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**MASTERS IN PUBLIC HEALTH**

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**BARRIERS TO CATARACT SURGERIES  
AMONG HIGHLAND QUICHUAS  
IN ECUADOR**

**USFQ-BIBLIOTECA**

**In Partial Fulfillment  
Of the Requirements for the Degree  
Master in Public Health**

**Debra Haynes**

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## **Abstract:**

This study sought to identify barriers to cataract surgery in Highland Quichua Indians who originate from the Chimborazo Province in Ecuador. First an analysis was performed with data obtained from community work vision screenings of 1,410 participants (0-96 years of age) by the Fundación Oftalmológica del Valle in Yaruquí in order to establish a prevalence rate. The prevalence rate for those younger than 60 years of age was 1% and 13.3% for those 60 years old and older for cataract in either eye. The prevalence for those presenting with cataracts in both eyes in the younger than 60 years of age group was 0.7% and 13.9% in the 60 and older age group. Methods consisted of two descriptive studies; a cross sectional survey and case series reports. The cross-sectional survey was applied to 148 Highland Quichua Indians establishing 'cost', as the greatest perceived barrier of this group with 86.4% followed by 'not knowing a place of treatment' with 20%. The case series reports came from vision screenings carried out in several Quichua Indian villages to find the elderly Highland Quichua Indian cataract patients with the purpose of applying a survey to discover their barriers to having cataract surgery. Out of 144 patients screened, 44 were diagnosed with either unilateral or bilateral cataracts. Again the number one barrier was cost (95%) and the second main barrier to cataract surgery was fear of surgery (40%). Language (22.5%) ranked as the third barrier. Likely explanations of these findings are discussed as well as recommendations such as education and innovative ideas to cost reduction as possible ways to eliminate barriers.

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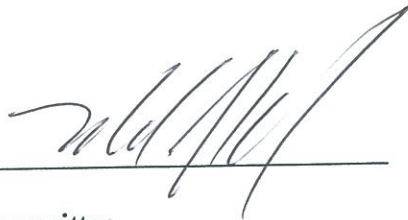
**by:**

Dr. Marco Fornasini



Thesis director

Dr. Mike Koziol



Member of thesis committee

Dr. Cesar Zambrano



Member of thesis committee

Final Grade: \_\_\_\_\_

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# **I. INTRODUCTION**



## 1.1 Background for the Study

This study investigates the existence of barriers to cataract surgery by the aboriginal people of Ecuador in the high mountain plateaus, through the identification of types of barriers and the reasons for these barriers. These people are generally referred to as Highland Quichua Indians. One must investigate the background and reality of these people by taking a look at their history and how it has shaped the manner in which they think, not only about cataract surgeries but also about life in general; therefore a brief review of their history is merited.

The Highland Quichua belong to an agrarian, pre-Colombian ethnic group which was quickly subjugated, dominated, and transformed into a working class within the complex agricultural, political, and religious system of the Inca Empire. They served the Inca rulers for many years and the infiltration of the Inca culture into the Highland Quichua culture can still be seen today.

The Highland Quichua are culturally, linguistically, and ethnically distinct people with an identifiable group consciousness. They are distinguishable anthropometrically from the dominant mestizo culture as they have tea-colored skin rather than brown like the mestizo or white skin, like the European. Due living in a high-altitude environment above 9,000 feet for centuries, the Highland Quichua have larger upper torsos housing increased lung capacity and average about two liters more blood volume with twice the hemoglobin than sea-level dwellers. Traditionally the average height for a Highland Quichua man was about five feet two and a half inches and four feet nine and half inches for a Highland Quichua woman (1, 2).

The Highland Quichua have a self-realization that they are distinct from other races. Although they live side by side with the mestizo culture, they are not seen as equals by either culture. Both cultures realize that the dominant culture is that of the

mestizos which could engulf that of the Highland Quichua if care is not taken. This is a factor that causes tension. This distinctiveness is reflected even in their language, Quichua. The word for an Indian man is “*runa*” with the word “*cari*” meaning men who are not Quichua. Each group has their own dialect and they do not welcome the idea of a unified Quichua as proposed by the government. Although Quichua was not the original language of the Incas, they adopted it as the common (official) language of the Inca Empire perhaps because of its linguistic flexibility and resourcefulness. Quichua is a typical American Indian language that is not related to European languages. The grammar is very complex. The Quichua dialects of Ecuador do not have the long “o” or the short “e” sound, which accounts for the fact that it is known as Quichua in Ecuador and Quechua in Peru and Bolivia where these vowels do exist.

The religion of the Highland Quichua was one of animism, centering around a mountain mythology that assigned names, gender, rank and spouses to the mountains. (“Animism is the nativistic religious system of people who believe that phenomena are inhabited by spirits, soul, or demons which must be appeased by sacrifice or performance of specified duties”(1).) Since they derived their existence from the earth, they also incorporated a respect for the earth, considering it a goddess and naming it *Pachamama*. The Highland Quichuas viewed their entire world as being filled with spirits, believing that the creator-god had given the same kind of life-spirit which they had to every created thing. The Highland Quichua’s animistic religion was based on reciprocity meaning that a sacrifice to a god was considered to be a favor which would be repaid by the granting of their petitions. The renewal of life as seen in every crop and birth of a child or farm animal reinforced their beliefs in their god’s power (1).

When the Highland Quichua were conquered by the Incas, a new religion, culture, language and political system were forced upon them, however, they were also allowed to retain their own religion, culture, and language to the extent they did not cause problems for the new empire.

“However, the unification was not always accomplished without a hitch...The northern regions of the Ecuadorian Andes, which had been conquered with some difficulty at the beginning of the 16<sup>th</sup> century, also displayed a certain hostility to the central power.

In order to secure his dominion over these distant territories, the Inca resorted to a policy which has proved effective in many instances; it consists of moving entire populations so as to break up local solidarity. Hence families from Cuzco or other safe provinces were transported thousands of kilometres and settled, for example, in the valleys near Quito or in those of Tucuman (Argentina).

Even so, rebellion continued to smolder in many areas...a rebellion against the Inca's authority broke out in the equatorial region of Quito, which had only recently been conquered.

Huayna Capac, eleventh in the dynasty, went there in person and subdued the rebels with a cruelty that has stuck in local memory. At Otavalo in Ecuador, the corpses of the rebels were thrown into a lake and turned its waters red: since then it has been called Yawar Cocha, the ‘lake of blood’”(3).

The Inca Empire (350,000 square miles) reached a very sophisticated level of social structure that made it possible to sustain its large populations (6,000,000) in a pre-capitalistic, pre-urban time. The Incas were incredible architects, building temples in which the stones fit together without mortar. They constructed a road system that contained 3,000 miles of main roads and totaled 5,000 miles with all other major arteries included. This road system was a key to their success but it was also a major factor in their downfall as the Spanish conquerors were able to access the empire quickly with their horses and cannons by means of the elaborate roadway (1).

The elaborate roadway enabled the Inca Empire to deploy its army quickly in the advent of problems and allowed for efficient communication within the empire through the *chasquis* system. The *chasquis* were official runners who could transport a message 250 miles a day, thus enabling the sending of a message the entire length

of the Inca Empire in only five days. (This ability to communicate over long distances and rugged terrain has continued to the present among the Highland Quichuas and can potentially be a barrier or facilitator in regards to cataract surgery among the Highland Quichua Indians depending on the level of perceived service and personal satisfaction of the outcomes. Contented patients will refer others; unhappy patients will deter others.) The *chasquis* carried a *quipu* which consisted of a strand with many knotted cords tied to it. Each knotted cord represented a quantity based on the decimal system as well as non-quantitative information such as dynastic tales or songs (3). From studying the *quipus*, Dr. John Murra from Cornell University has concluded that the priorities of the Inca culture in order of importance were: 1) people, 2) llamas, 3) cloth, and 4) ceramics (1). This was a culture that placed great value on its members. This can be seen in the way that they provided food for their members even when there was no harvest. The process of freeze-drying allowed them to store vast quantities of food in their storage cities called *tambos*. This process consisted of exposing meat or vegetables to the freezing temperatures at night and then to the tropical sun during the day. This food (*chuño*) could then be kept indefinitely and be re-hydrated as needed.

Another way in which the Inca Empire cared for their members was through the manner in which they managed the Empire; political stability and orderliness. This made it more attractive to those whom they subdued and incorporated into the Empire. They had a set of commandments by which all society lived. In short these can be summed up by the idea of reciprocity (2). This common thread of reciprocity is still evident in each of the following four actions prohibited by the Inca Empire:

- Theft: A lack of sharing assets can be interpreted as theft.
- Lying: A lack of sharing information can be interpreted as lying.

- Laziness: A lack of sharing in the work force can be interpreted as laziness.
- Incest: A lack of sharing sons and daughters in marriage can be interpreted as incest (1). (If a family refused to allow their son or daughter to marry another's son or daughter, than they were not sharing and would in some way be forcing the other's children into incest due to the lack of marriage partners.)

The Incas were benevolent in allowing regional languages to continue and some local rulers to continue in office but they were totalitarian in the adoption and required use of the Quichua language for administration and in always requiring complete submission to the Inca. A lack of absolute loyalty and submission to the Inca resulted in the transplanted of the problem group of subjects to a new region.

“These individuals who settled in new lands were called *mitimaes*, which is the same as to say ‘newcomers’ or ‘outsiders’ in contrast to the natives; this name referred to the new vassals as well as to the old ones who were exchanged for them; in fact, both went from their own lands to strange lands... Care was taken in this transmigration that those who were transferred, the recently conquered as well as the others, did not move to just any land, in a haphazard way, but to the places that were of the same climate and qualities or very similar to those they were leaving and in which they were raised.

The Inca introduced this change of residence in order to keep his dominion quiet and safe” (4).

Local rulers would be placed over them to teach them the religion, culture, language and government system of the Inca. In this manner the Highland Quichua became the members of the working class of the Inca Empire. The Incas also divided up their kingdom into parts just like they had done in Cuzco, Hanan Cuzco and Hurin Cuzco. Each town and *cacicazgo* (dominions of a native chief) were divided into two parts called the upper district and the lower district. “The object the Inca had in dividing the towns and provinces this way into fraction and tribal groups was so that with this division of *ayllus* (an extended family or lineage believed to

have a common ancestor) and tribal groups, in some measure the will of his vassals would be divided, so that they would not join together in order to promote uprisings... Another reason that moved them to make this division was to give their subjects occasion for competition and rivalry in the jobs and work that they were ordered to perform... The vassals were not permitted to move from one province to another on their own free will. In fact, all vassals had to reside in their towns; they could not leave or wander around or take trips through strange lands without permission from their *caciques* (native chiefs)" (4). Von Hagen states that "normally an Indian, unless he died in battle in a far-away land or was transferred by orders, was born, matured, and buried in his *ayllu*; it was his primary and principal loyalty" (5).

The Incas also brought with them their own religion. Although it too, was animistic like the religions of the groups that they conquered, it was more complex in nature. They allowed the syncretism of religions among its new people groups and modeled this behavior themselves by adopting local gods into their own pantheon of deities. As long as local gods and forms of worship did not interfere with Inca animistic distinctive they were allowed to continue. Everyone had to worship the Inca (head ruler). The Incas did impose upon the Highland Quichua, ancestor worship, festivals to *Inti* (the sun), and a complex sacrificial system. Because the Inca (head ruler) was considered a descendent of the Sun god, he was held in utmost esteem and worshipped while alive. Upon his death, his subjects performed an obligatory mourning ritual during which his remains were preserved through a mummification process developed by the Incas. The Highland Quichua had so embraced the mourning of the end (death) that even with all the Roman Catholic Church's efforts to eradicate it, it still remains.

The Highland Quichua saw many advantages in following the way of the Inca. They observed that rebellious groups were exiled to new locations, and took note of the well-ordered society, intelligence and wisdom of new rulers, and all the advantages to “fitting in”(1). At first the conquered people were not allowed to participate in the cult (Inca worship) as it was maintained just out of reach so that it was considered an honor when one was allowed to profess it. Due to the tactics of the Incas the Highland Quichua had the following motivations to change from their own form of animism to the Inca’s:

1. “The Inca form of animism was enforced as the State religion.
2. The Highland Quichua identified easily with the new religion since it had much in common with their own.
3. Syncretism was not only allowed, it was encouraged and modeled for them by the conquerors.
4. It was advantageous for the Highland Quichua to accept the new religion, not only to avoid persecution, but to receive one’s share of the new empire” (1).

Through this the Highland Quichua were taught and led in Highland Quichua Inca Religion worship by Inca holy men, making them submit rather than lead. Even though the Highland Quichua had lived in Andean Ecuador for hundreds of years before the Incas came, they were dominated and had the religion, language, culture, and political structure superimposed upon them without creating much opposition.

Then came the Spanish conquest with the arrival of Francisco Pizarro to Peru in 1532. The Incas had a myth that the gods had left the area of Lake Titicaca and Cuzco walking across the sea. These gods were said to have been men with blue eyes and beards, so when Pizarro’s group arrived they were not immediately resisted,

rather they were welcomed as possible returning mythical gods. The vast road system in the Inca Empire paved the way, so to speak, for the conquerors to have relatively quick and easy access to take over the entire empire. Another aspect, which worked to the favor of the conquerors, was that Pizarro and his men considered their struggle a holy war, which meant that there were no holds barred. They believed that God not only supported, but also approved of their relentless search for gold and fame as evidenced by the presence of missionaries who played a role in the “convert or die” campaign of conquest (1).

“The ills that the Indians suffered were so many and so great, that nothing could be conceived of as more deplorable. They killed them, robbed them, and enslaved them without motive or necessity. For forty years they treated those innocent creatures with the cruelty of hungry wolves, tigers, and lions; they oppressed and destroyed them by all the means that human malice could devise. The inhuman policy of the conquerors caused, as is commonly believed, twelve millions of Indians to die. Greed of gold has been the cause of this terrible butchery; the conquerors have known no other god, and to fill themselves with treasure they have treated as vile refuse the people who received them as the messengers of heaven. Military oppression, government extortion and cruelty united with priestcraft, superstition, and a religion whose every act was a part of a system of greed, reduced the people of one of the richest sections of the earth’s surface to a state of ignorance, poverty, and moral degradation which is admitted by the clergy themselves to far surpass that in which the conquerors found them when they entered the land”(6).

The Highland Quichua did not miss the many similarities between the system of the Inca Empire and the new system of *encomienda* by the Roman Catholic Church. Under this new system the landowners were given absolute control over a quantity of indigenous people in exchange for teaching them the truths of Christianity, the doctrines of the Roman Catholic Church, and civilizing them (3). Specific laws were enacted and enforced upon the indigenous people from which the Spaniards were exempted. The saying of that day was “The law is for those who wear the poncho” (“La ley es para los de poncho”) (1). José de Acosta, a Jesuit missionary, stated that “If it were not for the use of fear and force, nothing could be done with the Indians”(1). Over the centuries the process of exploitation and looting



has continued which has resulted in unstable governments, graft, corruption and distrust especially on the part of the Highland Quichua.

“The new Spanish empire had destroyed their Inca incarnation of the sun-god, razed their temples, buried the mummies of the *venaca*, and outlawed their Highland Quichua Inca Religion. The new kingdom established laws that required adherence to the State religion. The conquistadors owned the land, made laws in their own favor, and used any force necessary to impose the Roman Catholic Church.

However, the Highland Quichua also found bridges to the new religion which smoothed the road to accept it. It was like their own Highland Quichua Inca Religion in many respects. These elements that were alike enabled acceptance of the Roman Catholic Church without a complete conversion. The elements that were even remotely alike were reinterpreted to make them more so. The Highland Quichua found the ability to mix the religions together, accept the outward forms, and express their ancient worship as before”(1).

Another advantage was the fact that outward acceptance of the new religion made the Highland Quichua more acceptable to the conquistadors and the priests. Since the Conquistadors and the priests owned the land and made the laws, it was to the Highland Quichua’s advantage to accept their demands. They soon learned that the path of least resistance was to accept the new religion, even if only outwardly, thus the blending of the two was as much a result of time as of intention (1).

Out of this syncretism the Highland Quichua live in fear of both the spirits and the saints, and not wanting to offend either, they pray to both. This explains why even today, when a family member is sick, the ill one is taken to the Highland Quichua *curandero* (village healer) for the traditional healing from the animistic spirits as well as the mestizo priest to get a prayer or mass said. It also helps to explain the hesitancy to trust modern western medicine. Dr. Sills summed up the Highland Quichua’s journey through two conquests and religious movements as the following (1):

- 1) The movement from the old religion into the new resulted in a syncretized form of the two religions rather than a pure rejection of the old and an embracing of the new.
- 2) Both movements retained the animistic elements of previous religions.
- 3) Both movements resulted in the Highland Quichua being under the religious domination of conquering forces.
- 4) Both resulted in the Highland Quichua submitting to the holy men of the new religion without their own cultural representatives in leadership positions.

The new religion that the conquistador brought had its own ideals. According to Blanca Muratorio (7), the Catholic ideology considered the order of the universe as ordained by God, that poverty was a blessing that should be accepted with resignation and believed in the absolute racial inferiority of the Indians. The State as well as the Roman Catholic Church used this to their advantage, imposing taxes and *mingas*. The religious feasts were another way of “enslaving” the Indians by imposing a fee that they were required to pay thus causing the Indians to become debtors to the haciendas and the church. For example, in 1908 when the Bishop of Riobamba officially declared neighboring villages to be under the parroquial authority of the large haciendas. They would be the center of the fiestas and therefore the Indians would not need to go anywhere else to celebrate. As a result, they were further bound to the land or area in which they already lived as serfs (workers bought and sold with the land). Even in the period of Independence from Spain the Highland Quichuas were still tied to the land. In her book, *Quichua y Castellano en los Andes Ecuatorianos los Efectos de un Contacto Prolongado* (Quichua and Spanish in the Ecuadorian Andes the Effect of Prolonged Contact),

Marleen Haboud states that linguistically, Spanish continued as the principal language. This continued even into the period of Independence from Spain while the Indians and their languages continued being degraded. Many of the Indians who had worked for the *señores de España* and the church were converted into property of the haciendas, as were their descendants. It is important to remember that the haciendas were the centers of economic and political power. This is an important factor in understanding the intensity and effect of the linguistic contact, especially when we take into consideration that the Indians worked not only on the hacienda but also in the houses of the hacienda owners (8). This feeling of being tied to the land and under the authority of all, led to much unrest. The indignation of the indigenous peoples came to a head in 1871 during the presidency of Garcia Moreno due to the abuse of their oppressors collecting the religious tithes. This uprising was led by Fernando Daquilema attacking the town of Cajabamba in the Province of Chimborazo with 10,000 Indians. The Governor sent more than 150 armed soldiers. They eventually captured Daquilema. Daquilema was later sentenced and shot to death (9).

With the presidency of Eloy Alfaro (June 5, 1895-1912) came major changes which caused great reforms. The Law of the Dead Hands (*Ley de Manos Muertas*) expropriated great amounts of land from the Roman Catholic Church returning it to the control of the State. They were major changes with regards to public education, civil marriage and divorce and the separation of Church and State. Then came Galo Plaza Lasso (1948-1952) who is lauded by the Highland Quichuas as liberating them from serfdom. With land reform in the 1960's and 1970's the necessary conditions were provided for the Highland Quichuas to be able to work their own land for their own profit and to travel to other regions if they so chose. Another change which

gave the Highland Quichuas more freedom of choice and right over their own lives, were the encyclicals of Popes John XXIII and Paul VI which significantly changed the social and political ideology of the Latin American Roman Catholic Church. This new orientation proclaimed freedom of the poor from social injustices and pointed out the responsibility of the Roman Catholic Church to help change the structure of exploitation, which was in place from the time of the Spanish conquistadors. Even with all these changes, there still is not a positive monetary change for the Highland Quichuas as the agricultural scene is still controlled by the *mestizos* (7).

Is it any wonder then, that even today the Highland Quichuas are hesitant to trust outsiders, especially those who do not speak their language or understand their culture? For many of the older Highland Quichua Indians, the idea of traveling outside of their communities or any farther than the nearest market is very intimidating. They were raised with the idea of having to stay on the land where they were born. There is a great oneness with the land. There is also great security in staying where you know and are known. Venturing into unknown territory is a threatening thought, especially if it means communicating in another language with which one is not very comfortable.

Examining the history of the Highland Quichuas, a pattern becomes evident in regards to the issue of barriers. The Highland Quichuas were first conquered by the Incas who imposed a new political and religious system upon them. As long as they complied with the requirements, they lived in relative peace but they did not have freedom to move about as they liked nor did they have their own religious leaders. They were subject to a power over them. Then came the Spanish conquistadors who not only imposed a new religion, but also brought degradation

and humiliation of the Highland Quichuas under the pretext of religion. They enslaved the Highland Quichuas and treated them almost worse than animals. "Indian -Mestizo relations are rooted in historical factors: in the survival of the feudal pattern of the Period, and a belief in the racial inferiority of the Indian, which accompanies and provides the rationalization for the continuance of the pattern. Prejudice and exploitation of the Indian group are not, therefore, deviations, but are rather an accepted part of the social system (10)." The Highland Quichuas were bought and sold with the land. They were seen as the property of the landowners. The Roman Catholic Church took advantage of them as well. They were bound to the land and not allowed to leave the haciendas without permission. They learned not to trust anyone and saw every outsider as someone who wanted to take advantage of them.

All these factors come into play when one seeks to bring medical aid to the Highland Quichuas. There is a major distrust of the outsider. There is the difference of language and the fear of having to travel to an unknown place in order to receive an unknown treatment. There is always a question in the mind of the Highland Quichuas of, "how much it will cost me?" This cost is not just a monetary issue as it involves the cost of time away from work, how to care for one's animals and fields, and what might be expected in return by the one offering the service.

Another factor that comes into play is the perception that the Highland Quichuas have of illness itself. Illnesses are attributed to a supernatural cause, to a natural cause, and sometimes to both. For the Highland Quichua, bad air (*mal aire*) is the most common cause of illness. Another cause of illness is sorcery, which is that someone through the help of a sorcerer puts a curse on another person. The Evil Eye and Fright are other cited causes of illness. The older Highland Quichuas

believe that when the child of an Indian is good looking, the Whites (Spanish or foreigners) do not like that and so cast the evil eye on the infant that *Taita Dios* (Father God) desired to make like jewels. An Indian can also give the evil eye to another Indian's baby (10). Highland Quichuas have home remedies that they administer for all the different illnesses. In particular it is interesting to note the remedies for eye problems. They believe that nearly everyone has bad eyes due to strong wind and smoke or because they have seen something they should not have seen. In the latter case, bad eyes from seeing something one should not have seen is considered to be a punishment from *Taita Dios* (Father God). They take 10 drops of the juice extracted from the fruit of a plant call *chiricique* and mix it with glycerin. This is then put into the irritated eyes. However, there emerged an interesting fact from a study done by Cornell University in 1966. Cataracts are uniquely considered an illness of old age without a traditional indigenous remedy, leaving cataract surgery of modern western medicine as the only solution (10).

In their research, the Cornell University team found that discrimination against Indians exists to a high degree throughout Ecuador but is more pronounced in the area of Chimborazo. The question that the Cornell team, which consisted of two anthropologists, one social worker and two graduate students, had was "Why had the feudal pattern with its discriminatory practices persisted in its extreme form in this zone when it has been modified in other areas of Ecuador? (10)". The team from Cornell University found that historical data which could provide an insight into the process of change in inter-group relations were not available but that:

"...one of the variables in the maintenance of discriminatory practices has been the lack of economic resources in the zone. Land and other sources of wealth are scarce commodities. The large and medium-sized land-holdings are owned by absentee landlords. The Indians have been left with minimal plots which have been divided and sub-divided through inheritance and do not even provide subsistence let alone excess produce for sale. This means that the

Indian is dependent on the Mestizo merchants and moneylenders when emergencies arise that necessitate the acquisition of credit or ready cash.

Combined and related to economic deprivation is the low self-esteem of the Indian group. Centuries of degradation have left psychological scars which any organization whose goal is to improve the socioeconomic welfare of the Indian must eradicate before they can succeed”(10).

## **1.2 Definition of Problem**

Why do people in general, and Highland Quichua Indians in Ecuador in particular, not undergo cataract surgery if it is the answer to the most preventable blindness in the world? What are the barriers that keep people from having cataract surgery?

## **1.3 Purpose**

The purpose of this investigation is to discover the barriers to cataract surgeries among the older Highland Quichua Indians of Ecuador.

## **1.4 Objectives**

- A. To identify barriers to cataract surgery in Highland Quichua Indian people through surveys.
- B. To describe and correlate cataracts with gender, age, and pathologies in the population of patients seen by the Fundación Oftalmológica del Valle Yaruquí in their community work outings, January 2002 to June 2002.
- C. Conduct vision screenings to identify the prevalence of cataracts in Highland Quichua people.
- D. Conduct in depth surveys with Highland Quichua Indian adults who have cataracts and who have not had cataract surgery.

### 1.5 Justification

Throughout the world, age-related cataracts are believed to be the main cause of visual impairment and blindness. It is believed that cataracts are the cause of blindness for more than 15,000,000 people worldwide and that by the year 2025 this number could reach 40,000,000 (11).

There are four basic kinds of cataracts and a brief description of each is in order but the focus of this study is age-related cataracts as they have the greatest socioeconomic impact. In developing countries the problem is especially critical because for every one individual who is blind it removes two individuals out of the workforce, when the blind individual requires the care of an able adult. In the realm of health there are many problems that affect the public to such an extent as to cause serious impediments to living a quality life that is productive and contributes to society as a whole. One of the many problems affecting the health of millions of people worldwide is the *problem* of blindness due to cataracts. In their article "*Social economic development in the prevention of global blindness*" Viet Ho and Ivan Schwab state the following.

"The three principal causes of blindness in the world - cataract, trachoma, and glaucoma - together account for 71% of all blindness, with cataract being the most common cause in all developing regions. Though the data on prevalence of cataract in developing countries have not always been well assessed, Javitt *et al* note that cataract is more prevalent in developing countries where it may occur at an earlier age than in developed countries"(12).

"In public opinion surveys, blindness was named the most feared of all disabling afflictions. The World Health Organization (WHO) estimates that more than 42 million people in the world are currently blind. Almost half of all blindness is caused by cataracts. Any plan for elimination of blindness in the world must deal with this problem. No one is immune to cataracts. The longer each of us lives, the greater the chances of becoming a victim of this disease. There are currently approximately one million free cataract operations performed annually, but there are 1.5 million new cases of cataract blindness occurring in the world's indigent population per year. In other words, the world is slowly becoming more blind" (13).



### 1.5.1 Pathogenesis:

To understand better the magnitude of the problem of blindness due to cataracts it is necessary to understand the *agent*, or in other words, what causes a cataract. The eye's lens located behind the pupil is normally transparent and biconvex. This lens is suspended within the eye by a complex ring of zonular fibers, which originate in the ciliary body. This lens continues to grow throughout one's life. The adult lens weighs about 255mg and measures 9mm equatorially and 5mm anteroposteriorly. With age the lens thickens and becomes increasingly curved in shape causing more refractive power but due to the increasing presence of insoluble protein particles the index of refraction decreases. With age the lens increases in weight and thickness while decreasing in accommodative power. New layers of cortical fibers are formed concentrically causing the lens' nucleus to undergo compression and hardening known as nuclear sclerosis. Lens proteins called crystallins are changed by chemical modification and aggregation into high-molecular-weight proteins. The protein aggregate which results causes abrupt fluctuations in the refractive index of the lens, scatters the rays of light and reduces the transparency of the lens. Progressive pigmentation occurs due to the chemical modification of nuclear lens proteins causing the lens, with age, to take on a yellowish or brownish hue (11). This opaquing of the lens is what is termed as a cataract in age related cataracts.

The *condition of a cataract* is usually a gradual process that takes place over time, years in the case of senile cataracts. The person gradually loses vision as their vision becomes cloudy and unclear. Each case is distinct and the time frame for a cataract to reach a stage needing surgery varies from person to person and from eye to eye of each person. Many times the person does not realize how much vision they

have actually lost until they undergo a vision test and it is pointed out to them, due to a gradual accommodation to the vision loss.

The *characteristics of the host* of a cataract are distinct to the kind of cataract which is being discussed. There are four origins of cataracts, 1) congenital, 2) metabolic, 3) traumatic, and 4) senile. Each will be described briefly but the main focus of this study is the latter because they have the greatest socioeconomic impact, as stated previously.

Congenital and infantile cataracts occur in a newborn (congenital – present at birth) or in the first year of the baby's life, respectively. Occurring in 1 out of every 2000 live births, congenital and infantile cataracts are fairly common. They cover a broad spectrum of severity. Some lens opacities do not progress, remaining visually insignificant while others can produce profound visual impairment. Congenital and infantile cataracts can be either unilateral or bilateral. Generally one third of these cataracts are associated with other disease syndromes, one third occur as an inherited trait, and one third from undermined causes. Bilateral cataracts are more commonly associated with metabolic diseases. Conditions such as Down Syndrome, hypoglycemia, Marfan Syndrome and hypoparathyroidism just to name a few, tend to be associated with congenital and infantile cataracts. Maternal infections such as rubella, varicella, syphilis and toxoplasmosis contribute to congenital and infantile cataracts (11).

The metabolic cataract can be found in diabetic patients of any age. It is possible for *diabetes mellitus* to affect the clarity of the lens, its refractive index, and its accommodative amplitude. Along with increases in blood sugar there is an increase in glucose content in the aqueous humor. Since glucose enters the lens by diffusion, an increase in the aqueous glucose level leads to an increased glucose

content in the lens. Since some of the glucose is converted to sorbitol by the enzyme aldose reductase, which is not metabolized but remains in the lens, there is subsequently an influx of water into the lens. This influx of water into the lens causes the lens fibers to swell and this state of lenticular hydration can affect the refractive power of the lens. This causes diabetic patients to exhibit decreased amplitude of accommodation as compared to age-matched controls. There are normally two types of cataracts observed in diabetic patients. a) The first type of cataract associated with diabetes is called the true diabetic cataract or snowflake cataract. It consists of bilateral, widespread subcapsular lens changes of abrupt onset and acute progression. It is found typically in young people with uncontrolled *diabetes mellitus*. Many researchers believe that the underlying metabolic changes associated with the true diabetic cataract in humans are closely related to the sorbitol cataract, which has been studied in experimental animals. b) The second type of diabetic cataract is the senescent cataract, which according to evidence suggests that diabetic patients have an increased risk of age-related lens changes and that these lens changes tend to occur at a younger age than in people without diabetes. The accumulation of sorbitol within the lens, subsequent hydration changes and the increased glycosylation of proteins in the diabetic lens may be the reason for the high risk of age-related cataracts in diabetic patients. Another source of metabolic cataracts may be from nutritional diseases. There is epidemiological evidence that suggests that severe episodes of diarrhea, with attendant risk of malabsorption and electrolyte disturbance, may be associated with increased risk of cataract formation. It has been determined through prospective studies of men and women that cigarette smoking increases the risk of posterior and subcapsular cataracts in both sexes.

Trauma cataracts can be found in any age group where mechanical injury or physical forces have occurred (such as radiation, electrical current or chemicals). These can result from a blow to the head close to the eye or to the eye itself. Even the explosion of a firecracker in very close proximity to the eye can induce formation of a cataract. An injury that perforates or penetrates the lens often results in opacification of the cortex at the site of rupture usually rapidly progressing to complete opacification of the lens. A cataract can also develop due to ionizing radiation but with a latent period of up to 20 years before it becomes clinically apparent. The period of latency is due to the dose of radiation and due to the patient's age, thus making a younger patient with more actively growing lens cells more susceptible. Chemical injuries can also cause cortical cataract formation either acutely or as a delayed effect of the chemical injury. This is especially true in the case of alkali compounds which penetrate the eye readily causing an increase in aqueous pH and an decrease in the level of aqueous glucose and ascorbate as compared to acids which tend to penetrate the eye less easily (11).

In the case of senile cataracts, the host is not gender specific and usually 60 years of age or older. The prevalence in cross-sectional studies in people between the ages of 65 –74 is 50% and increases to 70% in people over the age of 75 (11). Although “senile cataract appears to have earlier onset in certain areas in Africa than in other parts of the world (with incidence becoming significant in the 40-50-year age group) a recent report from Asia indicated that in a certain population group in Nepal, cataracts apparently start at about 35 years of age. In one region of India, with a total cataract prevalence of 4.3% for all ages, a prevalence rate of 1% was revealed for the 30-49-year age group and increased markedly to 67% for ages 70 and older”(14).

There are three main types of age-related cataracts: a) nuclear, b) cortical, and c) posterior subcapsular. The reason it is important to make this distinction is because there seem to be different causative factors for each type of age-related cataract.

A nuclear cataract is an excessive amount of sclerosis and yellowing of the lens, which causes a central opacity. This kind of cataract tends to progress very slowly and tends to cause greater impairment of distance vision than of near vision. The progressive yellowing of the lens causes poor hue discrimination, especially at the blue end of the visible light spectrum (11).

The cortical cataract is characterized by changes in the ionic composition of the lens cortex, and subsequent changes in the hydration of the lens fibers, leading to cortical opacification. How they affect vision varies greatly depending on the location of the opacification relative to the visual axis. Glare from intense focal light sources, such as car headlights, is one of the most common symptoms of this type of cataract. Cortical cataracts may remain unchanged for long periods of time or progress very rapidly (11).

The third kind of age-related cataracts are the posterior subcapsular cataracts. This type of cataract can often be seen in patients who are younger than those with the previous two types of age-related cataracts mentioned. This type of cataract is characterized by granular opacities and a plaque like opacity of the posterior subcapsular cortex. The patient usually complains of poor vision and glare under bright light conditions. The near vision tends to be reduced more than the distance visual acuity (11).

### 1.5.2 Etiology:

What causes cataracts is a question many are asking and that still requires continued research. Some research that has been done linking *environmental and social factors* to specific kinds of cataracts and there is overwhelming evidence that age, trauma, and intraocular inflammation are important cataract risks according to the article, *Risk factors for age-related cataracts* by WG Hodge *et al* (15).

“To date, there are consistent findings linking ultraviolet B (UV-B) radiation to cataract, particularly cortical and posterior subcapsular opacities”(16). According to the article *Epidemiology of age-related cataract* by HR Taylor, “our current understanding of the aetiology of cataract shows that by far the greatest effect is seen with increasing 'age'. However, exposure to ultraviolet-B (UV-B) radiation, use of dietary antioxidant vitamins and the presence of diabetes, the occurrence of dehydration and severe diarrhea and the use of therapeutic drugs such as steroids, and recreational drugs such as nicotine and alcohol, may be important risk factors”(17).

“Some 12 to 15 million people are blind from cataracts. WHO has estimated that up to 20% of cataracts or 3 million per year could be due to UV exposure. Given that, in the United States alone, it costs the US Government \$US 3.4 billion for 1.2 million cataract operations per year, substantial savings in cost to health care can be made by prevention or delay in the onset of cataracts. ...It is widely accepted that lifelong exposure to UV is associated with the formation of certain types of cataract”(18).

It is interesting to note that “age-related cataract is a multifactorial disease, and different risk factors seem to play a role for different cataract types. Cortical and posterior subcapsular cataracts appear to be most closely related to environmental

stresses such as ultraviolet exposure, diabetes, and drug ingestion. Nuclear cataracts appear to be associated with smoking. Alcohol use seems to be associated with all cataract types”(19).

Although posterior subcapsular cataracts are one of the main types of age-related cataracts, they can also occur as a result of a trauma, systemic and topical corticosteroid use, inflammation, and exposure to ionizing radiation (11).

Even with all the research, the exact causes of cataract are not presently known. Poor nutrition in childhood, shorter life expectancy, and even light damage (infrared and ultraviolet radiation) have been implicated as risk factors according to the article *Social economic development in the prevention of global blindness* by Viet H Ho and Ivan R Schwab (12). So there are several environmental factors, which can contribute to earlier cataract formation such as age, light damage, trauma, the use of corticosteroids, inflammation, smoking, alcohol consumption, and poor nutrition. Obviously some of these factors can be altered but others are inevitable and pose a risk with which one just has to live.

There is not really any *season of the year* that would be a major contributor to the formation of cataracts specifically. Those who live in geographical areas such as close to the equator would have a possibility of greater exposure to light damage, but it is not dependent on the season as to a greater incidence in cataracts as compared to diseases, whose increased incidence can be seasonally related. “The reflective properties of the ground have an influence on UV exposure. Most natural surfaces such as grass, soil and water reflect less than 10% of incident UV. However, fresh snow strongly reflects (80%) UV. During spring in higher altitudes, under clear skies, reflection from snow could increase UV exposure levels to those encountered during summer”(18).

There are, however, *additional epidemiological variables* that could contribute to cataract formation. One of these variables is in the case of congenital cataract formation due to the mother's infection with the rubella virus during her pregnancy, especially during the first trimester. Another variable would be that of *diabetes mellitus* which causes earlier formation of cataracts as a result of metabolic changes. Hypocalcemia (titanic cataract) can be idiopathic or as a result of unintended destruction of the parathyroid glands during thyroid surgery (11). Arthritis is another variable in cataract formation as many arthritic patients have to take corticosteroids and this contributes to cataract formation as mentioned earlier. Two other interesting variables associated with cataract formation are mountain climbers and glassblowers. The mountain climbers have more exposure to intense sun rays especially as reflected off the snow, thus intensifying the light. The glassblowers are exposed to infrared radiation and intense heat over time, which can cause the outer layers of the anterior lens capsule to peel off thus possibly associating cortical cataract (11).

One additional variable that is involved in the formation of cataracts that was very interesting was that of obesity. According to a study *Obese Men More likely to Get Cataracts* by Jeremy Appleton, obesity is a risk factor for gout and gout has been found to predispose to cataracts. Also, obesity is a strong risk factor for glucose intolerance and insulin resistance which are conditions involved in the development of type 2 (adult-onset) diabetes which as stated earlier is known to cause or accelerate the formation of cataracts (20).



### 1.6 Hypothesis

Cost is the principal barrier to cataract surgery among the Highland Quichua Indians in Ecuador.

## II. THEORETICAL FRAMEWORK

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## 2.1 Revision of Literature – Universal

Still the question remains, why don't people with cataracts have cataract surgery to prevent their blindness? Cataracts are the most common cause of preventable blindness in the world. However many people do not undergo the surgery that could restore some to most of their vision due to perceived barriers. In his booklet, "*Breaking Down Barriers How to Increase the Cataract Surgical Rate*" (21), Geert Vanneste describes several barriers to cataract surgeries. He divides the barriers into different categories. The first category is that of barriers on the side of the patients, close relatives and the community at large. The other category has to do with barriers on the side of the hospital (eye unit). While the second category is important, the focus of this thesis is on those of the first category.

### *Five Patient Barriers (21):*

Vanneste states that fear is the first barrier a patient has to overcome in order to have cataract surgery. This fear can be defined as fear of surgery, especially for a cataract patient who may still have the perception of light and by undergoing surgery is putting his remaining vision at risk.

Vanneste lists the second barrier for the patient, as that of age. If one has to travel to get to the eye care unit and it was difficult when the patient was younger, at an advanced age with low vision it results even more difficult. The author suggests that many times there are other problems or barriers behind this such as lack of information of the real cost or lack of transport; not finding an escort/escort/caretaker; being a woman; cost; or distance. (A woman, in many cultures has less value than a man thus causing the family to be inclined to care for a

male family member before caring for a female family member, especially an aging female.)

The third barrier for the patient, is distance, which is closely related to the one of cost but with distinct considerations. Vanneste states that in eye care facilities in Asia the availability of public transport is one of the main reasons why they have had fewer problems getting cataract patients than has been the case in the African context (17).

A fourth barrier of cataract patients to having cataract surgery is that of the slow process to cataract blindness itself. The patient may think that he is fine not realizing the amount of vision loss that he really has. Cataract blindness is usually a very slow process and takes years before the person becomes "functionally" blind. The rural patient, due to the very slow deterioration of vision, can continue with most daily activities, even when functionally blind. If the patient is a woman, many times she can still fetch water, prepare food, take care of children, and feed the animals. If the patient is male, due to his age he can be led to a place to sit and chat with others, go to church or to community gatherings. These people may remain integrated in communal life and therefore may not appear to have a major problem.

Vanneste states that a fifth barrier, which keeps many cataract patients from having surgery, is that they think the cataract needs to be mature. This can be due to having been sent away from eye care units with the message to "come back when its mature" during the era of the ICCE type of surgery which is no longer the case with the current generation of IOL (Interocular Lens) surgeries. (ICCE surgeries are intracapsular cataract extraction first practiced by Samuel Sharp in London in 1753. It is the procedure by which the cataractous lens with capsule intact is expressed through a limbal incision. In 1957 Joaquin Barraquer used chemical dissolution of the zonular fibers which hold the lens in place, thus greatly enhancing the safety of

ICCE surgeries.) There remained however, a 5% chance of potentially blinding complications and the problem of optically rehabilitating the patient with glasses as this surgery does not insert an intraocular lens (11).

A patient may still have one eye that is normal and therefore not find their cataract to be disabling. This is especially true of rural patients where a unilateral cataract hardly has any disabling effect. By contrast, a unilateral cataract would handicap a taxi driver or a woman who knits for a living.

*Seven Close Relatives Barriers (21):*

The following are barriers on the side of close relatives which affect whether a cataract patient has surgery or not. One of those barriers is that aged people are "no priority". If the family has barely enough money for school fees or food, it is unlikely that they are going to spend it for treatment of an old person. Many times an elderly relative is seen as a burden and not worth spending money on since they are just going to die anyway. If they do decide to do surgery, they may do it on the elderly woman of the family to see how it turns out and if her surgery does turn out well, then the elderly man may consider undergoing the same surgery. In other cases the elderly woman is the last one to be considered worthy of any medical help (22).

The second close relative barrier is that of cost and the lack of money. People in many parts of the world as well as Highland Quichua Indians do not have available cash throughout the year rather it is usually available at certain periods of the year such as after harvest or when an adult child returns from town. These time frames often do not coincide with surgery schedules of the eye care unit. Also one must take into consideration the cost for the patient and the family in broader terms than just that of the cost for the surgery. Such costs could include the following:

- Buying small things for the trip (according to local culture on how one should dress when staying in a hospital, maybe some additional food, may perceive a need for appropriate hospital clothing)
- Transport for patient and escort/caretaker
- Place to stay for the escort/caretaker in town or at the hospital
- Registration at the hospital
- Ward registration
- Fees for surgery
- Bribes?
- Food for two persons
- Post-operative drugs (eye drops)
- Post-operative medicines (any painkillers needed)
- Small gifts, if the relative stays with relatives in town
- Loss of income for the escort/caretaker, for the duration of the trip
- Transport back home (21, 22)

A third close relative barrier is that of no escort/caretaker to accompany the blind patient. This implies that someone has to accompany the patient who will help with the care of the patient after the surgery. The necessity of an escort/caretaker increases the cost because this person needs transport, accommodations and food, not to mention the loss of wages if this person is employed and takes time off from his work to accompany the patient.

Discrimination against woman is a fourth close relative barrier stated by Vanneste. Since women tend to live longer than men do and there seem to be more woman than men, it should mean that more women should be getting cataract surgeries. The reality is often very different with up to 70% of operated cataract patients being men in some areas (21).

A fifth barrier on the side of the close relatives is the social role of being blind. Mr. Vanneste states that, "In some cultures, particularly in Muslim countries, some tasks are customarily allocated to blind people, like in Egypt, where blind men are often the ones to give the call to prayer from the mosque, or to recite the scriptures at the start of any public event" (21). He goes on to say that at home

everyone, especially in poor communities, has a role to play. It may be that the blind person takes care of the house and children as they are always there since they can't go anywhere. This arrangement can be a major factor why the family does not regard the eye surgery and its cost as a priority.

An uncertainty about the final total cost including corruption and follow-up treatment represents a sixth close relative barrier. If there is corruption involved at the level of the eye care unit/hospital it makes the price higher and unpredictable which turns it into a barrier. Also the lack of knowledge of the cost of follow-up care constitutes an additional barrier.

Finally, due to costs to the family, they may be waiting for free treatment from a Service Club (as in Africa or some medical caravan or free service), which can convert into another barrier to having cataract surgery. They may simply decide to wait until they come back, which means that the blind relative stays blind longer.

*Two Barriers on the side of the Community at Large (21):*

There seem to be two barriers identified on the side of the community at large. The first one being that of an informational barrier: unawareness of the existence of treatment for cataract. There is a lack of information in regard to cataract surgery "this is after all only the first or second generation of people for whom modern, highly effective, very low-risk cataract surgery is available. The only "modern" type of surgery that was available till a short time ago, known as ICCE surgeries, requiring thick post-operative lenses, provided only a very poor vision, leaving part of the patients functionally disabled"(21). Since many of the younger generation have left for the towns and cities leaving a poor and aging population in

the rural areas, this means that the information on available services filters into the rural areas very slowly.

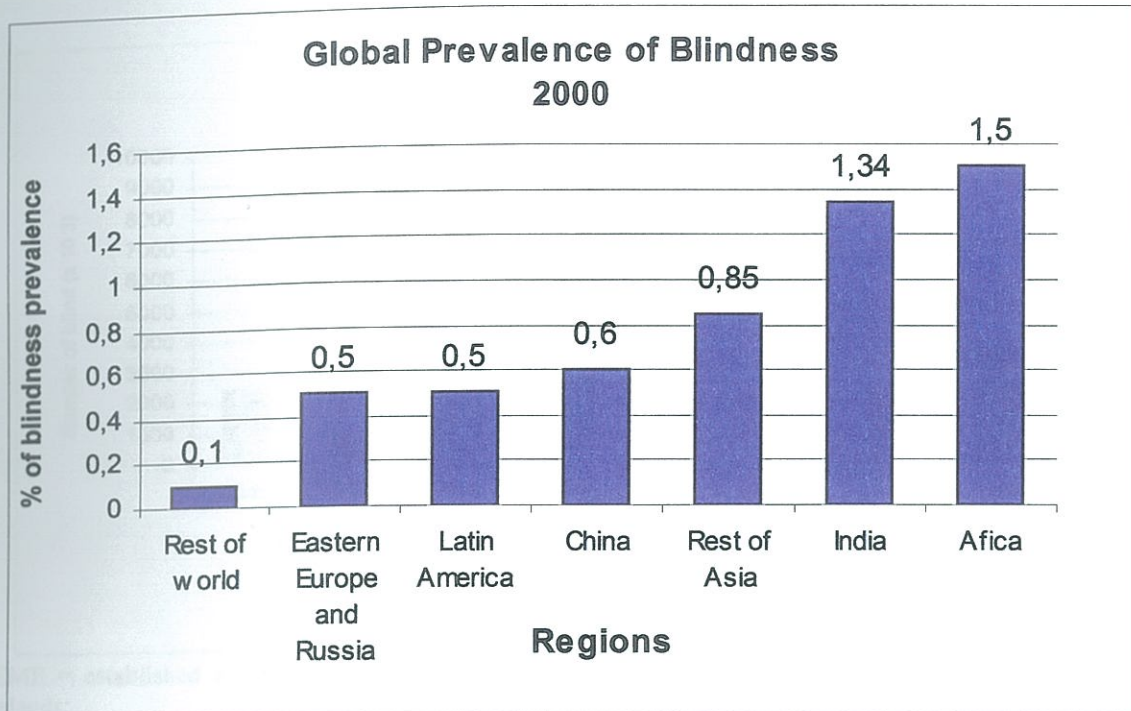
The other barrier on the side of the community is that of cultural and religious beliefs about blindness and eye treatments. In his booklet, *Breaking Down Barriers*, Vanneste states that "some Muslims and some East Asians do not wish to have cataract surgery, as they believe that their body should remain intact, if they wish to enter heaven. The minor loss of body (eye) liquid is for them enough for preferring to remain blind"(10). In other cultures the blind are so highly respected that it makes it next to impossible for them to seek treatment even when the blindness is curable.

According to Dandona and Dandona in their article, *Socioeconomic status and blindness*, "the relation between lower socioeconomic status and higher blindness rate is unambiguous. This is clearly indicated from the higher prevalence of blindness in the poorer countries of the world compared with the developed countries. In addition, data also suggest that within a particular country those with lower socioeconomic status are more likely to suffer from blindness, around the world. The contributions to this phenomenon seem to include higher prevalence of blinding conditions in those with lower socioeconomic status, less access to health services by those with lower socioeconomic status for the treatable and preventable causes of blindness, and poor quality of health services available to those with lower socioeconomic status"(23).

Following chart indicates the prevalence of blindness globally by region in the year 2000.



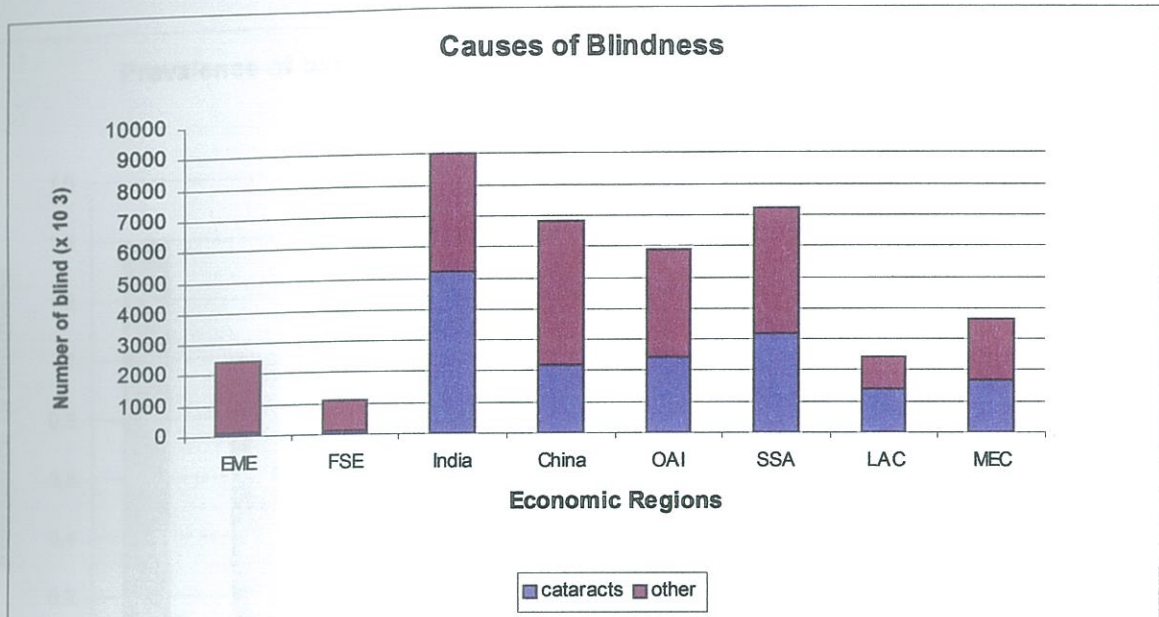
**Figure 1** Estimated prevalence globally in 2000 of blindness by region.



Fuente: Socioeconomic status and blindness (23)

Following graph depicts the different economic regions and the cause of blindness and number of persons blind in each region.

Figure 2 Major causes, and global distribution of blindness by economic region.



EME = established market economies; FSE = former socialist economies; OAI = other Asia and islands;

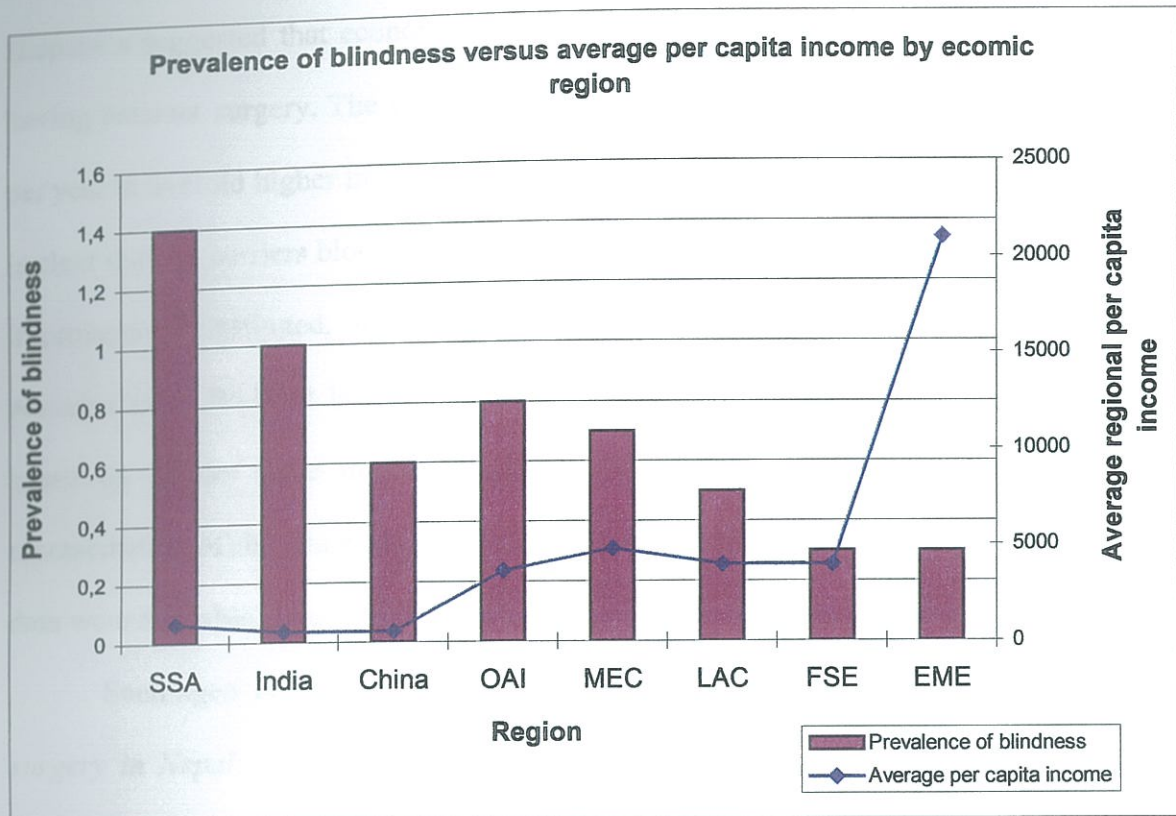
SSA = sub-Saharan Africa; LAC = Latin America and Caribbean; MEC = Middle Eastern crescent.

Other = Trachoma, Glaucoma, Onchocerciasis, and others.

Source: *Social economic development in the prevention of global blindness* (12)

The authors of the various articles researched indicate that the socioeconomic level of an individual and of a country as a whole plays a huge part in the blindness of that individual and of the population of the country as a whole. Those countries, which have higher socioeconomic levels, seem to have lower levels of blindness as compared to those countries that have lower income levels. An interesting comment made by Viet and Schwab in their article *Social economic development in the prevention of global blindness*, "Genetic factors aside, diseases like xerophthalmia, other nutritional causes of blindness, and nutritional influences on cataract can be eradicated with improvement in socioeconomic development"(12).

**Figure 3** Average per capita income by economic region versus the prevalence of blindness



SSA = sub-Saharan Africa; OAI = other Asia and islands; MEC = Middle Eastern crescent; LAC = Latin America and Caribbean; FSE = former socialist economies; EME = established market economies.

Source: *Social economic development in the prevention of global blindness*. (12)

In the article *Blindness and visual impairment in the Americas and the Caribbean* (24), the authors say that the primary causes of visual loss of adults are age-related diseases with cataracts being one of the first. As the population ages and risk factors increase, the problem of cataracts will continue to be an issue for Public Health in the future. In Latin America the rates of blindness and visual loss are higher than in comparable age groups in the United States largely due to those who are blind from cataracts. There are data from two studies done, one in Peru and the other in Brazil that "...suggested that only two thirds of people who were offered cataract surgery were operated. No apparent reasons for refusal were reported,

although fear of surgery, acceptance of visual loss as a consequence of old age, and poor outcomes were reasons in other studies. Data from another study in US based Hispanics suggested that economic barriers, such as no insurance, were barriers to having cataract surgery. The estimated cataract surgery rate per million population per year is fivefold higher in North America compared to the rest of the Americas. It is clear that the barriers blocking access to cataract surgery need to be identified, and improvements instituted, in order to reduce the burden of blindness in Latin America”(23). While it is true that drawing conclusions for all of Latin America based on studies done in two countries, Brazil and Peru, could be a partial representation of the situation, it is interesting that in these two countries for which data were available, cataracts and barriers to cataract surgery were mentioned.

Snellingen *et al.* (25) in their article *Socioeconomic barriers to cataract surgery in Nepal: the South Asian cataract management study* state that cataract blindness continues to be the major cause of all blindness worldwide. The estimate is that 41.8% of all blindness still is due to cataracts and since cataract blindness is a preventable blindness, it is a problem that is of great concern to the Public Health sector. The problem is that many times even when the people with cataracts are offered surgery they refuse it due to several reasons. The results of a study in which 319 cataract patients participated only 45.5% were reported as having accepted surgery. “The most frequent reasons given for not accepting surgery were economic (48%) and logistical (44.8%) constraints followed by fear of surgery (33.3%) and lack of time (18.8%). Half of the subjects complained of problems with self care but only 10% needed help for their most basic every day activities. 17.7% said they needed help to visit neighbors and 26% needed help to attend the field or market”(25). The conclusion of this particular study was the following: “It was found that in this

population with a majority of patients with severe vision loss and blind, even when offered transport and free surgery the utilization of cataract surgery is below 60%. Medicine tends to be prescriptive based on technological advances that it is able to offer. Medical practice needs to develop a more holistic understanding of the needs of the communities cultivating a greater capability to analyze the role of cultural, social, and economic factors when planning medical services for the population. ... Next to the quality of services, it is likely that real changes in economic wealth and adult literacy in the communities, particularly in the female population, will be the most important determinants for improving the surgical uptake”(25).

Mansur M. Rabi (26) states that cataracts are responsible for about 16 million blind people worldwide with the burden of blindness being more in remote rural communities of developing countries. “These countries are characterized by high backlog of unoperated cataract and increasing incidence of cataract due to population aging. However, these countries have inadequate and inefficient cataract surgical service. For these regions of the world, it becomes imperative to develop a cost effective, sustainable service delivery system for cataract surgery. However, this is only possible with relevant data on the magnitude of the cataract blind in the areas and also information on factors that hinder the people from accessing such sight restoring services in the areas. This is important because various studies had revealed that availability of eye care services in such communities may not necessarily translate into appropriate utilization”(26).

This study used a rapid form of cataract blindness assessment in Nigerian communities which involved surveying the most vulnerable portion of the community that is, the elderly, because cataract blindness (senile cataract) occurs mainly in old age. It wanted to determine the number of cataract blind and the

barriers to cataract surgery uptake among people 40 years and above in a rural community of northern Nigeria. The study was conducted in the months of April and May 1999 and was a population based cross sectional survey of people 40 years and above in a rural community of Katsina State, northern Nigeria. The study had 1924 people registered for the survey in the 15 villages randomly selected. Out of those that were registered, a total of 1461 subjects were examined, thus achieving a participation rate of approximately 76%. In the sampled population, the prevalence of bilateral cataract blindness was found to be 3.6% (95% CI 2.5%-5%) with no difference in the prevalence of cataract blindness between males and females;  $p = 0.74$ ; relative risk (RR) of 1.14 (95% CI 0.67-1.93). These patients were offered surgery but many people with cataract or "couched eye" reported more than one factor, which was responsible for them not having surgery. One common reason mentioned by most is the inability to afford the treatment (61%). Another factor was that some did not know where they could get treatment even if they could afford it (10%). Virtually all the people with unilateral cataract also reported that they can at least see with the other eye. The following table shows the barriers this study identified to the uptake of cataract services.

**Table 1 Barriers to cataract surgery**

Barriers	No of responses (%)
Cannot afford treatment	94 (61.0)
Can see with the other eye	29 (18.8)
Not aware of place for treatment	16 (10.4)
God's wish	7 (4.5)
No trust	3 (1.9)
Distances	2 (1.3)
Prefers couching	2 (1.3)
No escort to treatment site	1 (0.6)
Total	154 (100)

Source: Cataract blindness and barriers to uptake of cataract surgery in a rural community of northern Nigeria. (26)

The article goes on to state that there was a cataract surgical coverage for people of 4.1% and a couching coverage for people of 18.0% meaning that couching was being practiced about four times more frequently than cataract surgery in this particular area. (Couching is the ancient surgical treatment that started as early as 800BC. The surgeon sat facing the patient whose face would be illuminated by the bright sunlight coming in the window. An assistant would hold the patient's head from behind while the surgeon would plunge a pointed needle either through the sclera 4mm temporal to the limbus or through clear cornea in a blind approach behind the iris toward the lens. The surgeon would then use a blunted needle to push the white opacity downward or backward. The patient would have to move their eye medially or superiorly to help further wiggle the lens from its zonular fibers. The surgery was considered successful if the patient could see forms and figures again (11).) It was interesting to note that 78% of the people with cataract blindness in at least one eye had not had any treatment for it (in terms of either cataract surgery or couching). They said it could be argued, however, that these values might be an exaggeration since the couching recorded in this study was presumed to have been done on cataract blind eyes only, which may not be so.

“The couching could have been done on an eye that did not have a cataract nor was blind at the time of the couching and the cataract surgery might not have been done on a blind eye. They thought that the low level of cataract surgical coverage was likely due to the non-availability of cataract services in the area or, at best, the cataract services were very irregular. Most people cannot afford the charges even when the services are available, because they are very poor, living essentially by subsistence farming and some of the villages are inaccessible for part of the year (in the rainy season for example). An additional problem has been that the outcome of some cataract surgeries has not inspired confidence in the operation, this being an important consideration in an area where couching is performed also. People will make do with what is readily available and affordable to them; in this case, couching. Many people in this sub-district seem to have no choice other than to take a chance with couching, even though the outcome of couching is largely unfavorable. Complication rates can be high due to the usage of a

common, unsterilized sewing needle. This procedure is done without anesthesia and depends on the cooperation of the patient to hold his eye still or move it only under the direction of the one performing the couching procedure. (A successful couching procedure would be defined as the patient being able to ambulate without assistance (11).) The cataract is not replaced with a lens so vision is not restored rather only the passage of light is unblocked by the removal of the opaque cataract allowing the patient to see forms and figures. The financial limitations of the people ranked first constituting over 60% of responses as to the reason for not having cataract surgery, as in most surveys done on the barriers to uptake of cataract services. The issue of cost was the most frequently mentioned, although most respondents gave more than one reason. The researchers stated that the total of the direct and indirect costs of obtaining cataract services was excessively beyond the ability of the poor peasant subsistent farmers, who participated, in this particular study. About 16 (10%) reported that they did not know of a place to seek treatment even if they had the money to pay for it. Three people (2%) expressed their distrust of surgery, due to some people having had cataract surgery in one eye with poor visual outcome.

The author concludes that, "cost, lack of information, "can see with other eye," and fear of operation are the main factors identified in most studies as the barriers to uptake of cataract services. Studies by Johnson *et al* in Gambia, Limburg and Kumar in Karnataka state of India, Snelligen *et al* in Nepal, and Limburg *et al* in Maharashtra state of India all reported similar barriers"(26).

Courtright *et al* (27) agreed that the issue of the barriers that keep general cataract patients from receiving surgery has been receiving increased attention in the past few years. They state,

"It has become apparent that many cataract patients do not take advantage of services because of cost, distance to service, fear of surgery, fear of poor outcome, sex discrimination, and other factors.

We sought to determine the cataract surgical coverage rate (percentage of those needing surgery who have received it), the barriers which prevented patients from receiving surgery, and the outcome of surgery in a population of cured leprosy patients with access to modern high quality ophthalmological services. As has been found in many other non-leprosy rural populations, distance to the surgical facility is one barrier preventing patients from receiving surgery. Either the services must be taken to the patients, or patients must be provided with transport to the services. Whichever method is used it is imperative that the quality of the surgical services is high. It appears from our findings that a major barrier to surgery is related to the service provider. Patients with visual impairment or blindness are under the impression that their cataracts are not "ready" for surgery. In non-leprosy patients in India it has been demonstrated that if large numbers of patients reporting for treatment are being told to wait then there is either inadequate capacity for surgery or the visual acuity cut off for surgery is too low"(27).



One of the objectives in a study (28) done in rural India was to identify barriers to uptake. The study conducted a routine eye camp within 5 km of 48 randomly selected villages of typically Hindu, backward-caste communities. Of the 749 adults with an eye problem only 51 (6.8%) attended the eye camp. There were 552 people who did not attend the eye camp but did have an examination. Of these, 242 (43.8%) had low vision (visual acuity  $<6/18$  to  $>$  or  $=3/60$  in presenting better eye) and 38 (6.9%) were blind in both eyes. For 197 (35.8%) of the persons who did not attend the eye camps, cataract surgery was recommended. There were 109 persons who had had a previous cataract operation, 42 (38.5%) people who had low vision, and 11 (10.1%) who were blind. This study encountered fear (principally of eye damage), cost (direct and indirect), family responsibilities, ageism, fatalism, and an attitude of being able to cope (with low or no vision) as being the principal barriers to attending the eye camps.

Another study (29) conducted in a Rehabilitation of the Aged Campaign at the Hospital das Clinicas of the University of Sao Paulo Medical School Brazil interviewed 70 subjects by administering a questionnaire. These 70 subjects were 32.86% male and 67.14% female. With 42.86% of their ages varying between 50 and 70 years of age, 72.86% of these subjects, had low vision acuity in both of their eyes for one year or longer with 27.14% having it for 5 years or longer. The interesting information that came out of this study is that 40% had, for one year or longer, previous surgery indication and 80% of these said that the reason that they had not had cataract surgery was due to financial reasons.

In a study done in Gambia, the most frequently identified barriers were cost, which was closely followed by lack of information about services, fear, transport difficulties, and the lack of an escort (30).

It was interesting to note that in an article entitled, *Changing trends in barriers to cataract surgery in India* (31), cataract is considered a major cause of blindness in Asia. There has been limited success in efforts to reach the cataract blind population in India and provide cataract surgical services. Previous studies had identified the major barriers to cataract surgery as the following: poverty, lack of awareness, difficult access, and cost. However, based on the results of a present study in Karnataka State, there is an indication of a shift in the nature of the barriers. These new results appear to be more related to case selection and service provision, meaning the way the patients are selected and the services being provided.

In another study (32), which was done among patients presenting to district hospital in rural Malawi, the object was to assess the barriers to cataract surgical acceptance by blind rural Malawians. The cataract blind patients who were recognized and referred for surgery by ophthalmic assistants in Chikwawa and Nsanje Districts were interviewed 9-12 months after enrollment for the purpose of determining if they had undergone cataract surgery and to assess the factors associated with surgical acceptance. The patients living near the district hospital were the most likely to go to the ophthalmic assistant and men with lower socioeconomic status were more likely to accept surgery than men who had a higher socioeconomic status. If the patients had talked to someone about cataract surgery or know another patient who had had surgery, they were more likely to accept surgery themselves. It was found that economic barriers and the lack of family support were likely to impede improved surgical acceptance, especially among the women (32).

All of the articles researched suggest the need for more research. Muñoz and West state in their article *Blindness and visual impairment in the Americas and the Caribbean* (24) "More data are needed on the magnitude and causes of visual loss for

the Caribbean and Latin American countries. Rates of blindness and visual loss from available data within these countries are widely disparate. Prevention and control of avoidable blindness needs to be an ongoing focus in this region." This is definitely true with regards to all countries especially in Latin America. All the articles reviewed stated that there is a lack of data and research especially in developing countries. The data that does exist can not be extrapolated across the board as each country and each region of each country is so distinct.

## **2.2 Revision of Literature – National**

Searching for data and statistics on the prevalence of cataracts in Latin America and specifically in Ecuador, very little data was found locally as there are not records with regards to prevalence of cataracts to be accessed. The author also searched the Internet, multiple library sources, interviewed ophthalmologists and Minister of Health workers. They all indicated that there is not data recorded on the prevalence and incidence of cataracts in Ecuador. There definitely is a lack of information seemingly due to the lack of registering the information in the health centers that deal with cataracts and due to the diversity in the region and within Ecuador itself. Some figures that could be found from the region, are in the following four studies. "The excess risk of blindness in the Latino-American surveys was probably the result of an unoperated cataract. An estimated 72%–74% of the blindness in Chimbote, Peru and Campinas, Brazil was cataract related compared to the highest proportion reported for the United States, 27% in black people in the Baltimore Eye Survey. In another two studies in Chile and Brazil the proportion of blindness due to cataract was 55% and 62% respectively, also much higher than in North America"(24).

The search for literature on a local level, which is within Ecuador, revealed a true lack of information. Attempts to find information, which would reveal the prevalence of cataracts in Ecuador, were not met with much success. Upon checking local sources and the Investigation Center of the United Nations the only articles found were the following two articles from the magazine *Revista Medica Vozandes*. In this magazine published by the Hospital Vozandes, there were two articles that deal with cataracts (Volume 11 November 1997 and Volume 13 January 2000). One article (33) discusses the transition from the conventional extracapsular cataract extraction technique to Phacoemulsification. The article states that 95% of people older than 65 years of age have some level of opacification of the lens and that there are 17 million treatable cataract cases of blindness in the world. In this article the advantages of Phacoemulsification were listed over those of extracapsular cataract extraction technique in general and in its usage in the 108 uncomplicated cataract cases during 1999 (33). The other article published in this magazine yielded more information relevant to the present study. This article, entitled *Study of the Causes of Blindness in the Hospital Vozandes Quito* (34), related the information from a prospective study made of the patients who came for the first time to the Ophthalmology Service of Hospital Vozandes Quito (HVQ). They examined 1457 patients and found 192 (13.18%) to be considered blind by the examiner. One hundred fifty five (80.73%) of these 192 patients were blind in only one eye and 37 (19.27%) were blind in both eyes. This study found that the most frequent causes of blindness were senile cataracts - 63 eyes (24.42%). This was followed by 38 eyes (14.73%) blind due to corneal pathology; 33 eyes (12.79%) blind due to trauma; 17 eyes (6.59%) blind due to secondary glaucoma; 16 eyes (6.20%) blind due to primary glaucoma; and 16 eyes (6.29%) blind due to diabetic retinopathy. The ages in this

study ranged from 5 months old to 97 years old with the median age being that of 50 years of age. Of the 192 considered blind in this study, 97 were females (50.52%) and 95 (49.48%) were males. The socioeconomic rankings of these patients were given as the following: 2 (1.0%) from high class, 125 (65.1%) from middle class and 65 (33.9%) from low class. (However, there were no definitions given as to the socioeconomic rankings.) This study also classified these patients by race with 3 (1.56%) white, 9 (4.69%) black, 158 (82.29%) mestizo, and 22 (11.46%) indigenous. The patients came from different sectors of Ecuador. There were 128 (66.67%) from urban areas, 21 (10.42%) from rural areas, and 43 (22.4%) from urban-marginal areas. There were 93 (48.44%) of these 192 blind patients which came from other provinces than Pichincha. The study also classified the principal cause of blindness for each age group. In the age group of 0-15 years (21 – 10.9% of the 192 patients) the principal cause of blindness was corneal pathology, retinopathy, trauma and congenital cataract. In the 16- 45 age group with 57 patients (29.7%) the causes of blindness were corneal pathologies and trauma in order of importance. In the 46-97 age group there were 114 patients (59.4%) of the 192 blind patients and the primary cause of this blindness was senile cataracts followed by diabetic retinopathy, primary and secondary glaucoma, trauma, and macular degeneration related to age. This article (34) states that the information that is available on the prevalence of blindness in western countries shows an index of 150-250 per 100,000 in the total population. In Asia it states that the prevalence is between 0.2% and 1.5% and in Africa that the range is between 0.3%-3.1%. The authors of this article compared their study of 1457 patients where they found 155 (80.73%) to be unilaterally blind and 37 (19.27%) with bilateral blindness, with a study in Jamaica and India where 2523

patients were examined, finding 191 (68.5%) with unilateral blindness and 88 (31.5%) with bilateral blindness.

The authors state that there is a vast variation between countries and between the rural and urban populations because the urban population usually has greater access to health services which can determine the reduction in blindness which are attributable to preventable causes such as cataracts. Cataracts are still the principle cause of blindness in the world accounting for an estimated 17 million cases of blindness (34).

### III. METHODS

### 3.1 Model/study design

In order to answer the objectives, two descriptive study designs were used, a cross-sectional survey and case series reports.

### 3.2 Universe and Sample

The universe for the cross-sectional surveys was the Highland Quichuas who traditionally resided in the Province of Chimborazo. Through the years many have migrated to the cities in pursuit of work because they struggle to make a living on the land that has been handed down to them. All of the individuals surveyed originate from the Highland Quichuas. The universe for the case series reports are Highland Quichuas and even more specifically, Puruhua Indians from the Chimborazo Province.

The pilot survey was applied in Guayaquil to a group of Highland Quichua married couples attending a Marriage Retreat in February 2002 (18 Highland Quichuas).

The revised actual survey was applied in several locations to different groups of Highland Quichuas. The first application was on March 13, 2002 to the students and staff of the Highland Quichua Men's four-year Bible Institute in the Chimborazo Province (70 Highland Quichuas). The second application was on March 20, 2002 to Highland Quichua leaders attending a retreat in Majipamba, Chimborazo Province (n=24 Highland Quichuas). The third application of the survey was to Highland Quichua couples attending a Marriage Retreat held in Mangayacu, Pastaza April 1-4, 2002 (n=24 Highland Quichuas). The fourth application of the survey was on May 16, 2002 in Huaicupungu, Otavalo to Quichua students attending a four day seminar (n=30 Otavalan Quichuas). The total number of surveys gathered was one hundred forty eight.



The data obtained from the Fundación Oftalmológica del Valle (Ophthalmologic Foundation of the Valley) was from their community work outings. This consisted of data of 1410 persons whose vision was tested and a preliminary diagnosis made by the attending foundation health worker.

The final survey was applied in three villages in the Province of Chimborazo to all those Highland Quichuas who were found to have cataracts during the vision screenings. Out of a total of one hundred forty nine patients screened, forty-four were found to have cataracts in one or both eyes, and the survey was applied to these people.

### **3.3 Investigation techniques**

Three different surveys were created, which were applied to Highland Quichua Indians in different sectors of the country of Ecuador. Also the data from the Fundación Oftalmológica del Valle from their community work during the time period from January 2002 to June 2002 was analyzed to assess prevalence of cataracts. The information from 1410 cases was entered into the SPSS 6.0 and 6.1 for Windows program. Upon running the analysis of frequencies, it became obvious that it was necessary to review the data entered to eliminate errors and create a code in order to consolidate information into workable categories (See Appendix 1 for code employed).

### **3.4 Statistic analysis**

The statistical analysis was done using the SPSS 6.0 and 6.1 for Windows program. All data were entered into this program. Then all the data was reviewed to make sure it was accurate and readable for the processing of the data using

frequencies and crosstabulations. Cross tabulations were done calculating the Odds Ratio in 2 by 2 variables and Chi squared in more than 2 by 2 variables. For independent and dependent variables the t Test and the Anova were applied. The final application was Logistic Regression to find the factors of risk, adjusting for other independent variables. A P value of  $\leq 0.05$  was considered statistically significant. A 95% Confidence Interval of the Odds Ratio that did not cross '1' was also considered statistically significant.

### **3.5 Collection of data**

The collection of data was done using several instruments. A preliminary survey was created using questions that were quantitative but also allowing for open answers. This first survey was applied in Guayaquil to a group of Highland Quichua married couples attending a Marriage Retreat in February 2002. The surveys were reviewed and assessed by Dr. Marco Fornasini and the author. Based on the responses obtained this was considered the Pilot Survey.

The next step was to create a revised survey (Appendix 2), which consisted of many of the same questions but with closed answers in the hope of creating less confusion as to the information that the survey was seeking. This survey was applied in several locations to different groups of Highland Quichuas. It was applied on March 2002 to the students and staff of the Highland Quichua Men's four-year Bible Institute in the Chimborazo Province. Each question was read in Spanish and then translated into Quichua to the whole group. The second application of this survey was March 20, 2002 to a group of Highland Quichua leaders from different communities who were attending a 3-day seminar. The third application of the survey was at a Highland Quichua Marriage Retreat on April 1-4, 2002. The fourth

application of this survey was in Otavalo on May 16, 2002 to a group of Highland Quichua students attending a 4-day seminar. The data from these surveys was then entered into the SPSS Program and an analysis was conducted in frequencies and cross tables. A final survey (Appendix 3) was then created for the purpose of interviewing Highland Quichua Indians who have cataracts but who have not had cataract surgery. These two surveys were applied to the cross-sectional universe.

At the Headquarters of the AIIECH (Asociación Iglesias Indígenas Evangélicas de Chimborazo) Highland Quichua leaders in the Chimborazo Province were presented with the option of going to their communities to realize a vision exam of the elderly people in their villages. Arrangements were made with several village leaders who responded positively to the request presented allowing entrance to their villages. The leader of the village called all village members 60 years of age and older to attend a mandatory meeting on the agreed upon date.

Upon arrival at the village, those who were present met in the community center where, after an introduction by the community leaders, the purpose of the visit was explained. This explanation consisted of what the visual exam was and how the patient would need to cooperate. Then it was explained that there would be a survey administered to those who had cataracts. This was the universe for the case series reports.

The visual exam consisted of the patient standing at a 3-meter distance from the wall on which a Snellen eye chart has been placed with the 20/20 line at the eye level of the patient. The Snellen chart used was the one that is for those who can not read or write. It consists of a table with three legs (which to a literate person would be the letter "E") and the patient is instructed to indicate with their hand the direction in which the legs of the table are pointing. First the left eye was covered with an

occluder that the patient held in their left hand. With the right eye the patient was asked to indicate in which direction the legs of the table pointed. This indication could be done verbally or with the right hand pointing in the direction of the legs. The point at which the patient could no longer correctly indicate the direction of the legs of the table on the chart, the vision score was recorded on a slip of paper. This was the slip of paper on which, upon entering the examination room their name, age, and community from which they originated had been noted. The next step was to change hands holding the occluder and cover the right eye. Then the same exam was repeated for the left eye. For those who had less than 20/20 vision, the eye with less than the 20/20 vision had to look through the Pin Hole on the occluder while covering the other eye with their hand. Then they had to attempt to indicate in which direction the legs of the eye chart went. The purpose of this exam is to see if they could obtain a better score with the usage of the Pin Hole, which could indicate either the presence of a cataract or possible need for prescription glasses. If both eyes had less than 20/20 vision this exam was performed on both eyes, always beginning with the right eye. If it was a problem of only one eye, than only that eye was examined in this way.

Then in order to assess the actual condition of the eyes and to confirm the presence of a cataract, a visual exam of the eyes was performed. This exam consisted of examining looking the eyes according to the following criteria:

The 8 rules of a healthy eye (35):

1. The cornea should be transparent.
2. The pupil should be black and reduce when a light is shone on it and grow in size when the light is removed.
3. The sclera should be white.
4. The eyelids should close and open.
5. The eyelashes should always be pointing outwards.
6. The eyes should be straight.
7. The eyes should be clean, without tears, matter or pus present.
8. The vision should be normal. (20/20 or 20/30)

With the aid of a flashlight, pupil response, clarity and color of the pupil was examined. Questions were asked of the patient as to loss of vision perceived over the past year or if they saw as though through a cloud. Based on the exam the presence of a cataract was diagnosed in one or both eyes, as the case might be.

The patient then proceeded to where the village leader accompanied a research assistant/translator in applying the survey to those who were diagnosed as having a cataract. The survey was written in Spanish therefore making it necessary for the research assistant and the village leader to translate the questions into Highland Quichua as they asked them of the cataract patients, as these patients understand or speak very little to no Spanish. Then all the data from these surveys were entered into the SPSS statistical program for analysis.

All data from the Community Work outings of the Fundación Oftalmológica del Valle during the time period from January 2002 to June 2002 were put into SPSS 6.1 for Windows, in order to analyze using frequencies and crosstabulations. The data that were available for analysis were: name, age, community where living, vision score in right and left eye, vision score in right and left eye with Pin Hole, vision score in both eyes with correction (if they had glasses), and a diagnosis for many of the cases.

#### **IV. RESULTS:**

With the data from 1410 cases from the Foundation Oftalmológica del Valle in Yaruquí from their Community Work from January 2002 through June 2002, the following results were obtained. Of the persons who were attended to in the community work outings from January 2002 to June 2002, 50% were 50 years old or younger and 50% were older than 50. The mean age was  $48.39 \pm$  standard deviation 19.729. The frequency of gender resulted as 30.9% being male and 69.1% being female of the 1410 total cases.

Doing a crosstabulation of gender and cataract in both eyes the following results were obtained. Out of 435 men, 32 had cataracts in both eyes, which is 7.4%. Out of 975 women 37 had cataracts in both eyes, which is 3.8%. This was statistically significant with an Odds Ratio of 2.01 and a 95 % CI of 1.24-3.28, P value 0.004.

In a crosstabulation for gender and cataract in one eye, either right or left 31 men out of 435 had a cataract in one eye (7.1%). For women, the percentage was 3.9% since there were 38 out of 975 who had a cataract in either eye. These findings were statistically significant with an Odds Ratio of 1.89 and a 95% CI of 1.16-3.08, P value 0.009.

It became obvious that re-codifying the age ranges was necessary in order to find the age at which the prevalence of cataracts is greater and thereby know the age with which to begin the vision screenings with the purpose of discovering those with cataracts. The first re-codifying was done with the age range to 50 years old and less as one range with the other range being greater than 50 years old. This re-codified age range was compared means with cataract in either the right or the left eye. In the 50 or less age range as having cataract in one or other of their eyes the result was 2.9%. In the greater than 50 age range those having a cataract in either eye was

9.5%. This had statistical significance with an Odds Ratio of 0.03 at 95% Confidence Interval of 0.01 - 0.11, P value .00.

Re-codifying again to see the difference of age ranges of less than 60 years of age, and 60 and greater years of age was done. When compared with the variable of cataract in either eye, the range of less than 60 years of age had a 1% prevalence of cataracts and the 60 and greater age range had a 13.3 % prevalence. This was of statistical significance with Odds Ratio = 0.06 with a 95% Confidence Interval of 0.03 - 0.13 (P value .00) with 20 missing observations just as in the previous instance. The next comparison was that of the  $\leq 60$  age range and the greater than 60 age range with the cataracts in both eyes. Here the  $\leq 60$  years old age group had 0.7% as contrasted by 13.9% in the 60 & + age group. There was statistical significance with Odds Ratio of 0.05 with a 95% Confidence Interval of 0.02 - 0.10 for 1390 observations (P value .00).

According to the American Academy of Ophthalmology, the prevalence in cross-sectional studies in people between the ages of 65 -74 is 50% and increases to 70% in people over the age of 75 (11). Based on this information, re-coding was done for the data in this study to see if the same results would be obtained. The re-coding was done in the following manner. The 1390 valid cases were re-codified into 12 cases in the <65 age group, 24 cases in the 65-74 age group, and 33 cases in the >74 age group for those with cataracts in both eyes. This resulted in showing the <65 age group with a 1.1% prevalence rate, the 65-74 age group with a 11% prevalence rate, and >74 age group with a 27.7% prevalence rate for cataracts in both eyes. For those with cataracts in either eye, this study found that there were 19 cases in the <65 age group with a 1.8% prevalence, 27 cases in the 65-74 age group with a



12.4% prevalence, and 22 cases in the >74 age group with a 18.5% prevalence. Both of these had statistical significance.

The next step was to compare cataract with other observations such as gender and symptoms in the eyes. The majority of these did not have statistical significance. However, in the association of Pterigium with cataracts in both eyes there was statistical significance with an Odds Ratio of 0.14 and a 95% Confidence Interval of 0.04 - 0.45, P value .00. There was also statistical significance for the association of Pterigium with cataract in either eye with an Odds Ratio of 0.19 with and 95% Confidence Interval of 0.07 - 0.55, P value .00 (n=1410 for these two comparisons).

A comparison of presbyopia with cataracts in both eyes and with cataracts in either eye was done. Subjects who have presbyopia have less probability of the development of cataracts as the results are statistically significant with an Odds Ratio of 1.06% and a 95% CI of 1.05 - 1.07, P value .00 (in both eyes). When comparing presbyopia with a cataract in either the right or left eye the result was an Odds Ratio of 0.09 with a 95% CI of 0.01-0.67, P value .00. (Presbyopia is farsightedness of old age due to the loss of elasticity and ability to bulge of the lenses (36).)

In the data from the Fundación Oftalmológica del Valle, upon comparing gender with cataract in both eyes the result was that males with 7.4% were significantly more likely to have bilateral cataracts than females with 3.8% (Odds Ratio 1.9; 95% CI of 1.05-1.07, P value 0.00). When compared with cataracts in either eye the males at 7.1% were still more likely to have a cataract as compared to women at 3.9% (Odds Ratio =1.89; 95% CI of 1.16-3.08; P value 0.00). By contrast in the case series reports when comparing gender with cataracts in both eyes, men had only 14.3% likelihood as compared to women with 33.8% of cataracts in both eyes. This was statistically significant with an Odd Ratio of 3.07 and a 95% CI of

1.38-6.82; P value 0.00. When comparing gender with cataracts in either eye men still had less likelihood than women but this was not of statistical significance.

**Table 2 Association of cataract and variables**

<b>Description</b>	<b>Odds Ratio</b>	<b>95% IC</b>
Age 50 or less; >50 by cataract in either right or left eye	0.03*	0.01-0.11
Age 50 or less; >50 by cataract in both eyes	0.04*	0.01 -0.13
Age less than 60; 60 and older by Cataract in either right or left eye	0.06*	0.03-0.13
Age less than 60; 60 and older by cataract in both eyes	0.05*	0.02-0.10
Complaints by cataract in both eyes	0.34	0.05-2.47
Complaints by cataract in both either right or left eye	0.70	0.17-2.92
Glaucoma/diabetes by cataract in both eyes	1.63	0.21-12.70
Glaucoma/diabetes by cataract in either right or left eye	1.63	0.21-12.70
Pterigium by cataract in both eyes	0.14*	0.04-0.45
Pterigium by cataract in either right or left eye	0.19*	0.07-0.53
Gender by cataract both eyes	2.01*	1.24-3.28
Gender by cataract in either right or left eye	1.89*	1.16-3.08
Presbyopia by cataract in both eyes	1.06*	1.05-1.07
Presbyopia by cataract in either right or left eye	0.09*	0.01-0.67
Conjunctivitis/blefaritis by cataract in both eyes	1.05	1.04-1.07
Conjunctivitis/blefartits by cataract in either right or left eye	0.50	0.07-3.73

\*Value statistically significant.

To further investigate the initial results of the association of Pterigium and presbyopia with cataracts, another analysis was run. In a logistic regression model using the Enter method, cataracts in both eyes was used as the dependent variable. The independent variables used were those which were significant in the bi-variate analysis such as Pterigium, gender, age and presbyopia. The variables, which were significant in this test, were age and Pterigium while gender and presbyopia were not significant as shown in the following table.

**Table 3 Logistic Regression Analysis of Cataracts and sociodemographic and other eye pathologies**

Variable	R	Exp B	Sig. (P value)
Gender	0.0000	1.3891	0.2320
PT	-0.0957	0.1987	0.0080
Age	-0.4066	0.2062	0.0000
Presbyopia	0.0000	0.0011	0.5453

The survey of Barriers to Cataract Surgery was administered to 148 Quichuas from different areas of Ecuador.

The mean for years of education of these 148 people surveyed was 7.88 years with a Standard deviation of  $\pm 3.27$ .

Table 4 Socioeconomic Indicators from first survey

Description	Category	%
Type of dwelling (n=140)	Block	49.3%
	Brick	14.3%
	Adobe	10.0%
	Cement	10.0%
	Block & cement	7.1%
	Wood	2.9%
	Other	2.9%
	Carton	1.4%
Floor of dwelling (n=146)	Dirt	45.2%
	Cement	42.5%
	Wood	11.0%
	Other	1.4%
Rooms to sleep in (n= 145)	Two	33.1%
	One	31.0%
	Three	22.8%
	Four	11.0%
	Five	1.4%
	Six	0.7%
Animals inside house (n= 139)	No	54.7%
	Yes	45.3%
Type of employment (n=142)	Agriculture	30.4%
	Commerce	28.4%
	Pastor of a church	8.1%
	Housewife	8.1%
	Handyman	4.7%
	Professor	3.4%
	Student	2.7%
	Bricklayer	1.4%
Income per week (n=89)	\$0-10	25.8%
	\$11-20	25.8%
	\$21-30	15.7%
	\$31-40	13.5%
	\$41-50	6.7%
	More than \$80	6.7%
	\$51-60	3.4%
	\$61-70	2.2%

The following table provides some information as to the knowledge that those surveyed have with regards to what a cataract is, the treatment of a cataract, and family members who may have a cataract.

**Table 5 Knowledge of a cataract and treatment**

Description	Category	%
Location (n=134)	Inside the eyeball	72.4%
	Outside the eyeball	27.6%
Treatment (n=135)	Surgery	50.4%
	Medicines	29.6%
	Herbal water	8.1%
	Medicine & surgery	7.4%
	Medicine & herbal water	2.2%
	Witch doctor	0.7%
Knowledge of someone with a cataract (n=137)	Yes	53.3%
	No	46.7%
Relation to person answering survey (n=73)	Mother	20.5%
	Other (not on list)	12.3%
	Friend (male)	9.6%
	Father	9.6%
	Grandmother	6.8%
	Brother	5.5%
	Friend (female)	5.5%
	Sister	4.1%
	Son	4.1%
	Cousin (female)	4.1%
	Uncle	2.7%
	Aunt	2.7%
	Daughter	2.7%
	Cousin (male)	2.7%
Father-in-law	2.7%	
Mother-in-law	2.7%	
Received treatment (n=83)	No	78.3%
	Yes	21.7%

The majority, 46.6% of 140 valid cases, responded as living in a block house. Those who lived in brick houses were in second place with 13.9% and adobe houses took third place with 9.5%. An interesting variable that goes along with this one is what the floor of the house is made of. The majority (n=146) had a floor of dirt, 45.2%, followed closely by those who had a floor of cement, 42.5%. Those who have two rooms to sleep in comprised 33.1% followed by those who had one room to sleep in at 31.0% of 98 valid cases. The majority of the 142 who answered the question if they owned or rented their house, owned their home (88.7%) as compared to only 11.3 % who rent their living quarters. Of the 139 who answered the question

if they kept animals inside their home, 54.7% said they did not and 45.3% said that they did. In response to the question as to what kind of work that they did, 30.4% were involved in agriculture while 28.4% were involved in commerce. The rest responded as being pastors of churches (8.1%) housewives (7.4%) general laborers (4.7) teachers (3.4%) and other professions such as students, carpenters, chauffeurs and artisans (n=148). Those who stated more than one type of employment indicated that of a pastor (in a church) and agriculture. The average incomes per week were the ranges of \$0-10 and \$11-20. These two ranges represent 25.8% of the 89 valid cases. This is followed by the second place range of income per week, that of \$21-30, which represents 15.7% of the 89 valid cases. The figures obtained can be analyzed to help indicate and establish the socioeconomic level of those surveyed.

Then frequencies were run on variables which had to do with the specific information the study was looking for. The majority of subjects (72.4%) said that a cataract was inside the eye as opposed to 27.6% saying that it was outside the eye. When asked what treatment that they thought was appropriate for treating a cataract, of the 135 valid cases on this question, 50.4% responded that surgery was the treatment for a cataract. Of the 137 who responded to whether or not they knew someone who had a cataract, 46.7% said that they did. The next question asked what relation this person was to the one answering the survey and 20.5% of the 73 who answered this question, responded as it being their mother followed by someone else not on the list (other) with 12.3% and then father and friend both with 9.6%. For those that answered with a second relative, this was a sister with 23.5% of 17 valid cases.

The majority (78.3%) of the 83 who responded to this question said that the relative had not received treatment. This led into the questions on the Barriers to cataract surgeries.

**Table 6 Frequency of Perceived barriers to cataract surgeries**

<b>Barrier</b>	<b>Category</b>	<b>%</b>
Cost	Yes (n=70)	86.4%
	No (n=11)	13.6%
Does not know of place of treatment	Yes (n=16)	20.0%
	No (n=65)	80.0%
Fear of surgery	Yes (n=6)	7.4%
	No (n=75)	92.6%
No one to accompany	Yes (n=5)	6.2%
	No (n=76)	93.8%
Language	Yes (n=4)	4.9%
	No (n=77)	95.1%
Fear of hospital	Yes (n=2)	2.5%
	No (n=79)	97.5%
Distance	Yes (n=2)	2.5%
	No (n=79)	97.5%
Fear of doctors	Yes (n=2)	2.5%
	No (n=79)	97.5%

\*Total n=81; More than one answer was allowed

The barrier that had the highest “yes” response was that of cost. Out of 81 who answered this question 86.4% said that cost was a barrier to cataract surgery. It is interesting to note that the average age of those who said the cost was a barrier to surgery was 32.91 years of age while those who said that it was not a barrier were of 29.30 average age.

The other barrier that ranked high with a “yes” response was that of “not knowing of a place of treatment” with 20% of the 81 valid cases. Here the average age of those who responded “yes” to this barrier were 37.75 years old while those who responded “no” were 31.14 years old. The third ranking barrier was fear of surgery with 7.4% with the average age of those responding “yes” being 36.0 years

old and those responding “no” being 32.0 years old. In fourth place was the barrier of no one to accompany them with 6.2% and the average age of those responding “yes” being 33.6 years old and those responding “no” being 32.39 years old.

**Table 7 Association between age and barriers to cataract surgery**

Barrier compared with age	Mean age “yes”	Mean age “no”	P value
Cost	32.91 ± 9.97 (n=70)	29.30 ± 9.74 (n=10)	0.29
No one to accompany	33.60 ± 7.02 (n=5)	32.39 ± 10.15 (n=75)	0.80
Language	34.75 ± 10.47 (n=4)	32.34 ± 9.98 (n=76)	0.64
Fear of hospitals	26.50 ± 4.950 (n=2)	32.62 ± 10.02 (n=78)	0.39
Fear of surgery	36.00 ± 11.40 (n=5)	32.23 ± 9.891	0.42
Distance	38.50 ± 6.36 (n=2)	32.31 ± 10.01 (n=78)	0.39
Fear of doctors	26.00 ± 4.24 (n=2)	32.63 ± 10.01 (n=78)	0.36
Does not know of a place of treatment	37.75 ± 11.53 (n=16)	31.14 ± 9.15 (n=64)	0.02

\*Total n=81; More than one answer was allowed.

An interesting observation is that for all the barriers except for two, those who responded “yes” were older than those who responded “no” are. The only two exceptions are the fear of hospitals and the fear of doctors where those who responded “yes” were younger than those who responded “no” are. The other interesting thing is that the average ages of both of these barrier categories are around 26 years old where as all the other barrier categories range in the 30’s.



**Table 8 Association between age and views on blind people in the village**

<b>View of Blind person and age (<math>\pm</math> SD)</b>	<b>Mean age "yes"</b>	<b>Mean age "no"</b>	<b>P value</b>
Cause me sorrow/ Sadness	29.76 $\pm$ 8.82 (n=67)	31.82 $\pm$ 10.09 (n=73)	0.20
Concerns me	30.74 $\pm$ 9.80 (n=65)	30.92 $\pm$ 9.35 (n=75)	0.91
Punishment	37.80 $\pm$ 17.80 (n=5)	30.58 $\pm$ 9.10 (n=135)	0.10
Desire to help	31.52 $\pm$ 9.16 (n=52)	30.43 $\pm$ 9.77 (n=88)	0.52
Contagious	29.67 $\pm$ 14.364 (n=3)	30.86 $\pm$ 9.47 (n=137)	0.83
Sin	30.33 $\pm$ 14.012 (n=3)	30.85 $\pm$ 9.48 (n=137)	0.93

It is interesting to note the average age associated with the different perceptions that these people, who responded to this question on the survey, have of a blind person in their village. Although none of these reached statistical significance it is useful information to consider when searching for barriers to cataract surgery, as a Highland Quichua's perception of a blind person could play into his/her decisions regarding cataract surgery.

The result of the surveys applied to the Highland Quichua Indians who were found to have cataracts during the vision exams conducted in the villages follow (case series reports).

Table 9 Social economic status of cataract patients

Variable	Category	%
Education (total n=44)	0 years (n=42)	95.5%
	5 years (n=1)	2.3%
	6 years (n=1)	2.3%
Gender (total n=44)	Male (n=17)	38.6%
	Female (n=27)	61.4%
# Of persons living with patient (total n=44)	3 (n=15)	34.1%
	2 (n=9)	20.5%
	1 (n=4)	9.1%
	4 (n=4)	9.1%
	5 (n=3)	6.8%
	7 (n=3)	6.8%
	8 (n=3)	6.8%
	6 (n=2)	4.5%
12 (n=1)	2.3%	
Type of living quarters (total n=44)	Block (n=29)	65.9%
	Adobe (n=13)	29.5%
	Brick (n=1)	2.3%
	Cement (n=1)	2.3%
Animals in house	Yes (n=17)	38.6%
	No (n=27)	61.4%
Floor of house (total n=44)	Dirt (n=26)	59.1%
	Cement (n=10)	22.7%
	Wood (n=8)	18.2%
# Of sleeping rooms (total n=44)	One (n=30)	68.2%
	Two (n=9)	20.5%
	Four (n=3)	6.8%
	Three (n=2)	4.5%
Health insurance (total n=44)	Yes (n=4)	9.1%
	No (n=40)	90.9%
Type of insurance (total n=4)	Seguro campesino (n=4)	9.1%
Work (total n=44)	Yes (n=44)	100%
	No (n=0)	0%
Type of work (total n=44)	Agriculture	95.5%
	Commerce	2.3%
	Housework	2.3%
Income weekly (total n=43)	\$0-10 (n=41)	93.2%
	\$41-50 (n=2)	4.5%

The majority (95.5%) of these cataract patients has very little classroom education but all of them said that they work. The majority (95.5%) works in agriculture no matter what their age. Their ages ranged from 40 years old to 85 years old. Women made up the majority of the patients that were examined and found to have cataracts (n = 27 women 61.4% to n = 17 men 38.6%). The average weekly income for these people is between \$0-10 dollars (93.2%). Block (65.9%) and adobe (29.5%) houses were the most common types of houses that these patients lived in but dirt floors were the most common types of floor (59.1%) in their houses. The majority had two (20.5%) to three (34.1%) others living with them but most only had one room (68.2%) for sleeping in. There were only 36.6% of the people who had animals living in the house with them as compared to 61.4% who did not.

**Table 10 Time frame of knowledge of cataract**

<b>Description</b>	<b>Frequency</b>	<b>%</b>
Did not know	35	81.4%
Since 7 months to one year	1	2.3%
More than 1 year	7	16.3%

\*Total n = 43

Table 10 indicates that the majority (81.4%) did not know that they had a cataract prior to this vision exam. The next question was to find out who had diagnosed their cataract and in which eye it had been diagnosed.

**Table 11 Who diagnosed the cataract and in which eye**

Description	Frequency	%
Doctor	2	4.7%
Ophthalmologist	5	11.6%
Other	36	83.7%
(Total n =43)		
Right eye	5	11.4%
Left eye	8	18.2%
Both eyes	31	70.4%
(Total n = 44)		

The majority (70.4%) of the cataracts diagnosed was in both eyes. The next question was to find out if they had done any treatment for their cataracts and in which eye.

**Table 12 Treatment\* and in which eye\*\***

Description	Frequency	%
Treatment -Yes	7	16.3%
Treatment -No	36	83.7%
Right eye	1	16.7%
Left eye	4	66.7%
Both eyes	1	16.7%

\*Total n = 43 subjects

\*\*Total n = 6 subjects

The majority had not done treatment but there were seven patients who knew they had a cataract and who responded as having done some kind of treatment. The following table shows the various barriers to cataract surgery in these patients diagnosed with cataracts.

**Table 13 Barriers to Cataract Surgeries in Cataract Patients**

<b>Barrier</b>	<b>Frequency*</b>	<b>%</b>
Cost	Yes (n=38)	95.0%
	No (n=2)	5.0%
Fear of surgery	Yes (n=16)	40.0%
	No (n=24)	60.0%
Language	Yes (n=9)	22.5%
	No (n=31)	77.5%
No one to accompany	Yes (n=6)	15.0%
	No (n=34)	85.0%
Fear of doctors	Yes (n=6)	15.0%
	No (n=34)	85.0%
Do not know of a place of treatment	Yes (n=4)	10.0%
	No (n=36)	90.0%
Distance to care facility	Yes (n=4)	10.0%
	No (n=36)	90.0%
Fear of hospital	Yes (n=2)	5.0%
	No (n=38)	95.0%
Bad experience previously	Yes (n=1)	2.5%
	No (n=39)	97.5%

\*Total n = 40; Yes means they perceived this as a barrier for them to cataract surgery. More than one answer allowed.

## V. DISCUSSION

Some interesting comparisons emerged between the present study and the published results of previous studies. With the data obtained from 1410 cases from the Community work done by the Fundación Oftalmológica del Valle, a mean age of this population was found to be 48.4 with a standard deviation of 19.7. The minimum age was 0 years of age and the maximum age was 96 years of age. About one half (50.1%) of the patients were 50 years old or younger with the rest over 50 years of age.

It was established that the age at which the risk for cataract increases was 60 years of age. Those who were less than 60 years old had only a 0.7% prevalence of cataracts as compared to those who were 60 years and older with a 13.9% prevalence. By determining the age at which the risk increase significantly, the vision screenings were carried out for that age group with relative assurance of finding those who did have cataracts.

The other variables which were diagnosis of the patients seen in the Community work, were compared with each other to see if there were some correlation. The majority was of no statistical significance, however, there was one which achieved statistical significance. When Pterigium was correlated with the variables of cataracts in both eyes and cataract in either eye, the result was notable. In the comparison of Pterigium with cataracts in both eyes the Odds Ratio was 0.14 with a 95% CI of 0.04-0.45. In the comparison of Pterigium with cataract in either eye, the Odds Ratio was 0.19 with a 95% CI of 0.07-0.53. These findings indicate that, after adjusting for confounding factors such as age, gender and presbyopia, patients who were diagnosed with Pterigium had significantly less probability to present with cataracts in both eyes or in either eye. For those who have Pterigium, it appears as if it is a protector factor because statistically there is only a 0.15% chance

that they will develop a cataract in both eyes. Also for those who have Pterijium there is only a 0.19% chance that they will develop a cataract in either the right or left eye as compared to those that do not have Pterigium.

Another important piece of information that was obtained from the data analysis of the Community work from the Fundación Oftalmológica del Valle were those regarding gender and the presence of cataracts in both eyes or either eye. In the comparison of gender with cataracts in both eyes, men had 7.4% prevalence and women had only 3.8% prevalence. (OR = 2.01 95% CI 1.24-3.28) In comparing gender with a cataract in either eye, men had 7.1% prevalence as compared to only 3.9% prevalence for women. (OR = 1.89 95% CI 1.16-3.08) In the comparison of gender with cataract in both eyes, men again had a greater prevalence (7.4%) as compared to women (3.8%). According to the results obtained from this data, men have more risk of developing cataracts. This can be contrasted with the information from the cataract surveys (the case series reports) which found when comparing gender with cataracts in both eyes, men had only 14.3% likelihood as compared to women with 33.8% of cataracts in both eyes. This was statistically significant with an Odd Ratio of 3.07 and a 95% CI of 1.38-6.82; P value 0.00. When comparing gender with cataracts in either eye men still had less likelihood than women but this was not of statistical significance. A possible explanation could be the factors such as nutrition (10, 16), exposure to sunlight (UV) (17) and type of work (10). (Lack of adequate nutrition and bouts of diarrhea from parasites could also play a role in the formation of cataracts, but studies would need to be done to see if the Highland Quichua Indian women are more at risk in this area.) It may be that Highland Quichua Indian women in the remote villages are toiling out in the sun more, than the women who attended and were examined in the Community Work outings of the



Fundación Oftalmológica del Valle. Another factor could be that these Indian villages are usually at a higher elevation than those of where the data from the Fundación Oftalmológica del Valle did their screenings and the UV rays may be more intense there. Also, one must consider that the Highland Quichua Indian woman has traditionally been the one who carried the greater load of work as compared to those women who live closer to cities where ideas are changing, placing more value on women. This would mean that those women living closer to larger towns might have to work less out in the sun, leaving it more up to the men.

All of this data were accessed in order to obtain the prevalence of cataracts in this population and the age at which doing cataract vision screenings would be most effective. The prevalence of cataract in the population of patients seen in the Community work of the Fundación Oftalmológica del Valle in both eyes is 4.96% and in either eye the prevalence resulted as 4.89%. The data from this population was comprised of 1410 people from the ages of 0 years to 96 years old, both male and female with 1390 valid cases. This population was comprised mostly of people who reside in a rural setting and many were from indigenous communities as well. This prevalence seemed high when compared with the figures for Latin America which is 0.50% according to Dandona and Dandona in their article, *Socioeconomic status and blindness* (23). However in the article, *Cataract blindness and barriers to uptake of cataract surgery in a community of northern Nigeria* (26) the author describes a population based cross sectional survey study. In this study a total of 1461 subjects were examined and in the sampled population, the prevalence of bilateral cataract blindness was found to be 3.6% (95% CI 2.5%-5%) (26). Although “senile cataract appears to have earlier onset in certain areas in Africa than in other parts of the world (with incidence becoming significant in the 40-50-year age group)

a recent report from Asia indicated that in a certain population group in Nepal, cataracts apparently start at about 35 years of age. In one region of India, with a total cataract prevalence of 4.3% for all ages, a prevalence rate of 1% was revealed for the 30-49-year age group and increased markedly to 67% for ages 70 and older”(14). The prevalence in cross-sectional studies in people between the ages of 65 –74 is 50% and increases to 70% in people over the age of 75 (11).

In the present study, the results indicated a prevalence rate of 13.9% for those 60 years and older. According to the American Academy of Ophthalmology, the prevalence in cross-sectional studies in people between the ages of 65 –74 is 50% and increases to 70% in people over the age of 75 (11). Based on this information, re-coding was done for the data in this study to see if the same results would be obtained. The results of this study differed somewhat with the previously mentioned results. The 1390 valid cases re-codified into three age groups, <65 age group, 65-74 age group, and >74 age group for those with cataracts in both eyes. The <65 age group showed a 1.1% prevalence rate, the 65-74 age group a 11% prevalence rate, and >74 age group a 27.7% prevalence rate for cataracts in both eyes. For those with cataracts in either eye, this study found that there was a 1.8% prevalence in the <65 age group, 12.4% prevalence in the 65-74 age group, and a 18.5% prevalence in the >74 age group. By comparison this study found a lower prevalence in the age specific age groups but a higher prevalence for the overall population. This could be due to the age distribution of the population.

Based on these results, the vision screening was targeted for all adults, 60 years of age and older. The village leader with whom prior arrangements had been made, had called all the members of the community, 60 years and older, to a mandatory meeting. It was at this meeting that the vision screening was done. There

were a total of one hundred forty four patients screened and out of those, forty-four were diagnosed with either unilateral or bilateral cataracts. A survey was then administered to these people. The goal of this survey was to determine the barriers as to why the person had not had cataract surgery. The survey also provided data as to the socioeconomic status of the person.

One of the things that must be discussed and analyzed is the basic living conditions and education of the people that were studied. It became obvious that the economic level is closely related to seeking out cataract surgery for those who need it. Following are some interesting results that were obtained from these surveys. Only two out of the forty-four who were diagnosed with cataracts had any formal school education. One of these two had five years of education and the other had six years of education. The lack of formal education can limit a person, especially a Highland Quichua Indian, in obtaining the necessary health care that he or she may need. There is a lack of information available to this person due to the limitation of being able to read and write and search out health options. Those who have had less formal educational opportunities usually also have fewer sources of information as well as the abilities to reason through options that may be available. A disadvantage to not having had the opportunity for formal education is a limited world-view and the hesitance to leave one's known territory to try something new.

Another aspect of living conditions is the number of people living in each dwelling. The majority (72.7%) of these people had between 1-4 others living with them. The more people that live in a household, the more expenses there are and the more the financial resources have to be split up in various directions. In the case of only one person living there, if this person is elderly with cataracts, then if they were to have cataract surgery there would be no one to accompany them to the surgery nor

care for them or their animals and fields after the surgery. Most of them lived in a block home (65.9%) but a fair number of them lived in an adobe home (29.5%). Even though they lived in block home, over half (59.1%) had dirt floors although some did have cement (22.7%) and wood (18.2%) as well. Their houses most likely do not contain bathroom facilities which would make recovery from cataract surgery more difficult as the cataract patient is not to bend over for the first month after surgery and an outhouse or the field would most likely require this position. Most (68.2%) had only one room for sleeping although 20.5% did have two rooms for sleeping.

The lack of medical insurance can also play a part in decisions regarding seeking medical treatment and surgery. Only four out of the forty-four diagnosed with cataracts had any type of medical insurance, but all of them (100%) worked. Without medical insurance the possibility surgery is reduced greatly as all of the responsibility of the cost for surgery falls on the individual. This is very different in countries such as the United States where many have insurance and the insurance covers cataract surgery. Thus in North America the rate of blindness due to cataract is very low as the patients with cataracts usually have surgery long before the cataract causes blindness. "Data from another study in US based Hispanics suggested that economic barriers, such as no insurance, were barriers to having cataract surgery. The estimated cataract surgery rate per million population per year is fivefold higher in North America compared to the rest of the Americas" (24). Those who do have medical insurance had Seguro Campesino (Rural Worker Insurance). Supposedly cataract surgeries are covered by this medical insurance but usually one has to have connections in order to actually acquire the surgery. Then

there is the whole issue of discrimination against the indigenous people and the way they have been and continue to be treated by those who are not indigenous.

Another major issue is that of language. The majority of these elderly Highland Quichua Indians speak very little to no Spanish and would have great difficulty communicating in such a setting. If those who have had the opportunity to acquire an education find it difficult at times to understand medical terminology, how much more difficult it would be for these elderly Highland Quichua Indians with little or no formal education to grasp the concepts of the surgery in that setting in particular. A possible solution is for public health workers who speak the Quichua language and understand the Quichua culture to do the vision screenings with the participation of the community and its leaders. They could explain what a cataract is and what the surgery consists of. Then with the participation of community members accompanying the patient, along with the public health worker, the patient could be taken to a reliable eye care unit. The public health worker and the community member would be present at the appointments and the community member would be instructed in the post-operative care. The community member would also be responsible to see that the patient's fields and animals were taken care of. Community involvement would be crucial to the successful outcome of the elderly Highland Quichua Indian's cataract surgery since the majority (95.5%) reported as working in agriculture with only two reporting other types of work.

The costs associated with cataract surgery must be taken into consideration. Since the majority (93.2%) reported as earning \$0-10 dollar per week, the cost of cataract surgery would require a great economic sacrifice. Suppose they earn \$10 a week, that would be \$520 for the year. If a cataract surgery costs between \$120 - \$220 in a eye care foundation (\$1,000-1,500 in private eye care practices), that

would leave the patient with only \$400 –or \$300 to live on for that year. The other important factor is that most of these cataract patients do not receive their income on a weekly basis, rather on a seasonal basis such as after harvest or when an adult child returns from working in the city (21). The social economic profile of these patients suggests that they are poor with very little monetary and educational resources.

For most of the patients seen in these vision screenings, this was the first time they had ever had their eyes checked. Many did not even know that there was such a thing as a doctor for the eyes or that they could not really see well. A few, even after having received the explanation of what the Snellen chart was did not understand how to cooperate in the vision exam. Of the forty-four diagnosed with cataracts, thirty-five (79.5%) of these people did not know that they had a cataract. However, it is interesting to note that eight people knew that they had a cataract, and that they still had their cataract for whatever reason. One person (2.3%) of these eight knew of their cataract for more than seven months, one person did not respond to the question, and seven had known of their cataract for more than one year (15.9%). Seven, who had knowledge of their cataract, had received some kind of treatment but the rest had not received treatment or did not respond to the question. This could possibly be due to the fact that probably the treatment was not effective. However only six of these seven who responded as having done some kind of treatment, answered the question about which eye they had had treated. This led into the question of why they had not had their cataract treated. Here they were to choose a reason why they had not pursued treatment for their cataract.

When asked why they had not done treatment, they responded stating the reasons or barriers for them to cataract surgery. The major barrier that this study found was that of cost. Thirty-eight (95%) of the forty who responded to this

question choose it as a reason or barrier to why they had not had cataract surgery. When the results of the average weekly income of these people is reviewed and compared to the cost of cataract surgeries, it stands to reason that cost is a major barrier for these Highland Quichuas to receive cataract surgery. The fact that the majority of these patients gain their livelihood from agriculture means that they do not have a constant flow of cash. They may be able to save up for it. Vannesete (21) says in his booklet that the barrier of cost is definitely one that must be considered. People in the villages whose livelihood is based on agriculture may not have the dollars for cataract surgery at just any time of the year but they may have it at certain other times, such as after harvest. The barrier of cost has several facets. There is the actual cost of the surgery and medications required afterwards, but this is just a part of the total cost that will be borne by the cataract patient. In order to help reduce individual costs, some eye care facilities create an all inclusive surgery fee or a type of package deal. This is the cost of the surgery, the medications required during the month following and the first post-surgery appointment. It also eliminates concern on the part of the patient the uncertainty as to bribes and reduces corruption in the eye care unit (22). The cataract patient must also consider the cost of transportation to and from the eye-care entity. The Director of Community work for Fundación Oftalmológica del Valle affirms that the costs are more involved than just the actual cost of the surgery (22).

Four of the forty cataract patients who answered the survey did not know of a place to receive treatment, which was a barrier to their receiving treatment. The mean age of these four people was 75.5 years of age with a standard deviation of  $\pm 10.847$ . This lack of information has been supported in two works reviewed by this study. Vameste in his booklet, *Breaking Down Barriers* (21), states that one barrier

on the side of the community at large which affects these older people is an informational barrier. Many of the younger generation have left for the towns and cities leaving a poor and aging generation in the rural areas. This means that the information on available services filters into the rural areas very slowly. This is compounded by the fact that the majority of these cataract patients did not have formal education which becomes a barrier to gaining the information.

The other work reviewed was that of the Director of Community Work for the Fundación Oftalmológica del Valle. In this presentation, "Why don't people go to the Ocular Services? (¿Por qué no acude la gente a los Servicios Oculares?) she states that one of the barriers is lack of information, especially to the family of the cataract patient. They do not know what a cataract is, how to practice early prevention, how to prevent going blind, where to go to get medical help for their cataract nor how much it will cost them (22).

Another barrier or reason why six of these patients have not had cataract surgery is because they have no one to accompany him or her. Vanneste (21) states that this implies that someone has to accompany the patient who will help with the care of the patient after the surgery. The necessity of an escort/caretaker increases the cost because this person needs transport, accommodations and food, not to mention the loss of wages if this person is employed and takes time off from his work to accompany the patient. Director of Community work at the foundation points out that this involves cost, not only as in money for the round trip, food and lodging for two, but also time lost for the one accompanying the patient from their employment (22). It also involves confidence. The patient has to have a relationship of confidence with the escort/caregiver as this person will have to help them with their personal needs such as bathing, dressing and using the bathroom. If the elderly



patient lives alone, then who will do this for them? Also in the rural areas this implies the need for someone to care for their animals and fields and house while they go to have the surgery as well as during the recovery time following the surgery. The escort/caregiver needs to accompany them on several occasions, such as preliminary appointment, surgery, and follow-up appointments. This becomes a formidable barrier to the elderly patient living alone, trying to survive on their little plot of land with a few animals. There is also the fear of losing the little eyesight, and independence that it gives them, which they still, have (22). Vanneste states that cataract blindness is usually a very slow process and takes years before the person gets "functionally" blind. The rural patient, due to the very slow deterioration of vision, can continue with most daily activities, even when functionally blind. If the patient is a woman, many times she can still fetch water, prepare food, take care of children, and feed the animals. If the patient is male, due to his age he can be led to a place to sit and chat with others, go to church or to community gatherings. These people may remain integrated in communal life and therefore may not appear to have a major problem (21).

Nine of the forty cataract patients, who responded, indicated that language was a barrier to them not having cataract surgery. These people have grown up in the rural highlands, speaking Quichua as their main language and using Spanish only when trading in the market. Since the majority (65.62%) of these forty-four people interviewed who had cataracts did not have a school education, they also did not have the opportunity to learn Spanish as do the younger generation. The vast majority of healthy of health facilities are staffed and run by those whose main language is Spanish therefore making it difficult for communication to take place, especially with regards to medical matter. For anyone, medical terminology can be

intimidating and in particular for the elderly who may not have the educational background to comprehend the concepts or the hearing to capture all that is said. Then compound this with the fact that the medical personnel speak a language with which the elderly patient is not fluent or even comfortable and it develops into a great barrier to medical treatment in general and to cataract surgeries in particular.

Another barrier to cataract surgeries in particular, as well as other surgeries, is the fear of hospitals. Only two of the forty who had cataracts surveyed chose this as a barrier for them to cataract surgery. This barrier can be accompanied by another similar barrier, which is a fear of surgery. According to the results of the survey administered in this study, sixteen of the forty stated that this was a barrier for them to having cataract surgery. Vanneste defines this as a fear of surgery, especially for a cataract patient who may still have the perception of light and by undergoing surgery, is putting his remaining vision at risk (21).

For the elderly cataract patient who still cares for himself, his animals, and land, giving up his remaining vision could mean giving up not only his independence but also his only means of livelihood. They see it as having everything to lose and maybe very little to gain, especially if they have heard of others who have had a bad experience or they themselves have had a bad experience with medical procedures in the past. Although in this survey only one out of the forty responded to having had a previous bad experience, as the Director of Community work at the foundation states, bad news travels twice as fast as good news in respect to surgery outcomes; bad results equals closed doors (22). Related to the barrier of having cataract surgery is the barrier of having fear of doctors. Six of those surveyed in this study cited this as a barrier for them to cataract surgery. This barrier can also have to do with the language barrier because if the elderly cataract patient does not speak the language of

the doctor or at least understand, he will have a fear of being able to relate to the doctor.

The barrier of distance was only chosen by four of the forty. This was somewhat surprising, as so many of these patients were elderly and the distance to a quality eye-care entity was great for many of them. Especially taking into consideration the factors of their background being one of where they were tied to the land for generations, with little possibility of leaving it is interesting that more of them did not choose this as a barrier. Perhaps they see the other barriers as being so great that they do not think that much of this barrier. However, when the option of traveling to the Fundación Oftalmológica del Valle in Yaruquí for eye-care was mentioned, many were hesitant, stating that they were not sure that they could travel that far. It may be that they are hoping that transportation would be provided, possibly due to fear to leave their known area and travel to an unknown area.

The results from the surveys administered to Highland Quichuas in different areas of Ecuador, confirm that cost was a perceived barrier even by those who did not have cataracts. Out of 80 who answered the survey question if they perceived cost as being a barrier to cataract surgery, 70 (87.5%) said that another barrier was not knowing of a place for treatment of cataracts. The barrier of no one to accompany the cataract patient and fear of surgery 5 (6.25%) affirmed this as a barrier. For all of the rest barriers, (fear of hospitals, distance, and fear of doctors) only 2 (2.5%) of the 80 who answered the survey said they perceived these as barriers to cataract surgery.

One of the strengths of this study is that data were obtained from the Fundación Oftalmológica del Valle with which statistics could be run. Seeing as there is a great lack of information on cataracts within Ecuador, this data was

especially pertinent to establishing prevalence rates for this population. Another strength of this study is the fact that there was access to the various Highland Quichua villages in order to find the actual cataract patients and question them regarding the reasons or barriers to having cataract surgeries. Due to the lack of trust that many Highland Quichua Indians have from years of discrimination and oppression, the information that this study was seeking can be very difficult to acquire. This caused the sample to be somewhat limited and therefore this study should be considered to be a basis for more in depth studies in the future. One of the drawbacks of this study is the small number of patients with cataracts that knew they had cataracts and did not have surgery or did have surgery. Another drawback is the lack of the existence, and availability of statistical information regarding cataracts in Ecuador.

## **VI. CONCLUSION AND RECOMMENDATIOIS**

This study has sought to discover the barriers to cataract surgery among Highland Quichuas and compare them with barriers stated in the sources researched. The majority of these sources supported the findings of this study. All of them state that cost is a major barrier to cataract surgery although not the only one responsible for the hesitance to cataract surgery.

The hypothesis of this study was, "cost is the principal barrier to cataract surgery among the Highland Quichua Indians in Ecuador", and the results have proven this to be true. Although this is the most outstanding barrier, the other barriers bare consideration as removing only one barrier without consideration of the others could still keep Highland Quichua Indians from having cataract surgery. There is a definite intertwining of the barriers with each other and the therefore all of them must be taken into consideration. Both sets of surveys revealed the average income of a Highland Quichua Indian between \$0-10 dollars or \$11-20 dollars per week. With this amount of income the cost of cataract surgery in itself is almost unaffordable and when considering including all the additional costs previously discussed, cataract surgery is out of reach of most of the elderly cataract patients.

The majority of these elderly Highland Quichua Indians live in the rural areas of the Chimborazo Province. This means that the accessibility of eye care services is limited for them, implying that they would have to travel to an eye care entity. If there were eye care units closer to where these elderly Highland Quichua Indians live, the costs could be reduced, as the cost of transport would be less. Also, they would be able to return to their own homes and not need to find housing for themselves and their escort/caretaker, which could significantly reduce costs. There will still be the need for commitment on the part of members of their villages. Their animals and fields need to be cared for while they are having surgery and upon their

return, they will need the help of community members to continue to care for their animals and fields, and also to care for them. The cataract patient who has had surgery can not get out of bed alone for the first week, bend over as in putting on their shoes or lift things for the first three weeks or so. When one considers the bathroom facilities or the lack of in the rural areas, an action such as using the restroom becomes a difficult task for the cataract patient who has had surgery. Since the majority would have latrines or use the fields, stooping or bending to go to the bathroom becomes a major problem. It is imperative that the community is involved in the decision of the elderly Highland Quichua Indian to have surgery, as they will play a major role in the success or failure of the surgical outcome. Therefore, one important recommendation would be that the community be involved in the entire process, from the vision testing to the decision for surgery to the choice of the escort/caretaker and follow up appointments. Without the support of the community members, the elderly Highland Quichua Indian cataract patient will have a tremendous struggle to take advantage of the surgery, and have a favorable outcome.

Another recommendation is the need for education with regards to eye care health. There needs to be information made available to the Highland Quichuas with regards to the need for eye care and the possibilities of not only regaining lost vision as in the case of cataract surgery but also blindness prevention. This education can be done in the communities through the health promoters or the students of the high schools in the area. The Fundación Oftalmológica del Valle has two such programs whose focus is promotion of healthy eyes through education, and prevention through vision screenings. The Foundation conducts eye care seminars for health promoters and medical personal of clinics and rural hospitals. In these seminars they educate the participants on what healthy eyes are, how to keep them healthy, and basic first

aid for eye problems. They also teach them to do vision testing. These participants then return to their areas and are equipped to teach good eye hygiene, perform first aid and refer problems to the eye care unit. Another facet of this is the training of high school students to do vision screenings in their own neighborhoods and refer patients to the eye care unit. They are thus instilling and promoting good eye care habits in these young people as well as fostering responsibility to their own communities. Another method of promotion is vision wellness eye checks that are done in grade schools. In these schools they give talks to the children, encouraging them to eat healthy for their eyes and have regular eye check ups to maintain healthy eyes. They promote prevention by sending teams from the eye care unit to communities and doing vision screenings, with the goal of the prevention of blindness by finding those who need treatment and referring them to the eye care unit. Prevention is also stressed in the talks given to those attending the seminars as well as to all the patients, stressing taking care to avoid sharp objects and foreign objects entering one's eyes as well as rubbing one's eyes when something does enter the eye. Emphasis is put on cleanliness such as washing one's hands before touching one's eyes and especially after touching a cat or the cat litter in particular. (Cats are a primary source of toxoplasmosis, which can lead to blindness especially in young children and in the unborn child if the mother is in contact with it during her pregnancy.) Prevention is encouraging people to have regular eye check ups and to avoid putting anything other than what the ophthalmologist prescribes, into one's eyes.

Since cost is one of the principle barriers to cataract surgeries, ways to lower the costs must be researched and creative financing found. Another idea would be to allow the cataract patient to begin paying for a surgery and when he has acquired



sufficient funds to pay for the surgery; he could then have the surgery. Another option could be a revolving cataract surgery fund. The cataract patient would have to come up with 75% of the cost of the surgery and the rest would be paid by the fund. However there would be the stipulation that the patient or his family would then make payments to repay the remaining 25% of the cost over a specific period of time. A third idea could be that of a matching fund. The patient would come up with 50% of the funds and non-governmental organizations and foundations could be solicited to match the remaining funds necessary for the cataract surgery. There would have to be certain criteria to meet in order to qualify for this help. It is important that the patients understand the actual cost and that it includes everything needed for the surgery as well as the medications required after the surgery. A total cost surgery is much more feasible as this will build confidence for the Highland Quichua, knowing that there will not be any hidden costs. This type of plan –all cost included cataract surgery- helps eliminates individual costs such as; registration at the hospital, ward registration, fees for surgery, bribes, post-operative drugs, and post-operative medicines, combining it all into one simple fee. It also helps to ensure that the attention administered by the staff of the eye care unit is based on ethical treatment of the patient and not with the expectation of bribes. The attention that is given must always be of the highest quality and must be given with respect. It is very important that all those who go out to the communities to do vision screenings (first level of attention) are very conscious and considerate of the culture and ways of that area. They should be very clear in the services that they are and are not providing at that time. It is important that these screenings be done in conjunction with community leaders, especially in the rural indigenous areas as the community will need to be involved long term in the care of the cataract patient. The personnel,

who provide the service on the first level, need to instill confidence in the cataract patients and their family members. When the cataract patient arrives at the eye care unit there should not be any confusion as to the date, time, and cost of the appointment as well as the care that will be provided at that time. This can help to eliminate the corruption factor many times associated with these types of help agencies. The exams that are performed at the eye care unit (second level of attention) should be done very professionally, meaning with quality and kind treatment of the patient regardless of his/her background. A thorough explanation of the treatment needed must be given so that the patient and his family can understand it. In many cases, the eye care unit can perform the cataract surgery and hospitalization is not needed. However, in some cases hospitalization would be needed and the patient would be referred to a hospital (third level of attention). In every level of attention, the goal must be competent medical care combined with considerate treatment of all patients regardless of race, gender, religion or socioeconomic level.

Whatever approach to eliminate the cost barrier that is used, it will be very important that the community and especially the community leaders are involved. The Highland Quichuas are a communal people and one must work within their system in order to obtain the results desired, that of the elderly regaining their vision through cataract surgeries. There must be care given to not degrade their beliefs with regards to illnesses and vision problems while at the same time providing them with the information that they need to make a wise decision. The rehabilitation of the elderly Highland Quichua Indian cataract patient is largely dependent on the involvement of the community. Rehabilitation will entail the community members caring for the cataract patient during recovery and adding them to return to a

productive life within the community. This would mean that the community members need to be responsible for not only the care of the patient and his fields and animals, but also to reintegrate them into communal life. The elderly Highland Quichua Indian cataract patient may have been on the sidelines of the community so to speak due to their vision loss. Part of the rehabilitation would involve getting them active in the community activities and respecting their input again.

There are many suffering needlessly from blindness due to cataracts. This study has sought to research the barriers to this needless blindness. It has pointed out the anthropological background of the Highland Quichua Indians as well as researched their reasons for not having cataract surgery. The present study has also provided a prevalence rate of 4.96% for cataracts in both eyes and 4.89% for cataracts in either eye. The prevalence rate, identified by this study, of cataracts for those younger than 60 years of age was 0.7% and for those 60 years of age and older it was 13.9%. This study has also identified some of many elderly Highland Quichua Indians who need cataract surgeries and the various barriers, which keep them from realizing those surgeries. It would be a priority to perform intervention studies to assess the efficacy of different strategies to overcome the different barriers, putting special emphasis on the cost barrier.

## VII. APPENDIXES

## Appendix 1

Código: Code

Columna 1:	cat. ou	Catarata en ambos ojos – Cataracts in both eyes
Columna 2:	catodoi the	Catarata en ojo derecho o ojo izquierdo – Cataract in right eye or left eye
Columna 3:	gladiab	Glaucoma o diabetes – Glaucoma or diabetes
Columna 4:	PT	Pterijium/penguincula - Pterijium
Columna 5:	conblef conjunctivitis	conjuntivitis alérgica o blefaritis – Allergic or blefiritis
Columna 6:	corn	Cornea, lecema o trauma – Corneal problems or trauma
Columna 7:	irreg	Irregularidades: estravismo, ectropia, entropia – Irregularities of the eyes like estravism, ectropia, entropia
Columna 8:	pres	Presbicia - Presbyopia
Columna 9:	molestia de stinging,	ardor, comezón, picazón, basura, sensible al sol, dolor cabeza – Complaints such as burning, itching,  Feeling of something foreign in the eye, sensitivity to sunlight, headache
Columna 10:	daorvl	dacrocititis/orzuelo/vía lagrimal – Dacrocititis, orzuelo, tear duct problems

## Appendix 2

## Encuesta de Cataratas

1. Nombre \_\_\_\_\_
2. Edad \_\_\_\_\_
3. Genero: Hombre                        Mujer
4. ¿Cuál es el último año de educación que usted ha cumplido?
 

Primaria:	1	2	3	4	5	6
Secundaria:	1	2	3	4	5	6
Universidad:	1	2	3	4		

 Otro \_\_\_\_\_
5. Número de personas en la familia que viven en la casa con usted: \_\_\_\_\_
6. ¿En qué tipo de vivienda vive usted?
 

<input type="checkbox"/> Adobe	<input type="checkbox"/> Bloque	<input type="checkbox"/> Cartón	<input type="checkbox"/> Madera
<input type="checkbox"/> Ladrillo	<input type="checkbox"/> Cemento	<input type="checkbox"/> Latón	
7. Su vivienda es: Propia                       Arrendada
8. ¿Tiene usted animales dentro de su casa? (excluyendo perros y gatos)
 

Si <input type="checkbox"/>	No <input type="checkbox"/>
-----------------------------	-----------------------------
9. ¿De qué está hecho el piso de su casa?
 

Cemento <input type="checkbox"/>	Madera <input type="checkbox"/>	Tierra <input type="checkbox"/>
----------------------------------	---------------------------------	---------------------------------
10. Número de cuartos para dormir: \_\_\_\_\_
11. ¿De cual comunidad es usted? \_\_\_\_\_
12. ¿Dónde vive usted ahora? \_\_\_\_\_  
\_\_\_\_\_
13. ¿Hace cuanto tiempo vive en su comunidad actual? \_\_\_\_\_
14. ¿Tiene usted seguro de salud? Si                       No
15. ¿Qué tipo de seguro de salud tiene usted? \_\_\_\_\_  
\_\_\_\_\_
16. ¿Trabaja usted? Si  No
17. ¿En que trabaja usted? \_\_\_\_\_  
\_\_\_\_\_
18. ¿Cuánto gana por semana?
 

<input type="checkbox"/> \$0-10	<input type="checkbox"/> \$11-20	<input type="checkbox"/> \$21-30	<input type="checkbox"/> \$31-40	<input type="checkbox"/> \$41-50	<input type="checkbox"/> \$51-60	<input type="checkbox"/> \$61-70
<input type="checkbox"/> \$71-80	<input type="checkbox"/> más que \$80					
- ¿Qué es una catarata?
 

<input type="checkbox"/> Nube dentro del ojo	<input type="checkbox"/> Nube fuera del ojo
--	---
19. ¿Cuál es el tratamiento para una catarata?
 

<input type="checkbox"/> Medicamentos	<input type="checkbox"/> Agua de hierbas
<input type="checkbox"/> Cirugía	<input type="checkbox"/> Curandero
<input type="checkbox"/> Tener parchado el ojo	<input type="checkbox"/> Nada
20. ¿Conoce usted a alguien que tiene una catarata?
 

Si <input type="checkbox"/>	No <input type="checkbox"/>
-----------------------------	-----------------------------

21. ¿Qué relación tiene con usted?

Papá	Hermano	Hijo	Amigo
Mamá	Hermana	Hija	Amiga
Abuelo	Tío	Primo	Suegro
Abuela	Tía	Prima	Suegra
Otro	_____		

22. ¿Sabe si esa persona recibió tratamiento?

Sí  No

23. Si no ha hecho el tratamiento para su catarata, ¿por qué no ha hecho el tratamiento?

<input type="checkbox"/> Costo	<input type="checkbox"/> Miedo de cirugía
<input type="checkbox"/> Nadie para acompañarles	<input type="checkbox"/> Demasiado lejos
<input type="checkbox"/> Idioma	<input type="checkbox"/> Miedo de médicos
<input type="checkbox"/> Miedo de quedarme en el hospital	<input type="checkbox"/> No conoce un buen cito para tratamiento
<input type="checkbox"/> Otro	_____

24. Si le hicieron tratamiento, ¿quien lo hizo el tratamiento de la catarata?

<input type="checkbox"/> Médico	<input type="checkbox"/> Oftalmólogo
<input type="checkbox"/> Enfermera	<input type="checkbox"/> Promotor de salud
<input type="checkbox"/> Otro	_____

25. ¿Qué tipo de tratamiento hizo para su catarata?

<input type="checkbox"/> Medicamentos	<input type="checkbox"/> Agua de hierbas
<input type="checkbox"/> Cirugía	<input type="checkbox"/> Curandero
<input type="checkbox"/> Tener parchado el ojo	<input type="checkbox"/> Nada

26. ¿Mejoró después del tratamiento?

Sí  No

27. Si ha hizo tratamiento ¿cuanto costo el tratamiento?

\$50 - \$100  \$101 - \$120  \$121 - 150  más que \$151

28. ¿Ayudó usted con el costo del tratamiento?

Sí  No  ¿por qué?

\_\_\_\_\_

\_\_\_\_\_

29. Si algún miembro de su familia tuviese una catarata ¿le ayudaría con el tratamiento?

Sí  No  ¿por qué?

\_\_\_\_\_

30. ¿Que opinión tiene usted de una persona ciega o con pobre visión en la comunidad?

<input type="checkbox"/> Me da pena	<input type="checkbox"/> Es un castigo de Dios	<input type="checkbox"/> Es contagioso
<input type="checkbox"/> Me preocupa	<input type="checkbox"/> Quiero ayudarle	<input type="checkbox"/> Es por pecado

Otro  \_\_\_\_\_

## Appendix 3

## Encuesta de Cataratas para Personas con Cataratas

1. Nombre \_\_\_\_\_
2. Edad \_\_\_\_\_
3. Genero: Hombre  Mujer
4. ¿Cuál es el último año de educación que usted ha cumplido?  
 Primaria: 1 2 3 4 5 6  
 Secundaria: 1 2 3 4 5 6  
 Universidad: 1 2 3 4  
 Otro \_\_\_\_\_
5. Número de personas en la familia que viven en la casa con usted: \_\_\_\_\_
6. ¿En qué tipo de vivienda vive usted?  
 Adobe  Bloque  Cartón  Madera  
 Ladrillo  Cemento  Latón
7. Su vivienda es: Propia  Arrendada
8. ¿Tiene usted animales dentro de su casa? (excluyendo perros y gatos)  
 Si  No
9. ¿De que está hecho el piso de su casa?  
 Cemento  Madera  Tierra
10. Número de cuartos para dormir: \_\_\_\_\_
11. ¿De cual comunidad es usted? \_\_\_\_\_
12. ¿Dónde vive usted ahora?  
 \_\_\_\_\_
13. ¿Hace cuanto tiempo vive en su comunidad actual? \_\_\_\_\_
14. ¿Tiene usted seguro de salud?  Si  No
15. ¿Qué tipo de seguro de salud tiene usted?  
 Seguro Social (IESS)  Seguro Campesino  Otro
16. ¿Trabaja usted?  Si  No
17. ¿En que trabaja usted?  
 \_\_\_\_\_
18. ¿Cuánto gana por semana?  
 \$0-10  \$11-20  \$21-30  \$31-40  \$41-50  \$51-60  \$61-70  
 \$71-80  más que \$80
19. ¿Desde cuando sabe usted que tiene catarata?  
 No sabía  menos de 1 mes  desde hace 1 mes  desde 2-6 meses  
 desde 7 meses hasta 1 año  más de un año  
 \_\_\_\_\_ (¿cuánto?)
20. ¿Quién diagnosticó su catarata?  
 Médico  Enfermera  Promotor de Salud  Oftalmólogo  Otro
21. ¿En cual ojo?  
 OD  OI  OU(ambos ojos)



22. ¿Hizo usted tratamiento para su catarata?  
 Si                       No
23. Si hizo tratamiento, ¿En cual ojo?  
 OD                       OI                       OU(ambos ojos)
24. Si no ha hecho el tratamiento para su catarata, ¿por qué no ha hecho el tratamiento?  
 No conozco un buen sitio para tratamiento     Miedo de cirugía  
 Nadie para acompañarme                       Demasiado lejos  
 Idioma     Miedo de médicos  
 Miedo de quedarme en el hospital             Costo  
 Una mala experiencia con tratamiento médico  
 Otro
- 
- 
25. Si le hicieron tratamiento, ¿quien lo hizo el tratamiento de la catarata?  
 Médico     Oftalmólogo  
 Enfermera                                         Promotor de salud  
 Otro \_\_\_\_\_
26. Si le hicieron tratamiento, ¿dónde hizo el tratamiento de la catarata?  
 Hospital                       Centro de salud     Clínica     Caravana médica  
 Fundación ¿cuál? \_\_\_\_\_  
 Otro sitio \_\_\_\_\_
27. ¿Qué tipo de tratamiento hizo para su catarata?  
 Medicamentos (cuales \_\_\_\_\_)     Agua de hierbas  
 Tener parchado el ojo                       Curandero
- Cirugía  
 Medicamentos: antes de cirugía \_\_\_\_\_  
después de cirugía \_\_\_\_\_
28. ¿Mejóro después del tratamiento?  
 Si     No    ¿Por qué cree usted que no mejoró con el tratamiento?
- 
29. ¿Cuánto costó el tratamiento?  
 \$50 - \$100     \$101 - \$120     \$121 - 150     más que \$151     Otro
30. ¿Ayudó su familia con el costo del tratamiento de su catarata?  
 Si                       No
31. ¿Que opinión tiene usted de una persona ciega o con pobre visión en la comunidad?  
 Quiero ayudarle     Es un castigo de Dios     Es contagioso  
 Me preocupa     Me da pena     Es por pecado  
Otro  \_\_\_\_\_

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## RESUME

Debra Helen Haynes-Winkowitsch

Born August 15, 1963

Newton, Kansas

### **EDUCATION:**

Studio Academy of Graphic Art and Design – Omaha, Nebraska

Associate of Arts (AA) 1986

Grace University – Omaha, Nebraska

Bachelor of Science in Liberal Arts (BS) 1987

University of San Francisco – Quito, Ecuador

Masters in Public Health (MPH) 2003

### **WORK EXPERIENCE:**

Member of an NGO working in Ecuador with Highland Quichua Indians

1989 – present day

Teaching courses in graphic art and design in SATEA and Highland Quichua

Women's Institutes

Facilitating courses on health and women's issues for Highland Quichua

Indian Women

Designed and directs Marriage Seminars for Highland Quichua married couples

8040 310 5 1

**PUBLICATIONS:**

“Building a Bridge” The Gospel Message 2001 Issue 3

“A Letter to Dad and Mom” Scamps, Scholars and Saints 1991

**LANGUAGE:**

Spanish – fluent

Quichua – fluent

**TECHNICAL SKILLS:**

Grant and proposal writing, project implementation, educator, leadership and community development

**COMPUTER SKILLS:**

Word, Excel, PowerPoint, SPSS 6.0, 6.1