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A comparison of entering vs. exiting visual acuities from a humanitarian vision clinic in Guayaquil, Ecuador

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Abstract

Background: The purpose of this study was to determine the improvement in distance and near visual acuity in a sample population in Guayaquil, Ecuador.

Methods: A humanitarian eye clinic was established for 4 days in Cooperativa Luchadores del Norte, Guayaquil, Ecuador. 961 patients were evaluated for refractive error and ocular health. An entering visual acuity was taken both at near and far and an exiting visual acuity was taken after a spectacle correction was dispensed, at both near and far.

Results: Of the 961 patients seen there were 796 complete files that are included in the analysis. 247 of the patients with reduced distance visual acuity received a distance prescription. The average entering distance acuity was 20143.8 and the average exiting acuity improved to 20129.0. 297 patients with reduced near visual acuity received a near prescription in the form of bifocals or single vision readers. The overall mean for the near entering acuity was 20150.8 and improved to a mean exiting visual acuity of 20126.5. 415 patients entered into our clinic having excellent visual acuities at near and far. An improvement in near visual acuity was also noted in the majority of patients with cataracts.

Conclusion: A large number of patients in this population had a significant improvement in their visual acuities, especially at near with the provision of spectacle correction.

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visually impaired, acuity, legal blindness, world health organization

Subject Categories

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A COMPARISON OF ENTERING VS. EXITING VISUAL ACUITIES FROM A HUMANITARIAN VISION CLINIC IN GUAYAQUIL, ECUADOR

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Signature Page

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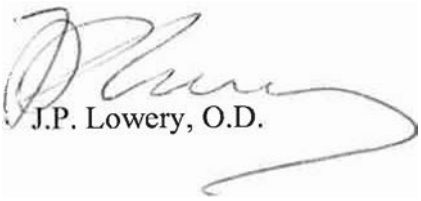

Biography

Rachel Gibson is a distinguished graduate of University of Colorado, Boulder, Colorado. She has a masters in Biochemistry and a minor in Chemistry. Awards include Beta Sigma Kappa, a National Optometric Honors Society for the years of 2003-2006, the Brim Health Professions Scholarship in 2004, and the Optometry Dean's Scholarship in 2003. Rachel plans on practicing optometry in Colorado after graduation from Pacific University College of Optometry.

Darcy Christensen was born and raised in Edmonton, Alberta. She completed her undergraduate work at Grant MacEwan College and the University of Alberta prior to her admittance to Pacific University's College of Optometry. Darcy acted as the Student Optometric Association President-Elect for PUCO during 2004-2005 and the Student Optometric Association President during 2005-2006.

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Introduction

Recent evidence has demonstrated that a large number of people in the world are visually-impaired due to an uncorrected high refractive error Blindness due to refractive error is curable with the correct treatment from an eye care professional. Therefore, blindness due to refractive error in any population suggests that eye care services in general in that population are inadequate.' Many other public health issues contribute to this problem, including poverty, lack of government for support eye health initiatives, and lack of education regarding vision conditions.

The World Health Organization estimates that approximately 161 million people worldwide are visually impaired. This approximation is based upon best corrected visual acuity measurements, which excludes visual impairment due to uncorrected refractive error. Thus, the WHO estimate of global visual impairment may be inaccurately low.[2] Recent studies indicate that uncorrected refractive error is the second leading cause of preventable blindness behind cataracts.' Other studies suggest that refractive error is a significant contributor, or the primary contributor to visual impairment in specific populations of older adults.[4]

Currently humanitarian eye care clinics serve the vision care needs for some of the population in developing countries. One particular group involved in humanitarian eye care organizations is Volunteer Optometrists in Service to Humanity (VOSH). The Amigos (Student VOSH) organization of Pacific University College of Optometry has been conducting vision care missions since 1975. The present study provides acuity

outcome data from 3 days of clinical services provided by the Amigos (Student VOSH) organization of Pacific University College of Optometry in the town of Cooperativa Luchadores del Norte, which is a sector of Guayaquil, Ecuador. The study evaluates the outcome of this humanitarian vision care clinic using the change in acuity as the primary measure. Presenting visual acuity is compared to corrected acuity at both distance and near. This comparison also allows us to determine the relative contribution of refractive error to visual impairment and blindness in this particular clinical population.

Methods

Data was collected on 961 patients over 3 days at the vision clinic set up in an existing health clinic in the town of Cooperativa Luchadores del Norte, which is a sector of Guayaquil. Individuals were seen on a first come first serve basis. A case history including the patient's name, age, sex, occupation, primary visual complaint, current medications, personal medical and ocular history, and known allergies was performed. The patient's entering visual acuities, at distance and near, were then taken along with extra-ocular muscle testing. Auto-refraction was then performed on each patient. Retinoscopy was only done on select patients. The patient was then directed to a station where direct ophthalmoscopy, pupil evaluation, and tonometry with a tono-pen was performed. Patient's with significant ocular disease also had a dilated fundus exam. All prescriptions were finalized by one of the optometrists present. Patient's were then directed to obtain prescription lenses. The lens library consisted of donated prescripton lenses. Each patient received lenses that best matched their final prescription from the

lens library. Distance and near acuities were taken through the dispensed lenses. At this time prescription lenses that allowed the best fit and acuity were dispensed.

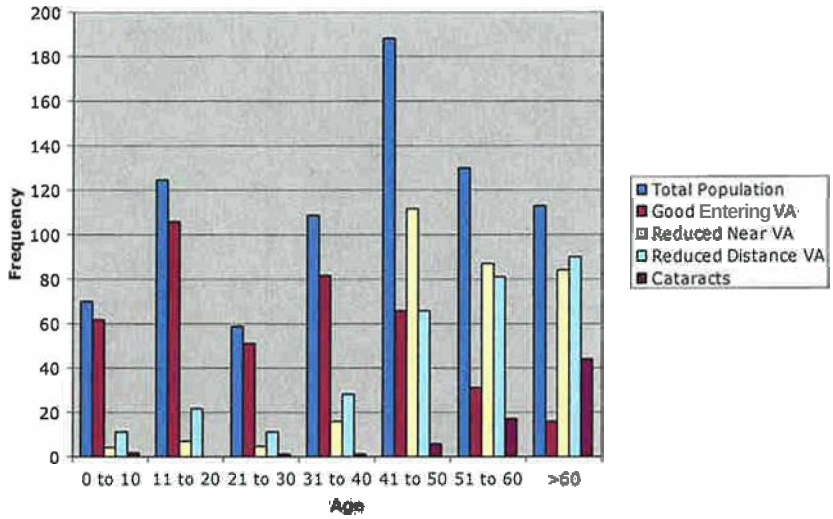
Acuity Measurement

Entering acuities were measured monocularly and binocularly. Acuities were measured at 20 feet with standard Snellen letter or Tumbling E charts. The letter sizes on the charts ranged from 201200 (MAR=10') to 20120 (MAR=1'). Entering near acuities were measured binocularly with numerical charts. The number sizes ranged from 201100 to 20125. Binocular exiting acuities were measured the same way as the entering acuities. Lighting was not uniform between the locations in which entering and exiting acuities were measured. Entering acuities were taken outdoors under full sunlight, and exiting acuities were taken indoors where there was a window that allowed some sunlight in.

Population Profile

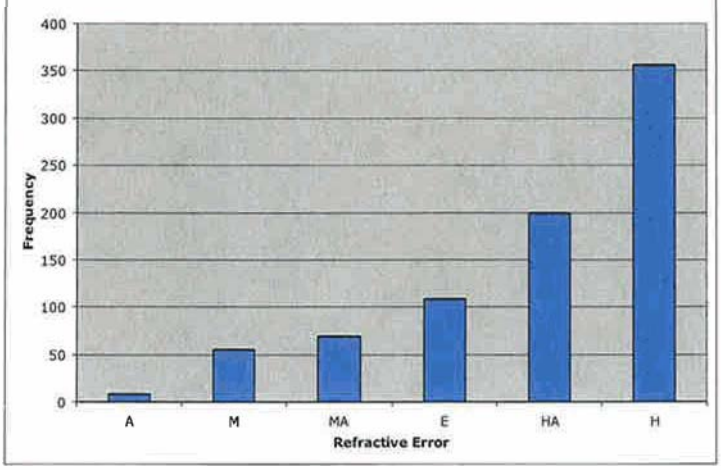
Of the 961 patients seen, 657 were females and 304 were males. The number of persons over the age of 40 was 516 (54%). The age range of persons seen was from 6 months old to 97 years old. Figure 1 shows a representation of all ages.

Figure 1: Population Profile



Refractive error was recorded for 796 patients of the 961 patients seen. Of the 796 patients there were 356 hyperopes, 200 hyperopic astigmats, 108 emmetropes, 69 myopic astigmats, 55 myopes, and 8 atigmats. Figure 2 illustrates the distribution of refractive errors. At least a 0.50D sphere was needed to categorize a person as myopic or hyperopic and at least a 0.50D of cylinder for astigmatism.

Figure 2: Refractive Error Distribution



Ocular Disease Conditions

Specific ocular disease conditions that could have had an impact on visual acuity were found in this population. They include cataracts (99), ptygerium (52), diabetic retinopathy (8), glaucoma (5), macular scar (2), bilateral optic nerve head coloboma (1), hypertensive retinopathy (1), keratoconus (1), corneal scar (2), nystagmus (1), toxoplasmosis (1), ARMD (1).

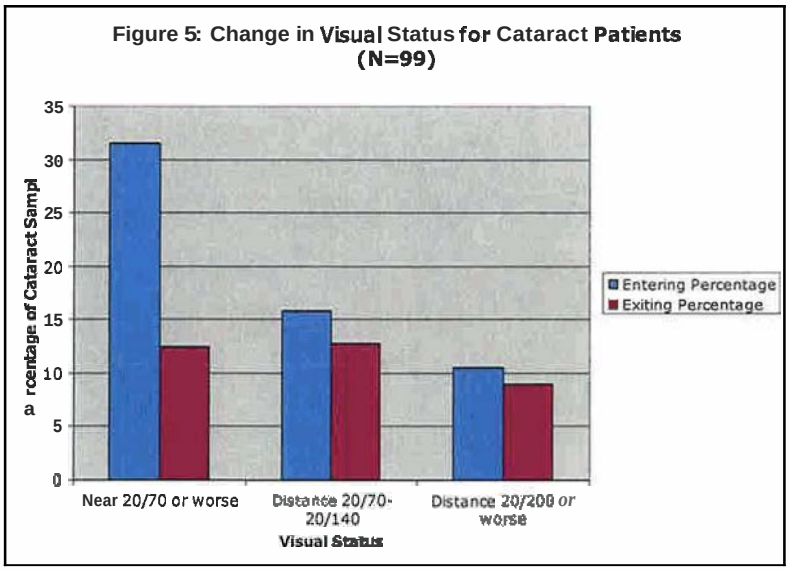
Results

Of the 961 patients seen, there were 796 complete files that are included in the analysis. The rest of the patient files were incomplete and did not provide enough data to be included in our analysis. 414 patients entered into our clinic having both distance and near visual acuities of 20125 or better. These patients can be divided as follows: 166 were not given glasses, 155 were given glasses for near due to complaints of near asthenopia, 93 were given glasses for distance. The data for these 414 patients is not included in our analysis of acuity change due to refractive correction, however, the data was classified as complete and is included in our analysis of overall change in the prevalence of visual impairment within our entire complete data sample population.

A total of 248 distance and 297 near point prescription lenses were dispensed to our patients. Patients who received bifocal lenses are included in our analysis of either the reduced distance acuity group (if they had reduced distance visual acuity), or the reduced near acuity group (if they had reduced near visual acuity), or both (if they had both reduced near and distance visual acuities).

Cataracts

There were 99patients that were diagnosed with cataracts. Seventy-eight patients received spectacles for distance and/or near vision. The average entering distance acuity was 20153 and the near visual acuity was 20/51. The average exiting distance acuity was 20146 and the average exiting near acuity was 20/34. The number of patients entering legally blind (201200 or worse at distance) was 10 (10.5%), and the number exiting legally blind was 7 (9%). The number of patients entering visual impaired (20170-201180 at distance) was 15 (15.8%), and the number that exited visually impaired was 10 (12.8%). Thirty (17.9%) of the patients with cataracts entered with near visual acuity measuring 20170 or worse, while only 10 (12.5%) of these patients exited with near visual acuity measuring 20/70 or worse.



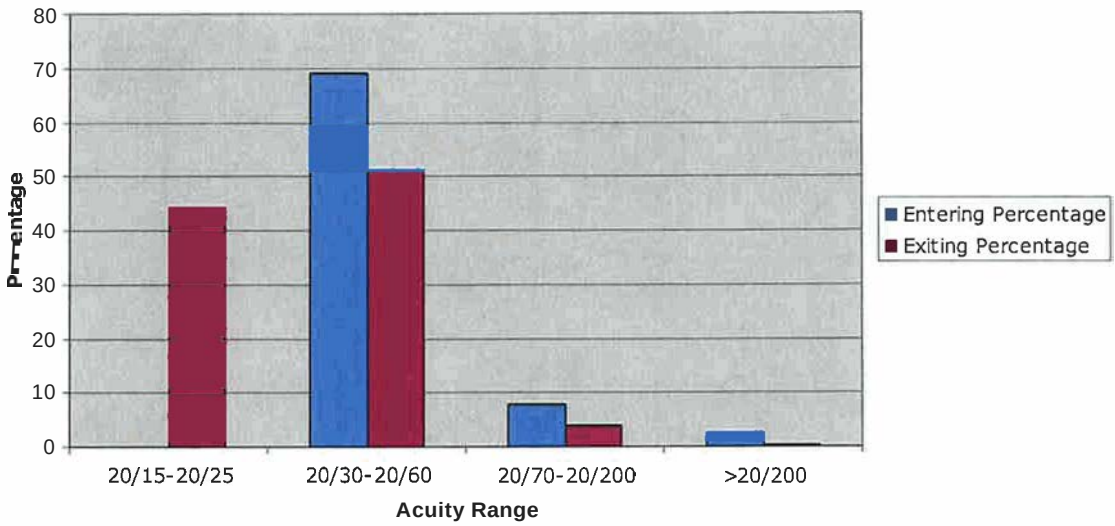
Reduced distance

The number of patients with reduced distance visual acuity is 310, and 247 of this sample received a distance prescription. The sample was divided into three groups based on entering acuity. These include 20130 to 20160, visual impairment (20170 to 20/140), and legally blind (≥20/200). The 20130 to 20160 group entered with a mean acuity of 20136.9 and exited with a mean acuity of 20127.1. The 20170 to 201140 group entered with a mean distance acuity of 20193.9 and exited with a mean acuity of 20140.7. The ≥20/200 group attained a mean exiting distance acuity of 20165.9. The overall mean entering acuity for the sample was 20143.8 and the exiting acuity was 20129.0. The changes in the mean acuity are shown in Table 1.

Table 1: Mean Distance Acuity Improvements

Entering Acuity Range	**Entering Mean**	**Exiting Mean**
≥20/200 (N=8)	201200	20165.9
20170 -201140 (N=25)	20193.9	20140.7
20130-20160 (N=217)	20136.9	20127.1
Entire Sample (N=493)	20143.8	20129.0

Figure 3: Change in Distance Visual Acuity for the Reduced Entering Distance Visual Acuity Group (N=310)



Near Prescription Profile

The population that demonstrated reduced near acuity was 316. Of the 316 patients, 297 received a prescription for near. Within this group, 124 received a single vision lens prescription alone and 173 were bifocals. One-hundred fifty-five patients received a near prescription, even though they had good entering near visual acuity, because they had complaints of near asthenopia. The criteria for being in the near asthenopic group was a near entering acuity of 20/25 or better and glasses prescribed for near. Data from these individuals was not included in the analysis of the reduced near acuity group. The majority of these patients were pre-presbyopic and were given a relatively low power near lens.

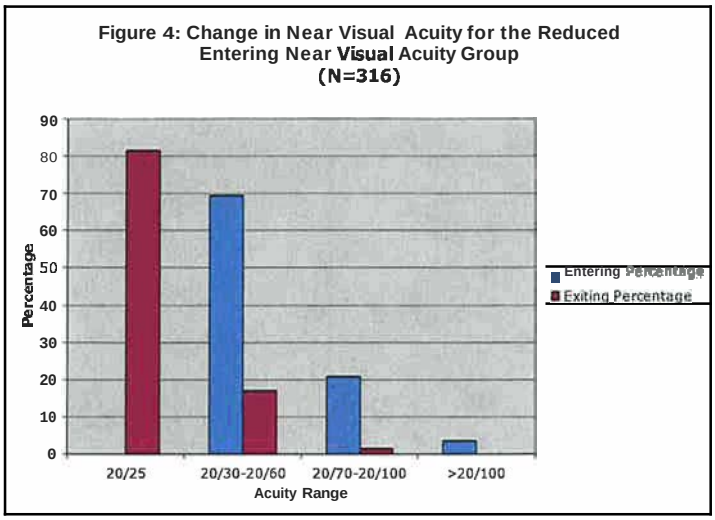
Reduced Near Acuity Group

Included in the reduced near acuity group are individuals that had an entering near acuity worse than 20125 due to refractive error and/or ocular pathology. There were 297 patients in this category. Of the reduced near visual acuity group, only one person did not have complete data that could not be used in our analysis.

Patient data was divided into four groups: patients demonstrating entering near acuity from 20130 to 20160, those with 20170 to 201100, and those with less than 201100. The 20130 to 20160 group demonstrated a mean entering near visual acuity of 20140.7 and exiting acuity improved to a mean of 20126.0. The 20170 to 201100 group demonstrated a mean entering near acuity of 20185.0 and had an exiting mean acuity of 20127.2. The 201100 or worse group had a mean exiting acuity of 20133.7. The overall mean for the reduced near entering acuity was 20150.8 and improved to a mean exiting visual acuity of 20126.5. The data for near mean entering acuity and exiting acuity is illustrated in Table 2. Figure 3 shows the change in near visual status.

Table 2: Mean Near Acuity Improvements

Entering Acuity Range	**Entering Mean**	**Exiting Mean**
>20/100 (N=11)	201200	20133.7
20/70 – 20/100 (N=66)	20/85.0	20/27.2
20/30 – 20/60 (N=220_	20/40.7	20126.0
Entire Sample (N=297)	20150.8	20126.5



Discussion

1) Epidemiology:

The primary refractive conditions found within our population sample are hyperopia and hyperopia with astigmatism. These two categories comprise 70% of the sample population. You can't classify ernmetropic presbyopes as hyperopes if their distance refraction does not meet your criteria for hyperopia...you need to define your criteria as I stated in the refractive characteristics section. Presbyopia is not technically a refractive error so the way we discussed this issue is by stating the number of subjects over 40 in the sample gives it a high proportion of presbyopes... You actually have a fairly even age distribution in your sample which is why we don't see the same level of acuity change with correction of hyperopia as we did in our Mexico sample. This is useful discussion as you analyze the effects of refractive correction on ametropia in the sample.

As is expected in a population of primarily hyperopes and hyperopic astigmats, reduced near visual acuity is much more prevalent than reduced distance visual acuity.

10.4% of the population sample have visual acuities of 20170 or worse at near, whereas only 4.5% of the sample have visual acuities of 20170 or worse at distance. The legal definitions of visually impaired (≥20/70) and legally blind (2201200) are based upon distance visual acuity only, but in effect, our sample population indicates that a significant number of Ecuador's citizens are living visually impaired, or blind, in their near environment. The average age of the reduced near visual acuity group is 52, so it can be assumed that a large percentage of these individuals are presbyopic. Presbyopia, especially in combination with hyperopia, is guaranteed to affect everyone, and yet there is little to no vision care available to many in this population, leaving perfectly capable individuals without the ability to read or work up close as they age. A desire to read the Bible again was a common chief complaint amongst our sample. In addition to the emphasis being placed on cataract surgeries in developing countries, our data suggests that an emphasis on the provision of single-vision reading glasses would significantly increase the standard of living in these populations.

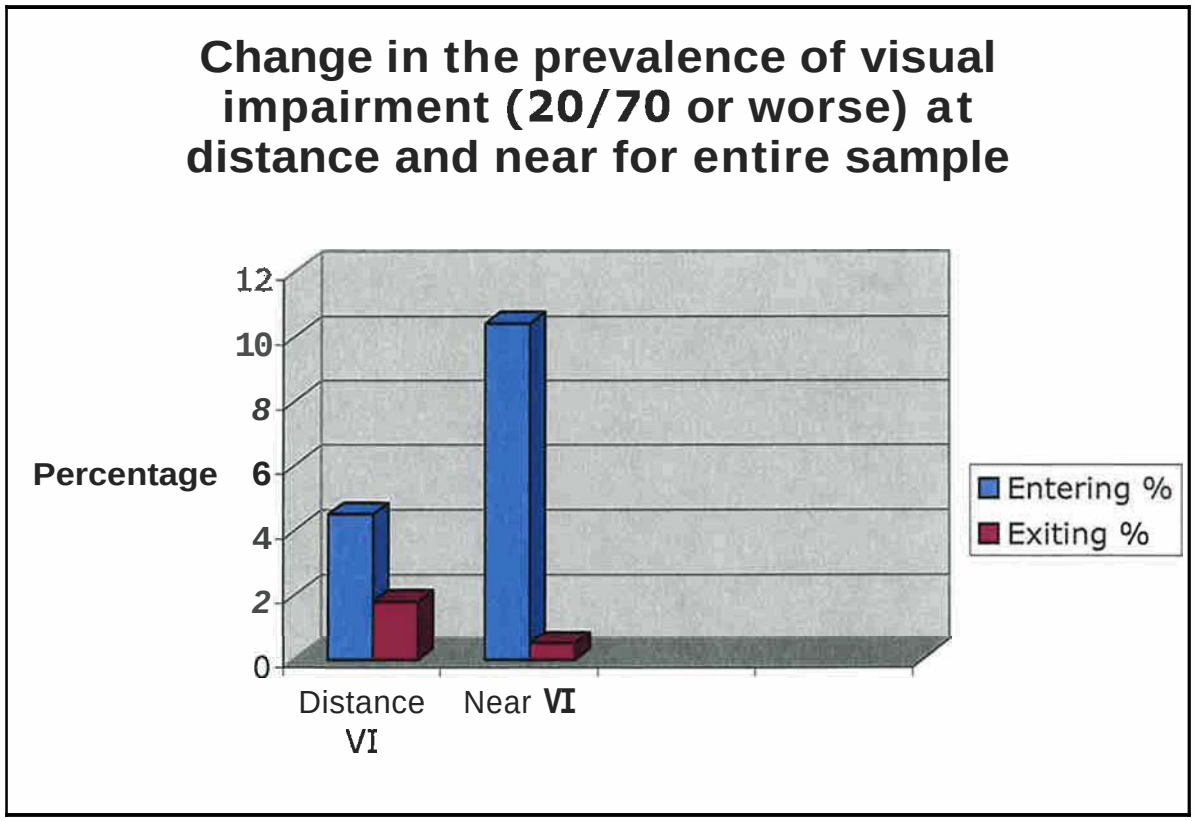
A group of interest in our population sample is the good visual acuity group. These individuals entered with both distance and near visual acuities of 20125 or better. Of the 415 in this group, 156 were prescribed reading glasses, 66 were prescribed distance glasses for hyperopia, and 27 were prescribed distance glasses for myopia. In theory, none of these individuals required a prescription, because their visual acuities were great entering the clinic. There are a few reasons that might explain why these individuals were given glasses: patient complaints of asthenopia; manifest presbyopia, myopia, or hyperopia not supported by entering visual acuities due to small pupil size (entering

visual acuities were taken in direct sunlight); prescriptions given based solely on autorefraction with no comparison to entering visual acuities to assess actual need; and patient desire for glasses despite no actual need. I bet if you look specifically at the refractive characterisitcs of this group, you would find a high proportion of relatively young hyperopes...? What did the age range and RE of this group look like?

Pterygium and cataracts are the most common ocular diseases found in this population sample. Both of these conditions can be precipitated and/or aggravated by ultraviolet radiation. Few to none of the individuals who were admitted to our clinic were wearing sunglasses. Headaches are a common medical complaint in this population and may be another indication that these individuals require, but do not use sunglasses.

2) Efficacy of humanitarian vision clinic:

The efficacy of our vision clinic is greatest for improvements in near visual acuity. 10.4% of our sample enter with near visual acuity of 20170 or worse and 0.5% remain in this category upon exiting, whereas 4.5% of our sample enter with distance visual acuity of 20170 or worse and 1.8% remain in this category upon exiting.



Efficacy within our cataract group is less than within the previous distance and near groups. 17.9% enter with near visual acuity of 20/70 or worse and 10.5% remain in the category upon exiting. 26.3% of the cataract sample enter with distance visual acuity of 20/70 or worse and 21.8% remain in this category upon exiting

It should be noted that incomplete disease data is included in this analysis to avoid a biased, positive indication of improvement by eliminating data that was incomplete due to the disease itself. Far more of the cataract patients have complete near visual acuity measurements than distance visual acuity measurements; were we to pull records out of

our analysis due to missing distance data, it would limit our near analysis. However, including incomplete data limits our ability to accurately compare entering and exiting acuities. Each method has its problems and we chose one; perhaps we should have used both and compared the results.

There were three limitations in our ability to gather complete and accurate data that should be noted. Firstly, the lighting conditions differed between the locations in which entering and exiting acuities were being measured. Entering acuities were measured in direct sunlight outside; exiting acuities were measured inside our lit clinic facilities. Direct sunlight not only provides higher contrast on a Snellen chart, it has the potential of reducing pupil size and thus improving visual acuity for most individuals. Secondly, there are a very high number of records with incomplete data. Generally, records are incomplete because exiting visual acuities were not measured. This can be attributed to the very busy and cramped nature of our facilities. The location in which visual acuities were measured was in the main room of the clinic in which there was constant traffic between patients and the Snellen chart and in which large numbers of patients waited for glasses and dismissal. In such a high demand and busy situation, writing visual acuities down was often overlooked or decided to be of a lower priority than meeting patient needs. There are certainly other explanations, but we believe that these are the primary ones. Lastly, the Snellen charts used to take near visual acuities did not have *20120* letters. The smallest possible measurement for visual acuity at near was *20125.* Thus, our data for near visual acuity and measured changes in near visual acuity may show less of

an improvement than what might have been found, had we used near cards with 20120 letters.

Conclusion:

The primary need of our sample population in Ecuador was near vision correction, and our vision clinic was able to provide the greatest visual acuity improvements in near visual acuities. Hyperopia and hyperopia with astigmatism were the most common refractive error conditions. Cataracts and pterygium were the most common ocular disease conditions. Future Amigos trips to Ecuador might be advised to place great emphasis on single-vision reading glasses and sunglasses.

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