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Introduction:

The Peruvian Amazon region presents a number of challenges to the provision of health care. Outside of Iquitos, the average government medical clinic is understaffed, poorly supplied, deficient in medications, needing diagnostic capabilities, and without reliable electricity or running water. Remote rural health posts are staffed by a single technician and have far fewer resources. The results are predictable. Rural Amazonian residents suffer and die from a wide range of treatable and preventable illnesses and medical conditions. Many health problems are so chronic and pervasive that local people consider them to be another fact of daily life, on par with breathing, eating and sleeping. Such conditions include; malaria, parasitosis (worms), diarrhea, upper respiratory infections, dehydration-related conditions (headaches, migraines, and urinary tract problems), dermatological problems (resulting from fungi, allergies, and environmental irritants), and chronic muscular and joint pain resulting from lifetimes of hard physical labor. Poverty and a lack of health education compound the problems.

As deeply ingrained as the health problems in the region may be, they can be addressed and either improved or eliminated. All that is lacking is innovative thinking, creative solutions, and dedicated application. A medical clinic in the region provides the opportunity to take the lead in vastly improving



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the health of the residents of the Amazon Rainforest, and to provide a health-care model to be emulated by others, both within the Peruvian Amazon and in other underdeveloped regions of the world.

The town of Mazán is identified as an optimal site for a clinic due to a combination of critical needs and strategic location. This document assesses the potential impacts (in health, education, sanitation and capacity building) associated with building a state-of-the-art clinic in Mazán. It examines the existing medical facilities and health issues, as well as the current and projected population of the area that would be served by the clinic. The document also addresses opportunities for improving and expanding health services and developing partnerships. A major objective will be the transformation of healthcare and health-education provisions in the region into a strongly proactive approach to health.

Advantages to a New Medical Clinic In Mazán:

- Medically, the District of Mazán is plagued with both urban (due to proximity to Iquitos) and rural medical problems.
- The medical clinic will serve as the primary medical source on the Napo River, and Mazán River (*noted nationally for being a malaria endemic region*).
- Current medical infrastructure and staffing falls far below what is actually needed to address the existing health problems of the community and surrounding districts.
- The town of Mazán itself is located on a geographical crossroads – located at a critical location for movement of people and goods between the Napo River watershed and the urban metropolis of Iquitos.
- The population of the district and region has been steadily increasing, and further increases could be steeper still if proposed infrastructure projects are realized.
- Future development plans for the region will directly impact Mazán, bringing increased access and population.
- Political support (at both regional and local levels) for a Mazán medical clinic is high and enthusiastic.
- High levels of opportunity exist for establishing partnerships with both national and international institutions and organizations.



Sections:

INTRODUCTION:	1
SECTIONS:	3
POINTS OF CONTACT:	4
<i>Community Leaders:</i>	4
<i>AidJoy:</i>	4
<i>Project Amazonas:</i>	4
MEDICAL ISSUES AND CONCERNS IN MAZÁN AND SURROUNDING DISTRICTS	5
PROJECT AMAZONAS MAZÁN RIVER MEDICAL EXPEDITION	7
2. CURRENT MEDICAL FACILITIES IN MAZÁN: CENTRO DE SALUD III	19
COMMUNITY PROFILE	25
3. COMMUNITY & POLITICAL SUPPORT	27
4. MAZÁN INFRASTRUCTURE & RESOURCES	29
5. GEOGRAPHICAL AND PHYSICAL CONSIDERATIONS	33
7. POPULATION PROJECTIONS	38
8. FUTURE TRANSPORTATION AND MOBILITY CHANGES:	39
8. POTENTIAL PARTNERS & OTHER PARTNERSHIPS	41
9. CONCLUSIONS	45
1. Medical Issues and Concerns in Mazán and Surrounding Districts	
2. Current Medical Facilities in Mazán	
3. Mazán Infrastructure	
4. Geographical and Physical Considerations	
5. Current Population in Mazán and the Surrounding Districts	
6. Population Projections	
7. Future Transportation & Mobility Changes	
8. Community and Political Support	
9. Potential Partners	
10. Conclusion	



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Dr. Olivier Drouin, from Montreal Canada, helping a patient on a Project Amazonas expedition.

Medical Issues and Concerns in Mazán and Surrounding Districts

Overview: 120-140 patients are seen by the Mazán clinic on a daily basis (7:00 AM to 1:00 PM, Mon-Sat). Patients attended by medical technicians in the six outlying *Puestos de Salud* (Health Outposts) overseen by the Mazán clinic, are not included in these numbers. The clinic reports from 2-3 serious conditions/emergencies per day, including 3-5 venomous snakebites per month, one gunshot injury/month (mostly from shotgun traps for game or other hunting accidents), and 2-3 cases of appendicitis/month. Not included in “emergencies” are numerous cases of malaria (addressed at greater length below) which are one of the common causes of patient visits.

Less serious cases or medical conditions include hernias, deliveries (15 babies per month), and dental care (15 to 20 patients daily). The most common causes of patient visits are diarrhea, bronchitis and respiratory infections (including pneumonia), parasitosis and malaria. A significant challenge for the clinic, as expressed by Director Grace Ramirez, is that families do not take the illnesses of children



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seriously, and they take the children to a local herbalist or shaman for primary care. Children are taken to the clinic only when conditions worsen or complications set in and the child's health is seriously compromised.

Concerns and priorities expressed by the clinic director and staff include:

- Preventative medications, such as anti-parasitic medications and blood-pressure lowering meds, are unavailable. Currently patients can only obtain medications after the onset of a health problem.
- No reliable clean water is available for wound-treatment and deliveries. The clinic boils its own water for these purposes.
- There is no comprehensive health education plan or strategy for the community. Personnel and resources are lacking.

Examples of sporadic education campaigns and activities:

- An anti-malaria campaign was deployed in Mazán in late 2010 to combat an outbreak of Malaria¹.
- A dengue education and prevention campaign for 40 women leaders in the community was conducted in 2011².

Medical records from the Mazán clinic are not comprehensive. Apart from reasonably complete long-term data for malaria and snakebite (addressed in following sections), the most useful data set pertained to incidences of respiratory infections (these records are from the 45th week of 2011). There were at least 14 cases of urinary tract infections attended to during this brief period.

Other data sets for the same week contained only the header row of columns, but had no patient data. The best and longest duration data sets were obtained from the clinic biologist, a permanent employee of the clinic. The biologist has a well-defined set of tasks to accomplish. Many of the other staff are temporary, and they are often moved to various medical posts as the demands require. Currently regional medical clinics have neither the personnel or time to collect and summarize comprehensive patient records.

¹ <http://www.telecentros.pe/mazan/noticias.shtml> - posted on 23 December 2010, accessed 29 November 2011

² <http://www.telecentros.pe/mazan/noticias.shtml> - posted on 3 October 2011, accessed 29 November 2011



Project Amazonas Mazán River Medical Expedition

A well-documented Project Amazonas medical campaign on the Mazán River in November 2008 provides a snapshot into medical conditions in the region. The new clinic will be servicing the medical needs and preventative health education of the communities served during this expedition.

Expedition Synopsis:

From 9-14 November 2008, a team of health care professionals from the Mazán Health Center, the Progreso, San Juan Health Post, and volunteers with Project Amazonas conducted a medical campaign to benefit communities on the Mazán River and nearby areas. From 9-14 November, free clinics were conducted in seven communities, attending to 422 medical and dental patients. An additional 220 students and children were vaccinated against Hepatitis B, and 22 children received standard vaccinations. Transportation, lodging, and meals were provided aboard the B/F Tucunare riverboat, owned and operated by Project Amazonas. Funding was provided by Project Amazonas, Inc., and participation of the Peruvian medical personnel was authorized by the Ministry of Health, Loreto, Peru.

Patient Demographics: During expeditions, females regularly outnumber males at clinics, and this trend is confirmed by the directors and staff of various clinics in the region. Gender roles account for this discrepancy. Women typically bring children to clinics, and once at the clinic they are more likely to seek attention for their own conditions. Males are also more likely to be working outside of the community, explaining lessened clinic attendance (see table 2).

During the Mazán River medical campaign, approximately 40% of the estimated population of the river was attended to in clinic.



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Table 1. Distribution of Patients by Gender (Mazán River)

Community	# Male	# Female	% Male	% female	Total # Patients
Nueva Maucallacta	18	14	56.3	43.8	32
Gamitana Cocha	26	37	41.3	58.7	63
Visto Bueno	28	24	53.8	46.2	52
Libertad	20	43	31.7	68.3	63
1 de Enero	15	28	34.9	65.1	43
4 de Abril	2	4	33.3	66.7	6
Santa Cruz	61	101	37.7	62.3	162
Mazán	1	0	100.0	0.0	1
Corazón de Jesús					vaccination only
Tiwinza					vaccination only
TOTAL	171	251	40.5%	59.5%	422



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Young children always form the largest block of patients seen at clinic. This is no surprise given the large family size of many Peruvians residing in the Amazon Rainforest. Rural dwellers may tend to have more children than urban dwellers (i.e., people residing in Mazán proper), but the following table provides a useful measure of the age structure in the region.

Table 2. Distribution of Patients by Age in Years (inclusive)

Age Group	total # patients	% of total patients	# male	# female	% male	% female
>1	27	6.4%	15	12	55.6%	44.4%
1-2	48	11.4%	23	25	47.9%	52.1%
3-5	47	11.1%	24	23	51.1%	48.9%
6-10	81	19.2%	37	44	45.7%	54.3%
11-15	53	12.6%	19	34	35.8%	64.2%
16-20	20	4.7%	6	14	30.0%	70.0%
21-25	26	6.2%	5	21	19.2%	80.8%
26-30	20	4.7%	2	18	10.0%	90.0%
31-35	27	6.4%	7	20	25.9%	74.1%
36-40	15	3.6%	6	9	40.0%	60.0%
41-45	18	4.3%	7	11	38.9%	61.1%
46-50	17	4.0%	9	8	52.9%	47.1%
51-55	5	1.2%	2	3	40.0%	60.0%
56-60	3	0.7%	2	1	66.7%	33.3%
61-65	5	1.2%	1	4	20.0%	80.0%
66-70	4	0.9%	2	2	50.0%	50.0%
71-75	4	0.9%	3	1	75.0%	25.0%
76-80	1	0.2%	0	1	0.0%	100.0%
81+	1	0.2%	1	0	100.0%	0.0%
Total	422	100.0%	171	251	40.5%	59.5%



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Medical Conditions: Wide ranges of medical conditions were encountered on the Mazán River as summarized in Table 3. Because the expedition lacked sophisticated diagnostic equipment, there may be medical conditions that were not adequately or accurately diagnosed. By far, the most common complaints by patients were upper respiratory infections of various types, followed by work-related musculo-skeletal pains and associated conditions (arthritis, dehydration, etc.). Also common were parasitosis (particularly among children), fungal and other skin infections. Conditions recorded in more than 5% of all patients attended are highlighted. Some categories have no patients, but were included in table three, as they have been recorded from other medical expeditions in the region.

Table 3: Summary of Medical Conditions (Mazán River – November 2008)

Category	Diagnosis	# patients	% of patients
Respiratory infections	Viral URI – common cold – bronchitis, pharyngitis, laryngitis	103	24.41%
	Pneumonia	0	0.00%
	Tuberculosis	0	0.00%
Cold related conditions	Fever	26	6.16%
	Cough	42	9.95%
Respiratory problems	Asthma	3	0.71%
Allergies	Allergic conjunctivitis	3	0.71%
	Fish allergies (food)	0	0.00%
	Contact dermatitis	7	1.66%
Parasitosis	Ascariasis (round worms, tapeworms, hookworms, and whipworms)	25	5.92%
	Scabies	Few cases	
	Lice	0	0.00%
	Malaria (falciparum)	2	0.47%
Fungal Infections	Tinea corporis	6	1.42%
	Tinea cruris	0	0.00%
	Tinea versicolor	Various not treated	
	Tinea pedís	1	0.24%
	Tinea capitis	1	0.24%



	Candidiasis	1	0.24%
Gastrointestinal problems	Dysentery	28	6.63%
	GERD / gastritis	9	2.13%
	Viral gastroenteritis	1	0.24%
Musculo-skeletal problems	LBP / back pain	44	10.43%
	Upper back pain	10	2.37%
	Osteoarthritis	4	0.95%
	Sciatica	5	1.18%
Otitis	Otitis externa	7	1.66%
	Otitis media	0	0.00%
	Perforated tympanum	0	0.00%
Dehydration	Dehydration	6	1.42%
	Dizziness	30	7.11%
	Cephalaea / headaches	69	16.35%
Urinary tract disorders	STD	0	0.00%
	Urinary tract infection	35	8.29%
Dermatology (not including fungal infections or allergic reactions)	Impetigo	6	1.42%
	Abscesses, lesions & boils	15	3.55%
	2ndary skin infections	15	3.55%
Visual Problems	Not specifically noted but 30 pairs of glasses distributed		
Trauma	Foot injuries	3	0.71%
	Major trauma (injury)	0	0.00%
Dental	Dental extractions	79	18.81%
Anemia	Anemia (includes very minor cases where patients wanted vitamins, but also post malaria cases)	132	31.43%
Other	Inguinal hernia	2	0.48%
	Abdominal hernia	1	0.24%
	Snake bite (fer-de-lance)	1	0.24%
	Abscess	1	0.24%
	Cellulitis	3	0.71%
	Oral ulcer	1	0.24%
	Tonsillitis	3	0.71%



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Dental Health: Dental health on the Mazán River was poor. The expedition dentist was not able to attend all patients who requested/needed dental care due to time constraints. While the majority of patients attended were children, there was a demand for dental attention at all ages other than very young children. It should be noted that many patients had problems with two or more teeth; however, the dentist only performed one procedure per patient. The distribution of dental patients by age and sex is given below:

Table 4. Dental Attention by Age and Sex

Age	# patients	% of total	# male	# female	% male	% female
1-2	0	0.0%	0	0		
3-5	2	2.8%	0	2	0.0%	100.0%
6-10	17	23.9%	6	11	35.3%	64.7%
11-15	13	18.3%	2	11	15.4%	84.6%
16-20	4	5.6%	1	3	25.0%	75.0%
21-25	8	11.3%	3	5	37.5%	62.5%
26-30	4	5.6%	1	3	25.0%	75.0%
31-35	5	7.0%	2	3	40.0%	60.0%
36-40	3	4.2%	1	2	33.3%	66.7%
41-45	2	2.8%	2	0	100.0%	0.0%
46-50	5	7.0%	2	3	40.0%	60.0%
51-60	1	1.4%	1	0	100.0%	0.0%
61-70	3	4.2%	2	1	66.7%	33.3%
71-80	4	5.6%	3	1	75.0%	25.0%
Total	71	100.0%	26	45	36.6%	63.4%



Alternate dental clinic in Mazán.



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Mosquito-transmitted Diseases: Mosquito-transmitted diseases are common throughout the Peruvian Amazon. *The area served by the Mazán clinic is an endemic zone for malaria diseases.* Remote areas of the Peruvian Amazon towards the Ecuadorian border are host to most (if not all) of the annual cases of yellow fever.

Other discrete areas have outbreaks of various arboviral diseases, and the most common mosquito-borne diseases, malaria and dengue, show decidedly non-uniform patterns of distribution. From 2000 through 2010, a total of 23,887 cases were reported at the clinic, ranging from a high of 3,476 cases in 2007 to low of 1,260 cases in 2008 (this decrease is most likely due to The Ministry of Health’s aggressive control effort and public education campaign). Over the 11-year reporting period, the weeks with accumulated totals in excess of 350 patients per week extended from the 3rd week of May through the last week of September³ – coinciding roughly with high water levels in the Napo watershed.

Malaria: Malaria cases included both *Malaria vivax* (the common, more benign form) and *M. falciparum* (the more deadly “cerebral malaria”) with *M. falciparum* representing up to 46.4% of the total cases. There is, however, no clear pattern of increasing dominance by one or the other species of *Malaria* (see figure below). The data should be considered to be a conservative estimate of the overall malaria problem; many cases of malaria are not reported and/or verified by analysis of blood smears. With a current district population of approximately 14,000 people currently, annual cases may have represented from 10 to 20% of the total population infected. On the Mazán River itself, infection rates are 100% in many communities during a one-year period. In excess of 800 cases were reported from the Mazán River alone in 2010, and the population of the river is a little more than 800 people.

Table 5: Numbers of *Malaria vivax* and *falciparum* cases from 2000 to 2010.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total cases	1393	1556	2991	1756	2878	3135	2759	3476	1260	1271	1412
<i>M. vivax</i>	888	834	2260	1503	2116	2069	2069	2335	705	880	918
<i>M. falciparum</i>	505	722	731	253	762	1066	690	1141	555	391	494
<i>M. falciparum</i> as % of total cases	36.25	46.40	24.44	14.41	26.48	34.00	25.01	32.83	44.05	30.76	34.99

³ Unpublished data obtained from the biologist at the Mazan Clinic – 14 November 2011.

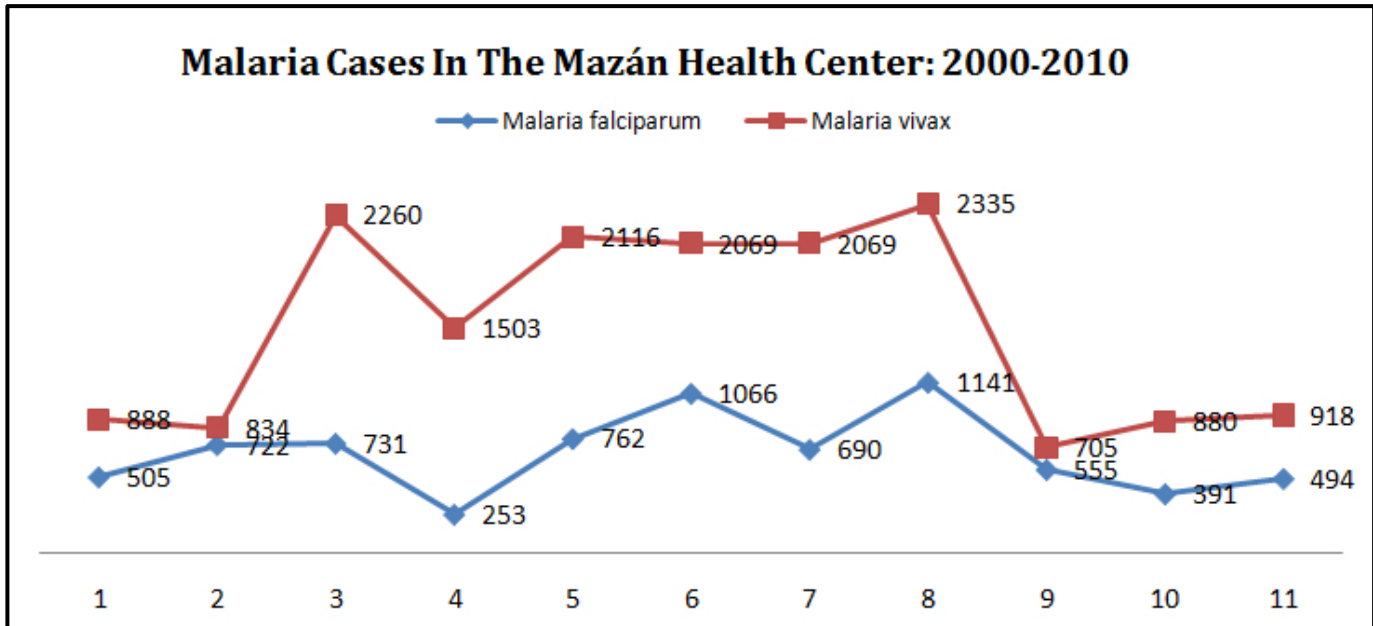


Figure 1: Malaria incidence in the Mazán district: 2000 to 2010.

Dengue: In the last decade, dengue (another mosquito-transmitted disease) has emerged as a serious public health threat in the Peruvian Amazon. The mosquitos that transmit dengue are not forest-based insects, but instead favor the hotter and drier climates created by urban development and peri-urban land clearing. Iquitos and immediately surrounding areas have experienced rapid increases in dengue cases, with an outbreak of over 20,000 cases in Iquitos in the early months of 2011. To date, there have been few cases of classic dengue in Mazán (one in 2008, three in 2009, and ten in 2010) and no cases of hemorrhagic dengue. This is certain to change rapidly as land clearing continues and increased mobility offers mosquitos the opportunity to easily move from one location to another.

Emerging Diseases: In July 2011, the first confirmed case of Hantavirus for Peru was recorded from an Iquitos patient who died from the disease⁴. Many other animal-borne viruses (including arboviruses and Hantaviruses) are also possible and present in the region⁵. Many cases undoubtedly go unreported due to lack of laboratory capabilities. Patients are often misdiagnosed with bronchitis, unexplained fevers, or a mixture of dengue/malaria.

⁴ <http://www.diresaloreto.gob.pe> – accessed 29 November 2011

⁵ Yanoviak, Ph.D., Stephen, 2008 – personal communications

Venomous Snakebites: From 2000 through 2010, a total of 228 cases of snakebite (presumably all venomous) were treated at the Mazán clinic. In our experience in the Peruvian Amazon since 1994, local people are all very familiar with the common venomous vs. non-venomous snake species, and the great majority of venomous snake bites are reportedly vipers in the family Viperidae, in particular the abundant *Bothrops atrox* (“jergon”: adults / “cascabel”: juveniles). This is an aggressive species that is common in areas inhabited by people and attracted to mice, rats, chickens and other small prey items.



Photo (left): Business end of a sizeable *Bothrops atrox*.

Photo (center): *Bothrops atrox* demonstrating remarkable camouflage capabilities.

Photo (right): The arboreal viper *Bothriopsis bilineatus*.

Most bites are on the extremities, and incurred while people are engaged in land-clearing and gardening activities or when walking around their dwellings at dusk or night. Bites suffered by people hunting or foraging for building materials in forest areas are also primarily from *Bothrops atrox*, but also include bites from tree vipers – *Bothriopsis bilineata* and *Bothriopsis taeniata* (“loro machaco”). Although the famed bushmaster snake (*Lachesis muta* “shushupe”) is much feared, it is extremely rare and is non-aggressive⁶. Project Amazonas has encountered no cases of bushmaster bites, nor any first-hand knowledge of such a bite. Likewise, bites of the highly nocturnal and reclusive, though quite common, coral snakes (family Micruridae “naka-naka”, all species) are extremely rare, and the only known cases have involved herpetologists or would-be herpetologists who were handling them. Despite the rarity of bites from a bushmaster or coral snake, such bites would need to be considered extremely serious and likely fatal (if not treated immediately) due to the potential quantity of venom injected (bushmasters) or to the neurotoxic qualities of the venom (coral snakes). Antivenom for vipers (lyophilized powder form)

⁶ Based on personal experience of Dr. Devon Graham with approximately 15 encounters with bushmasters in Costa Rica and Peru since 1988.

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is available at most larger clinics in the Peruvian Amazon. Antivenom for coral snakes (which must be kept refrigerated) is not generally available in country⁷.



Project Amazonas rescued this herpetologist (man lying down). Transporting him to the nearest clinic, Dr. Devon Graham holds an IV bottle for the duration of the ride. The herpetologist was evacuated to Iquitos, and spent a week in ICU (Intensive Care Unit) on a respirator before antivenom could be obtained.

Viper bites are under-reported. Currently, remote communities and logging/hunting camps on the Napo River are days from well-equipped medical facilities. For that reason, severely injured people are often kept at home to slowly recover or die. Most fatalities are among children and the elderly, or adults who may have underlying medical conditions. An otherwise healthy adult will likely survive a venomous bite,

⁷ In the one serious coral snake bite we treated, antivenom was brought in by charter flight from Manaus, Brazil some 7 days after the bite. Efforts to obtain antivenom from Peru, Colombia, Costa Rica and Florida were unsuccessful. Meanwhile, the patient was kept alive on a respirator in the ICU of the *Clinica Ana Stahl* in Iquitos.

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but may suffer extensive tissue and neurological damage and effectively be handicapped or limited in mobility or work potential for life. Many rural patients that we have treated over the years have been bitten by vipers multiple times (2 to 5 times) and have the scars to prove it⁸.

It is critical that antivenom be administered as soon as possible after a bite to prevent extensive tissue damage and organ trauma. Ideally, health promoters in each community should have the training and antivenom on hand for immediate treatment of snakebites. The main issue is cost (about s/100⁹ per unit [\$37 USD]), and multiple units may be needed depending on the severity/location of the bite) but the immediate cost of the antivenom pales when compared to the lifetime costs in productivity and medical maintenance for bite victims who survive but who suffer extensive muscular and neurological damage from failure to receive immediate treatment.



Fer de Lance Bite Victim: Lack of immediate antivenom application, resulted in extensive tissue damage and permanent muscular and neurological damage.

Table 6: Cases of snakebite treated at the Mazán clinic from 2000-2010¹⁰.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
# cases	15	21	22	17	19	18	25	22	25	23	21

⁸ Data collected during survey work for: Nawaz, H., et. al. Health Risk Behaviors and Health Perceptions in the Peruvian Amazon. Am. J. Trop. Med Hyg., 65(3), 2001, pp. 252-256.

⁹ s/ denotes the Peruvian currency Nuevo Sol. 1 Peruvian Nuevo Sol = 0.37 US Dollars = 0.28 Euros

¹⁰ The Mazán data is not broken down by season, by species of snake, nor are there any indications of the seriousness or results of each case. Proper documentation in the future of bites, treatment received, and the recovery process and resulting patient conditions would be an invaluable tool for managing snakebites, and could easily result in important and useful publications.

Current Medical Facilities in Mazán: Centro de Salud III

In October 2011, a joint Project Amazonas, AidJoy, Ministerio de Salud, and Siemens team visited the Centro de Salud III: Mazán. This was followed by a subsequent visit by Dr. Devon Graham and Fernando Rios (Project Amazonas) in November 2011 (bolstered by visits by Graham and Rios, as well as medical volunteers in 2009, 2010 and at other times during 2011). The current Mazán clinic is approximately 1,500 square meters in area. The clinic is located near the population/business center of town, 200 meters from the current port facility, and close to the municipal marketplace. The facility is notably dark, poorly ventilated, and noisy. When it was referred to as a “horno” (oven), the minister of health for Loreto, Dr. Hugo Ferrucci, immediately responded with an anecdote about how hot it had been on a previous visit.



Photos (left & center): Waiting area in the center of the clinic structure – no ventilation and very limited natural lighting.

Photo (right): Patient hospitalization room – the only windows are small and near the ceiling; the partial wall to the left separates this room from another patient room.

The clinic is not officially rated to hospitalize patients, it does so by necessity. The three patient hospitalization rooms each contain two beds, some of which do not have mattresses. One toilet is provided for all six of the patient’s beds. These three rooms are separated by a partial height dividing wall (visual separation only). The rooms have small windows high in the walls, and have no system of ventilation. Due to the clinic location in the center of town and close to the market area, it is very noisy. During visits in October and November, it was difficult to carry on, or hear conversations in the clinic director’s office due to the music and street noise blasting through the office windows.



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In conversations with clinic director Grace Carmen Ramirez Flores¹¹ on 14 November 2011, Director Ramirez noted that from 550 to 600 medical (not including dental) patients were seen at the clinic on a weekly basis. At the times of visits during November, 30-40 people were waiting in the clinic at any given time, though it should be noted that not all may have been patients.

Personnel: The Mazán clinic currently has no senior health professionals who are “*nombrado*” (i.e., permanently assigned). The current senior personnel are “*contratado*” – essentially on one-year contracts. As such, few of the clinic staff actually reside permanently in Mazán, and most have residences in Iquitos.

The 27 staff includes the following personnel:

- 3 registered nurses (including the clinic director)
- 1 medical doctor
- 2 obstetrical technicians
- 1 dentist (*contratado*)
- 20 *técnicos* (both *nombrado* and *contratado*) which include one biologist, two laboratory technicians, and other support personnel/maintenance staff.

Lack of permanent staff who resides in Mazán or the immediately surrounding communities poses a serious restraint on the ability of the clinic to carry out its intended mission. With short-term staff rotating in and out of the clinic on a regular basis, it is difficult or impossible to design, implement, and follow up on integrated health education campaigns, and to establish trust and long-term patient-physician relationships with the local population. In recent history, the clinic has been without an MD for extended periods of time (weeks to months). For a medical clinic in Mazán, at least a portion of the senior staff (perhaps 50% or more) should be on a long-term contract and be resident in the District of Mazán itself. Job security will not only encourage staff to put down roots in Mazán (where the cost of living would be cheaper than in Iquitos), but would also promote high levels of morale. Scheduling regular clinic boat service to Iquitos would allow those staff who have family in Iquitos, or who are not able to relocate to Mazán (perhaps due to elderly parents living in their home in Iquitos, for instance) to travel back and forth in a timely and rapid manner. Such a service for staff would also have a significant impact on morale.

¹¹ RN – one year contract as director of the Mazán “microred de salud” (Cell: 953-61-8624 / Email: greca_raf83@hotmail.com)

A concerted effort will be made to ensure that non-senior staff is from the District of Mazán. For some positions such as cleaning staff, grounds crew, and security, this will be easy to accomplish. For others – lab techs, nurses, etc., it may be more difficult at least initially, but over the long-term, the objective should be to have a largely “resident” cohort of both senior and non-senior staff.

Laboratory: A small separate structure houses the laboratory facilities. These are essentially limited in scope to one microscope and an autoclave. Additional rapid-assay tests (HIV, urine dip-stick) are also possible when test kits are available. There is no capacity for culturing and identification of bacterial or viral agents, no incubator, no centrifuge. Again, both natural lighting and ventilation are very restricted.

Because of the lack of critical laboratory equipment, the clinic's staff takes most blood, tissue, fecal, and other samples to Iquitos. **Delayed initiation of patient treatment would be eliminated with a sufficiently equipped medical laboratory.** The laboratory facility in Mazán would also directly serve the clinic in Indiana. At minimum, the laboratory should have the capacity to conduct common blood work, urinalysis, parasite and fungal isolation and identification, culture and identify bacterial and viral agents and optimally culture tissue and cell samples for identification of malignancies or other cellular abnormalities. The laboratory could also house X-ray capabilities, and conduct mammograms, ultrasound and other non-invasive diagnostic procedures.



Photo (left): Entrance to laboratory structure.

Photos (center & right): Interior of the laboratory structure.



Director Ramirez's, Mazán Clinic Director, Immediate, or Critical Clinic Needs:

Overall Infrastructure, Power, & Water:

- **Permanent electrical power:** Currently, a five-kilowatt generator provides power, on an as needed basis during clinic hours. Power from the municipal generator in Mazán is available only from 5-11 PM, currently the generator is in Iquitos undergoing repairs, and there is no municipal power (as of November 2011). When in operation, the current municipal generator is at its generation capacity and brownouts or blackouts are frequent.
- **Solar power capacity (solar panels):** The clinic currently has two solar panels, which provide limited lighting for the consulting rooms. The clinic generator must currently be operated to power computers and other equipment. Adequate solar power would enable the clinic to operate independently of the unreliable local power grid, and would save substantially on fuel expenditures.
- **Reliable water supply:** Water from the municipal water tank is available only from 5-6 AM daily and occasionally for two hours at noon – water is stored in barrels on site for use during the day.
- Improved interior and exterior lighting.

Capacity & Structure:

- Space for waiting patients (the current waiting area is in the physical center of the clinic – poorly lit, poorly ventilated).
- Additional hospitalization beds (although the clinic is not rated for hospitalization, it regularly hospitalizes patients by necessity; Director Ramirez estimated that 15 beds would be needed to meet the true needs of the District).
- Internet access and improved computer capability, ability to keep patient records on-line.
- Minor surgery capability.
- An improved and more reliable supply of medications is needed.
- In the laboratory, there is critical need for all reagents. The laboratory is equipped with only a single microscope – a minimum of two are needed. Lab capabilities are limited to only very basic blood and urine analysis. There is no capability of testing blood sugar.
- An adequate system of inventory for medicines – currently inventory is kept manually.
- An adequate system for refrigeration of vaccines – currently a propane-powered refrigerator is used to maintain cold-chain.



Impact Study and Growth Potential

Equipment:

- X-ray
- Ultrasound
- Incubator unit for newborns and a well-equipped delivery room
- Nebulizer
- Multi-parameter monitors, pulse oximeter
- Defibrillator
- A complete dental unit and improved dental capability. Two to three dental volunteers in residence at any time would be of great benefit to the clinic.
- Incinerator for medical waste
- A larger sterilizer/autoclave (the current one is very small and not sufficient to meet clinic needs)
- Oxygen generating machine and O₂ tanks.

Staffing & Staff Facilities:

- Additional staff –currently there is a total of 27 people on staff.
 - Frequently only one MD (or no MD) is on staff. A minimum of two MD's are needed.
 - There is only one cleaning staff member; at least two cleaning personnel are needed.
- Restrooms, changing rooms, lockers, showers or other facilities for staff. Currently there are no staff amenities.



Photo (left): Biologist's office in the Mazán clinic – cramped space.

Photo (center): Consulting room desk and syringe depository (hanging on wall).

Photo (right): Delivery room.



Photo (left): Director's office in Mazán clinic: From left – Dr. Ernesto Salazar, Dave Russo, Clinic director Grace Ramirez (standing), Jonathan Shanin, David Lynch, and Giancarlo Bermudez – during meeting in October 2010.

Photo (center): Patient records.

Photo (right): Lavatory facilities consisting of a urinal (in the small entryway) and a single toilet (behind door).

Director Ramirez also noted that the majority of the clinic staff (herself included) actually live in Iquitos. They stay in rented accommodations in Mazán during the week, but return to Iquitos for the weekends (apart from those on weekend emergency duty). Director Ramirez, like many of the clinic staff, is on a one-year contract. The short-term annual contract nature of employment at the clinic for many of the staff appears to present little incentive for staff to establish permanent residences in Mazán and to integrate fully with the local community. In terms of additional capabilities, it was noted that the clinic does have a small aluminum skiff (“*chalupa*”) with a 40 HP outboard motor. However, gasoline for the skiff is only available through official allocations for vaccination and malaria prevention campaigns – not for general health-education campaigns or for patient evacuation or medical emergencies.

The Local Health “Network”: The *Mazán Centro de Salud* is the main medical facility in a “microred” (group of medical facilities) region which includes six *Puestos de Salud* (manned by a single technician – four of these *puestos de salud* have satellite telephone capability) in outlying areas of the District of Mazán. There are 22 communities in total in the district. *Mazán Centro de Salud* is also the center of a larger “microred” that incorporates the nearby districts of Indiana, and Las Amazonas. Medical establishments forming part of this larger “microred” are the following¹²:

Table 7: Clinics forming part of the Mazán “microred” health network.
None of these facilities is currently rated for hospitalization of patients.

Clinic ID Code (used by Ministry)	Location	Category	Classification used by Ministry of Health 1= lowest capacity, 7= highest capacity	District
000000054	Indiana	<i>Centro de Salud</i>	I-3	Indiana
000000055	Maniti I Zona	<i>Puesto de Salud</i>	I-1	Indiana
000000056	Santa Cecilia	<i>Puesto de Salud</i>	I-1	Indiana
000000057	Yanayacu Bombonaje	<i>Puesto de Salud</i>	I-1	Indiana
000000058	Vainilla	<i>Puesto de Salud</i>	I-1	Indiana
000000059	Sinchicuy	<i>Puesto de Salud</i>	I-1	Indiana
000000060	San Francisco de Orellana	<i>Centro de Salud</i>	I-3	Las Amazonas
000000061	Santa Maria de Marupa	<i>Puesto de Salud</i>	I-1	Las Amazonas
000000062	Oran	<i>Puesto de Salud</i>	I-1	Las Amazonas
000000063	Yanashi	<i>Centro de Salud</i>	I-3	Las Amazonas
000000064	Mazán – Nucleo Base	<i>Centro de Salud</i>	I-3	Mazán
000000065	Tamanco	<i>Puesto de Salud</i>	I-1	Mazán
000000279	Huaman Urco	<i>Puesto de Salud</i>	I-1	Mazán
000000280	Mangua de Mazán	<i>Puesto de Salud</i>	I-1	Mazán
000000281	San Pedro de Buen Paso	<i>Puesto de Salud</i>	I-1	Mazán
000000282	Libertad – Rio Mazán	<i>Puesto de Salud</i>	I-1	Mazán
000006946	San Pedro de Manati	<i>Puesto de Salud</i>	I-1	Indiana

NO
Hospitalization

¹² www.minsa.bog.pe/oie/servicios/DescargaEst.asp (2009 publication-accessed 28 November 2011)



Ministerio
de Salud



Community Profile

An example of community data collected on medical service expeditions is provided from *Libertad (where a *Puesto de Salud* is located). Data are from November 2008.

Libertad (Rio Mazán): Visited November 2008

Notes: On both banks of Rio Mazán – community scattered over several miles of riverbank, no “center”.

Community lands: total about 5,000 ha.

Coordinates: none obtained

Population: 283 (47 houses)

Community Facilities:

School: 1-6 grades; 51 students, 1 professor; no computer, no uniforms

School lavatories: No – no plans for one, no water collection from roof

Generator: No (no solar panels either)

Radio/phone: No

Puesto de Salud: Yes – operated by health promoter – has rapid analysis sticks for malaria and malaria medications.

Authorities: *Teniente:* Jhon Babilone / *Promotor:* Elio Satavaya / *Promotor:* Erikson Garcia Vargas

APAFA: none / Agente Municipal: none / School Director: Jacqueline Gomez Bastida (from IQT).

Health Issues:

Water: No clean water supplies, residents take water directly from river. The communities in area are attempting to recreate a hydrobiological reserve that existed prior to the Fujimori administration. A major concern is that commercial fishermen are destroying resources depended on by local people and contaminating water supplies.

Malaria: Mosquito nets distributed in 2007 have too large a mesh, ineffective against mosquitos.

Travel Times: 2.5 hours to Mazán in *peke-peke* boat (large canoes with basic gas powered engines); 5-6 hours by canoe.



Community & Political Support

From the onset of conversations about the possibility of establishing a modern clinic in Mazán, the political and social leadership at all levels has been highly supportive.

Regional and Community Leaders In Support of the Medical Clinic:

- Regional Governor Mr. Yvan Vazquez (Iquitos, Loreto)
- Minister of Health Dr. Hugo Ferrucci (Dirección Regional de Salud [DIRESA]), Iquitos, Loreto
- Mazán Mayor Dr. Edward Reategui
- The five Mazán Aldermen: Mr. Segundo R. Villacorta Alegria, Mrs. Evelin Pinedo Falcon, Mr. Nehey L.Chota Chavez, Mr. Luzmildo Arbildo Flores, and Mr. Manuel Indelso Alayo Borseyu.
- Mazán Centro de Salud director Ms. Grace Ramirez and the clinic staff.

The greater Mazán community with whom we interacted has not been told details regarding the project, but they have historically expressed their opinion that a better-equipped and situated clinic is one of the primary needs for the community.

The mayor of Mazán has worked with Project Amazonas in the past, and several of the aldermen know Project Amazonas' general manager Fernando Rios Tulumba on a personal level (Fernando having a multi-generational history in Mazán). Because of these personal connections, we believe that each of the parties involved (the Municipality of Mazán, Project Amazonas, and AidJoy) is starting from a position of strength. There is already a strong element of good faith that has been established, and a demonstrated willingness for collaboration on health issues in the region. This relationship will only grow stronger as the project moves forward. The mayor and aldermen/women of Mazán have already accomplished a great deal in their relatively short time in office and are also favorably looked-on by the local populace. We anticipate their confidence in us will carry over to the general population as well, and as they are not term-limited, it seems very likely that they will be re-elected in 2014 for another term. Once land clearing and construction activities begin, a transparent and fair procedure for hiring and compensating local labor will also strengthen community support for the project.

The degree of local support (in Mazán) coupled with the support expressed at the regional government level (the regional governor, the Ministry of Health, the Schools of Medicine and Nursing, etc.) all bode well for a future clinic project. Improving health care provision makes everyone, at every level of the




Ministerio de Salud



Impact Study and Growth Potential

political and social ladder “look good,” and is appreciated by all sectors of society, especially those who are the most impoverished.

Below is the Letter of Intent signed between the Municipality of Mazán and Project Amazonas regarding the rights for Project Amazonas’s title to land for the new clinic.

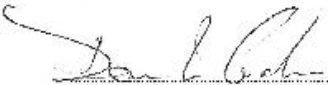
 **MUNICIPALIDAD DISTRITAL DE MAZAN**
MAZAN – MAYNAS – LORETO
RUC Nº -2019792919



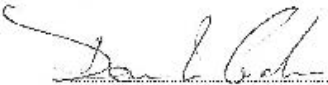
CARTA DE INTENCION

Por medio de la presente carta en nombre de los pobladores del distrito de MAZAN, distrito al que represento, quiero manifestarles la necesidad de contar con una CLÍNICA MÉDICA- ODONTOLÓGICA que nos ayude a solucionar los problemas de salud que padecemos nuestra población, es por eso que solicitamos a la ONG, PROYECTO AMAZONAS, que nos ayude a buscar amigos cooperantes para hacer realidad la construcción de esta clínica, la población de MAZAN y sobre todo los niños les viviremos profundamente agradecidos; quiero informarles queridos amigos de PROJECT AMAZONAS INC que con la CLÍNICA MÉDICO-ODONTOLÓGICA se estarán beneficiando a los 13,098 pobladores asentados en las 73 comunidades que conforman la jurisdicción de nuestro distrito, a los vecinos del distrito de INDIANA con quienes nos separa 10 minutos de distancia y que cuentan con una población de más de 14,000 habitantes, a los amigos del distrito del Napo con más de 12,000 habitantes y a los vecinos del distrito de TORRES CAUSANA con más de 10,000 habitantes y donde predomina la etnia nativa de los hermanos quichuas.

Deseo comprometerme también como Alcalde del distrito de MAZAN, en la entrega del terreno necesario en calidad de CONCESIÓN DE USO, para la construcción de la CLÍNICA MÉDICO-ODONTOLÓGICA, esta decisión ha sido aprobada en SESIÓN DE CONSEJO MUNICIPAL, que es la máxima instancia legal para la tomar decisiones en nuestro distrito.




Mazán, 15 de Noviembre del 2,011.



Devon L. Graham, Ph.D.
Presidente/Scientific Director
Pasaporte USA N° 048365797
Project Amazonas INC

RUC 2019792919
Oficina de Coordinación Yavari Nº 335 Oficina Nº 12 Iquitos Teléfono 065-236571

MUNICIPALIDAD DISTRITAL DE MAZAN
SEGUNDO VALZORTA ALEGRIA
REGIDOR

MUNICIPALIDAD DISTRITAL DE MAZAN
EVELIN PINEDO FALCON
REGIDOR

MUNICIPALIDAD DISTRITAL DE MAZAN
NEHEY L. CHIGTA CHAVEZ
REGIDOR



Ministerio
de Salud



Mazán Infrastructure & Resources

Communications: A major asset is the presence of good cellular phone reception throughout the community. The cell phone tower is located behind the municipal hotel. When generator power is available, internet services is also available via the cell phone tower. Obtaining Wi-Fi reception via cell phone signals is inexpensive – about s/90 per month (\$33 USD).

Electrical: Mazán has its own generator, but it is currently at capacity and incapable of meeting the energy needs of the community. As of November 2011, the generator had experienced catastrophic failure and had to be dismantled and transported to Iquitos for servicing and repair. Even if the current generator is repaired and reinstalled, the increasing power demands of the community will likely result in additional future failures of the local power grid. Permanent electrical power from generators in Iquitos was supposed to have happened >1 year previously, and although all the concrete power poles have been installed and wiring installed, the underwater electrical cable across the Nanay River (close to Iquitos) has not yet been installed.

Water: Mazán has a municipal water tower, with water pumped from the Napo River and treated with aluminum hydroxide and granular chlorine. The water distribution systems (community-level plumbing) have not been maintained in the past. Currently water distribution in the community is extremely limited to an hour or two per day (alternating between various locations). One of the infrastructure projects of the current municipal leadership is to bring the water distribution system up to par and to expand its capacity to supply potable water to the community all day. According to the mayor and aldermen, the current plumbing system is the problem.

Sewage: No sewage treatment facilities are currently in place in Mazán. Local households either have pit latrines, flush toilets with a septic tank, or systems that drain directly into the closest river or creek. In areas along the creeks that wander through portions of town, outhouses situated directly over the creek (only about 1 meter wide in most places, and choked with grasses) are a conspicuous sight. Rectifying the health hazards that lack of sewage and human waste disposal poses to the community is one of the priorities of current elected officials.

Solid Waste Disposal: In collaboration with the town of Indiana, Mazán is developing a permanent solid-waste disposal and recycling site (*botadero*). This site is located about 300 meters off of the road



between the two communities. Development of the site is slated to begin in early 2012. Currently solid waste is simply dumped in a ravine off of one side of the Mazán-Indiana road. A Mazán clinic would “pre-treat” any waste prior to sending it to the *botadero*. The first priority would be incineration of any medically hazardous materials, followed by sorting and separation of all recyclables. A major emphasis would also be to minimize the amount of waste generated in the first place – organic materials (food scraps) could be composted, while use of “disposables” – plastic bags, paper, plastic cups, etc. would be minimized.

Transport & Ports: An important asset of Mazán is the transportation access that it provides between the Amazon and Napo Rivers. Having access to two port areas on the Amazon (Timicurillo – closest to Iquitos) and Indiana (about 5 miles further downriver from Iquitos) helps to ensure that goods and people can move from one river system to the other year-round. The port at Timicurillo has a large beach area that forms in front of the port during low-water months on the Amazon. The port at Indiana is located in a site where the Amazon runs deep next to the riverbank, and there are no accessibility issues there (only that transit time to Iquitos is a bit longer and a bit more expensive).

Transportation by river taxi takes place at irregular intervals daily between Iquitos and Mazán/Indiana. Speedboats carrying 15 to 25 passengers are the most common means of transport, and the trip takes from 30 to 45 minutes. The *Puerto de Productores* is the point of departure in Iquitos. Passage for an adult passenger is s/13 (\$4.80 USD). Baggage may be extra if bulky. The boats typically do not depart until they have a full load of passengers. This frequently means that the boat may sit at port for over an hour until enough passengers show up. The wait thus exceeds the actual travel time. Motokar fares from Mazán to Timicurillo or to Indiana are set at s/2.00 (\$0.75 USD) per passenger. That rate generally includes a modest amount of luggage.

The port facility at Mazán currently consists of a floating dock moored to a gangplank/stairs structure to provide access whatever the river levels may be. Most vessels (of all sizes) merely pull up to the shore to load/unload goods and passengers. The vast majority of vessels are smaller wooden boats with peke-peke motors, though several long-haul ships (metal hull) do travel up and down the Napo, as far as the Ecuadorian border at Pantoja. A future port facility is planned farther east from the current port facility. That site will have better road access for transporting goods, with a wide road connecting up to the current Mazán-Indiana road, and also future planned roads between Mazán-Indiana, and Mazán-Bellavista/Iquitos. Road access to the current port area is extremely limited.



Ministerio
de Salud



Accommodations: Mazán operates a municipal hotel, which has 20 rooms with singles, doubles and “matrimoniales” available at a very reasonable cost. The municipal hotel has round-the-clock security and staffing, and is set back from the roadway between Mazán and the Amazon. A security fence surrounds the facility. Rooms are simply furnished, but all have a shower and flush toilet (although water is not available continuously - see below). The hotel management and the mayor’s office in Mazán were both very receptive to the suggestion of fixing up rooms with additional features (security bars on windows, ceiling fans [floor fans are in each room], wall hangers, small tables and dressers) to better accommodate construction personnel and/or clinic volunteers in the future.

Public Buildings & Facilities: The Municipal building in Mazán is located on high ground overlooking the river. The buildings are east of the current population center and on the current Mazán-Indiana roadway. The site is attractively landscaped, though the municipal building itself is a basic square building. It is neatly painted and clean. Directly across the road from the municipality is a meteorological station operated by SENAHMI, the meteorological institute of Peru.

A brand-new library building has been constructed next door to the municipal building. The library will be fully equipped in the near future with books and also with computers and internet access for use by the community. The mayor and aldermen were criticized by some in the community for investing in a library (as opposed to spectator stands at the soccer field). It speaks well about their commitment to eliminating illiteracy in Mazán, pushing through a project that might not have been the most popular option.

A public market area close to the current port area is also operated by the municipality. It is clean and orderly (at least relative to the Belen Market area in Iquitos) and food vendors there personally know the mayor and mentioned that he occasionally ate at their stalls.

Schools: Two primary schools (with associated kindergartens) and one secondary school are present in Mazán. The primary schools are situated close to either end of the current axis of population. The secondary school is located near the municipality. The secondary school has six solar panels for powering computers and lights. Basic flush toilets are located behind the school.

Other: A Peruvian National Police station is located close to the municipal hotel on the Mazán-Timicurillo road, and just opposite one of the primary schools.



Mazán Road Map



Area including Mazán, Timicurillo, and Indiana

Geographical and Physical Considerations

The Peruvian Amazon state of Loreto is the largest (368,852 square kilometers) and most sparsely settled state in Peru, comprising some 28.7% of the national land territory (see Map 1), and with an official population of 859,960 inhabitants (the unofficial estimate is 943,807¹³), according to the 2005 census. The state of Loreto is divided into seven



Map 1: States of Peru

provinces. One of which, Maynas (Map 2), encompasses both the state capital of Iquitos (home to approximately 50% of the total population of Loreto), but also the Peruvian Napo watershed. A second province, Mariscal Ramon Castilla (Map 3) borders portions of the lower Napo watershed, and also forms part of the geographic region influenced by the Napo River.



Map 2: Provincia de Maynas



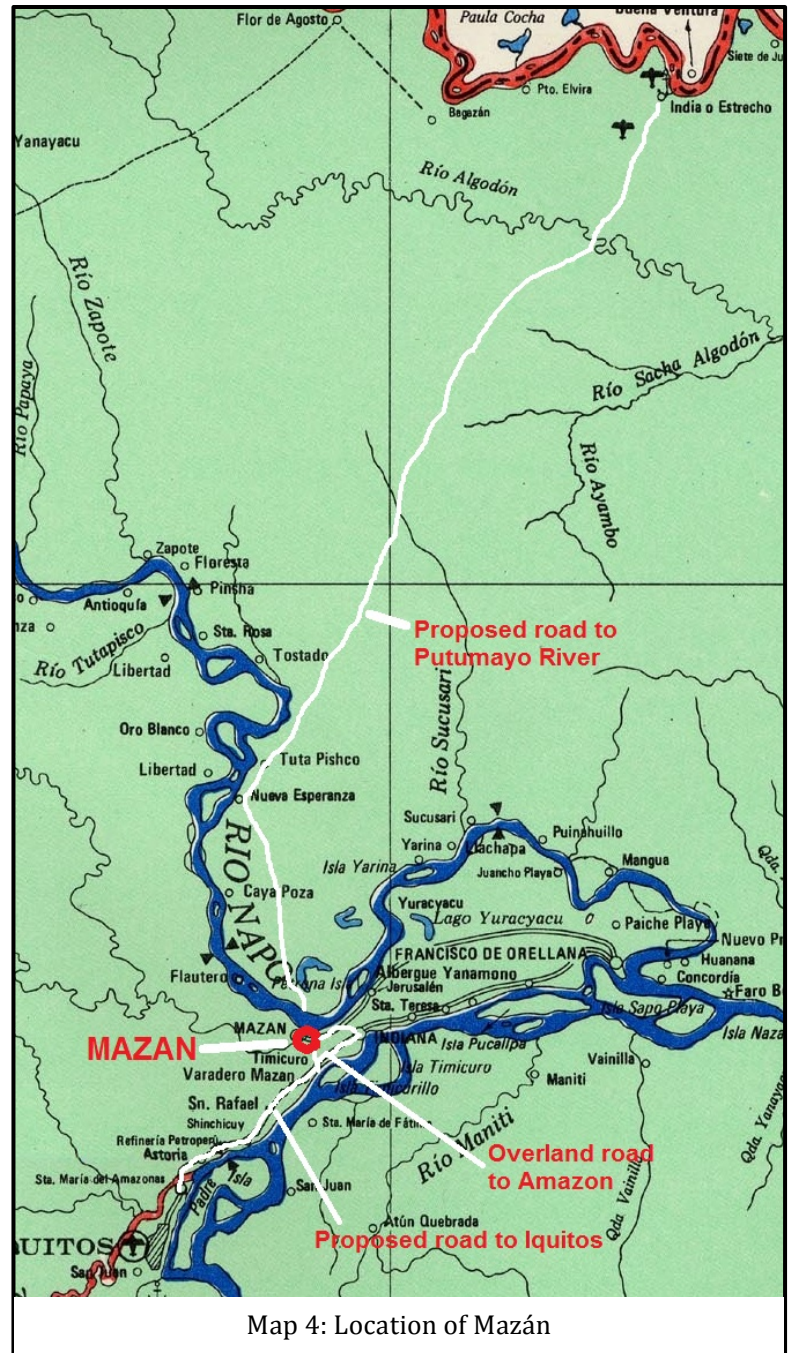
Map 3: Provincia de Ramon Castilla

The town of Mazán, a candidate location for the Medical Clinic, is situated at a strategic geographic crossroads. It is located on the Napo River, and on the narrowest point of the extensive isthmus, that separates the lower Napo from the Amazon. An overland paved trail about 5 km in length provides the main transportation route for people and goods between the Napo and Iquitos (Map 4).

¹³ <http://www.regionloreto.gob.pe/OATSIG/OT.htm> (pdf file - accessed 25 Nov 2011)

The Napo River is the most westerly of the major Amazon tributaries that originate to the north and has its headwaters in the mountains of Ecuador. The length of the Napo River is 1330 km, with the lower half located entirely within Peruvian territory¹⁴.

It has long been envisioned that commercial river traffic between the two countries would surge, but for a variety of reasons, this has not happened. Nevertheless, the Peruvian and Loreto (national and regional) governments have increasingly looked to the Napo River watershed as a new and accessible region for agricultural and commercial development.



Map 4: Location of Mazán

¹⁴ Rio Napo: http://es.wikipedia.org/wiki/R%C3%ADo_Napo (accessed 26 Oct 2011)



Current Population in Mazán and Surrounding Districts

District populations: In addition to the district of Mazán (the town and surrounding area, including the entire watershed of the Mazán River), three or four other districts would also be served by a Mazán clinic. Upriver on the Napo River (towards the Ecuadorian border) are the *Distrito de Napo* (capital is Santa Clotilde) and the *Distrito de Torres Causana* (capital is Pantoja). Immediately downriver and largely bordering on the Amazon is the *Distrito de Indiana* with its capital of Indiana – a mere 10 minutes away by *motokar* (motorized rickshaw). Further downriver, at the junction of the Napo and Amazon rivers is the *Distrito de Las Amazonas*, with its capital of Orellana. Any person traveling from any of the above-mentioned districts to Iquitos will, by geographical necessity, pass by Mazán. Hence, a well-regarded and well-equipped clinic there would care for a considerable number of people who might have otherwise been traveling to Iquitos for treatment.

Population estimates for the districts and the principal towns in each district are given in the table below. Data was obtained from the following references and do not all necessarily agree; the most recent figures and estimates available were used for the table below.

Table 8: Populations and land areas of Provinces and Districts in the greater “clinic area.”

Political Unit	Principle towns * Capital Cities	Total Population	Land Area
Provincia de Maynas	Iquitos*	539,901 (Jun 2010 est.) 534,396 (Jun 2009 est.)	119,859 km ²
Mazán (district)	Mazán* (3,626 pop, 2007 est.)	13,977 (Jun 2010 est.) 13,098 (2007 est.)	9,922 km ²
Indiana (district)	Indiana* (3,241 pop Dec 2010 est.)	12,457 (Jun 2010 est.) 12,198 (2007 est.)	3,298 km ²
Napo (district)	Santa Clotilde* (2,685 pop, 2007 est.)	16,104 (Jun 2010 est.) 14,882 (2007 est.)	24,298 km ²
Torres Causana (district)	Pantoja* (564 pop, 2007 est.)	5,197 (Jun 2010 est.) 4,865 (2007 est.)	7,363 km ²
Las Amazonas (district)	Orellana* (924 pop) Oran (729 pop) Yanashi (1,639 pop)	10,669 (Jun 2010 est.) 10,331 (Jun 2007 est.)	6,952 km ²



	(2007 estimates)		
El Putumayo (district)	El Estrecho (2,902 pop, 2007 est.)	6,116 (Jun 2010 est.) 5,638 (2007 est.)	34,942 km ²
Provincia de Mariscal Ramon Castilla	Caballococha*	61,510 (Jun 2009 est.) 54,829 (2007 est.)	37.413 km ²
Ramon Castilla (district)	Caballococha*	18,783 (2007)	7,123 km ²
Pevas (district)	Pevas*	13,624 (2007)	11,437 km ²
San Pablo (district)		12,197 (2007)	5,046 km ²
Yavari (district)		10,225 (2007)	13,807 km ²

* Capital Cities

Economic and Educational Indicators: Data from 2003 give a picture of the overall educational and economic status of people in the region. The data is broken down only by province, which unfortunately means that data for the Mazán area are lumped together with the large urban population of Iquitos under data for the Provincia de Maynas. Data from the adjacent rural province of Mariscal Ramon Castilla are most likely more approximate to the values for Mazán, so they are included in the table below. Notably the rural area has lower rates of literacy and secondary school attendance, and a significantly lower monthly family income.

Table 9: Life expectancy, educational and economic data for select areas of Loreto.

Area	Life Expectancy	Literacy Rate	Secondary School Attendance	Monthly Family Income {S/ = Solis}
Loreto (Average of all Provinces)	68.8 years	92.0%	64.8%	s/212.3 (\$78 USD)
Provincia de Maynas	70.1 years	94.5%	71.7%	s/237.6 (\$88 USD)
Provincia de Mariscal Ramon Castilla	69.7 years	86.8%	51.3%	s/164.3 (\$61 USD)

Poverty: Poverty and extreme poverty are difficult to define, however the Peruvian government has utilized a two-pronged approach to classify who is living in poverty or in extreme poverty. One factor relies on estimating if families and individuals have sufficient income to meet the costs of the most basic of food supplies. Another assesses the degree of access to basic services – health, education, clean water, government services, etc., and a combination of the above two factors is generally taken as the definitive indication of poverty level. Peru has made considerable strides in reducing poverty levels but



Ministerio de Salud



Impact Study and Growth Potential

there is still great inequality between regions and urban vs. rural areas. In 1993, an estimated 12 million Peruvians (of a total population of 22.6 million) were living in poverty and 6 million in extreme poverty (26.5% of the total population). By 1997, that percentage of Peruvians living in extreme poverty was estimated at 14.7% and projected to drop to 11% by 2000 (a goal that was not achieved)

The gap between urban and rural areas in terms of poverty is dramatic with rural areas having an extreme poverty rate of 24.5% of the rural population, compared to only 9.3% of the urban population in 1997. The rural rainforest areas of Peru fared the worst in all measures of poverty across Peru as shown in the following table:

Table 10: Poverty levels in Loreto and the Peruvian National Average.

Poverty Level (% of pop)	Peru National Avg.	Loreto (total)	Iquitos (urban area)
Extreme Poverty	13.7%	23.8%	10.52%
Poverty	39.3%	54.6%	37.68%

Loreto as a whole has significantly higher rates of poverty and extreme poverty than the national average, and yet the urban area of Iquitos is actually below the national average in these measures. A high percentage of rural populations fall into the poor and extremely poor categories. A 2006 poverty ranking of districts within Loreto corroborates this analysis. Districts that would be directly served by, or within the zone of influence of a Mazán clinic are highlighted.

Table 11: Districts of Loreto and relative poverty levels.

Poverty Level	# of Districts	District Names (not all are listed)
Not Poor	1	Iquitos
Poor	2	Yurimaguas, Punchana
Very Poor	18	Belen, Indiana, Putumayo, Ramon Castilla, +14 others
Extremely Poor	30	Las Amazonas, Mazán, Napo, Pevas, Torres Causana, San Pablo +24 others



Ministerio de Salud



Population Projections

As is clear from the population trends in Table 8 (previous section), populations in the region are growing, and actual census numbers and estimates are likely undercounted or underestimated due to individual mobility, the presence of many impoverished and indigenous people who may not have national identity cards, and the large population of infants and young children. Long-term demographic trends estimated from historic (and incomplete) data show a very strong growth curve for Loreto. While much of this growth is concentrated in and around the city of Iquitos (including Belen, Punchana, and San Juan Bautista) rural areas will certainly grow as well, and rural “residents” may be bolstered by workers in oil exploration, fishing, hunting, and logging camps who spend extended periods of time in rural areas, but who consider themselves to be residents of the urban population center of Iquitos.

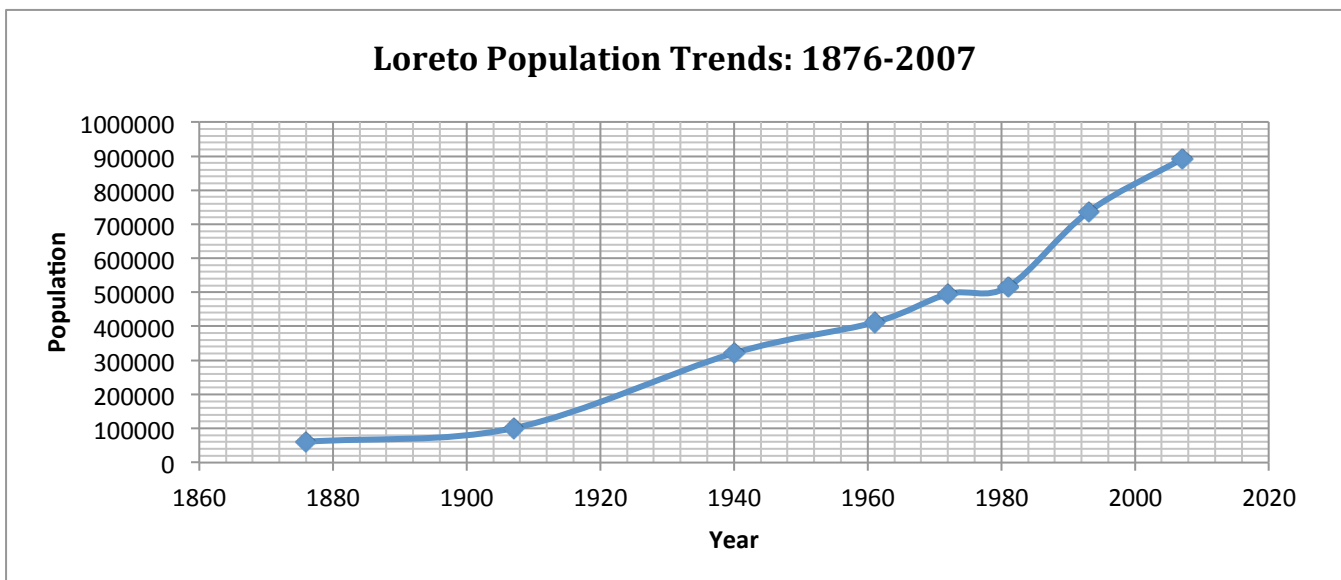


Figure 2: Population trends in Loreto from 1876 to 2007. Data from¹⁴

Population trends in Mazán and the surrounding districts are projected to be consistently upward at greater than the average rate if planned development for the area (roads, communications) goes forward. Given the strong state of the Peruvian economy at the current time, and the ongoing discoveries of hydrocarbon and mineral wealth in the Peruvian Amazon, it is likely that most of the planned development activities will take place, with resulting immigration from other parts of the country adding to natural population growth.



Ministerio
de Salud



8. Future Transportation and Mobility Changes:

Several proposed projects would lead to considerably more mobility among communities on the Napo River as well as adjacent watersheds. These projects all center on Mazán as being the best point of access to Iquitos and to the Amazon River for both individuals and commodities. Should any one of the proposed projects become reality, the population of Mazán would likely boom with the influx of travelers from now considerably isolated communities.

- **Carretera Mazán-El Estrecho**, Rio Putumayo: The Peruvian portion of the Putumayo River is one of the most isolated parts of the country, with 12 to 20 days of boat travel from Iquitos required to access the most remote communities. A road was constructed decades ago from the mid-Peruvian Napo River to the Putumayo, but was never paved. Although it can still be followed, it is a 2-4 day journey of foot depending on river conditions. In order to more closely integrate the Putumayo into the national fold, a multinational initiative is underway to construct a permanent road between Mazán, and extending to El Estrecho, the largest population center on the Peruvian Putumayo (see Map 4). As of 2009, the Putumayo watershed (including both the Colombian and Peruvian sides) had a total of 128 communities with a population of 20,360 people¹⁵. If a road is constructed, a clinic in Mazán would be the nearest well-equipped medical care center for a significant portion of that population. Currently the population of the Putumayo depends on the *centro de salud* in El Estrecho (accessible by airplane from Iquitos – a paved landing strip was completed in the late 2000's; otherwise only accessible by a very long boat trip¹⁶). The initiation of the Mazán-Putumayo road (an asphalt road) is projected to begin in 2012, and to require 3 years for completion¹⁷.

An ancillary project related to the roadway would be the construction of new port facilities in Mazán. These would be centered at the current location of the town's generator facility. A new paved (and

¹⁵ Zumaeta Ramirez, N. Oct 2009. Inversión para el Desarrollo y la Integración Regional (PowerPoint).

<http://www.bcrp.gob.pe/docs/Proyeccion-Institucional/Encuentros-Regionales/2009/Loreto/EER-Loreto-Nilo-Zumaeta.pdf>. Proyecto Especial Binacional: Desarrollo Integral de la Cuenca del Rio Putumayo.

¹⁶ The journey from El Estrecho to Iquitos would take a minimum of 12 days in large powerboats such as Project Amazonas's *Nenita*. Speedboats are capable of this journey in 4-5 days. However, they will not have sufficient fuel capacity. Using a speedboat for this journey will require the purchase of fuel sold at a premium cost in remote locations.

¹⁷ Reategui, Edward; mayor of Mazan. Personal communications.

Impact Study and Growth Potential

wide) road would lead from the new port location through the town, connecting to another new (wide) road connecting Indiana to Mazán and continuing on to Bellavista (see below).



Photo (left): Road leading through Mazán commercial district to current port facilities. This road is highly congested on most days.

Photo (center): Mazán Riverfront Boulevard, and ramp leading to dock areas. All produce must be moved to/from boats manually.

Photo (right): Boats in the port area on Monday morning (main market day).

- **Carretera Bellavista-Mazán:** In the 1970's, a road was constructed from Bellavista (the furthest eastward extension of the city of Iquitos) to Mazán but was never maintained and rapidly grew back to forest. There are no plans to re-open that road which did not follow an optimal route. Instead, a new road will parallel the Amazon – passing through the population centers between Iquitos and Mazán¹⁸. This road will service the current oil refinery, the naval shipyards, the Peruvian police post at Sinchicuy and the communities of San Rafael, Santa Clara de Ojeal, and Santa Maria de Ojeal (see Map 4). Six bridges would need to be constructed, but transit time would be fast and the overall road length would be considerably shorter than the 1970's road.

¹⁸ Vazquez, Ivan. Oct 2011. Governor of Loreto; and Reategui Salas, Edward, Mayor of Mazan, 14 Nov 2011. Personal communications.



Ministerio
de Salud



9. Potential Partners & Other Partnerships

University of Mississippi School of Medicine: The UMISS School of Medicine has undertaken medical service expeditions with Project Amazonas since 1998, and those trips have become annual affairs scheduled in late February each year (to coincide with their academic calendar). The head of the Department of Epidemiology, Dr. Rathel Nolan, has been a primary mover of the program since its initiation, but with increasing official responsibilities, the “Amazon Program” has been taken over by Dr. Svenja Albrecht, who also has extensive international experience. Both Drs. Nolan and Albrecht will be on the February 2012 medical trip, and are excited about the collaborative possibilities that would center on a land based, permanent clinic. In addition, Dr. John Cleary of the UMISS School of Pharmacy, has participated in several of the medical service trips, and has initiated several research projects while on those trips (with resulting publications in medical and pharmaceutical journals), and would also be enthused regarding collaborative possibilities, not only at the clinic, but also with other initiatives in Peru.

The School of Medicine and the School of Nursing at Florida International University (FIU) and the Honors College at FIU: Recently established schools of medicine and nursing at FIU provide an excellent opportunity for developing collaborative links. The FIU student body is currently 42,000, and the administration intends to increase that to 60,000 within the next five years, with resulting increases in enrollment in all fields. Since both programs are new, this provides an excellent opportunity to get in on the ground floor and develop some long-lasting collaborative ties. The Honors College at FIU can be very helpful in this regard. The Honors College has sent its students to the Peruvian Amazon for that last 4 years for a service-learning study-abroad experience, and has made the “Amazon Program” one of its signature programs which receives a great deal of visibility and promotion on-campus. They are actively working to transform their other study-abroad programs to also incorporate service-learning activities. Dean Lesley Northup has been unwavering supportive of involving students working in the Amazon. Given that 60% of FIU students are of Hispanic origin, with a very high percentage of students conversant or fluent in Spanish, developing ties with Loreto and Peru would be a natural fit. Should direct flights from Miami to Iquitos be initiated in the coming year (as has been promised the national government), Iquitos would only be a short 3.5 hour flight away from Miami.



The School of Pharmacy, University of Missouri: Dr. Frank Caligiuri of the School of Pharmacy has taken students to the Amazon several times in the past, and the school currently has an extensive program in northern Mexico. Given the increasing security concerns in that country, he is actively looking for alternate locations, and recently contacted me about the possibility of bringing students to Peru in May 2012. Dr. Graham has been in initial conversations with him regarding those prospects, and setting up a permanent program, which could be centered at the clinic.

Servicio Rural Medico (SERUM): The SERUM program is the means by which the State is able to staff remote rural clinics and health centers. Any medical or dental professional who aspires to work for, or to be eligible to work for the State is required to spend a year at a location selected by the State. Graduates who plan to enter private practice immediately can avoid SERUM service, but most graduates complete their year of SERUM service as a matter of course. The advantages to SERUM personnel are that they are young, have just finished their medical training (they may not have the work experience, but they do have the latest medical knowledge), and mostly do not yet have families meaning that they are more mobile. MD's conducting their SERUM service are paid s/3,500 per month (\$1,320 USD). Obstetrical technicians are paid s/1,500 per month (\$570 USD).

Escuela de Medicina – Universidad Nacional de la Amazonia Peruana: The school of medicine at UNAP is well known and well respected. Offering students the opportunity to intern/study at a clinic in Mazán would be a valuable experience for them away from the large urban area of Iquitos. Transport of students would need to be by boat, and as noted earlier in this document, public river transport can be unreliable. A clinic boat would likely be necessary in any event for transporting personnel, supplies and patients between Mazán and Iquitos. A weekly schedule of transport could be established to ensure that staff/students are able to travel back and forth in a timely manner. Transit time between Iquitos and Timicurillo (on the Amazon) is 30 to 35 minutes, with an additional 5 minutes by overland transport to Mazán. This is less than the time required to travel from the center of Iquitos the UNAP facilities at Zungarococha (by bus). Fuel costs would be about 12 gallons/round trip using a boat equivalent to the Mai-Kai speedboat with a 60 hp motor.

Escuela de Odontologia – Universidad Nacional de la Amazonia Peruana (UNAP); Universidad: The same considerations would apply as for the UNAP School of Medicine.



Impact Study and Growth Potential

Científico del Perú (UCP); Universidad Peruana del Oriente (UPO): Three dental training programs are currently offered in Iquitos. All three programs are in need of locations for internships and for *Servicio Rural Medico* (SERUM) postings.

- UNAP – program has been offered for 8 years, has a class size of 25 students.
- UCP – the first group graduated this year, has a class size of 15 students.
- UPO – the first group will graduate in two years, has a class size of 15 students.

Escuela de Obstetra- Universidad Científico del Perú: Offers the only obstetrics-training program in Loreto. Needs places where its students can intern. Students are given a stipend of s/400 (\$148 USD) per month.

Plan NOAH: This is a novel pilot program financed by a Finnish NGO, which aims to strengthen infant growth from 0-3 years of age. The initial budget is projected to be s/100,000 (\$38,000 USD). This larger program incorporates the existing program; “*Vaso de Leche*” (the name of the program translates to “Glass of Milk”). As well as two “*comedores populares*” (community kitchens). These will be established for the purpose of ensuring young children receive an adequate and healthy breakfast each day. Integrating this effort and the municipality’s efforts to combat extreme poverty into the day-to-day operations of the clinic would have both short-term and long-term positive health benefits (as well as educational and political benefits).

Peruvian Medical Association: Established Peruvian medical professionals from cities on the coast or in the highlands (or internationally) who want to experience the jungle could come for 1 to 3 weeks each year to participate in various medical campaigns. These could include hernia surgeries, cleft-lip reconstruction, and a variety of other, non-complicated reconstructive surgeries. Dr. Ernesto Salazar has the necessary contacts with the Peruvian and international medical establishments to coordinate such opportunities.

Course in Tropical Medicine: Currently the best-known course in Tropical Medicine is the Gorgas Course, offered at the *Universidad Cayetano Heredia* in Lima, Peru. This course lasts 5-6 weeks and costs from US \$3,500 to US \$4,000, not including room and board. All but one week of the course is spent in the lab in Lima, with the final week consisting of a field trip to *Concepción* in Southern Peru, and then ending in Iquitos for two days of closing ceremonies and tourism. One possibility would be to



Impact Study and Growth Potential

entice the Gorgas Course to utilize the clinic facilities in Mazán for a portion of their course, or to offer a competing three-to-four week Tropical Medicine Course (at perhaps US \$2,000) that actually takes place in a tropical environment (as opposed to in a lab in frequently chilly and dry Lima). The expertise exists in Iquitos to cover most of the topics that would be touched on by such a course, and outside experts could be obtained to cover additional topics such as traditional medicinal plant use. Outside funding would be sought to initiate and promote such a course. The course could be paired with direct clinic observations and experience, and also with a boat-based service expedition immediately after the course ended for those participants wishing to obtain additional “real-life” jungle experience.

Medical Technology and/or Assistant Nurse Programs: Two-year training programs in medical technology and/or nurse’s assistant training could be established in conjunction with the clinic. Such courses would have a small cohort of 10 students per year. Students would work and learn in the clinic during their two-year program. The programs could be State approved, with graduating students receiving a certificate directly from the State qualifying them as an “*Asistente de Tecnológica Medica*” or similar. Outside grants would be sought for the establishment of both this and the following program.

School of Housekeeping: In a similar vein to the medical technology/assistant nurse programs, a school of housekeeping with a small cohort of students could be of great benefit to both the clinic and the community. Students could intern both at the clinic, the municipal hotel and at nearby eco-tourist facilities and lodges. Training could include not only the entire range of housekeeping duties (cleaning, sewing, cooking, serving), but also management (both budgetary and personnel), computation, English language, and general tourism-related topics. Student would graduate with a certificate from the State. Given the expected boom in tourism in the area if the promised direct international flights to Iquitos materialize, graduates would have few problems in finding jobs.

University of Toronto School of Medicine: Contact: Carla Rosario (Peruvian-Canadian) – interested in bringing service groups to Peru in the near future.



9. Conclusions

Tens of thousands suffer or die annually in the Peruvian Amazon from treatable or preventable medical conditions. The highest rates of mortality are among neonates and infants, and the #1 cause of death is common diarrhea and resultant dehydration. Another important source of mortality and morbidity among all age groups is malaria. The suffering and death among residents of the Peruvian Amazon is the result of the following factors:

- Inadequately staffed clinics that often lack basic medicines (see pages 4, 5, 18, 19, 21, and 22).
- Lack of diagnostic capabilities at clinics (see pages 19-22).
- Inability of local people to access clinics due to distances and poverty. Travel to reach the nearest clinic may require multiple days, provided transportation and or fuels are available (pages 16, 17, 29, 32, 33, 35, 36, and 38).
- Sporadic or incomplete vaccination campaigns (pages 5 and 6).
- Lack of health education in regards to infant and childhood diseases. Too often children are taken to the clinic only when the illnesses are well advanced (see pages 4, 5, 6, 9).
- Accidents, including snakebites, often happen in remote areas, far from clinics. Accident victims frequently die in route to medical care (see pages 4, 13-17).

A well-equipped and well-staffed medical clinic in the town of Mazán will directly address the serious health and health-education issues identified above by filling critical needs and by taking a strongly proactive approach to health.

Mazán is strategically located between the Amazon River and the Napo River watershed, which dominates northeastern Peru. For anything other than the most basic of medical care, residents of the Napo watershed must currently pass through Mazán on their way to Iquitos.

A Mazán medical clinic will serve a growing population that is living in poverty or extreme poverty. The clinic will serve as a base for the health education and preventative medical care that is key to reducing the staggering levels of preventable illnesses, morbidity, and death in the region.

High levels of political and social support for the establishment of a clinic in Mazán by the Ministry of Health, and particularly by the leadership of the District of Mazán currently exist. They recognize that a modern, well-staffed, and well-equipped clinic in Mazán would be a focal point for aggressive health



Impact Study and Growth Potential

education and preventative health campaigns in a malaria endemic region. The clinic will improve the quality and duration of life for tens of thousands of people in the region.

There is high potential for additionally developing long-term partnerships with other institutions and organizations interested in health. Partners would have the opportunity to experience both urban and rural conditions and health situations. Partnerships between a Mazán clinic and both Peruvian and International institutions and organizations would have impacts far beyond the district of Mazán – opening up opportunities for collaborative research, student and professional exchanges, and improved training and capacity building for Peruvian health professionals.

Medical, demographic, geographical, political, and socioeconomic factors all combine to identify Mazán as an optimal clinic site for producing the greatest and most widespread advances in health for the population of the Peruvian Amazon.