in Peru[19,20,21,22,30].

Canto Grande's population has cultural characteristics similar to those of Andean populations. As a rule, people in Canto Grande are quite friendly and open in everyday transactions. They are somewhat shy, particularly when compared to people in older settlements in Lima, or people in the coast in general. The investigator did not have trouble in establishing rapport with patients and mothers, especially after spending a little time in instructing them on how to take care of their children.

Crime is not a major problem in Canto Grande but petty theft is common.

Children are in a particularly difficult situation in Canto Grande. It is common to see them playing by themselves. There are few day care centers available. Mothers have to devote considerable time to the purchasing and preparation of food. In addition, they must devote much more time to household chores owing to the lack of facilities such as running water

and the absence of mechanical aids around the home. When one or both parents work, it often means long bus trips to the city. Mothers frequently manage small food stalls or else do such things as sewing. There are many homes where the father has abandoned the family.

The economic situation is most evident when one considers children's nutrition. A CSCG survey in 1978 showed that approximately 80% of all girls and 60% of all boys in one of the settlement's schools had clinically evident malnutrition. This is evident on observation. Children seen by the investigator were invariably thin and small for their age, even when not overtly malnourished. It is not unusual to see kwashiorkor or marasmus. Martin[28] and Burton[2a] give similar descriptions of poverty in Peru.

Since their parents are fairly busy, children over two or three must spend considerable time by themselves or in the company of other children. Only a small minority of children have access to day care centers. Peru's schools operate in two shifts so the amount of time children spend in school has been reduced. Because of this, morbidity due to lack of adult attention is high. In addition to illnesses related to poor nutrition and sanitation, children are exposed to other risks. Trauma is a serious problem. The investigator noted the following health problems in children to be significant:

1. Osteomyelitis due to infected wounds, particularly affecting the feet and knees
2. Kerosene ingestion
3. Sprains and fractures (many children help their parents in demanding activities such as construction)
4. Motor vehicle accidents
5. Burns

Most families in Lima's shantytowns have to live in one or two room homes; thus, some rooms have multiple functions. The kitchen is very accessible to the toddler, resulting in a high proportion of burns from boiling water or kerosene from the small one-burner stoves used for cooking. Explosions involving kerosene stoves are common. Most burns in Peru are in the pediatric population and most occur in sites like Canto Grande: 62% of all burns requiring hospitalization in children under 12 are due to liquid agents and half of all burns requiring hospitalization in children under 12 occur in children under 3[31].

B. Centro de Salud Canto Grande

The CSCG began operating on the day people arrived at Canto Grande (February 22, 1976). Mario Chuy, current head of the CSCG, arrived with a 4 x 4 meter tent and two nurse's aides (one for the morning and one for the afternoon). The main activity was first aid. Soon after, a woman who vaccinated children was added to the staff, and she was joined by two health education trainees. A census was taken as people arrived at the site to determine immunization rates (this activity is no longer feasible).

In addition to first aid, subsequent activities performed by the center were designed to encourage vaccination, latrine construction, proper water storage, and garbage disposal and burning. Food sold in markets was controlled (another activity no longer carried out). Most of the patients were children, of whom 60 to 80 were seen daily. Occasional campaigns to eliminate stray dogs (extremely common in Lima) were carried out.

A straw house and a tent for vaccinations were soon added. This permitted better record keeping and the use of a small room for obstetrics

and gynecology. A nurse and a midwife joined the staff. Funding was from the Ministry of Health, although a considerable amount of volunteer labor was involved. The Ministry provided a prefabricated metal building. Some false positive results from patients' sputum led to the implementation of a tuberculosis control program. By the end of 1976, 4 SECIGRA's and one full-time physician treated patients. From December 1976 until October 1977, the Red Cross helped with transport, food, volunteers, and a well-child program. Only two tables were available for examining patients.

In May of 1977 the UPCH Community Development program and a pharmaceutical company donated a prefabricated wooden building to the CSCG. Funds for a cement floor were lacking so the community organized a Civic Council for Health which raised the necessary money. A petition was made to the Ministry of Housing for land and, upon receiving a favorable reply, construction was begun in late August of 1977; the building was inaugurated in October of 1977. It is important to note that the rapidity of development of the CSCG is unusual by Peruvian standards and that, despite the tremendous progress made, the CSCG would still be considered a primitive center by United States or European standards.

Significant reductions in personnel have taken place since August of 1977. Personnel of the CSCG are listed below; August 1977 levels are in parentheses:

1 pediatrician (1)
1 general practitioner (1)
5 auxiliares (nurse's aides) (7)
1 nurse (4)
6 SECIGRA's in medicine (4)
1 midwife (1)
2 janitors (2)
1 dentist (1)
1 SECIGRA in pharmacy (1)

Externos (4-6) and, sometimes, an interno are assigned to the CSCG by the UPCH but their participation is not constant. The general practitioner is also the head of the center; administrative duties reduce his available time for patient care. As in other centers in Lima, morale is low and absenteeism is high. Consequently, there are many times when an externo may find himself alone in the center (i.e., being the only medically trained person available; this happened to the investigator as well. Currently, the CSCG operates from 8:00 A.M. to 6:00 P.M., Monday through Saturday; virtually all other peripheral health centers operate only until 2:00 P.M. The cost of a visit ranges from nothing to 50 soles (U.S. $0.18). About 80 to 120 patients are seen per day for illnesses unrelated to tuberculosis; the tuberculosis control program has 20 to 30 patients per day. Children make up 80% of the patient load. The major causes of death are diarrhea and respiratory infections.

The investigator was unable to obtain 1980 statistics from the CSCG because of the prolonged health personnel strike that took place in Peru during his stay. In 1976-77, the major causes of morbidity were respiratory tract infections, diarrhea, skin infections, trauma, depression, pregnancy and its complications, and tuberculosis. The distribution of illnesses has not changed significantly since 1977. Clinical facilities available at the CSCG are described in Appendix 7.

Afternoon visits are generally limited to emergencies, a program for malnourished children, control of pregnancy, a few pediatric cases, and special problems. The procedure followed for routine visits (most of which are pediatric) is as follows. Mothers arrive with their children early in the morning (8:00-8:30 A.M.) and purchase a ticket for which they receive a number. If the child has been seen in the CSCG before, the mother hands the child's CSCG ID to the auxiliar at the entry window. The mother then goes

to a bench and awaits being called. When her number is called, she goes to a second window where, if it is the first visit, a full history is taken. History forms are labeled by the auxiliares who assign patients to the members of the medical staff. The child is then weighed and his temperature is taken. After this procedure, the mother takes her child and awaits her turn to see a physician or medical student.

By about 9:00-9:30 A.M., each staff member has received a bundle of clinical history forms. Internos, SECIGRA's, and doctors receive up to 20 patients while externos receive up to 7 or 8. Most of the work is finished by around 1:00 P.M. There is a tendency for staff members to be in a hurry once lunch time arrives and mothers may have considerable waits before their children are seen; these factors are a source of tension between the center and the community. Procedures for adult visits are not significantly different.

APPENDIX 5

HOSPITAL AREA N° 1 AND THE

HOSPITAL GENERAL BASE "CAYETANO HEREDIA"

A. Area Hospitalaria N° 1, Región Norte

Lima's Area Hospitalaria N° 1, Región Norte (Hospital Area N° 1, North Region) comprises the districts of San Juan de Lurigancho (site of the CSCG), Rimac, San Martín de Porres, Independencia, Puente Piedra, Santa Rosa, and Ancon. Located in what is called the "northern cone" of Lima, its area is 33 square miles. The Area is located in one of the zones of fastest growth in Lima so the effective borders of its area of influence are difficult to determine. The administrative center for the area is the HCBCH, which is the teaching hospital for the UPCH. This is of importance because the university's reputation is such that a significant number of patients, particularly the more complicated cases, come from outside the Area. The Instituto de Enfermedades Tropicales, of international repute, is also located at the HGBCH and patients from all over Peru come for treatment there.

The Area is part of the health care system administered by the Peruvian Ministry of Health. It is under the jurisdiction of the Región de Salud Lima Metropolitana (Greater Lima Health Region).

In addition to the HGBCH, which has 320 beds, the Area has two other centers capable of hospitalizing patients; they are Hospital Puente Piedra (31 beds) and the Centro de Salud Ancón (8 beds). The Area has jurisdiction over 23 other health centers, including the CSCG, that cannot hospitalize patients. 9 other health centers operate within the limits of the Area but are not under its jurisdiction. 2 are private (one with 10 beds), 1 is under exclusive community control, and 6 belong to the Ministry of the Interior.

It is difficult to say what the exact population of the Area is. In 1969, it was estimated to be 516,000. Current estimates range from 906,000 to 1,032,000 but there is reason to believe the total is much higher--sectors such as Canto Grande are growing at tremendous rates. About 40% of the

population is estimated to be under age 15, but this is only an estimate. In 1980, the Area employed 1164 people; of these, 154 were physicians and 26 were dentists (not including residents, internos, and SECIGRA's). 15 pediatricians were employed by the Area in 1980.

Peru's economic crisis has not spared Lima's Area Hospitalaria N° 1. Figure 1, which shows the Area's budgets since 1969 in constant soles, does not tell the whole story because it does not take population growth into account. In 1969, the Area received approximately 54 (constant) soles (about U.S. $1) per inhabitant; the figure for 1978 was approximately 45 soles. Salaries and wages make up a greater proportion of the budget in 1978 than in 1969.

Although the number of physicians in the Area has stayed fairly constant at about 5 per 10,000 (reflecting an increase in private practitioners due to migration of doctors to Lima and increased output of doctors by Peru's medical schools), the situation with respect to auxiliary personnel has changed. In 1969, the number of nurses per 10,000 population was 2.3, while the number of nurse's aides was 6.1 per 10,000 population. By 1978, the figures for these personnel were 1.6 and 4.2 per 10,000 population. This reflects a decrease in the delivery of care by public institutions (where most nurses and nurse's aides are employed). Figure 2 shows how, during a time period when the population doubled, the total number of visits to the Area's centers fell from 345,000 to 285,000. The drop does not represent an increase in the use of private practitioners but rather a decrease in the use of health care facilities in general--not surprising when one considers the tremendous drop in real salaries and wages that has occurred in Peru.

A detailed discussion of other aspects of the Area is beyond the scope of this paper. Data quoted in this section are from the Servicio de Estadistíca del Area Hospitalaria N° 1 (references 29,32,33).

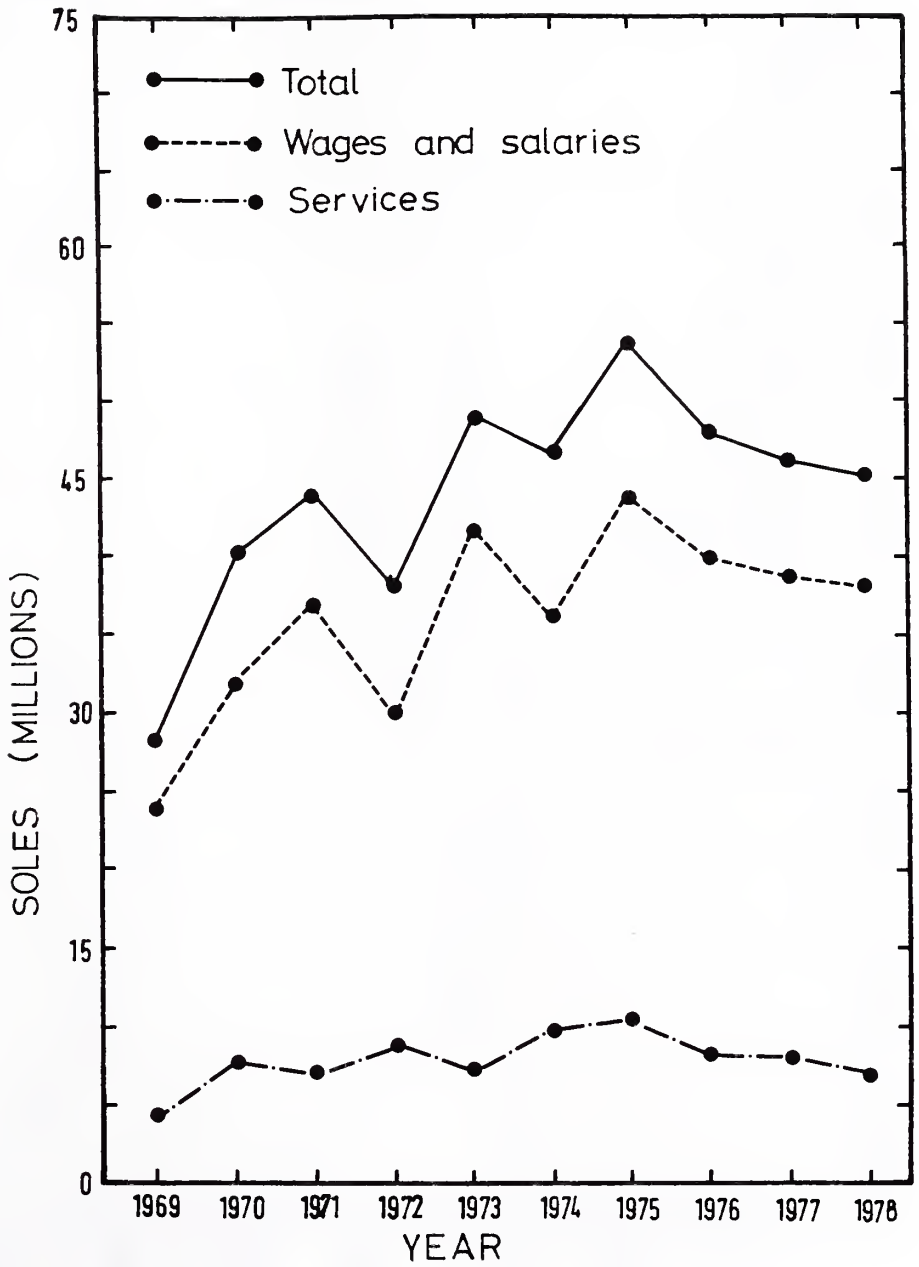


Fig. 1

Budget for Health Area Number 1, Lima, in 1969 soles. (in 1969, US $1 = 44 soles)

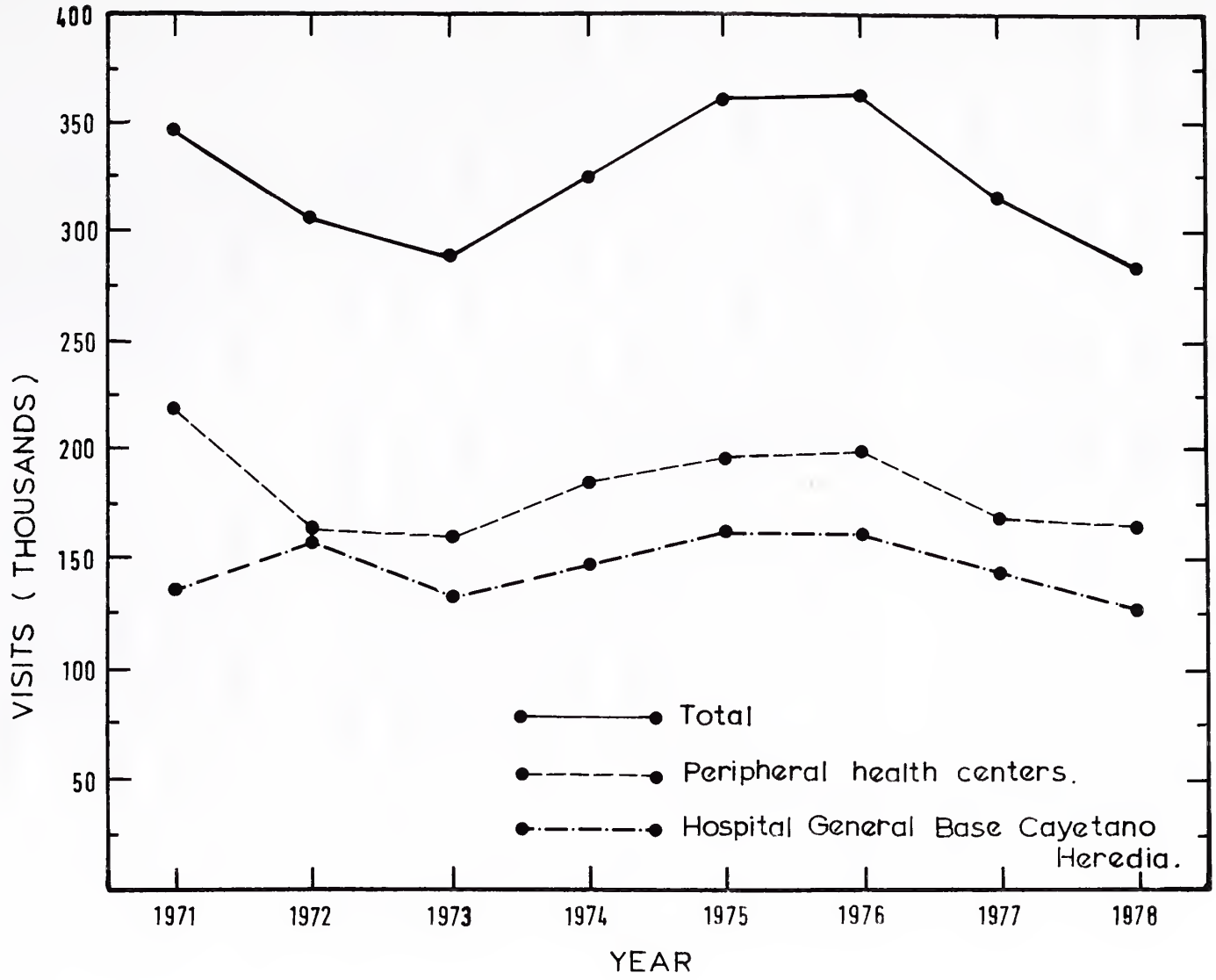


FIG. 2. Visits to Hospital Area No.1 Health Centers, 1971 - 1978.

B. Hospital General Base "Cayetano Heredia" (HGBCH)

The HGBCH is located in the district of San Martín de Porres. In addition to being the administrative center for Lima's Area Hospitalaria N° 1, the HGBCH is the main teaching center for the UPCH; this results in greater contact with entities outside Peru. Because of its university and international affiliations, the HGBCH tends to be more influential in the community than other Peruvian hospitals, particularly true in the area of health education.

The HGBCH is staffed by teaching and attending physicians, residents, and medical students (internos and externos). SECIGRA's do not work in the hospital. The HGBCH has 320 beds and handles all types of medical problems with the exception of complicated neurosurgical cases and burn patients.

In 1978, there were 9,404 hospitalizations in the HGBCH; this reflects a steady increase in the last ten years, as shown on Figure 3. The average length of a hospital stay has decreased in recent years, from 13.3 days in 1969 to 9.2 days in 1978, as shown on Figure 4, while the number of patients per bed has almost doubled (from 16.1 to 31.2) in the same time period, as shown on Figure 5. Figure 6 shows occupancy rates of the HGBCH in the same time period.

Table 1 shows that about a third of all hospitalizations are in the pediatric age groups (at the peripheral health centers such as the CSCG, this is about four fifths), which should be compared to Table 5, which shows about a half of all outpatient visits to be pediatric. The absence of a rational birth control policy in Peru* is reflected in Table 2--more than a fifth of all hospitalizations are due to abortions (illegal in Peru) and related hemorrhages--

* Abortion is illegal in Peru, as are some forms of contraception--some of which were dispensed at health centers receiving government support; this reflects Peru's ambivalent birth control policy. The investigator was approached on several occasions in order that he might perform illegal abortions, requests that he refused. He was informed that such requests are common, even to medical students.

as well as Tables 14 and 15. Tables 2 and Tables 14 through 17 also show the importance of accidents in underdeveloped nations.

Mortality at the HGBCH (Tables 3 and 4) is typical of underdeveloped nations.

An approximate idea of morbidity in the community can be obtained by looking at outpatient visits (Tables 5-12). Respiratory infections are quantitatively important in all age groups, followed by diarrhea in the younger age groups, genitourinary tract infections in the middle age groups, and illnesses of the nervous sytem in the older age groups. The prevalence of tuberculosis--a serious health problem in Peru--cannot be gauged from these tables alone because routine treatment and control of such patients (when it occurs) is done in the smaller health centers. Peru's economic crisis is reflected in the high number of children with malnutrition and anemia (Tables 7 and 8).

Adult emergency visits are shown on Tables 13 through 17. Pediatric emergency visits are discussed in greater detail in the following section.

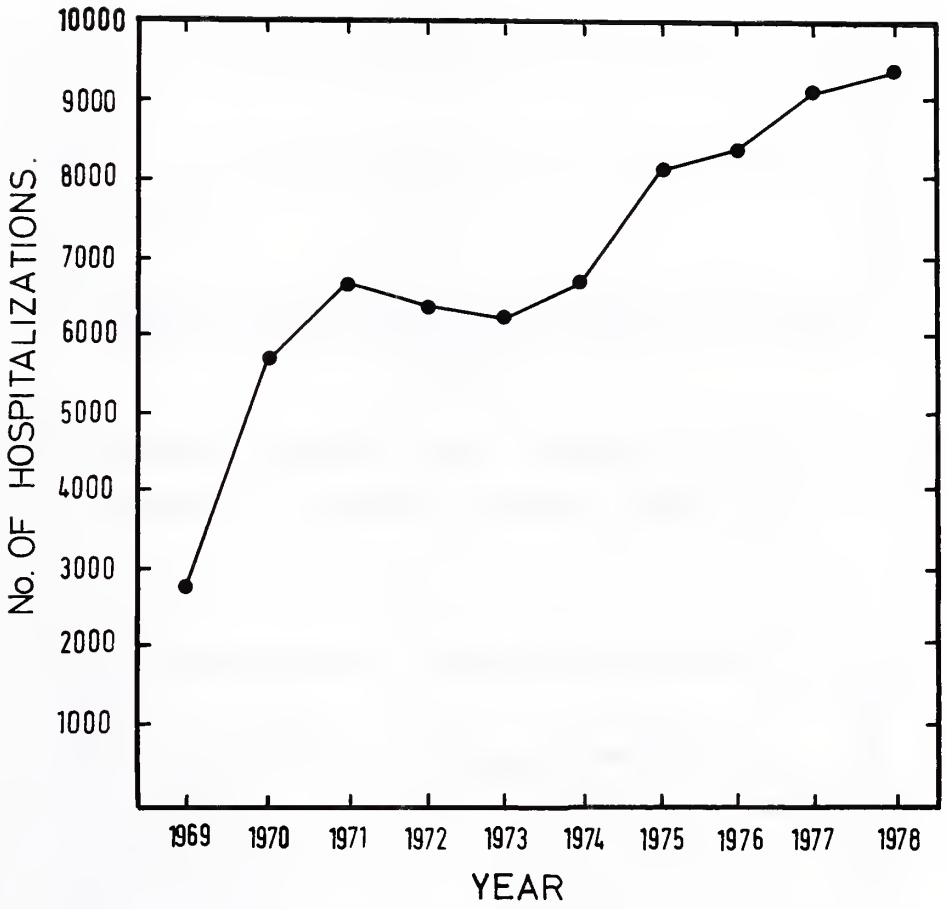


FIG. 3. Hospital General Base Cayetano Heredia Hospitalizations, 1969 - 78.

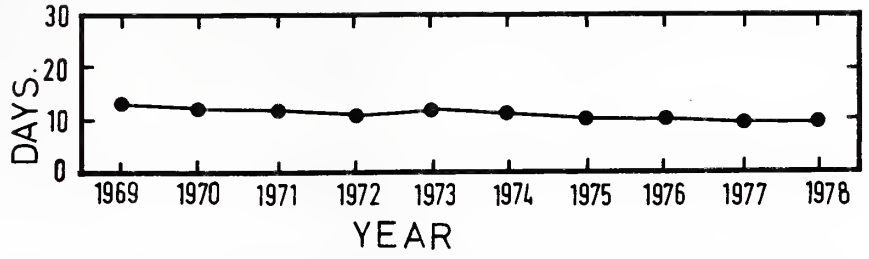


FIG. 4. Hospital General Base Cayetano Heredia, average length of hospitalizations, 1969-78.

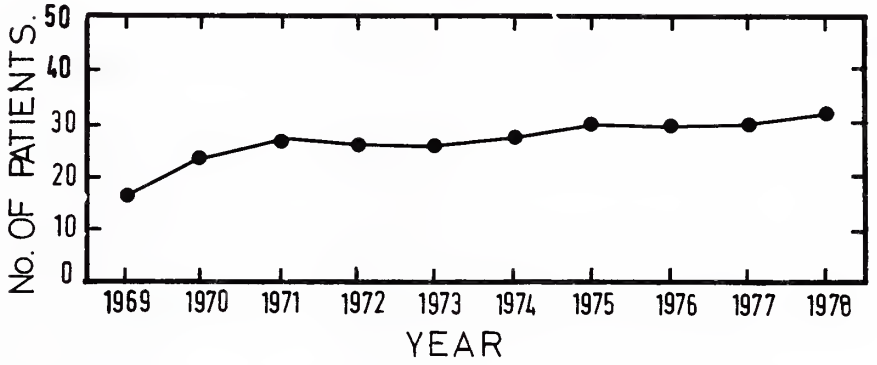


FIG. 5. Hospital General Base Cayetano Heredia, average number of patients per bed, 1969-78.

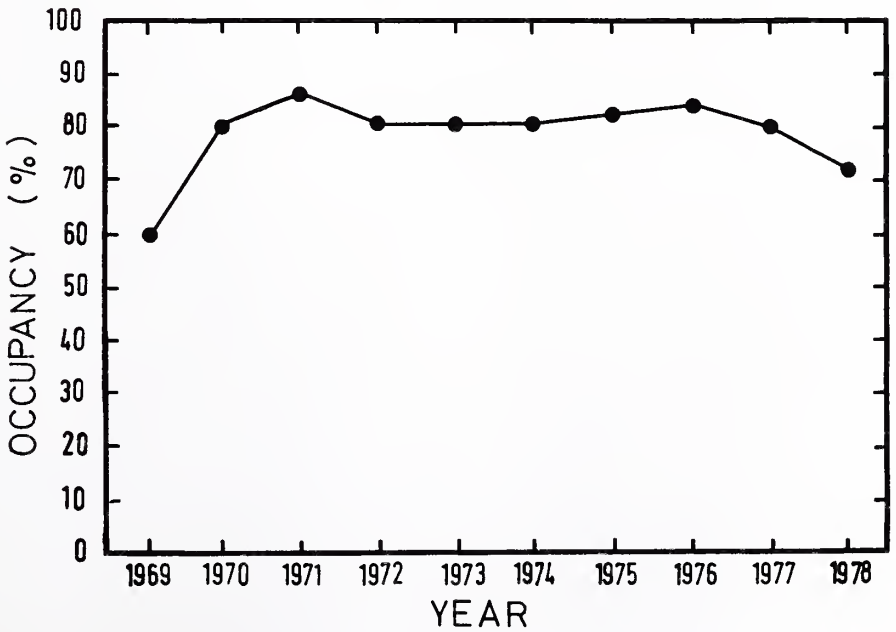


FIG. 6. Hospital General Base Cayetano Heredia, occupancy, 1969-78.

TABLE 1

HGBCH, HOSPITALIZATIONS, 1978[29]

Total:	9,404
Total patient days:	84,782
Average length of stay:	9.0 days

Age	Number	%	AVERAGE LENGTH OF STAY, DAYS
< 1 yr	976	10.3	9.3
1-6	630	6.7	10.0
7-14	554	5.9	14.4
15-19	1035	11.0	8.0
20-44	4977	52.9	6.8
45-64	788	8.4	16.2
65+	444	4.7	14.8

TABLE 2

MAJOR CAUSES OF HOSPITALIZATIONS, HGBCH, 1978[29]

Total: 9,404 (100%)

Cause	Number	%
Abortion and hemorrhages of pregnancy, birth, and post-partum period	2,038	21.7
Normal births	1,426	15.2
Trauma, all ages	600	6.4
Respiratory infections, all ages	597	6.3
Other complications of pregnancy	466	5.0
Diarrhea in children under 6 years*	357	3.8
Genitourinary infections, all ages	396	4.2
Illnesses affecting CV system, all ages	309	3.3
Tumors, all ages	279	3.0
Tuberculosis, all forms	239	2.5

* Diarrhea represents 22.2% of all hospitalizations in children under 6 and 29.9% of all hospitalizations in children less than 1.

TABLE 3

HGBCH, MORTALITY, BY AGE GROUPS, 1978[29]

Total: 1,520

Age	Number	%
1 yr	337	22.2
1-6	163	10.7
7-14	52	3.4
15-19	23	1.5
20-44	127	8.4
45-64	228	15.0
65+	560	36.8
not known	30	2.0

TABLE 4

HGBCH, MAJOR CAUSES OF MORTALITY, 1978[29]

Total: 1,520 (100%)

Cause	Number	%
Respiratory tract infections	314	20.7
Illnesses of the CV system in adults 45 and older	268	17.6
Tumors, all ages	259	17.0
Diarrhea in children under 6 years*	125	8.2
Tuberculosis, all ages	72	4.7

*Diarrhea accounts for 25% of all deaths in the HGBCH of children under 6 years

TABLE 5

HGBCH, OUTPATIENT VISITS, 1978[29]

Total: 298,492 (100%)

Age group	Number	%
1 yr	49,943	13.7
1-6	45,943	15.4
7-14	45,916	15.4
15-19	18,349	6.1
20-44	119,447	40.0
45-64	21,167	7.1
65+	6,727	2.2

TABLE 6

HGBCH, OUTPATIENT VISITS, CHILDREN UNDER 1 YEAR OF AGE, 1978[29]

Total: 40,943 (100%)

Cause	Number	%
Respiratory infections	17,729	43.3
Diarrhea	3,255	8.0
Skin infections	3,039	7.4
Other illnesses of GI tract	4,822	11.8
Illnesses affecting nervous system	914	2.2

TABLE 7

HGBCH, OUTPATIENT VISITS, 1-6 YEAR AGE GROUP, 1978[29]

Total: 45,943 (100%)

Cause	Number	%
Respiratory infections	16,959	36.9
Diarrhea	2,587	5.6
Skin infections	3,435	7.5
Helminthiases	1,084	2.4
Other illnesses of GI tract	3,054	6.6
Malnutrition and anemia	2,408	5.2

TABLE 8

HGBCH, OUTPATIENT VISITS, 7-14 YEAR AGE GROUP, 1978[29]

Total: 45,916 (100%)

Cause	Number	%
Respiratory infections	9,867	21.5
Malnutrition and anemia	16,608	36.6
Diarrhea	994	2.2
Tuberculosis, all forms	1,382	3.0
Skin infections	1,168	2.5
Illnesses affecting nervous system	3,032	6.6

TABLE 9

HBGCH, OUTPATIENT VISITS, 15-19 YEAR AGE GROUP, 1978[29]

Total: 18,349 (100%)

Cause	Number	%
Respiratory tract infections	1,997	10.9
Genitourinary tract infections	1,627	8.9
Illnesses affectiing nervous system	1,494	8.1
Tuberculosis, all forms	1,409	7.7
Diarrhea	994	5.4
Skin infections	777	4.2
(Normal) pregnancies	4,559	24.8

TABLE 10

HGBCH, OUTPATIENT VISITS, 20-44 YEAR AGE GROUP, 1978[29]

Total: 119,447 (100%)

Cause	Number	%
(Normal pregnancies	45,405	38.0
Genitourinary tract infections	27,500	23.0
Tuberculosis, all forms	4,610	3.9
Illnesses affecting nervous system	4,179	3.5
Trauma and poisonings	3,517	2.9

TABLE 11

HGBCH, OUTPATIENT VISITS, 45-64 YEAR AGE GROUP, 1978

Total: 21,167 (100%)

Cause	Number	%
Genitourinary tract infections	3,034	14.3
Illnesses affecting nervous system	2,522	11.9
Illnesses affecting CV system	2,172	10.3
Respiratory tract infections	1,548	7.3
Tuberculosis, all forms	1,424	6.7
Endocrine and metabolic illnesses	1,535	7.2

TABLE 12

HGBCH, OUTPATIENT VISITS, OVER 65 YEAR AGE GROUP, 1978[29]

Total: 6,727 (100%)

Cause	Number	%
Illnesses affecting nervous system	1,091	16.2
Senility and ill-defined states	1,026	15.3
Illnesses affecting CV system	995	14.8
Respiratory tract infections	498	7.4
Tuberculosis, all forms	410	6.1

TABLE 13

HGBCH, EMERGENCY VISITS, BY AGE GROUPS, 1978[29]

Age group	Number of visits	%
1 yr	4,627	6.5
1-6	11,708	16.4
7-14	8,968	12.5
15-19	9,971	13.9
20-44	28,980	40.5
45-64	5,316	7.4
65+	1,400	2.0
not known	623	0.9

TABLE 14

HGBCH, EMERGENCY VISITS, 15-19 YEAR AGE GROUP, 1978

Total: 9,971 (100%)

Cause	Number	%
Trauma and poisoning	3,021	30.3
Normal pregnancy, labor, delivery, and post-partum	1,828	18.3
Abortions and hemorrhages of pregnancy	799	8.0
Other complications of pregnancy	1,013	10.2
Respiratory tract infections	698	7.0

TABLE 15

HGBCH, EMERGENCY VISITS, 20-44 YEAR AGE GROUP, 1978[29]

Total: 28,980 (100%)

Cause	Number	%
Trauma and poisoning	8,385	28.9
Normal pregnancy, labor, delivery, and post-partum	3,798	13.1
Abortions and hemorrhages of pregnancy	1,312	4.5
Other complications of pregnancy	2,096	7.2
Respiratory tract infections	1,893	6.5
Diarrhea	1,513	5.2

TABLE 16

HGBCH, EMERGENCY VISITS, 45-64 YEAR AGE GROUP, 1978[19]

Total: 5,316 (100%)

Cause	Number	
Trauma and poisoning	1,693	31.8
Senility and ill-defined states	734	13.8
Skin infections	725	13.6
Respiratory tract infections	309	5.8
Illnesses affecting CV system	255	4.8

TABLE 17

HGBCH, EMERGENCY VISITS, 65+ AGE GROUP, 1978[29]

Total: 1,400 (100%)

Cause	Number	%
Trauma and poisoning	455	32.5
Respiratory tract infections	152	10.9
Illnesses affecting CV system	146	10.4
Senility and ill-defined states	85	6.1

C. Pediatric (Medicine) Emergency Service, HGBCH

Interviews of mothers at the HGBCH were done in the Pediatric (Medicine) Emergency Service. The following description is necessary to understand the limitations of the sampling procedure as well as to understand some associated problems in the treatment of diarrheal dehydration. A description of an actual case is given in appendix 6.

The pediatric emergency room at the HGBCH is used for treatment of patients under 14 years of age who do not require surgery (such patients are treated in the surgery emergency room). It is staffed 24 hours a day by residents and internos. A senior staff member is present from 8:00 A.M. to 2:00 P.M., Monday through Saturday; externos are assigned to the emergency room during the academic year and nurses and nurse's aides are avilable. Patient records at the emergency service are extremely rudimentary and the true number of visits is probably higher than the number given in statistics. Recent information on the service is given in Tables 18 and 19. The service handles from 20 to 80 visits per day. For some reason, the busiest day of the week is Monday and the lightest is Thursday.

No study has been made of how many of the vists are true emergencies. For a variety of reasons, the HGBCH's system of outpatient clinics does not operate well and the emergency room is used by patients best treated in a clinic setting. The number of visits that are true emergencies is probably around 20%. There is no triage system. Of the true emergencies, the most common are, in approximate order of frequency: diarrheal dehydration, bronchopneumonias, septic shock, and meningitis. During the investigator's stay there was an epidemic of typhoid fever in Lima.

The emergency room is not very accessible. In order to enter, patients have to come in from a side entrance and go around the back of the hospital.

If a person is coming on foot and does not know how to reach the emergency room, two or three minutes can be required to get to the waiting room--a long time if a child is in shock.

In order for a patient to be treated, a ticket must be purchased. At the time of writing the cost of a ticket was 100 soles (U.S. $0.40). Buying a ticket may be a time consuming affair due to the lack of organization of the waiting room. Once a mother buys her ticket, she shows it to the porter, who allows her to enter the hospital proper. However, if the number of patients at the emergency room is too great, the mother may be asked to wait either outside the emergency room or in the waiting room. Since there are no firm policies on handling of patient flow, the situation can be fairly chaotic if the number of patients is large.

If a mother has a child who is seriously ill, the auxiliary staff may let her in without the customary formalities. This is not an optimal situation because the criterion for speedy entry is not really the severity of the clinical situation but, rather, the degree of emotional pressure that can be put on the porters. There are always a significant number of people who try to get in out of turn as well as many who have to enter the emergency room for miscellaneous reasons; the result is that the porter--and sometimes the medical staff--has to haggle with many patients.

The emergency room itself can be fairly chaotic because there is no real attempt made to limit the flow of non-essential personnel. Arguments with relatives (other than parents) who insist on being present during treatment are common. The emergency room has two doors; during the investigator's stay no firm policy regarding these doors was made. The result is that parents will often bring in a child through a door that was left open, interrupting treatment of other patients.

The emergency room is not equipped to handle emergencies. There is no defibrillator or EKG machine and the oxygen supply is limited to a tank without adequate flow controls or even proper tubing. The suction apparatus often breaks down and the tubing is inadequate. Because of the danger of theft, the Ambu bag is kept in the nurses' station under lock and key, the same is true of the blood pressure cuff. No oto-ophthalmoscope is available and, since many residents or students cannot afford them, often one finds that the only diagnostic instruments available are stethoscopes and flashlights. In the best of cases, an X-ray can take 45 minutes to obtain; considerable pressure must often be brought to bear on X-ray personnel, further reducing a resident's available time. Blood gases cannot be obtained and a hematocrit and differential blood count take too long to be of practical use in an emergency.

Because of these and other factors, the emergency service is a difficult and exhausting place in which to work. The degree of bustle is greater than one would expect in an emergency room. Residents dislike the emergency room rotation and having to be on call there. They have to face a heavy load of patients with common colds and ear infections that would best be treated in a clinic setting on one hand, and bursts of intense activity where the lack of organization and facilities stand out on the other. Administratively, the emergency service is directly linked to the rehydration unit; this arrangement is impractical because the rehydration unit probably should be administered as a separate service.

TABLE 18

HGBCH, EMERGENCY VISITS, PEDIATRIC EMERGENCY SERVICE, 1978[29]

Total: 25,303 (35.3% of all emergency visits)

Major causes of pediatric emergency visits, by age group (1% is from total pediatric visits)

Cause	Less Than One Year	1-6 Years	7-14 Years
TOTAL	4,627 (18.2%	11,708 (46.2%)	8,968 (35.4%)
Diarrhea	1,292 (5.1%)	1,578 (6.2%)	412 (1.6%)
Respiratory tract infections, incl. TB	1,481 (5.8%)	1,237 (4.9%)	910 (3.6%)
Skin infections	455 (1.8%)	1,220 (4.8%)	677 (2.6%)
Trauma and poisoning	279 (1.1%)	4,338 (17.1%)	4,062 (16.1%)
Illnesses affecting the nervous system	206 (0.8%)	534 (2.1%)	327 (1.3%)

TABLE 19

HGBCH, PEDIATRIC EMERGENCY SERVICE, 1979[32]

Total visits:	20,753
Total cases of diarrhea:	1,813 (8.8%)
Total ER admissions:	578
Total admissions due to diarrhea:	407 (71% of ER admissions)
Deaths in ER due to diarrhea:	46

APPENDIX 6

CLINICAL AND CULTURAL OBSERVATIONS

A. Clinical and epidemiological observations

A. 1

Medical practice under adverse conditions

As was shown in tabular form in Section II, Peru's health situation in 1979-80 was critical. It should be stressed that, by United States standards, Peru's situation has never been adequate. However, it is important to point out that the situation has markedly deteriorated in recent years and that, by 1979-80, there was a consensus among the medical profession that the situation was especially hard.

Important aspects of this crisis observed by the investigator include the following:

a. Equipment and material shortages. During his stay in the CSCG, these were routine, while in the HGBCH they were more sporadic. The amount of medical supplies anywhere in Peru is always below that available in the United States. There were days when the following occurred, either singly or in combination:

   1. electricity was cut off
   2. water was cut off
   3. articles of prime necessity--gauze, sterile swabs, tongue depressors, alcohol, iodine, cotton, and so forth--were unavailable
   4. auxiliary personnel were on strike
   5. certain key medicines, e.g., IV solutions for dehydrated children or epinephrine ampules for shock patients, were unavailable at the hospital and patients had to purchase these outside the hospital

b. Theft of equipment with subsequent failure of replacement. Theft of equipment is a serious, generalized problem in Peru's hospitals (the problem also occurs in the United States). The lack of operating funds prevents replacement of such equipment; this also occurs with equipment that breaks down due to normal use. In addition, the possibility of theft results in keeping much equipment under lock and key, resulting in a drop in efficiency in general; under emergency conditions it can be catastrophic. A copy of a letter circulated in the HGBCH during the investigator's stay is shown on the following page.

c. Cost of medicines. The high cost of medicines is a serious problem for most of Peru's population. Significant rises occurred during the investigator's stay (on June 4, 1980, for example, all drug prices went up 17%). Peru's government instituted a program aimed at providing inexpensive basic medicines to the public (Medicamentos Básicos) but the program has been unsuccessful, controversial, and has been partially discontinued.

When a patient arrives at one of Peru's hospitals or health centers, (this includes the HGBCH), the patient or his family has to pay individually for virtually every item used during the hospital stay, in addition to the basic charge for the visit or bed, which includes food and care. Even more difficult, from the standpoint of care, is that the patient or family has to go to purchase such items before being treated, either at the hospital pharmacy or at a private pharmacy. This includes IV solutions, electrolyte ampules, IV catheters, analyses, X-rays, and so forth. Usually, such purchases can be made at the hospital pharmacy. However, there are occasions when, for example, the hospital owes money to the pharmaceutical companies that provide it with, say, IV solutions. When this occurs, the pharmacy is unstocked and patients or their families must go to private pharmacies located at variable distances from the hospital, especially troubling at night.

Many patients cannot afford some drugs or services, which results in one of these outcomes:

a. service or medicine is not provided

b. physician in charge somehow obtains service or medicine (e.g., from samples distributed by drug salesmen, or left-over items from a previous patient)

c. hospital waives charge

Fee waivers by the hospital require the approval of both a social worker and the office of the Director; waiving a fee is a complex and necessarily limited option.

M E M O R A N D U M

No [illegible] SE-AEN01-R-79

DE : Dr. Diego Gonzáles del Carpio - Médico Coordinador del S.E.

A : DR. [illegible] - Médico Residente del S.E.

FECHA : Lima, 5 de Diciembre de 1979.

Estimado Doctor :

La creciente frecuencia de hurtos dentro del Hospital y del Servicio de Emergencia agrava la falta de equipos medicos y desalienta su adquisición. Es imprescindible establecer prácticas agresivas en el control del escaso patrimonio del Servicio si queremos mejorar nuestros equipos o, al menos, mantenerlos.

En relación al instrumental Médico del Servicio de Emergencia, la responsabilidad de su adquisición corresponde al Responsable de Tópico (MR2 del turno regular y MR1 que encabeza el rol de guardia) bajo las siguientes pautas :

1.- El instrumental será guardado bajo llave en el armario; usado por el responsable, o entregado bajo responsibilidad con cargo firmado a otros medicos del Servicio.

2.- El Responsable de Tópico recibirá y entregará llave y materiales en cada cambio de guardia.

3.- El Responsable de Tópico se compromete a cuidar del instrumental bajo los términos arriba mencionados y a reponer el candado que se pierda en su turno.

Atentamente,

HOSPITAL GENERAL BASE
"CAYETANO HEREDIA"

DGC/nb.

Dr. Diego Gonzáles del Carpio
Méd. Coordinador del Servicio
de Emergencia

MEMORANDUM

N° 337 SE-AHN°1-R-79

FROM: Dr. Diego Gonzales del Carpio - Coordinating Physician of the Emergency Service

TO: Dr. - Resident in the Emergency Service

DATE: Lima, December 5, 1979

- -

Dear Doctor:

The increasing frequency of thefts within the Hospital and the Emergency Service aggravates the lack of medical equipment and discourages its employment. It is imperative to establish aggressive policies in the control of the limited patrimony of the Service if we wish to improve our equipment or, at least, maintain it.

With respect to the medical equipment of the Emergency Service, the responsibility for its use belongs to the 2nd year Resident during regular hours and to the 1st year Resident on call subject to the following rules:

1. Equipment shall be kept locked up in the cupboard, used by the responsible physician, or signed out to other physicians in the Service.

2. The responsible physician will receive and present keys and equipment when the on-call team changes.

3. The responsible physician commits himself to care for the equipment as described above and to replace any lock that is lost when he is on call.

Sincerely,

(Signed) Dr. Diego Gonzales del Carpio
Coordinating Physician,
Emergency Service
Hospital General Base
"Cayetano Heredia"

The health worker in Peru is thus in an extremely difficult situation, often finding her or himself unable to provide care due to material limitations. At times other factors come in to play as well. In 1974, for example, there was an epidemic of Salmonella in the HGBCH. An asymptomatic carrier who worked in the kitchen was identified. When it was suggested that he be transferred, the union strenuously objected and the hospital was unable to obtain his transfer.

Bureaucracy, a mounting problem worldwide, is another problem in Peru's health centers. The investigator found that, compared to similar institutions of which he had experience in the United States, the level of paperwork for minor matters was higher. This is true in general in Peru. Many operations which are done on an autonomous basis in a United States hospital have to be cleared by the Director's office in a Peruvian hospital.

One important result of all the problems described in this study is that there is a tremendous pressure to manage patients on a clinical and epidemiological basis. Since the Peruvian health worker cannot count on the level of technological back-up that his North American or European counterparts have, he is forced to develop his clinical skills to a maximum. A greater reliance is also put on the epidemiology of the location, some of which is based on the sum of many conversations and observations and not on detailed studies. If one knows that there is a major epidemic or typhoid (this was the case in Lima in 1979-80) one tends to look at patients with fever and headache in a different way. For example, all children with lobar pneumonia at the CSCG are treated with IM procaine penicillin G. There are two reasons for this procedure: the drug has been effective in most cases, and a large box of penicillin G vials was donated by a Swiss firm. At the HGBCH rehydration unit, the staff grades depression of the fontanel, tenting of the skin, and loss of ocular tone on

a scale of + to ++++. This approach, forced by necessity, results in personnel with tremendous clinical skills but is not optimum since many illnesses are not differentiable clinically.

A. 2

Behavior and morale of health personnel

As is the case in other countries, different social groups in Peru often have difficulties in communicating with one another; this is true even with groups of similar income. Peru's population is as heterogeneous (culturally) as that of the United States--communication between regions in Peru is difficult and when people migrate to the city, many retain the social and cultural characteristics of their original region. A significant portion of the population is outside the economy and many speak Aymara and Quechua instead of Spanish. Differences in education are also quite marked.

The investigator saw--and experienced--many problems of communication between staff and patients. Some members of the staff were either harsh or condescending with patients. Additionally, social and cultural differences between staff and patients can be quite marked. Notions of causality, for example, are very different--many patients ascribe the cause of an illness to the signs and symptoms. For these reasons, a hospital visit or stay can be a traumatic experience for patients over and above the grief and economic hardship inherent in a serious illness.

Many parents were terrified to have their child admitted to the hospital, citing fears such as that the staff would forget about the child, or that so-and-so is a harsh doctor, and so forth. The investigator also saw the other extreme of behavior--parents who, lacking confidence in their own knowledge of health care, insisted on their child being admitted even when not warranted.

There is no doubt that low morale and fatigue are serious problems among Peru's health personnel, especially the auxiliary personnel in the smaller health centers. That this is understandable does not, of course, eliminate the problem, analysis of which is beyond the scope of this paper.

B. Cultural observations on health care in Peru

Observations on beliefs relating to health were also made during the course of the study; these are of interest because they help describe the cosmology of the populations most at risk for infantile diarrhea. The most important of these are given below.

NAVELS:

It is common to use ombligueras--umbilical bands--on babies. This is due to a belief that a child's intestines will come out through the navel. The bands are made of cloth and are wrapped tightly around the abdomen; obviously, many children are in discomfort as a result. One of the residents at the HGBCH found a useful way to explain to mothers not to use these bands; "You do not need to use this any more, please do not worry that the intestines will come out. The baby cannot speak; if he could talk, he would tell you how uncomfortable he is." Stressing that a baby cannot complain is always an important way of obtaining a mother's trust.

A related belief is that falls or sudden movements cause the intestines of a child to become tangled. This is similar to beliefs recorded by Frisancho--pregnant women are not supposed to use spindles because spinning will result in rotation of the fetus with strangulation of the child by the umbilical cord[34].

Although little care is taken to protect children from tetanus at birth (in the absence of trained midwives or some contact with health education),

there is tremendous concern about babies with protruding navels. Frequently, a coin is placed over the navel prior to tying the ombliguera.

WATER:

Most people in Peru believe their water to be contaminated. This leads to curious situations. People will refuse to drink tap water at, say, a restaurant, but will drink fruit juices prepared with unboiled tap water--somehow, the water loses its "water" quality when it is in the form of juice. Mario Chuy, head of the CSCG, did some culture studies with water in Canto Grande. He found that water was not contaminated prior to loading in tank trucks, nor was there significant colony growth in water in the tank trucks themselves. Significant colony growth appeared in the tanks and containers used in people's homes, which is not surprising since knowledge of proper hygiene is limited and lack of running water makes application of such knowledge difficult in any case. Of course, sometimes the water is contaminated--in March of 1980, Dr. Uriel Garcia (later named Minister of Health by the new civilian government) examined about a hundred cases of children with diarrhea and skin infections that were traced to water in some of the reservoirs that supply sectors of Canto Grande that do have (some) running water. The water in those reservoirs was found to have Staphylococcus aureus and 105 colonies of coliform bacteria per milliliter; not surprisingly, the article describing this situation in the popular press was called "Water that you shall not drink"[35].

Even more interesting is the belief that water drinking as such is dangerous, particularly for children. This belief is not restricted to those of low socio-econimic status. It is widely believed that a child, if unsupervised, is in danger of developing water intoxication. One mother told the investigator that foreigners drank too much water.

MAGIC COLORS:

Red and black are believed to be powerful magic colors in Andean communities. Red ribbons on babies' wrists are meant to ward off the evil eye: the person with the "strong" eye is supposed to look at the ribbon, thus missing the baby. Use of these was more common in Canto Grande than in the HGBCH.

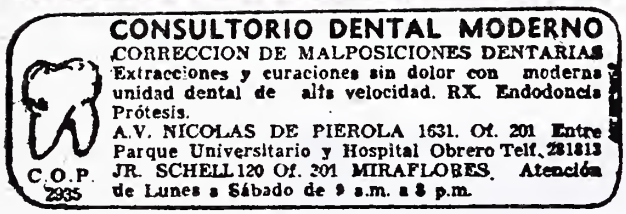
LUMBAR PUNCTURES:

Many parents have a terror of having their children undergo lumbar punctures. This is probably due to the high mortality associated with meningitis--death is ascribed to the lumbar puncture, not to the illness--and to the idea that the soul can leave the body, as occurs in susto and similar illnesses[34,7].

Other beliefs relating to health typical of Latin America are quite strong in Lima. These include susto (fright) and mal de ojo (evil eye). The most common treatments for these involve prayer by a child of the opposite sex while an egg is rubbed over the body ("pasar huevo"). Many excellent descriptions of such beliefs have been made in Peru and elsewhere in Latin America[7,13,34,11,9,12,14]; susto is treated in greater detail in the next section.

Atlhough extremely sophisticated medical facilities exist in Peru, use of traditional medicine is quite common, even among people with university degrees, in Peru. This occurs despite the sense of admiration for the advances of medical science that most Peruvians have (for example, interferon received profuse coverage in the popular press). The following pages contain advertisements from a popular newspaper (Nuevo Extra, Lima, 27 May, 1980 #4717). One is a series of advertisements for "orthodox" medicine. It is followed by an advertisement for a "huesero" (bone setter) and an advertisement for an herbalist. Occasionally, traditional healers are obtaining medical degrees from medical schools; nowadays, hueseros routinely ask for X-rays; this was the case with one who treated the investigator's father.

30!



Advertising for "orthodox" medical services in a Lima newspaper

Lima, 26 de mayo de 1980.

Maestro Huesero

Atiende luxaciones, torceduras, dislocaduras, desgarramientos, tendones, relajamiento musculares, masajes a la columna, desviaciones. ATENCION: de 10 a.m. a 8 p.m.— También se atiende a domicilio. Feriados y domingos media mañana. Calle MIGUEL ALJOVIN 322, Dpto. 48 (cuadra 2 Palacio de Justicia).

Master Bonesetter: attends luxations, sprains, dislocations, tearings, tendons, muscle relaxations, spinal column massages, deviations...

"Heraclio" Master herbalist from the northern town of Salas, Chiclayo (a town renowned for its witch doctors), the only one who brings the true and powerful waters and herbs of the Huaringas. Visit him.

C. Personal experiences

Two accounts of personal experiences of the investigator in Peru in 1979-80 will be presented in order to give a better idea of some aspects of health care in Peru. These are given in the first person and are necessarily subjective.

C. 1

Child in shock

I was sitting in the pediatric emergency room one morning; I had just finished interviewing a mother and had finished giving her instructions on how to take care of her child. In addition to me there was an interno and a resident. The interno was also sitting, waiting like me, while the resident was attending a ten year old girl with typhoid fever. Lima was in the midst of a typhoid epidemic. I had just said something silly and the interno and I were both laughing.

Suddenly, a woman entered the room. Her anguished face denoted a true emergency--the porters had let her in without paying for her ticket and she was shown in right away. She carried a two year old child which was covered with a blanket. When mothers bring children with covered faces, it usually means the child's condition is really serious. The resident stopped prescribing and asked the mother what was the matter while he quickly uncovered the child; she burst into tears and the resident set the child down on the examining table. The mother began wailing. I saw the child's face, it was a face I had seen many times: the blank face of a gasping, acidotic child with sepsis.

Since the resident was there, I immediately ran to the nurse's station to obtain the pediatric Ambu bag, feeling angry that the bag had to be kept in a different room. This took about forty seconds--a long time when a child is in shock. When I got there, I had a nasty surprise: the man who had the key to the cabinet (where the Ambu is kept) was gone. He had to be called and

the nurse there began calling his name out loudly. Fortunately, he arrived fairly soon, although another two minutes had passed. I had a feeling of utter frustration while I waited for the cabinet to be opened.

When I got back to the emergency room, the child's heartbeat was extremely faint and soon I was giving it CPR with the resident. At this point the child's father returned; he had been sent to buy an ampule of epinephrine. The resident asked the interno to run upstairs to see a friend of his who had an ampule of epinephrine (probably a free sample). When the interno returned, a nurse loaded the syringe and the epinephrine was injected into the child's heart. I thought of the time, a few days before, when we had done this--when Dr. Salazar pulled back on the syringe to see that he was in the heart, the syringe had filled with pus. The child's heart began beating spontaneously again and the nurse was asked to put an IV in while oxygen was finally given--the plastic tube that connected the Ambu bag to the O_2 tank was missing and we had to fumble around until a proper tube was found (this meant a couple of trips to the nurse's station). The IV was started and the interno kept watch over the baby, whose respiration had improved. Fifteen minutes later, though, the baby's heart stopped and, despite all our efforts, could not be started again.

I watched while the resident explained to the weeping mother, feeling that same feeling of frustration--sometimes the Ambu bag was not available, another time it was the suction apparatus, or this tube or that ampule. We had the skill and the knowledge but lacked the material.

C. 2

Mountain spirits in Cuzco

The end of the year in 1979 was a rather bad time for me. I was very exhausted from working at the Pedi ER--it was my first real long experience with clinical medicine, and I had been expected to assume a degree of

responsibility that I did not feel prepared to assume. I was also a bit depressed, it was Christmas time and it seemed to me that everyone, with the exception of myself, was with their family.

A few days before Christmas, I went on a harrowing ride through Lima that nearly ended in an accident due to the driver's recklessness. This shook me up but not as much as what happened on Christmas day. After visiting some relatives in the morning, I went to see my father's brother. His son suggested that we go swimming and my uncle lent us the car. Marco decided that we should go to one of Lima's southernmost beaches, Conchán. I nearly drowned there, and I was rescued by a young man who threw a surfboard towards me; he had gone in, along with most of the other people there, when my cousin noticed that I was not returning after a long time in the water and alerted people at the beach. Afterwards, people kept telling me that I was crazy to go swimming at Conchán. After this incident, I began having trouble sleeping--I kept having nightmares about drowing. The last straw came on New Year's Day, when a friend from Uruguay nearly blew us up with the oven around three in the morning--like many Latin American males, he did not know how to use it.

Soon after this, my aunt saw me and was impressed by how haggard I looked. She decided that, as a result of my brushes with death, I was suffering from susto. "My (little) son," she said, "I don't like the way you are living now, you are suffering from susto, you are traumatized and need help." I of course agreed. My aunt left Lima a few days before I did and began mobilizing resources for my healing. She told me that I was going to be called, a ceremony which stems from the idea that the soul leaves the body in susto; being called is a relatively simple ceremony in which people pray for the

afflicted and, sometimes, rub an egg over the body of the person to be healed.

When I arrived in Cuzco, another aunt told me that I was not going to be called but, rather, be cured in a mesa. Mesa means table but its derivation is from the Quechua mispronunciation of misa, which means mass; the word retains both connotations.

What is a mesa? There is a network of "priests" throughout the Anes. These meseros are in charge of summoning the apus or mountain spirits. They train in various parts of the country, and many receive authorization to practice following a ritual bath in an icy lake in Bolivia. They have an ambiguous relationship with the law and are occasionally persecuted by the police; however, they are an indispensable source of healing for the common people of Peru, Ecuador, and Bolivia. A given mesero has jurisdiction over a certain geographic area--Cuzco, for example, has 40 mesas--and a hierarchy exists. An alto misa is the term for the highest rank, although the term is often used to describe any wise man or healer.

Apus are beneficent local spirits and represent a persistence of Inca religion in a Catholic nation. Some retain Inca names: the apus Saccsayhuaman, Huayna Picchu, and Salcantay are the spirits of mountains in Cuzco. There are other apus as well, like Copacabana (head of the apus in Cuzco; Copacabana is a location in Bolivia) and Ruben Solimana (the spirit of a physician). The archangels Michael, Gabriel, and Raphael are also invoked as apus. My second aunt, who is a firm believer in the apus, and who had assumed responsibility for my healing, told me all this. She also referred to the apus as the papacitos, the best translation for this term is "daddies," but the term daddy does not carry the reverence which my aunt placed on papacitos.

I went to the ceremony with a mixture of curiosity, nervousness from anticipation, and my continuing depression and anxiety. My aunt and I arrived at 7:00 P.M. at a handcrafts store in a street best known for its taverns.

At the crafts shop there were four people sitting behind the merchandise. There were two small women, one in her mid-thirties, the other in her seventies. A more middle sized woman in her fifties was telling how she had cured a paratrooper of susto (the man's parachute almost failed to open). The president of the assembly, a man in his early sixties, told my aunt and me to buy two bottles of cognac for the papacitos, so my aunt and I went to a store nearby to buy the bottles. We passed a lot of tourists on the way: Cuzco is full of travelers, who include left-over hippies and many Hare Krishna devotees.

When we came back, we sat for a while, waiting for the mesero to arrive. I told the oldest woman there that I was severely depressed and that I had had a close call in Lima. She replied that a lot of people had been cured of similar problems, that a lot of people were afraid before the ceremony, and that, if I did not know the prayers (Hail Mary, the Lord's Prayer), I should just recite along with the rest. Then she said that she had sent an alcanzo at noon. Alcanzo comes from alcanzar (to reach); an alcanzo is a preliminary offering to the apus consisting of a packet of coca leaves. After all, they were not expecting my presence at the mesa and protocol is inherent in anything done in Peru.

After a bit, we went through the back door of the shop to the room where the mesa was to be held. Like most old houses in Cuzco, this one was built around a central courtyard open to the sky. There was a toilet in one of the side rooms. It was dark and I saw people cooking in another side room; I could smell delicious food.

The room where the mesa was held was about twenty feet by eighteen feet without any windows; it was roughly quadrilateral; wooden beams at the ceiling

pushed through the white stucco. The door was at the far left of the room; three of the walls were lined by green sofas and, as I came in, I saw a long table on the right. When I was inside, I noticed a beautiful nativity scene in a niche that could not be seen when one came in. The nativity scene was actually three nativity scenes arranged in tiers--the largest and oldest and loveliest of the baby Jesuses was at the top, a smaller one one step down, and a tiny one on the bottom step of the niche. Hundreds of figurines surrounded the figures of Jesus and his parents--animals, shepherds, angels, stars, little trees. Below the niche, which must have been three feet by three feet and about two feet deep, there was another table joined to the central table. This table had a lot of real flowers in vases and two large figures of the archangels Raphael and Michael. The tables were covered by white tablecloths and had numerous offerings--two bottles of Coca Cola, one of champagne, several bottles of Cuzco's outstanding beer, one of Fanta, and my two little bottles of cognac (which cost 140 soles--about U.S. $0.60).

My aunt and I sat facing the door and niche while more people arrived. There was a man at the central table preparing an elaborate offering on a piece of gift paper--herbs, coca leaves, rose petals, a few lead figurines. This man was an apprentice masero--he could help conduct the ceremony but could not conduct it. When he was finished preparing the offering, he wrapped it and tied it and put it on the other table. Then he went about making a central cross in the center of the table; this cross was made of coca leaves with an occasional flower or two. Meanwhile, people came in and talked and laughed, while the president of the assembly stressed: "When the papacitos arrive, instead of greeting them as individuals, I think we should--to save time--greet them in unison, like this, 'Hail Mary full of grace, papacitos'" and he made us rehearse this a few times. The mesero arrived: "Where is the hypodermic needle?" he asked, or "Where is the teapot?" These were items that had to be placed along with the offerings in the event that the apus required them for their healing. The

atmosphere was solemn but not stern, people talked like people in Cuzco usually talk, some spoke in Quechua, more people came in, the president of the assembly began singing a hymn he had composed in honor of the papacitos. The woman in her seventies fussed about, helping the mesero set up the table. Several people brought dishes of food and a discussion arose as to whether the food should go on the center of the table--already full of offerings and the coca leaf cross--and I got the impression that the apus needed a surface to land on.

I kept looking around and greeting people, asking my aunt questions about this or that. Then the woman in her seventies handed me a package of (I presume) coca leaves wrapped in brown paper. She told me that I had to write Ruben Solimana's name at the top and my name at the bottom. Everyone smiled when I wrote--"He is left handed, no sorcery can harm him!" Then the assistant mesero made me put the package inside my shirt, touching my heart. "When the papacitos arrive they come like a rushing of wings," someone said, "take off your glasses, you won't need them in the dark anyway!" "Sometimes they hit people lightly on the head, they love to joke!" "Have you seen our book?" asked the president of the assembly, handing my aunt a notebook where the organization's bylaws were written in very flowery Spanish.

Eventually everyone who was going to be there arrived and a consensus that the ceremony should begin resulted. The mesero and his assistant closed the door and sealed it with blankets so that darkness would be complete when the lights were put out. There were fifteen people in all: myself, the president of the assembly, three other men in their thirties and forties, the mesero and his assistant, and six women, including my aunt. There were two women in their seventies, the rest were in their forties and fifties. The mesero was in his late twenties, his assistant was in his late thirties.

The president of the assembly spoke to the now silenced group. He told us that we, as Christians and servants of apu Jesus Christ, should participate in the ceremony with all faith, so that we would be delivered from the nest of sorrows and sin in which we lived. The papacitos would listen to our pleas, but we had to remember to greet them as quickly as possible, to save time. He then asked those not formally inscribed to place their name in the book. Three or four people formally joined the association; one said she could not always come because she had to work some nights; the president said that was permitted: "The papacitos recognize the need to earn one's daily bread." A brief discussion arose as to how much money to put on the table; eventually people put S/. 200 each ($0.80); and I noticed that people were concerned as to the appropriateness of the amount, giving me the impression that the apus could be offended by too much or too little money. Everyone was seated with their back to the wall except for the mesero and his assistant, who sat in chairs in the center of the room, facing the central table. The mesero told his assistant to grab a candle and matches; when the assistant did so, the mesero turned out the one electric light and the room was completely dark.

We recited one or two Hail Mary's, the Catholic credo, and the Lord's Prayer. Suddenly, there was a sound and I felt as if two very large wings were flapping for about fifteen seconds, brushing air into my face, making me involuntarily turn away, lest the wings strike my face. The apu had arrived. A voice spoke--a sort of squeaky falsetto somewhere between the voice of a child and a woman, with just a trace of irritation. "Viva!" it squeaked. "Viva papacito!" we replied and we clapped, "Hail Mary full of Grace, papacito!" The apu squeaked back: "Our Father!" and we all repeated the prayer in unison. I remember one time when I went to get some rats out of an animal room at the Yale-New Haven Hospital: I could not find the light and, as soon as I went

into the cage room all the rats began moving, making a buzzing sound, eerie in the total darkness. The same feeling came over me: the buzzing of all the voices seemed to press in on me. The apu asked us to sing a couple of religious songs, told us he was the apu Saccsayhuaman (a famous fortress overlooking Cuzco), "Oh! Welcome papacito Saccsayhuaman, please help my daughter, and please take some of the champagne we have brought you," one person would ask, others made similar pleas. "Allright, allright," the apu squeaked in reply, or he might ask for another Hail Mary, or give a bit of advice or instructions. "Papacito Saccsayhuaman," my aunt said, "this is my nephew I told you about, he is very ill and needs to tell you about his problems, he has susto and needs your help, papacito." "Allright,very well," said the apu, "We'll cure him--where's the teapot? Where is the bottle of medicine?" In the darkness, a hand gave my aunt a cup of herb infusion and a pill; she handed me the cup and the pill and told me to take the pill, which I did, drinking a little of the herb tea. People continued with their pleas and prayers until the apu said, "That's all with me, Saccsayhuaman." The group replied, "Good-bye, papacito, please come back, help yourself to the food."

We said a few prayers after Saccsayhuaman left and then a series of apus arrived, one at a time. Each time one arrived the same flapping of wings took place. Ruben Solimana came but did not speak very much; other apus that came that night were: Copacabana, Salcantay, and Huayna Picchu. Several things occurred. My aunt told the other apus that I needed help, so they said that I needed a double treatment and the ritual with the pill was repeated. One of the apus helped himself to some champagne, sending the cork into the air, like at a party. One of the spirits told the assembly to go to the ruins of Saccsayhuaman the following Tuesday, another said that the next time people were to bring fruit instead of food. Huayna Picchu told us to see what was

happening in Andahuaylas--a cryptic statement. As the apus came and went, they were asked for help with this or that: my daughter's mother in law is ruining her marriage, papacito, I have chills and fever, is it OK for me to make the trip to Abancay this next week? Please give your blessing to my marriage, papacito... Sometimes the apu, just before leaving, would say, "Allright, let's hurry up with the questions!" And, constantly, the prayers and songs pressing on my ears. At times I found myself carried away by the ceremony, at times totally lucid and in control. Sometimes I even found myself afraid, lest I not be cured. Finally, the last of the apus left, and we said a few closing prayers, sang a song to apu Jesucristo, and the mesero turned on the lights.

On the table, the cross made of coca leaves had been turned into a circle and the flowers were scattered; there were also coca leaves and rose petals spread all over the room, and I brushed some out of my hair and off my coat. My two bottles of cognac were empty, and so was the bottle of champagne. A bite had been taken out of one of the ears of corn. People were in a very happy mood, discussing the ceremony, commenting about the champagne cork, about this or that apu, about how they felt--"And how do you feel?" I was asked, "I feel better," I replied.

The curious thing, for me, was that I did feel better. I had the sensation that my initial emotions--depression, extreme anxiety and fear, and the fright of nearly having drowned--had been dissected, and only my usual anxiety was left. But I did not have time to think too much about these things there, because we then had a feast with the food and drink left on the table, and I stuffed myself with delicious Cuzco corn and cookies. People offered me beer, but it was noted that I had received "medicine" so they all said I should avoid alcohol for the time being.

Oddly, too, was that, when people realized I was studying medicine, they began asking me questions about treatment of children. The older women also made comparisons with traditional methods of healing. I got the impression that these sessions were a sort of out-patient clinic, not intensive care units--the problems one took there were not major ones and were those with emotional overtones. Somehow, this ceremony had enabled me to marshal my own resources to face a depression associated with a frightening incident and fatigue; this must be an important role of such sessions.

Several months later, I had the experience of verifying the use of conventional medicine by those who also believed in the apus. I was visiting Cuzco again with my aunt and we stopped by the home of one of the elderly ladies who was at the ceremony. She was not there, but her daughter showed me her little girl who was doubled up with abdominal pain. I looked at the little girl, felt her belly--she had rebound tenderness and guarding--and suggested that she go to a hospital, because I feared appendicitis. The following morning, my aunt informed me that the little girl had been operated for appendicitis that same evening.

APPENDIX 7

CLINICAL ASPECTS OF DIARRHEA

A. Description of major types of diarrhea

This section deals with clinical aspects of infantile diarrhea observed by the investigator during his stay in Lima. It is intended to describe the clinical aspects of diarrhea as seen in underdeveloped nations. Detailed references on individual topics are given for the interested reader. The classification of types of diarrhea is that of Dr. Eduardo Salazar L., head of the HGBCH's rehydration unit.

A. 1

Definition of diarrhea

The term diarrhea is a relative one. Generally, it is defined as abnormally frequent evacuation of watery stools. How frequent is abnormal is of course debatable, as is what consistency of stools should be considered watery--normal ranges are quite broad. For the purposes of this study, diarrhea was taken to be what a mother thought was diarrhea, which usually meant an increase in the frequency and a decrease in the consistency of her baby's stools. The investigator saw several hundred cases of diarrhea during his stay in Peru but on only one occasion did he disagree with a mother's diagnosis that her child had diarrhea.

A. 2

Causes of diarrhea

Diarrhea can be caused by a number of factors. In underdeveloped nations, the principal causes are infections due to poor sanitation, housing, nutrition, and education of the populations at risk. Until the seventies, few micro-organisms could be definitively identified as being etiological agents of infantile diarrhea. In recent years advances in technology have made diagnosis more accurate. Whereas a few years ago identification was limited

to Shigella, Salmonella, parasites and a poorly defined group called enteropathogenic E. coli, the situation today is such that there is reason to believe that from 80 to 90% of cases of diarrhea could have an etiology determined using modern microbiologic and immunologic techniques.

During the author's stay in the CSCG and the HGBCH, the range of diagnostic techniques routinely available for the identification of etiological agents of diarrhea was extremely limited. In the CSCG, the only technique available was microscopic examination of stool samples. In the HGBCH, a more complete stool examination was available (some biochemical determinations could be made in addition to examination for parasites) and culturing for Shigella, Salmonella, and Candida (differentiation between serotypes is unavailable). On the basis of studies being carried out at time of writing, there is reason to believe that recovery of organisms is low. Rotavirus epidemiology is still unknown in Peru; at time of writing, Dr. E. Salazar was doing a comprehensive etiological study. Endoscopy and biopsy are only available in exceptional cases. In addition, one must consider limitations due to hospital infrastructure. For example, stool specimens can only be accepted between 8:00 and 9:00 in the morning--residents have to be at rounds at 8:30. Due to lack of funds, there are many shortages of cotton swabs and sterile containers. Finally, many parents cannot afford the cost of cultures. Thus, there is clear underutilization of resources that are available, which results in a stimulus for handling patients on a purely clinical basis.

A. 3

Acute versus chronic diarrhea

For the purposes of this study, chronic diarrhea is defined as either a single episode lasting more than two weeks or multiple episodes separated by intervals of less than two weeks.

A. 4

Watery diarrhea

This is a self-limited disease of varying severity. Bowel movements are explosive, abdominal cramping is common and may be severe; 5 to 10 watery stools per day for about a week is the norm. Vomiting is almost always present. Stools are usually yellow without mucus or blood. The incubation period is around two days, except in the case of organisms with pre-formed toxins (e.g., Staphylococcus and Clostridium), when the incubation period can be minutes to hours and the effects last only about one day.

This type of diarrhea is secretory; common causative organisms include enterotoxigenic E. coli (ETEC), some strains of Shigella, Vibrio cholerae (not found in Latin America), as well as the two organisms just mentioned. The elucidation of the molecular mechanisms of secretory diarrhea has been a significant advance in medicine. These organisms produce toxins that enhance small bowel fluid secretion by increases in either cAMP or cGMP in epithelial cells. This subject is described by Evans[36].

A. 5

Dysenteriform diarrhea

Dysenteriform diarrhea is characterized by a more variable number of stools (very few up to 20 per day), generally of a smaller volume than in secretory diarrhea. Abdominal cramping is common and may be severe, fever up to 40° C occurs but vomiting is rare. Rectal prolapse occurs in severe cases. The stools are not as watery as with ETEC diarrhea but do contain mucus or pus, and may contain blood; stools may be foul-smelling. Symptoms usually subside spontaneously within 5-10 days. This type of diarrhea is caused by Shigella, enteroinvasive E. coli(EIEC), Campylobacter fetus, Yersinia enterocolitica, and some strains of Salmonella.

The pathogenic mechanisms involve penetration of organisms into the colonic and terminal ileal epithelium. Salmonella reproduce in the interstitium resulting in an inflammatory response. If the response is primarily a PMN response, the infection is localized, whereas if it is predominantly lymphocutic, the infection spreads (lymphocytes ingest but do not kill the bacteria, disseminating them elsewhere). Submucosal microabscesses form, accounting for the bloody stools. Shigella kills epithelial cells that are infected; the cells die producing a micro-ulcer. Lesions generally begin to heal spontaneously within 4-7 days.

The presence of abdominal cramps and blood are important from the point of view of belief systems in Lima; bleeding may be ascribed to the cramps or fever accompanying the illness. These, in turn, may be belived to be due to the diarrhea being permitted to continue (see RESULTS).

Diarrhea caused by Shigella may be associated with convulsions, nuchal rigidity, delirium, coryza, cough, roentgenographically proven pneumonia, and, rarely, arthritis. Shigella hs been cultured outside the gastrointestinal tract very rarely; the etiology of these complications is not defined. Dysenteriform diarrhea is discussed in references 37 and 38.

A. 6

Undifferentiated diarrhea

This type of diarrhea is the most frequent in Peru. Stools are semi-liquid, blood is absent, and mucus is not always present; stools are yellow or green. Fever and vomiting may be present; abdominal cramping is uncommon. Examination for fecal leukocytes is usually negative as are stool cultures for Salmonella and Shigella.

Rotavirus diarrhea probably falls into this group. Rotavirus is probably most frequent in winter, when it may account for up to 80% of cases of diarrhea

in children. Because of the nature of immunity to rotavirus, children around 6 months of age are most affected. Fever is generally present and is moderate; vomiting is almost always present. Stools are semi-liquid. The illness lasts 3-7 days. Rotavirus infection is also frequently accompanied by coughing, rhinorrhea, rhonci, pharyngeal injection, and reddened tympanic membranes--thus, it may account for many cases of so-called "parenteral diarrhea"[39].

Rotavirus diarrhea causes a blockage of glucose stimulated sodium transport; diarrhea appears to occur because epithelial cells fail to differentiate as they migrate to repair regions damaged by virus. Disaccharidase activity is thus variably reduced, resulting in a net increase in fluid losses and a variable decrease in glucose absorption. Significantly, diminished disaccharidase activity may persist for up to 3 weeks. Detailed descriptions of rotavirus diarrhea are found in reference 40.

Other organisms causing this type of diarrhea include Salmonella[38], enteropathogenic E. coli[41,42], some strains of Shigella, and mild strains of ETEC.

A. 7

Diarrhea caused by milk

This type of diarrhea appears when a child is fed milk again after or during an episode of diarrhea. Thus, this type of diarrhea occurs either late in the recovery phase or after an episode of diarrhea. It is due to the anatomic alteration that occurs in the small intestine following its contamination by some pathogens, particularly those which cause damage or destruction of epithelial cells with a reduction of disaccharidase activity.

Stools are usually liquid, yellow, have an acid odor and frequently irritate the perianal region of the child. Blood and mucus are seldom present. Flatulence with marked distention of the abdomen can be present; cramps and colics may occur. Usually, it ceases abruptly when lactose is excluded from the diet (if no other disaccharaidases are affected).

Lactose intolerance following diarrhea can last from one to three weeks. It is not possible to determine when the intestine has recovered its ability to handle lactose without administering lactose (and provoking diarrhea). Although the incidence of this complication is probably quite high, the degree of lactose intolerance is probably not as high as one would think if one were to rely on the lactose tolerance test alone. At the rehydration unit at the HGBCH, an attempt is made to identify children with significant lactose intolerance by means of the Benedict test for reducing substances. Children are given milk (breastmilk is used when it was being employed prior to the episode) as soon as is feasible. 12 or 24 hours later, reducing substances are sought in the stools. If the test is positive, a lactose-free formula (e.g., Isomil) is prescribed if the child was bottle fed. If the child was being breastfed, such changes are not always recommended because of the risk of discontinuation of breastfeeding. Using this system, it has been found that few children who have had an acute episode of diarrhea require a lactose-free diet, even though their glucose curves in the lactose tolerance test might be flat (the test is not performed routinely at the HGBCH). This system has been found to be simple and highly suitable to the situation in Lima.

A. 8

Diarrhea caused by parasites

Entamoeba hystolytica is uncommon in Lima. The situation with

Giardia lamblia, however, is different--a gastroenterologist at the HGBCH told the author: "If Giardia wer luminous, Lima would not need electricity at night." Giardia produces two types of diarrhea: acute and recurrent (chronic). Acute diarrhea is self-limited and is characterized by watery stools without mucus or blood; often, these have an odor of rotten eggs. Flatulence is present, but fever is not. Recurrent (chronic) diarrhea is characterized by successive episodes of diarrhea. Giardia probably invades the mucosa of the proximal bowel or attaches itself to the epithelial surface; the nature of infection depends on the infective dose and on the condition of the host.

In addition to Giardia, Ascaris and Hymenolepis are common in Lima. The author also saw three cases of strongyloidiasis with complete rectal prolapse but these were in children who had been in Peru's jungle. Parasites, even when they do not cause diarrhea, undoubtedly account for a significant number of children with reduced weight and growth in Peru. Detailed descriptions of intestinal and other effects of parasites are given in reference 43.

B. Complications of diarrhea

B. 1

Dehydration

Dehydration is the major complication of infantile diarrhea. Dehydration is in effect an acute form of malnutrition: some writers refer to it as FEM--fluid and electrolyte malnutrition.

Dehydration occurs due to fluid and electrolyte losses in excess of intake. Losses occur primarily in the stool but losses in vomit can be quantitatively significant. Evaporative and insensitive water losses may be higher because of fever and acidotic respiration; urine losses may be significant

due to physiologic immaturity of the infant kidney or renal complications.

Fluid losses are of variable sodium content (generally lower than that of blood), depending on etiologic agent, severity, and age. As a rule, sodium loss tends to increase with age and severity. Intake is important: in Lima, a child is most likely to receive panetela (see also RESULTS) and sodium losses will not be replaced. A recipe for panetela is given below:

> toasted rice
>
> toasted bread (the burnt part is scraped--question 56 refers to this "charcoal"--and used)
>
> cinnamon or anis
>
> toasted avocado seed
>
> a little bit of sugar
>
> a soup is prepared with these ingredients, after which the broth is strained; this is the fluid given to children with diarrhea

It will be noted that panetelas do not have sodium. Orange juice is widely believed to cause diarrhea, as are some kind of bananas ("cold" bananas; there are varieties believed to be "hot" but all bananas lose their "coldness" upon cooking). Strong tea is also prescribed frequently for diarrhea, including for adults.

Magnitude of deficits can be gauged from changes in body weight. Any acute loss of body weight in excess of 1% per day represents loss of body water. Effects such as loss of skin turgor, weak pulses, tachycardia, sunken eyes and fontanel, hoarseness, cold skin, cyanosis, dry mucous membranes, anuria, and uremia are primarily due to water loss. Vomiting, increased depth and rate of breathing, and intracellular potassium loss are primarily due to the acidosis of dehydration. Potassium and sodium loss, in turn, can cause muscle weakness, paralytic ileus, arrhythmias, and CNS changes. Table 1 deals with the diagnosis of the degree of dehydration on a clinical basis, as is done at the HGBCH.

TABLE 1

Clinical Signs of Dehydration

Mild dehydration (up to 5% of body weight)

Thirst
Tachycardia
Dry mucous membranes
Mild loss of skin turgor
Oliguria

Moderate dehydration (6-9%)

Marked dryness of mucous membranes
Tenting of the skin
Tachycardia with weak pulse
Sunken eyes and fontanel
Diminished ocular tone

Severe dehydration (10-12%)

Extreme tenting of the skin
Arterial hypotension
Reduced capillary filling
Pale, gray skin
Marked oliguria with azotemia
Acidotic respiration
Mental confusion, restlessness

Very severe dehydration: circulatory collapse (13-15%)

Coma
Mottled or marble-like skin
Very faint heart sounds
Imperceptible pulse
Gasping respiration

- - - -

This table was provided by Dr. E. Salazar, of the HGBCH's rehydration unit. Unlike some tables published in developed nations, it differentiates between severe degrees of dehydration.

Laboratory values can be helpful in the initial planning of therapy as well as in the determination of the type of dehydration. None is so essential that adequate therapy cannot be initiated without it; lab data are of greater importance in assessing the results of therapy and in guiding subsequent maintenance therapy.

Dehydration may be isonatremic, hyponatremic, or hypernatremic depending on the net result of intake and losses. The clinical presentation of these three types is contrasted in Table 2. Hypernatremic dehydration is rare in Lima.

Shock and acidosis may supervene with severe dehydration or moderate dehydration when another disease is already present. Blood pressure is difficult to determine (the Doppler technique is unavailable in underdeveloped nations). The state of the peripheral circulation can be assessed by the warmth and the color of the skin, and by the cutaneous capillary bed after pressure over the ear lobe, the nail bed, or the dorsum of the hand or foot. However, peripheral circulation can be affected by local factors such as ambient temperature; care must be taken when evaluating these signs. The characteristic signs of metabolic acidosis (e.g., Kussmaul breathing) may be less marked in the presence of severe circulatory insufficiency.

Dehydration in the chronically malnourished child presents additional problems. Protein and vitamin deficiencies make interpretation of signs difficult (e.g., sunken eyes and tenting of the skin). Anemia, hypoproteinemia, and lowered levels of serum electrolytes may be present prior to dehydration and make interpretation of laboratory values difficult. This is also the case with urine osmolality. Hypovolemic dehydration may coexist with edema and with relatively small changes in body fluids. Overhydration during

TABLE 2

Types of Dehydration[52]

	Isonatremic	Hyponatremic	Hypernatremic
Serum [Na^+]	Normal	Decreased	Increased
ECF Volume §	Marked Decrease	Severely Depressed	Decreased
ICF Volume §	Maintained	Increased	Decreased
Skin color*	Gray	Gray	Gray
Skin Temperature	Cold	Cold	Cold or Hot
Skin Turgor+	Poor	Very Poor	Fair
Feel of Skin	Dry	Clammy	Thickened, Doughy
Mucous Membranes	Dry	Slightly Moist	Parched‡
Eyeball	Sunken and Soft	Sunken and Soft	Sunken
Fontanel	Sunken	Sunken	Sunken
Psyche	Lethargic	Coma	Hyperirritable
Pulse*	Rapid	Rapid	Moderately Rapid
Blood Pressure*	Low	Very Low	Moderately Low

* Signs of shock rather than of dehydration itself

\+ Reflects magnitude of loss from ECF

‡ Tongue often has shriveled appearance due to loss of cellular fluid

§ ECF-extracellular fluid

§ ICF-intracellular fluid

management may occur.

Most mothers seen by the investigator did not know how to distinguish the physical signs of dehydration (e.g., see RESULTS). Mothers who did know such signs knew, in approximate order of frequency, how to recognize:

dry mucous membranes
sunken eyes
tenting of the skin
sunken fontanel
lack of tears

B. 2

Malnutrition

Malnutrition following diarrhea is a major complication. It must be stressed that many children with diarrhea already have malnutrition--subsequent episodes worsen their already compromised state. There are several reasons for malnutrition following diarrhea, and synergistic relationships occur. Important ones are as follows.

1. Imposed fasting. This reflects the arbitrary character of many adults' actions toward children. Many parents will stop feeding a child with diarrhea (see Section B. 6,below); the number that do so is probably higher than one would infer from simply asking parents. The same is true of breastfeeding. One of the most common questions asked the author was whether mothers should give their children milk of any kind. Considerable time was spent by the author and many of the staff he saw explaining the need to continue with lactation. Many doctors still insist on fasting a child when and after diarrhea is present. Many mothers do not simply interrupt breastfeeding but discontinue it altogether.

2. Anorexia. Many diseases affecting the GI tract may cause anorexia, leading to inadequate food intake even in the presence of adequate food supplies. Anorexia is also a complication of malnutrition and may simply be the result of fasting.

3. Inadequate feeding. Even without overt fasting, caloric and protein intake may be inadequate. This is because a child with diarrhea must cope with the stress of an infection. Children receiving antibiotics have increased caloric requirements. In underdeveloped nations, a child hospitalized for diarrhea is more likely to be receiving antibiotics--prescribed or non-prescribed.

4. Real protein and calorie loss. This may occur via stools, vomiting, and a catabolic state. Many intestinal infections damage the intestinal epithelium, resulting in a diminished ability to absorb nutrients, even when intake is adequate. Many children hospitalized with diarrhea also have renal problems which result in losses via the urine.

5. Use of laxatives and enemas. Use of these is still common in populations at risk. They are often given for fever, or constipation; they may trigger an episode of diarrhea. This is due to the widespread belief that intestines get "dirty" and have to be cleaned (see RESULTS).

For this study, malnutrition was based on weight according to the criteria used at the HGBCH. These criteria are based on the work of Ramos Galvan[26,27] since no studies of age versus weight and length are available for Peruvian children. Viteri[44] discusses the interaction between diarrhea and malnutrition in greater detail.

B. 3

Associated infections

Infections other than the one causing diarrhea are a problem in children hospitalized for diarrhea; such children are at higher risk for other infections and these infections are often worse than in non-diarrheic children. Significant infections observed by the author in this context include:

1. Lobar pneumonias (often secondary to measles)
2. Skin infections
3. Meningitis
4. Encephalitis
5. Urinary tract infections

Sepsis in diarrheic children is controversial. Many such children appear to have sepsis on clinical grounds. Administration of antibiotics is a matter of debate, particularly in the face of inadequate culture facilities. In those children who develop sepsis after or during a diarrheal episode, it is not known whether the GI tract is a significant source of infection. Given the economic situation of most families with children at

risk, the question of unnecessary antibiotic therapy is of more than academic interest.

B. 4

Malabsorption

Malabsorption is also common in acute diarrhea and can be the step that makes the transition to chronic diarrhea and malnutrition. The best known of the forms of malabsorption is lactose malabsorption. Glucose malabsorption of varying severity can also occur. Lipid malabsorption usually manifests itself during an episode of acute diarrhea as an increased excretion of fatty acids. This may be due either to defects in degradation of fats or else in their absorption (the latter seems more likely). Malabsorption, of course, represents a considerable loss of calories.

The most likely mechanism for malbsorption is contamination of the duodenum and upper jejunum by coliform and anaerobic bacteria and Candida. These organisms cause deconjugation of bile salts, reducing micelle formation in the small intestine, effectively reducing fat absorption. Deconjugated bile salts also, by some mechanism, block the absorption of glucose in the small intestine; additionally they cause damage in the lower ileum, resulting in reduced absorption of substances such as vitamin B_{12}. Moreover, deconjugated bile salts are lost (they are not reabsorbed by the enterophepatic circulation) and this results in a net decrease in the pool of available bile salts, further reducing fat absorption[45-47].

Fortunately, protein degradation and absorption is usually spared by diarrhea.

Several cases of children with more or less total malbsorption were seen by the author during his stay in Lima. As a rule, such children die, because total parenteral nutrition solutions are extremely expensive by

Peruvian standards and the risks of infection when they are used is very high.

B. 5

Secondary (nosocomial) infection

Nosocomial infection is a serious problem in Peru. The primary cause is lack of operating funds for hospitals, resulting in reduced maintenance. The investigator frequently witnessed staff advising mothers with sick children to take their chances at home: given the risk of nosocomial infection (higher for malnourished children) admission was a calculated risk for borderline cases. This problem is so serious that Caretas, probably the most influential news magazine in Peru, devoted several pages to it, in an article, "Health in Bankruptcy" in October 1979[48]:

> In the third floor of wing 1, in a dark corridor, Dr. Gamaniel Guevara made a confession to us: "In this hospital--he said--the intrahospital infection situation is extremely severe. Because it is one thing to have an epidemic of Salmonella and another, a very different one, to have a situation where Salmonella are endemic.

The quote refers to Lima's major pediatric hospital, the Hospital del Niño; the HGBCH is similar, and there have been epidemics of Klebsiella, as well as frequent infections with Pseudomonas and Staphylococcus.

Specific source of such infections are the following:

1. Contaminated food in the hospital.
2. Infections of intravenous therapy sites; lack of funds results in practices such as re-use of butterfly needles and venous catheters used in cutdowns.
3. Cross-infections due to lack of isolation facilities.
4. Superinfections due to inadequate use of antibiotics, either before or after admission (facilities for identification and determination of antibiotic sensitivity of micro-organisms are severely limited).

B. 6

Child neglect

This aspect of diarrhea has not received serious study. Since facilities are invariably inadequate, it is not practical to have children be with their parents while they are hospitalized, and the child's contact with his mother is sharply reduced. When one considers the tremendous economic difficulties experienced by families in Latin America, it is not surprising that an episode of disease requiring hospitalization sometimes results in a family abandoning a child. Each year, approximately 6 children are abandoned by their parents after being hospitalized in the HGBCH.

In informal conversations outside the hospital setting, the investigator learned that child neglect following a serious illness is a common problem in Peru. Even when a child is not abandoned, parental and family behavior after the illness may change and be harmful to the child; this seems to be the case with some burn patients, for example, and the phenomenon has been described in mothers whose children were hospitalized in neonatal intensive care units in the United States and Great Britain[16b]. Peru's adoption laws are inadequate to cope with the magnitude of the problem of child neglect and abandonment.

C. Management of Diarrhea at the HGBCH

C. 1

Management of diarrhea outside the HGBCH

The conventional or "orthodox" management of infantile diarrhea usually employed in Peru includes:

1. Hospitalization, usually for periods averaging 5 days
2. Fasting the child for at least 24 hours
3. Gradual and cautious intravenous rehydration with solutions not exceeding 50mM of sodium
4. Parenteral antibiotics

5. Oral antidiarrheics
6. Slow and cautious use of oral fluids, usually 48 to 72 hours after admission; even more restricted use of solid foods
7. Lactose-free diets, often with active discouragement of breastfeeding
8. 3-5 days of IV therapy

Management of diarrhea at the HGBCH is more aggressive due to a desire to reduce the length of stay in the hospital and to encourage the return to normal feeding as soon as possible so that breastfeeding is not discontinued.

C. 2

Oral rehydration solution

The World Health Organization advocates systematic use of oral rehydration in underdeveloped nations[49]. The solution recommended is the following, henceforth referred to as ORS (oral rehydration solution):

Water	1 liter		
NaCl	3.5g	Na^+	90 mM
KCl	1.5g	K^+	20 mM
$NaHCO_3$	2.5g	Cl^-	80 mM
Glucose	20.0g	HCO_3^-	30 mM
		Glucose	111 mM

This solution has been controversial due to its sodium content[50]. A greater problem is its unavailability in Peru, where packets of the solution (to make one liter) are not commercially available. Those distributed by UNICEF are in extremely short supply--at the HGBCH such packets are available for use only in the rehydration unit itself; out-patients are treated with sugar water or soft drinks (see section D). ORS is used for rehydration of mildly dehydrated children (those admitted temporarily for observation).

The scheme for oral rehydration at the HGBCH is shown below (Fig. 1) and details of its administration are given in Table 3 (which is used in conjunction with Table 1, Clinical Signs of Dehydration).

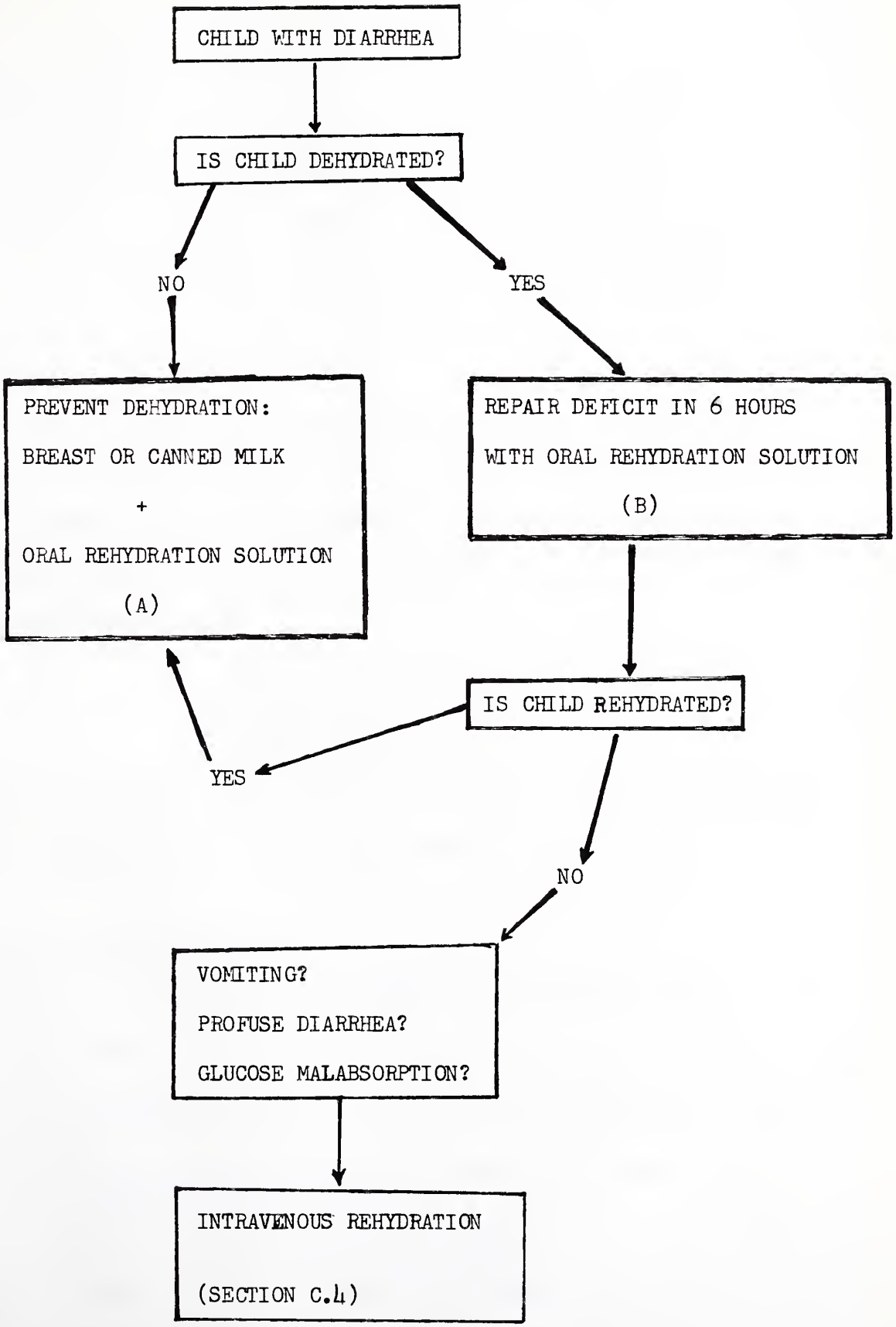

CHILD WITH DIARRHEA
IS CHILD DEHYDRATED?
NO
YES
PREVENT DEHYDRATION:
BREAST OR CANNED MILK
+
ORAL REHYDRATION SOLUTION
(A)
REPAIR DEFICIT IN 6 HOURS
WITH ORAL REHYDRATION SOLUTION
(B)
IS CHILD REHYDRATED?
YES
NO
VOMITING?
PROFUSE DIARRHEA?
GLUCOSE MALABSORPTION?
INTRAVENOUS REHYDRATION
(SECTION C.4)

FIG. 1

Vomiting has not been a serious obstacle in oral rehydration at the HGBCH, where experience shows that vomiting is related to the degree of dehydration--as hydration improves, the number of patients that vomit decreases, as does the volume per vomiting incident. The staff is more persistent in its efforts to get a child to drink. Should the degree of dehydration warrant it, of course, the staff does not try for six hours in the presence of severe vomiting.

Mothers whose children are sent home are instructed to prevent dehydration using the scheme given in Table 3. Since ORS packets are unavailable (pre-mixed solutions are inadequate; Lytren, for example, has an excessive glucose content), the mother is advised to prepare the following home lectrolyte solution daily:

1 liter boiled water
8 teaspoons sugar
1 teaspoon table salt

This measure is not optimal but is the most feasible under the circumstances. The home electrolyte solution does not have potassium.

C. 3

Protocol for intravenous rehydration

IV rehydration is indicated at the HGBCH in the following cases:

a. Shock

b. Patients with paralytic ileus and intestinal sequestration of fluid

c. Patients with diarrhea, dehydration, and a significant extraintestinal infection

d. Failure of oral rehydration attempts

Solutions employed are given in Table 4 and their use is outlined in Figure 2 and Table 5.

TABLE 3

Clinical use of WHO ORS at the HGBCH

1. Maintenance (prevention of dehydration, "A" on flow chart)

   Initiate after 6 hours of initiating deficit therapy or else as soon as child arrives home.

   Breastmilk or whole milk (diluted to 50%) or free water

   100-120 ml/kg/day

   plus

ORS	60 ml (up to six months of age)	
	90 ml (6 months-1 year)	after each bowel movement
	120 ml (1 year & up)	

2. Deficit therapy in 6 hours ("B" on flow chart)

   Mild dehydration (up to 5%)

   10-15 ml/kg/hr X 6 hr

   Moderate dehydration (5-9%)

   20-30 ml/kg/hr X 6 hr

   Severe dehydration (10-12%)

   40 ml/kg/hr intravenous (isotonic or half-isotonic saline) X 1-2 hr

   followed by

   20-30 ml/kg/hr X 4-5 hr orally

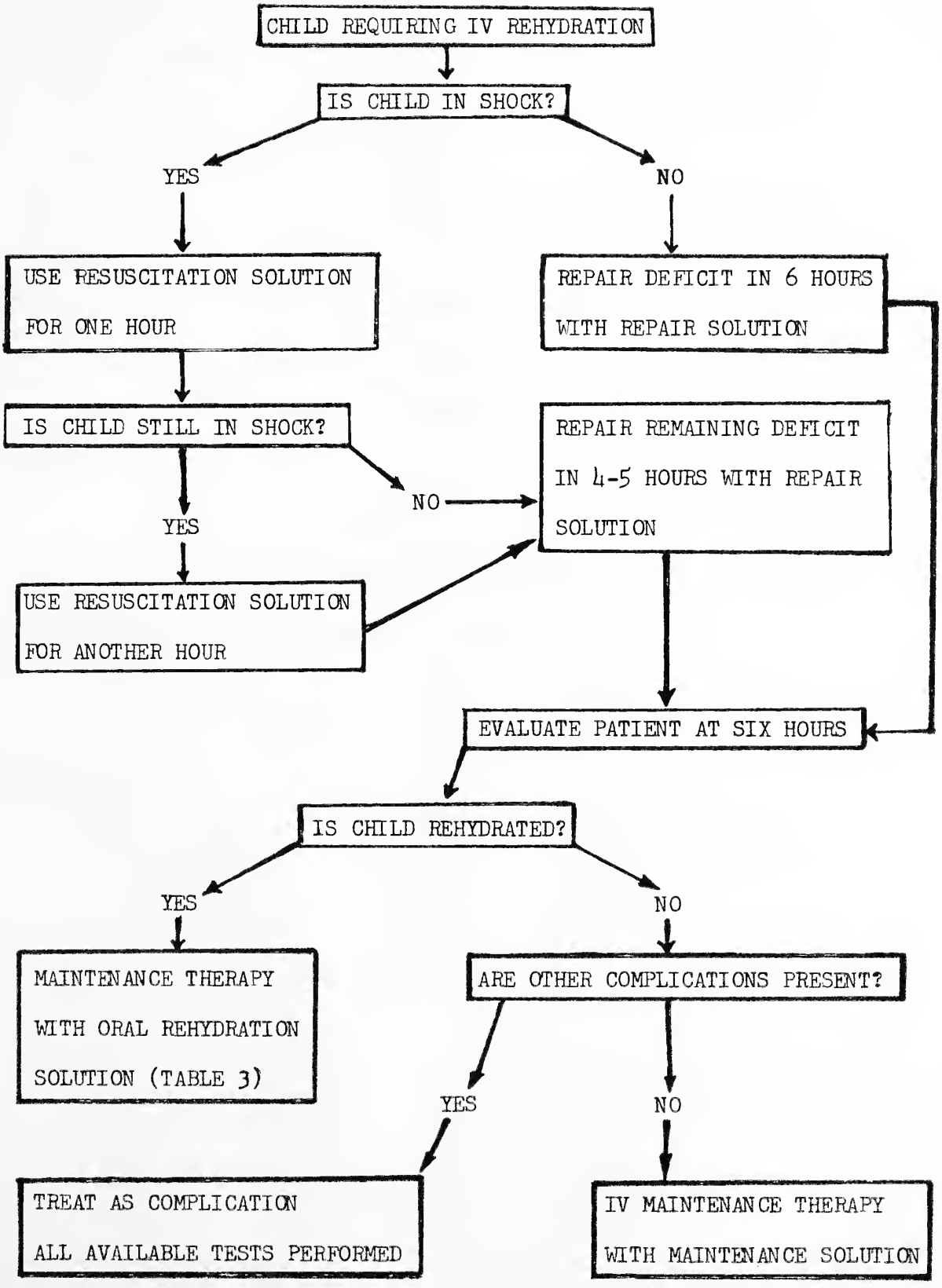

CHILD REQUIRING IV REHYDRATION
IS CHILD IN SHOCK?
YES
NO
USE RESUSCITATION SOLUTION FOR ONE HOUR
REPAIR DEFICIT IN 6 HOURS WITH REPAIR SOLUTION
IS CHILD STILL IN SHOCK?
NO
YES
REPAIR REMAINING DEFICIT IN 4-5 HOURS WITH REPAIR SOLUTION
USE RESUSCITATION SOLUTION FOR ANOTHER HOUR
EVALUATE PATIENT AT SIX HOURS
IS CHILD REHYDRATED?
YES
NO
MAINTENANCE THERAPY WITH ORAL REHYDRATION SOLUTION (TABLE 3)
ARE OTHER COMPLICATIONS PRESENT?
YES
NO
TREAT AS COMPLICATION ALL AVAILABLE TESTS PERFORMED
IV MAINTENANCE THERAPY WITH MAINTENANCE SOLUTION

FIG. 2

Evaluation after 6 hours of therapy is based on changes in weight, clinical status, and urine density. If a patient has an appropriate improvement in weight, clinical status, and if the urine has a specific gravity less than 1.012, the patient is considered rehydrated.

After six hours of therapy, patients who in addition to being dehydrated show other significant signs (e.g., anuria, convulsions, etc.) are treated as a group apart (complications). These patients have all available lab tests performed, including blood cultures and lumbar punctures if felt necessary. The incidence of hypernatrenic dehydration is extremely low in Lima.

TABLE 4

HGBCH IV REHYDRATION SOLUTIONS

Resuscitation Solution (prepared in one syringe)

17 cc water	Na^+	150 mM
3 cc 8.4% $NaHCO_3$	HCO_3^-	150 mM

Repair Solution

1000 cc 5% dextrose	Na^+	75 mM
25 cc 11.7% NaCl	Cl^-	50 mM
25 cc 8.4% $NaHCO_3$	HCO_3^-	25 mM
	glucose	278 mM

KCl is added (post-micturition) for a final concentration of 20-40 mM

Maiantenance Solution

1000 cc 5% dextrose	Na^+	50 mM
25 cc 11.7% NaCl	K^+	20 mM
10 cc 14.9% KCl	HCO_3^-	70 mM
	glucose	278 mM

TABLE 5

USE OF IV REHYDRATION SOLUTIONS AT THE HGBCH

1. Patient arrives in shock and metabolic acidosis (10% wt. loss and up)
   Bolus of Resuscitation Solution given ("1 syringe per kilo")

   20 ml/kg given in 30-60 min

   If patient is still in shock, 20 ml/kg is given for a second hour.
   Remaining deficit is then repaired using Repair Solution

   20-30 cc/kg/hr X 4-5 hr

2. Moderately dehydrated patients (5-9%)

   15-20 cc/kg/hr X 6 hr (Repair Solution)

3. Mildly dehydrated patients (up to 5%)

   10-15 cc/kg/hr X 6 hr (Repair Solution)

   IV maintenance therapy

   120-150 cc/kg/d (Maintenance solution--100 cc maintenance + 50 cc probably losses)

Intravenous therapy is not as effective in settings such as the HGBCH as it can be in developed nations. Control of flow rates is often inadequate due to faulty tubing; pumps are not available. The level of education of those who are in direct contact with the patient and the intravenous solutions--nurses and nurse's aides--is generally lower and limits the complexity of treatment plans. The limitations imposed by the lack of equipment and of trained personnel and the high incidence of nosocomial infection which has been previously described make oral rehydration much more attractive in underdeveloped nations. It is much simpler and does not require highly trained personnel.

There is a need for protocols such as the ones employed at the HGBCH, however. Such schemes must be as simple as possible since the personnel employing them will probably lack the sophistication required for complex fluid manipulations; the design of such schemes must not presuppose the availability of physicians. Pre-mixed intravenous solutions for various degrees and types of dehydration are also needed.

It is important to keep the above factors in mind when one considers that oral rehydration is used in circumstance where intervenous rehydration would be employed in the United States.

C. 4

Antibiotic therapy of diarrhea at the HGBCH

Antidiarrheic medications and neomycin are never employed at the rehydration unit.

Antibiotics are only given for severe shigellosis and non-typhoidal salmonellosis with bacteremia. Patients with severe dysenteriform diarrhea are assumed to have Shigella (stool cultures are done if possible). Trimethoprim-sulfamethoxazole is used in standard doses.

Patients with watery or undifferentiated diarrhea without fecal leukocytes do not have stool cultures taken and do not receive antibiotics. If fecal leukocytes are present, stool cultures are taken; antibiotics are given if high fever or severe diarrhea are present. If stool cultures are positive for Salmonella, antibiotics are suspended unless bacteremia is present.

Antibiotic therapy is handled differently in children with severe malnutrition. Such children are at an increased risk of sepsis. All such children are cultured (blood, stool, and urine), have a complete blood count performed, and are checked for fecal leukocytes. Sepsis is assumed if rehydration does not bring clinical improvement.

Although a number of laboratory tests are available at the HGBCH, it must be stressed that they are not used as often as they would be in a U.S. hospital. Underutilization is due mainly to cost, although inconveniences due to hospital infrastructure also play a role. Most families of patients in the rehydration unit could not afford, say, a daily set of electrolytes or a daily BUN. Monitoring of therapy is done by monitoring clinical signs.

The author was impressed by the ability of the staff to manage patients under such circumstances--an occasional laboratory value was received as a welcome addition to therapeutic monitoring of clinical signs. Mortality is high at the unit but it is most often due to the child's being severely malnourished and in shock on arrival, or else due to previous or hospital acquired sepsis, over which the staff have little control.

D. Management of Diarrhea at the Centro de Salud Canto Grande

Management of diarrhea at the CSCG reflects the lack of facilities such as running water. The emergency room at the CSCG is also used as a treatment room. Available resources are limited to the following:

a. Application of some injectable drugs (anticonvulsants, antipyretics, and antibiotics); needles are re-used after sterilization.

b. Minor surgery: wounds requiring only sitching, debridement of abscesses, etc.

c. Treatment for 1st and 2nd degree burns where no other body systems are compromised.

d. Occasional administration of IV fluids for brief periods in adults (the center is not really equipped to handle cases of shock); since the center closes at 6:00 P.M., it is not feasible to give IV fluids to children.

Given these limitations, treatment of severely dehydrated children (8% and up, or less if other complications are present) is limited to the following:

a. Injection of an anti-pyretic if body temperature is dangerously elevated.

b. Filling out of a transfer form so the child will be rapidly received at the HGBCH--this may seem trivial to point out but, with Peru's infrastructure, is an important step.

c. Instruction of the mother as to the urgency of her reaching the HGBCH.

Since it can take up to two hours to reach the HGBCH from the CSCG, mothers are hurried out of the center if their children are severely dehydrated.

Treatment of children with dehydration ranging from 5-7% is as follows. After the physical exam, the mother is asked to buy a bottle of Coca Cola and a small amount of sugar is added or the bottle is gently shaken (to eliminate CO_2). The mother is asked to hold her baby while she sits at the waiting room, near the doctors who can keep watch. Coca Cola is given to the baby at intervals of ten minutes or so to see if he will drink it or vomit*. If the baby is thirsty and drinks profusely, the mother is instructed to rehydrate her child at home. Since commercial rehydration solutions are unavailable (and most mothers could not afford them in any case) a home electrolyte solution is prescribed; these are variants of the recipe given in section B. 1 and variations include such things as adding quinces or boiled avocado seed, depending on the person who is prescribing.

If vomiting is present, management is difficult. If the child's dehydration is on the low side (5%), the mother is usually sent home, with instructions to persist with slow feeding (so as not to induce vomiting) of the home electrolyte solution. If the baby's dehydration

* It is important to stress that only Coca Cola is used for this--no other soft drink is so prescribed. Moreover, the other mothers who are waiting see the entire process, which undoubtedly has an effect on beliefs. Of the mothers who said they would give soft drinks to a child with diarrhea (see Results), virtually all stated that Coca Cola was the soft drink they would give. The author asked around as to the origin of the practice; the only thing turned up was that at one point someone had written that Coca Cola had a high potassium content--however, Coca Cola has a potassium content of 0.1 mM, according to a standard pediatric textbook[52].

is closer to 8% or if vomiting is severe, the mother will be instructed to take her child to the HGBCH. Some staff members will presecribe antihistamines and send the mother home with instructions on oral rehydration. This is a matter of debate.

Some staff members also prescribe anti-diarrheic agents that contain, singly or in combination:

atropine or derivatives
compounds such as Lomotil
kaolin
neomycin
chloramphenicol
tetracycline

This is a matter of some controversy. Some staff members, citing recent works[51], refuse to prescribe them. Others**, however, are not aware that such agents are no longer indicated, while some members of the staff prescribe them anyway, on the grounds that patients want a prescription and not giving them one will lead to distrust and seeing another doctor in any case***.

** This was also true of staff members with whom the author spoke elsewhere in Peru. It must be remembered that personnel associated with the HGBCH are more up to date regarding medical literature.

*** This is not a totally unjustified position in the opinion of the author. A few mothers told the author outright that they felt they could not trust him because no prescription (other than, say, a home electrolyte solution) was given.

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