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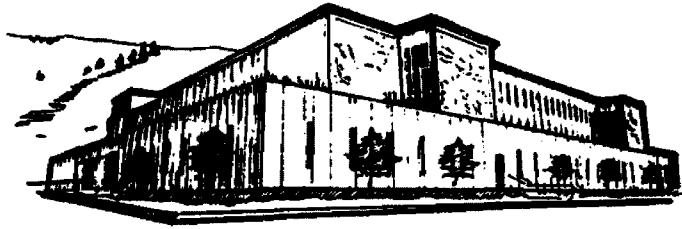
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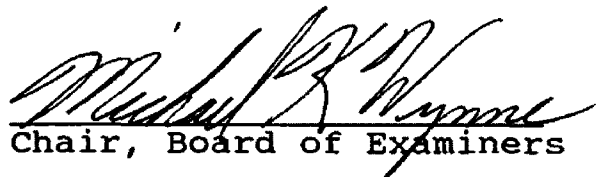
THE FAILURE RATE OF HEARING SCREENING
Among Migrant and Seasonal Farmworkers in Montana
During the 1988 Season.

By:


Yusnita Purnomohadi Weirather
B.A. Vacana Mandira College, 1977

Presented in partial fulfillment of the requirements
for the degree of
Master of Arts
University of Montana
1989

Approved by:


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The failure rate of hearing screening among migrant and seasonal farmworkers in Montana during the summer of 1988.

Director: Michael K. Wynne. 

This study investigated the failure rate among a population of migrant and seasonal farmworkers who participated in a hearing screening in Montana during the summer of 1988. This study also examined the relationships between the failure rate and the following variables: age, gender, ethnic background, and the length of time in migration (for the adult subjects only). A total of 484 children and 52 adults participated in the hearing screening. All subjects were screened using the guidelines developed by the Montana Office of Public Instruction and the US WEST Foundation's Rural Speech and Hearing Outreach Program. The results indicated that 38% of the adults and 11% of the children failed the pure tone screening, while 1% of the adults and 10% of the children failed the oto-immittance screening. The failure rate was observed to vary considerably as a function of the parameters identified above.

Due to the small sample size of adult subjects, the generalization of the adult data is restricted. A statistical comparison of the data obtained for children to the data obtained for children from the Education Hearing Conservation Program generally indicated a greater prevalence of negative screening outcomes for the migrant children than for their Montana peers. A follow-up study was recommended to more closely examine the relationship between the failure rate and the length of time migration for adult migrant workers. In addition, conventional screening protocols, referral criteria and result dispositions should be more fully developed in order that the hearing status and hearing health care needs of the migrant worker population can be better defined.

ACKNOWLEDGEMENTS

The word "migrant worker" contains a stereotyped meaning which relates to hard work. In my limited experience in knowing more about this population and the organizations which deal with them, the notion of "hard work" was very much apparent in the commitment of both professionals and workers to the future of the migrant workers.

The following individuals clearly reflect this image of hard work as they unselfishly provided me with unsolicited and valuable information in a very timely manner: Ms. Irene Bushnell of the Rural Employment Opportunities, Inc., Helena; Ms. Joan Smith of the East Coast Migrant Head Start Project, Virginia; Ms. Valerie A. Wilk of the Farmworker Justice Fund, Inc., Washington, D.C.; Ms. Angela M. Branz-Spall of the Office of Public Instruction, Helena; and finally Ms. Maria Stephens, the Executive Director of the Montana Migrant and Seasonal Farmworker Council, Inc., Billings. Their information made most of Chapter II possible.

I would also like to thank Ms. Barbara Ranf and the U.S. WEST Foundation for providing the financial support to extend the Rural Speech and Hearing Program in Montana to the migrant and seasonal farmworkers and their families in the Yellowstone Valley. Without the Foundation's support, this project would not have been completed.

Writing a thesis is not just an act of transferring and expressing data and ideas but using this material in

constructing a new and meaningful document. As a first-time thesis writer, I greatly appreciated the academic guidance of Dr. James M. McQuiston; the guidance in technical writing and finding information from Dr. Anthony F. Beltramo, the guidance in applicability and consistency of the thesis content from Dr. Charles D. Parker, and the content and technical direction from my thesis director, Dr. Michael K. Wynne. I am particularly grateful for the assistance of Dr. Wynne who had unenviable tasks of encouraging me to complete this thesis as well as chiding me to complete the drafts before certain deadlines. Finally, I would like to give a special thanks to Dr. Jesse G. Kennedy for his guidance and availability on short notice to bring this thesis to a successful conclusion. I believe that all of your contributions to my thesis project will not be forgotten as they contributed to my academic and personal maturation.

From the earliest preparations to the final document, I was guided and fortified by the unswerving support of my husband. I have struggled with many physically, psychologically and emotionally problems during this project and he was the only person who brought me through until the end. Thank you, Randy.

With the assistance of all of the above people, as well as from many others who have helped along the way, I hope very much that the results of this study will contribute to a better life for the migrant and seasonal farmworkers in the United States.

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CHAPTER I : INTRODUCTION

Background information.

Over the past sixty years, America has been witness to an expanding workforce consisting of migrant and seasonal farmworkers. This is the result of the increased annual need for a large labor force to engage in the extensive activities involved in the planting, care, and harvesting of fruits and vegetables across the United States.

Estimates obtained from data collected in 1986 indicated that roughly 3.5 million migrant and seasonal farmworkers, including their dependents, are hired in the United States each year (Wilk, 1986). This number has been steadily increasing during the past few years and, as a result, this trend has generated a distinct impact on the nature of American society.

The main features that distinguish these migrant and seasonal farmworkers from other workers in the United States are their ethnic backgrounds with the concomitant language and cultural differences, living conditions, salaries and benefits, annual incomes (which fall below the poverty level for farmworkers), occupational safety practices, and health care attitudes. These differences have had and will continue to have a direct and indirect impact on the workers health status.

Although the migrant and seasonal farmworkers have been part of the social and economic life in the United States for several decades, effective health care planning and intervention models are not readily developed or implemented for these workers. The lack of these models, in turn, have limited the description of the any comprehensive demographics or valid health statistics for this population (Littlefield and Stout, 1987).

In the area of hearing health care, many questions have been raised due to the high incidence of otitis media among migrant children, the possible adverse effects of pesticides on the auditory system, and the exposure to high levels of noise from farm equipment. Some limited health care data collected within the past 10-15 years and reported by Farmworkers Justice Fund, Inc, have indicated that migrant and seasonal farmworkers face overlapping and serious health hazards (Wilk, 1986). In regard to hearing health care, otitis media was identified as the fifth most frequent diagnosis made by upstream (working place) as well as downstream (home-base) migrant health centers. However, Wilk (1986) stated that these data were not representative of the migrant workers in the United States due to the existence of unpublished, out-of print or uncataloged health records. Furthermore, these farmworkers often sought medical treatment only for acute conditions rather than for

any disease prevention or health maintenance. In spite of the above data, there apparently has not been a systematic and published study regarding the status of the auditory systems in a population of migrant and seasonal farmworkers. In addition, the incidence and prevalence of the more common otological and/or audiological disorders are not known for this population.

Statement of the problem.

The purpose of this study was to investigate the prevalence of hearing impairment in a cohort of migrant and seasonal farmworkers as well as their children. This cohort was limited to those individuals who participated in a health care program provided by the Montana Migrant and Seasonal Farmworker Council in Yellowstone Valley, Montana, during the 1988 sugar beet weeding season. Specifically, the following questions were addressed:

1. What is the percentage of migrant and seasonal farmworkers, and their children, who have a hearing loss as identified by screening audiometry?
2. What is the relationship between the prevalence of hearing loss in this population and the following variables: age, gender, ethnic background and the length of time in migration?
3. Do the children of migrant and seasonal

farmworkers have a higher percentage of hearing loss as compared to a sample of nonmigrant children seen by the Montana Educational Hearing Conservation Program and by the Rural Speech and Hearing Outreach Program in Montana?

CHAPTER II : REVIEW OF THE PREVIOUS LITERATURE

Definition of the population

Migrant and seasonal farmworkers are individuals whose primary income comes from agricultural work. They can be further differentiated by their residential status; that is whether they are foreign or domestic workers. A migrant farmworker is defined as a "foreign" worker whereas a seasonal farmworker is defined as a "domestic" worker. Unfortunately, these definitions are not uniformly used by every government or community agency. In practice, each agency uses its own definitions which are related more to the worker's length of employment than to his citizenship (Wilk, 1986). Sakala (1987) stated that clear-cut definitions describing the workers often become arbitrary because many workers often shift their status from seasonal to migrant and vice versa according to political, economic and weather conditions, personal circumstances, or other factors. The subjects of this study were workers who migrate from one farm area to others with or without their families during the planting and harvesting seasons, regardless of their residential status or length of employment.

Characteristics of Migrant Workers

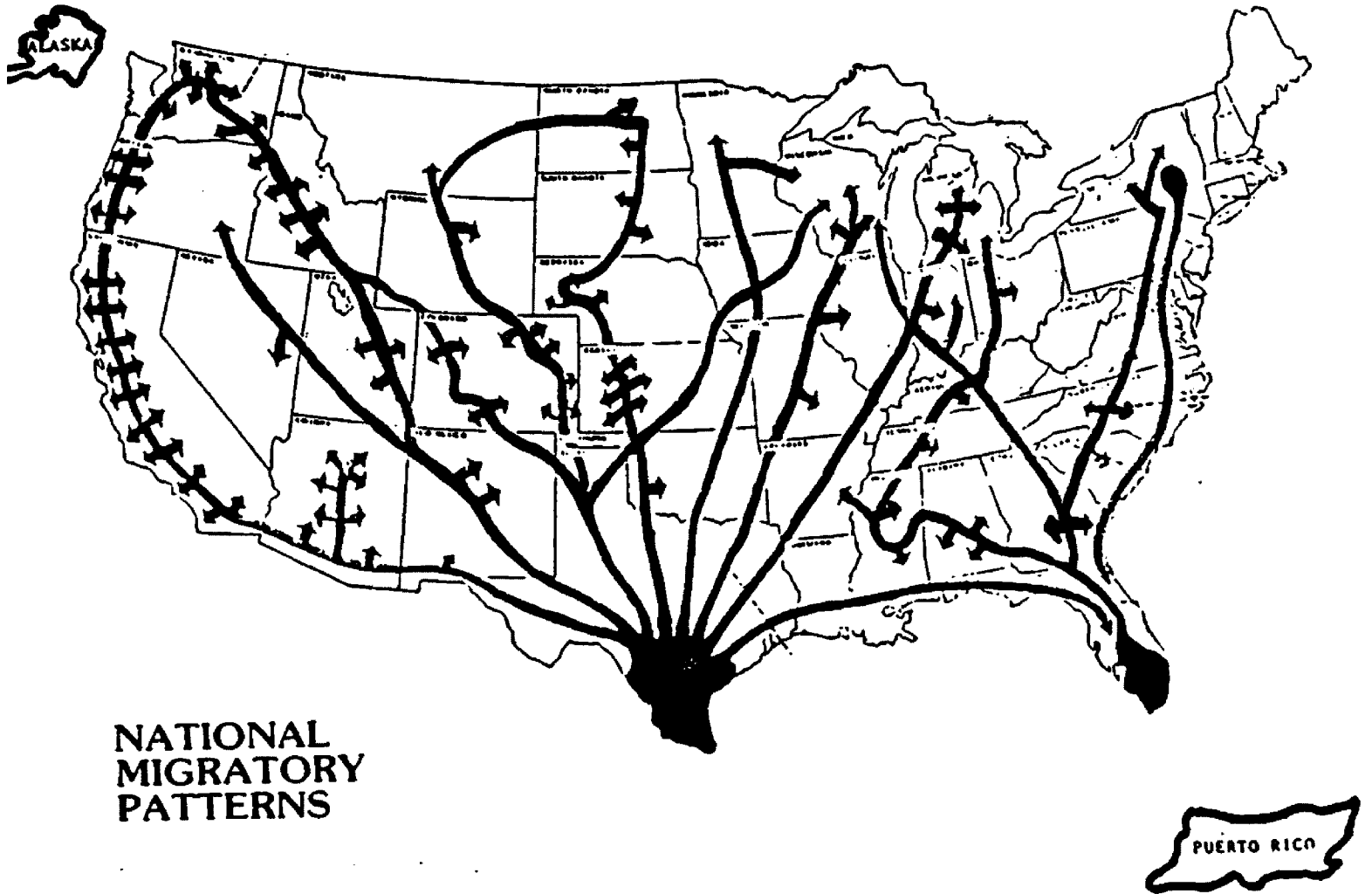
The migratory nature of this population causes some anxiety and uncertainty in these workers and their families

in response due to their poor socioeconomic status and the risks that this status offers. These workers are often never certain about where they will go, where they will stay when they get there, or what their future may bring. Their annual migration pattern is illustrated in Figure 2.1.

In Montana, 65% of the migrant population identify Texas as their home state. The remaining workers and their families come from Washington, California, Oregon, Florida, and Wisconsin while a small number of workers come from Mexico and Central America (Newsletter of the Montana Migrant Health Project, 1987; Montana Office of Public Instruction, 1987).

The migratory nature of this population exposes the workers and their families to a variety of health problems and often causes a discontinuity in their medical care (Wilk, 1986). This is true especially for children who are medically treated with antibiotics for persistent episodes of otitis media. Often before the medical treatment is completed, they will have moved to another work site and the medicine is frequently lost along the way. As a result, the dosage is often increased at the next work site. Furthermore, after they recover, subsequent bad weather may lead to a recurrence of the middle ear infection. Thus, in some cases the child may be over-medicated by a new physician and in other cases, the child may not receive any additional medical services at all (Newsletter of the

Figure 2.1.



U.S. Department of Education (1987), p. 12.

Montana Migrant Health Project, 1987). Finally, as the virus or bacteria may become resistant to the antibiotic, the medication may become essentially ineffective in the treatment of the child's middle ear infection. The situations described above are considered to be typical patterns for migrant workers and their children. These patterns often result in an ineffective and inefficient medical care program for many otologic diseases.

Two unique characteristics of this country's migratory population are their ethnic heritage and language distinctions. Approximately 85% of the migrant and seasonal farmworkers are Hispanics while the remaining 15% are Anglo, Black, Native Americans or Southeast Asians. Many, if not most, of the Hispanic workers have only a minimal knowledge of the English language (U.S. Department of Education, 1987). These language barriers can and do pose significant difficulties in the provision of health services in many health clinics without a bilingual staff. Furthermore, a strong sense of family, self-sufficiency, and responsibility encourages these workers to solve their own problems independently. As a result, any interference from a public agency may cause the entire worker's family to relocate.

Poverty is often thought to be the primary characteristic responsible for the migrant worker's social status and health conditions. By assuming that poverty is often a life style which is passed from one generation to

the next, one can understand that a poor economic status is not the only condition caused by the migrant worker's poverty, it also manifests a distinct subculture for this population. Any subculture creates boundaries between itself and the society at large where integration and adaptation become difficult if not impossible. These boundaries are not only created by the low socioeconomic class of the migrant workers but also by the beliefs of the larger society. The poor do not usually attempt to solve their problems by approaching institutions or agencies because either they cannot afford it, they are not eligible for the service, or they are not optimistic about the results. On the other hand, members of the larger society often discriminate against migrant workers and their families as they are often suspicious or fearful of this subculture (U.S. Department of Education, 1987)

Poverty has been routinely correlated with conditions of malnutrition, inadequate sanitation, overcrowded housing and an insensitivity or inattention to disease symptoms, all of which lead to a poor health status. This poor health status, in turn, may increase the incidence of any disease condition such as otitis media. These poor health conditions are further compounded by lack of services of good professional health care, as confirmed by a large number of studies described by Paradise (1980).

Occupational safety.

Sakala (1987) listed four major occupational hazards faced by the migrant workers: pesticides, exposure to sunlight, injuries and poor field sanitation. In their study among agricultural workers in Southwestern Idaho, Bondy, Lebow, Malley and Reilly (1976) added noise exposure as another potential hazard. However, the results of this last study appeared to be contaminated by several uncontrolled variables such as the excessive ambient noise conditions in the test environment, a lack of follow-up for the persons who failed the screening, and a lack of consistency between the patient's history and the severity/configuration of the hearing loss recorded on his audiogram.

The noise levels generated from the tractors and other heavy farm equipment during seedbed preparation often exceed 93 - 95 dBA (Bondy, Lebow, Malley and Reilly, 1976). According to the Occupational Safety and Health Act (Federal Register, 1969), workers are allowed to work in these high noise level environments for no more than four hours per day in order to protect their auditory systems from developing a noise-induced hearing loss (Melnick, 1985). Unfortunately, there is currently no means to verify that farmers comply with these regulations. As a result, many workers are exposed to dangerously high levels of noise and even a greater number of workers are unaware of the nature and

consequences of the noise-induced hearing loss.

The second major hazard that relates to hearing health is the worker's exposure to chemical pesticides. The primary avenue of pesticide exposure is through dermal absorption, while secondary exposure is through inhalation and ingestion. The clinical conditions connected with chronic exposure to pesticides are noted by some researchers to include Bell's Palsy, Guillain-Barre syndrome, Parkinson's disease, aplastic anemia, deafness, premature birth and diabetes mellitus (Sakala, 1987).

Eight hundred million pounds out of the one billion pounds of pesticides used annually in the United States are applied to approximately 20% of the nation's total crop acreage (Wilk, 1986). These crops are mostly require extensive manual labor. Not only are the seasonal workers exposed to a proportionately large amount of pesticides when they work in these fields but they also live in close proximity to the farm area during periods of maximum pesticide application. These workers are, therefore, all the more at risk for an inordinate exposure to chemical pesticides. However, no specific data exist which clearly define the adverse effects that may arise from such exposure among migrant and seasonal farmworkers. Wilk (1986) stated that this paucity of data is due mainly to three factors: (1) the absence of information among the farmworkers themselves about their exposure to work place hazards,

(2) the lack of physician training in recognition and treatment of these problems, and (3) the lack of a national reporting system to tabulate such poisonings.

Epidemiology.

Epidemiology is a science whose methodology is descriptive, analytic and comprehensive. Greenberg (1965), in his book Studies in Epidemiology, defined epidemiology from its two Greek roots, epi which means "upon" and demos which means "people". In its modern usage, epidemiology is comprised of methods which are not only concerned with the causes, subject susceptibility factors and environments of both communicable and noncommunicable diseases, but also with the comparative studies investigating the incidence and the prevalence of hearing disorders (Hinchcliffe, 1979).

In the application of the epidemiologic method, the disease is measured by identifying the rate of new occurrences of the disease and the number of existing cases over a given time period. Incidence rate is defined as the number of people who are newly affected by a particular disease over a given population at risk during a certain period of time. Prevalence rate is defined as the total number of cases of a particular disease in the population during a certain period of time. Incidence is primarily used to identify the etiology or communicability of a disease, while prevalence is used to plan the treatment and rehabilitation of a disease (Morton & Hebel, 1979) as it

documents the actual number of cases requiring services.

The current study focused on the prevalence of hearing impairment in migrant and seasonal farmworkers for the purpose of designing and implementing future audiology intervention programs. Several previous studies have indicated migrant and seasonal farmworkers with their children have an increased incidence of infection and chronic diseases, generally at a rate several times greater than that of other children in the United States. This is thought to be due to their overall socioeconomic and health conditions (Slesinger, Christenson and Cautley, 1986).

Otitis media was found as the sixth most frequent diagnosis in 1979, and the fourth most frequent diagnosis in 1980 in the medical evaluation of these workers and their children (Wilk, 1986). The prevalence rates of several diseases for the migrant populations are shown in Table 2.1. Due to the high prevalence of otitis media, some type of intervention program for the identification, evaluation, and treatment of middle ear pathology is warranted with this population.

In Montana, where approximately 40% of the migrant population have had a history of either viral or bacterial infections, the prevalence of otitis media is felt to be relatively high (Newsletter of the Montana Migrant Health Project, 1987). Infections of the ear, nose and throat were identified as the most common infections within this cohort.

Table 2.1.
 Frequency of diagnosis within federally funded
 migrant health centers - 1979 & 1980 (Wilk, 1986)

Diagnosis	No. Times Cited	% T*	% N†	Total No. Encounters**		% 1979	Rank in Re. No. Encounters	
				1979	1980		1979	1980
Acute Upper								
Respiratory Infection	40	66.66	95.24	23,671	30,364	+28.3	3	3
Hypertension	35	58.33	83.33	30,745	32,067	+ 4.3	1	2
Obstetrics	34	56.66	80.95	27,392	36,125	+31.9	2	1
Diabetes Mellitus	27	45.00	64.29	14,526	17,266	+18.9	5	6
Otitis Media	25	41.66	59.52	12,962	17,931	+38.3	6	4
Dermatitis	21	35.00	50.00	2,846	3,727	+30.95	11	11
Trauma	20	33.33	47.62	3,441	4,132	+20.1	9	10
Urinary Tract Infection	20	33.33	47.62	9,875	10,705	+ 8.4	7	7
Anemia	13	21.66	30.95	15,772	17,889	+13.4	4	5
Obesity	13	21.66	30.95	3,356	4,322	+28.8	10	9
Gastroenteritis	13	21.66	30.95	2,091	2,594	+24.1	13	13
Family Planning	12	20.00	28.57	3,539	6,827	+92.9	8	8
Heart Disease	11	18.33	26.19	2,220	2,671	+20.3	12	12

*These diagnoses are actual, not groupings of related diagnostic categories. Hicks (1982), p. 20.

**Encounter data was of poor quality. Many Migrant Centers did not have this data. For those reporting data, some had 1979 only, some 1980 only. Several of the reporting data "double counted" i.e., they reported their encounters in terms of *primary* and *secondary* diagnoses. These data do not include encounters identified by respondents as "double counted." Total number of encounters for all conditions not specified.

†T = total number responding to survey (60).

‡N = total number providing some data regarding diagnoses (42).

In addition, Klein's (1983) epidemiological study in Boston found that Hispanic children had the highest incidence of otitis media when compared to the results of children from other ethnic or racial populations. These differences in the incidence rates of otitis media among these children were not felt to be a function of socioeconomic status. Instead, they were thought to reflect differences in the morphology of the auditory mechanism between races. Still, this hypothesis has not been substantiated by other research findings (Paradise, 1980). The results of Klein's study also indicated that children in crowded housing were more likely to develop otitis media than those in less crowded households.

Farmworker' health care.

By reviewing the preceding discussion, one may conclude that an intensive health care program is a tremendous need of the farmworker population, for both children and adults. The Migrant Health Program was designed to assume the major responsibility in providing health care services, but the quality and quantity of services delivered to migrant and seasonal farmworkers varies across centers due to variations in the size of funding and staff. Nevertheless, a minimal or core group of health services is felt to specifically include immunizations, dental care, hypertension follow-up, pap smear follow-ups, adolescent family planning, counseling visits and anemia screenings (Wilk, 1986).

For various social, political and economic reasons as well as limited knowledge about health problems, many migrant and seasonal farmworkers do not avail themselves of the services regardless of the services provided. They often prefer to treat health problems themselves by using herbs or over-the-counter medications. According to the 1985-87 report from the Migrant Health Office in Montana, less than 50% of the past year's workers who needed medical assistance actually sought some form of medical assistance.

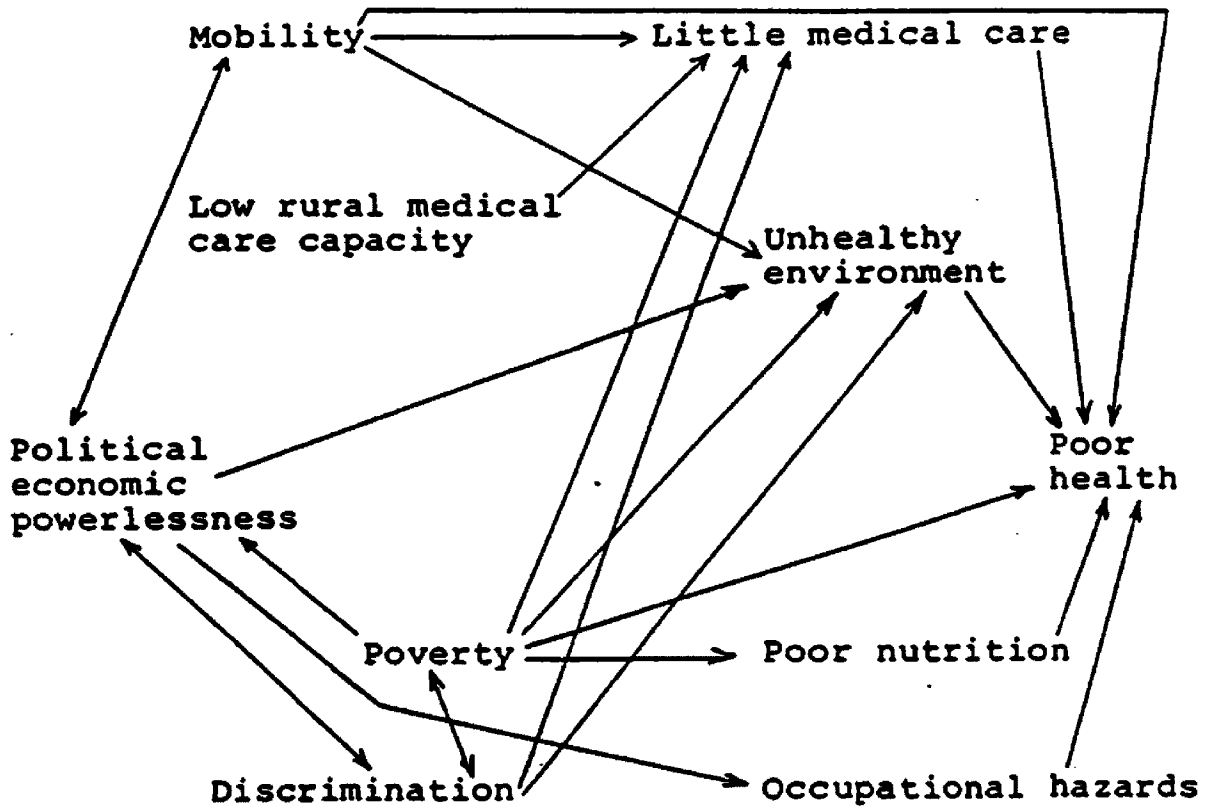
Many factors contribute to a worker's poor health status. A model presenting these factors is illustrated in Figure 2.2. This model was modified from that presented by Shenkin and cited in the Bondy (1976) study. While most health care systems will target poor health conditions for remediation, it is clear that these systems are severely compromised in the effectiveness of their remediation by the presence of so many other health related factors that are often beyond the worker's control.

The comprehensive identification of health problems in the children of migrant and seasonal farmworkers has been more systematic. State educational agencies qualified to apply for an annual grants for programs designed for migrant children with priority must be given to children enrolled in kindergarten through grades 12. In spite of regular academic instruction, the program also provided medical screening such as immunizations, eye and hearing screenings.

Figure 2.2.

Causal scheme of poor health care among migrants

(Shenkin as cited in Bondy et al., 1976)



The health records, together with the child's records of educational progress, must be transferred to the Migrant Student Record Transfer System (MSRTS). The MSRTS is a nationwide computerized communications network based in Arkansas. It is designed to transfer the records of migrant students as they move from school to school or from location to location and thus improve the ability of the health and school personnel to provide appropriate programs for these children (U.S. Department of Education, 1987).

Summary.

"Americans pay a smaller percentage of their income for food than the citizens of any other industrialized nation"

(U.S. Department of Education, 1987, p.3).

Statements such as the one presented above allow the reader to suspect that agricultural workers, and farmworkers in particular, receive comparatively less of the economic pie than do other categories of workers. Clearly, the standard of living for most farmworkers is low due to their inability to tap the wealth which is available in an industrialized society. "Trickle down economics" leaves very little financial reward for the agricultural worker. The problem is compounded if the farmworker is a migrant worker. Previous studies of this population have overwhelmingly found an intricate overgrowth of political, social and occupational factors which have a cumulative

unfavorable impact on their health conditions. Even though the sources of these problems have been identified and systematic recommendations have been made to alleviate some of them, the concomitant and subsequent health problems cannot be ignored. To this end, the field of health services requires an intensive health care model. In addition to providing primary health care services, the status of the auditory system of the migrant and seasonal farmworkers and their families must also be addressed through appropriate and effective identification & assessment programs. Appropriate intervention programs should be then implemented, if needed. The purpose of the present study was to identify the need for comprehensive audiological services for the migrant worker population in Eastern Montana.

CHAPTER III : METHODOLOGY.

The hearing screenings were conducted between June 14 and June 25, 1988. The screening sites were located at seven public schools and six health clinics across the Yellowstone Valley from southeastern Montana to the northwest corner of North Dakota.

Subjects.

Children. A total 484 children (260 females and 224 males) participated in the hearing screening. The distribution of children by gender who participated in this study was relatively equally divided between male and female children as shown in Table 3.1. Table 3.2 presents the number of participants within four age categories. As the public schools also acted as day care centers for children between the ages of one month and three years, the children who attended school therefore ranged in age from one month to twenty-one years. The number of older school-aged children (greater than 12 years of age) participating in this study was found to be limited (11 subjects) due to the need of many migrant families to use their older children as additional field laborers in an effort to improve the family income. The children screened through this program primarily included those children who were enrolled in a public school program sponsored by the Montana Migrant Program. As a consequence, the migrant and seasonal

Table 3.1.
The distribution of children subjects
according to their gender.

	Male	Female	Total
Infant	42	61	103
Preschool	44	44	88
Kindergarten	37	51	88
School age	101	104	205
Total	224	260	484

Table 3.2.
The distribution of children subjects
according to their age group.

Age group	Number screened
Infant (0 - 2 years)	103
Preschool (3 - 4 years)	88
Kindergarten (5 - 6 years)	88
School age (7 - 16 years)	205
Total	484

farmworkers' children who attended school at the time of the hearing screening automatically received the hearing screening. The actual number of children enrolled in the program differed from the number of children who were actually screened as some of the children had already left the area with their families due to the field conditions at the time of the screening. In addition, these data differed markedly from the total number of children who were apparently on site as revealed by family registrations in a census count. Figure 3.1. illustrates these discrepancies.

Adults. The adults screened through this program primarily included the patients from the various health clinics and any adult volunteer who indicated interest in receiving this hearing screening (N=52). The majority of the adult subjects fell between seventeen and fifty-four years of age. One subject reported that she was 64 years of age and there were no subjects who stated that they were older than 65 years of age.

Table 3.3 shows the distribution of adults who participated in the hearing screenings according to their gender, ethnic background, and the length of time in migratory work. Only one family, which consisted of two adults and two children, did not have a Hispanic origin, having instead a Native American origin. The length of time in migration appeared to be independent of the subject's age

Figure 3.1

The distribution of children according to census count, school enrollment records, and hearing screening data.

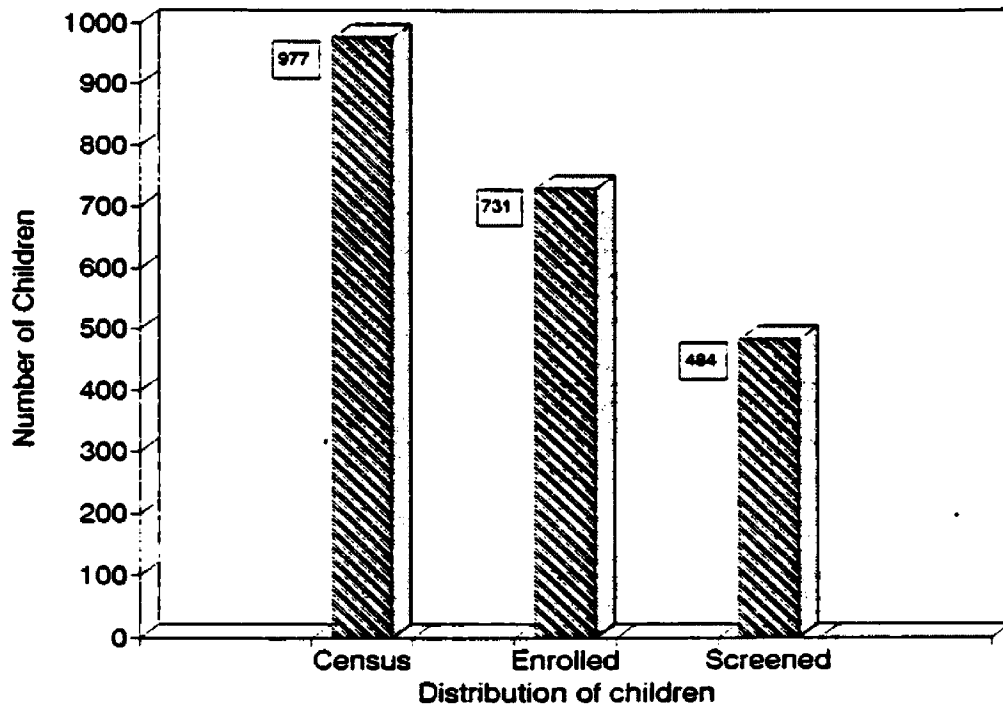


Table 3.3.

The distribution of Adult subjects according to
 their gender, ethnic background,
 and years in migration.

	Female	Male	Total
Hispanic	30	20	50
Native American	1	1	2
Migration time:			
1-5 yrs	13	7	20
6-10 yrs	10	4	14
11-15 yrs	1	3	4
16-20 yrs	5	4	9
21 or more	1	4	5

as some adult subjects had been migrating since they were born while others entered the migration flow only after they reached thirty years of age.

Group characteristics. The overall number of participants in each screening site (schools and health clinics) is identified in Table 3.4. The "0" indicates that there were no subjects in that particular age range while the "-" identifies that a hearing screening was not conducted in that particular area. As is presented by this table, the communities of Billings, Sidney, and Glendive, Montana, and the community of Trenton, North Dakota, had the largest concentrations of migrant workers who participated in the hearing screening program. Generally, as the sugar beet harvest in the Yellowstone Valley occurs early in the migratory season, many migrant and seasonal farmworkers come to this Valley as their first stop along their migratory routes. These workers and their families who participated in this study come primarily from the southwestern United States and Mexico. As seen in Table 3.5, approximately 79% of the subjects identified Texas as their primary domicile.

The family occupations were also found to be very similar across the workers at the time of screening. Most subjects reported picking, thinning, and weeding as their primary occupations.

Table 3.4.

The distribution of all subjects according to
school and health clinic sites.

Site	School				Health clinic					Total
	Age group				Age group					
	I	Ps	Kg	Sa	I	Ps	Kg	Sa	A	
Billings	11	11	12	26	1	2	0	8	7	78
Fromberg	8	6	7	14	-	-	-	-	-	35
Bridger	-	-	-	-	0	0	0	0	0	0
Hardin	12	15	13	22	1	-	-	-	7	70
Hysham	7	9	11	24	0	0	0	2	11	65
Glendive	21	11	15	27	1	0	0	0	5	80
Sidney	23	21	13	45	-	-	-	-	-	102
Fairview	-	-	-	-	4	1	0	5	22	32
Trenton	15	12	15	33	-	-	-	-	-	75
Total	97	85	86	191	7	3	0	15	53	536

I = Infancy (0-2)
 Ps = Preschool (3-4)
 Kg = Kindergarten (5-6)
 Sa = School age (7-16)
 A = Adult (17+)

Table 3.5.

The distribution of subjects according to
their identification of domicile.

Home base	Number of subjects participating							Total
	Gl.	Sd.	Hy.	Hr.	Bl.	Fr.	Fv.	
Texas	74	94	51	51	47	17	33	371
Washington	3	2	-	2	1	12	-	20
Florida	-	5	4	5	5	-	-	19
Oregon	-	3	6	-	6	-	-	15
California	-	3	-	12	-	-	-	15
Kansas	6	-	-	-	-	-	-	6
Arizona	-	-	-	5	-	-	-	5
Idaho	-	-	1	-	2	1	-	4
Wisconsin	-	-	-	-	1	-	-	1
Nebraska	-	-	-	1	-	-	-	1
Mexico	-	-	-	2	4	4	-	10

Gl. = Glendive ; Sd. = Sidney ; Hy. = Hysham; Hr. =
Hardin; Bl. = Billings ; Fr. = Fromberg and Fv. = Fairview.

The data from Trenton was not available.

Instrumentation.

The screening protocol consisted of otoscopic inspection of the external ear canals, manually operated pure-tone audiometry, oto-immittance screening and sound level measurements of noise in the test environments.

A Welch Allen 2.5 volt otoscope with size #3 speculum was used during the otoscopic inspections. Each speculum was cleaned and sterilized prior to each use. Two portable Maico MA-20 pure-tone audiometers with TDH-39P (10 ohm) earphones and MX-41/AR cushions were employed for the pure-tone screening. The audiometers were calibrated electroacoustically one week prior to and one week after the study and met the ANSI S3.6-1969 (ANSI, 1969) standards for pure-tone audiometers. Daily biological calibration was performed on each audiometer prior to each screening. This listening check was performed to rule out extraneous mechanical and electronic noise, cross-talk, loose attenuator and frequency dials, damaged cables and loose connectors (See Appendix A).

The oto-immittance screening was accomplished by a Madsen ZS76-B Model PS 100-1 portable electroacoustic impedance bridge. An annual conventional calibration of the immittance instrument was performed prior to the screening project in order to determine the intensity and frequency of the probe tone, the rate and degree of manometer changes,

and the accuracy of the volume measurements. A daily biological check was conducted prior to each screening to insure its appropriate operation and function. The results of the daily biological checks were documented in a form which is also presented in Appendix A.

A Realistic Model 33-2050 Type II sound level meter was used to measure the ambient noise levels of the screening environments. The ambient noise levels were determined prior to each screening and then during the screening if there was any necessary change in environments noise. All noise measurements fell below the measurement floor of this sound level meter (less than 50 db SPL). The calibration and ambient noise measurement worksheets are presented in Appendix B.

Method.

In attempting to estimate the prevalence of hearing disorders in a population of migrant and seasonal farmworkers, this study incorporated the following protocols: a brief case history, an otoscopic inspection, an oto-immittance screening, a pure-tone air conduction screening and an interpretation conference if needed.

The hearing screening was conducted by two graduate students and one instructor from the Department of Communication Sciences and Disorders at the University of Montana. The instructor, a licenced audiologist with the

Certificate of Clinical Competence in Audiology of the American Speech-Language-Hearing Association, was present throughout the screening in order to supervise the screening personnel, to monitor protocols, and to direct any medical or audiological referrals. The project also received administrative assistance from the Montana Migrant and Seasonal Farmworkers Council during each screening.

Hearing screening was conducted in five permanent health clinics in five communities and in one mobile health clinic which was parked in Hardin and Hysham during a community outreach. Several announcements, generally consisted of bulletins in English and Spanish languages distributed at each health clinic and given to each child at school, were made at every site prior to each screening date. The children were instructed to take the pamphlet home to his or her parents to announce the hearing screening.

The hearing screening began by obtaining the identifying information and any relevant case history information. The case history was administered by a bilingual staff member or volunteer in order to overcome any language barriers. The case history form is presented in Appendix C. For preschool and school-age children, the intake information was obtained from an interview with their parents and/or with their school teachers when this

information was deemed necessary. All subjects were instructed in English or Spanish depending on their competence in English.

The otoscopic inspection was used to identify any possible congenital and/or traumatic deformities of the auricle, collapsing ear canals, ears with excessive cerumen, presence of foreign objects, and any gross abnormalities of the tympanic membrane. If the otoscopic inspection identified any of these possible problems, appropriate action was taken either by incorporating a modification in the screening protocols (e.g. collapsing canal) or by providing a medical referral to the health clinic for further medical intervention (e.g. foreign object or excessive cerumen in the ear canal).

The third protocol was the oto-immittance screening using tympanometry only. Due to equipment limitations, acoustic reflexes were not tested. Tympanometry has been documented as being effective in enhancing sensitivity in detecting otitis media when it is used in conjunction with pure-tone screening (Barrett, 1985). In addition, oto-immittance screening can accommodate an uncooperative individual who is not able to respond to conventional pure-tone audiometry for the identification of possible conductive hearing losses.

Finally, some of the children who were older than seven

years of age (26 subjects) did not receive tympanometry due to time constraints during their screening. However, all children older than six months and below seven years of age were tested by tympanometry often twice if the otoscopic inspection did not permit a good visualization of the tympanic membrane, showed scarring of the tympanic membrane, or suggested any other possible sign of external or middle ear disease.

The final protocol administered during this screening was pure-tone audiometric testing. The ASHA 1985 (American Speech and Hearing Association, 1985) guidelines for identification audiometry stated that pure-tone air conduction testing is considered an important tool in identifying any hearing impairment which interferes with or has the potential to interfere with communication abilities. These guidelines specified that the examiner should use screening levels at 20 dB HL for the frequencies of 1000 and 2000 Hz, and 30 dB HL for 4000 Hz. Both play and conventional audiometric techniques were used to elicit responses during the pure tone testing.

Results.

Screening criteria. The screening criteria followed the ASHA 1985 guidelines for identification audiometry. The subjects failed the otoscopic inspection if the tympanic membrane was not visible due to occluding cerumen in the ear

canals or if the ears were draining. The tympanometric results were classified as Class I - pass, Class II - at risk , and Class III - fail. An individual passed the oto-immittance screening (Class I) if the tympanometric peak pressure was obtained between +50 dekapascals (daPa). A compliance peak occurring at a pressure from +100 to - 300 daPa qualified the individual as being at risk (Class II), and when the peak compliance for tympanometric testing occurred beyond an air pressure range of +100 or -300 daPa, the subject failed the screening (Class III) and received a medical referral. An additional description of each result and the referral criteria are presented in Appendix D.

Any person who failed to respond to any of the pure tone stimuli for any test frequency and at the screening levels used for air-conduction testing, whether in one or in both ears, was considered at risk for a significant hearing loss. Threshold estimates were then obtained at those frequencies where the individual failed to respond at the designated screening levels of 20 dB at 1000 and 2000 Hz, and 30 dB for the at 4000 Hz pure tone stimuli. When the threshold showed 15 db or greater differences between the estimated threshold and the screening level for any frequency, the subject received an audiological referral. Otherwise, an annual hearing screening was recommended to the subject.

The "DNT" (did not test) criteria in the result's presentation represented those subjects who could not be tested for any one of a variety of reasons. As a result, they failed to produce any reliable data regarding their hearing status.

Referral. The referral criteria for these screening protocols and the recording forms are presented in Appendix D. "MR" (medical referral) took place when the subject failed a recheck due to either an abnormality in the otoscopic inspection or in the middle ear pressure (less than -300 daPa) as measured by a portable Madsen ZS76-B electroacoustic impedance bridge. "AR" (audiological referral) took place when the subject failed an audiometric screening due to a failure to respond to pure tone testing at any frequency presented at the screening intensity levels (in the absence of abnormal otoscopic or oto-immittance screening results), or a failure to respond to pure-tone testing only with thresholds obtained at 15 dB or above the screening levels at any two of the frequencies. This final referral criterion was modified from the original criteria on-site and used to avoid a high over-referral rate.

For those children who required a medical referral, a referral form was provided and accompanied by letter to the parent in either English or Spanish language as presented in Appendices E and F.

Finally, the results for each child were summarized and forwarded to their teachers. The referral forms for any adult subjects who failed the hearing screening were submitted to the health clinic for further intervention. These referral forms are presented in Appendix G.

Rescreening. Children and adults were determined to be "at risk" if they failed either the oto-immittance and/or pure-tone testing and if they did not receive any medical or audiological referral. The subjects in this grouping were documented as requiring future monitoring by a hearing health professional, primarily as an annual hearing rescreening offered by this or another hearing conservation program.

Reliability.

Inter-examiner reliability was conducted on 25 subjects who failed the initial screening. These subjects were retested twice, once by a second examiner and again by the previous examiner. The number of agreements was added, divided by the overall number of subjects retested and multiplied by 100 to yield the percentage score of reliability.

Data analysis.

The screening results were analyzed according to the subject's age, gender, and the length of time in migration. The comparison of the screening outcomes in each age

category was analyzed by Chi-square statistical analyses in order to determine any similarities in the data. In addition, the screening results obtained for the preschool and school-age subjects were compared to the 1987-88 hearing screening data from the Montana Office of Public Instruction and the Mountain Bell Foundation's Rural Speech and Hearing Outreach Program. Since the Chi-square statistical analysis only supports the acceptance or rejection of the null hypothesis, a contingency coefficient was also computed to determine the degree of any significant differences. "Contingency coefficient is a way to measure the strength of association on a numerical scale in much the same way that we employ the coefficient of correlation as index of association between two sets of measurement" (Bhattacharya & Johnson, 1977, p.434).

CHAPTER IV : RESULTS

Statement of the problem

This study investigated the prevalence of hearing impairment among migrant and seasonal farmworkers, and among their families, in the Yellowstone Valley, Montana, and Western North Dakota during the 1988 farm season.

Specifically, the following questions were addressed:

1. What is the percentage of migrant and seasonal farmworkers, and their children, who have a hearing loss as identified by screening audiometry?
2. What is the relationship between the prevalence of hearing loss in this population and the following variables: age, gender, ethnic background, and the length of time in migration?
3. Do the children of migrant and seasonal farmworkers have a higher percentage of hearing loss as compared to a sample of nonmigrant children seen by the Montana Educational Hearing Conservation Program and by the Rural Speech and Hearing Outreach Program in Montana?

Screening Results

Adults. The results for the adult population (N=52) indicated that 20 adult subjects failed the pure tone air-conduction screening. This number yielded the failure rate of 40%. Only one subject failed both the oto-immittance and

the pure-tone screening protocols. Table 4.1 presents the distribution of outcomes by the type of the screening protocol for the adults screened through this project. Eighty percent of the subjects who failed the pure tone testing were counseled and referred for a complete audiological examination if this service was available at their home base. The remaining subjects were advised to be rescreened in one year. One subject was referred for further medical intervention due to flat tympanograms and to poor responses during the pure-tone testing.

When the results were compared to the subjects' case histories or concerns about ear or hearing problems, only one of the seven subjects who complained of hearing difficulties actually failed the pure tone testing. The remaining six subjects had essentially normal hearing sensitivity. In contrast, of the twenty-two subjects who failed the screening only one subject reported any subjective hearing problems prior to the testing. A noticeable irritation (some redness and/or swelling) was commonly observed along the floors and walls of the external auditory canals in the patients who reported that they frequently used cotton swabs to clean their ear canals. Several subjects also complained of itching after their extended use of these swabs.

Children. A total of 484 children participated in the hearing screenings. Of these children, 17 failed the

Table 4.1
 The distribution of screening outcomes
 in the adult subjects by screening protocol.

	Test results		Type of referral		Rescreen	Other
	Pass	Fail	MR	AR		
Otoscopic	51	1	0	0	0	2 (Wax)
Oto- Immittance	5	1	1	0	0	46 (DNT)
Pure Tones	32	20	0	16	4	

N = 52

MR = Medical Referral

AR = Audiological Referral

DNT = Did not test

otoscopic inspection, 47 failed the oto-immittance screening, and 53 failed the pure-tone screening. Twenty-nine children received a medical referral and four school age children received an audiological referral. The data regarding the pass and fail outcomes for each test protocol and for each of the four age groups of children are presented in Table 4.2. In addition, Figures 4.1 and 4.2 illustrate the results for each age group by otoscopic inspection/tympanometry and by pure-tone testing respectively.

The otoscopic inspection indicated that 14 % of the children in the infant category (age 0-2) had sufficiently unusual appearances to the ear canals and tympanic membranes to suggest they may have had an active and/or draining middle ear infection in at least one ear. Approximately one half of these infants appeared to have middle ear infections in both ears. Twenty-one percent of all children screened had an excessive amount of cerumen either in one or both ears which made it impossible to visualize any aspect of the tympanic membrane. This finding was consistent with the nurses' reports who routinely commented on the large percentage of children who presented with excessive cerumen in the ear canals.

Twenty percent of the infants tested with tympanometry failed, followed by an 18% failure rate for preschool children and a 9% failure rate for school age children. The

Table 4.2.

The distribution of screening outcomes
in children by age and by test protocol.

Age	Test protocol								
	Otoscopy			Immittance			Pure tone		
	P	F	Wax	P	F	DNT	P	F	DNT
I	89	14	20	44	10	49	7	1	95
Ps	88	0	23	72	16	-	64	14	10
Kg	87	1	21	85	3	-	76	12	
SA	203	2	39	161	18	26	179	26	

Wax = occlude with cerumen but tympanic membrane still visible.

I = Infant (0-2)

Ps = Preschool (3-4)

Kg = Kindergarten (5-6)

SA = School age (7-16)

DNT = Did not test

Figure 4.1
Otoscopic and oto-immittance screening outcomes
in children by age group.

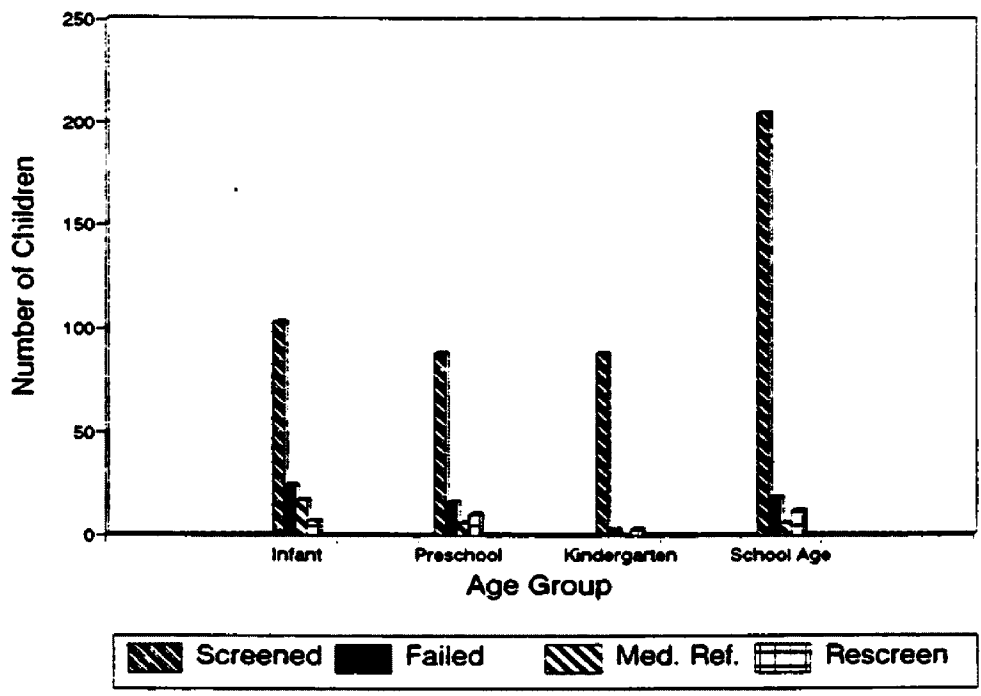
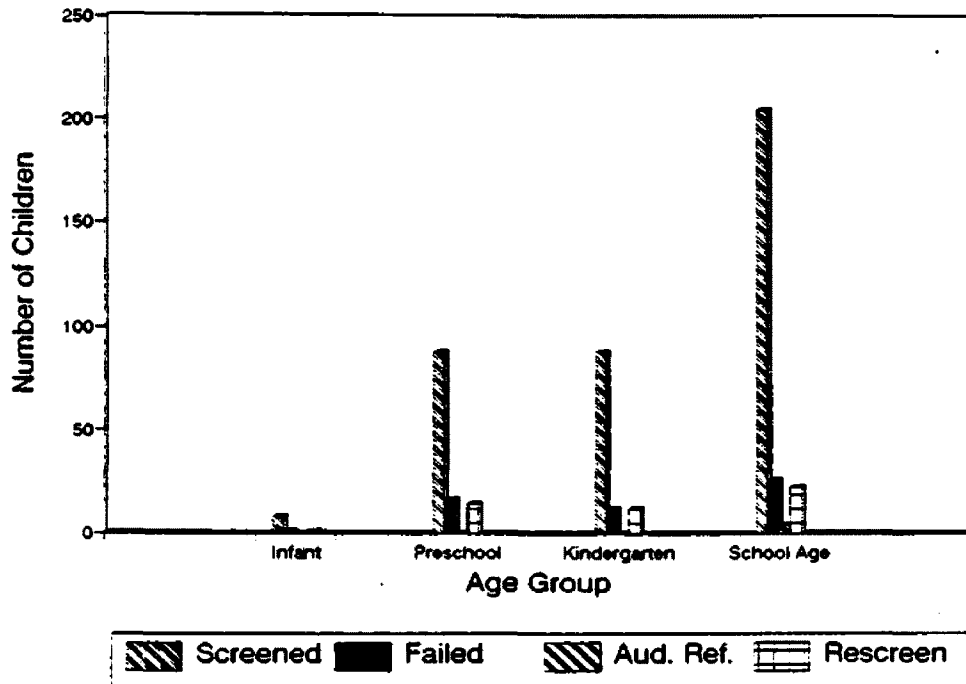


Figure 4.2

Pure tone screening outcomes in children by age group.

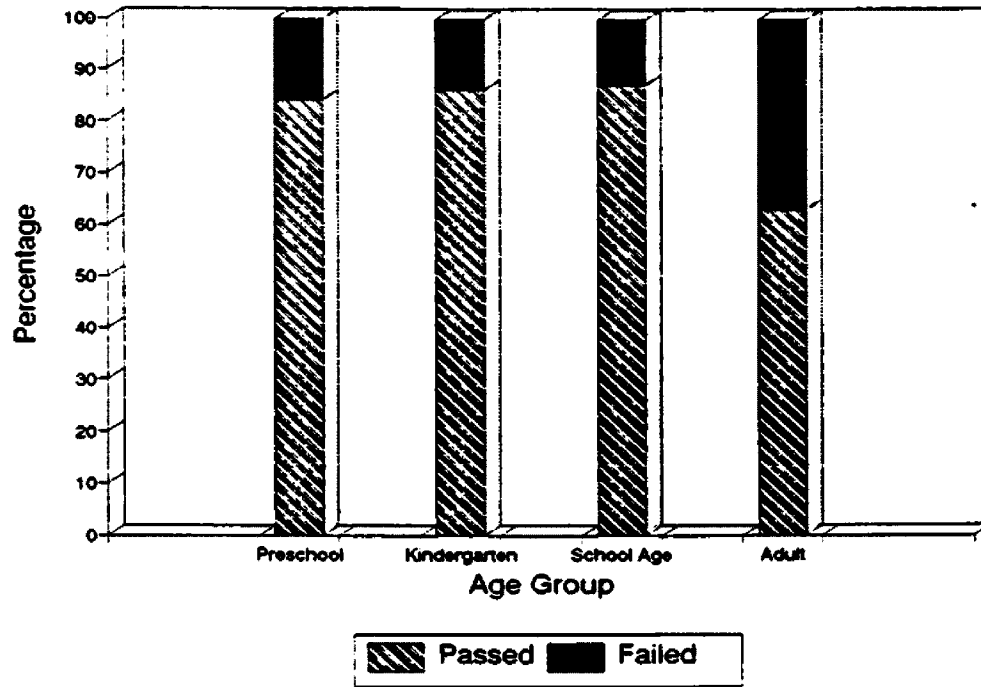


kindergarten children had the lowest failure rate (3%) of the child tested with tympanometry. Forty-two percent of all children who failed the oto-immittance screening had either flat tympanograms or significantly low ear canal volumes due to an excessive cerumen that they required a referral to a physician. The remaining subjects who failed the oto-immittance screening had demonstrated peak tympanic membrane compliances at negative middle ear pressures between -150 daPa and -300 daPa. This last result placed those children at risk for developing middle ear infections at a later date.

Eleven percent of all children failed the pure-tone audiometric screening. Twenty-six percent of the children who failed were preschool children and 49% were school age children. The kindergarten children had the lowest prevalence of hearing loss (23%) when identified by pure-tone screening. Audiological referrals were provided for 8% of the children who failed the pure tone screening, while the remaining children were advised to have their hearing rescreened in one year. The pure tone screening also identified one case of a nonorganic hearing loss among the school age subjects.

Results as a function of subject variables

Age. Figure 4.3 illustrates the pass/fail rates for pure tone screening as a function of age. Among children, preschoolers had the highest failure rate (16%), followed by

Figure 4.3**Pure tone pass/fail rates by age group.**

kindergarten (14%), and school age children (13%). Adult subjects had the highest failure rate of all age categories (39%). These rates exclude infant data because a large number of these subjects (95 out of 103) could not be tested.

Ethnic background. Only one Native American family participated in the hearing screening. Only one child in this family failed the screening and that child failed both the oto-immittance as well as pure-tone screening. This data were too limited to make any comparison.

Time in migration. Figure 4.4 illustrates the failure rates across all screening protocols as a function of the length of time the subjects worked in the migratory flow. The farmworkers who had worked in a migratory flow for more than 21 years had the highest failure rate (60%) among the five different time groupings. Two other groupings that demonstrated high failure rates were the group of one to five years had a failure rate of 47% and the 16 to 20 years group had a failure rate of 46%. The subjects who had been in migratory flow between 11-15 years had a 25% failure rate. The lowest failing rate (8%) was among the workers who had worked in the migratory flow from 6 to 10 years.

Gender. Table 4.3 presents the distribution of results according to the subject's gender. The male subjects demonstrated higher failure rates across all screening protocols among the preschooler children and the adults. In

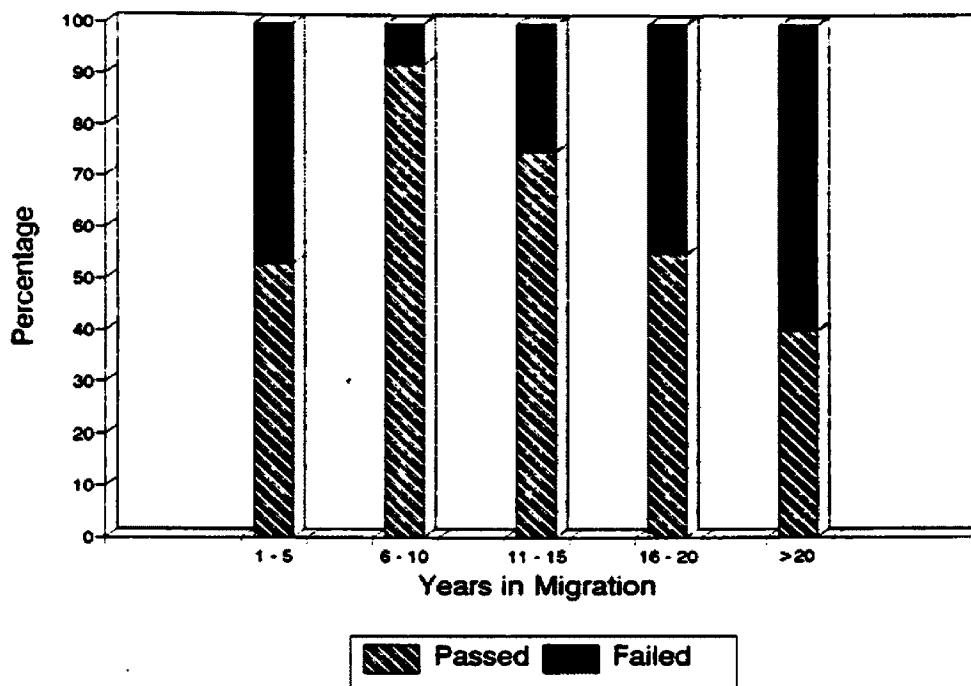
Figure 4.4**Pure tone pass/fail rates by time in migration.**

Table 4.3.

The percentage of failure for pure tone screening
by age group and gender.

Age	Male	Female
Ps	18%	14%
Kg	11%	16%
SA	8%	17%
A	54.5%	27%

Ps = Preschool
Kg = Kindergarten
SA = School age
A = Adult

contrast, the female subjects demonstrated higher failure rates across all screening protocols for the kindergarten children and school-age children. These relationships are illustrated in Figure 4.5.

Reliability

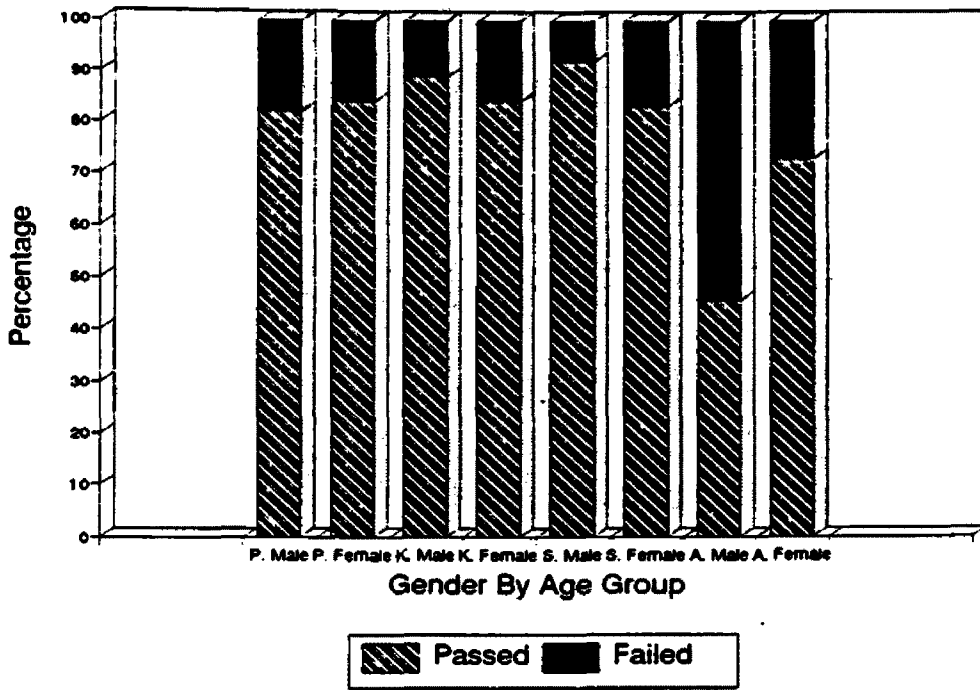
The interexaminer and intraexaminer reliability for determining whether the subjects failed any one of the screening criteria was 100 % for those randomly selected 25 subjects who had failed at least one of the hearing screening protocols.

Population Differences

Using the data obtained from the 1987-88 Educational Hearing Conservation Program in Montana, the hearing screening results from the four age groups of children participating in the public school program in the Montana Migrant Program were compared to the hearing screening results from children residing in Montana. The statistical comparisons were performed by using a chi-square analysis. As presented in Table 4.4, there were significant differences between the migrant/seasonal and nonmigrant children across all age categories except for the infant age group during the pure-tone screening. Infants were excluded from this analysis as they generally could not be tested by play and conventional pure-tone audiometry. There was also a significant difference for the oto-immittance screening, but only for the preschool age group. These significant

Figure 4.5

Pure tone pass/fail rates by gender and age group.



P = Preschool
 K = Kindergarten
 S = School age
 A = Adult

Table 4.4.
Chi-square values and contingency coefficients (C)
for pure-tone and immittance results between
migrant and non-migrant children.

Protocol	Age group	χ^2	C
Pure tones	Infant	*	*
	Preschool	25.4011	0.003
	Kindergarten	4.6093	0.0004
	School age	47.8903	0.0012
Immittance	Infant	1.9153	*
	Preschool	5.108	0.0006
	Kindergarten	2.419	*
	School age	1.9335	*

$\chi^2 = 3.8415$ at $p = 0.05$ and $df=1$

* = not applicable

differences were observed for both the Chi-Square values as well as for the Contingency Coefficients. For all statistical and nonstatistical differences, the migrant and seasonal farmworker children group had higher failure rates when compared to the children residing in Montana.

CHAPTER V : CONCLUSIONS AND DISCUSSIONS

This study investigated the prevalence of hearing impairment in migrant and seasonal farmworkers, for both children and adults during the 1988 weeding and thinning season in Eastern Montana. Since appears to be the first audiological study of this population, there were no pre-existing guidelines that could be followed, and there were no previous data available for any comparison. Therefore, this study focused on the descriptive statistics of this population and presented data which may assist a clinician or researcher study the hearing status of these workers in the future.

CONCLUSIONS.

One of the purpose of the study was to determine the percentage of migrant and seasonal farmworkers and their children who failed hearing screening to relate this data and the prevalence of subjects' ages, gender, ethnic backgrounds, and length of time in migration.

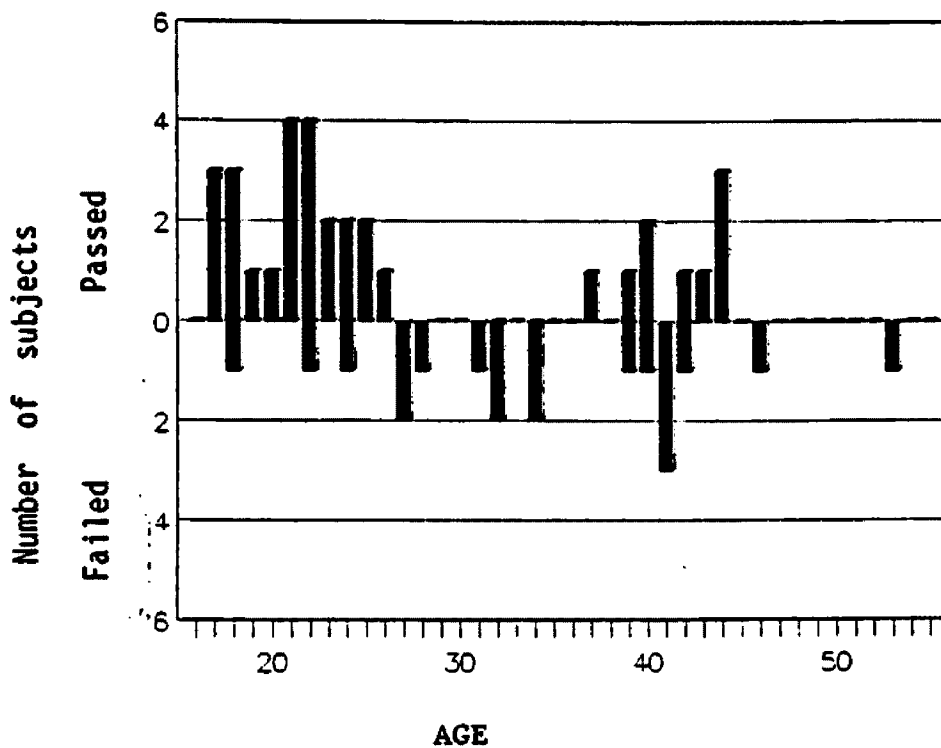
Adults. The number of adults who participated in the study was limited and, as a result, may not be representative of the migrant and seasonal farmworkers who were actively working in the Yellowstone Valley of Montana and Western North Dakota during the summer of 1988. Thirty

eight percent of the adult subjects failed either the pure tone or immittance screening. Thirty percent of this group were referred for a complete audiological evaluation. This number represents a relatively high prevalence of hearing problems in adults when compared to the 9% prevalence rate of hearing loss across the United States (Vital and Health Statistics, 1982).

When the present findings were plotted as a function of age, as is illustrated in Figure 5.1., the failure rate increased for those adults in this sample who were older than twenty-seven years of age. The low number of subjects, however, limits the generalization of these results. Most of the subjects with identified hearing loss denied any hearing problems during intake interview while most of the subjects who complained of ear or hearing disorders actually passed the hearing screening. It is unclear as to what variables may account for the discrepancies in the subjects' perceptions.

Children. The data from the children who participated in this study were felt to be more representative of the population due to the larger sample size. The rate of failure during the oto-immittance screening was dependent on the age of the children tested. Twenty percent of the

Figure 5.1.
The failure rate of adult subjects
by age categories.



infants and eighteen percent of the preschool children who received tympanometry, failed. This finding is consistent with previous findings in the literature as this age group is suspected to have a high prevalence of middle ear infections (Paradise, 1980).

The failure rate for all children for the pure tone screening (11%) was higher than that for the oto-immittance screening (10%). The preschool children who failed the immittance screening typically failed the pure tone screening as well. While a failure on the oto-immittance screening was positively correlated with a failure on the pure tone screening, the opposite was not true. Thirty-one percent of the children who failed pure tone screening, did not fail the oto-immittance screening.

Subject variables. The data were also analyzed in respect to the subject's age, subject's gender, and the subject's length of time in the migratory flow. The ethnic background of the subjects was not analyzed due to the homogeneity of this sample studied. Four subjects were, a family of Kickapoo Indians, not of Hispanic ancestry. Among the five age categories, the failure rate of the hearing screening for adults was twice as high as for any other age category, whereas the existence of middle ear

problems was most pronounced in the preschool children. In regard to gender, the failure rate for the males subjects tended to be generally higher than the failure rate for the female subjects, a finding which is consistent with the prevalence of hearing loss nationally. Still, the gender difference among the kindergartners and school age children was reversed. In comparing the length of time in migration and the prevalence of hearing loss, the group with the longest history of working in the migratory flow had the highest failure rate than the other groups, but once again the sample size may preclude any firm conclusions from this data.

When the hearing screening results of the children of the migrant and seasonal farmworkers were compared to the results of the children screened by the 1987-1988 Montana Educational Conservation Program, the data indicated significant differences between the two populations. The migrant population showed a significantly larger percentage of children who failed the initial pure tone screening. After the rescreening, the failure rates decreased dramatically for both groups. An initial false positive rate of 90% was observed among migrant and farmworker children. This high false positive rate may have been due

to the children's language barriers as they had to first understand the instructional set in order to appropriately respond to testing, or it may have due to the children's inattention to the task.

The immittance results, on the other hand, were similar between the migrant and nonmigrant children except for the preschool children. In the preschool age category, the migrant children had a higher failure rate than did the nonmigrant children. This finding is particularly meaningful if one also examines the dates during which the two groups were screened. The nonmigrant children were tested during the school year (fall through spring) whereas the migrant children were tested in early summer. According to the Gardner's (1988) epidemiological study which investigated the effect of weather on the hearing screening results, hearing screenings provided during cold weather period tend to increase the incidence of ear and hearing problems. Based upon this report, one would expect that the migrant preschool children, who were tested in the summer, should have had a lower or, at best, a similar failure rate to that of the nonmigrant children. The present results fall opposite to this prediction, thereby suggesting that the differences found between the two populations cannot be

due to climate alone.

It is difficult to find reasons to explain the significant difference between the populations occurring for preschool children alone. While some hypotheses can be made, these hypotheses cannot be verified within the constraints of the data collected during this study. As the preschool age child is at risk for middle ear problems (Paradise, 1980), there may have been a summation of the predisposing factors for the migrant preschool children which put them at greater risk for develop otitis media. These factors could include their health history, their itinerant life-style, and the difficulties with the tracking of their medical problems by a single physician. This summation then, in turn, may result in the greater prevalence of immittance failures. In addition, the preschool populations may differ in the frequency and duration of contact with other children in their respective day care and preschool environments. As the nonmigrant child may spend more time with a consistent group of children in preschools on a year-round basis, he may be exposed to a more consistent cohort of peers than is the migrant child. In addition, the more stable daycare or preschool environment may provide a greater opportunity for

trained personnel to detect various medical problems in children and then to refer these children to physicians or health care centers.

For the adult subjects, the following observations may help to account for the discrepancy found between the prevalence of hearing loss among migrant and seasonal farmworkers and the national prevalence of hearing loss among nonmigrant adults. First, the migrant adult subjects may not have had access to the health services routinely available for the nonmigrant populations. These services have only become available to the migrant workers during the past ten years (Rodriquez, personal communication, June 1988; Carmen, personal communication, June 1988). Therefore, the adult subjects of this study may have had a greater risk for infections and other health problems. Then, once an infection was identified, the migrant workers may not be able to participate in the appropriate treatment regimes for the infection. Second, the degree of poverty is more pronounced among the migrant workers which may indirectly affect the health-related aspects of family life such as nutrition and the awareness of health-related concerns such as hearing loss.

DISCUSSION.

Adults. As noted earlier, there are several constraints that may have limited the number of adult subjects who participated in the screenings. These problems were noted during personal interviews with nurses, farmer, the workers themselves and the director of the Montana Migrant Council. First, any notification or announcement of the hearing screening clinics was based simply on the distribution of flyers through the health clinics or schools. These flyers may not have reached the adults who did not have children enrolled in school program or who were not previously served at the health clinics (Narehaz, personal communication, June 1988). It was not known how many individuals may not have been aware of the availability of the hearing screenings simply due to a lack of communication.

A second problem concerned the calendar period of the screenings themselves. Approximately 30% of the workers had already left the work sites when the hearing screening program was administered (Stephens, personal communication, June 1988). The unusually hot weather during this season permitted the migrants to work faster and without any interruptions caused by poor weather conditions (Klebaan,

personal communication, June 1988). This weather pattern allowed the workers to leave the Yellowstone Valley much earlier in the season than what was usual. In addition, the calendar period was scheduled after the 1987-1988 academic year to allow for the examiners participation in this project. Unfortunately, the 1988 weeding season was almost over by the middle of June.

The clinic hours scheduled for hearing screenings (from 3 to 7 p.m.) may have also restricted to the workers' opportunities to obtain these services. The workers tend to begin work early in the morning, often as early as sunrise. They will then typically work until noon, at which time they will break for one to two hours for lunch in order to avoid the hottest time of the day. They return to work around mid-afternoon and work through the early evening. They will often break for only as short a time as possible during their work hours in order to finish the job quickly and, thus, free themselves to move on to another work site (Rodriquez, personal communication, June 1988).

A fourth reason for the low number of adult subjects may be related to the impact of improved technology on agricultural work, which is eliminating the need for manual labor. Several years ago, all activities from planting

through harvesting required extensive numbers of manual laborers. Currently, manual labor is only required for the thinning and weeding of the sugar beet fields (Walters, personal communication, June 1988).

As most of the migrant workers have never had a hearing screening as part of their general health examination, they may not have had any idea about the nature and purpose of this screening, its administration, or the information it provides. This lack of understanding may have made the workers reluctant to participate. Furthermore, the oral interviews with the subjects revealed that some workers had already received other types of health screenings in other communities. They often complained about a lack of follow-up or the usefulness of the health testing (Stephens, personal communication, June 1988). A skeptical attitude may have made many migrant adults reluctant to take yet another test when past experience suggested that it would not provide any real or direct benefit.

Although the number of adults may have been limited for any or all of the reasons given above, the hearing screening identified a large number of adults who were unaware of any hearing problems. The case history and otoscopic inspection indicated that this cohort had little knowledge about ear

and hearing health care. For example, there were numerous adults who failed to wear ear protection in loud noise environments. There were also a large number of adults who routinely used cotton swabs to remove cerumen from their ear canals. These facts suggested a significant need for increased education regarding preventive health care activities for the ear and hearing among this population.

Finally, any etiological relationship between hearing loss and the exposure to pesticides could not be established by this study. The use of pesticides in Eastern Montana was reported by one farmer to be completely safe as he routinely sprayed his fields before the weeding season began. In addition, if it was necessary to spray the field during the weeding season, the farmer would inform the workers prior to the spraying activities and then would not permit these workers to return to work in the fields until a specified period of time had elapsed as defined by the pesticide's manufacturer. However, the farmer's belief regarding the safe use of pesticides was not entirely shared by the workers. During one interview, one man stated that the workers still were exposed to pesticides as they often developed skin rashes after they were allowed to return to the fields. Still both the farmer and worker reported that

the levels of pesticide used in the Yellowstone Valley, Montana, and in the Western part of North Dakota was relatively small.

Children. The hearing screening data from the children who participated in this study indicated a lower failure rate in comparison to previous findings discussed in the literature. The 1980 migrant health record showed that 59% of the clinic patients were diagnosed as having otitis media, whereas only 13% of the migrant and farmworker children tested in this study had some form of middle ear problem, as identified by oto-immittance screening. The decrease in the prevalence of middle ear disorders also paralleled the improved general health condition of this population as reported in several interviews. That is, the improved health status of the migrant worker and his family has been observed by a variety of health professionals, the farmers, and by the farmworkers themselves (Johnson, personal communication, June 1988; Walters, personal communication, June 1988; and Narehaz, personal communication, June 1988).

As migrant and seasonal farmworkers become more familiar with the available health services offered to them each year, more of these workers have begun to routinely use

these services, not only for emergency purposes but for health maintenance and disease prevention purposes as well. Several reports indicated that most parents carefully administer any medication and will provide it to their children as prescribed. These children are also now brought immediately to the nurses for follow-up once they have completed their prescription. This improvement in the migrant worker's health status may be related to their increased knowledge about general health and nutritional needs and practices. It may also be due to the increasing number of skilled and dedicated health care workers who have provided more and better quality services over the past ten years (Stephens, personal communication, June 1988; Carmen, personal communication, June 1988).

Another contributing factor to the better health condition, especially among children may be the new day care facilities for infants which are currently provided as part of school programs. This service allows parents to leave their infant in an adult supervised day care environment when they are working in the fields. In the past, the parents often left their infants in the car which was parked near the field in which they were working throughout the work day (Stephens, personal communication, June 1988).

One significant aspect contributing to the improved health status of the migrant workers and their families may be the improved farmer-worker relationship. The workers who have come to Montana every year for more than five years have typically established a good working relationship with a specific farmer. As a consequence, the farmer will often provide better accommodations, salaries and other incentives to these workers and their families in order to retain them for future employment (Walters, personal communication, June 1988 ; Rodriquez, personal communication, June 1988). The improved housing and living conditions may then result in better health conditions for the workers and their families.

Previous hearing screening.

A large number of school age children who came from Texas and California stated that they have had their hearing screened previous to this study and many of these children reported that they have had their hearing screened on more than one occasion. As hearing screening services become more widely available and routinely administered to this group of children, a child with a significant hearing loss or other ear-related difficulties should be identified earlier. Unfortunately, the data is not yet available to define the number of migrant children who receive regular

hearing screenings. In addition, the protocols and criteria used for these hearing screenings as well as whether they are offered by the public schools or by their home communities are not known. Once this data becomes available, the children who do not receive a hearing screening and the children who fail the hearing screenings can be identified and then screened. Moreover, a uniform follow-up concerning the borderline cases will be much more appropriate. As a results, the role and scope of the hearing screening program during working season in Montana can be more fully defined.

RECOMMENDATIONS

Farmwork, as well as other forms of manual labor, is undergoing long term changes as improved technological systems are designed and implemented in order to limit the use of human labor. Still, the nature of the products and the soil often dictates the attention and flexibility of services which can only offered and provided by human labor. As a result, the demand for healthy workers is likely to remain high in the future, in spite of a long tradition of, and need for, increased mechanization.

In light of the continued presence of a substantial migrant and seasonal agricultural work force in Montana,

several recommendations concerning the future of a hearing screening program can be made. First, state or local agencies should be encouraged to participate in funded hearing health programs in order to further clarify the hearing status of the migrant and seasonal adult farmworkers. By incorporating the results of the present investigation, better strategies could then be developed to encourage adult workers' participation in a hearing screening. These strategies should include:

1. informing the farmer of the nature of, need for and availability of the hearing screening;
2. sending out recruiters to explain the nature and purpose of the hearing testing;
3. encouraging the hearing health care providers to go out into the fields for case history intake and recruitment, when possible; and
4. adjusting the screening hours to coincide with the workers' break hours.

Second, the hearing conservation program should emphasize techniques to increase the worker's knowledge about ear and hearing health care. This recommendation should be considered as one means to improve the future physical and financial health of the workers as well as to

promote the area's economic health. This study received reports that the workers appeared to be better educated now than in the past, and that they are now more open to health-related information and its benefits as long as the information is readily available. Therefore, a hearing health care and education program can be made available to most workers either as they participate in the hearing screening or during their interactions with the medical staff in the health clinics.

Third, there should be defined follow-up protocols for the workers who are identified as having ear and/or hearing problems. Sources of funding should be located and monies obtained in order that comprehensive medical and audiological services can be provided, if needed and deemed appropriate.

Fourth, conventional screening protocols, referral criteria, and result dispositions should be established for the screening hearing with this population. Ultimately, developing conventions and standards for the hearing screenings is critical for the understanding of the hearing status of the migrant worker population.

Fifth, the nurses at each site should be educated in the performance of an oto-immittance testing and in the

diagnosis of some common middle ear problems. They should also be educated regarding the danger of cleaning cerumen by irrigation when the status of the tympanic membrane is unknown. In the general population, infants and preschooler children are considered to be the population most at risk for middle ear problems. The results of this study found that the prevalence of middle ear problems among the infants and preschooler children of the migrant and seasonal farmworkers is higher than that among the infant and preschool children resident to Montana. When an ear and/or hearing problems occur in a migrant child, the school and health clinic nurse may be the first health professional who is able to identify and resolve this problem. Therefore, additional training of the direct care personnel and medical staff is needed. Oto-immittance and pure tone screening audiometers should than be made available to staff in the permanent and mobile health clinics.

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Appendix A

Listening check form (biological check) - Northwestern University Hearing Clinics as cited in Handbook of Clinical Audiology (1985), p. 124.

Audiometer	Serial No.	Date	Time	Checked by	Earphone Cords	Power Cord	Attenuator Cord	Hum	Dials	Frequency	Attenuation	Intensity Right Phone	Left Phone	Tone Interrupter	Tone Pulse Rate	Cross-Talk	Acoustic Reflections	Bone Vibration	Loudspeakers

Appendix B
Worksheet for ambient noise levels in
audiometric test environment.

Place: _____ **Date:** _____ **Examiner:** _____
Equipment used: _____

Frequency: 250 500 1KHz 2KHz 3KHz 4KHz 6KHz 8KHz

Obtained levels

Under earphones

Difference:

Appendix C
 UNIVERSITY OF MONTANA AUDIOLOGY CLINIC
 Mountain Bell Foundation Rural Speech and Hearing Outreach
 Program

1988 Hearing screening for Migrant and Seasonal Farmworkers
 in Yellowstone Valley - Montana.

Case History

1. Name: _____
 Home state/Country of Origin: _____
2. D.O.B.: _____ Age: _____
3. Gender: M _____ F _____
4. Ethnic background: White/Caucasian () check one
 American Indian () of these
 Southeast Asian ()
 Black ()
 Hispanic ()
5. Type of occupation: _____
6. Native language: English () check one of these
 Hispanics ()
 Other ()
7. Ear/hearing problem: ear infection () check one
 pain () that you have
 ringing () problem with.
 feeling of fullness ()
 problem hearing speech ()
 problem hearing shouted speech ()
 problem hearing non-speech sounds ()
8. Previous test or medication: Yes () No ()
 Provider: Physician ()
 Nurse ()
 Other ()
 When? _____
9. Is there any family member who have a hearing problem?
10. How long have you been in migratory stream? _____

Interviewer: _____

Signature: _____

Date: _____

Appendix D
 UNIVERSITY OF MONTANA AUDIOLOGY CLINIC
 Mountain Bell Foundation Rural Speech and Hearing Outreach
 Program

1988 Hearing screening for migrant and seasonal farmworkers
 in Yellowstone Valley - Montana.

AUDIOMETRIC-SCREENING TEST FORM

Name: _____ Age: _____
 Date: _____

Clinician: _____
 Supervisor: _____

PURE-TONE SCREENING:

	Frequency (Hz)				
	1 KHz	2 KHz	3 KHz	4 KHz	6 KHz
Level (dB-HL)	20	20	30	30	30

Right Ear:

Left Ear:

OTOSCOPIC INSPECTION:

Right Ear: Appears normal () Possibly abnormal ()

Left Ear: Appears normal () Possibly abnormal ()

ACOUSTIC-IMMITTANCE SCREENING: Right Ear Left Ear
 Pass No Pass Pass No Pass

Normal (+50 mmH2O)

Tympano- Mildly positive/nega-
 metric tive (+100 to -300
 peak mmH2O)
 pressure

Abnormal (outside
 +100 to -300mmH2O)

ACOUSTIC-REFLEX SCREENING

Contralateral Acoustic Reflex at 1000 Hz at 100 dB HL	Ipsilateral Acoustic Reflex at 1000 Hz at 105 dB HL
Probe right: Present Absent	Probe right: Present Absent
Probe left: Present Absent	Probe left: Present Absent

(Appendix D - Cont.)

Disposition

Pass (at screening levels):

- a. All pure-tones - passed
- b. Otoscopic examination - normal
- c. Middle ear pressure - normal
- d. Acoustic reflexes - present

Recheck (any one of the following):

- a. Fail one or more pure tones in either ear
- b. Otoscopic inspection possibly abnormal, either ear
- c. Middle ear pressure- mildly abnormal or abnormal
- d. Acoustic reflex absent, either mode

Medical referral (after recheck):

- a. Otoscopic inspection possibly abnormal
- b. Middle ear pressure - abnormal
- c. Acoustic reflexes absent or elevated

Audiological referral:

- a. Failure of any recheck criteria of pure tones above
- b. Failure of any recheck criteria after medical referral for b-d

Comments:

Appendix E

School _____ Grade _____

Dear Parent,

This is to notify you that your child
_____did not pass the hearing screening on
_____.

Our results indicated that:

() Further medical attention is necessary to identify a possible medical problem relating to hearing.

() Further hearing evaluation is necessary to assess the degree, type and possible cause of any hearing problem.

In the future, if your child complains of ear pain or should you notice a decrease in hearing ability, you may wish to contact a physician, nurse or audiologist to schedule a more in-depth hearing evaluation.

If you have any further questions, please feel free to contact:

Michael K. Wynne Ph.D, CCC-A/SLP
Audiologist
University of Montana
(406) 243-4131

Sincerely,

Michael K. Wynne CCC-A/SLP
University of Montana
Speech, Hearing and Language Clinic
Missoula, MT 59812

Appendix F

Escuela: _____ Año
 escolar: _____

Estimados padres:

Nos dirigimos a ustedes para comunicarles que su hijo(a)

_____ no hizo bien en la prueba de audicion que se le sometio el _____.

Los resultados nos indican que:

- () Se necesita mayor atencion medica para averiguar si hay algun problema de salud asociado con la audicion.
- () Se necesitarian mas evaluaciones del oido para medir el grado, tipo y motivo de un presunto desorden del organo auditivo.

En al future, si su hijo(a) se queja de dolores de oido a si parece sufrir alguna perdida de audicion, les aconsejamos a ustedes que se comuniquen con un medico, enfermero o audiolologo para volver a examinar mas detenidamente la condicion auditiva del nino.

Si desean ustedes mas informacion les rogamos que se dirijan a:

- Michael K. Wynne Ph.D, CCC-A/SLP
 Audiologist
 University of Montana
 (406) 243-4131

Atentamente,

Michael K. Wynne CCC-A/SLP
 Speech, Hearing and Language Clinic
 University of Montana
 Missoula, MT 59812

Appendix G

Summary of test results for health care providers.

HEARING & SPEECH/LANGUAGE SCREENING RECORD

Date _____ KEY 1—Passed Screening 5—Borderline Impedance 9—Failed Voice
 Location _____ 2—Failed Impedance Only 6—Assent 10—Failed Pharynx
 City _____ 3—Failed Pure Tone Only 7—Failed Speech CNT Could Not Test
 Aud. _____ 4—Failed Pure Tone and Impedance 8—Failed Larynx
 Ctr. _____
 No. Screened _____

Age	NAME	CLASSIFICATION	IMPEDANCE		PURE TONE SCREENING						Follow up Screening	Speech & Language	Block of Referral	Specialty Referral	Aural Check	Hearing Aid	Hearing Instrument	Possible H.A. Candidate	Factual Status	Hilly Aud of CSI	Otitis/Earwax	
			0-1000 Hz	20-40 dB	500 Hz	1000 Hz	2000 Hz	3000 Hz	4000 Hz	6000 Hz												
1		R																				
1		L																				
2		R																				
2		L																				
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1987 - U.S. Printing Services

Appendix H

The O.P.I. data for initial and rescreening
pure tones and immittance.

Age Group	Initial pure tones			Rescreen		
	Pass	Fail	Total	Pass	Fail	Total
Infants	897	207	1085	49	59	108
Preschool	7316	977	8293	484	177	677
Kindergarten	8931	1046	9977	1696	578	2186
School age	33768	4850	38618	6207	2608	8815

Age group	Initial immittance			Rescreen		
	Pass	Fail	Total	Pass	Fail	Total
Infant	1130	387	1517	31	34	65
Preschool	6397	1292	7689	555	237	792
Kindergarten	5340	748	6088	1402	609	2011
School age	13875	1860	15735	4231	1630	5861

Appendix I

The pure tones and immittance initial screening outcomes
from migrant and seasonal farmworkers children.

Age group	Pure tones			Immittance			Total
	P	F	DNT	P	F	DNT	
Infant	7	1	95	44	10	48	103
Preschool	64	14	10	72	16	-	88
Kindergarten	76	12	-	85	3	-	88
School age	179	26	-	161	18	-	205