Research and the Expansion of Services in the Developing World: A Costa Rican Experience

La recherche et l'élaboration des services dans les pays en voie de développement : expérience costaricaine

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ABSTRACT

The article reviews the various steps necessary to successfully complete a national epidemiological study focusing on the incidence and prevalence of sensorineural hearing loss in children. With particular emphasis on funding, equipment, staff, test sites, procedures and data processing/analysis, the authors provide a step-by-step description of the difficulties encountered in attempting major epidemiological research in a developing nation. Results suggest that the incidence of sensorineural losses in children in Costa Rica is between 1.50-1.63 per 1000 live births. The authors conclude with a discussion of the strengths and weaknesses of various approaches to assisting nations as they develop services.

ABRÉGÉ

L'article examine les diverses étapes nécessaires à la réussite d'une étude épidémiologique nationale portant sur l'incidence et la prédominance de la surdité de perception chez les enfants. En mettant l'accent particulièrement sur le financement, l'équipement, le personnel, les sites et procédures d'essai, et le traitement et l'analyse des données, les auteurs offrent une description détaillée des difficultés que l'on doit surmonter lorsqu'on veut entreprendre une importante recherche épidémiologique dans un pays en voie de développement. Les résultats portent à croire que l'incidence de surdité de perception chez les jeunes costaricains se situe entre 1,50 et 1,63 par 1 000 naissances vivantes. Les auteurs terminent en étudiant les atouts et faiblesses de diverses méthodes employées pour aider les pays à élaborer les services.

KEY WORDS: audiology • Costa Rica • epidemiology • sensorineural hearing loss • hearing loss research

The World Health Organization (WHO, 1993, 1996; WHO & Hearing International, 1995) estimates that 2.2% of the world's population has a disabling hearing impairment. That is about 120 million people with a hearing loss of a long enough duration and a significant enough pattern to cause interference with everyday activities. WHO suggests that 15% of those losses are in the Americas, 17% in Europe, 52% in Asia, 12% in Africa, and 4% in Oceana. If we look more carefully at these figures, we can see that the "Americas" includes the North, South, and Central American groups with a total estimated hearing impaired population of 18 million. Of the 18 million, approximately 8.5 million are in North America (Canada: 7.8% - 663,000; United States: 73% - 6,205,000; and Mexico: 19.6% -1,666,000). The balance is divided between South America (8.5 million) and Central America (1.0 million). Please note that while these figures are reasonable and probably accurate, they are only estimates based on known incidence/prevalence figures for disabling hearing loss and general population statistics. Further, "disabling hearing loss" includes both conductive and sensorineural (SNHL) losses. A review of the research indicates an average of 1.368 sensorineural hearing losses per 1000 live births to be the common rate in children throughout the world (Mencher, 1999). How accurate that figure is cannot be stated with certainty as the figure is based on a compilation of individual country reports, each based on its own research protocol. The fact is, very few countries have exact knowledge of the incidence/prevalence of sensorineural hearing loss within their borders.

In 1987, McGill University carried out a comprehensive study of children in schools for the deaf and special programs throughout Canada (MacDougall, 1987). Results of that study indicated approximately 1:1000 hearing impaired per 1000 children from 0-21 years of age in Canada. While this was an excellent study and remarkable in its

scope, it did not measure or seek information regarding the number of hearing-impaired children not enrolled in special programs or schools for the deaf. Furthermore, inclusion of an age range reaching 21 years may have resulted in skewed data including some adult onset hearing loss. Consequently, even these apparently reasonably accurate results must be interpreted with some caution and even in a well developed western nation, there isn't really a true picture of the size of the population with childhood sensorineural hearing loss. Given these facts, is it any wonder that the nations of Central America, South America, Africa, and Asia have even less information?

Mencher and Madriz Alfaro(in press) have already reported the results of a national demographic study of hearing impairment in the children of Costa Rica. The purpose of the present paper is to discuss some of the challenges they faced in undertaking a large epidemiological study in a developing nation. A description of parts of the original research protocol is offered for interest and clarification of certain aspects of the work; however, this paper is not designed to present the rigid scientific protocol followed by the authors, but rather to offer a brief insight into the problems and problem solving encountered when working under unusual circumstances.

Costa Rica

Costa Rica is a Central American nation with a population of 3.2 million. It has a very stable democratic government, no army, and has not had a war since 1948. It has a healthy economy which permits its citizens to have a healthy diet, employment, a socialized health care system similar to Canada's, and living standards equal to North American requirements. Things are not perfect there, however. It is a country with a poor balance of payments because its imports exceed its exports. Thus goods cost more, taxes are higher, and the health care and educational systems, although well defined and structured, are grossly underfunded and inadequate. Consequently, less essential special services for children, such as identification/management of hearing impairments, take a back seat to the more basic health and educational requirements of the people.

Costa Rica is an excellent locale to begin to look at the magnitude of the problems faced by hearing impaired children in Central America. Not only does the well organized structure of its educational and health systems provide a basis for such an investigation, but the population size, geography, and physical infrastructure (highways, complete access to cities and towns, etc.) combine to make it ideal. Further, located in San Jose, the nation's capital, is an International Society of Audiology/Hearing International/International Federation of Otolaryngological Societies (ISA/HI/IFOS) Centre whose charge is research and the provision of hearing health services in Central America. Finally, socioeconomically, linguistically, and culturally, Costa Rica appears to be a microcosm of Central America, suggesting data from that country might provide insight into patterns throughout the region.

The Costa Rican Study

In September, 1996, the Ministry of Health of Costa Rica through its Department of Otolaryngology (Division of Audiology) determined it wished to begin a study of the incidence and prevalence of sensorineural hearing loss in children in the country. The government wanted to know how many children there were in the country who needed specialized services and the extent of the services required. "Services" were defined as both health and educational programming ranging from identification to diagnosis to treatment/amplification to education. Government indicated an interest in developing necessary "services" (health and educational programming) for hearing impaired children, if data suggested a need was there, and the cost was not prohibitive.

Dr. Madriz, initially as head of the Division of Audiology, and subsequently as Chief of Otolaryngology at the Ministry of Health was in charge of the study. Dr. Mencher, on leave from the Nova Scotia Hearing and Speech Clinic, was officially designated by President Figueres of Costa Rica as a "Consultant to the Government, Department of Health" and also given an appointment as a Visiting Professor at the University of Costa Rica. The two worked cooperatively throughout the entire project. It was determined early on that, in addition to governmental requirements, they were interested in obtaining a cross section of information regarding all hearing impaired children in the country (those newly identified as a result of the study and those in existing

programs) with particular emphasis on such things as age at diagnosis, family history, medical history, and quality of life.

After extensive consultation with the Department of Statistics at the University of Costa Rica and the Office of Demographic Studies of the Government of Costa Rica, it was determined that to meet the objectives of a comprehensive national study of the incidence and prevalence of sensorineural hearing loss (SNHL) in children and a study of their status, the following major components were necessary:

1. A determination of the prevalence of SNHL in school- aged children. This could be achieved by screening and audiological and medical follow-up of a stratified sample of 12,500 second graders (presumably born in 1988) in regular schools. The cohort of 12,500 needed to consist of carefully designated divisions/strata to ensure an adequate sample of the entire population. These included public/private schools, male/female, rural/urban schools, geographical distribution throughout the country, etc. The children were to be screened and rescreened by teams of audiometrists. Children who failed the rescreening were to be examined by an audiologist who was to determine if there really was a hearing loss present, and if so, what type (SNHL, conductive, mixed).

2. Search the entire country through parent, school, doctor, and hospital referrals, as well as newspaper, radio, and television advertisements and word of mouth for children with SNHL not enrolled in any school or educational program. After confirmation of a hearing impairment, any children identified should be included in all other components of the study.

3. Obtain demographic information about all the hearing impaired children by interviewing families using a questionnaire that included questions about family and medical history, birth records, age of identification, degree and pattern of the hearing loss, hearing aids, type of education, language usage (oral/total/manual), etc. The questionnaire was designed by the authors in conjunction with NIH and the Medical Research Council of Nottingham University, United Kingdom.

4. Compare the data from Costa Rica with other studies to identify national or potential regional differences.

It is important to reiterate here that while this was a research study in the scientific sense, the ultimate goal was to identify the number of hearing impaired children, their location throughout the country, and information about their status and quality of life so that the Government of Costa Rica could plan, develop, and implement prevention, treatment, and educational programs for that population. In the end, the study involved 250 elementary schools in all seven provinces of the country. Data collection has taken approximately 18 months to date, although it is not completed.

Parameters of the Study

The key components of any study are funding, equipment, staff, testing sites, data processing, results, and analysis. In Canada, or any part of the developed world for that matter, we tend to assume that all of these elements will fall into place as a part of the "funding" process. However, research in the developing world is completely different and obtaining the resources for each component becomes a major hurdle to completion of the project. What follows are some simple illustrations of the complexity of the process. References to specific companies and agencies are deliberate and designed, where appropriate, to acknowledge the generosity and support of those groups.

Funding

The Government of Costa Rica has very limited resources. Therefore, while they were more than willing to provide "in-kind" services and materials, they were not in any position to provide any hard currency to carry out this project. However, money was necessary to purchase some equipment, supplies, food, lodging, travel, telephone, fax, etc. Thus, it became necessary for the investigators to contact private corporations, other national governments, and individuals to obtain funds. The authors' first thought was to approach the Canadian International Development Agency (CIDA). Discussions with them were very interesting. Yes, Costa Rica is a country that CIDA helps, however, hearing loss and deafness is not one of their areas of interest. If the study aided in the growing of crops or was involved in industrial expansion, there was money. However, CIDA is not involved in health and/or education.

Ironically, the National Institute for Deafness and Other Communication Disorders of the U.S. National Institutes of Health was interested in the project. They were specifically concerned with the genetic aspects of hearing loss, hav-

ing already funded a major project through the University of Costa Rica on a deafness syndrome called "Monge Syndrome." In addition, we were supported in our efforts by the Etymotic Research Foundation and the Nova Scotia Hearing and Speech Clinic. Between these groups, the authors were able to raise sufficient funds to carry out the first part of the study. Recently (1999), Hearing International awarded a grant to the ISA/HI/IFOS Costa Rican Regional Centre to complete the project. None of the funding groups or donors restricted the study or influenced the outcome in any way.

Equipment

The Costa Rican Government Audiology program and the ISA/HI/IFOS Regional Centre had some audiometric equipment to use for the study. However, it was necessary to have a good portion of it repaired, recalibrated, and upgraded. In addition, it was necessary to obtain some new equipment. Support from the Overseas Trading Corporation (New Orleans), Hal Han (Dahlberg Canada), and the Maico Hearing Aid Company resulted in obtaining audiometers, impedance bridges, and other necessary equipment as gifts or on loan. Used equipment was also obtained from centres in the United States and Nova Scotia.

Sometimes it became necessary to use ingenuity to obtain what was needed. For example, some equipment required batteries (e.g., otoscopes, lights, etc.). Batteries are very expensive in Central America. A negotiated contract with several manufacturing companies led to a hearing screening of their employees in exchange for the batteries and other supplies needed for the study. In another situation, a major problem was encountered with accommodations. Staff doing the testing had to travel to dozens of locations throughout the country. In many cases this required staying in a hotel. After some negotiations, members of the national hotel association provided rooms for our staff in exchange for publicity, testing of hotel staff, and/or examinations of various owner's families. The old fashioned "barter" process and exchange of "in-kind" services worked wonderfully. However, one should not overlook the notion that doing something so important for their country as identifying the number of hearing impaired children and/or ensuring that literally hundreds of children with medical problems received treatment was a wonderful motivator, bringing out the skills and generosity of a warm and giving people.

Having obtained adequate equipment, the next step was ensuring it remained viable and calibrated, and if it wasn't, that it was repaired or replaced. In Canada most programs have biomedical engineering support or, failing that, can ship a unit to the distributor or manufacturer. The developing world does not have such luxuries. Much of the time, equipment consists of older units which by North American programs were donated as they were replaced with newer, faster, more up-to-date systems. That usually means parts are impossible to find for the recycled equipment. If the reader can imagine many of the Grason-Stadler 1701 audiometers once functioning in Canada being considered brand new and major upgrade equipment in small, poor hospitals in Central America and Africa, it is easy to grasp the concept. As for biomedical engineering, most governments cannot afford to properly train staff for such a program or pay them accordingly. Furthermore, the few people who have those skills are pulled between hospitals, clinics, government offices, and private enterprise. The result is that service is essentially nonexistent or not available.

How does a research program overcome such a problem? For this study the authors were fortunate enough to persuade Starkey Canada to send an electronics repair group to Costa Rica. They checked all our equipment, ensured it was calibrated, and then they taught a small group of technicians how to do minor "in the field" repairs and checks. They also helped obtain a Sound Level Meter to be used for weekly calibration checks of each audiometer. Further, each unit was checked biologically on a daily basis by the testing teams. This was vital as the units were transported daily from school to school or clinic to clinic and were often bounced around on dirt roads and over rocky and rough terrain. The authors, both audiologists, were often seen repairing and recalibrating units in hotel rooms late at night.

One last comment regarding equipment. It was not possible to do this study without a computer to keep records and help with the analysis process. At the time the study was initiated, the Government of Costa Rica had limited computer availability and there was no chance

of obtaining one of theirs. Fortunately, contact with the distributor for Packard-Bell Costa Rica resulted in the donation of a computer to the study. However, the new computer had only 8 mg of ram and 16 mg was required to run the statistical programs essential to the study. The Costa Rican government was asked for approximately $75 for the upgrade. Once again, the shortage of real cash was a factor and after three months, the authors turned to other sources for the money. The Government simply could not pay for anything with cash. That is the reality of the developing world.

Staff

The Costa Rican Department of Health did make available its entire ENT/Audiology program for the study because the personnel involved were already on salary and did not require additional funds. This resulted in a team of approximately 12 audiometry technicians, a secretary, an ENT physician, and an audiologist. Later in the study a part time data entry clerk was provided.

The staff underwent a training program during which they were instructed in the rationale and purpose of the study, the exact hearing screening and testing protocols, and the use of test equipment, forms, and materials. Care, maintenance, and calibration of equipment was also covered. All staff were experienced in testing hearing in the schools prior to the training course. Three had extensive experience of more than ten years and were considered the senior technicians. Many of the rest had been testing for at least five years, so the research and teaching effort was facilitated by prior knowledge, interest, and experience. Once again, however, the idea of doing something important for their country and ensuring that hundreds of children with medical and educational needs would receive needed services was a strong motivator.

One significant issue faced as a part of the research design was transporting and housing staff going to rural locations to test. The Government was quick to offer vehicles and drivers, again, materials and people already included in their budget which did not cost any additional money. Staff and sometimes patients were driven anywhere at any time by a host of professional chauffeurs who helped carry equipment and transport children, and were willing to drive on steep mountain roads, washed out river beds, modern highways, and city roads at any time of day or night. They were as interested in what we were doing for the Costa Rican children as we were, and they often volunteered to do extra things just to help out. Housing included the hotels referred to earlier, couches in the homes of relatives, cots in hospitals, rehabilitation centres, and, once, a night in the back of a truck.

Food was another matter. Many of the staff brought food and saved the per diem they were paid to supplement their inadequate salaries. Often meals were provided by local service clubs or grateful parents. Sometimes the group stopped along the road at a community barbeque. Occasionally lunch came directly from the trees (oranges, papaya, mangos, and an unknown vegetable one of the author's vowed never to eat again!). Often the group shopped, cooked, and ate cooperatively, thus ensuring a variety of good food at a reasonable price. The most common practice, however, was to eat lunch at the school in which the children were being tested. Nearly every Costa Rican school provides a free hot meal at noon every day. Usually consisting of black beans, rice, and a tasty mixture of spices, onions, and a taste of chicken or beef accompanied by a salad, it was healthy, filling, and always delicious.

Test Sites and Test Procedures

As already indicated, the initial screening of all children generally took place within the confines of one of the 250 local schools involved in the study. Unfortunately, schools are not the quietest of locations and so occasionally churches, homes, and other quiet community-owned facilities were used. In every case, however, the children were tested while wearing circumaural headphones. In addition, rooms were selected to permit testing with the least interference, and all met the specifications set by the audiologists for the study. Ironically, the major noise problem came from nature itself. Costa Rican schools are built with metal roofs designed to release heat and reflect the sun. However, during the rainy season, the roofs are pelted with great force and the sound is unbelievably loud. It was often necessary to stop testing for 15 or 20 minutes until a shower passed. Occasionally, school itself would come to halt during one of these torrents as any form of teaching or learning in that level of noise was impossible.

Electricity was another matter. Costa Rica uses 110v, the same as Canada, and so equipment purchased in North America could be used with modification. However, while

we have fire safety codes in our schools which require a grounding plug, such is not the case in Costa Rica. Thus, adapters were necessary at every stage of the study. Finally, most schools have only one outlet per classroom. Thus, placement of the equipment in a location near a power source or use of extension cords became a major planning and safety issue.

The screening-test procedure began with otoscopy during which the child was scored as Pass or Fail. Audiometry followed according to the following protocol:

1. Screen at 25 dB at 500 kHz, and then 20 dB at 1 kHz, 2 kHz, and 4 kHz by air conduction in one ear and then reverse the process in the other ear. Scoring was either Pass or Fail at each frequency in each ear. Passes were noted and the child dismissed from the screening program. Failure resulted in a second test.
2. Repeat the primary screening by another examiner on another audiometer the same day for children who failed any frequency in either ear during the first test. Scoring was by Pass or Fail at any frequency in either ear. Passes were noted and the child dismissed from the screening program. Failures resulted in further testing.
3. Any failure on the second screening resulted in a child being seen by one of the senior audiometric technicians for a threshold audiometric test at .5, 1, 2, and 4 kHz, followed by tympanometry and reflex testing. Children who failed any frequency on this test were referred to an audiologist for more detailed examination and diagnosis. In addition, all children who failed otoscopy, typanometry, or audiometric screening were referred for medical evaluation and, if appropriate, cerumen removal.

Data Processing

With the help of the Medical Research Council of the United Kingdom at Nottingham University and the special assistance of Dr. Adrian Davis, a customized computer program was written for data analysis. The data base was built to record the initial results of the screening and to maintain basic information about each child such as birth date, school, province, and audiometric and tympanometric results.

Next, the database was expanded so that more complex information about all children seen by an audiologist and diagnosed as sensorineural hearing impaired (SNHL), as well as those who had been previously diagnosed and enrolled in programs for the hearing impaired could be included. That information came from questionnaires filled out by members of the study team as obtained from parents, teachers, doctors, and care givers of each child. In addition, completed questionnaires were obtained from the teachers and/or parents of every child already enrolled in a special program for the hearing impaired supervised by the Department of Education. The questionnaire contains material ranging from family history of hearing loss (through great-grandparents) to age of identification of loss to potential or known etiological factors. The information obtained from the questionnaires has been processed and is currently being prepared for publication. The questionnaire will be included in a future publication.

Results and Analysis

It is important to note at the outset that the study is still in progress. The examination of the second grade children is complete, and questionnaires and materials have been gathered on children with a SNHL within that group. Furthermore, all children known to be hearing impaired and enrolled in programs for such children throughout Costa Rica have been identified and questionnaires have been obtained from them. However, before the study can be completed a final step is necessary. There is a group of children known to be hearing impaired, some not in schools or special programs, who have not been tested or from whom questionnaires have not yet been obtained. There is a reasonable estimate as to the size of that group, but there is no formal confirmation as to the number of children involved. This final step is to be completed in the very near future. Therefore, results can be reported to date, but for now, the figures represent best estimates until such time as the final piece of the national study is completed and the precise size of the hearing impaired population is clearly defined.

There were 12,612 children screened as part of the public school component of the national study of Costa Rica (See Table 1). Of those, 770 (6.1%) failed all screening tests and the follow-up threshold testing by the senior audiometrist. Of the 770, 27 children were lost to follow-up for a variety of reasons including family moves, dropped out of school, one death, etc. Of the remaining 743 children, 314 were found to have only a conductive loss when

examined by the audiologist and were referred for medical treatment. In addition, 333 were found to have normal hearing at the time of the examination by an audiologist. This was, in no small part, due to the medical care these children received as a result of the referral which followed the initial failed screening. The identified conductive losses, normals, and those lost to follow-up came to a total of 674, leaving 96 children, all of whom were diagnosed as having a sensorineural hearing loss. It should be noted that 3 of the 96 actually had a mixed loss. The 96 children were functioning in the public schools, and although 5-10% had been previously known to have a hearing loss, the majority of the children had never been recognized as hearing impaired or received support services for that disability.

Table 1. Results of the Public School Screening Aspect of the Costa Rican Study.

Number Screened:	12, 612 Second Graders (approximately eight years of age)
Number Failed:	770 (6.1%)
Normal Hearing:	333
Lost to Follow-up:	27
Conductive Losses:	314
Sensorineural Losses:	96

As noted at the outset, there are various aspects of this study still in progress. However, results obtained from the public school group coupled with results obtained from the phase of the study involving children enrolled in special education programs for the hearing impaired (reported elsewhere, Mencher & Madriz Alfaro, in press), suggest that the incidence of sensorineural hearing loss in Costa Rica (approximately 1.50-1.63/1000 live births) is within the prevalence range reported by other nations (average: 1.37/1000 live births; Mencher, in press). When the final phases of this study are completed, a more detailed analysis will be reported.

Another area of interest was the ability of the 96 children identified in the school screenings to function in the public schools. It would seem reasonable to assume that the majority of these children were not previously identified because they had mild losses in one or both ears, and that the losses were of such a minimal nature that there was no impact on day-to-day school activity. Nothing could be further from the truth. In fact, over 70% of the children had a moderate bilateral SNHL or worse (see Table 2). All teachers were informed about the presence of a hearing loss when one was found, and asked to comment about the child's performance in the classroom. Admittedly these were subjective opinions expressed by teachers with a wide variety of training and experience. However, the answers do provide an interesting view into the abilities of hearing impaired children to function in normal elementary classrooms. Many teachers reported being aware that the child was having some difficulty, however, the cause of that difficulty was not always known. There were children (estimate: 15) so astute at hiding their losses, or for whom the loss was not a problem, that the hearing problem was

Table 2. Extent of hearing losses of the Costa Rican school children identified in the initial phase of this study - SNHL only (N=93).

Type of Loss in Both Ears	*Percentage of Children*	*Number of Children*
Bilateral Mild (≤ 35 dB)	18.2%	17
Bilateral Moderate (≤ 75 dB)	40.9%	38
Bilateral Severe (≥ 76 dB)	27.3%	25
Mild/Moderate	9.1%	9
Mild/Severe	2.3%	2
Moderate/Severe	2.3%	2

completely unrecognized. Indeed, a small number (estimate: 5) actually excelled in the normal classroom without special assistance or the teacher's knowledge that a loss was present. Additionally, while there were some general trends apparent, the extent/degree of the hearing loss was not always an accurate predictor of the academic achievement level of the child. It should be remembered that the children were in the second grade at the time of this study. Perhaps their success is more a function of the materials and curriculum of that grade than of their own abilities. There is no way of knowing how successful they will continue to be as they progress through the higher grades.

Theoretically, second grade children should have been born in 1988 at the time of this study. Such was not the case. In fact, the age range of the entire test population of over 12,600 children was 7 to 13 years. It was difficult for the examiners to imagine a 13-year-old in the second grade, however, that was the case. The reason for such a seemingly unusual circumstance was related to the Costa Rican government's requirement that a child must meet a certain academic standard before being moved to a higher grade. Some of the children were in school only part of the year because of the agricultural requirements of their community and never managed to complete the academic requirements for their grade.

Initially, it was expected that a number of the hearing impaired children might be amongst those older children in the second grade. It was presumed they would have failed a grade or not been able to meet the academic requirements because of their hearing problem. Once again, that was not the case. The average age of the hearing impaired group was well within the age range expected for second graders (8.0-9.5 yrs) and not one hearing impaired child was beyond 9.5 years of age. In other words, the age profile of the hearing impaired mirrored that of the typical child in the normal hearing group in the second grade classroom.

Discussion

When a nation is asked for a report of the prevalence of hearing losses in its children, it is usually responding to a request by the WHO or a similar organization for some basic data. It is widely recognized that most developing nations do not have a valid answer to that question and will use generally accepted estimates/ratios of hearing impaired per 1000 population to calculate a response based on their own population size (WHO, 1996; WHO & Hearing International, 1995). Of course, in many cases, "their own population size" is a best estimate as they have never carried out a valid population study. Thus, the question of how many hearing impaired exist in a country is an estimate based on a formula based on an estimate of the population size. The problem is further compounded when SNHL and conductive hearing loss are combined in these calculations, making it nearly impossible for a poor nation to plan appropriately for its own population. For example, if a nation reports that 20% of its children have a disabling hearing impairment, it is likely that 15-18% of that 20% represent conductive losses that should be treated medically. Thus, the demand for more physicians, medicines, operating facilities, etc., is great. For the other 2-3%, hearing aids, special education, classrooms, etc. are required. But if the country does not distinguish between these populations in its planning, it will usually spend all its money on the conductive problems and provide little or no services for the children with sensorineural hearing loss.

Canadians consider themselves sophisticated in these matters and, undoubtedly, many readers will think the authors are preaching to the converted. However, a perusal of some of the services provided to First Nations' peoples suggests that similar mistakes are being made in Canada. Further, many Canadians are engaging in volunteer work in the Caribbean, Africa, and Central/South America. Some of that work includes development of programs and services, but regrettably, efforts are often limited to short visits of a week or two in which volunteers offer treatment and/or donate hearing aids to individuals fortunate enough to reach the visiting experts. Unfortunately, donating a few hearing aids to a school for the deaf or treating conductive hearing losses that happen to be present when a clinician visits, is a far cry from developing a model of service delivery for a country. It does not really solve any long-range problems. In fact, it may not even solve short-range problems. We are reminded of the children in one nation visited by one of these authors who were provided new hearing aids, but who could not afford batteries. The result was that as soon as the experts from a well meaning service club went back home and

the free package of batteries went dead, the children were no better off than before. In another case, both authors are aware of children in a poor Central American country being denied use of donated hearing aids in school so the units wouldn't be broken. Provision of the hearing aid without ongoing battery and repair support as well as proper education as to its use and abuse is of little value. We urge those who want to volunteer services to look at the overall view. Help to develop a program for a country, not just supply a few weeks of treatment and devices. Remember the old adage, "Feed a man a fish and he will have only one meal, but teach him to fish and he will eat forever." If a country needs a program but cannot afford it, then help them prioritize what is the most important and useful aspect of that program and help them develop just that portion.

Doing a national study of incidence/prevalence is not easy, but it is vital to the development of long-range services. As Jauhianen (1997. p. 59) suggested,

> Programs need to start or need to be based on a certain degree and availability of epidemiological data on the volume and etiological pattern of the ear and hearing problems involved, which vary from country to country. As soon as there is a concept of the extent of the problem, even if future epidemiological surveys are going to be continued, programs can be outlined to deal with the problems involving (1) treatment of ear infections, (2) regulation of the use of ototoxic drugs, (3) rehabilitation of hearing instruments, language and speech training for children, and (4) organization of educational facilities for children with severe impairments. (p. 59).

One additional advantage of a national epidemiological study is that it must involve the people of the country and its government, leading to a heightened awareness of the need for services for the hearing impaired. Once a careful study has been completed, and the nation has a reasonable picture of the size of the population involved, the types of services available and those required, as well as a sense of the costs involved, the next step is helping them determine priorities. This may be the most difficult part of the exercise, as vested interests compete. That is, disputes invariably rage over such things as funds for schools for the deaf or for integrated classrooms, for intensive programs for middle ear disease or for the cost of hearing aids and cochlear implants. Sacrificing the needs of one group for another is never easy. However, programs need to be systematically developed and justified and that usually calls for the development of logical progressive steps with gradually increasing resources. Hit and miss programs by well-meaning visitors may help to raise awareness of the problem, but are less effective than a systematic approach to defining the problem and its size, channeling resources toward its amelioration, and helping a nation develop within its available resources.

A good case in point is the British Virgin Islands (BVI). Several years ago, one of the authors had been visiting that island nation on a regular basis to help train nurses, examine children, and bring hearing aids. But behind these efforts was a constant attempt to convince the BVI government to establish a more comprehensive program. Over time, the government was convinced that a national study was necessary to really come to grips with the problem and a team from Nova Scotia went to BVI to conduct a thorough study of their children. Other study participants included public health nurses, the Ministries of Health and Education, and a variety of other BVI departments. Now, that country has a comprehensive program including noise control, hearing aids, hearing screening, etc. None of this would have been developed if not for the involvement of the Government of BVI, the people of that nation, and a comprehensive study which helped them to realize the extent of the problem they faced.

Participation in international programs is fun and exciting. It involves travel, meeting people from different cultures, being creative, and utilizing many problem-solving skills. It is a wonderful opportunity. But it is also carries with it a tremendous responsibility. Being an "expert" means people look up to you and depend on you. It means you must assume real responsibility for what you do and how you do it. It means working to better the human condition, but it also means helping to develop services and helping to make your profession grow. Taking such responsibility is critical to making a real and lasting contribution. By doing so you will have earned the sense of accomplishment you will feel when you look back at the places you have been, the people you have met, and the lives you have affected.

Submitted: October 1999
Accepted: December 1999

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