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**PRIMARY HEALTH CARE PLANNING:
HEALTH STATUS, HEALTH SERVICES UTILIZATION
AND COMMUNITY FINANCING,
San Julian, Mineros and Santa Cruz, Bolivia**

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1. INTRODUCTION

The present report has been developed from information gathered by several institutions which have supported efforts to develop privately financed primary health care services in the Department of Santa Cruz, Bolivia. The Bolivian Mission of the U.S. Agency for International Development conducted an initial feasibility study for the project in the early 1980s (1). In 1984, the Primary Health Care Operations Research Agency (PRICOR) funded the Fundacion Integral de Desarrollo (FIDES) of Santa Cruz to design service packages and test financing mechanisms. FIDES initiated this effort by conducting a household survey of three different populations in the Department of Santa Cruz: peri-urban neighborhoods in the Departmental capital, Santa Cruz; the town of Mineros and its rural dependencies; and the remote rural colonization zone of San Julian. Because of time and financial constraints, FIDES was unable to analyze the data or develop and test financial models for PHC packages.

Using the household survey data and other data collected by FIDES, the goals of this study are: 1) to describe recent health related events including morbidity, mortality, hospitalizations and pregnancies; 2) to develop a model which can be used to predict levels of health services utilization in the three different areas; 3) to describe the existing institutional infrastructure which could be incorporated into community-based primary health care (PHC) service delivery; and 4) to examine the applicability of different PHC financing mechanisms for the Santa Cruz area.

During the preliminary stages of this project, the Agency for International Development had identified three regional cooperatives to jointly administer the project. Based on the belief that the new PHC services would be administered and financed through these cooperatives, FIDES/PRICOR designed the field study, including the survey instrument and the sampling frames, around the idea of cooperative based PHC for low income households. In one of the three areas, this focus seriously compromised the overall representativeness of the sample which may have implications for the conclusions. (see Part III for a description of the sampling schemes).

For several reasons beyond the scope of this report, the PHC services will not be administered through the original three cooperatives. Data presented here, however, are still appropriate for any entity concerned with serious health planning in the Santa Cruz region and should be so considered.

II. THE THREE POTENTIAL SERVICE AREAS.

II.1 SAN JULIAN (2).

The name "San Julian" refers to a colonization zone located approximately 180 kilometers northeast of Santa Cruz between the Grand River to the southeast and the San Julian River to the northeast. Virtually all of the residents in the zone are first generation migrants from Bolivia's Andean highlands who are participating in a government sponsored colonization program. The area has been settled in stages from the late 1960s through the present. The major concentration of resettlement services was offered in the late 1970s and early 1980s, coinciding with the largest waves of migrants.

There is one main access road to the area from Santa Cruz, the Departmental capital. It is unpaved and in very poor condition. No public transportation operates along the road and travel time to Santa Cruz varies. The colonists wait for rides on the back of passing trucks, completing the trip in stages. During the dry season, when traffic along the road is fairly heavy, this process takes between 8 and 15 hours. During the rainy seasons, when fewer trucks pass, colonists often wait several days before getting a ride.

A second unpaved road (the brecha) cuts through the center of the colonization site, a long narrow opening into the tropical forests approximately 60 kilometers long. Fifty-five planned communities, located 5 kilometers apart, span the length of the brecha. Ideally, each of the communities contains 40 pie-shaped plots, of 50 hectares a piece. One family is settled

on each plot, and is responsible for clearing and cultivating the land and for constructing his own home. All of the main houses are concentrated in the center of the community, called a nucleo, where other community services such as the school, plaza, and church are to be built by the community members.

Both government and international organizations have played an important role in the 15 year history of the colonization zone. Among the most important services provided have been those aimed at building economic infrastructure. For example, public and private sector cooperation has led to the establishment of NADEPAS (nucleos asociados para la produccion agricola), or associations of nine neighboring nucleos to promote agricultural production. Rice production is the main source of income for most of the residents in the zone, and the NADEPA system offers a potentially beneficial economic support system to the colonists. A second major development has been the growth of a multipurpose cooperative. The cooperative has constructed a rice mill which is available to both members and nonmembers of the cooperative, with graduated fees depending on membership status.

II.2 MINEROS.

In sharp contrast to the planned communities in San Julian, the area of Mineros is a spontaneous colonization zone. The settlement pattern in the area has been called "piano-style" because migrants settle along roads. Communities develop as the number of households along a short stretch increases. As the

area opened up for settlement, many rural families took advantage of the available land to gain a second or third farm. Several urban-based families (from the town of Mineros) developed small farms in the outlying areas, but remained as permanent residents in Mineros. Thus, the area contains a very diverse population.

While in San Julian virtually all residents own and farm their own land, the agricultural and occupational panorama in the Mineros region is diverse. Rice cultivation is the main source of income for the rural poor while sugar cane production feeds a growing rural elite. The cane farms also employ large numbers of landless and/or seasonal laborers. A variety of service occupations are found in both the town and country. In the town one also finds professional occupations and a very small urban elite.

Overall, the infrastructure throughout the Mineros zone is better than in San Julian, although the more distant communities are frequently accessible only by dirt roads. Some public transportation operates between Mineros and the nearby rural towns. Flooding impedes good maintenance of the roads and completely isolates outlying communities for weeks at a time during the rainy season.

II.3. SANTA CRUZ.

The target population within Santa Cruz includes the poor and lower middle class people living outside of the center of the city. As in the rural areas, internal migration is largely

responsible for the rapid growth of the city within the past twenty years. Most of the migrants have come from rural communities within the Departments of Santa Cruz, Potosi and Chuquisaca. With respect to residence patterns, these people are grouped into loosely structured neighborhoods having a varying sense of community. Some urban neighborhoods have active grass roots political and religious organizations which devote time and resources to developing local infrastructure. Other neighborhoods are communities only by virtue of shared residence.

There is considerable variation between neighborhoods with respect to infrastructure. Generally, as one moves out from the center of town the availability of public services (schools, lights, sewerage, potable water) decreases. The poorest neighborhoods tend to be found on the outskirts of town. Serious flooding of the Pirai River in the spring of 1984 caused major population dislocation in poor, peripheral areas. Residents were forced to resettle, increasing the size of the migrant population in need of housing and other assistance. Thus, several of Santa Cruz's urban areas may be designated as "emergency" barrios because they lack most basic services and infrastructure. However, the city as a whole offers far more health and related social services than are found in either of the two rural areas.

III.THE HOUSEHOLD SURVEY

Due to varied conditions in the three sample areas, a different sampling strategy was developed for each as described below:

III.1 SAN JULIAN.

The sampling frame for San Julian was the simplest of the three zones because of the homogeneous nature of local residence patterns. The San Julian colonization zone contains 63 communities. Fifty five are evenly distributed along the brecha, and eight additional communities lie along the main road (see map, Appendix A). The layout of these communities varies little. Each has 40 pie-shaped plots, with one household per plot. The houses are centrally located in the center of each community. In only a few cases, when the land was unfit or unavailable for settlement did communities deviate from this pattern.

At the time of the survey, FIDES and the local cooperative estimated that San Julian had 2,031 households in the 63 communities. Based on cooperative records, approximately 52.5% of these households contained at least one cooperative member (see Table One, p. 13). The distribution of members throughout the zone was fairly even, with only 8 of the communities lacking any members at all. These 8 villages were dropped from the survey, and of the remaining 55 villages, half (28) were randomly selected. Briefly, the sampling frame is described below:

1. Households with permanent residents were located on

community maps for potential inclusion in the sample. Permanent residence was defined as at least 6 months full time occupancy of the house.

2. In each community, 25% of the permanent households were randomly selected for the survey.
3. An additional 5 - 10 households were randomly selected as potential replacements. A replacement household was interviewed when 1) an interviewee had been mistakenly identified as a permanent resident or 2) the survey team found no one at home after three visits. Refusal cases were not replaced.

In total, 267 interviews were completed.

III.2 MINEROS.

The area of Mineros is comprised of the town of Mineros and 49 small rural communities (see map, Appendix A). Members of the targeted local cooperative lived in only 13 of the 50 communities (24.0%) (see Table Two, p. 14). Sampling of the 12 rural communities followed the same general procedure as in San Julian except 40% of the households in each community were randomly sampled. In total, 300 interviews were conducted.

The survey team's field reports on the rural areas indicated several unanticipated problems with the sampling scheme. First, in about half of the communities, most of the residents were not permanent. Second, several lots in the same communities were owned by the same person/family. And, third, the team estimated that in approximately 30% of the cases, the entire household

resided in the community only during the harvest and lived elsewhere during the rest of the year. In developing the list of permanent residents for possible inclusion in the sample, temporary residents were excluded and owners of multiple lots were included only once.

Sampling in the town of Mineros followed a different set of procedures, largely because of the size and distribution of the population and the high concentration of cooperative members. It was anticipated that the town had 1225 households, more than 10 times the number of households as the two largest rural towns surveyed.

Seven administrative districts form the town of Mineros. Census information from the local hospital provided a list of all households. FIDES/PRICOR financial constraints led to the decision to interview 14.3% of the households in each urban zone to produce a total of 178 interviews. After omitting refusals, 170 (36.1%) of the interviews were done in the town and 300 (63.9%) in the eleven rural communities.

III.3 SANTA CRUZ.

The City of Santa Cruz contains several hundred administrative entities, known as unidades vecinales, or neighborhoods (see map, Appendix A). The sampling procedure for peri-urban Santa Cruz was considerably more complicated than for the other two areas. First, FIDES/ PRICOR and the local cooperative selected by AID decided to ignore cooperative membership in designing the sampling frame. Second, like most urban areas,

financial and logistic constraints made it necessary to select a subset of neighborhoods from the total, rather than do a total random sample. A two-stage stratified random sample was chosen as the optimal design for Santa Cruz. Development of the design was based on the following considerations:

1. The upper limit of 550 interviews had been established by financial constraints.
2. Santa Cruz is comprised of five concentric rings which divide the city into discrete geographic areas. At the time of the survey, key informants verified that the target population, the lower and middle classes, lived primarily beyond the third ring. Thus, the neighborhoods for the survey were selected from those beyond the third ring.
3. A windshield survey of each neighborhood beyond the third ring permitted the classification of each as emergency (very poor, newly settled), popular (lower class), mixed (transition from popular to middle class), and middle class. All affluent neighborhoods beyond the third ring were eliminated from the study. Table One summarizes the results of the windshield survey from the ten neighborhoods selected for the sample.
4. Beyond the third ring, it was found that 10% of the neighborhoods could be classified as emergency, 40% as popular, 30% as mixed, and 20% as middle class. In order to enhance the overall representativeness of the

sample, an attempt was made to select neighborhoods based on the true distribution of neighborhood types in the city. The final sample contained the following distribution: one emergency/popular; four popular; three popular/middle class; and two middle class. In summary, although the sample reflects fairly well the distribution of neighborhood types, it does not focus on the lowest income groups which may be those most in need of primary health care services. In fact, no exclusively emergency class neighborhoods were studied.

5. After verifying all of the blocks and households within each neighborhood, a two-stage random sample was drawn. By taking 25% of 40% of the blocks within each neighborhood, a total sample size of 576 households, 10.4% of the total estimated population in the ten neighborhoods, was identified.
6. Replacements were included in the sample if the household was found uninhabited or if it was unoccupied during three consecutive visits.

Tables One, Two, Three and Four summarize the sampling information described above. The refusal rate in each area was low. In San Julian only 0.7% of the desired number of interviews were not obtained. In the rural areas of Mineros, only 0.33% refused while in the town 3.9% refused. The overall refusal rate for the entire Mineros area was 1.7%. The refusal rate in the city of Santa Cruz was 3.5%.

In summary, the four sampling schemes emerged from the

original project goal of developing health services for cooperative members and their neighbors, the wishes of the leadership of the three cooperatives, and the financial resources available. The samples in San Julian and urban Mineros are population based and generalizations from the data could be applied without hesitation to the total population. The communities or neighborhoods were randomly selected in both cases. The sampling schemes in rural Mineros and Santa Cruz were not population based. The twelve rural communities selected in Mineros were not randomly selected, but were chosen because of the presence of cooperative members. In Santa Cruz, the ten neighborhoods sampled were not randomly selected from the city, and in fact, the lowest socio-economic stratum was not interviewed.

TABLE ONE

Breakdown of Household Interviews
By Community, San Julian

Community	Anticipated # Households	# Households Encountered	Required # Households (25%)	# Interviews Completed			
				Total	Regular	Replacement	Refusals
Nucleo 1	40	40	10	11	8	3	0
Nucleo 2	40	40	10	10	9	1	0
Nucleo 3	72	72	18	19	13	6	0
Nucleo 7	40	40	10	10	7	3	0
Nucleo 8	40	40	10	10	8	2	0
Nucleo 9	40	38	10	10	10	0	0
Nucleo 10	40	33	8	9	6	3	0
Nucleo 11	40	40	10	11	8	2	1
Nucleo 12	31	31	8	8	7	1	0
Nucleo 13	40	28	7	7	7	0	0
Nucleo 16	40	40	10	10	6	4	0
Nucleo 64	40	40	10	10	9	1	0
Nucleo 19	40	33	8	8	7	1	0
Nucleo 20	40	40	10	10	7	3	0
Nucleo 21	40	40	10	10	8	2	0
Nucleo 24	40	34	9	10	4	6	0
Nucleo 25	12	40	10	10	9	1	0
Potrerito	10	14	4	4	4	0	0
Nucleo 29	40	40	10	10	7	3	0
Nucleo 32	40	40	10	10	9	1	0
Nucleo 33	40	40	10	10	9	1	0
Nucleo 34	40	21	5	7	4	3	0
Nucleo 38	38	38	10	10	8	2	0
Nucleo 40	17	20	5	5	5	0	0
Nucleo 44	40	40	10	11	5	5	1
Nucleo 45	37	35	9	9	9	0	0
Nucleo 48	40	38	10	10	9	1	0
Nucleo 50	40	40	10	10	10	0	0
TOTAL	1,057	1,035	261	269 (a)	212	55	2 (b)

(a) Percentage of households interviewed = $269/1,035 \times 100 = 26.0\%$

(b) Percentage of refusals = $2/269 \times 100 = 0.7\%$

TABLE TWO
Breakdown of Household Interviews
By Community, Mineros

Community	Anticipated # Households	# Households Encountered	Required # Households (40%)	# Interviews Completed			
				Total	Regular	Replacement	Refusals
Mineros	1,225	1,264	181*	177	130	40	7
Pueblo Nuevo	153	116	46	47	42	5	0
Rio Hondo	138	27	11	12	7	5	0
Rio Viejo	45	40	16	16	14	2	0
Nuevo Mundo	85	34	14	14	9	5	0
Faja Tunari	70	30	12	12	9	3	0
San Lorenzo	71	40	16	16	14	2	0
Faja Jerusalem	??	55	22	22	19	3	0
Chane Magallanes	72	116	46	45	37	8	0
El Carmen	48	104	42	42	41	0	1
La Isla	66	49	20	20	19	1	0
Villamontes	54	96	38	39	30	9	0
19 de Agosto	??	23	9	16	16	0	0
TOTAL	2,027	1,994	473	478 (a)	387	83	8 (b)

* Sampled 14.3% in town of Mineros to compensate for size of urban population and greater concentration of cooperative members.

(a) Percentage of households interviewed = $478/1,994 \times 100 = 24.0\%$

(b) Percentage of refusals, = $8/480 \times 100 = 1.7\%$

TABLE THREE
Breakdown of Household Interviews
By Community, Santa Cruz

Community	# Households Occupied	Required # Households (10%)	# Interviews Completed			
			Total	Regular	Replacement	Refusals
La Chacarilla	951	95	95	78	15	2
San Antonio	457	46	46	24	28	4
Estacion Argentina	620	62	63	57	6	0
Heroes del Chaco	385	39	38	27	11	0
Guaracal	702	70	69	52	15	2
Los Olivos	547	55	78	52	26	0
La Cuchilla	803	80	78	64	10	4
Mercedes/Universidad	220	22	21	14	5	2
Guapay	391	39	38	29	4	5
Villa Brigida	486	49	50	31	18	1
TOTAL	5,562	557	576(a)	428	128	20(b)

(a) Percentage of households interviewed = $576/5,562 \times 100 = 10.4\%$

(b) Percentage of refusals = $20/576 \times 100 = 3.5\%$

TABLE FOUR
Neighborhood Profiles, Santa Cruz

Neighborhood	Type	Years of Existence	Health Post	Medicines Available	Public Services			Market
					Water	Lights	Transportation	
La Chacarilla	Popular/ Middle	?	No	No	Yes	Yes	Yes	No
San Antonio	Popular	?	Yes	No	Yes	Yes	Yes	No
Estacion Argentina	Popular/ Middle	11-15	Yes	Yes	Yes	Yes	Yes	No
Heroes del Chaco	Popular	7	No	No	Part	Part	Yes	No
Guaracal	Popular	5-8	Yes	Yes	Yes	Yes	Yes	No
Los Olivos	Emergency/ Popular	1	No	No	No	No	No	No
La Cuchilla (1)								
Mercedes/ Universidad	Middle	?	No	No	Yes	Yes	Yes	Yes
Guapay	Middle	?	No	No	Yes	Yes	Yes	Yes
Villa Brigida	Popular	?	No	No	Yes	Part	Yes	No

(1) No information was available in FIDES' records.

III.4. SAMPLE WEIGHTING

Because of the variety of sampling techniques and percentages of households surveyed in each locale, it was necessary to apply a series of weights to some of the epidemiological analyses. The Mineros sample did not draw the same percentage of households in the urban and rural areas. While 40% of the households in each rural community were sampled, only 14.3% of the urban households were interviewed. Therefore, the urban data from Mineros was weighted by a factor of 2.8. In order to highlight the differences between the town of Mineros and its rural dependencies, the results are presented separately.

It was also necessary to weight the contribution of each area when calculating a combined sample total. The San Julian data were weighted by a factor of 1.6, Santa Cruz by 3.8 and Mineros by 2.8, to compensate for the different percentage which was sampled in each area. The figures and rates reported below reflect the sample population. They have not been adjusted to reflect the real population since data were not available on Santa Cruz and rural Mineros.

IV. SOCIODEMOGRAPHIC CHARACTERISTICS.

IV.1. AGE

Table Five contains the distribution by five year age groups of each surveyed population. (The <5 year olds were split into <1 year and 1-4 years). These distributions are typical of developing areas. In San Julian 48.3% of the population is under the age of fifteen. The figure for Mineros is 49.2% and for Santa Cruz is 45.4% (3). The region will continue to experience rapid population growth, straining both community and family resources.

The age-dependency ratio provides a summary measure of the relative youthfulness and productivity of a population. This ratio estimates the number of "economically dependent" persons (<15 and >64 years) to those in the "economically productive" ages (15-64 years). A dependency ratio that approaches or exceeds 1.0 indicates an economically dependent population. The ratio for each sample area is high: San Julian .97, rural Mineros 1.07, urban Mineros 1.04, and Santa Cruz .93. These figures are somewhat higher than those of the Population Reference Bureau which estimated that the 1984 dependency ratio in Bolivia was .89, and .72 for Tropical South America for the same year (4).

The age distributions have implications for health planners since children, particularly those under five years, are one of the highest risk groups for morbidity and mortality. The percentage of children under five in the sampled populations is 23.3 % in San Julian, 20.4% in rural Mineros, 15.7% in urban

TABLE FIVE
SAMPLE AGE DISTRIBUTIONS IN
SAN JULIAN, MINEROS AND SANTA CRUZ

AGE IN WEIGHTED * YEARS	SAN JULIAN %	SAN (RURAL) %	MINEROS (URBAN) %	MINEROS+ CRUZ %	SANTA TOTAL %
< 1	6.0	4.3	3.4	1.9	2.8
1-4	17.5	16.1	12.3	13.5	14.0
5-9	15.3	17.6	16.6	16.7	16.6
10-14	9.7	11.8	16.0	13.5	13.3
15-19	9.5	9.2	11.1	10.4	10.3
20-24	10.2	7.1	6.2	7.5	7.6
25-29	9.2	7.1	6.0	8.6	8.1
30-34	7.2	6.5	5.2	7.7	7.1
35-39	5.2	6.6	5.8	6.0	6.0
40-44	4.4	4.2	6.2	5.1	5.1
45-49	2.3	2.9	2.8	2.7	2.6
50-54	1.8	2.2	1.7	2.8	2.4
55-59	0.6	1.6	2.0	1.1	1.3
60-64	0.5	1.0	2.2	1.1	1.2
>64	0.8	1.8	2.5	1.5	1.6
TOTAL	100.0	100.0	100.0	100.0	100.0
SAMPLE SIZE	1299	1850	1074	3100	18,715
WEIGHT*	1.6	1.0	2.8	3.8	

Mineros, and 15.4% in Santa Cruz. The two rural areas have proportionately more children less than five than the urban areas, but the percentages indicate that all areas contain large risk groups of children.

IV.2 SEX.

Table Six summarizes the population distributions by sex and age groups. In both of the rural areas, there are significantly more males than females in the "15-44" age group. The sex ratio in the age group, or number of males per every 100 females, was 1.4 in San Julian and 1.3 in rural Mineros, while it was .89 in urban Mineros and .85 in Santa Cruz (5). This urban - rural difference is partly explained by the type of in-migration encountered in the rural zones. Male heads of households arrive first, usually waiting for a few years before bringing the rest of the family. Of the houses surveyed in the San Julian colonization zone, single male heads of household were found in 10.9% of the cases.

TABLE SIX
AGE GROUP BY SEX
FOR SAN JULIAN, MINEROS AND SANTA CRUZ

AGE GROUP	SAN JULIAN		RURAL MINEROS		URBAN * MINEROS		SANTA CRUZ	
	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %
under 5 years	11.3 (147)	12.0 (156)	10.7 (198)	9.7 (180)	7.5 (227)	8.2 (246)	7.3 (227)	8.0 (248)
5 - 14 years	13.2 (172)	11.8 (53)	15.2 (282)	14.1 (261)	16.3 (490)	16.3 (490)	15.7 (487)	14.5 (449)
15 - 44 years	26.9 (349)	18.7 (243)	23.4 (432)	17.4 (322)	19.1 (574)	21.4 (644)	20.8 (646)	24.4 (757)
over 44 years	3.7 (48)	2.4 (31)	5.6 (103)	3.9 (72)	6.1 (185)	5.0 (151)	4.9 (151)	4.4 (135)
TOTAL	55.1 (716)	44.9 (583)	54.9 (1015)	45.1 (835)	49.1 (1476)	50.9 (1532)	48.7 (1511)	51.3 (1589)

* Each age/sex category for urban Mineros has been weighted by a factor of 2.8 to account for the difference in sampling techniques in the rural and urban areas.

IV.3. ETHNICITY.

The ethnic compositions of the four areas are quite different. Rather than having the mother place herself in an ethnic group, the ethnicity of the mother was determined by the interviewer after the questionnaire was completed (45 minutes, on the average) based on observation (clothing, items in the household, etc.) and conversation.

In San Julian, over 75% of the mothers were of Indian background

compared to only 22% in urban Mineros and 21% in Santa Cruz. Rural Mineros communities had the greatest variation in ethnicity with 37% of the mother's coming from Indian background and 41% from mestizo.

TABLE SEVEN
ETHNICITY OF MOTHER IN HOUSEHOLD SURVEY,
SAN JULIAN, MINEROS, SANTA CRUZ

ETHNIC GROUP	SAN JULIAN	RURAL MINEROS	URBAN MINEROS	SANTA CRUZ
Mestizo	9.4%	36.7%	67.1%	60.4%
Quechua	66.7	33.7	16.5	13.9
Aymara	5.6	1.0	0.0	2.8
Tupi-Guarani	4.5	4.7	4.1	1.5
Other	0.0	1.7	1.8	2.9
No Information*	13.9	22.3	10.6	18.6

* The interviewer was unable to code mother's ethnicity if the mother was not at home or did not live in the household (deceased or a member of migrant family and still not resettled into the area).

IV.4. LANGUAGE

The linguistic profiles of the areas are also varied. The percentage of households which spoke Spanish as a first language ranged from 23.6% in San Julian to 97.1% in Santa Cruz; the figures for rural and urban Mineros are 56.3% and 84.1%, respectively. Bilingualism, defined as Spanish as a second language, is found in 57.7% of San Julian's households, 38.7% in rural Mineros, 13.5% in

urban Mineros, and 2.4% in Santa Cruz. In San Julian, 18.7% of the households are monolingual Indian language speakers, compared to 5.0% and 2.4% in rural and urban Mineros respectively, and 0.6% in Santa Cruz.

VI.5. MOTHER'S EDUCATION.

In both of the rural areas the formal educational levels of the mothers was low. The mean number of years of schooling in San Julian was 1.1 years and 1.7 in rural Mineros. On the other hand, the mean was 4.2 in urban Mineros and 6.0 in Santa Cruz. Table Eight below compares the distribution of mothers across educational groups (number of years of formal education):

TABLE EIGHT

YEARS OF FORMAL EDUCATION OF MOTHERS
IN SAN JULIAN, MINEROS, AND SANTA CRUZ

# YEARS OF FORMAL EDUCATION	SAN JULIAN	RURAL MINEROS	URBAN MINEROS	SANTA CRUZ
	%	%	%	%
None	57.6	48.3	18.4	12.0
1-3 years	31.7	36.1	29.3	19.2
4-6 years	9.9	13.4	36.6	32.5
>6 years	0.8	2.2	15.7	36.3
Total	100.0	100.0	100.0	100.0

IV.6. HOUSEHOLD SIZE.

Mineros has the largest mean household size (6.2) followed by Santa Cruz (5.7). The mean household size in San Julian (4.9) is smaller than expected because of the relatively large percentage of new households (10.9%) which are still awaiting the arrival of the mother and children. An additional 7.5% of San Julian's households are composed of just the young married couple with no children. When eliminating the single male households from the sample, mean family size in San Julian increases to 5.4. As transitional period of adjustment to the area passes, the family size in San Julian is likely to increase.

IV.7. MEAN AGE OF THE HEAD OF HOUSEHOLD.

The mean age of the head of the households is considerably lower in San Julian than in the other areas:

San Julian	33 years
Rural Mineros	40 years
Urban Mineros	44 years
Santa Cruz	39 years

The relatively young mean age in San Julian is consistent with the migration pattern described above.

IV.8. OCCUPATION.

The occupational profiles of the four areas vary, primarily by rural-urban residence. In San Julian 94.0% of the heads of household are farmers, 5.6% are engaged in unskilled labor, and

0.4% are teachers. In the rural areas of Mineros 91.7% are farmers, 6.2% are in unskilled jobs, and 2.1% hold skilled positions.

In town of Mineros, 36.6% of the heads of household were farmers, 57.6% were engaged in unskilled labor and 5.8% were in skilled or administrative positions. In Santa Cruz only 6.0% of the heads of household were engaged in agriculture. Over half (54%) held semi-skilled positions, including carpentry, mechanics, transportation and tailoring. About one fourth (26%) had jobs requiring no skills such as domestic services and street vending. Fourteen percent were in skilled or administrative positions.

IV.9. INCOME

Due to a continued period of economic crisis in Bolivia before and during the taking of these surveys, income data had meaning which was cloudy. With annual inflation during 1984 over several thousand percent, the value of the peso changed weekly, or even daily, affecting prices of basic food supplies, transportation, drugs, health services provider fees, and clothing. Thus, monthly income is very difficult to interpret. Particularly in the rural areas, it was highly questionable as to the exact meaning of cash income figures. As a result of this, only in the urban Santa Cruz survey were the interviewees asked to provide income data. The average monthly income was U.S. \$ 69.82 and the average monthly expenditure was U.S. \$ 60.01. The average monthly gain (income minus expenditure) was

U.S. \$ 11.12. Twenty percent of the households showed a loss and 18.6% reported neither gain nor loss. 61.4% of the households reported some net gain. Approximately ten percent showed a net gain which exceeded \$50.00. All peso amounts were converted to U.S. dollars based on the average parallel market exchange rate for the month of October, that being the month for which respondents reported their income data.

V. MORBIDITY AND MORTALITY: THE RECENT PICTURE.

V.1 INTRODUCTION.

The household survey gathered health related information on all members of the household, including the nuclear family and all other permanent residents such as extended family members, resident employees, and others. Each person's age, sex, 2-week illness history and 3-month hospitalization history were recorded. In addition, the 12 month pregnancy history was recorded on all women between the ages of 15 and 44 years. And, finally, all deaths within the household during the past year were recorded by cause. The mother reported on herself as well as all other household members. If the mother was unavailable for any reason (absent, deceased, etc.), the oldest daughter was accepted as the second choice. If she was unavailable, any other adult was interviewed. As noted above, in 10.9% of the households in San Julian, the only possible interviewee was the male head of household. The interviewee reported on household morbidity for the two week period immediately preceding the date of the interview.

A two-week recall for illness reporting and health services utilization has been adopted in many studies as a compromise between obtaining enough information about current illness and loss of accuracy due to the vagaries of memory (6,7). In general, research shows that the reliability of the period for the respondent's recall of symptoms and use of health services follows the principle that severe symptoms are remembered longer than mild ones (8,9,10,11). Freij and Wall (12), in a study

completed in urban Ethiopia, found that recent illness was overestimated and earlier events were underestimated, so that during a two-week recall period over- and under-reporting largely cancelled each other out.

The decision to adopt a three month recall period for hospitalizations and a one year period for mortality were based on the notion that these are more severe events and long term memory about them is more reliable. In order to obtain enough cases of these relatively rare events, the recall period had to be extended beyond two weeks. However, hospitalization histories and mortality data here are to be interpreted as less reliable than the two week morbidity data.

V.2. MORBIDITY.

The questionnaire contained 23 different types of signs and symptoms of illness (see Appendix B) which have been collapsed into eight different categories based on functional area or the absence of significant morbidity in the area:

- | | |
|---------------------------------|----------------|
| 1. Respiratory | 5. Dental |
| 2. Gastrointestinal | 6. Skin |
| 3. Nutritional | 7. Trauma |
| 4. Eye, ear, nose throat (EENT) | 8. Ill-defined |

Although the last category contains a large proportion of the reported episodes, most of them were vague symptoms recorded as "other" or "ill-defined" during the interview. These included surgery, malaria, ill-defined, congenital problems, and "other." In addition, problems related to pregnancies are not

included here since the population at risk (women aged 15 to 44) is a special group. Pregnancy histories are discussed in Section V.4.

The annual morbidity rates presented in Table Nine were derived by expanding the two week recall data to a 12 month calendar year. Because the data are unavailable, no attempt has been made to account for possible seasonal trends in morbidity. All of the survey work was completed during the dry winter season (June through October).

TABLE NINE
ANNUAL MORBIDITY BY CAUSE PER 10,000 POPULATION
BASED ON HOUSEHOLD SURVEY DATA
IN SAN JULIAN, MINEROS, AND SANTA CRUZ, BOLIVIA

SYMPTOM	SAN JULIAN	RURAL MINEROS	URBAN MINEROS	SANTA CRUZ	TOTAL*
Respiratory	5204	12,649	7,004	4,277	5,654
Gastrointestinal	10,007	11,946	8,473	8,637	9,086
Nutritional	800	2,951	1,902	671	1,098
EENT	7,005	8,573	4,583	3,606	4,626
Dental	1,801	1,968	2,421	4,277	3,473
Skin	2,402	6,324	5,361	2,852	3,543
Trauma	1,001	1,265	2,940	1,258	1,500
Ill-Defined	7,206	8,714	5,793	4,697	5,557
TOTAL	35,427	54,389	38,476	30,277	34,537

* The total rates were weighted to account for the variation in sampling techniques: San Julian by a factor of 1.6, urban Mineros by 2.8 and Santa Cruz by 3.8.

Gastrointestinal problems were the leading cause of morbidity in every area except rural Mineros where they were second. In addition, respiratory, eye, ear, nose, throat and skin infections were consistently high. In Santa Cruz, dental problems were reported with greater frequency than in the other areas. Ill defined problems were common, occurring at relatively higher rates in the rural than urban areas.

Since these rates were calculated from the reported recall of diseases, they cannot be interpreted as if they were clinical data. In San Julian, for example, which is the most remote and least developed of the areas, we would expect malnutrition to be higher than in any other area. Yet, San Julian's rate is close to Santa Cruz. Rural Mineros reported over three times as many nutritional problems. Because of overall lower educational and socio-economic levels, the mothers' ability to recognize nutritional problems is therefore assumed to be much lower in San Julian. Respiratory and skin problems are also seemly underreported in San Julian. Cultural definitions of illness and treatment, health beliefs, social status and health care expectations have been shown to influence the recognition and interpretation of symptoms as well as the use of services (13, 14,15). Thus, these data must be regarded as subjective recall of family members health problems and not as clinical diagnoses.

The average number of illness events per person per year in San Julian was 3.5, 5.4 in rural Mineros, 3.8 in urban Mineros, and 3.0 in Santa Cruz. A rural health survey completed in 1979 in the Montero region (lying between Mineros and Santa Cruz)

estimated there were about 12.5 illness episodes per person per year (16). Although considerably lower than the Montero figures, the current survey figures are internally consistent.

Table Ten compares the annual morbidity rates by sex for each of the four areas.

TABLE TEN
ANNUAL MORBIDITY RATES BY CAUSE PER 10,000 FOR MALES AND FEMALES,
SAN JULIAN, MINEROS, AND SANTA CRUZ, BOLIVIA

SYMPTOM	SAN JULIAN		RURAL MINEROS		URBAN * MINEROS		SANTA CRUZ	
	Male sample size (716)	Female (583)	Male (1015)	Female (635)	Male (1476)	Female (1532)	Male (1511)	Female (1589)
Respiratory	4,732	5,798	12,298	13,078	6,864	7,124	3,796	4,758
Gastrointestinal	8,346	12,038	11,778	12,142	7,930	8,996	7,566	9,646
Nutritional	728	884	3,068	2,808	1,404	2,366	520	806
EENT	5,798	8,476	7,436	9,958	5,460	3,744	4,134	3,120
Dental	2,184	1,326	1,014	3,120	3,536	1,352	3,094	5,408
Skin	1,820	3,120	5,902	6,838	5,460	5,252	1,196	1,820
Trauma	1,092	884	1,274	1,248	2,470	3,406	1,560	988
Other	6,812	7,592	7,176	10,582	4,914	6,630	3,432	5,902
TOTAL	31,590	40,144	49,946	59,800	38,038	39,026	25,298	35,022

* Each age/sex category for urban Mineros has been weighted by a factor of 2.8 to account for the difference in sampling techniques in the rural and urban areas.

In all of the areas except urban Mineros, the total reporting of female episodes far exceeded male episodes. The

rates show considerable variation by region and symptom.

Tables Eleven through Fourteen compare the percentage of each age group sampled which reported each of symptoms. In all cases except San Julian, the largest percentage came from the children under five. It is again hypothesized here that the socio-economic, cultural and educational backgrounds of the mothers explain the comparatively lower percentages in San Julian. Evidence from another study (17) suggests that infant mortality is higher among Bolivian migrant populations, such as the colonists in San Julian.

TABLE ELEVEN

PERCENTAGE OF EACH AGE GROUP REPORTING SYMPTOMS
DURING TWO WEEKS PRECEDING SURVEY, SAN JULIAN

SYMPTOM	< 5 years (n=303) %	5-14 years (n=225) %	15-44 years (n=592) %	≥ 45 years (n=79) %
Respiratory	1.98	2.22	2.36	1.27
Gastrointestinal	8.91	1.33	3.04	2.53
Nutritional	0.33	0.44	0.17	1.27
EENT	4.62	3.11	2.03	2.53
Dental	---	0.44	1.18	1.27
Skin	1.65	0.89	0.51	2.53
Trauma	0.33	---	0.34	2.53
Ill-Defined	2.31	1.78	3.21	7.59
TOTAL	20.13	10.22	12.83	21.52

TABLE TWELVE

PERCENTAGE OF EACH AGE GROUP REPORTING SYMPTOMS
DURING TWO WEEKS PRECEDING SURVEY, RURAL MINEROS

SYMPTOM	< 5 years (n=378) %	5-14 years (n=534) %	15-44 years (n=754) %	≥ 45 years (n=175) %
Respiratory	7.14	4.97	3.05	7.43
Gastrointestinal	10.58	2.58	3.05	4.57
Nutritional	1.32	1.66	0.80	0.57
EENT	5.29	3.13	2.65	2.29
Dental	---	0.18	1.46	1.14
Skin	5.82	2.03	1.46	0.57
Trauma	---	0.55	0.80	---
Ill-Defined	2.38	0.92	3.32	13.14
TOTAL	32.54	16.02	16.58	29.71

TABLE THIRTEEN

PERCENTAGE OF EACH AGE GROUP REPORTING SYMPTOMS
DURING TWO WEEKS PRECEDING SURVEY, URBAN MINEROS

SYMPTOM	< 5 years (n=473) %	5-14 years (n=980) %	15-44 years (n=1218) %	≥ 45 years (n=336) %
Respiratory	5.92	1.12	2.55	3.57
Gastrointestinal	13.11	1.73	0.99	2.68
Nutritional	---	0.92	0.74	---
EENT	5.92	2.04	---	---
Dental	---	1.12	0.49	---
Skin	4.86	2.55	0.49	1.79
Trauma	---	1.22	0.74	4.17
Ill-Defined	0.63	---	3.28	7.44
TOTAL	30.23	10.61	11.08	19.05

* The weighting factor of 2.8 was used for urban Mineros

TABLE FIFTEEN

PERCENTAGE OF EACH AGE GROUP REPORTING SYMPTOMS
DURING TWO WEEKS PRECEDING SURVEY, SANTA CRUZ

SYMPTOM	< 5 years (n=475) %	5-14 years (n=936) %	15-44 years (n=1403) %	≥ 45 years (n=286) %
Respiratory	2.95	2.14	1.07	0.70
Gastrointestinal	11.16	2.35	1.71	1.40
Nutritional	---	0.64	0.14	---
EENT	4.00	1.60	0.57	0.35
Dental	0.84	2.24	1.71	0.70
Skin	1.47	1.39	0.78	1.05
Trauma	0.21	0.53	0.36	1.40
Ill-Defined	1.05	0.75	2.28	4.20
TOTAL	21.68	11.65	8.62	9.79

V.3. HOSPITALIZATIONS

Hospitalization histories for the past three months were recorded for all individuals in the sampled households. Based on the survey data, there were fewer hospitalizations per thousand in both of the rural areas. San Julian and rural Mineros reported 9.2 and 10.3 hospitalizations per thousand population while urban Mineros and Santa Cruz reported 23.3 and 16.1 per thousand, respectively. Geographic accessibility, probably accounts for the differential rates.

There are no hospitals within the San Julian colonization zone. At the time of the survey, the nearest hospital was in San Ramon, 125 kilometers from the entrance to the brecha, or main road through the zone. Key informants report, however, that poor roads and seasonal flooding discourage travel to the distant town. Since there is no public transportation in the zone, potential hospital users must wait for a passing private vehicle to pick them up at the entrance to the brecha. There is more traffic going towards Mineros/Saavedra than west toward San Ramon. Thus, most persons in search of hospital services travel at least 100 kilometers to reach a hospital in Mineros or Saavedra, with a smaller number going west to San Ramon. All the reported hospitalizations in San Julian came from 6 communities, each of which is located relatively close to the main highway. Accessibility may be partly responsible for the concentration of cases at one end of the brecha. There is little traffic along the brecha and unless they walk to the entrance, people may wait several days for a ride.

After the survey was completed, in May, 1985, the Catholic Church added hospital services (8 beds) to its clinic in Fortin, 15 kilometers from the beginning of the brecha. The hospital offers a new options to San Julian colonists, and the frequency of hospitalizations is likely to increase.

In the Mineros area, hospitals are used more frequently by the urban sector than the rural. Again, poor roads and longer travel time reduce accessibility, and consequently reducing utilization. In contrast to San Julian where the majority of communities did not report any hospitalizations, in ten of the twelve rural Mineros communities, at least one person had been hospitalized.

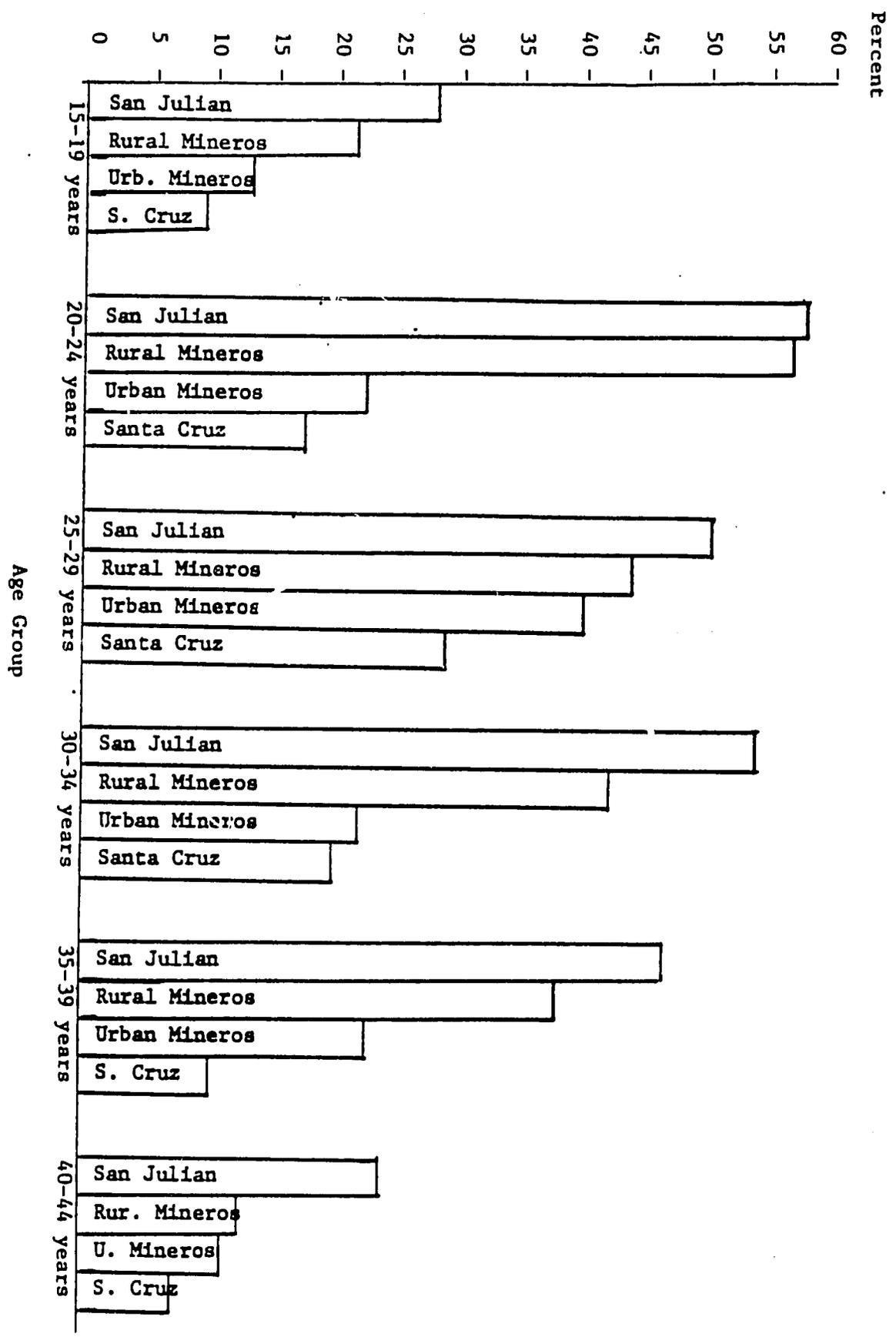
The town of Mineros has two hospitals. Saavedra's hospital, reportedly more popular among the population, is easy to reach on public transportation from Mineros. Santa Cruz reported a lower rate of hospitalizations than those in Mineros, but usership was consistent across the population. All of the neighborhoods reported at least two hospitalizations.

V.4. MATERNAL DATA.

In San Julian, Mineros (rural and urban) and Santa Cruz the sample population sizes of women between the ages of 15 and 44 were 240, 313, 221, and 751, respectively. At the time of the survey, the highest proportion of women who were currently pregnant was found in San Julian (15.4%) compared to 9.8% in rural Mineros, 13.1% in the town of Mineros and 7.3% in Santa Cruz. Likewise, San Julian had the highest proportion of women

who had given birth within the past 12 months (45%), compared to Mineros (37% in the countryside and 21% in the town) and Santa Cruz (15.8%). The weighted sample total was 21%. Figure One shows the percentage of women in each group reporting a birth within the past twelve months.

FIGURE ONE
 PERCENT OF WOMEN IN AGE GROUP
 WHO DELIVERED WITHIN PAST 12 MONTHS



The San Julian data, and to a lesser extent the rural Mineros data, are probably biased by two factors: inaccurate 12 month recall leading to overreporting of births and the fact that many couples are recent migrants who are starting families. Mothers may have reported births for more than the past 12 months, a likely possibility given their overall low levels of education. They simply may not have remembered how long ago their young children were born, reporting births that took place more than 12 months prior to the survey. A second possible confounding factor is the unusual population composition of the area. As stated previously, due to the recent migration of many young couples, there are fewer than expected older people, allowing the overall rate to increase. On the average, a higher percentage of San Julian women reported having a birth than women in rural and urban Mineros or in Santa Cruz. As seen in Figure One, San Julian women in the older age groups report significantly more births than in the other areas.

The figures presented in Table Fifteen illustrate this bias quite clearly. While the rates for the two urban areas are close to the general fertility rate for Bolivia estimated by the United Nations (189/1,000), the two rural rates are clearly too high (20).

TABLE FIFTEEN
 AGE-SPECIFIC FERTILITY RATES
 PER 1000 WOMEN IN
 SAN JULIAN, MINEROS, AND SANTA CRUZ

AGE GROUP	SAN JULIAN	RURAL MINEROS	URBAN MINEROS	SANTA CRUZ
15-19 years	393.4	217.4	128.7	90.9
20-24	574.4	565.2	217.8	179.1
25-29	500.0	442.6	398.0	258.7
30-34	542.8	428.6	222.0	200.0
35-39	466.6	386.0	239.1	101.0
40-44	240.0	125.0	105.3	79.4
GENERAL FERTILITY RATE	447.3	373.8	213.7	157.8

The biases are also reflected in the crude birth rates:

San Julian	78.5
Mineros-rural	61.6
Mineros-urban	43.9
Santa Cruz	34.8

The biological maximum for the crude birth rate is believed to be approximately 65 births per 1000 population. San Julian's rate of 78.5/1000 is clearly worrisome.

V.5. MORTALITY

The reported number of deaths was too small for each of the areas to calculate reliable annual rates by cause or by age. The crude death rate per thousand population was 30 in San Julian, 21 in the rural villages around Mineros, 8.3 in Mineros proper and 9.4 in Santa Cruz. The combined (weighted) crude death rate was 12.6 for the entire sample, only slightly higher than the annual rate of 11.6 found during the Montero study (18). The United Nations estimate for Bolivia in 1984 was about 17 (19).

VI. DEMAND FOR HEALTH SERVICES

VI.1. Introduction

Demand for formal health services is a central issue in planning a primary health care program. Those who become ill or deliver a child represent potential users of formal services, but not everyone will become an actual user. People often rely on a variety of home remedies or nonformal providers during illness and/or childbirth. Those who do seek assistance, and utilize formal health services, are the actual users.

For each illness episode which was reported, the interviewer elicited information on health services utilization. Up to three responses per episode were recorded. Below is a classification of the possible responses categorized as "demand" (formal provider) or "no demand" (informal provider).

<u>Demand</u>	<u>No Demand</u>
Trained midwife	Family member, neighbor
Health promoter	Traditional healer
Nurse auxiliary	
Nurse	
Physician	

For the two week period preceeding the survey in San Julian, 13.6% of the survey population reported an illness episode. Of these, 65.5% utilized formal health services and in other words, 9.8% of the total survey population utilized formal health services. In Mineros, 18.5% of the total survey population reported an illness episode, with 23.4% of these utilizing formal services; 2.3% of the total population used

services. In Santa Cruz, 11.6% of the population surveyed reported an illness episode; 51.5% of those reporting an episode visited a formal provider and 6% of the total population used formal services.

As noted above, various economic and demographic factors are associated with the utilization of health services. By studying the distribution of these factors across households, it is possible to predict the probability of health services utilization. Through the use of the logistic technique, a model of demand for health services has been developed for each of the three survey areas. Logistic regression is a technique of choice for multivariable analysis if the dependent variable is dichotomous and at least some of the predictors are categorical.

The dependent or outcome variable "DEMAND" was created for each individual in every household surveyed. If the person visited a formal provider during any of the three visits, he was considered a user of formal services, and demand was coded "1." The dependent variable was coded as zero (no demand) when the individual did not utilize formal care during his illness. Of course, those individuals who did not report any illness were also coded as zero.

The logistic regression technique allows any type of variable (categorical, integer, continuous) to be used as a predictor or independent variable. Using selected indicators developed from the survey, several predictors were identified for study. It was hypothesized that socioeconomic status, age, and sex were important predictors of health services

utilization. Because of the unique qualities of each of the three surveyed populations it was not possible to utilize the exact same indicators for socioeconomic status. For example, while homeownership was believed to be an important indicator of socio-economic status (a potential predictor of demand) in peri-urban Santa Cruz, in San Julian it would have been a useless indicator since 99.9% of the populations was owned its home. Only those socioeconomic indicators which had reasonable variance and were significantly associated with the dependent variable (Chi-square test of association, $p < .05$) were entered into the logistic model. In addition, level of mother's education, mother's ethnicity and/or language, the individual's age and sex.

Described below are the indicators selected for each of the areas and the resulting logistic models.

VI.2. SAN JULIAN.

The potentially significant predictors which were analyzed for San Julian included:

1. Ethnicity: coded as "Indian" or "mestizo".
2. Mother's education: coded as "none" or "some".
3. Length of residence: reported in years.
4. Density index: calculated as number of persons/room.
5. Roof: coded as poor or good.
6. Sex: "male" or "female".
7. Age: coded as "less than 5;" "5 through 14;" "15 thru 45;" or "greater than 45" years.

Given the relatively homogeneous quality of the colonization zone's families, traditional indicators of socioeconomic status such as homeownership, land tenure, house type, and occupation did not show significant variance. The condition of the roof, however, was useful in discriminating between higher and lower socioeconomic groups.

Three of these predictors were significant ($p < .05$) and were included in the model. Age was the strongest ($p < .0013$), followed by mother's education ($p < .0088$) and roof ($p < .0271$).

Using the Biomedical Data Processing (BMDP) stepwise logistic regression, the predictive model of demand for services was:

$$p(\text{demand}) = \frac{e^{-2.44 - .265(\text{momed}) - .219(\text{roof}) + .14(\text{age1}) + .11(\text{age2}) - .726(\text{age3})}}{1 + e^{-2.44 - .265(\text{momed}) - .219(\text{roof}) + .14(\text{age1}) + .11(\text{age2}) - .726(\text{age3})}}$$

The Goodness of Fit Chi-Square (D. Hosmer) for the model was 6.569, with a p-value of 0.765. Using a p-value of < 0.1 as a cutpoint for rejecting the model, we can conclude that this model does fit the data well. The equation can be solved by substituting the values of the design variables listed below:

Variable	Category Index	Frequency	Design Variables		
			(1)	(2)	(3)
Mother's Education	0 (none)	679	-1		
	1 (some)	610	1		
Roof	1 (poor)	577	-1		
	2 (good)	712	1		
Age Group	1 (< 5)	344	-1	-1	-1
	2 (5-14)	303	0	0	1
	3 (15-44)	563	0	1	0
	4 (≥ 45)	79	1	0	0

The predicted probabilities of health services utilization during a two week period will vary according to the age of the individual the socioeconomic status of the household (as measured by mother's educational status and condition of the roof). The table belows compares these probabilities by agegroup for low and high socioeconomic groups:

	Low (uneducated mother; poor roof)	High (educated mother; good roof)
Age group 1	p(demand) = .187	p(demand) = .078
2	.064	.025
3	.136	.057
4	.140	.058

There is a positive relationship, or increased likelihood of health services utilization, among the lower socioeconomic group. The preschool age group (< 5) has the highest probability of utilization followed by the oldest (≥ 45), the young adults (15-44) and finally the school age group (5-14).

VI.3. MINEROS.

Based on the preliminary Chi-square tests of association, the indicators described below were selected as possible predictors of demand for formal health services. Mother's ethnicity was excluded since no significant association between it and utilization was found ($p > .05$).

1. Residence: "town of Mineros" or "rural village"
2. Mother's education: "none" or "some".
3. Water: "piped" or "not piped".
4. Density: number of persons/room in the house.
5. Sex: "male" or "female".
6. Age: "< 5;" "5 - 14;" "15 -44;" and ">44".

Four of these variables emerged as significant predictors of health services utilization among the Mineros population. Age was the strongest ($p=.0096$), followed by density ($p=.0105$), water($p=.0183$) and mother's education ($p=.055$). The Goodness of Fit Chi-Square (D. Hosmer) for the model was 1.993, with a p-value of .85, indicating that the model fits the data well. The model produced by the BMDP stepwise logistic regression procedure was:

$$p(\text{demand}) = \frac{-2.67 - .10(\text{dens}) - .19(\text{ed}) + .23(\text{H20}) - .047(\text{age1}) - .14(\text{age2}) - .31(\text{age3})}{1 + e^{-2.67 - .10(\text{dens}) - .19(\text{ed}) + .23(\text{H20}) - .047(\text{age1}) - .14(\text{age2}) - .31(\text{age3})}}$$

Using the design variables described below, the predicted probabilities of health services utilization for individuals of differing backgrounds can be solved. The actual value for

"density" can be used, since it is a continuous variable for which design codes are not generated.

Variable	Category Index	Frequency	Design Variables		
			(1)	(2)	(3)
Mother's Education	0 (none)	1810	-1		
	1 (some)	1062	1		
Water	1 (open)	1883	-1		
	2 (piped)	989	1		
Age Group	1 (< 5)	534	-1	-1	-1
	2 (5-14)	880	0	0	1
	3 (15-44)	1169	0	1	0
	4 (≥ 45)	289	1	0	0

In contrast to San Julian, those individuals from higher socioeconomic backgrounds have a greater probability of health services utilization during a two week period:

	Low (uneducated mother; no potable water; density=7/room)	High (educated mother; piped water; density=2/room)
Age group 1	p(demand) = .036	p(demand) = .129
2	.016	.050
3	.019	.070
4	.021	.076

As in San Julian, the same pattern with respect to age and demand applies here.

VI.4. SANTA CRUZ.

Based on the Chi-square test of association, the indicators described below were selected as possible predictors of demand for formal health services. Different indicators of socioeconomic status were selected here than in San Julian or

Mineros.

1. Mother's Ethnicity: "Indian" or "mestizo"
2. Mother's education: "none" or "1-6" or "> 6".
3. Waste Disposal: "latrine" or "no latrine".
4. Home: "own home" or "do not own home".
5. Income: "low" or "high" monthly income; the mean monthly income (\$75.00) was the cutpoint.
6. Sex: "male" or "female".
7. Age: "< 5;" "5 - 14;" "15 -44;" and ">44".

In the logisitic model generated for Santa Cruz, mother's education (p=.0023) was the only socioeconomic predictor which was included in the model. While there were more significant socioeconomic differences within this urban population than in the homogeneous San Julian colonization zone, the logistic model favored age (p=.0000) and sex (p=.0128) over other socioeconomic distinctions.

Using the Biomedical Data Processing (BMDP) stepwise logistic regression, the predictive model of demand for services was:

$$p(\text{demand}) = \frac{-2.6 - .20(\text{sex}) - .24(\text{ed1}) - .24(\text{ed2}) + .18(\text{age1}) - .43(\text{age2}) - .14(\text{age3})}{1 + e}$$

The Goodness of Fit Chi-Square for the model was 14.53 (17 degrees of freedom), with a p-value of 0.629. Using a p-value of < 0.1 as a cutpoint for rejecting the model, we can conclude that this model does fit the data well. The equation can be

solved by substituting the values of the design variables listed below:

Variable	Category Index	Frequency	Design Variables		
			(1)	(2)	(3)
Mother's Education	0 (none)	360	-1	-1	
	1 (lower)	1564	0	1	
	2 (higher)	1069	1	0	
Sex	1 (male)	1456	-1		
	2 (female)	1537	1		
Age Group	1 (< 5)	461	-1	-1	-1
	2 (5-14)	902	0	0	1
	3 (15-44)	1352	0	1	0
	4 (≥ 45)	278	1	0	0

The predicted probabilities of health services utilization during a two week period will vary according to the age of the individual the socioeconomic status of the household (as measured by mother's educational status and condition of the roof). The table belows compares these probabilities by agegroup for low and high socioeconomic groups:

	Female (uneducated mother)	Male (uneducated mother)
Age group 1	p(demand) = .238	p(demand) = .174
2	.113	.080
3	.087	.061
4	.110	.077

	Female (Mother's ed. >6 yrs)	Male (Mother's ed. >6 yrs)
Age group 1	p(demand) = .132	p(demand) = .093
2	.059	.040
3	.044	.031
4	.057	.039

As in San Julian, there is an inverse relationship between mother's education and health services utilization. Females have a higher probability of using services than males. The youngest age group has a higher likelihood than any other, followed by the second age group, the oldest and finally the young adults.

VII. THE DELIVERY SYSTEMS.

VII.1 SUGGESTED DELIVERY SCHEMES.

During the initial planning stages of the service delivery side of this project, one cooperative was selected from each area to administer the delivery of services. However, each of the three original cooperatives has withdrawn from the project. Proposed here are some possible alternative delivery schemes. Individual and group key informant interviews and notes from meetings, combined with FIDES' archival records on interviews conducted between March, 1984 and June, 1985, were the primary sources of information.

A recent study of constituency organizations by Milton J. Esman concludes that the extension of social services to the underserved, lower socioeconomic groups in developing countries should promote the growth of local organizations (21). In addition, reliance on local organizations promotes the participation of the community in the decision making process, which has been regarded as beneficial to community development and community based primary health care (22,23,24). Therefore, an attempt is made to describe as many existing institutions as possible so that health planners and organizations working in the area in the future have an idea of the existing infrastructure which could be incorporated into a delivery system.

VIII.2. SAN JULIAN.

There are six active organizations in the San Julian

colonization zone which could potentially become involved in the delivery of primary health care services and/or supporting services. The information used in these brief institutional profiles was generated through several brainstorming sessions in Santa Cruz in which FIDES staff, two colonists, two community members, the cooperative's president and an administrator, the President of the Federation of San Julian Colonists, and a manager from the Unidad Sanitario (the local Ministry of Health office), a health economist and an epidemiologist participated.

First, the National Institute of Colonization (INC), created and financed by the Bolivian government, has been responsible for the overall development of the colonies (nucleos) in the entire zone, including the coordination of all private and public sector programs. Directly responsible to the national colonization offices in La Paz, INC established an office in los Cafeses on the fringes of the zone in the early 1970s. Although at one time actively involved in the provision of various social and health services, in recent years INC has suffered from severe budgetary cutbacks and loss of personnel. It's small hospital in Los Cafeses (a few kilometers outside the zone) is very poorly equipped and rarely utilized by the colonists. INC contracts two physicians who are also directly responsible to La Paz and are not required to work under the Unidad Sanitario, the local Ministry of Health representative. Ideally, the physicians are available for general (free) practice in the mornings and for private consultations (fee-for-service) in the afternoon. The colonists seem to regard these services as

unreliable; frequently after making the trip to the clinic (as much as 50 or 60 kilometers for some), they frequently find the office unattended or out of medications. In summary, the INC must be regarded as an extra-community organization because of its direct links with La Paz. Although it will be necessary to advise INC of all PHC activities in the zone, INC does not have the rapport with community members to effectively administer service delivery.

The Catholic Church in Fortin, about 20 kms. outside of the zone, runs a small clinic and hospital. The nuns who run the services report that both are underutilized, despite their consistent presence of staff and a well stocked pharmacy. The hospital recently opened and is equipped to handle minor surgery. The clinic's small laboratory can perform basic analyses. Working with CARITAS (Catholic Relief Services), the nuns in Fortin have also combined missionary work with food distribution programs inside the zone. They have established mother's clubs in many of the nucleos.

The Ministry of Health is represented throughout the Department of Santa Cruz through the Unidad Sanitaria. Like INC, the Unidad is an extra-community organization, rarely developing any contact with the zone's residents. However, the Unidad is potentially important to the development of health services. It controls an "item," or a position for a physician, for San Julian which has never been filled. In addition, the Unidad can offer technical assistance, subsidized medicines (including vaccinations), and supervision of personnel. The Unidad's

school for auxiliary nurses and health promoters, and its new program to retrain physicians in public health and primary health care are two potentially useful mechanisms for training personnel. The Unidad can provide minimal salary support for one physician and four nurses. Working with a community based program in San Julian, these providers could generate the balance of their salaries through the new program. In addition, the Unidad's association with the project will lend legitimacy to activities.

The Federation of Colonists of San Julian is the only organization in the area which has universal membership. The federation's leadership is elected annually and it is primarily focused on grassroots political activities. The Federation has virtually no resources, however, it wields considerable influence in the zone. Although it would not be able to contribute resources, the Federation could be expected to organize people into work crews to construct health posts and to initiate communal agricultural to generate small funds in each community to support the health system.

The The Multipurpose San Julian Cooperative, founded in 1979, is the first major local organization developed by the colonists themselves. Membership in the cooperative is estimated at over 1,250, with at least 50% of all households represented in the Cooperative by at least one family member. The Cooperative's rice mill and main offices are located in Los Cafeses, however, nearly every community has an almacén (store) which infrequently serves as a pharmacy. Thus, the

Cooperative's infrastructure could become an important part of the primary health care program. The cooperative is interested becoming involved in the distribution and sales of medicines. Through its rice milling and marketing programs, it already has an established system to transport goods into and out of the zone.

Finally, FIDES is the major private voluntary organization which has been involved in community development projects since the late 1970s. FIDES has solid rapport with the communities and could lend a lot of credibility to any health program. Currently, FIDES supervises about 12 community health promoters working at the far end of the brecha, manages a pharmacy out of one nucleo (which is open 2 times per month and supplies the promoters), and also operates a radio communication service out of two interior nucleos (23 and 38). Potentially, FIDES could lend its radio system to a health program, increasing greatly the frequency of communication between field people and those in Santa Cruz, or from one end of the brecha to the other.

VII.3. MINEROS.

Like San Julian, the Mineros region houses a variety of local organizations which could be involved in the management and delivery of primary health care services. Most of these organizations, however, enter into competitive struggles for membership and extramural resources, making the selection of appropriate constituency organizations difficult.

Key informants estimate that there are approximately 150

local sugar cane cooperatives, offering services to small cane growers at the community level. Many of these cooperatives are members of the regional Union de Caneros Campesinos. The Federacion de Campesinos de Colonia, whose membership overlaps with the Union, represents a second loose network of small rural farmers. Third, the Confederacion de Caneros de Santa Cruz (CCSC), is a strong organization, primarily of large cane growers. And finally, the Central de Cooperativas Agropecuarias de Mineros (CCAM) is comprised of fourteen local cooperatives. The CCAM had originally planned to act as the local coordinator of the primary health care program but withdrew in early in 1985. In the spring, 1985, the CCSC entered into preliminary negotiations with AID/PRICOR to become the local coordinator for services delivery. The initial target population of the delivery system includes the confederation's membership, seasonally contracted laborers, and their dependents. Thus, as presently conceived, the Mineros project may not provide regional services. In addition, this project will begin with curative services, based out of the Caneros hospital in Warnes, some 85 kilometers south of Mineros. The institutional analysis provided below is intended to serve as a basis for expanding the delivery system by complementary services coordinated by other institutions and for developing a stronger community-based orientation.

In conjunction with the Mary Knoll Hospital de Saavedra, the Mennonite Central Committee is planning to develop primary health care services for approximately 5,000 inhabitants in the

El Carmen region east of the Rio Grande (see map). Community health promoters will be trained and supervised by MCC. The Hospital de Saavedra will contribute the services of one dentist, one physician, one graduate nurse and one lab technician for 6 days apiece during every 4 months. Referral services will be provided by the Hospital. In addition, the Hospital's ambulance will be available to pick up patients on the west bank of the Rion Grande. Regular communication with the hospital will be possible with the MCC radio system.

In other communities, the Hospital de Saavedra has formed local mothers' clubs, many of which are active and meet regularly. Through these clubs, the Hospital has been attempting to establish local infrastructure for eventual community health programs by creating community savings banks.

The Centro de Mujeres Rurales (CEMUR) is an growing organization, recently funded by the Inter American Foundation for rural development programs.

And finally, the Ministry Hospital in Montero, some 50 kilometers south of Mineros, coordinates a growing program of community outreach around "social promoters" whose primary activities are health education and promotion. Additionally, the Montero Hospital has a strong training program for nurse auxiliaries many of whom are active in providing first aid in their villages, some of which are within the Mineros region.

A major problem in the Mineros region is a lack of regional planning and coordination. The Director of District Two (which includes most of Mineros), argues strongly that there

fragmentation of coverage between competing agencies is a much more significant problem than lack of resources. There are two hospitals in the Town of Mineros and the Hospital de Saavedra is heavily utilized. As shown on the map, rural health posts are also scattered throughout the region. It seems clear that these strong curative, clinical services has been gained at the expense of community based prevention and health education programs. The facilities to train promoters and auxiliaries are in place in Montero (the school for auxiliaries) and attention should be given to coordinating a regional effort along these lines.

VII.4. SANTA CRUZ.

The information available on community resources in Santa Cruz is scattered. During the windshield survey of the area, FIDES recorded whether or not each urban barrio had a health service (clinic or post) and if the service had a stock of drugs. The information is presented in Table XX. An even distribution of services is not found, with most emergency and popular class neighborhoods lacking any local services. With the exception of a few scattered cooperatives, communal organizations appear to be rare. Therefore, it may be appropriate to develop a new network of community promoters supervised by local physicians. Prior to establishing a delivery system in these barrios, further research on existing infrastructure will be necessary. Also, the movement of people outside their neighborhood in search of providers must also be

investigated. If people have an established pattern of utilizing providers in the center of town, for example, they may not seek care from a neighborhood provider.

VIII. FINANCING PRIMARY HEALTH CARE SERVICES

VIII.1 INTRODUCTION.

Community financing of primary health care services in developing countries is difficult to design and plan. Stinson (25) and more recently Ferranti (26) have reviewed the community based mechanisms for financing primary health care services. Both agree that people are more willing to pay for curative services than for preventive. This fact poses a conflict for health planners who want to develop what people are willing to pay for, while at the same time creating strong preventive health programs which are more cost effective over the long term.

In a study of 72 community health projects in Africa, Latin America and Asia, Stinson identified eight principle community financing mechanisms for primary health care. These were: fee for service; drug sales; personal prepayment; production-based prepayment; income generation; community labor; individual labor; donations and ad hoc assessments; and festivals and raffles. It should be noted that training, supervisory and logistical support, and referral backup are generally financed through extra-community sources (27). He found that the most common forms of community contributions to health services were voluntary labor and direct personal payments, both of which have limited utility (28). The former usually supports construction of a facility or other "one time" costs, while the latter generally contributes to health worker compensation and/or revolving drug supplies. Neither is generally used to support

the costs of health education and other preventive activities. Both Ferranti and Stinson argue that direct personal payments and fee for service place the burden on the sick and can limit access to those who can afford to pay. Ferranti argues that risk sharing mechanisms which spread the costs of health services across all members of the community are more equitable. Furthermore, argues Ferranti, coverage charges may even be assessed on a graduated scale with respect to income, perhaps including exemptions, or at least reduced fees, for the poor (29). One potential problem with many risk sharing schemes, however, is the lack of disincentives to overutilize services. That is, since people do not pay on a fee-for-service basis, they are likely to utilize services with inflated frequency (30). In summary, a combination of fee-for-service and risksharing schemes may be best.

The household questionnaire provides some information which can be used to study possible community financing mechanisms. First, Table Sixteen shows the preferred payment scheme as reported by the head of household. The interviewer asked the respondent (head of household) whom he felt was responsible for providing health services in the community. The percentage frequency distribution was:

TABLE SIXTEEN
 PREFERRED PAYMENT SCHEME AS REPORTED
 BY THE HEAD OF HOUSEHOLD,
 SAN JULIAN, MINEROS, SANTA CRUZ

PROVIDER	San Julian	Mineros	Santa Cruz
1. Government	58.8%	51.1%	63.5%
2. Cooperative	12.0	15.3	2.6
3. Unions	5.2	3.6	1.7
4. Churches	0.4	1.3	0.6
5. Community or family	2.1	17.0	25.3
6. Other	2.2	9.4	3.7
7. Don't know	0.0	2.3	2.8

In each area, a majority of the respondents feels that the government should provide services. In Santa Cruz, 25% felt that the community/families should provide services, while that figure was 17% in Mineros and only 2.1% in San Julian.

Table Seventeen below compares the response to ideal payment mechanism. In strong contrast to ideal provider, these data indicate that a majority of households feel it is the family's or the community's responsibility to pay for health services: 51.3% in San Julian; 57.6% in Mineros; and 61.0% in Santa Cruz.

TABLE SEVENTEEN

PREFERRED PAYMENT MECHANISM
AS REPORTED BY HEAD OF HOUSEHOLD,
SAN JULIAN, MINEROS, SANTA CRUZ

PAYMENT	San Julian	Mineros	Santa Cruz
1. Government	39.0%	30.9%	33.2%
2. Cooperative	6.4	5.1	1.5
3. Unions	0.7	1.7	0.2
4. Churches	0.0	1.1	0.0
5. Community	27.3	28.9	44.2
6. Each family	24.0	28.7	17.8
7. Other	0.0	1.1	0.9
8. Don't know	2.2	2.6	2.2

While it is informative to understand the preferred, or ideal, delivery scheme (provider and payment mechanism) in each area, it is perhaps more useful to examine what financing schemes people in these areas are willing to support. Table Eighteen compares 12 types of community or individual payment mechanisms studied by FIDES in the household survey. The percentages reported reflect those who would be willing to support the mechanism:

TABLE EIGHTEEN

HEAD OF HOUSEHOLDS' SUPPORT FOR
VARIOUS PRIMARY HEALTH CARE FINANCING MECHANISMS,
SAN JULIAN, MINEROS, SANTA CRUZ +

MECHANISM	San Julian	Mineros	Santa Cruz
1. Installments	31.8%	36.4%	19.6%
2. Fee-for-service	9.4	11.5	9.4
3. Long term credit	12.7	20.0	45.7
4. Annual dues	34.8	26.0	21.7
5. Payment in kind	25.5	22.1	7.7
6. Raffles	18.0	12.6	17.2
7. Crops	43.4	14.3	2.9
8. Labor	11.6	9.6	9.7
9. Taxes	0.0	4.3	4.0
10. On credit	19.1	11.7	8.4
11. Coop discount	4.5	8.5	2.4
12. Coop dividends	12.7	4.0	2.6
13. None	3.0	1.5	1.3

+ Percentages for each area total more than 100% because respondents were asked to select all schemes which they would be willing to support.

In San Julian, the most popular financing mechanisms were crops, annual fees, and installments. In Mineros, they were installments, annual fees and payments in kind. In Santa Cruz,

long term credit was overwhelmingly the most popular, followed by annual fees and installments. The percentage of respondents unwilling to support any of the schemes was very low in each area: 3% in San Julian, 1.5% in Mineros and 1.3% in the city of Santa Cruz.

While it seems clear that people in each of the survey areas are willing to contribute to the financing of health services, a combination of mechanisms is indicated since no one mechanism is supported by a majority of residents. Furthermore, by combining techniques, it is possible to encourage risksharing while at the same time reducing potential overutilization. Based on the research of Stinson and Ferranti, the advantages and disadvantages of eight schemes are summarized in Table Nineteen.

The 12 mechanisms which FIDES analyzed can be recategorized according to Stinson as follows:

FIDES	STINSON
1. Installments	Personal prepayment
2. Fee-for-service	Fee for service; drug sales
3. Long term credit	Personal prepayment
4. 1/year	Personal prepayment
5. Payment in kind	Personal prepayment; fees
6. Raffles	Raffles
7. Crops	Production based prepayment
8. Labor	Community labor; income generation; individual labor

TABLE NINETEEN

OVERALL EVALUATION OF COMMUNITY FINANCE ALTERNATIVES

Methods	Strengths	Weaknesses	Appropriate Uses	Supplemental Needs	Common Problems
Fee for service	Familiarity; may draw current private spending into public sector	Mostly supports curative services for those who can afford to pay; no risk sharing	Payment of health workers if moderated by sliding scale	Support for preventive and community work	Many are reluctant to pay admittally trained community worker when traditional or private practitioner is available
Drug sales	Reduces drug costs through use of unpaid labor and emphasis on limited range of essential drugs	Supports mainly curative care for those who can afford to pay; no risk sharing	Coverage of in-country drug costs	Help for the poor; foreign exchange for imports; support for preventive and community work	Supply interruptions; "decapitalization"; black marketing
Personal prepayment	Spreads health costs between the healthy and the sick	People often reluctant to pay for health care, except when specifically required	Prepayment of fixed costs, if adjusted for family income	Back-up funds may be needed for cost overruns	Many people prefer service fees when given the option; adverse selection
Production-based	Bases financing on existing economic unit	Available for limited population groups (except where production is communal)	Appropriate for employed persons or for cooperative or communal production	Support for substance groups	Especially subject to economic forces
Income generation	Allows community labor to be used for recurrent costs	Start-up costs may be especially high	Most appropriate for multisectoral (especially FVO) projects	Back-up funds	Especially subject to economic forces
Community labor	Uses an abundant resource	Only seasonally available and only for one-time costs	Appropriate for facility construction and maintenance	Support for recurrent costs	Community loses interest if government does not provide expected inputs
Individual labor	Uses an abundant resource	Generally available only part-time; high turnover may raise training costs	Mainly for part-time and supplemental health activities	Referral links for all but simple problems	May be unavailable when needed
Donations and ad hoc assessments	May use readily available local materials; donations allow people to contribute according to ability	Limited utility, mainly for one-time costs	Purchase of equipment or initial drug supply	Support for recurrent costs	May be difficult to motivate
Festivals, raffles, etc.	People may "enjoy" paying	Limited utility, mainly for one-time costs; low efficiency	Purchase of equipment or initial drug supply; capital construction in some countries	Support for recurrent costs	

Source: Stinson (1982).

C

Taxes and the three cooperative schemes (credit, discounts, and dividends) are not easily recoded into Stinson's schema. The only one of Stinson's mechanisms not included in the FIDES questionnaire was "donations," which as suggested above have limited utility since they generally only cover one time costs.

VIII.2. HEALTH EXPENDITURES.

The household survey gathered information on the amount spent on each illness for provider fees and drug purchases. For each area the average amounts spent by those reporting illness and the per capita expenditure are reported below (Table Twenty). All figures are for the two week recall period prior to the survey.

TABLE TWENTY

AVERAGE TWO WEEK EXPENDITURE FOR FEES AND DRUGS

	Fees	Drugs	Total
A. San Julian			
1. Per episode	\$0.69	\$3.95	\$4.64
2. Per capita	0.09	0.52	0.61
B. Rural Mineros			
1. Per episode	0.28	2.92	3.20
2. Per capita	0.06	0.62	0.68
C. Urban Mineros			
1. Per episode	0.52	4.31	4.83
2. Per capita	0.08	0.64	0.72
D. Santa Cruz			
1. Per episode	1.13	3.25	4.38
2. Per capita	0.13	0.38	0.51

Based on these figures, the annual per capita expenditures in the three areas were calculated as follows (Table Twenty-One):

TABLE TWENTY-ONE
AVERAGE ANNUAL PER CAPITA
EXPENDITURES FOR FEES AND DRUGS

	Fees	Drugs	Total
San Julian	\$2.34	\$13.52	\$15.86
Rural Mineros	1.56	16.12	17.68
Urban Mineros	2.08	16.64	18.72
Santa Cruz	3.38	9.88	13.26

These dollar amounts give some indication of how much money is presently being spent on curative health services. Planners should use these data with caution since the economic situation is so inflationary. The dollar amounts were calculated from the peso amounts reported by converting at the average monthly exchange rate for the month surveyed.

VIII.3. FINANCING MECHANISMS.

It is recommended that a combination of financing strategies be implemented in each of the areas. Fee for services and drug sales are two common ways to finance curative services. Fee for service is one way to provide compensation for community health workers. The sale of drugs, if well managed, can make a small profit and does make needed medicines accessible to remote communities. The FIDES pharmacy which sells drugs twice per

month in the San Julian zone does operate at cost and channels otherwise unavailable drugs into the zone. Drug sales also give planners greater control over what is sold, allowing the curative services to focus on what promoters are trained to treat.

The strongest rationale in support of fees and drug sales is that they do tend to inhibit excessive utilization. At the same time, however, Stinson and Ferranti argue that these mechanisms may exclude the poorer members of communities who cannot afford to pay. A graduated scale might be developed in accordance with ability to pay.

In Bolivia, setting prices in a highly inflationary setting is the primary problem. The prices of most goods sold in local markets change daily, and it might be difficult for community health workers to adjust prices so frequently. In addition, health workers may not benefit from cash compensation if they cannot purchase foodstuffs or durable goods immediately. Likewise, it will be difficult to maximize the cash received from drug sales. If community health workers or local pharmacies wait even two to three days to restock inventories, they may not be able to replenish the stock without suffering a loss. In addition, as demonstrated in the Montero rural health program, drug supplies are frequently unreliable, reducing the overall utility of drug sales (31).

Given the economic crisis which Bolivia suffers, direct cash outlays for services and drugs should be complemented by other financing schemes. Attention should be paid to risk sharing.

Based on the household surveys, personal prepayment mechanisms should be the focus of financing. They were generally the most popular and they do spread the risks across the community. Perhaps the amount of the prepayment could be scaled according to ability to pay. In San Julian the popular schemes included one time annual payments, installment plans, crops, and payment in kind. In Mineros, installments, payments in kind, and one time fees were popular. Santa Cruz households favored long term credit, one time annual payments, and installments.

Regardless of the particular combination of financing schemes in each area, all goods and monies should be converted into durable goods immediately. Because of Bolivia's unprecedented inflation rates, it represents a challenge for any community financing plan.

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APPENDIX A

**Area Maps of
San Julian, Mineros, and Santa Cruz**

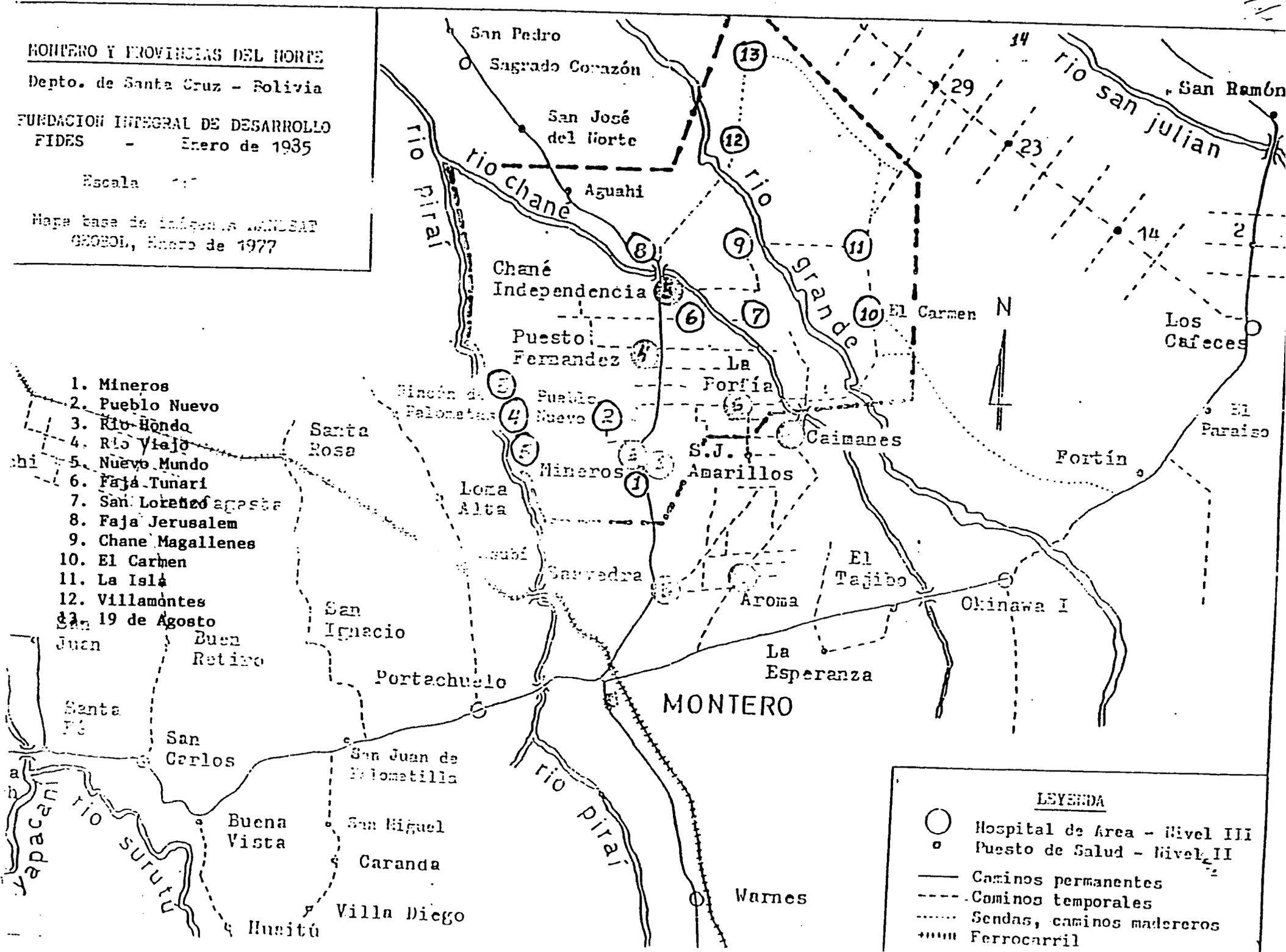
MONTERO Y PROVINCIAS DEL NORTE

Depto. de Santa Cruz - Bolivia

FUNDACION INTEGRAL DE DESARROLLO
FIDES - Enero de 1935

Escala 1:100,000

Mapa base de la Ing. A. GARCIA
GEOBOL, Enero de 1977



1. Mineros
2. Pueblo Nuevo
3. Rio Hondo
4. Rio Viejo
5. Nuevo Mundo
6. Faja Tunari
7. San Lorenzo
8. Faja Jerusalem
9. Chane Magallenes
10. El Carmen
11. La Isla
12. Villamontes
13. 19 de Agosto

LEYENDA

- Hospital de Area - Nivel III
- Puesto de Salud - Nivel II
- Caminos permanentes
- - - Caminos temporales
- Sendas, caminos madereros
- ▬ Ferrocarril

APPENDIX B

**Signs and Symptoms of Illness
Contained in the Household Survey Instrument,
San Julian, Mineros, and Santa Cruz**

SIGNS AND SYMPTOMS OF ILLNESS
CONTAINED IN THE HOUSEHOLD SURVEY INSTRUMENT,
SAN JULIAN, MINEROS AND SANTA CRUZ

1. Respiratory: respiratory diseases; tuberculosis
2. Gastrointestinal: non-specific diarrhea; other gastrointestinal and parasitic diseases
3. Nutritional: nutritional deficiencies and anemias
4. Eye, ear, nose and throat: inflammation of the eye; diseases of the ear; mouth, throat and nose infections
5. Dental: dental diseases/problems
6. Skin: skin infections
7. Trauma: fractures; burns; wounds and light trauma; animal, snake and insect bites; other lesions and traumas
8. Pregnancy-related: pregnancy complications; abortion, stillbirth
9. Ill-defined: malaria; congenital problems; other specific diseases; surgery; ill-defined; other