



FOUNDATION FOR INTERNATIONAL  
MEDICAL RELIEF OF CHILDREN

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# Estimating Health Risks

*An Initial Report of a Survey of Four Communities in Tola,  
Rivas, Nicaragua.*



Project Duration: June 8, 2009 - August 1, 2009  
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*ONE VISION... MANY PATHS... A CELEBRATION OF HUMANITY.*

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## Executive Summary

The four communities most served by the Roberto Clemente Santa Ana Health Clinic (Limón I, Limón II, Cuascoto Asentamiento and Cuascoto Adentro) were surveyed in order to gain a better understanding of the population and their needs. A census with five modules was administered via house visits as a means to obtain data on these populations (See Appendix A). Data was collected and analyzed on 119 households, 667 individuals, 60 children under the age of 5, 164 women aged 15-50, and 105 mothers to age 50. Also, 144 responses to questions regarding local health services were gathered.

## Background to the Survey

FIMRC's mission is to provide access to medical care for the millions of underprivileged and medically underserved children around the world. FIMRC began efforts in Nicaragua in 2009 through a formal partnership with the Roberto Clemente Santa Ana Health Clinic. The purpose of this survey is to assess the needs of the communities served by the clinic so that FIMRC can further focus its efforts there.

## Methodology

119 of 120 target households between the four communities were surveyed. The sample size of each community was based on population data obtained from the local government health clinics. 34 houses were surveyed from Limón I (total population = 408), 41 households from Limón II (total population = 507), 23 houses from Cuascoto Asentamiento (total population = 269) and 21 houses from Cuascoto Adentro (total population = 263). All houses in each community were mapped and assigned numbers before the sample households were selected using an online random number generator.

Two statistical packages for the PC, WHOanthro and XLStatistics, were used for the analysis of the data. HAZ, WHZ, WAZ and BMI were calculated by WHOanthro from the survey data spreadsheets. Descriptive statistics were generated using XLStatistics. An Excel spreadsheet containing the collected data is stored at the Roberto Clemente Santa Ana Health Clinic and at FIMRC headquarters. Copies of the data are available on request from FIMRC.

## Ethics and Confidentiality

All respondents were informed of the purpose of the census and verbally agreed to participate.

The names of the people from which the data was extracted have been withheld from publication in this report. The censuses that do include the names of the respondents are filed as confidential documents at the Roberto Clemente Santa Ana Health Clinic.

It is intended that the information contained in this report, and the data on which it is based, be forwarded to national and international agencies and organizations with an interest in child welfare.

## Major findings

Analysis of the data suggests that poor nutrition, failure to access health services, kidney-related problems, blood pressure problems and respiratory problems are the most pressing health issues facing these populations.

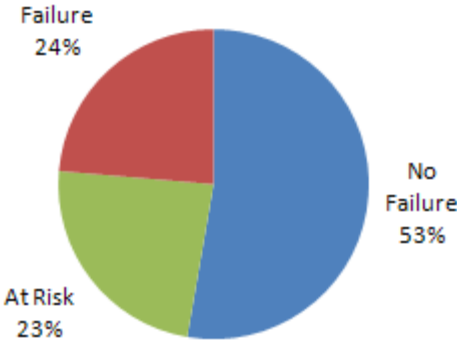
### Children's Nutritional Status

When the growth performance measures of children in the FIMRC study area aged 0-5 years old are compared to national figures from the World Health Organization database on Nicaragua (See Appendix B) there are several areas of concern (Table 1).

Measure	WHO Survey		FIMRC Survey		
	Males	Females	Males	Females	
WAZ	14.10	9.70	9.00	12.00	Underweight
WHZ	4.00	2.20	9.00	9.00	Wasted
HAZ	55.30	38.00	13.00	17.00	Stunted
BMI	3.50	2.70	8.00	8.00	Underweight

**Table 1**

Furthermore, according to a composite index of anthropometric failure (CIAF), an alarming 24% of the children in the sample are experiencing one or more of the indicators for anthropometric failure and another 23% are at risk for failure (Figure 1). See Appendices C and D.



**Figure 1**

**Women’s Health**

There is a complete failure to access women’s health services. The vast majority of women do not visit gynecologists, have pap smears or self-examine for breast irregularities. At present, the specific reasons for this are not clear.

**Principal Reported Illnesses**

The most commonly reported health issue by respondents was kidney problems. The most commonly reported health problems for children aged 0-5 were the flu, colds and parasites.

The reported illness information is consistent with the most common diagnoses made at the Roberto Clemente Santa Ana Health Clinic where respiratory infections (which can cause cold and flulike symptoms), urinary tract infections (which can cause kidney pain) and parasites top the list of illnesses treated by clinic staff (See Appendix E).

**Health Services**

The cost of a consultation (\$1.00) at the Roberto Clemente Santa Ana Health Clinic is not common knowledge among community members. This lack of communication between the community and the clinic presents an obstacle to people utilizing its services.

## Statistical Description of the Survey

This section describes the survey sample along a number of dimensions of interest in the current project. The following generalizations are made on the basis of the statistical data and are thus often vague. Future research should include more focused and in depth, open-ended interviews in order to elicit more detailed information.

### Population

Figure 2 shows a general population pyramid by sex for all 4 communities combined. The largest age group (175 people) is between 10.8 and 20.6 years old. The general shape of the pyramid suggests a growing population.

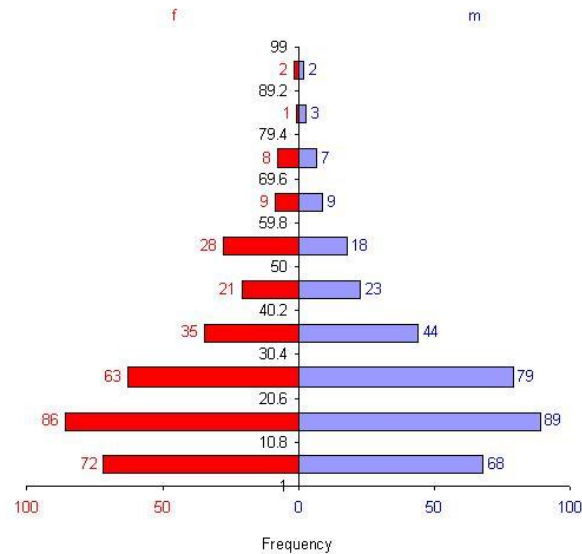


Figure 2

Figure 3 shows a bar graph for households that are experiencing overcrowding, defined as 3 or more people sleeping in a single room. 46% of the households sampled are overcrowded, a characteristic that can have serious implications for the health of populations.

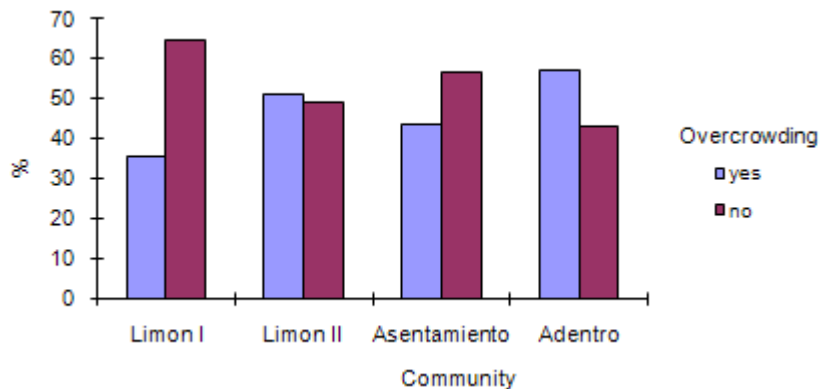


Figure 3

## Household Income

There are significant differences between the communities in terms of reported monthly cash income (See Figure 4). While there is overlap between the communities when viewed as ordered in 3, it is clear that Limón I has roughly twice the monthly cash income per household than is seen in Adentro.

Animals are a constant feature of the surveyed communities; animals provide significant subsistence and can be used as economic resources but also may be vectors of disease and can cause other health concerns. The most common animals in the survey area are chickens, pigs and cattle. Figure 5 shows the number of medium and large animals (pigs, cattle, horses) per household by community. Interestingly, there appears to be an inverse relationship between household cash income and animal resources.

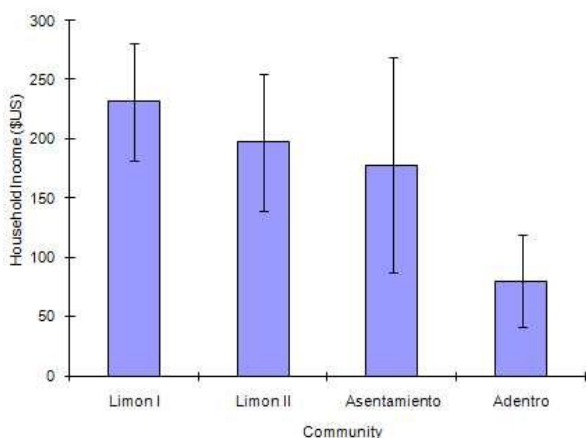


Figure 4

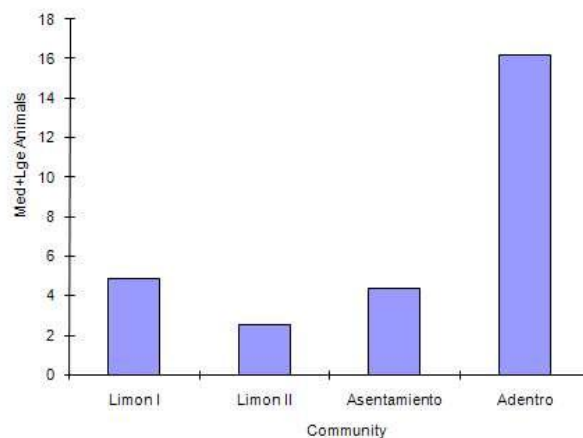


Figure 5

## Children's Nutritional Status

Anthropometric measures were defined, based on reference data from the National Center for Health Statistics (NCHS) and World Health Organization (WHO). Standard measures, that can be accomplished quickly by trained, non-medical staff and used in this report include:

- ❖ Height-for-age (HAZ): used to measure long-term faltering in growth, referred to as stunted if less than -2 z-score
- ❖ Weight-for-age (WAZ): used as a measure of both linear growth and body proportion, referred to as underweight if less than -2 z-score
- ❖ Weight-for-height (WHZ): used to estimate evidence of acute growth disturbances, referred to as wasted if less than -2 z-score
- ❖ Body Mass Index (BMI): used as a tool to estimate a healthy body weight based on how tall a person is
- ❖ Composite Index for Anthropometric Failure (CIAF): the only measure that provides a single, aggregated figure of the number of undernourished children in a population<sup>1</sup> (See Appendix D).

Figure 6 shows the weight-for-age (WAZ) results in comparison to WHO standards for children 0-5 years old. 12% of females and 9% of males were identified as underweight.

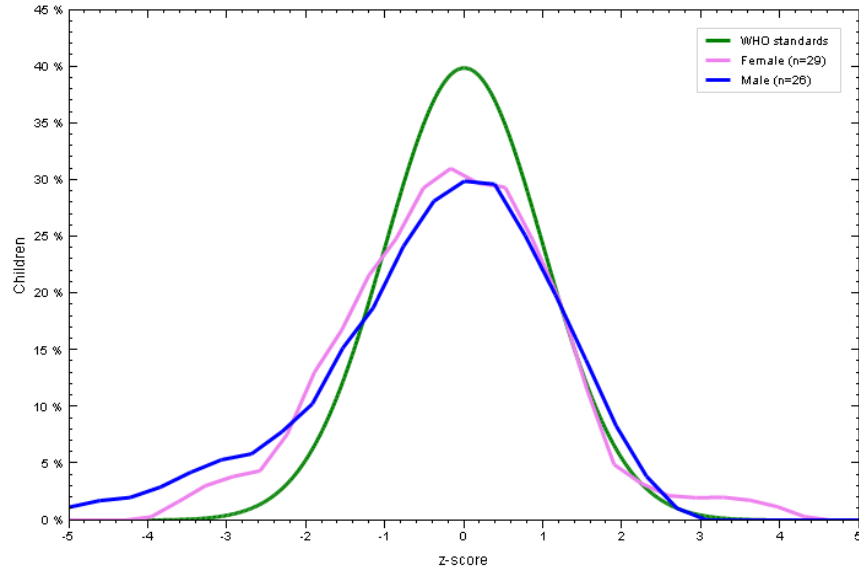


Figure 6

Figure 7 shows the weight-for-height (WHZ) results of the children surveyed in comparison with WHO standards. 9% of both males and females were identified as wasted.

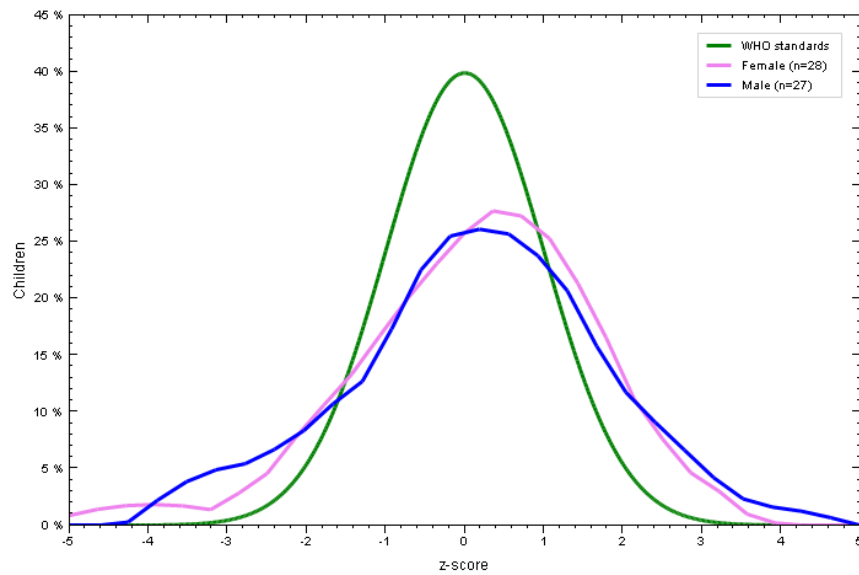


Figure 7

Figure 8 shows the height-for-age (HAZ) results of the children surveyed in comparison with WHO standards. 13% of males and 17% of females were identified as stunted.

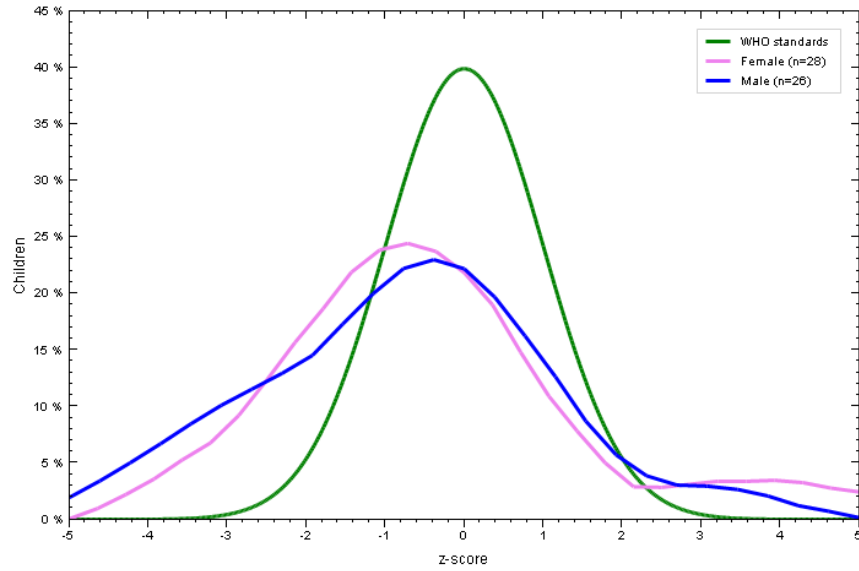


Figure 8

Figure 9 shows the body mass index (BMI) results of the children surveyed in comparison with WHO standards. 8% of both males and females were identified as being underweight. It is important to note that 13% of both males and females classified as overweight. *[O]besity (30 kg/m<sup>2</sup>) is a serious public health problem in Latin America...*<sup>2</sup>

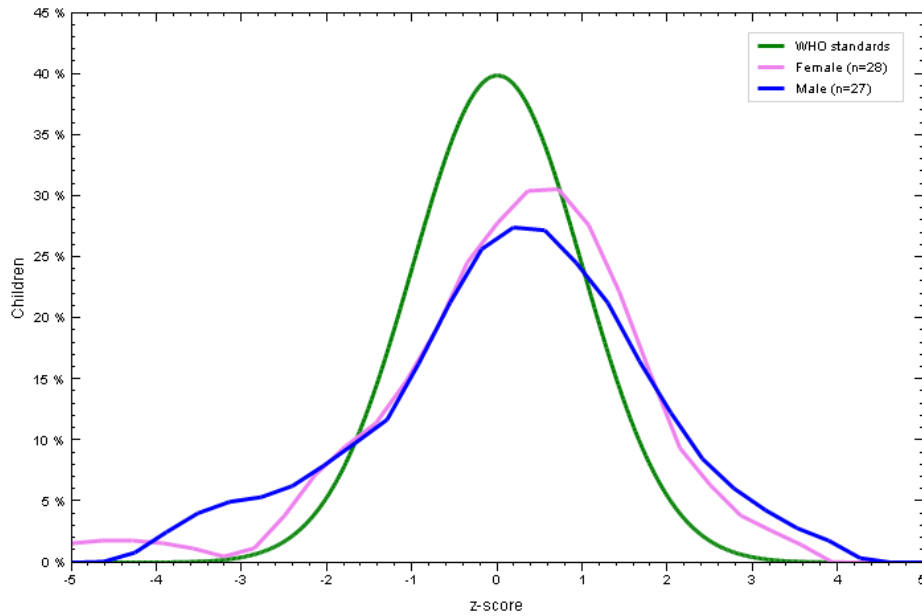


Figure 9

The following table illustrates the CIAF classifications of the children in the sample.<sup>3</sup>

Group	Number of Children	%
A (no failure)	42	76.4
B (wasting only)	2	3.6
C (wasting and underweight)	2	3.6
D (wasting, stunting, and underweight)	0	0
E (stunting and underweight)	3	5.5
F (stunting only)	6	10.9
G (underweight only)	0	0
<b>Total</b>	<b>55</b>	<b>100%</b>

Table 2

### Women's Health

Women in the region do not avail themselves regularly of medical services specifically related to women's health. Most women report never having visited a gynecologist (See Figure 10)

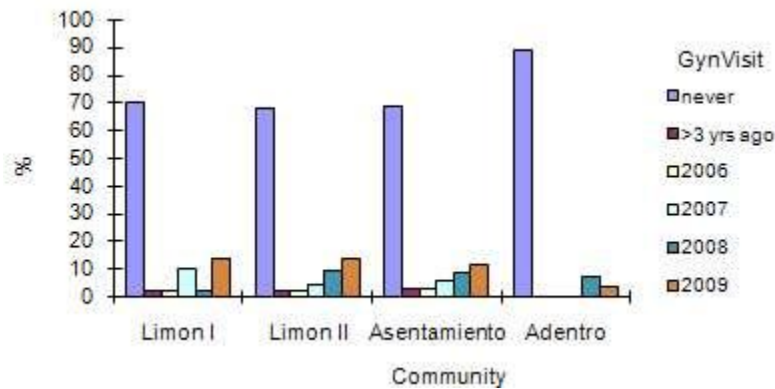


Figure 10

Unfortunately, a similar observation may be made regarding women who have had a pap smear (See Figure 11). More than half of the surveyed women have never had this test.

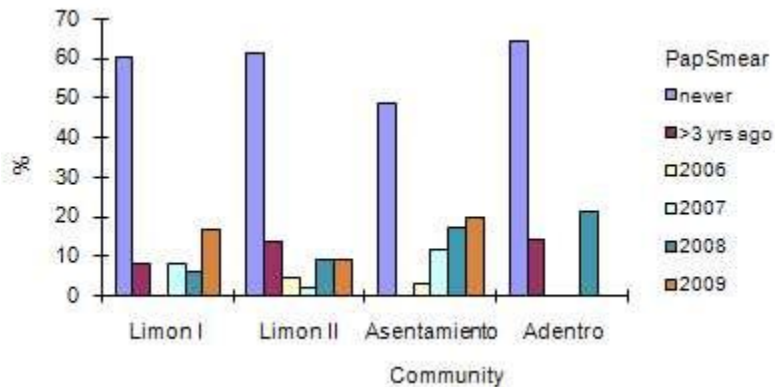


Figure 11

A comparable, even worse, pattern exists for breast self examination (See Figure 12). More than three quarters of the women never examine themselves.

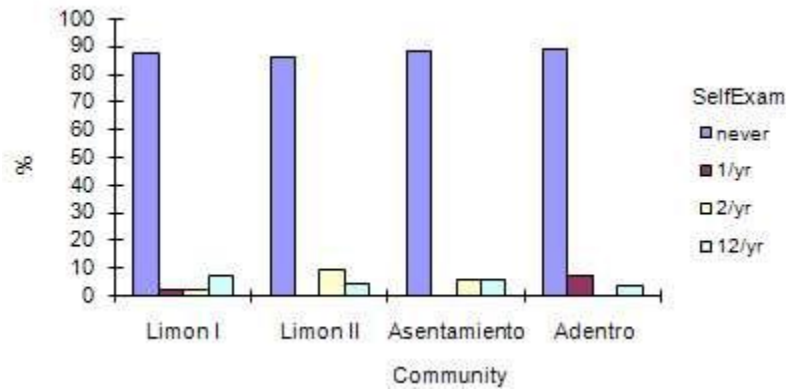


Figure 12

### Reported Illnesses

Information regarding the health problems present among the sample population was obtained by asking the respondent (typically, the head of household) which illnesses household members were currently experiencing. As such, only a rough correspondence between actual illness and reported illness can be assumed. Diagnoses made at the Roberto Clemente Santa Ana Health Clinic from January-June 2009 are available for comparison in Appendix E.

At least one health problem was reported for 64% of the 667 individuals in the sample (See Table 3).

Reported Illness				
Community	All	No	Yes	% Yes
Limon I	182	59	123	68%
Limon II	225	70	155	69%
Asentamiento	133	49	84	63%
Adentro	127	63	64	50%
<b>TOTALS</b>	<b>667</b>	<b>241</b>	<b>426</b>	<b>64%</b>

Table 3

Table 4 shows the top eleven most commonly reported illnesses broken down by age group. See Appendix F for the complete table.

Reported Illness	Age Group												Totals
	0 to 1 (n=11)	1 to 5 (n=46)	0 to 5 (n=57)	5 to 9 (n=60)	9 to 18 (n=142)	18 to 25 (n=138)	25 to 35 (n=90)	35 to 50 (n=93)	50 to 60 (n=46)	60 to 70 (n=18)	70 to 80 (n=15)	80+ (n=8)	
Kidney problems	0	3	3	4	12	27	32	28	19	9	3	0	137
Blood pressure	0	0	0	0	4	4	6	20	12	5	6	3	60
Headaches	0	0	0	2	18	10	14	6	3	0	2	0	55
Gastritis	0	0	0	0	3	12	5	2	6	3	1	1	33
Fever	2	4	6	5	10	6	2	2	2	0	0	0	33
Cold	3	4	7	8	7	5	3	0	3	0	0	0	33

Parasites	1	6	7	7	8	0	0	1	0	0	0	0	23
Flu	1	7	8	5	4	3	1	0	0	0	0	0	21
Asthma	1	2	3	0	5	5	1	2	0	1	1	0	18
Arthritis	0	0	0	0	0	0	0	3	3	4	5	1	16
Allergies	0	2	2	2	1	1	3	2	4	0	1	0	16

Table 4

### Health Services

People in the area receive primary healthcare from three clinics. The Cuascoto and Salinas clinics are free governmental facilities and the Roberto Clemente Santa Ana Health Clinic is a non-governmental, non-profit organization that requires a \$1.00 donation per consultation from their patients. Exoneration from this fee is possible under special circumstances.

In order to gauge community awareness of healthcare costs, respondents were asked what the cost of a consultation was at each of these clinics.

It is clear in Figure 13 that the majority of the respondents are aware that healthcare was provided free of charge at the governmental clinics. The variety in responses regarding consultation cost at the Roberto Clemente Santa Ana Health Clinic suggests that the population is not aware of the cost per consultation.

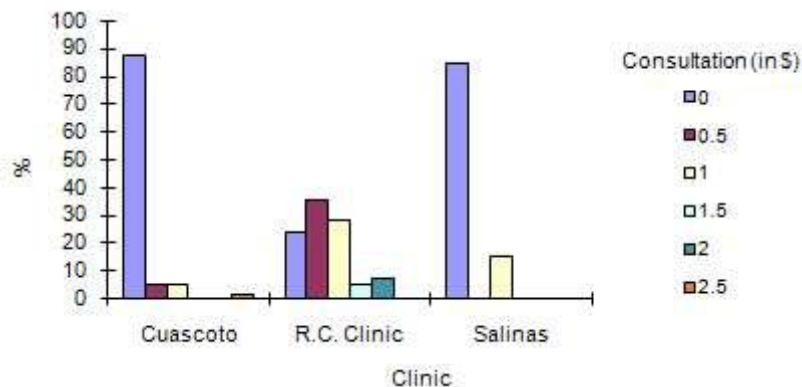


Figure 13

### Conclusions and Recommendations

The communities surveyed represent an opportunity for continued FIMRC intervention, particularly in the areas of children’s and women’s health. Because the population lacks economic resources, particularly Cuascoto Adentro, it is recommended that free prevention-based pediatric care be offered to children at the Roberto Clemente Santa Ana Health Clinic. Scheduled periodic wellness visits to monitor children’s health status that include an education component and complimentary healthcare services for the accompanying caregiver (more than likely mothers) would improve both children’s and women’s health.

While it is widely assumed that poor quality drinking water and poor diet are the primary causes of the principal illnesses this population is experiencing, further research into the conditions that produce these illnesses is required.

Continued efforts toward educating the communities about the payment policies of the Roberto Clemente Santa Ana Health Clinic are necessary in order to increase the utilization of the clinic by the surrounding communities.

It is imperative that this report be translated to Spanish and distributed to the local ministry of health, the World Health Organization and other organizations present in Nicaragua that focus on children.

## Acknowledgements

The following people were indispensable in gathering and compiling the information for this report: Sarah Cairo, Dr. William Macdonald, Maya Furman, Benjamin Williams, FIMRC volunteers, Jocelyn Wagman (The Foundation for Sustainable Development), Dr. Julio Flores, and the staff at the Cuascoto Health Clinic. Without the patience, willingness and interest on the part of the residents of Limón I, Limón II, Cuascoto Asentamiento and Cuascoto Adentro this study would not have been possible.

The statistical software that allowed for the analysis of the collected data can be found at the following URLs:

- ❖ XLStat: <http://www.deakin.edu.au/~rodneyc/XLStatistics>
- ❖ WHO Anthro for personal computers, version 3, 2009: Software for assessing growth and development of the world's children. Geneva: WHO, 2009, available from: <http://www.who.int/childgrowth/software/en/>

## Appendix A. Census

Community: \_\_\_\_\_

Sector: \_\_\_\_\_

Family Number: \_\_\_\_\_

Conducted by: \_\_\_\_\_

Census Date: \_\_\_\_\_

1. No.	2. Name	3. Role	4. Date of Birth	5. Age	6. Sex

1. No.	7. Education	8. Profession	9. Risk Factors/Illnesses

HYGENIC/SANITARY CHARACTERISTICS				
10. Number of Rooms People Sleep In	15. Domestic Animals		17. Accident Risk	20. Environmental Factors
	Chickens		Imminent	
11. Cooking Fuel	Pigs		Risky	
	Cows		Occasional Risk	
12. Indoor?	Dogs		Fairly Safe	
	Cats		Safe	
13. Water Storage	Horses		18. Garbage Deposit	
	Other			
14. Water Sources	16. Water Treated? How?		19. Electricity	21. Excrement Deposit

SOCIOECONOMIC FACTORS					
22. Structural Characteristics			23. Sanitary Culture	24. Avg. Monthly Income	25. Satisfaction of Basic Needs
a. Floor	b. Walls	c. Roof			

FAMILY FUNCTION
26. Present Crises
27. Observations

**MODULE A. CHILDREN 5 YEARS AND YOUNGER**

1. No.	2. Ht.	3. Wt.	4. How many times per day?							5. How many times has child been to the Dx this year?	6. Last visit to Dx/Why?	7. Does child have a vaccine card?
			a. Breastfed	b. Formula	c. Meat	d. Rice	e. Beans	f. Fruit	g. Dairy			

**MODULE B. WOMEN 16 YEARS AND OLDER**

1. No.	2. Date of last visit to gynecologist	3. Date of last pap smear	4. Date of last dental visit	5. How often do you give yourself breast exams?				
				1x/week	1x/month	Every 6 months	1x/year	Never
				1x/week	1x/month	Every 6 months	1x/year	Never
				1x/week	1x/month	Every 6 months	1x/year	Never
				1x/week	1x/month	Every 6 months	1x/year	Never
				1x/week	1x/month	Every 6 months	1x/year	Never
				1x/week	1x/month	Every 6 months	1x/year	Never

**MODULE C. MOTHERS**

1. How did you learn to breastfeed?	
2. Until what age should a baby receive <i>only</i> breast milk?	
3. Which methods of birth control are you aware of?	

**MODULE D. HEALTH SERVICES**

1. What is the closest health facility?	
2. How long does it take you to get to this facility?	
3. What is the estimated total cost of a visit to this facility?	
4. For any visits listed in Module A. question 6, describe perceived effectiveness of treatment.	

## Appendix B. National Growth Performance Statistics

Rural Nicaragua WHO global database

Sex	Age from	Age to	Sample size	Percentage below/above median													
				Wgt / Age		Hgt / Age		Weight / Height					BMI / Age				
				-3sd	-2sd	-3sd	-2sd	-3sd	-2sd	+1sd	+2sd	+3sd	-3sd	-2sd	+1sd	+2sd	+3sd
	0	5	1711	2.2	11.9	16.1	39.2	1.2	2.8	21.1	5.4	1.2	0.9	2.6	27	7.2	1.5
M	0	5	1693	2.1	10.2	12.7	31.4	1.4	3	22.4	5.8	1.2	1.1	3	28.3	7.6	1.6
M	0	0.49	188	4.3	9	5.4	14.6	4.9	10.9	14.2	7.1	2.7	3.3	12.5	11.4	4.9	2.2
M	0.5	0.99	189	4.8	15.3	9.9	21	4.8	7	24.7	7.5	1.1	4.3	6.5	24.2	7	1.6
M	1	1.99	315	1.6	8.3	11.2	31	0.3	2.3	24.4	5.5	0.6	0.6	2.6	34.7	10	1.3
M	2	2.99	313	1.3	12.8	16.7	39.2	0.6	1	22.3	6.8	1.6	0.3	1	34.1	10.4	1.6
M	3	3.99	355	1.7	8.7	14.5	36.2	0.6	1.4	26.2	6.8	1.7	0.6	1.1	33.1	9.3	2.5
M	4	5	333	1.2	9	14.1	34.5	0	0.9	19.8	2.4	0	0	0.3	23.7	3	0.3
F	0	5	1654	1.8	8.9	10.2	27.8	0.4	1.8	21.9	5.5	1.2	0.5	2.2	25.8	6.8	1.3
F	0	0.49	148	2	11.5	2	12.9	2.1	6.2	19.2	7.5	1.4	1.4	8.8	16.2	6.8	1.4
F	0.5	0.99	181	3.3	6.1	4.5	16.8	1.7	2.8	16.8	3.9	0	1.7	3.9	17.3	3.9	0
F	1	1.99	344	0.9	6.4	9.1	25.6	0.3	2.3	25.5	5.9	1.5	0.3	2.1	32.6	9.4	2.3
F	2	2.99	348	2.3	8.3	12.9	33.3	0	1.2	23.5	5.5	1.2	0.9	1.5	30.8	7.6	1.2
F	3	3.99	324	1.9	9.6	11.3	31.3	0	0.6	23.4	5.6	0.9	0	0.9	28.7	7.2	0.9
F	4	5	309	1	12.3	14.6	34.1	0	0.3	19.1	5.2	1.6	0	0.3	19.4	4.5	1.6

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## Appendix C. Children's Growth Performance from Sample

Children highlighted in grey are experiencing anthropometric failure (less than -2 z-score). Children highlighted in blue are at risk for failure (less than -1 z-score).

FIMRC: Children used in sample calculations of WHZ, HAZ, WAZ, AND BAZ; sorted by Age								wasting	stunting	underweight	BMI	Appendix B
Survey date	Cluster	Sex	Date of birth	Age (d)	Age (m)	Weight (kg)	Height (cm)	WHZ	HAZ	WAZ	BAZ	Classification
6/10/2009	Asentamiento	Female	4/17/2009	54	1.77	6	62	-0.67	2.79	1.5	0.03	A
7/7/2009	Adentro	Male	4/9/2009	89	2.92	7	57.2	3.4	-1.97	0.87	2.8	A
7/10/2009	Asentamiento	Female	4/10/2009	91	2.99	5	53.3	2.08	-3.08	-1.23	0.8	F
7/7/2009	Adentro	Male	2/27/2009	130	4.27	13	83.8	1.75	9.25	6.02	0.87	A
6/18/2009	Limon I	Female	2/6/2009	132	4.34	7.5	60	2.55	-1.27	1.04	2.38	A
7/9/2009	Asentamiento	Female	11/3/2008	248	8.15	7	78.7	-3.94	4.11	-1.1	-4.46	B
6/15/2009	Limon I	Male	9/30/2008	258	8.48	9	70	0.8	-0.57	0.25	0.79	A
6/15/2009	Limon I	Male	9/30/2008	258	8.48	10	71	1.72	-0.12	1.23	1.71	A
7/6/2009	Asentamiento	Female	9/25/2008	284	9.33	7	67.5	-0.97	-1.27	-1.43	-0.95	A
6/16/2009	Limon I	Male	8/4/2008	316	10.38	7.5	65	0.38	-3.81	-1.92	0.53	F
6/25/2009	Limon II	Female	8/11/2008	318	10.45	10	73	1.42	0.38	1.23	1.39	A
7/3/2009	Limon II	Male	8/7/2008	330	10.84	7	71.1	-2.7	-1.4	-2.65	-2.61	C
6/16/2009	Limon I	Male	7/18/2008	333	10.94	9.5	72	0.82	-1.06	0.1	0.97	A
7/10/2009	Asentamiento	Male	7/22/2008	353	11.6	6	66	-2.83	-3.93	-4.07	-2.62	C
6/17/2009	Limon I	Female	4/21/2008	422	13.86	10	74	1.19	-0.83	0.54	1.38	A
6/15/2009	Limon I	Female	4/9/2008	432	14.19	7	70	-1.75	-2.45	-2.51	-1.4	E
7/7/2009	Adentro	Male	4/3/2008	460	15.11	9	73.7	-0.31	-2.19	-1.25	0.11	F
6/24/2009	Limon II	Male	12/22/2007	550	18.07	13	83	1.92	0.25	1.54	1.91	A
6/10/2009	Asentamiento	Male	12/1/2007	557	18.3	10.4	83.8	-0.93	0.46	-0.5	-1.1	A
6/30/2009	Limon II	Female	12/13/2007	565	18.56	11	81.3	0.66	0.01	0.49	0.68	A
7/9/2009	Asentamiento	Male	12/12/2007	575	18.89	11.8	76.2	2.23	-2.52	0.53	2.8	F
6/30/2009	Limon II	Female	11/25/2007	583	19.15	11	81.3	0.66	-0.19	0.4	0.71	A
7/13/2009	Limon II	Female	12/5/2007	586	19.25	10	79	0.12	-1	-0.39	0.28	A
6/10/2009	Asentamiento	Male	10/21/2007	598	19.65	11	93	-2.57	3.27	-0.22	-3.12	B
7/10/2009	Asentamiento	Male	10/2/2007	647	21.26	11	83	-0.05	-0.82	-0.47	0.06	A
6/25/2009	Limon I	Female	9/4/2007	660	21.68	11.5	84	0.52	-0.1	0.36	0.58	A
6/25/2009	Limon II	Female	8/5/2007	690	22.67	12	82	1.45	-1.02	0.55	1.61	A

7/14/2009	Adentro	Female	5/15/2007	791	25.99	18	103	1.17	4.67	3.15	0.95	A
7/7/2009	Adentro	Female	4/6/2007	823	27.04	13	88.9	0.55	0.17	0.56	0.62	A
7/10/2009	Asentamiento	Female	1/16/2007	906	29.77	11	83.8	-0.1	-1.9	-1.14	0.1	A
7/1/2009	Limon II	Female	12/2/2006	942	30.95	11	88.9	-1.35	-0.7	-1.29	-1.32	A
6/17/2009	Limon I	Female	8/23/2006	1029	33.81	13	82	2.13	-3.1	-0.26	2.49	F
7/6/2009	Limon I	Female	8/15/2006	1056	34.69	12	87	0.1	-1.9	-1	0.32	A
6/18/2009	Limon I	Female	7/10/2006	1074	35.29	12	92	-1.04	-0.68	-1.06	-1	A
6/25/2009	Limon II	Female	7/10/2006	1081	35.52	13	92	-0.12	-0.72	-0.44	-0.04	A
7/7/2009	Adentro	Male	6/26/2006	1107	36.37	15	98	0.15	0.45	0.33	0.02	A
6/24/2009	Limon II	Male	4/6/2006	1175	38.6	14	94	0.16	-0.98	-0.44	0.25	A
6/15/2009	Limon I	Male	2/19/2006	1212	39.82	17	108	-0.55	2.45	1.02	-0.77	A
7/1/2009	Limon II	Female	3/1/2006	1218	40.02	16	99.1	0.72	0.34	0.68	0.68	A
7/3/2009	Limon II	Male	3/2/2006	1219	40.05	11	86.4	-1.11	-3.16	-2.56	-0.63	E
7/3/2009	Limon II	Female	2/5/2006	1244	40.87	13	99.1	-1.6	0.19	-0.98	-1.75	A
6/17/2009	Limon I	Male	11/16/2005	1309	43.01	16	100	0.49	-0.11	0.25	0.45	A
7/14/2009	Adentro	Male	10/8/2005	1375	45.17	19	105	1.39	0.8	1.41	1.37	A
6/30/2009	Limon II	Female	8/31/2005	1399	45.96	16	101.6	0.21	0.02	0.14	0.16	A
7/7/2009	Adentro	Male	8/15/2005	1422	46.72	15.5	102.9	-0.53	0.07	-0.32	-0.59	A
6/24/2009	Limon II	Male	7/1/2005	1454	47.77	18	107	0.33	0.91	0.77	0.3	A
7/7/2009	Adentro	Male	7/9/2005	1459	47.93	15	101.6	-0.64	-0.4	-0.67	-0.66	A
6/18/2009	Limon I	Female	5/26/2005	1484	48.76	18	110	-0.35	1.57	0.74	-0.28	A
7/7/2009	Adentro	Male	5/10/2005	1519	49.91	14	92	0.58	-2.91	-1.37	0.92	F
7/14/2009	Adentro	Male	5/14/2005	1522	50	18	103	1.21	-0.34	0.59	1.22	A
6/30/2009	Limon II	Male	4/24/2005	1528	50.2	15	97.8	0.2	-1.58	-0.84	0.3	A
6/10/2009	Asentamiento	Male	11/3/2004	1680	55.2	16	108	-1.27	0.15	-0.7	-1.27	A
6/10/2009	Asentamiento	Female	10/1/2004	1713	56.28	18.5	105	1.04	-0.53	0.35	0.96	A
6/10/2009	Asentamiento	Female	10/1/2004	1713	56.28	12	95.3	-1.74	-2.63	-2.8	-1.56	E
6/25/2009	Limon II	Female	6/25/2004	1826	59.99	17	103	0.57	-1.35	-0.47	0.48	A

## Appendix D. Anthropometric Classifications (CIAF)

Box 1. Classification of children with anthropometric failure <sup>a</sup>				
Group name	Description	Wasting	Stunting	Underweight
A	<b>No failure:</b> Children whose height and weight are above the age-specific norm (i.e. above $-2$ z-scores) and do not suffer from any anthropometric failure.	No	No	No
B	<b>Wasting only:</b> Children with acceptable weight and height for their age but who have subnormal weight for height.	Yes	No	No
C	<b>Wasting and underweight:</b> Children with above-norm heights but whose weight for age and weight for height are too low.	Yes	No	Yes
D	<b>Wasting, stunting and underweight:</b> Children who suffer from anthropometric failure on all three measures.	Yes	Yes	Yes
E	<b>Stunting and underweight:</b> Children with low weight for age and low height for age but who have acceptable weight for their height.	No	Yes	Yes
F	<b>Stunting only:</b> Children with low height for age but who have acceptable weight, both for their age and for their short height.	No	Yes	No
Y	<b>Underweight only:</b> Children who are only underweight.	No	No	Yes

<sup>a</sup> Another theoretical combination would be "wasted and stunted", but this is not physically possible since a child cannot simultaneously experience stunting and wasting and not be underweight.

## Appendix E. Roberto Clemente Santa Ana Health Clinic Diagnoses (1/09-6/09)

Roberto Clemente Santa Ana Health Clinic Diagnosis Totals January-June 2009																			
January- June	0-7 days	8 -28 days	29 days -11 months	1yr. - 2yrs.	2yrs.- 5yrs.	0- 5yrs.	5yrs.- 10yrs.	10yrs. - 15yrs.	15yrs. - 20yrs.	20yrs. - 25yrs.	25yrs. - 36yrs.	36yrs. - 50yrs.	50yrs. - 60yrs.	60yrs. - 65yrs.	65yrs. - 70yrs.	70yrs. - 75yrs.	75yrs. - 80yrs.	80yrs.+	TOTALS
Respiratory Infection	17	42	34	37	34	164	38	22	20	28	31	17	37	35	12	6	8	5	423
Urinary Tract Infection	0	6	24	35	35	100	30	20	26	35	35	37	19	23	15	15	18	19	392
Parasites	0	3	19	29	30	81	38	18	17	21	17	17	10	12	4	6	2	5	248
Anemia	0	7	17	25	24	73	34	9	10	17	18	15	12	4	4	8	6	5	215
Hypertension arterial	1	0	0	0	0	1	0	0	0	4	13	17	31	30	30	22	24	18	190
Fungal Infection	0	1	6	10	8	25	11	13	11	27	28	24	18	9	6	7	5	4	188
Gastritis	0	0	0	0	1	1	3	11	11	18	21	37	27	17	12	10	8	10	186
Headache	0	0	0	0	5	5	6	11	16	27	28	21	16	10	9	15	8	7	179
Uric Acid	0	0	0	0	0	0	0	0	3	6	8	15	23	21	19	20	23	19	157
Neuritis	0	0	0	0	0	0	0	0	2	11	21	25	19	20	15	17	9	6	145
Hypercholesterolemia	0	0	0	0	0	0	0	0	2	1	7	16	21	24	28	18	15	12	144
Arthritis	0	0	0	0	0	0	0	0	0	3	10	18	19	28	16	24	12	13	143
Diarrhea	2	2	9	14	17	44	16	19	10	13	7	8	0	7	4	4	2	2	136
Pneumonia	3	11	18	22	25	79	11	1	1	2	6	1	2	7	8	2	2	4	126
Diabetes	0	0	0	0	0	0	0	0	0	8	8	9	17	17	20	15	13	19	126
Colitis	0	0	0	0	0	0	0	2	4	12	16	19	12	14	17	11	11	8	126
Sutures	0	0	0	1	1	2	4	5	5	14	37	22	7	4	0	0	0	0	100
Allergies	0	0	5	3	10	18	4	8	7	9	5	1	3	5	4	1	6	3	74
Peptic Ulcer	0	0	1	1	2	4	0	0	0	6	12	15	16	8	5	5	1	2	74
Asthma	0	0	2	7	9	18	9	2	7	4	2	4	6	3	2	4	1	8	70
Pelvic Inflammatory Infection	0	0	0	0	0	0	0	1	8	15	14	14	6	0	0	0	0	0	58
Kidney Stone	0	0	0	0	1	1	0	2	2	6	9	9	6	8	4	2	0	0	49
Nephritic colic	0	0	0	0	0	0	0	0	5	8	11	12	6	4	3	0	0	0	49
Oral Thrush	2	6	11	6	9	34	5	2	0	0	1	1	0	0	0	0	0	1	44
Urticaria	0	0	0	3	2	5	3	5	1	3	6	3	2	4	2	2	1	3	40
Remove foreign body from eye	0	0	0	0	2	2	1	1	3	10	10	5	3	0	0	0	0	0	35
Congestive Heart Failure	0	0	0	0	0	0	0	0	0	0	0	2	6	7	4	5	4	7	35
Pregnancy	0	0	0	0	0	0	0	0	4	13	13	4	0	0	0	0	0	0	34
Abscess drain	0	0	0	1	0	1	2	2	3	6	10	0	0	6	0	0	0	2	32
Dysfunctional Bleeding	0	0	0	0	0	0	0	2	3	9	5	6	5	0	1	0	1	0	32
Conjunctivitis	0	0	0	2	3	5	4	6	2	4	6	1	0	0	3	0	0	0	31
Menopause	0	0	0	0	0	0	0	0	0	0	1	11	14	3	0	0	0	0	29
Presbyopia	0	0	0	0	0	0	0	0	0	0	0	4	8	10	3	2	1	1	29

Light trauma	0	0	0	0	0	0	0	1	0	3	4	1	2	2	4	1	0	0	18
Epilepsy	0	0	0	0	0	0	0	0	0	0	1	4	2	2	0	0	2	0	11
Chickenpox	0	0	0	1	2	3	1	4	1	1	0	0	0	0	0	0	0	0	10
Remove foreign body from ears	0	0	0	0	2	2	0	1	0	0	0	0	0	0	0	0	0	0	3
Closed Fracture Fibular Right	0	0	2	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	3
Girl Bit By Dog	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Abortion	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Brain Stroke + myocardial Infarction	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Myocardial Infarction	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
<b>Total</b>	<b>25</b>	<b>78</b>	<b>148</b>	<b>197</b>	<b>223</b>	<b>671</b>	<b>220</b>	<b>169</b>	<b>184</b>	<b>344</b>	<b>421</b>	<b>417</b>	<b>376</b>	<b>344</b>	<b>254</b>	<b>222</b>	<b>183</b>	<b>183</b>	<b>3988</b>

## Appendix F. Reported Illnesses by Age Group

Reported Illness	0 to 1 (n=11)	1 to 5 (n=46)	0 to 5 (n=57)	5 to 9 (n=60)	9 to 18 (n=142)	18 to 25 (n=138)	25 to 35 (n=90)	35 to 50 (n=93)	50 to 60 (n=46)	60 to 70 (n=18)	70 to 80 (n=15)	80+ (n=8)	Totals
Kidney problems	0	3	3	4	12	27	32	28	19	9	3	0	137
Blood pressure	0	0	0	0	4	4	6	20	12	5	6	3	60
Headaches	0	0	0	2	18	10	14	6	3	0	2	0	55
Gastritis	0	0	0	0	3	12	5	2	6	3	1	1	33
Fever	2	4	6	5	10	6	2	2	2	0	0	0	33
Cold	3	4	7	8	7	5	3	0	3	0	0	0	33
Parasites	1	6	7	7	8	0	0	1	0	0	0	0	23
Flu	1	7	8	5	4	3	1	0	0	0	0	0	21
Asthma	1	2	3	0	5	5	1	2	0	1	1	0	18
Arthritis	0	0	0	0	0	0	0	3	3	4	5	1	16
Allergies	0	2	2	2	1	1	3	2	4	0	1	0	16
Eyesight problems	0	1	1	0	1	3	2	3	1	1	0	1	13
Cough	0	3	3	3	3	3	1	0	0	0	0	0	13
Diabetes	0	0	0	0	0	1	0	1	3	3	2	2	12
Anemia	0	3	3	1	5	1	1	0	0	0	0	0	11
Pregnant	0	0	0	0	0	4	4	2	0	0	0	0	10
Severe menstruation pain	0	3	3	1	4	2	0	0	0	0	0	0	10
Back pain	0	0	0	0	2	1	1	3	0	0	0	0	7
Stomach pain	1	1	2	1	2	0	0	2	0	0	0	0	7
Hernia	0	0	0	0	1	2	2	0	0	0	0	1	6
Earaches	1	0	1	1	3	1	0	0	0	0	0	0	6
Joint pain	0	0	0	1	1	0	1	3	0	0	0	0	6
Skin problems	0	0	0	0	0	3	0	0	0	0	1	1	5
Heart problems	0	0	0	0	0	0	0	2	3	0	0	0	5
Cholesterol	0	0	0	0	0	0	1	0	2	1	0	0	4
Alcoholic	0	0	0	0	0	2	0	2	0	0	0	0	4
Insomnia	0	0	0	2	0	2	0	0	0	0	0	0	4
Throat infection	0	0	0	0	0	3	0	0	0	0	1	0	4
Leg pain	0	0	0	0	1	0	0	1	1	0	1	0	4

Reported Illness	0 to 1 (n=11)	1 to 5 (n=46)	0 to 5 (n=57)	5 to 9 (n=60)	9 to 18 (n=142)	18 to 25 (n=138)	25 to 35 (n=90)	35 to 50 (n=93)	50 to 60 (n=46)	60 to 70 (n=18)	70 to 80 (n=15)	80+ (n=8)	Totals
Tremors	0	0	0	0	3	0	0	0	0	0	0	1	4
Pneumonia	0	2	2	1	0	0	0	0	1	0	0	0	4
Ovarian cysts	0	0	0	0	1	1	0	1	0	0	0	0	3
UTI	0	0	0	0	0	1	1	1	0	0	0	0	3
Vaginal pain	0	0	0	0	0	1	1	0	1	0	0	0	3
Hepatitis	0	0	0	1	1	0	0	1	0	0	0	0	3
Body aches	0	0	0	0	0	0	0	0	0	1	1	1	3
Lice	0	0	0	0	2	0	0	0	1	0	0	0	3
Respiratory problems	0	0	0	0	1	0	2	0	0	0	0	0	3
Neck pain	0	0	0	0	0	0	1	0	0	1	0	0	2
Prostate problems	0	0	0	0	0	0	0	0	1	1	0	0	2
Vomiting	0	0	0	0	1	1	0	0	0	0	0	0	2
Hand pain	0	0	0	0	0	0	0	1	1	0	0	0	2
Uterus problems	0	0	0	0	0	0	1	1	0	0	0	0	2
Malnourished	0	1	1	1	0	0	0	0	0	0	0	0	2
Circulation problems	0	0	0	0	0	0	0	0	1	0	1	0	2
Dizziness	0	0	0	0	2	0	0	0	0	0	0	0	2
Eye allergies	0	0	0	0	2	0	0	0	0	0	0	0	2
Foot pain	0	0	0	0	2	0	0	0	0	0	0	0	2
Nosebleeds	0	0	0	0	2	0	0	0	0	0	0	0	2
Pimples	0	0	0	0	0	0	1	0	1	0	0	0	2
Toothaches	0	0	0	1	1	0	0	0	0	0	0	0	2
Bone problems	0	0	0	0	0	0	0	0	0	1	0	0	1
Gallstones	0	0	0	0	0	0	0	0	0	1	0	0	1
Liver problems	0	0	0	0	0	0	0	0	0	1	0	0	1
Nervousness	0	0	0	0	0	0	0	0	0	1	0	0	1
Broken neck	0	0	0	0	0	1	0	0	0	0	0	0	1
Confusion	0	0	0	0	0	1	0	0	0	0	0	0	1
Lack of appetite	0	0	0	0	0	1	0	0	0	0	0	0	1
Heart arrhythmia	0	0	0	0	0	1	0	0	0	0	0	0	1

Reported Illness	0 to 1 (n=11)	1 to 5 (n=46)	0 to 5 (n=57)	5 to 9 (n=60)	9 to 18 (n=142)	18 to 25 (n=138)	25 to 35 (n=90)	35 to 50 (n=93)	50 to 60 (n=46)	60 to 70 (n=18)	70 to 80 (n=15)	80+ (n=8)	Totals
Heartburn	0	0	0	0	0	1	0	0	0	0	0	0	1
Inflamed blood vessels	0	0	0	0	0	1	0	0	0	0	0	0	1
Panic attacks	0	0	0	0	0	1	0	0	0	0	0	0	1
Rheumatic fever	0	0	0	0	0	1	0	0	0	0	0	0	1
Sweaty hands and feet	0	0	0	0	0	1	0	0	0	0	0	0	1
Cysts	0	0	0	0	0	0	0	1	0	0	0	0	1
Deaf	0	0	0	0	0	0	0	1	0	0	0	0	1
Ectopic pregnancy	0	0	0	0	0	0	0	1	0	0	0	0	1
Extended menstruation	0	0	0	0	0	0	0	1	0	0	0	0	1
Geophagia	0	0	0	0	0	0	0	1	0	0	0	0	1
Hemorrhoids	0	0	0	0	0	0	0	1	0	0	0	0	1
Ulcer	0	0	0	0	0	0	0	1	0	0	0	0	1
Gall bladder problems	0	0	0	0	0	0	0	0	0	0	0	1	1
Broken leg	0	0	0	0	0	0	0	0	0	0	0	1	1
Cleft palate	0	1	1	0	0	0	0	0	0	0	0	0	1
Genital rash	0	1	1	0	0	0	0	0	0	0	0	0	1
Red eyes	0	1	1	0	0	0	0	0	0	0	0	0	1
Blind	0	0	0	0	0	0	1	0	0	0	0	0	1
Bronchitis	0	0	0	0	0	0	0	0	1	0	0	0	1
Diarrhea	0	0	0	0	0	0	1	0	0	0	0	0	1
Hyperactive	0	0	0	1	0	0	0	0	0	0	0	0	1
Knee pain	0	0	0	0	0	0	0	0	1	0	0	0	1
Mouth sores	0	0	0	0	1	0	0	0	0	0	0	0	1
Nausea	0	0	0	0	1	0	0	0	0	0	0	0	1
No thumb	0	0	0	0	0	0	0	0	1	0	0	0	1
Uric acid	0	0	0	0	0	0	0	0	1	0	0	0	1
<b>TOTALS</b>	10	45	55	48	115	114	89	97	73	34	26	14	665

## References

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<sup>1</sup> Nandy S, Irving M, Gordon D, Subramanian S.V., Smith G.D. Poverty, child undernutrition and morbidity: new evidence from India. *Bulletin of the World Health Organization* March 2005, 83 (3)

<sup>2</sup> <http://www.nature.com/ijo/journal/v24/n8/full/0801264a.html>

<sup>3</sup> Nandy, et al., op. cit.