

USAID LAST MILE INITIATIVE IN PERU

First Interim Report

Baseline Research Assessment in Jauja

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Prepared by
Instituto de Estudios Peruanos
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This report describes the results of the baseline study carried out in the first area where the Last Mile Initiative in Peru will start its operations, the province of Jauja.

The goal of this report is to provide useful information for (a) data-driven, evidence-based project planning, (b) helping predict and monitor financial sustainability of project operations, and (c) identifying a yardstick against which we can measure impact at the end of the project cycle.

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1. INTRODUCTION

1.1. Description of the LMI Project in Peru

The Last Mile Initiative (LMI) is a project sponsored by the United States Agency for International Development (USAID) that is being implemented in several countries worldwide. Its aim is to expand telecommunications connectivity to isolated rural areas, emphasizing the development of financially sustainable business models. In Peru, the project is being implemented by Voxiva, the local subsidiary of Voxiva International.

Voxiva is responsible for expanding telecom services under the LMI in two different sites in the country. The first site selected in Peru is Jauja, a province of the department of Junin, in the central region of Peru. As we will see in the next sub-section, Jauja is a province well connected to major highways and very close to the country capital, Lima. The province capital, Jauja, will be the central hub from where telecommunication services will expand to the following nine districts: Ataura, El Mantaro, Huamali, Huaripampa, Huertas, Molinos, Muqui, Muquiyauyo, Yauyos. In Yauyos, Huancas (instead of the district capital) will be the area served by the micro-telco. A wireless technology solution was selected for this project (Canopy, by Motorola). By using an unlicensed frequency, this technology reduces operational costs. However, technology deployment is affected by the difficult geographical conditions of the region (a mountainous area with abundant trees). The wireless signal range reaches up to eight kms., and the addition of a repeater allows it to reach up to 16 kms.

Voxiva plans to provide both fixed telephony and Internet access through the installation of terminals in households and local businesses, from which extensions can be plugged to bring connectivity to new clients. Operations and management will be conducted through a local micro-telco called "Televias Puyhuan" (Televias). As opposed to other LMI implementations worldwide, in Jauja there will only be one micro-telco.

Televias is owned by two people closely linked to Grupo Puyhuan, a private group promoting sustainable rural development in the area through the use of information and communication technologies. The group has been active in the area since 1999, and has emphasized work with local schools, including partnerships with the National Agrarian University. In addition, Grupo Puyhuan has established a *Center for Computer Science Research* in Molinos (the only settlement in the LMI target group that is already connected to the Internet). One of the reasons to select Jauja as the first LMI implantation site was the presence and previous efforts of Grupo Puyhuan.

At the time our baseline research was conducted (December 2005), the telecom equipment was already installed but operations had not started. There are two related reasons for this situation. On the one hand, Telefónica del Peru, the incumbent telecom services operator, had not reached an agreement with Televias regarding interconnection to the public telephone network. On the other hand, Televias had yet to file an application to obtain a license from the Ministry of Transport and Communications.

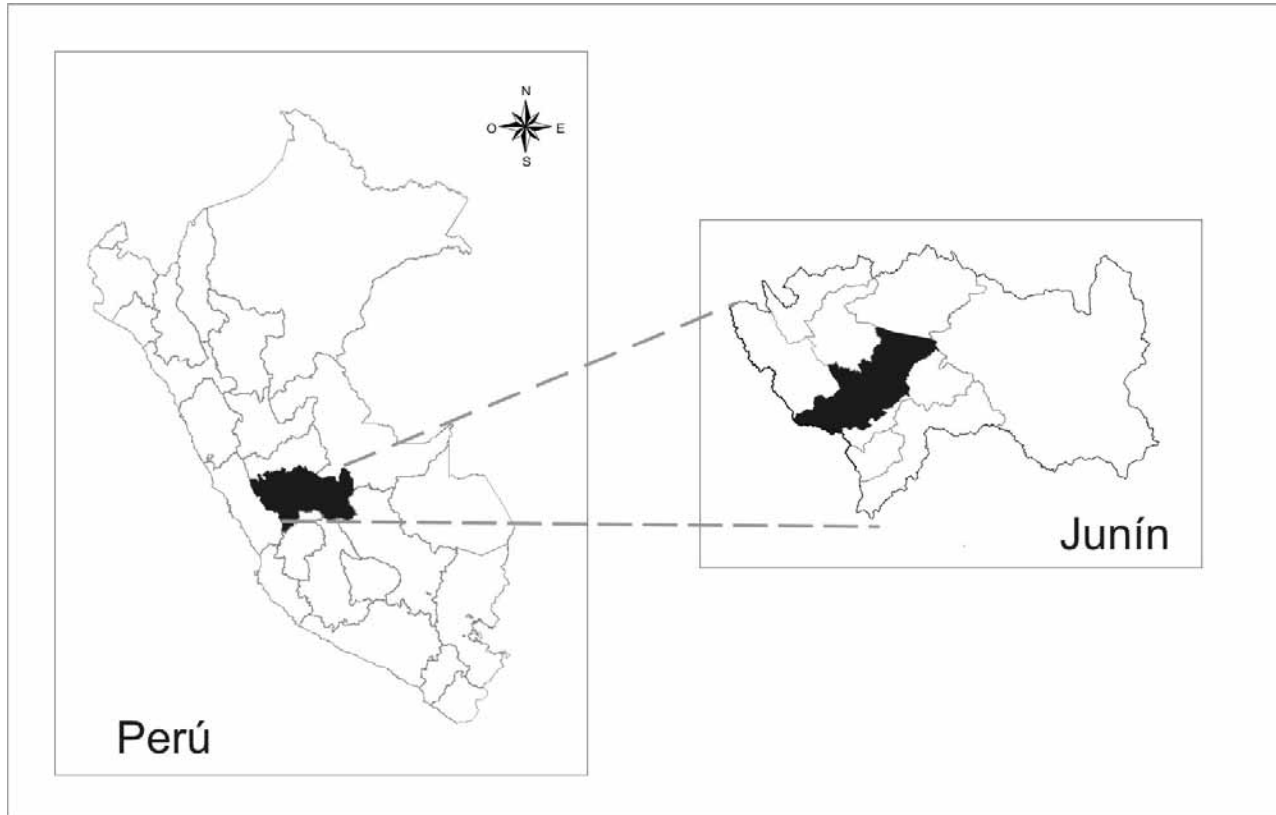
Compared to projects sponsored by the Peruvian Government to expand telecom services to rural areas in Peru, in which major operators (e.g., Gilat) receive subsidies to install and operate public telephones using VSAT technology, the LMI seeks to find a business model that can work at a smaller scale, and including Internet access into the basic telecom service package. In our case, we find a small local organization (Televias) as operator and service provider. However, it is important to note that Jauja is not an

isolated and poor rural area (as compared to other regions in Peru), and that Televias Puyhuan has emerged from existing initiatives by Grupo Puyhuan.

1.2. General characteristics of the area where the project is operating

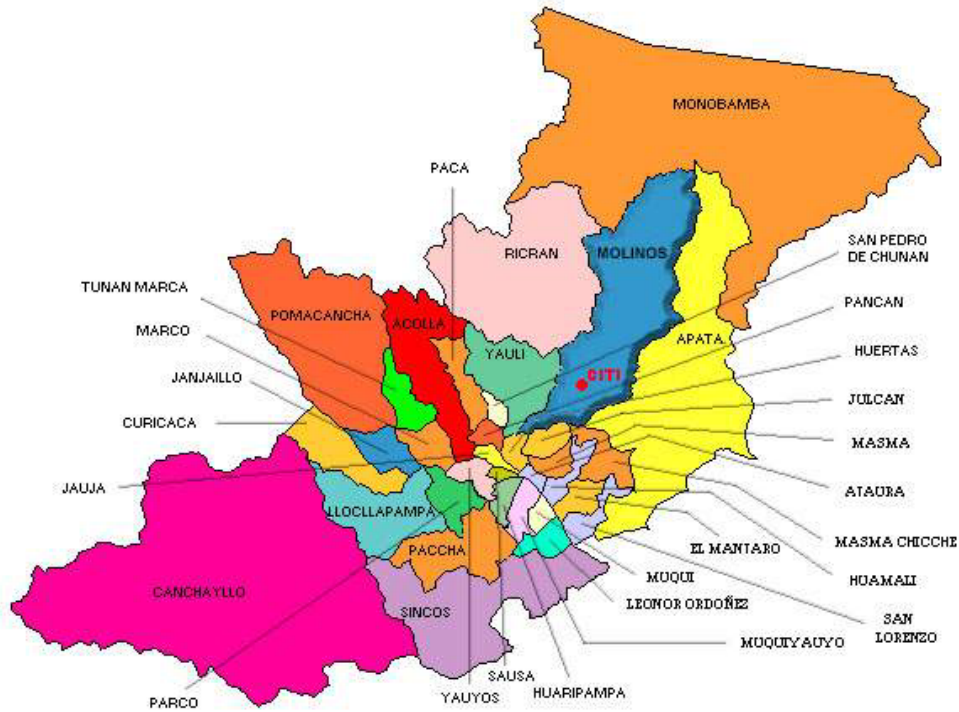
The province of Jauja belongs to the department of Junin, located 252 kms. east of Lima, the capital of Peru, and is well connected to Lima through the central highway. By car from Lima, it takes no more than five hours to reach Jauja and Huancayo, the capital of Junin.

Map 1: Peru, Junin and Jauja Province



As indicated above, the LMI project will be implemented in the following districts of the province of Jauja: Ataura, El Mantaro, Huamali, Huaripampa, Huertas, Molinos, Muqui, Muquiyauyo, Yauyos (see Map 2).

Map 2: Jauja Province



Source: Pyhuan Group (<http://www.setinedic.edu.pe/proyectoPuyhuan/modeloplan.htm>)

Population

The districts where the project will be implemented have a population between 1500 to 4000 inhabitants, the district of Muquiyauyo being the most populated, and Muqui the least populated with 1080 inhabitants (see Table 1). Each one of these districts is made up of one or two eminently rural annexes. Each district, in turn, is rather urban, and made up of "quarters", as called since colonial times. The implementation of the LMI project will mostly occur in the urban centers of each district —the exception being the case of Huancas, which is an annex of Yauyos.

Table 1- LMI Project: Districts and population

District	INEI* Projections	2005 National Census: Preliminary results	
Ataura	714	1,335	
El Mantaro	1,511	2,870	
Huamali	1,071	2,118	
Huaripampa	588	1,190	
Huertas	1,041	2,082	
Molinos	1,057	2,224	
Muqui	602	1,171	
Muquiyauyo	1,379	2,636	
Yauyos**	4,945	9,570	
Total	12908	25196	

*INEI - National Institute of Statistics and Informatics

** Only the annex of Huancas, with a population of 800, will be covered by the project.

In these districts, the main economic activity is agriculture, especially potato and artichoke. All these districts are located very close to the provincial capital, Jauja. All of them are extremely well connected among them, due to the fluid circulation of cars and “combis” at accessible costs for the population (S/. 0.80 in average, or U\$ 0.24). This fluid connection among districts is facilitated by their location bordering the main highway or well maintained rural roads. This infrastructure certainly helps the local economy and commercial interchanges between peasants and intermediaries of other provinces, such as Huancayo or even Lima.

Basic services

All the districts, including the annex of Huancas, are connected to the national electricity grid. That means that households and businesses in the area have electricity 24 hours a day. The monthly payment for this service is approximately S/. 15 per subscriber (approximately U\$ 4.4). Water and sanitation services are limited during the day and of very poor quality. Local municipalities offer water services in Ataura, El Mantaro and Molinos, but it is non potable water and only available in each building from two to six hours a day. The monthly cost for running water is cheap at S/. 2 per building (or U\$ 0.58). None of these three districts have sewerage services. The districts of Muqui, Muquiyauyo and Huaripampa have partnered to create the Potable Water and Sewage System Services Company (ESAPA) which offers potable water services six hours daily at S/. 5 per month (approximately U\$ 1.6). For non potable water provision, Huertas, Huamalíes, and Huancas rely on users’ councils. These three settlements lack sewerage services, and water reaches only their urban perimeter (see Table 2).

Table 2 - Public services: Provider and provision frequency

District	Electricity		Water		Sewerage
	Provider	Hours per day	Provider	Hours per day	Provider and coverage
Ataura	Electrocentro	24	Municipality	2	Municipality / urban area only
El Mantaro	Electrocentro	24	Municipality	12	No service
Huamalí	Electrocentro	24	Users’ Council	2	No service
Huaripampa	Electrocentro	24	ESAPA	6	ESAPA / urban area only
Huertas	Electrocentro	24	Users’ council	24	No service
Molinos	Electrocentro	24	Municipality	24	No service
Muqui	Electrocentro	24	ESAPA	12	ESAPA / urban area only
Muquiyauyo	Electrocentro	24	ESAPA	6	ESAPA / urban area only
Huancas	Electrocentro	24	Users’ council	1, every other day	No service

Economic activity

The main economic activity in these districts is agriculture. Potato, maize, alfalfa, and the recently adopted artichoke are the major crops. Households usually own no more than 5 hectares each. Due to its location near the main highway and the quality of its products, agricultural production (particularly potatoes) is usually bought by intermediaries and wholesale retailers of markets that supply Lima. Local potato seeds are popular and frequently used in other areas of the country, and partly explain why this is one of the most important agricultural regions of Peru.

Animal husbandry is secondary and usually a complementary activity for local farmers. Most peasant families own three or four heads of crossed cattle that graze next to some sheep. The largest farms have between 30 and 15 cows. Since the Gloria Milk Plant (a company owned by the multinational Nestle) buys the local milk production through its trucks hoarders, several peasants have formed associations of cattle owners, promoted by the Ministry of Agriculture. In El Mantaro, the association of milk producers has 15 members.

There are some fish farms in Molinos. In Muqui, there is an association that produces guinea pigs (*Cavia porcellus*) and sells them in Huancayo. Only a few families are dedicated to the production and commercialization of handicrafts in this part of the country. Molinos is known for Curimarca wood carvings. There are roofing tiles producers in Condorsije (Huertas), and in Huaripampa one can find loom weavers, supported by the local municipality-owned college (*Centro Educativo Ocupacional*).

The area is known for its different markets. Artisan products are sold in the markets of Huancayo and Lima. The commercial activity of farming products is focused on sales to wholesalers and intermediaries of Lima and Huancayo. The Jauja market, held on Wednesdays and Saturdays, is the main commercial hub in the area. Another important market is the one held in Chupaca, a suburb of Huancayo, where cattle is traded. In some districts weekly markets are held, but these are smaller and only people from different district annexes attend.

Another important point of commercial activity is represented by the local grocery stores. Many of these stores sell alcohol and have room for people to sit and drink. In Molinos, Huaripampa, Muqui and the annex of Huancas, the number of local groceries range from two to six. El Mantaro and Ataura —transit districts near the main highway that connects Lima to Huancayo— have more than 15 stores each. In all these districts, more than half the stores are located in or very close to the main plaza. In addition, there are two restaurants in Ataura, and one in El Mantaro. In Molinos, a community center was opened recently but it works only during weekends.

Institutions

The most important local institution in these districts is the municipality or local government. Generally, the municipality is open to the public from 8:00 a.m. to 2:00 p.m. Most civil employees, including mayors, live in Jauja and thus it is difficult to find them after office hours.

Regarding health, all the districts have either a small medical center run by the Ministry of Health (MINSA), or a first aid post (“Posta”). These health centers do not necessarily have a physician but a nurse, or a technician or “serumista” (medical students fulfilling the requirements necessary for graduation). Generally, since the health personnel reside in Jauja, in case of medical emergency patients are transferred directly to Huancayo or Jauja. In addition to a posta, Muquiyayuyo has a medical center from ESSALUD¹, which serves the insured of the nearby districts, mainly from Muqui and Huaripampa.

¹ ESSALUD is a health services provider financed by dependent workers —under payroll—which only serves those insured in that way. MINSA has a responsibility to serve any citizen. Generally ESSALUD has more resources than MINSA.

All the districts have one or two pre-schools, and one or two elementary schools—generally one located in the capital of the district and another one in some of the annexes. Huaripampa, Muqui, Ataura and Huancas do not have a high school. In Molinos, the secondary school, administered by Puyhuan group, is oriented to farming education and has internet access. In El Mantaro, the largest and oldest public university in Peru (San Marcos) has established the school of veterinary medicine research center. The University of the Center also has a research center in this district.

Table 3 - Health and Education Services

Districts	Schools				Health Center
	Pre K	Elementary	Secondary	Other	
Ataura	1	2	0	0	Posta MINSA
El Mantaro	1	3	1	IVITA from UNMSM Centro Experimental de la Universidad del Centro	Posta MINSA
Huamali	1	2	1	0	Posta MINSA
Huaripampa	1	1		Centro Educativo Ocupacional Municipal	Posta CLAS
Huertas	0	1	0	0	Posta MINSA
Molinos	1	1	1	0	Posta MINSA
Muqui	0	1	0	0	Posta MINSA
Muquiyauyo	2	1	1	ESSALUD	Posta MINSA
Huancas	1	1	0	0	Posta MINSA

2. RESEARCH METHODS

This section describes the research methods we used for the baseline data collection in the Jauja province. We used a mixed-methods approach: (a) a household survey that collected quantitative data from a probability sample of household heads, and (b) a set of qualitative interviews of relevant institutions and organizations in the area.

2.1 Household survey methods

2.1.1 Sample

The enumerators collected 400 surveys in total using a face-to-face approach. Our sample population is heads of households and their spouses living in the districts of Jauja where the first phase of the LMI project will be implemented. The sample was selected through multistage cluster probability sampling. First, we identified the geographical areas and settlements that are going to be covered by the LMI project (Ataura, El Mantaro, Huamali, Huaripampa, Huertas, Molinos, Muqui, Muquiyauyo, and Yauyos). We distributed interviews in proportion to the approximate population size of each area selected (taking into account we had an a priori limit of 400 surveys). Then we identified streets, buildings, and households in these areas by ‘random route’ method. Finally, individual households were selected using the Kish system of probability sampling method.²

² The ‘random route’ method consists of selecting a route to be followed by enumerators. Enumerators start in an intersection of two streets and continue from left side to right side until the end of the itinerary. The

Table 4 shows the geographical distribution of the sample. Eighty percent of the sample is urban. The sample reflects the definitions of urban/ rural used by the National Statistical Institute, and proportionally corresponds to the nature of the settlements to be served by the LMI project, according to information provided by Voxiva.

Table 4 - Geographical distribution of the sample (n=400)

Districts	Total	Urban	Rural
ATAURA	33	27	6
Ataura	27	27	0
Viscap	6	0	6
EL MANTARO	62	62	0
Pucucho	62	62	0
HUAMALI	51	36	15
Huamali	36	36	0
Conopa/ Ullpaypuquio	15	0	15
HUARIPAMPA	34	34	0
Huaripampa	34	34	0
HUERTAS	52	12	40
Huertas	12	12	0
Condorsinja/ Santa Ana/ Rumichaca/ Tumanaya	40	0	40
MOLINOS	54	40	14
Molinos	19	19	0
Curimarca	21	21	0
Quero/ Bellavista/ Collpa	14	0	14
MUQUI	28	28	0
Muqui	28	28	0
MUQUIYAUYO	62	57	5
Muquiyauyo	57	57	0
Los Andes/ Villa Cana	5	0	5
YAUYOS	24	24	0
Huancas	24	24	0
TOTAL	400	320	80

Source: IMASEN

This is a survey of individuals but retaining the household as the sampling unit. The household is the sampling unit because it is a conveniently identifiable unit, not because the data are reported in terms of household aggregates. The household acts as the location for the identification and selection of the survey population. In a sense, we were forced to redefine the survey population to fit the most adequate (and only available) sampling frame, considering there were *no* available lists of the target population. By choosing to survey only heads of households or their spouses, we eliminated from the sample people who are important potential users of micro-telco services (e.g., younger people) but could not be included in the study for practical reasons. Although this sampling option was an efficient way to narrow down our sample

Kish system is a table that allows to randomly select individual households in a dwelling place (only if a dwelling place has more than one household).

frame and to minimize sampling error, it forced us to somewhat compromise our ideal survey population. This also prevented us from obtaining a more gender-balanced sample, given that most heads of household in the area are male.

For overall results, the survey has a $\pm 5\%$ sample margin of error and a confidence level of 95.5%. More details about the sample populations are provided in sub-section 3.1.1 of this report.

2.1.2 Measurement

An English translation of the survey instrument is attached to this report as an appendix. Generally, respondents were asked roughly 100 questions on five domain areas: (a) individual and household demographics and socioeconomic status; (b) characteristics of local businesses (for those respondents who own a business) and information and communication uses and needs of business owners; (c) general patterns of information usage in the area (including current levels of interest and satisfaction with specific types of information); (d) key trends in current phone and Internet usage (including frequency of use and monthly expenditure on each medium); and (e) level of demand for communication and information services that might be offered by a micro-telco (including interest in and willingness to pay for different services). Each survey was typically completed in 20 to 25 minutes. The level of non-response was 20% for urban areas and 15% for rural areas.

2.1.3 Other observations

The household survey was conducted between December 17th and 20th 2005. A local research firm, IMASEN, was hired to prepare the survey logistics and administer the survey under the guidance and supervision of the Institute of Peruvian Studies. Roughly 40% of completed interviews were checked by IMASEN supervisory staff by revisiting households and selectively conducting several survey questions.

2.2 Qualitative interview methods

2.2.1 Sample

We conducted qualitative interviews with representatives from five key local sectors (government, health, education, business, and associations) in each of the nine areas that will be reached by the LMI project in Jauja. Before designing the interview guides for each target sector, we visited the area to identify our samples and conduct preliminary assessments.

We administered 49 interviews that included: (a) a local government representative from each district (9 interviews in total); (b) a representative from every health center at each district (9 interviews in total); (c) representatives from at least one elementary school, and a secondary school if available (15 interviews conducted); (d) owners of the most significant local businesses in the area (10 interviews); and (e) representatives from local associations (6 interviews). We used a purposive sampling method. For every sector our interviews covered almost our entire sample population (except in the case of businesses, where the largest ones with stand-alone locations were selected).

2.2.2 Measurement

An English translation of the interview guides for each sector is included in the appendix. The interview guides are mostly composed of open-ended questions that cover the following areas: (a) general characteristics of each sampling unit (institution, organization or business); (b) patterns of information and communication in the day-to-

day activities of each sampling unit; and (c) patterns of Internet and phone usage of each sampling unit.

2.2.3 Other observations

All the interviews were conducted by researchers from the Institute of Peruvian Studies between December 14-20.

3. BASELINE RESEARCH RESULTS

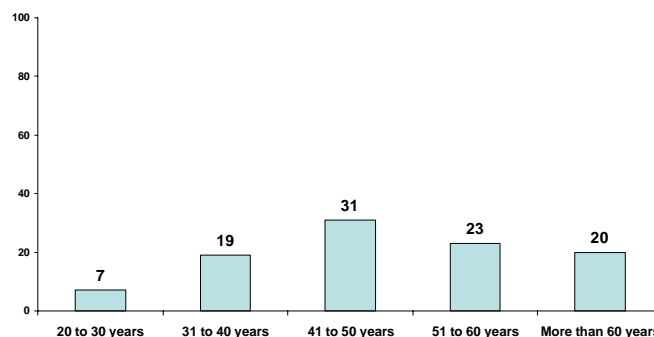
3.1 Results of the baseline household survey

The objective of this summary of baseline survey results is to provide relevant information for strategic planning of project operations in Jauja. The summary is divided into four parts: (a) an overview of demographic and socioeconomic characteristics of the target population; (b) a review of patterns of information use in the area; (c) key trends in current phone and Internet usage among the target population; and (d) a picture of the level of demand for information and communication services that might be offered by local micro-telcos (or contingent valuation of micro-telco services). For practical purposes, at this stage we decided to present descriptive data and avoid inferential statistical analysis.

3.1.1 Demographic and socioeconomic characteristics of the target population

Figures 1 and 2 below provide general information about the sample population. Because the sample is mostly composed of heads of households, the mean age is almost 50 years old (see Fig. 1). Only 10% of the sample is below 30 years. This needs to be taken into account when interpreting results, as we are leaving aside a good proportion of the youngest strata of the population—a group who is potentially more interested in micro-telco services in the area.

Figure 1 - Distribution of age groups in the sample

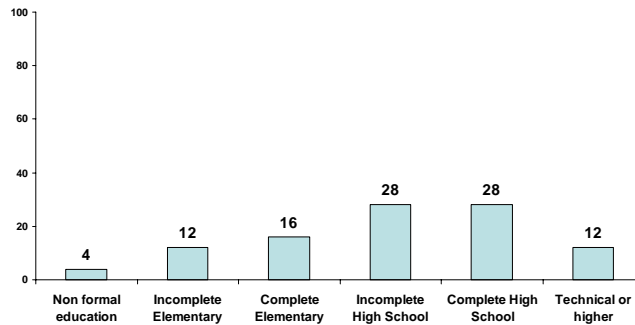


Sample: Total respondents (400)

Regarding the distribution of educational levels, almost 60% of the sample has completed at least part of secondary school education (30% of the sample has a secondary school diploma). About 15% of the sample has at least some higher education training. Only 4% of the sample never attended school. This educational

distribution is consistent with the high percentage of literacy we find in our sample: 80% of respondents asserted that they can “read and write without difficulty”, and only 3% of the sample cannot read nor write in Spanish (a percentage that matches the low number of people without formal schooling).

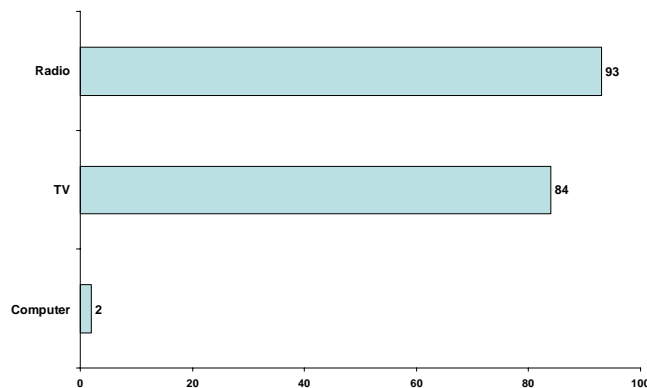
Figure 2 - Education levels



Sample: Total respondents (400)

The median number of family members living in a household is four, although almost 50% of respondents have a direct family member (husband or children) living outside the community. Only 7% of households do *not* have electricity. Figure 3 below shows the percentages of household media ownership in the communities studied. As shown, radio and television ownership is widespread, but only 2% of the households have a computer.

Figure 3 - Household media ownership

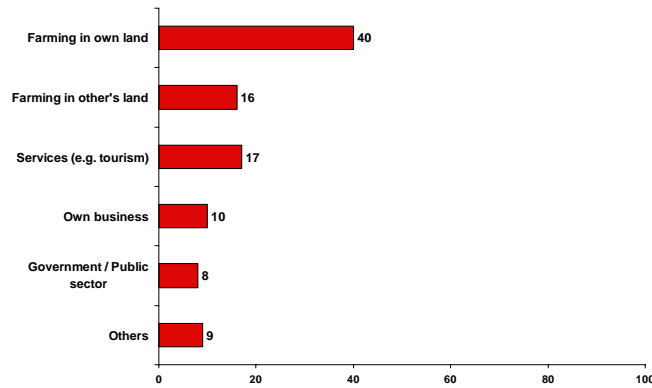


Sample: Total respondents (400)

Figure 4 shows that the main revenue generating activity for most families is farming (40% working on their own land or taking care of their own animals, and almost 20% working on agriculture or animal husbandry for other farmers). Almost 20% of respondents earn a living in the service sector, mostly doing manual work (from construction laborers to electricians). Some of the respondents working in the service

sector are self-employed and thus consider themselves as owning a small business (see Fig. 6). About 10% of households mostly live on revenues coming from operating a small business store –largely small convenience shops (see Fig. 6).

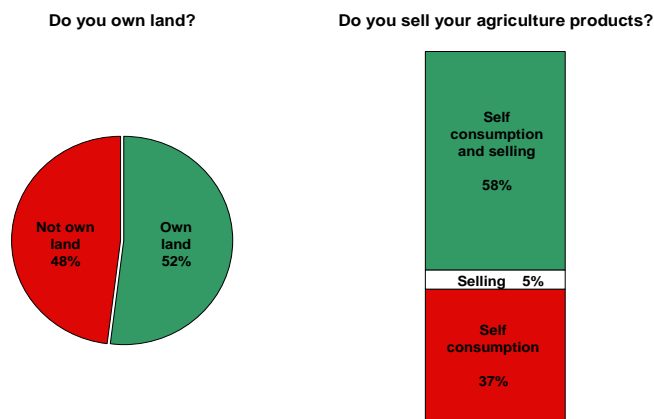
Figure 4 - Main revenue generating activity



Sample: Total respondents (394)

As seen in Figure 5, about 50% of households own land for agriculture and animal husbandry purposes. Land properties in this area have a median extension of one hectare, although most is significantly smaller (the mean being only half an hectare). Almost 40% of households that own land do *not* sell their own farm produce (i.e., subsistence farming). In any case, most households exploit their lands for commercial purposes, even though they usually reserve part of the yield for self-consumption. Almost all farmers sell their products in nearby markets in the district.

Figure 5 - Land ownership and economic use of own land



Sample: Total respondents (400)

Sample: Respondents who own land (206)

Figure 6 below shows that 30% of respondents have some type of business. Most businesses are related to selling food produce in convenience stores and small shops. Only about 15% of small businesses are devoted to other types of products and services (from hair dressers to launderers and drivers).

Figure 6 - Business Ownership and type of business

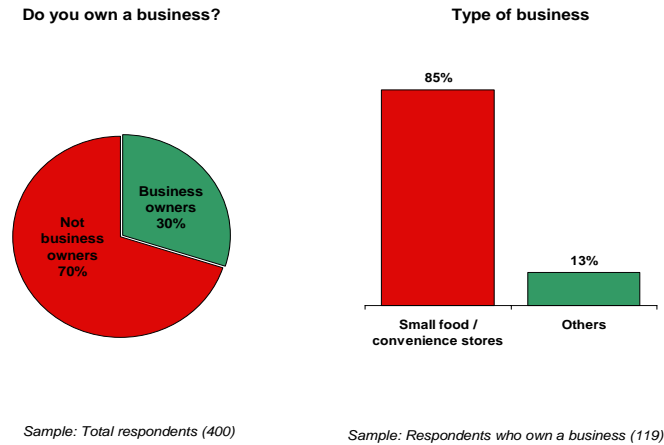
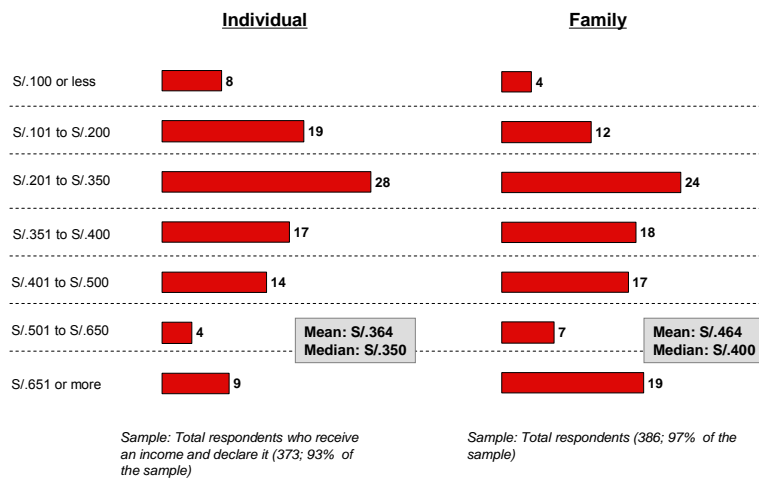


Figure 7 presents the individual and family monthly income of our target population. The distribution of both types of monthly income is fairly similar. The median family monthly income is S/. 400 (or U\$115). According to the National Household Survey of 2003, the poverty line in the department of Junin is S/. 194 per month (approximately U\$ 56). Considering that data, roughly 15% of our sample is below the poverty line.

Figure 7 - Individual and family monthly income

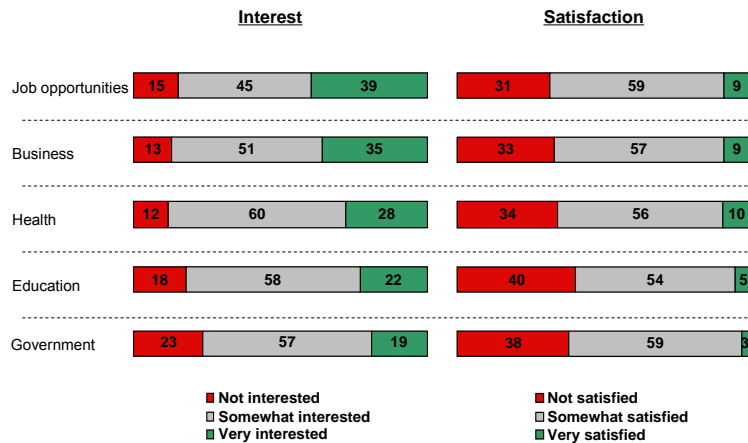


3.1.2 Patterns of information use

In this section, we explore the retrieval patterns of a specific type of information: instrumental information that has a functional or problem solving quality, and which may have the greatest impact on socioeconomic development in the target areas. Figure 8 shows respondents' levels of perceived interest and satisfaction with different types of information (job opportunities, business, health, education, and government). In general, the sample population is particularly interested in information about employment (almost 40% are "very interested") and about issues related to their business (35% are "very interested"). In addition, roughly 30% of the sample express a keen interest on health information (only 12% state they are "not interested" on this topic).

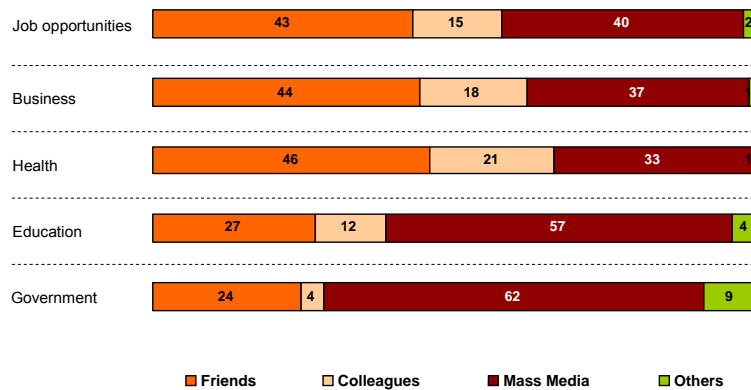
Although there are differential patterns of interest depending on the information domain, the levels of satisfaction about available information across these domains is fairly similar. Generally, satisfaction is fairly low (only roughly 10% of the sample is "very satisfied" with information on job opportunities, business, and health, while 5% or less are "very satisfied" with available information on education and government). Therefore, for example, although the levels of interest about information on employment and business are very high, only about 10% is "very satisfied" with the information they usually obtain about these two topics. In sum, we can safely assume that there is significant demand for localized information services on issues that affect socioeconomic development and quality of life in the target population.

Figure 8 - Interest and satisfaction with different types of information



Sample: Total respondents (400)

Figure 9 - Sources of different types of information

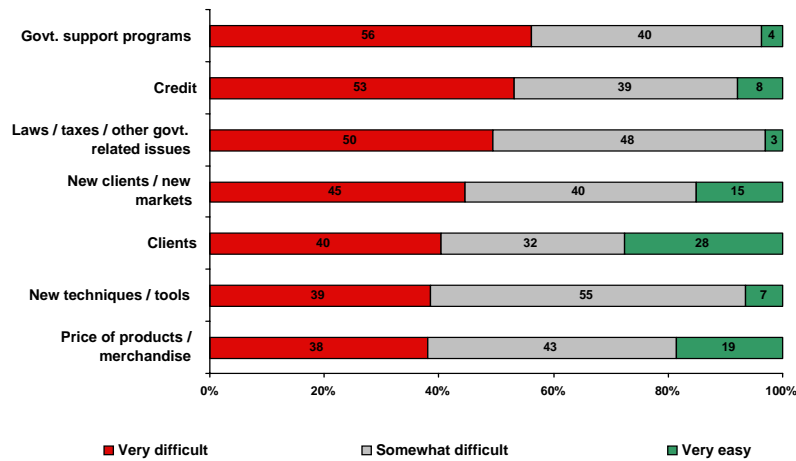


Sample: Total respondents (400)

Figure 9 presents the main sources of information for the different information domains. Interpersonal contact (such as friends, family, and colleagues) represents the most important information source about employment and business issues. This high-value and high-demand information is mostly transmitted informally, and probably is not very reliable (considering the low levels of satisfaction seen in Figure 8). Mass media (mostly newspapers and radio) are also mentioned as a main source of business and employment information by roughly 40% of the sample.

While the nature of health information is quite different, retrieval patterns do not differ significantly. Most respondents point out informal interpersonal contact as their main source for health information (professional doctors were only mentioned by 1% of the sample). Mass media (particularly radio) also function as a very relevant source of health information. As expected, mass media play an even more salient role as a source of information for education and government issues.

Figure 10 - Accessibility of relevant information for business owners



Sample: Respondents who own a business (166; 41% of the sample)

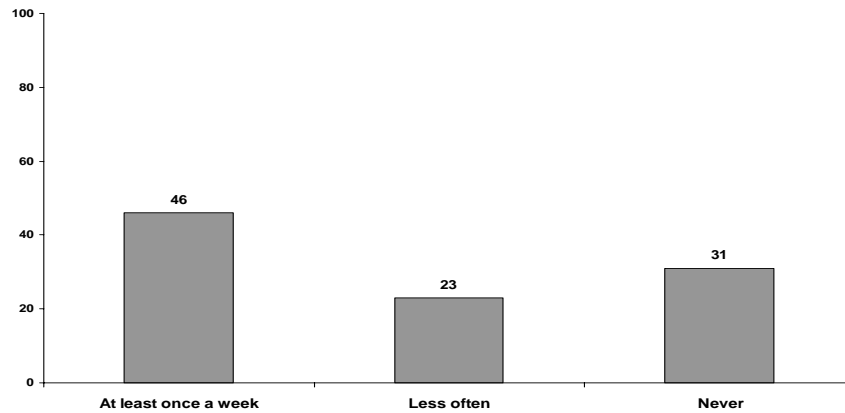
Figure 10 shows business owners' patterns of access to information that is relevant in their work. We clearly see that business owners (40% of our sample) in the study areas usually have significant difficulty in accessing information about issues such as (a) government support programs, (b) government-related issues (such as laws and taxes), and (c) credit sources. Roughly 50% of business owners state that accessing information on (a), (b), or (c) is "very difficult", and only roughly 5% consider it "very easy" to access information on these issues.³ It is also interesting to point out that about 20% of business owners find it "very easy" to obtain information on price of products and merchandise, but still almost 40% has a hard time obtaining price information. In sum, we find that relevant business-related information is generally unavailable (or not easily available) in the target area.

3.1.3 Trends in current phone and Internet usage

Roughly 70% of our sample uses the phone. In addition, it is interesting to note the significant difference in phone usage between the group that is below the poverty line (monthly family income below S/. 200 –U\$ 58–) and the rest of the sample. Only 55% of families below the poverty line are phone users, compared to exactly 72% of the rest of households. In Figure 11 we see how frequently our sample population makes phone calls. About 50% of household heads make phone calls at least once a week, 20% uses the phone less often (generally 1-3 times a month), and roughly 30% never make phone calls.

³ In all the figures presented in this section, the values are codified as follows: (a) for the lowest values (such as "not interested", "not satisfied", or "very difficult") we take those respondents that selected 1-3 in a 10-point scale; (b) for the highest values (such as "very satisfied" or "very easy") we group responses from 8-10 in the same 10-point scale.

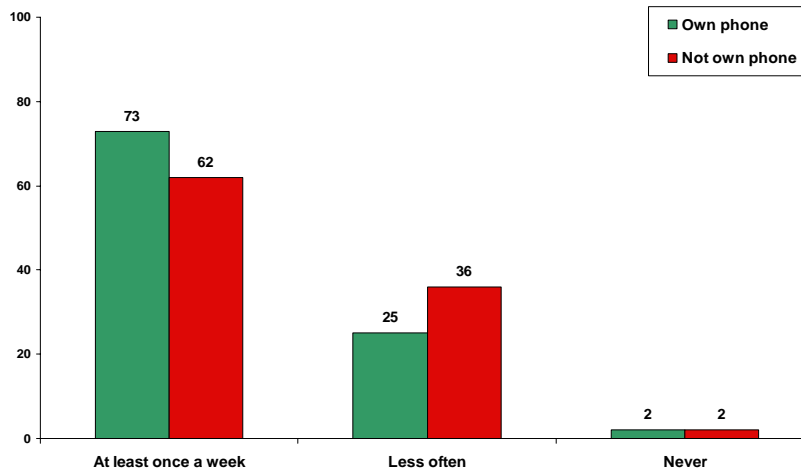
Figure 11 - Frequency of phone calling



Sample: Total respondents (400)

Just 7% of our respondents own a cell phone. However, in total, 15% of households in the area have a cell phone (the difference corresponds to cell phones owned by other family members living in the household). Considering the group below the poverty line, only 8% own a cell phone. About 60% of households with a cell phone are in the higher socioeconomic status (SES) group (the group of families whose income is above the median, or S/. 400 per month –US\$ 116–). The vast majority of cell phone owners use prepaid phone cards.

Figure 12 - Frequency of phone calling among users



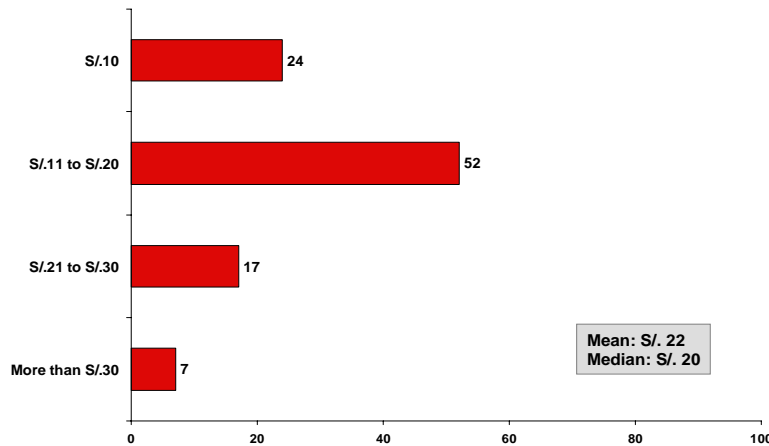
Sample: Total respondents who make and / or receive phone calls (282)

Figure 12 compares frequency of phone use among those in the population who own a cell phone and those who don't. Among phone users, we see that almost 70% of respondents who own a phone (as compared to the 60% who just use the public phone)

make at least one phone call a week. Only 2% of phone users never make phone calls (they just use the phone, their own or a public one, to receive calls).

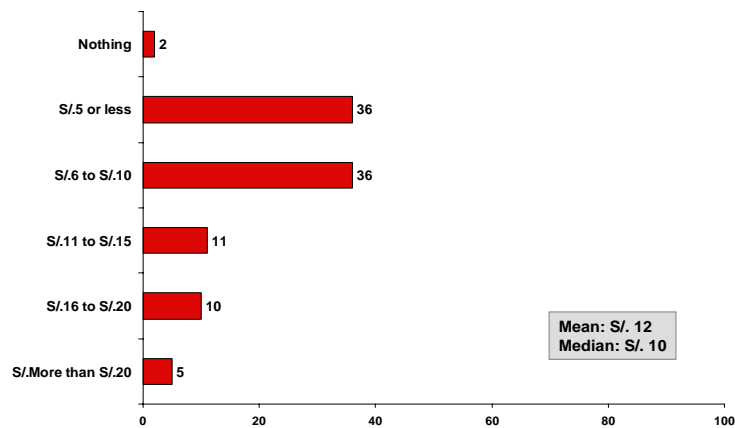
Figure 13 below shows the ranges of monthly expenditure on cell phone. The median monthly expenditure on cell phone use is S/. 20 (approximately U\$ 6). About 25% of the sample spends S/. 5 to S/. 10 (U\$ 1.5 to U\$ 3) per month on their cell phone. Less than 10% spends more than S/. 30 (U\$ 9) a month to make cell phone calls. Interestingly, none of the respondents in that 10% are business owners.

Figure 13 - Monthly expenditure on cell phone



Sample: Total respondents who own a cell phone themselves (29; 7% of the sample)

Figure 14 - Monthly family expenditure on public payphone



Sample: Total respondents who are phone users (278; 70% of the sample)

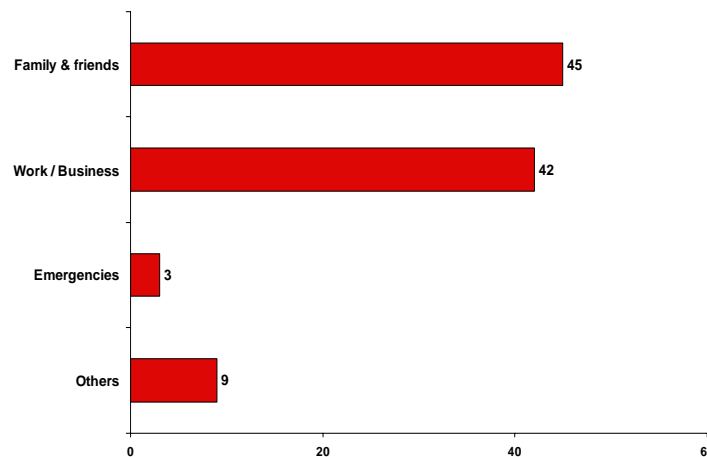
Roughly 95% of our sample population has access to a payphone in their own community. Figure 14 above shows that the median family expenditure on public payphone is S/. 10 (or U\$ 3) per month. About 20% of families spend from S/. 11 to S/.

20 (U\$ 3 to U\$6) on payphone per month, and only 5% spend more than S/. 20 (U\$ 6). In addition, there is a significant difference (at the .05 level) between socioeconomic groups in monthly payphone expenditure: 30% of the higher SES families (families with a monthly income above the median of S/. 400 –U\$ 116– per month) spend more than S/. 10 (U\$ 3) on public payphone, while only 20% of lower SES families spend more than S/. 10 monthly on payphone.

However, while 30% of households who own a cell phone spend more than S/. 10 (or U\$ 3) monthly on public payphone, about 25% of those who don't own a cell phone are above the median in monthly family payphone expenditure. In other words, there is *not* a significant difference in public phone expenditure among those families who own a cell phone and those who don't (although the percentage of households who own a cell phone and spend more than S/. 10 per month on payphone is slightly higher than the percentage of families who don't own a cell). There is also not a significant difference in public phone expenditure between those who own a business and those who don't. Specifically, 30% of business owners (as compared to 25% of non-business owners) spend more than S/. 10 per month in public payphone.

Figure 15 shows the main reasons our target population makes phone calls (the percentages are the sums of two questions: first and second main reasons for making a phone call). Although calling family and friends is the most popular option, over 40% of respondents usually makes phone calls for work or business reasons.

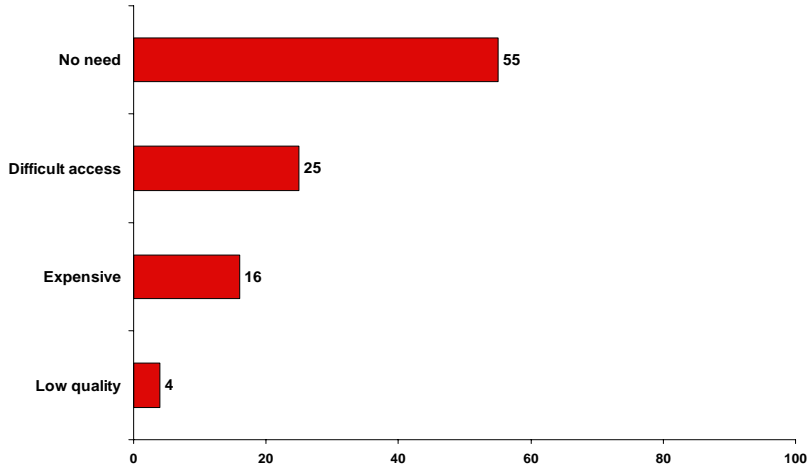
Figure 15 - Main reasons for making a phone call



Sample: Total respondents who make phone calls (281)

Figure 16 and 17 present the main reasons for not making more phone calls or for not making calls at all. In Figure 16, almost 70% express “no need” to use the phone or increase phone usage. However, it is interesting to focus on the 25% that perceive to have “difficult access” to a phone, and the 15% that consider making phone calls expensive.

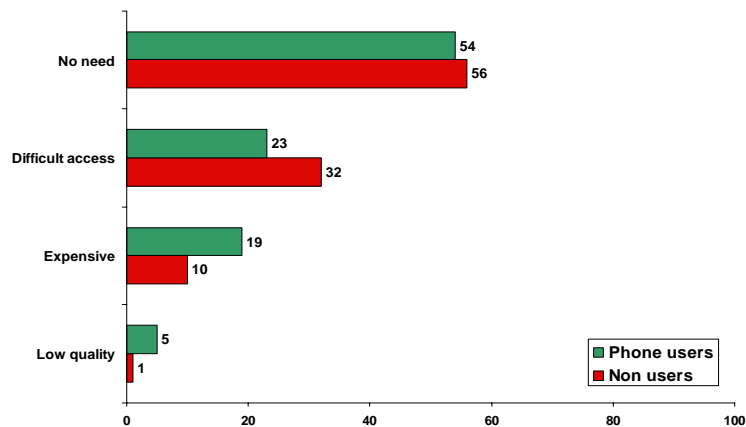
Figure 16 - Main reasons for not using phone or not making a phone call



Sample: Total respondents (400)

Figure 17 compares phone users' reasons for not making more phone calls to non users' reasons for not making phone calls at all. We observe that almost 70% in both groups simply perceive to have "no need". However, "difficult access" is the main constraint for over 30% of non-users (as compared to 20% of those who already use the phone). In other words, a significant number of people who never make phone calls have access problems, and thus may be potential clients of services provided by a micro-telco. Affordability does not seem to be a relevant constraint for most, since only 20% of phone users do not use the phone more often because it is "expensive" (and only 10% of non users mention this reason for never making phone calls).

Figure 17 - Main reasons for not using phone or not making more phone calls

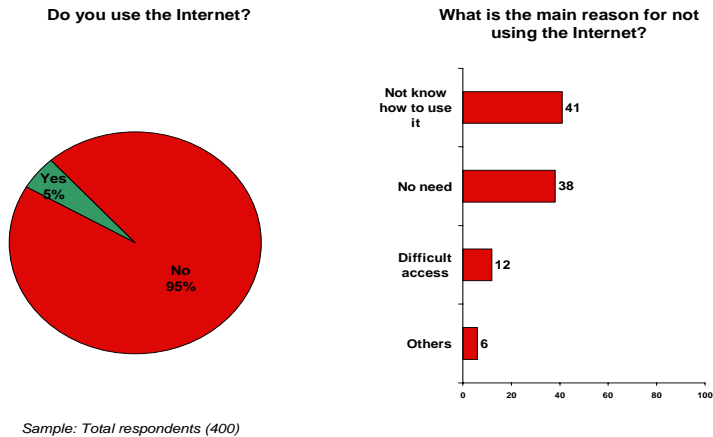


Sample: Total respondents (400)

Figure 18 shows that only 5% of respondents use the Internet. About 90% of them access Internet at public access places (such as cybercafés or "cabinas públicas"), while the remaining 10% have access at work. The main two reasons for not using the

Internet, particularly among non users, are perceived lack of skill and need. For users, the main reason for not using Internet more frequently is access difficulty (60% of Internet users report that this is the main problem).

Figure 18 - Internet use patterns



3.1.4 Contingent valuation of micro-telco services

The contingent valuation method is a technique used to assess willingness to pay for a good or service. The approach is labeled ‘contingent valuation’ because respondents are asked to value a good or service that is still conjectural and not available. Data collected this way are used to estimate a relationship between an individual’s willingness to pay for these ‘contingent’ services and the individual’s demographics and socioeconomic characteristics. Contingent valuation is a central element of our household survey. As indicated in the methods section, respondents were asked to value potential micro-telco services before these micro-telcos were actually established.

Figure 19 - Perceive importance of services by micro-telco

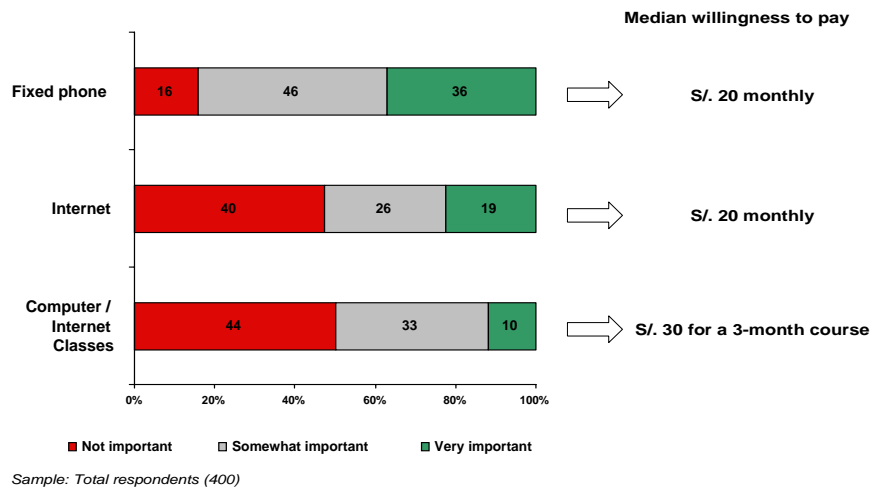
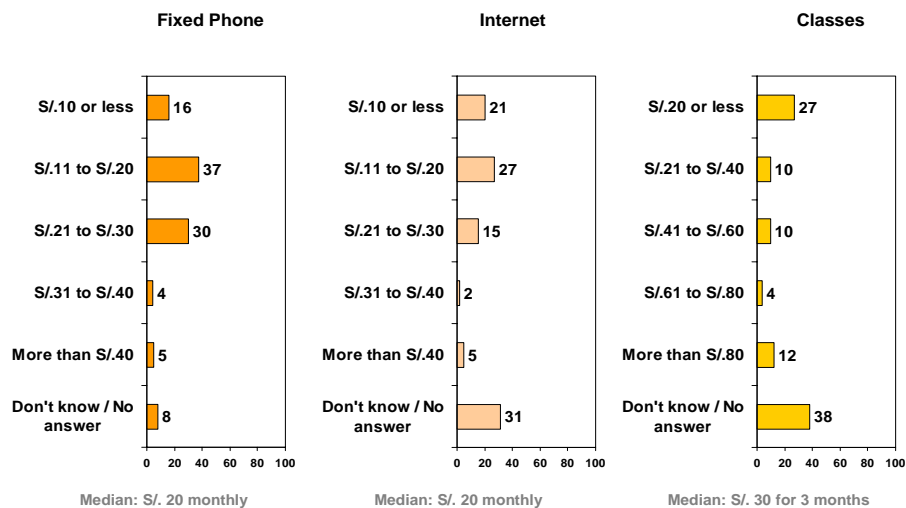


Figure 19 shows the levels of perceived importance of several potential micro-telco services (fixed phone, Internet, and computer classes), and the median willingness to pay for each of these services. Almost 40% of the sample is keenly interested (respondents who marked 8 to 10 in a 10-point scale where '10' is 'very interested') in having a fixed phone. It is important to note that there is not a significant difference in the percentage of "very interested" families below the poverty line (36%), and the percentage of "very interested" better-off households (37%). The median willingness to pay for a fixed phone is S/. 20 (or U\$ 6) per month.

The percentage of respondents who are very interested in having Internet service at home or taking computer courses is significantly lower. Forty percent of our target population is simply "not interested" in having Internet service home. The median willingness to pay for Internet per month is also S/. 20. In addition, only 10% of respondents are very interested in computer and Internet courses. The median willingness to pay for a three month course is S/. 30 (around U\$ 9). We generally find a lack of awareness about the potential of computers and Internet to contribute to the quality of life in the target area.

Figure 20 provides a more detailed picture of willingness to pay for potential micro-telco services. Regarding fixed phone services, although the median willingness to pay is S/. 20 (U\$ 6) per month, 40% of households are willing to pay more than S/. 20 (30% of respondents are willing to pay from S/. 21 to S/. 30 –U\$ 6 to U\$ 9– per month). Regarding Internet, it is important to observe that 30% of respondents are in the "don't know/no answer" category. This finding is consistent with the interpretation above regarding the general lack of "computer and Internet awareness". A similar pattern exists with regards to computer classes, considering almost 40% of respondents do not value or provide a price for that service. Still, 12% of respondents (a group of "early adopters") are willing to pay more than S/. 80 (U\$ 23) for a three month course on computers and the Internet.

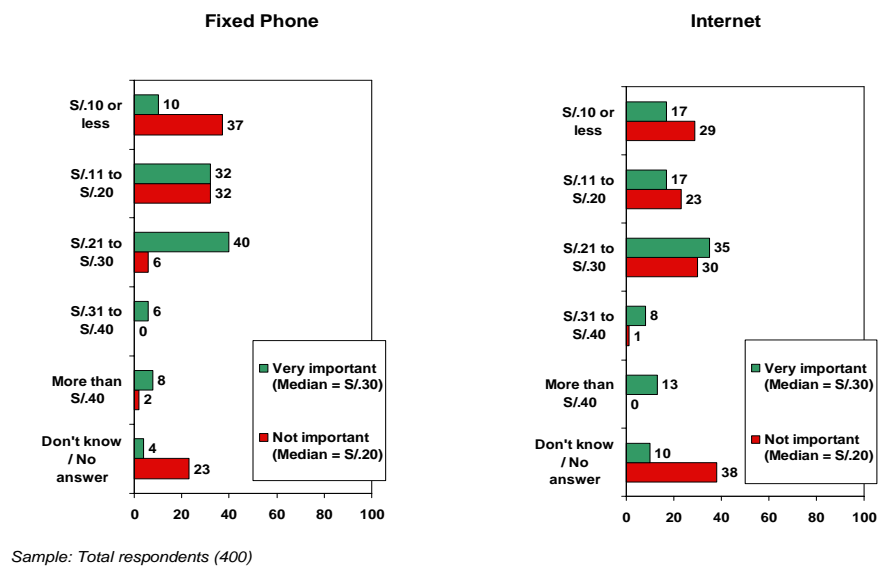
Figure 20 - Willingness to pay for potential micro-telco services



Sample: Total respondents (400)

The segment of the population who, on average, is more interested in potential micro-telco services is naturally willing to pay more for these services. Figure 21 below presents differential willingness to pay data. It compares the segment that considers potential fixed phone and Internet services ‘very important’ (those who marked 8 to 10 in a 10-point scale where ‘10’ means ‘very important’) to those that consider them less important. We see that the median willingness to pay for fixed phone service for the most interested group is S/. 30 –US\$ 9– per month (as compared to S/. 20 –US\$ 6– per month for the “less interested” sample). Almost 10% of the group who is most interested in having a fixed phone is willing to pay more than S/. 40 –US\$ 12–. Regarding Internet access, we observe that almost 50% of those who do not provide a value for this service simply do not know what Internet is or do not provide an answer. It is important to note that almost 20% of those who are more interested in Internet (again, likely “early adopters”) are willing to pay over S/. 40 monthly for household Internet access.

Figure 21 - Differential willingness to pay for potential micro-telco services



Basically we observe that the median monthly family income of those most interested in fixed phone service is S/. 420 (US\$ 122), and the median monthly amount they are willing to pay is S/. 30 –US\$ 9– (as compared to S/. 20 –US\$ 6– per month for the “less interested” sample which has a median monthly family income of S/. 400 –US\$ 116). In other words, the most interested segment would be willing to invest (in median terms) a 7% of their monthly family income to have a fixed phone.

When we examine the SES of the respondents who are willing to pay an above-median amount for monthly fixed phone service (i.e., above S/. 20 –US\$ 6–), we do not observe significant differences by SES groups (i.e., those above and below the median of S/. 400 –US\$ 116– monthly per household). In addition, there is not significant difference between business owners and non-owners in willingness to pay above S/. 20 for having a fixed phone, indicating that occupation does not help determine willingness to pay either.

Table 5 provides detailed data about the characteristics of the most interested potential clients of micro-telco services, as compared to the whole sample. For strategic purposes, we pay particular attention to fixed phone (as this seems to be the most promising service a local micro-telco might provide in the near future). The median family income for the segment most interested in getting a fixed phone is just 5% percent above the median for the whole sample (S/. 420 –U\$ 122–), indicating that SES is not a very relevant variable in predicting willingness to pay for fixed phone. In other words, there is a significant proportion of *lower* SES households willing to pay for a fixed phone above the mean of S/. 20 –U\$ 6– (or just as much as the higher SES segment of our population). In general, the group most interested in having a fixed phone is not very different in socioeconomic terms from the general population.

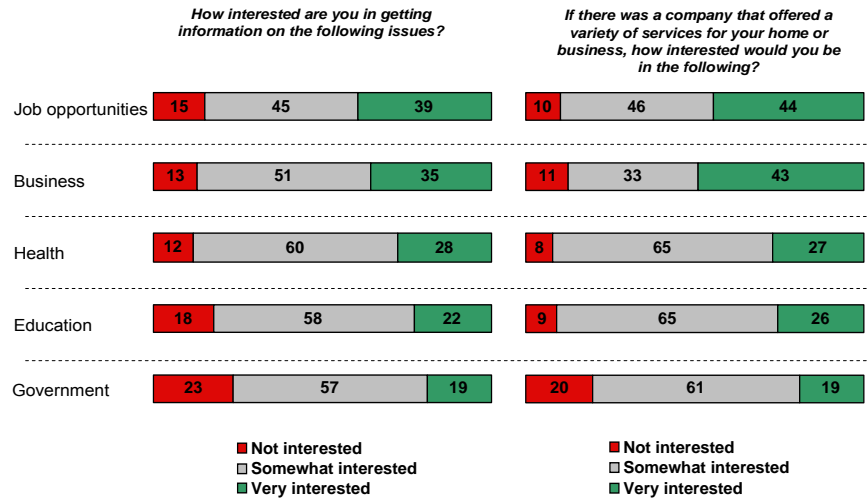
Table 5 - Understanding the characteristics of the most interested potential micro-telco clients

Characteristics	Total Sample	Most interested in getting a...	
		Fixed phone	Internet
Age (mean)	49	47	47
Education (High school or higher)	40%	53%	56%
Family income (median)	S/. 400	S/. 420 (5%+)	S/. 450 (13%+)
Owns land	52%	51%	56%
Owns business	30%	31%	33%
Uses phone	70%	71%	71%
Makes calls - at least once a week	46%	45%	42%
Receives calls - at least once a week	29%	30%	23%
Owns cell phone	8%	12%	17%
Cell phone expenditure (mean)	S/. 22	S/. 22	S/. 24
Payphone expenditure (mean)	S/. 12	S/. 15	S/. 16
Interest in phone (Top 3)	36%		94%
Interest in Internet (Top 3)	19%	34%	
<i>Base</i>	400	144	52

Roughly 45% of the population most interested in fixed phone service makes at least one call per week. This group is actually spending a median of S/. 15 –U\$ 4– for access to a public payphone, even though 12% already own a cell phone. In other words, generally this segment is willing to double their current phone expenditure for the convenience of a fixed phone at home. About 35% of those most interested in having a fixed phone line are also very interested in having Internet home. At the same time, almost 95% of those very interested in having Internet home are also very interested in having a fixed phone line. In other words, there is a significant percentage of households that are interested in having both a fixed phone and Internet access (also for a fee that is above the median for the whole sample).

Figure 22 presents data on interest in information services that might be provided by a micro-telco. The levels of interest in different types of information that could be offered by a micro-telco mirror the interest that respondents currently have on these services. As pointed out in Figure 8, employment and business information is of particular interest to our target population.

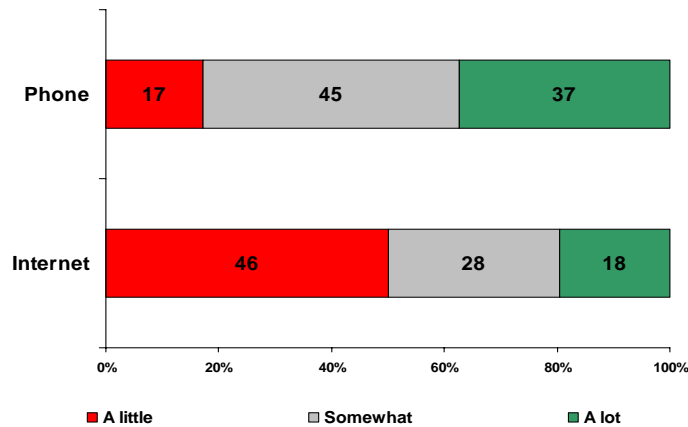
Figure 22 - Interest in other potential services by micro-telcos



Sample: Total respondents (400)

Figure 23 present levels of perceived impact of potential micro-telco services on quality of life. Almost 40% households believe that having a fixed phone at home would contribute “a lot” to their quality of life —only less that 20% considers that a fixed phone would contribute “a little”. On the other hand, just 20% of respondents consider that Internet would contribute “a lot” to their quality of life — most importantly, about 50% estimates that access to Internet would contribute just “a little”.

Figure 23 - Perceived impact of phone and Internet access on quality of life



Sample: Total respondents (400)

3.2 Qualitative interviews

3.2.1 Interviews to local government institutions

Interviews were conducted in eight municipalities of Jauja: Huertas, Molinos, Muquiyauyo, Muqui, Huamali, El Mantaro, Ataura and Huaripampa. Seven of the eight mayors were interviewed, except in Molinos, where the mayor's secretary answered our questionnaire. In Huancas, the deputy governor (*teniente gobernadora*) was interviewed.

All municipalities have more than one computer on the premises (see Table 6). Only the governorate of Huancas does not have any. This is not surprising, considering the Huancas governorate is part of the Ministry of Interior, one of the least technologically advanced arms of the Peruvian Government.

Table 6 - Computers on premises

Local Government	Number of Computers	Age (in years)
Huertas	5	5
Molinos	3	2
Muquiyauyo	3	3
Huancas (Yauyos)	0	---
Muqui	8	2
Huamali	5	1
El Mantaro	3	2
Ataura	4	3
Huaripampa	5	2

Due to the lack of flexibility in public hiring, many municipalities rely on external staff not bound by public servant rules. In this area, all district municipalities rely on at least one external worker, mainly the accountant and/or an external advisor. Usually, this person is better experienced in ICT use than regular employees, mayors or council members, since they mostly work in the city and are better connected with other government agents. All municipalities can be qualified as small ones when judged by the number of workers: they have more elected authorities than permanent workers (see Table 7).

Table 7 - Workers in local governments

Local Government	Mayor and Council Members	Internal Workers	External Workers (Accountant and advisor)	Total Workers
Huertas	6	3	2	11
Molinos	6	2	2	10
Muquiyauyo	6	4	1	11
Huancas (Yauyos)	1	0	0	1
Muqui	6	4	1	11
Huamali	6	3	2	11
El Mantaro	6	3	1	10
Ataura	6	5	2	13
Huaripampa	6	3	2	11

None of the municipalities is connected to the fixed telephone network. However, all mayors have mobile phones (see Table 8).

Table 8 - Fixed and Mobile lines in the municipality, according to staff rank

Local Government	Number of fixed phone in each Municipality	Number of mobile phones				Total
		Mayor ^{1/}	Council members	Staff	Others ^{3/}	
Huertas	0	1	1	3	0	5
Molinos	0	1	0	0	0	1
Muquiyauyo	0	1	0	0	2	3
Huancas (Yauyos)	0	1	--- ^{2/}	0	0	1
Muqui	0	1	1	1	0	3
Huamali	0	1	n.d.	2	1	4
El Mantaro	0	1	3	0	0	4
Ataura	0	1	2	2	0	5
Huaripampa	0	1	2	1	0	4

1/ In Huancas, it belongs to the Deputy Governor

2/ Since Huancas is a governorate, there are no council members.

3/ In Muquiyauyo, the secretary and the general manager own mobile phones. In Humali, the mayor's secretary also owns a phone.

In general, all municipalities are close to public phones from *Telefonica* and also from *Gilat-to-home (GTH)*, the firm that received the FITEL⁴ subsidy to expand telephony services to underserved areas. In Muquiyauyo we could not obtain information about public telephony near the municipality.

Table 9 - Public phones close to municipalities

Local Government	Public Phones at District		
	<i>Telefónica</i>	<i>Gilat</i>	Total
Huertas	1	1	2
Molinos	1	1	2
Muquiyauyo	n.d.	n.d.	n.d.
Huancas (Yauyos)	0	1	1
Muqui	1	0	1
Huamali	1	0	1
El Mantaro	2	0	2
Ataura	0	1	1
Huaripampa	1	1	2

In four district capitals public phones are available 24 hours a day, while in the rest public phones are available according to a specific schedule since they are located within a convenience store. One sol (U\$ 0.29) is typically charged anytime a call is received. According to our informants, three of the public phones presented in Table 10 do not provide a reliable service.

⁴ Peruvian Fund for Investment in Telecommunications – FITEL

Monthly phone expenditure varies a lot depending on the municipality (see Table 10). Monthly expenditure ranges from S/. 500 (approximately U\$ 145) for Huamali, which has only one public phone from Telefonica, to S/. 30 (approximately U\$ 9) in both Muqui and Ataura. Huancas, at S/. 25 (U\$ 7), is not strictly comparable since it is a governorate and not exactly a municipality (meaning that the number of institutions it has to contact to carry out its normal activities is smaller than the case of municipalities).

Table 10 - Mobile and Public phone expenditure per municipality

Local Government	Cost in S/.		Total
	Mobile Phone	Public Phone	
Huertas	240	100	340
Molinos	50	70	120
Muquiyauyo	n.d.	n.d.	50
Huancas (Yauyos)	10	15	25
Muqui	30	0	30
Huamali	250	250	500
El Mantaro	140	180	320
Ataura	10	20	30
Huaripampa	60	0	60

In all but one case (Ataura), government workers use the Internet, mostly to communicate with the Ministry of Finance, Consucode⁵ and CND⁶. However, the use of e-mail is not widespread. Moreover, it is important to notice that most of them (except Muquiyauyo and Huaripampa) do not have institutional e-mail addresses. Staff members from the municipalities of Molinos and Huertas use their personal free e-mail accounts for work-related communications. Annex 1 provides information which confirms that in Molinos, Huancas and El Mantaro, there is no Internet communication with any other government agency.

Huertas is the only municipality that has Internet access within their premises, although the quality of connectivity is considered low by our informant. The rest of local governments must go somewhere else to access the Internet. Distance from municipalities to public Internet facilities ranges between 15 and 40 minutes. Internet tariffs in public places are charged by the hour, and the most expensive amounts to S/. 2 or less than U\$ 1 per hour.

Several benefits associated with the internet are perceived by our informants, mostly coordination with other public entities. Other perceived benefits are: cheap communication as compared to the telephone, and access to direct and clear information in a more expedient way. Given the need of these local governments to coordinate closely with other government agencies, particularly those responsible for budget development and disbursement, there seems to be a potentially high demand for telecom services provided locally. A contributing factor to this potentially high demand is the amount of money that local governments already spend on communication services.

⁵ High Council for State Contracts and Acquisitions

⁶ National Council on Decentralization

3.2.2 Interviews to local educational institutions

In order to understand the information and communication services needs of educational institutions in the LMI project area, the team conducted personal interviews with representatives from elementary and secondary schools, as well as other local educational institutions. A total of 15 interviews were conducted, for the most part with school principals, in the nine districts surveyed.

Every district visited has at least one elementary school within its main urban center. As Table 11 shows, school population varies between 80 and 150 students. All the schools visited are connected to the electricity grid and the public water network, though water is generally available only 4-5 hours each day. Only two schools have sewage systems. There are only four secondary schools in the area, attended by children from local families as well as those living in districts without secondary schools – thus the higher school population. These schools are likewise connected to the electricity grid and have running water for a few hours each day, while only two have sewage systems.

Table 11 - School population by gender

School	Male	Female	Total
<i>Elementary Schools</i>			
Escuela Ataura	50	60	110
Escuela El Mantaro	65	85	150
Escuela Huamali	31	50	81
Escuela Huancas	37	37	74
Escuela Huaripampa	62	53	115
Escuela Huertas	47	39	86
Escuela Molinos	54	50	104
Escuela Muqui	51	59	110
Escuela Muquiyauyo	101	44	145
<i>Secondary Schools</i>			
Colegio El Mantaro	200	175	375
Colegio Huamali	103	68	171
Colegio Molinos	97	53	150
Colegio El Mantaro	200	175	375
Total	1098	948	2046

Our informants observed that the main obstacle for educational institutions is the lack of resources by families in the area, which often require that children help with agricultural and household duties from an early age. This results in poor graduation rates, particularly for female students.

The existing infrastructure for information and communication services is poor. On average, elementary schools have only three computers, resulting in about 325 students per computer. These computers are on average three years old, and are used for computing classes where students learn word processing and basic skills. None of the computers in elementary schools are connected to the Internet. In some cases, parents are required to pay a small annual fee for the maintenance and upgrade of school computers.

Secondary schools are likewise poorly equipped. On average, these schools have eight computers, resulting in about 134 students per computer. Some schools also have additional equipment such as printers and copiers. Students take one computing class per week, where they learn basic skills such as Windows, word processing and Excel. None of the schools have Internet connections. Nonetheless, schools principals observed that students make extensive use of the Internet at the several existing *cabinas* in Jauja, both for school work and personal purposes (email, chatting, etc.).

The same is true for teachers, most of whom live in Jauja and thus have ready access to the many Internet *cabinas*. According to our informants, while elementary school teachers make little use of the Internet for school-related purposes, secondary school teachers and principals are more actively using the Internet for these tasks, regularly checking the Ministry of Education webpage to gather information about the latest directives as well as teacher training activities. Most school principals have an email account which they use for job-related purposes.

Table 12 - Teacher and telephone expenditure by school

District	Teachers Total	Teachers w/mobile	Mobile phone expenditure per month (S/.)	Public phone expenditure per month (S/.)
<i>Elementary</i>				
Escuela Muquiyauyo	7	3	0	5
Escuela Huaripampa	7	3	0	10
Escuela Huertas	6	1	0	10
Escuela Muqui	7	2	0	5
Escuela Molinos	7	2	10	0
Escuela Huancas	4	1	10	0
Escuela Huamali	5	1	0	10
Escuela El Mantaro	7	3	0	15
Escuela Ataura	8	4	30	0
<i>Secondary</i>				
Colegio Huamali	11	3	5	10
Colegio Muquiyauyo	30	10	0	15
Colegio Molinos	13	5	60	0
Colegio El Mantaro	29	20	0	15

Interviewees agree that the Internet can serve as a powerful educational tool in schools, both for teachers and students. For teachers, because it would allow ongoing training and updating of teaching material. For students, informants emphasized the importance of familiarizing children with new technologies to widen future career opportunities. Some raise concerns about students visiting websites not appropriate for children. Yet in general, there was agreement about the need to connect schools and provide better computer skills training to students and teachers.

In terms of telephone services, none of the schools visited have a fixed telephone since as noted this service is not provided in the area. School principals mostly travel to Jauja or Huancayo to visit regional educational offices when needed, taking advantage of the proximity and the readily available transportation services. Personal visits are also the preferred communication medium with health and other institutions with which school principals coordinate activities.

The lack of fixed telephony services is partly compensated by the availability of public telephones near schools, usually within walking distance. As Table 14 reveals, the use of mobile telephony is also widespread among school principals and teachers. Our informants estimate that about 40% of the school teachers and administrators have a mobile phone, and that the prepaid service is affordable in most cases.

None of the schools have a budget allocation for telephone services, which means that teachers and administrators are typically not reimbursed when making work-related calls (either on public or mobile phones). As a result, calls are kept short and made infrequently. This represents a problem for the micro-telco operator since there is no budget line item to which a potential subscription can be allocated. On average, school administrators spend less than S/. 10 (U\$ 3) per month on mobile calls related to work. School-related calls are often received on personal mobile phones – since there is no service cost associated with them. The expenditure on public phones is even lower – an average of only S/. 7 –about U\$ 2– per month for each school.

In general, we find that there is a significant unattended demand for information and communication services among educational institutions in the area, in particular for Internet connectivity for schools. Fixed telephony services may also be marketed, although the ready availability of alternatives lowers the perceived demand among school administrators. The lack of a specific line item for these services in school budgets represents a significant obstacle for the micro-telco operator, since school administrators also mention a number of competing budget needs as critical for improving school performance.

3.2.3 Interviews to local businesses

As in most rural areas, the border between a household and a business in the study area is often tenuous. While the baseline household survey included a number of questions related to business activities conducted in the home, the team also decided to conduct guided interviews with the major businesses in the LMI project area. The team visited nine such businesses located in the main urban center of the targeted districts. Most of these were general-purpose retailers (dry goods, produce, etc.), which in some cases double as small bars with a few tables within the store. These businesses are mom-and-pop stores which in most cases (80%) operate within the household. Interestingly, most of them are run by women who combine their household duties with the store operation. Other family members (between two and three) often help as well.

The majority of the providers for these businesses are located in Jauja or Huancayo. While over half of the businesses have a public telephone, the preferred mode of communication with suppliers are personal visits. Typically, wholesalers stop once a week to deliver merchandise and take orders for the following weekly delivery. On occasions, store owners travel to Jauja or Huancayo to buy merchandise or collect information about products and prices. The main clientele for these businesses are local families, and in most cases the women are those visiting these stores.

As expected, none of the businesses visited have fixed telephony. Yet this is often where public telephones are located, making the store a sort of communication

hub for the community where people come to make or receive calls (often at a price of S/.1 per call). Five out of the nine businesses visited house a public telephone within their premises. This also helps explain why mobile phones are less widespread among store owners (compared to nurses and teachers for example). As Table 13 shows, less than half of the store owners interviewed have a mobile phone, and most prefer to simply use the public phone conveniently located within their store premises to make or receive work-related calls.

Table 13 - Telephony use and expenditure by businesses

District	Have a mobile phone?	Use public or mobile for work?	Telephony expenditure per month (S/.)
Muquiyauyo	No	Public phone	40
Ferretería	Yes	Mobile phone	40
Muqui	Yes	Public phone	21
Molinos	No	None	0
Huariyapampa	No	Public phone	10
Huancas	No	Public phone	5
Huertas	No	Public phone	5
El Mantaro	Yes	Public phone	10
Huamali	No	Public phone	10

Monthly expenditure on telephony is very limited. On average, the businesses interviewed spend about S/.15 (about U\$ 4.5) per month on business-related calls (though since most businesses operate within the household our informants sometimes had a difficult time separating these from personal calls).

As Table 14 reveals, Internet use is extremely limited among business owners. None of the interviewees use the Internet for business-related purposes, and in fact the majority asserts they do not know how to use it. Not surprisingly, none of the store owners has an email account. A possible explanation is the age group to which most store owners belong (30 and over). In fact, some report that what little they know about the Internet comes from their children. However, attitudes toward new technologies are quite positive. Most interviewees agree that using the Internet could help improve business transactions, particularly for merchandise supply.

In general, we find there is limited demand for micro-telco among business owners, given the limited needs of these general-purpose retailers to communicate with suppliers and the proximity to the commerce hubs of Jauja and Huancayo. However, since these businesses today serve as community communication hubs, there may be opportunities to expand the range of services from a single payphone to more sophisticated information and communication services offered at the premises. While attitudes toward new technologies are positive, the limited expertise and skills among these mostly middle-age women would require extensive training and support.

Table 14 - Internet Use and Attitudes by Business Owners

District	Use Internet?	Have email?	Internet help improve business?
Muquiyauyo	No	No	Yes
Muquiyauyo	No	No	Yes
Muqui	No	No	Yes
Molinos	No	No	Yes
Huaripampa	No	No	Yes
Huancas	No	No	No
Huertas	No	No	Yes
El Mantaro	No	No	Yes
Huamali	No	No	Yes

3.2.4 Interviews to local health institutions

The team visited a total of nine health centers located in the LMI project area. These centers are located within the main urban area of each district, and comprise basic health facilities and a staff of between three and four health professionals, for the most part nurses. All centers are connected to the public electricity grid and public water system, but only half have running sewage. Only three of the centers visited have a computer, though none are connected to the Internet.

Local health professionals coordinate their activities with the provincial health center located in Jauja, visiting at least once a week to submit epidemiological reports and gather medical supplies, as well as with local governments to report birth or death certificates and coordinate prevention campaigns, among other activities. In all cases, personal visits is the preferred communication medium between these institutions. On the other hand, communication with local residents is based on flyers, cars equipped with loudspeakers, or sometimes through local radio stations.

As in the case of other institutions, health centers lack fixed telephony service. Two of the health centers visited (in the Muqui and Muquiyauyo districts) are connected to a radio network operated by the Ministry of Health which allows radio telephony between health centers and the regional offices. The use of mobile telephony is widespread among health professionals, though when long calls are needed public phones are preferred (as with schools these are available within walking distance to health centers). Incoming calls are received on personal mobile phones as well as on public phones, at a cost of S/.1 (U\$ 0.29) per call.

Health center expenditures on telephony services is rather minimal. On average, health professionals spend about S/.10 (about U\$ 3) per month on mobile telephony and about S/. 7 (about U\$ 2) per month on calls related to work activities (Table 15). This is explained by the lack of telephony services associated with the health center per se, as well as the ready availability of alternatives (including personal visits).

Table 15 - Health center telephony expenditure

Health Center	Personnel have mobile phone?	Mobile phone expenditure per month (S/.)	Public phone expenditure per month (S/.)
Muquiyauyo	Yes	20	10
Muqui	Yes	20	15
Ataura	Yes	0	15
El Mantaro	Yes	30	0
Molinos	Yes	10	5
Huertas	Yes	0	5
Huariyampa	Yes	10	0
Huamalies	Yes	0	10
Muquiyauyo ESSALUD	Yes	3	0

In terms of Internet access, while none of the health centers are connected to the Internet, health professionals regularly use the Internet in the *cabinas* in Jauja (where most health professionals reside). The main websites visited for work-related activities are government websites such as those of the Ministry of Health and the Ministry of Women and Social Development. Nonetheless, the use of email for institutional communications is very limited. In fact, none of the health centers have an email account, while only a few of the health professionals interviewed use email for work activities regularly.

Generally, our informants agree that the use of the Internet would improve coordination with regional health centers and other governmental institutions, allow health professionals better access to relevant information and generally improve the provision of health services to the public. The existing radio network connecting health centers is evidence of the need for a reliable communication network between health centers and with other institutions. Replacing this single-purpose network with a multiservice wireless platform should be an attractive proposition to local health professionals. Despite this latent demand for micro-telco services, budget limitations and legacy communication practices (mainly personal visits) seem to represent significant obstacles for capturing clients among these institutions.

3.2.5 Interviews to local associations

The last set of interviews was conducted with representatives from six cooperatives and civil society associations active in the districts targeted by the LMI project. The cooperatives are composed of local farmers and are divided by activity (agriculture, cattle, etc.). Generally speaking, these are recently formed associations (although one dates back over a 100 years) which operate on an informal basis (none are officially registered). None of the associations visited has a physical location – they operate from the homes of the most active members. Membership is small, ranging from six to 25 members.

The main purpose of the associations is coordination. Farmers and cattle owners coordinate activities such as sales logistics and share relevant information (for example, one association composed of cattle owners has been active in helping members genetically improve milk production). Some associations intermediate between members and wholesaler clients, selling products on behalf of members. Typically, association meetings are held at least monthly, and leaders are elected by regular voting. Most of them also help members coordinate activities with relevant governmental institutions

such as the regional office of the Ministry of Agriculture, which offers veterinary advice and services.

Communication within the association is almost exclusively interpersonal, since most members live within a small area. As shown in Table 16, the lack of fixed telephony is compensated by the use of mobile and public phones. Most association leaders have a mobile phone, though public phones are preferred for business calls. Our informants estimate that calls are made very infrequently (monthly or bimonthly), and are mostly made to governmental offices such as the Ministry of Agriculture or to providers and clients in Lima, Jauja, or Huancayo. Monthly telephony expenditures are estimated at around S/.15 (US\$ 4.3). Interestingly, some associations have a specific budget line for communication services, ranging from S/.10 (US\$ 2.9) to S/. 50 (US\$ 14.5).

Table 16 - Telephony Use and Expenditure in Associations

District	Leaders have mobile phone?	Business calls made from?	Telephony expenditure per month (S/.)
Muquiyauyo	No	Public phone	5
Molinos	Yes	Mobile	30
Huancas	Yes	Public phone	50
Muqui	Yes	Public phone/mobile	10
Ataura	Yes	Public phone	10
El Mantaro	Yes	Public phone	30

As shown in Table 17, none of the associations visited nor their members have Internet access. Association leaders do not have an email account either, and most reported knowing very little about Internet services in general. As in the case of business, a plausible explanation is the fact that most these leaders are middle-aged men with few ICT skills. Yet attitudes toward new technologies are generally positive. Most association leaders agree that Internet use could expedite communication with relevant government institutions and help members stay informed about production techniques and developments in other rural regions.

In general, we find that since these associations lack physical locations, there is little potential demand for new communication services directly related to the associations' activities. Nonetheless, these associations play an important knowledge diffusion role among members. Association leaders are therefore an important target for they represent potential early adopters that could help market and diffuse new ICT services to their association peers.

Table 17 - Internet Use and Attitudes by Association Leaders

District	Use Internet?	Have email?	Internet help improve business?
Muquiyauyo	No	No	Yes
Molinos	No	No	No
Huancas)	No	No	Yes
Muqui	No	No	Yes
Ataura	No	No	Yes
El Mantaro	No	No	Yes

4. CONCLUSION AND RESEARCH IMPLICATIONS

The first site chosen for the implementation of the LMI project in Peru is Jauja, a province in the department of Junin located just east of Lima. Nine districts in Jauja have been selected to receive telecom services by a newly established micro-telco, Televias Puyhuan. Most of the areas (85%) selected for project implementation are considered urban settlements, though very small ones (typically around 2,000 inhabitants). All but one (Huancas) are district capitals, and all of them are well connected to both Jauja, the province capital, Huancayo, the department capital, and Lima.

The main economic activity in the project area is agriculture. The target population is mostly composed by farmers who grow potato, corn, and artichoke in small size plots. Some also own cattle, and milk production is bought by the local Nestle subsidiary. According to data provided by the National Household Living Standards Survey, the target area does not concentrate poor households when compared to the rest of the region. This is consistent with our results showing that only about 15% of the sample falls below the departmental poverty line (roughly below S/. 200 –U\$ 58– per month).

There is currently no fixed phone service in the LMI implementation area, which explains the strong interest found among the target population for the service. Our findings reveal that, despite the moderately low median family income in the region, many households are willing to pay up to 7% of their total income for the service, a considerable amount compared to international standards. This means that a sizeable portion of households is willing to almost double their current telephone spending. Even more interest was expressed by representatives from businesses and major educational, health, government, and civil society institutions present in the area, given their need for coordination with clients, members, and other institutions.

However, our analysis also reveals that this demand is somewhat weakened by the availability of substitutes. We found public phones to be readily available in all target districts, mostly located within convenience stores that function as information hubs for the community. These are widely used by household as well as businesses and the personnel from local institutions. While only a minority of households own a cell phone, they also represent a viable alternative, particularly for the higher SES population. Our findings reveal cell phone penetration to be very significant among local institution personnel (nurses, teachers, association leaders, etc.), who readily combine personal and professional use.

Such availability of substitutes represents a challenge to the sustainability of the micro-telco operator. Our findings reveal that, though the business opportunity exists, marketing and pricing will need to be carefully crafted to attract subscribers. In terms of marketing, an emphasis on convenience seems appropriate given that a quarter of our household sample mentioned “difficult access” as an important reason for not using the phone more often (or at all), a finding that was confirmed in our qualitative interviews. In terms of pricing, our contingent valuation analysis revealed a mean willingness to pay for fixed phone service of about S/.20 (US\$ 5.8) per month. This is consistent with existing spending patterns for alternatives. At this level, fixed phone service will be priced somewhere between public phone and cell phone services.

In the case of Internet access and related services, our findings reveal a significantly lower demand among households, though among some institutions (particularly schools, health centers and local governments) we found a significant demand for Internet connectivity given the need to improve more complex coordination and information retrieval tasks. As mentioned, it is important to note that the demographic profile of our respondents – in particular the age distribution – may lead us to underestimate potential demand. Yet our findings point to a consistent pattern of lack of skills and knowledge about the potential benefits of Internet access that significantly reduces potential demand for residential access, despite the lack of alternatives in most districts (the only exception being Molinos, where the Puyhuan Group runs a local telecenter adjacent to the school).

Given our limited information about the business plans of the micro-telco operator with regards to Internet connectivity and its planned information services, our recommendations are necessarily tentative. Our findings indicate that significant efforts must be directed at servicing local institutions (particularly schools and other government offices) and other key social actors, where unmet demand is apparent. They also suggest the need for outreach and training efforts to educate the wider population about benefits tied to specific Internet-based information services (e.g., health, business, and employment information). Public shared-access facilities seem better poised to attract significant usage than residential access. As the majority of the population relies on existing media to obtain high-value information, partnering with local radio and newspapers could be a promising strategy to educate the public and develop relevant services.

5. ANNEX

Annex 1 - Local Government communication with governmental institutions and frequency

Local Government	Health Center	Education	Province Municipality	Regional Government	CND	MEF	Consucode	Contraloría	PARSSA*
TELEPHONE									
Huertas	n.s.c.	n.s.c.	Monthly	Weekly	Monthly	Once in a while	Once in a while	n.s.c.	n.s.c.
Molinos	n.s.c.	n.s.c.	Weekly	Monthly	n.s.c.	n.s.c.	Monthly	Once in a while	n.s.c.
Muquiyauyo	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huancas (Yauyos)	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Muqui	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Once in a while	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huamali	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Monthly	n.s.c.	n.s.c.	n.s.c.
El Mantaro	n.s.c.	n.s.c.	n.s.c.	Monthly	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Ataura	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huaripampa	n.s.c.	n.s.c.	Diary	Weekly	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
E-MAIL									
Huertas	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Weekly	Monthly	Once in a while	n.s.c.	n.s.c.
Molinos	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Muquiyauyo	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	---	---	---	n.s.c.
Huancas (Yauyos)	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Muqui	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Once in a while	n.s.c.	n.s.c.
Huamali	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Monthly	Monthly	n.s.c.	n.s.c.
El Mantaro	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Ataura	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Weekly	Monthly	n.s.c.	n.s.c.
Huaripampa	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Diary	Monthly	Once in a while	Weekly	Once in a while
PERSONAL COMMUNICATION									
Huertas	Weekly	Weekly	Once in a while	Monthly	Once in a while	n.s.c.	n.s.c.	Monthly	n.s.c.
Molinos	Diary	Weekly	Monthly	Monthly	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Muquiyauyo	---	---	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huancas (Yauyos)	Diary	Diary	Diary	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.

...continue

Local Government	Health Center	Education	Province Municipality	Regional Government	CND	MEF	Consucode	Contraloría	PARSSA*
Muqui	Weekly	Weekly	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huamali	Monthly	Once in a while		Monthly	Monthly	Monthly	n.s.c.	n.s.c.	Weekly
El Mantaro	Monthly	Once in a while	Diary	Monthly	Once in a while	n.s.c.	n.s.c.	n.s.c.	Once in a while
Ataura	n.s.c.	Weekly	n.s.c.	Weekly	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huaripampa	Diary	Diary	Diary	Weekly	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
POSTAL SERVICE									
Huertas	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Molinos	n.s.c.	n.s.c.	n.s.c.	n.s.c.	Once in a while	Once in a while	Once in a while	Once in a while	n.s.c.
Muquiyauyo	n.s.c.	n.s.c.	n.s.c.	Once in a while	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huancas (Yauyos)	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Muqui	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huamali	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
El Mantaro	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Ataura	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.
Huaripampa	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.	n.s.c.

Notes:

* Program of Support to the Reform of the Cleaning Sector

- n.s.c. = *No se comunica* (It does not communicate)

- In case of Muquiyauyos municipality, the symbol “—” means that they have communication with the institution but frequency is unknown.

Source: Questionnaire to local governments

6. APPENDIX: RESEARCH INSTRUMENTS
(see separate document)