

INFORMATION TO USERS

This material was produced from a microfilm copy of the original document. While the most advanced technological means to photograph and reproduce this document have been used, the quality is heavily dependent upon the quality of the original submitted.

The following explanation of techniques is provided to help you understand markings or patterns which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting thru an image and duplicating adjacent pages to insure you complete continuity.
2. When an image on the film is obliterated with a large round black mark, it is an indication that the photographer suspected that the copy may have moved during exposure and thus cause a blurred image. You will find a good image of the page in the adjacent frame.
3. When a map, drawing or chart, etc., was part of the material being photographed the photographer followed a definite method in "sectioning" the material. It is customary to begin photoing at the upper left hand corner of a large sheet and to continue photoing from left to right in equal sections with a small overlap. If necessary, sectioning is continued again — beginning below the first row and continuing on until complete.
4. The majority of users indicate that the textual content is of greatest value, however, a somewhat higher quality reproduction could be made from "photographs" if essential to the understanding of the dissertation. Silver prints of "photographs" may be ordered at additional charge by writing the Order Department, giving the catalog number, title, author and specific pages you wish reproduced.
5. PLEASE NOTE: Some pages may have indistinct print. Filmed as received.

Xerox University Microfilms

300 North Zeeb Road
Ann Arbor, Michigan 48106

74-16,933

WINAKUR, Ira, 1941-
THE INCOME DETERMINANTS OF THE GALLAUDET
COLLEGE ALUMNI.

The American University, Ph.D., 1973
Economics, general

University Microfilms, A XEROX Company, Ann Arbor, Michigan

THE INCOME DETERMINANTS OF THE
GALLAUDET COLLEGE ALUMNI

by

Ira Winakur

Submitted to the
Faculty of the College of Arts and Sciences
of The American University
in Partial Fulfillment of
the Requirements for the Degree
of
Doctor of Philosophy
in
Economics

Signatures of Committee:

Chairman:

Harold M. Weatel
James H. Weaver
Jan B. Sawers

Harvey P. Moore
Dean of the College

Date: December 3, 1973

1973

The American University
Washington, D. C.

THE AMERICAN UNIVERSITY LIBRARY

4804

TO SUSANNE WHO ALSO DESERVES A DEGREE

ACKNOWLEDGMENTS

To my major advisor, Dr. Howard M. Wachtel, sincere appreciation is extended for his support and guidance in the research. The writer is also indebted to other members of the dissertation committee, especially Dr. Larry B. Sawers, for his interest and constructive guidance.

To Jack H. Gannon and the Gallaudet College Alumni Office goes appreciation for their assistance in obtaining the names and addresses of the alumni of Gallaudet College.

To Jerald M. Jordan and Robert J. Herbold, the writer is grateful for their programming assistance.

To Dr. Richard M. Phillips and the Office of Student Affairs goes appreciation for their assistance in obtaining Graduate Record Examination scores for the alumni of Gallaudet College.

To my wife, whose understanding, encouragement, and patience made it all possible.

TABLE OF CONTENTS

LIST OF TABLES iv

Chapter

I. OVERVIEW 1

Introduction

The Deaf

Education

Post Secondary School Education

Design of the Study

Hypothesis

II. EARNINGS, COMMUNICATION ABILITY AND THE HEARING
IMPAIRED 22

Introduction

Communication Ability

Earnings and Communication Ability of Non-
federally Employed Males

Earnings and Communication Ability of
Federally Employed Males

Hearing Impaired Males Employed in Education

Earnings and Communication Ability of Non-
federally Employed Females

Hearing Impaired Females Employed in Education

III. THE INCOME DETERMINANTS OF THE HEARING IMPAIRED. 52

IV. CONCLUSION AND RESULTS 71

Introduction

Findings

Questions Raised by This Study

Appendix

A. THE RAINBOW PASSAGE. 77

B. SURVEY OF THE INCOME AND OCCUPATIONAL DISTRIBUTION
OF THE GALLAUDET COLLEGE ALUMNI. 79

C. CORRELATION COEFFICIENTS 83

BIBLIOGRAPHY 88

LIST OF TABLES

Table	Page
1. The Percentage of Certified Teachers in Schools for the Deaf.	6
2. Average Grade Equivalents for Eighteen Year Old Deaf Students by Degree of Hearing Loss- Selected Test Areas	8
3. Verbal and Quantitative Graduate Record Examination Percentiles of Gallaudet College Seniors--1960-1968.	10
4. Profile Means for Lipreading, Speech, and Hearing of Those Surveyed and Respondents	16
5. Mean Graduate Record Examination Scores for Alumni and Respondents.	16
6. Occupational Distribution of the Respondents by Sex	17
7. Income Distribution of Hearing Impaired Persons With Four or More Years of College.	23
8. Earnings of Hearing Impaired Respondents by Region, Degrees Held, and Sex	27
9. Earnings of Hearing Impaired Respondents by Region, Degrees Held, and Sex of Nonfederal Employees	29
10. Earnings of Hearing Impaired Respondents by Region, Degrees Held, and Sex of Federal Employees	30
11. Median Incomes by Lipreading and Speech Abilities of Federally and Nonfederally Employed Male and Female Respondents with Known Abilities in Lipreading and Speech	34
12. Median Earnings of Deaf Males by Lipreading-Speech, Speech-Hearing, and Lipreading-Hearing Profiles.	36

LIST OF TABLES--Continued

Table	Page
13. Median Earnings of Federally Employed Deaf Males by Lipreading-Hearing, Speech-Hearing and Lipreading-Speech	39
14. Earnings Differentials of High Profile to Low Profile Ability Combinations for Federally and Nonfederally Employed Males	40
15. Ratio of High Earning Profiles to All Others by Lipreading-Speech, Lipreading-Hearing, and Speech-Hearing for Federally and Nonfederally Employed Hearing Impaired Males	42
16. Median Earnings of Deaf Males Employed as Teachers by Lipreading-Hearing, Speech-Hearing, and Lipreading-Speech	45
17. Median Earnings of Deaf Females Not Employed by the Federal Government by Lipreading-Hearing, Speech-Hearing, and Lipreading-Speech	47
18. Median Earnings of Deaf Females Employed as Teachers by Lipreading-Hearing, Speech-Hearing, and Lipreading-Speech	50
19. Regression Equations.	61
20. "Average" Income for Nonfederally Employed Males.	64
21. "Average" Earnings for Federally Employed Males .	65
22. Increase in Human Capital Due to the Possession of a Master's Degree for Nonfederally Employed Males and Teaching and Nonteaching Females. . .	67

CHAPTER I

OVERVIEW

Introduction

This paper is an analysis of the income determinants of one group of handicapped--the deaf. Two previous studies which analyzed the impact of deafness on income did not analyze deaf earnings on the basis of the interactions of lipreading, speech, and hearing abilities of the deaf, nor did they attempt an analysis of the income determinants of the hearing impaired.¹ Recently, a study done by Weinrich tried to estimate the cost of deafness.² Weinrich's analysis was based on the assumption that the earnings of the deaf were equal to those of hearing persons with equal years of schooling. He derived probable lifetime earnings of a hearing child by multiplying marginal lifetime earnings for various educational levels (elementary, high school, college, and more than four years of college) by the probability a hearing person has of attaining these various levels

¹Anders S. Lunde and Stanley K. Bigman, The Occupational Conditions Among the Deaf (Washington: Gallaudet College Press, 1959); Alan B. Crammatte, Deaf Persons in Professional Employment (Springfield: Charles C. Thomas, 1968).

²John E. Weinrich, "Direct Economic Costs of Deafness in the United States," American Annals of the Deaf, CXVII (August, 1972), 446-54.

of education. He defined the expected lifetime earnings of an individual as the sum of these four values. Using the same marginal values, but using the probabilities a deaf individual has of attaining these various educational levels (the probability of the deaf attaining any given educational level is less than those of a hearing person) he calculated the expected lifetime earnings of a deaf person. The difference between these two expected values (\$260,075) he defines as the economic cost of deafness. Weinrich's analysis, however, did not try to ascertain any difference in earnings based on sex, nor did he attempt an analysis of earnings differentials based on variations in lipreading, speech, and hearing abilities of hearing impaired individuals.

In this paper the following questions will be answered: (1) Do differences in lipreading, speech, and hearing abilities influence the earnings of the hearing impaired in different ways?; (2) Do the income determinants of the deaf differ by sex?; and (3) Do the earnings of a deaf person vary by type of employer?

The Deaf

To the totally deaf child the world around him is one in which things fall without crashing, trains move without chugging, ducks waddle but never quack, and parents speak without uttering a sound. The means of communicating between a young deaf child and his parents is composed of signs,

gestures, and motions.

A hearing child acquires language skill over a period of time through hearing his or her parents' everyday conversation, radio, television, and normal play activities among peer groups. However, for the young deaf child these means of acquiring language skill are barred. Because of his lack of hearing ability, communication for the hearing impaired child is of necessity visual in nature. There are, however, large variations in the degree of hearing loss among deaf persons.

In their study, The Occupational Conditions Among the Deaf, Anders S. Lunde and Stanley K. Bigman found that 87.7 percent of the deaf in their survey were either totally deaf or could only hear undifferentiated sounds or noises. The remaining persons in their survey could all hear conversation either with or without the use of hearing aids, but thought of themselves as deaf.³ This variation in the degree of deafness is shown by the fact that while it has been estimated that the number of totally deaf persons in the United States is 236,000, hearing impairment handicaps six million Americans.⁴ Thus, one out of every forty Americans suffers some handicap from hearing impairment.

³Anders S. Lunde and Stanley K. Bigman, The Occupational Conditions Among the Deaf (Washington: Gallaudet College Press, 1959), p. 17.

⁴U.S. Department of Health, Education, and Welfare, Human Communication and its Disorders (Washington: Government Printing Office, 1969), p. 15.

Education

It has been estimated that less than 50 percent of hearing impaired children that need special educational programs receive them.⁵ The deaf child that is enrolled in special educational classes has three basic types from which to choose. These three basic options are: (1) Residential schools for the deaf, where the student lives with other deaf students nine months a year; (2) Day schools, where the student has classes with other hearing impaired children but resides at home; and (3) Classes for the deaf in a regular public school.

During the 1968-1969 school year there were 25,363 hearing impaired students enrolled in special educational programs. The majority of these deaf students, 52.2 percent, were enrolled in residential schools. Day schools and full-time classes accounted for another 25.4 percent of the students, while the remainder were either in preschool programs or were receiving special educational programs on a part-time basis.⁶

A study entitled Education of the Deaf cites several disadvantages inherent in each of these educational programs.

⁵U.S. Department of Health, Education, and Welfare, Education of the Deaf (Washington: Government Printing Office, 1965), p. xv.

⁶Office of Demographic Studies, Annual Survey of Hearing Impaired Children, Series D, Number 4 (Washington: Gallaudet College Press, 1970), p. 4-5.

The basic problem confronting the deaf student in a residential school is one of isolation not only from his family, but also from society. This isolation can result in problems of adjustment in a non-isolated environment. As stated in the report ". . . residential schools generally do not prepare (deaf) students adequately for urban living."⁷

The basic problem faced by day schools and day classes for the deaf in hearing schools is that school programs for this small minority of students must compete with other programs for appropriations from school boards. To the extent that these programs are not adequately supported the deaf child suffers educationally.⁸

While each of the types of programs for the deaf have problems associated with them, the deaf student also suffers from a lack of educational input. The April 1972 issue of the American Annals of the Deaf presented educational staff data for 674 deaf schools and classes. Out of a total educational staff of 7,139 only 2,695, or 37.8 percent, were certified by the Conference of American Schools for the Deaf as having the training necessary for teaching the deaf. Among the various schools for the hearing impaired, the percentage of instructors that are certified varies from a high of 53.4 percent in residential schools to a low of

⁷U.S. Department of Health, Education, and Welfare, Education of the Deaf, p. 33.

⁸Ibid., p. 37.

22 percent in public day classes (see Table 1).⁹

TABLE 1
THE PERCENTAGE OF CERTIFIED TEACHERS
IN SCHOOLS FOR THE DEAF

Type of School (1)	Number of Instructors (2)	Number with Certificate (3)	Percent 3/2 (4)
Public residential school.	2,975	1,588	53.4
Private residential school.	280	104	37.1
Public day school .	966	346	35.8
Private day school.	215	100	46.5
Public day classes.	2,339	515	22.0
All other	364	189	51.9

Source: American Annals of the Deaf, CXVII (April, 1972), p. 172-237.

Additional evidence of the lack of complete educational programs for the deaf is apparent from the fact that while there are 249 schools for the deaf that claim to educate the deaf student through the twelfth grade only 106, or 42.6 percent, have accredited high school programs.¹⁰ An even more pertinent statistic, reported in the Education of the

⁹"Schools and Classes," American Annals of the Deaf, CXVII (April, 1972), 172-237.

¹⁰Calculated from: "Schools and Classes," American Annals of the Deaf, CXVII (April, 1972), 172-237.

Deaf, was the fact that there were probably no more than six complete high school programs for the deaf in the United States in 1964.¹¹

A temporary New York state commission established to investigate the problems of the deaf reported several reasons for the nonaccreditation of deaf secondary schools in New York. Three of the four reasons listed in this report, while specific to New York, also have general applicability for the United States. These three reasons are as follows: (1) unmet state certification requirements; (2) small enrollments which necessitate certain curriculum limitations; and (3) lack of physical facilities.¹²

The result of this lack of educational inputs is revealed in the grade equivalent scores that hearing impaired students attained on the Stanford Achievement Test in 1971. The weighted reading grade equivalent average for hearing impaired students (age 18) was 4.23. On the basis of individual tests for paragraph meaning, language, and arithmetic concepts the eighteen year old hearing impaired student achieved the highest grade equivalent, 8.7, in arithmetic concepts. The grade equivalent for the remaining two test

¹¹U.S. Department of Health, Education, and Welfare, Education of the Deaf, p. xvii.

¹²Temporary State Commission to Study and Investigate the Problems of the Deaf, The Minority Group Needs of the Deaf (Albany: State of New York, 1968), p. 38.

areas was 7.4 for paragraph meaning and 7.8 for language.¹³

As is evident from Table 2 below, these test results were not uniform when based on the hearing loss of these students. It should be noted that in each of these tests those students with the "middle" hearing loss, 60-98 decibels, had the highest grade equivalent level in each of the test areas.¹⁴

TABLE 2
AVERAGE GRADE EQUIVALENTS FOR EIGHTEEN YEAR OLD
DEAF STUDENTS BY DEGREE OF HEARING
LOSS--SELECTED TEST AREAS

Hearing Loss	Paragraph Meaning	Language	Arithmetic Concepts
59 db and below	6.8	7.1	8.0
60-98 db	7.6	8.0	8.8
99 db and above	7.0	7.4	8.3

Source: Office of Demographic Studies, Annual Survey of Hearing Impaired Children, Series D, Number 9 (Washington: Gallaudet College Press, 1971), p. 37.

¹³Office of Demographic Studies, Annual Survey of Hearing Impaired Children, Series D, Number 9 (Washington: Gallaudet College Press, 1971), p. 36.

¹⁴Webster defines a decibel as the usual unit for measuring the relative loudness of sounds, being approximately the smallest degree of difference of loudness ordinarily detectable by the human ear, the range of which includes about 130 decibels.

The lack of an adequate educational program for the pre-college deaf student is thus evident in the low scores obtained in these standardized tests regardless of the level of hearing loss.

Post Secondary School Education

In order to overcome some of the educational problems associated with deafness, Gallaudet College, the only college in the world devoted to the liberal arts education of the deaf, offers a preparatory program to those students who do not meet its entrance requirements in certain areas, but exhibit a potential for doing college work. After completion of this prep year these students are again tested and either allowed to enter the freshman year or are denied admission.

The hearing impaired students that graduate from Gallaudet College still reflect their lack of educational inputs. This can be observed by comparing the Graduate Record Examination Scores attained by Gallaudet College seniors with those of hearing students. Table 3 shows that the Gallaudet students who took these tests do not have the facility with English or Mathematics that 95 percent of hearing college seniors have. Thus, if verbal and/or mathematical ability are significant income determinants the hearing impaired will have lower earnings due to their lack of facility with English and Mathematics.

TABLE 3

VERBAL AND QUANTITATIVE GRADUATE RECORD
EXAMINATION PERCENTILES OF GALLAUDET
COLLEGE SENIORS--1960-1968

Year	Verbal Percentile	Quantitative Percentile
1960	1.0	4.0
1961	2.0	8.0
1962	1.0	5.0
1963	1.0	5.0
1964	1.0	5.0
1965	1.0	5.0
1966	1.0	6.0
1967	4.0	5.0
1968	1.0	4.0

Source: Compiled from Graduate Record Examination scores of Gallaudet College seniors.

Design of the Study

Deaf individuals, therefore, not only have a physical handicap, but also an educational handicap. However, earnings of the hearing impaired depend on other factors in addition to deafness and education.

The purpose of this study is to examine the fundamental determinants of the earnings among the hearing impaired alumni of Gallaudet College. Several reasons prompted the undertaking of this study. First, since Gallaudet College is the world's only liberal arts college devoted to the higher education of the deaf, a unique segment of the total class of all college alumni (hearing and deaf) can be studied. Second, the recent emphasis placed on racial and sexual

discrimination in the job market has overlooked the possible effect of discrimination based on physical handicaps, an area which should be studied. Third, within the broad classification of deaf persons, there is a large variation in the deaf characteristics of the hearing impaired and the relation of these characteristics to earnings, if any exist, should be analyzed.

The students at Gallaudet College are very heterogeneous because of a large variation in their lipreading, speech, and hearing abilities. This is reflected in the fact that speech abilities of the students range from normal to unintelligible; lipreading abilities vary from almost total comprehension of the spoken word to a complete lack of lipreading skill; and hearing ability varies from a total lack of ability to hear sounds to being able to hear but not well enough to be classified as normal. While no formal testing was undertaken to determine the Gallaudet College student's ability in lipreading, speech, and hearing prior to 1959, since 1959 tests have been given to incoming students by the Hearing and Speech Center at Gallaudet College to determine the student's "deaf profile" (ability in lipreading, speech, and hearing). The student profile data were made available to the author for most of the 1959-1968 alumni.¹⁵

¹⁵Some of the 1959-1968 alumni did not have profiles reported.

The following standards are used to determine a student's deaf profile:

- (1) Lipreading is classified into five categories which are determined on the basis of the number of words the student correctly understands out of 30 sentences with a total of 187 words. The following five categories have been established:

Category 1--140-187 words correct

Category 2--100-139 words correct

Category 3--60-99 words correct

Category 4--20-59 words correct

Category 5--0-19 words correct

- (2) Speech ability is determined by five undergraduate teachers after listening to a tape recording of the student reading the "Rainbow" passage (see Appendix A). The following standards are used in judging the student's speech profile:

Category 1--the student is easily understood by the general public. He has no obvious voice and/or articulation errors.

Category 2--the student is easily understood by the general public but he has obvious voice and/or articulation errors.

Category 3--"good deaf speech"--the general public has some difficulty understanding the student initially but the student can be understood once the listener adjusts to his "deaf speech".

Category 4--the student's speech is very difficult for the general public to understand. He is probably only understood by his family and teachers.

Category 5--the student's speech cannot be understood by listening to the tape.

(3) Based upon the puretone thresholds and supra-threshold speech discrimination, a student's hearing ability is classified into one of the following five categories:

Category 1--26 percent correct discrimination or better regardless of puretone thresholds.¹⁶

Category 2--2 percent through 24 percent correct discrimination regardless

¹⁶A puretone is a tone that does not have any overtones. A puretone threshold is defined as that point at which the student hears a tone presented to him 50 percent of the time. If the student hears the tone more than 50 percent of the time this is defined as a suprathreshold.

of puretone thresholds.

Category 3--0 percent correct discrimination but puretone air conduction responses at least 3,000 Hz.

Category 4--0 percent correct discrimination but puretone air conduction responses through at least 1,000 Hz but no responses beyond 2,000 Hz.

Category 5--0 percent discrimination and no puretone air conduction responses beyond 750 Hz.¹⁷

Data on wages and salaries of the deaf alumni of Gallaudet College were nonexistent when the decision was made to undertake this study. In order to obtain such data a survey was conducted of the 1945-1968 alumni of Gallaudet College whose addresses were known to the College (a total of 1,712 which is 85 percent of all alumni). One-hundred percent of the universe was "sampled". This survey on the income and occupational distribution of the Gallaudet College Alumni (see Appendix B) also obtained information on sex, age, prior schooling, marital status, educational degrees held, work experience, type of employer, and income received by other members of the household for 1969.

¹⁷Classification provided by the Department of Audiology and Speech, Gallaudet College.

The various alumni categories that constituted the total universe of "alumni with known addresses" were as follows: male graduates, 34.5 percent; female graduates, 26.9 percent; male nongraduates, 19.8 percent; female nongraduates, 18.8 percent. A total of 617 returns was obtained, yielding a response rate of 36 percent. Even though the response rate was higher than for most mail surveys, nonresponse still biases the results of the following analysis to some extent. These returns were proportioned in the following manner: 45 percent were male graduates, 36 percent were female graduates, 13.6 percent were male nongraduates, and 12 percent were nongraduating females. Thus, the returns overrepresented those alumni (both male and female) that graduated from Gallaudet College and underrepresented those alumni that did not graduate.

The means for lipreading, speech, and hearing for the alumni receiving the survey and the respondents is presented in Table 4. It is evident that the respondents had slightly lower abilities in each of the profile areas than did the universe. It is not known if these differences are statistically significant.

An extremely small variation in Graduate Record Examination quantitative scores between those receiving the survey and the respondents to the survey is apparent. A larger variation is evident for the Graduate Record Examination verbal scores for these two groups as is shown in

Table 5 below.

TABLE 4
PROFILE MEANS FOR LIPREADING, SPEECH, AND
HEARING OF THOSE SURVEYED AND RESPONDENTS

Profile	Average for Universe	Average for Respondents
Lipreading	2.7	2.8
Speech	2.9	3.2
Hearing	3.2	3.5

Source: Hearing and Speech Center, Gallaudet College.

TABLE 5
MEAN GRADUATE RECORD EXAMINATION SCORES
FOR ALUMNI AND RESPONDENTS

G R E	Alumni	Respondents
Verbal	317	291
Quantitative	363	361

Source: Office of Dean of Students, Gallaudet College.

While the difference between the respondents and the universe appear to be minor, some bias is unavoidable. However, the survey respondents can be thought of as an adequately representative sample of those "alumni with known addresses".

The occupational distribution of male respondents was

largely concentrated among the professional, technical, and managerial occupations (occupational classes 1 and 2), and the machine trade occupations (occupational class 6). These three broad classifications accounted for 88 percent of the total number of male respondents. Female respondents also had a high concentration in occupational classes 0 and 1. In addition, occupational class 2 (clerical and sales) accounted for a high proportion of female respondents (see Table 6).

TABLE 6
OCCUPATIONAL DISTRIBUTION OF
THE RESPONDENTS BY SEX

Occupational Class	Male		Female	
	Number	Percent	Number	Percent
0--professional, technical, or managerial	193	54.0	110	61.1
1--professional, technical, or managerial	49	13.7	21	11.7
2--clerical & sales	13	3.6	38	21.1
3--service occupations	1	0.3	2	1.1
4--farming, etc.	1	0.3	0	0
5--processing	5	1.4	0	0
6--machine trades occupations	72	20.2	7	3.9
7--bench work	6	1.7	0	0
8--structural	3	0.8	0	0
9--miscellaneous	13	13.6	2	1.1

Source: Survey of The Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

Hypothesis

In the Economics of Discrimination, Becker has shown that if discrimination exists against a group of workers that are identical with competing workers, except for some non-productive characteristic such as sex or race, the proportional difference in earnings between these two groups can be viewed as a market discrimination coefficient (MDC). In this case the MDC is equal to $\frac{W_o - W_d}{W_d}$, where W_d is the wage paid to workers discriminated against and W_o is the wage paid to those workers that are not discriminated against.¹⁸

If two groups of workers are not identical in all respects equilibrium wage rates between these two groups will differ. If, in addition, one of the groups is also discriminated against the MDC formula now becomes $\frac{W_o}{W_d} - \frac{W_o^e}{W_d^e}$ where W_o and W_d are nondiscriminatory and discriminatory wage rates and W_o^e and W_d^e are equilibrium wages paid to these workers in the absence of discrimination.¹⁹

However, an analysis of differences in earnings between hearing and deaf workers cannot be analyzed solely on the basis of discrimination. The deaf have certain influences on their earnings, other than possible discrimination, which must be taken into account. The following illustrates these influences:

¹⁸Gary S. Becker, The Economics of Discrimination (Chicago: University of Chicago Press, 1971), p. 17.

¹⁹Ibid., p. 17.

to earnings" would be if wages and salaries of hearing impaired workers with a greater communication ability were higher than those with less ability to communicate.

It is obvious that deaf workers lack the ability to perform certain jobs due to their handicap. Deafness itself is, therefore, a barrier to certain careers such as doctors, radio or television announcers, airplane pilots, etc. What may be of a greater hindrance to the deaf person in obtaining jobs is a lack of ability due to the lack of educational inputs these persons obtain.

While exact figures are not available, a large percentage of the primary and secondary schools for the deaf teach orally. This means that manual communication between teacher and student is discouraged, at least in the classroom. The advocates of manual communication methods maintain that since not all deaf children can either learn to speak effectively, or can acquire a great facility in lipreading, either manual communication by itself or in combination with oral methods should be used in schools for the deaf. The advisory committee on the education of the deaf concluded that educators of the deaf should stress oral methods, but supplement this with manual methods when it is obvious that success by oral methods will not be achieved.²¹

The implications for the deaf child of stressing oral

²¹U.S. Department of Health, Education, and Welfare, Education of the Deaf, p. xxx.

methods is tremendous. If earnings depend on educational input, the deaf child with a greater facility in lipreading and a smaller hearing loss will acquire a larger input from any given educational experience than those with less ability. If this is true, differences in earnings based on ability in lipreading and hearing should be apparent.

If the above analysis is correct it should be found that an interaction of lipreading, speech, and hearing abilities of a hearing impaired person is a significant determinant of his/her earnings. In order to ascertain the independent effect of communication abilities the analysis will have to control for other factors such as region of residence, length of work, and educational level. The specific hypothesis which will be tested is the following: lipreading, speech, and hearing ability are significant determinants of earnings for the Gallaudet College Alumni, after controlling for other factors that affect earnings.

CHAPTER II

EARNINGS, COMMUNICATION ABILITY AND THE HEARING IMPAIRED

As stated in the previous chapter, four factors could influence the earnings differential between the deaf and nondeaf. Three of these factors--discrimination against the deaf, lack of ability to perform certain jobs due to deafness, and a lack of educational inputs--will result in earnings differentials between the deaf and nondeaf. The fourth factor--innate lack of ability--will result in earnings differentials being manifested both between the deaf themselves and between the deaf and nondeaf. If these factors do influence deaf earnings the impact will be exhibited in a lower income for the hearing impaired compared to the total population.

Table 7 presents the income distribution and median earnings level by sex for those respondents to the Survey with four or more years of college.

A comparison of the median earnings of the hearing impaired by sex with white hearing persons with four or more years of college reveals that deaf males earned approximately 24 percent less than hearing males, while deaf females earned almost five percent more than their comparable group in 1969.

TABLE 7

INCOME DISTRIBUTION OF HEARING IMPAIRED PERSONS
WITH FOUR OR MORE YEARS OF COLLEGE

Income Class	Male		Female	
	Number	Percent	Number	Percent
Under \$4,000	2	0.7	13	9.3
4,000-4,999	4	1.5	8	5.7
5,000-5,999	13	4.9	14	10.0
6,000-6,999	19	7.2	22	15.7
7,000-7,999	0	0	0	0
8,000-8,999	56	21.1	47	33.6
9,000-9,999	0	0	0	0
10,000-11,999	66	24.9	21	15.0
12,000-14,999	82	30.9	15	10.7
15,000 and over	23	8.8	0	0
Total	265	100.0	140	100.0
Median	\$10,181		\$8,276	

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

While the lower earnings of deaf males is not unexpected, the higher earnings of deaf females at first seems inconsistent. However, the phenomena of a minority female group earning higher incomes than females of a majority

group is also exhibited by nonwhite females.¹ James Gwartney noted in his article, "Changes in Nonwhite/White Income Ratios", that during the 1960's nonwhite female income increased more rapidly than any other color/sex group. In addition, he found that the income differentials between nonwhite and white females with a high level of education was smaller than the white-nonwhite differential for men possessing a comparable amount of education. Gwartney's explanation for this relative income pattern of nonwhite females is their high percentage (77) in nondiscriminatory careers, such as teaching. A high relative income position of nonwhite females in teaching careers was also reported by Colberg who found that nonwhite female educators in many states earn a higher salary than the average salary for white female teachers.²

These two factors--a high proportion of employed deaf females in professional careers such as education, and a higher salary level for deaf female educators compared to their hearing counterparts--are also evident. Seventy-three percent of employed hearing impaired female respondents were employed in professional occupations. In addition, a survey conducted by the National Education Association found that

¹James Gwartney, "Changes in the Nonwhite/White Income Ratio, 1937-67," The American Economic Review, LX (December, 1970), 872-83.

²Marshall R. Colberg, Human Capital in Southern Development, 1939-1959 (Chapel Hill: The University of North Carolina Press, 1959), p. 63.

213 school districts out of 1,199 reported specific methods for scheduling higher salaries for special education teachers.³ It thus appears that the factors that accounted for the relatively high level of earnings of nonwhite females with a high level of education--a high proportion in professional careers and higher earnings compared to other female educators--are also responsible for the higher level of earnings among deaf females with four or more years of college.

In his article "Education and Income" Houthakker's analysis revealed that a definite relation existed between income and years of schooling for males.⁴ However, his study did not consider differences in the relation by region or race. This region-race-income relation was analyzed by Roy L. Lassiter. His analysis revealed that for both black and white males a definite relation existed, in both regions, between education and earnings. In addition, he found that nonSouthern white males earned a higher income than Southern white males and nonwhite males in both regions.⁵

The relation of nonSouthern white male earnings to all

³National Education Association, Research Memo, Number 5, 1969.

⁴H. S. Houthakker, "Education and Income," Review of Economics and Statistics, LIX (February, 1959), 24-28.

⁵Roy L. Lassiter, "The Association of Income and Education for Males by Region, Race, and Age," The Southern Economic Journal, XXXII (December, 1965), 15-22.

other male earnings revealed by Lassiter has persisted. In addition, white females residing in the nonSouth have also exhibited higher earnings compared to white females residing in the South. Specifically, Census Bureau data revealed that in 1969 incomes of white males residing in the South were 14.6 percent less than white male earnings in all other regions. During this year Southern white females earned 13.9 percent less than their counterparts in the nonSouth.⁶ Table 8 below presents the distribution of earnings by region, sex, and years of school completed for hearing impaired respondents to the Survey on the Income and Occupational Distribution of the Gallaudet College Alumni.

It is evident from Table 8 that the median wage and salary level for hearing impaired workers residing in the South did not follow the national pattern reported by the Census Bureau. Higher median incomes were exhibited by Southern respondents of both sexes with four years of college, and for males with more than four years of college. Southern hearing impaired respondents with less than four years of college and females with more than four years of college earned a lower median wage than those in all other regions.

An explanation for the higher Southern income of the hearing impaired might be that a high percentage of the

⁶United States Bureau of the Census, Current Population Reports, Series P-60, Number 75 (Washington: Government Printing Office), p. 130.

TABLE 8

EARNINGS OF HEARING IMPAIRED RESPONDENTS
BY REGION, DEGREES HELD, AND SEX^a
(in percent)

Income Class	1-3 Years of College		Four Years of College		More than Four Years of College	
	Males	Females	Males	Females	Males	Females
South						
Under \$4,000	0	10.0	0	7.8	0	0
4,000-4,999	6.9	20.0	0	3.9	4.3	0
5,000-5,999	6.9	20.0	3.7	9.8	0	9.1
6,000-6,999	10.3	10.0	11.2	19.6	4.3	0
7,000-7,999	0	0	0	0	0	0
8,000-8,999	27.6	0	22.4	47.1	17.4	36.4
9,000-9,999	0	0	0	0	0	0
10,000-11,999	34.5	20.0	31.8	7.8	8.6	45.5
12,000-14,999	10.3	20.0	20.6	3.9	47.8	9.1
15,000 & over	3.4	0	10.3	0	17.4	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Median	\$9,000	\$6,000	\$10,823	\$8,250	\$13,090	\$10,400
Nonsouth						
Under \$4,000	0	13.6	2.2	12.9	0	0
4,000-4,999	3.8	13.6	3.3	8.6	0	0
5,000-5,999	3.8	13.6	7.8	10.0	4.4	12.5
6,000-6,999	9.6	31.8	5.6	15.7	2.2	12.5
7,000-7,999	0	0	0	0	0	0
8,000-8,999	26.9	18.2	28.9	27.1	4.4	0
9,000-9,999	0	0	0	0	0	0
10,000-11,999	36.5	9.1	22.2	14.3	22.2	25.0
12,000-14,999	17.3	0	27.7	11.4	53.3	50.0
15,000 & over	1.9	0	2.2	0	13.3	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Median	\$10,315	\$6,285	\$10,200	\$8,105	\$13,000	\$12,000

^aComponents may not add to total due to rounding.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

respondents living in the South, which includes Washington, D.C., worked for the federal government. Federal employment is cited as a possible factor influencing the median income of the hearing impaired since the Bureau of the Census reported that based on type of employer (private, government, or self-employed) the median total money earnings for all white federal wage or salary workers, in 1969, was \$9,404 for males and \$6,742 for females, or 7.6 percent and 35.4 percent above the average for all workers respectively.⁷ The presumption is that deaf federal workers would also have higher than average income.

In order to analyze the influence of federal employment on median earnings of hearing impaired workers, I separated out those respondents classified as employed by the federal government in both regions under study. The percentage of respondents residing in the nonSouth and employed by the federal government was 7.6 compared to 43.6 living in the South. Tables 9 and 10 present the income distribution for federal and nonfederal hearing impaired workers.

A comparison of Tables 9 and 10 reveals that federally employed workers residing in the South had substantially higher incomes than deaf workers living in the South not employed by the federal government. Nonfederally employed males residing in the nonSouth with 1-3 and 4 years of

⁷Computed from United States Bureau of the Census, Current Population Reports, Series P-60, Number 75 (Washington: Government Printing Office), pp. 119-20.

TABLE 9

EARNINGS OF HEARING IMPAIRED RESPONDENTS BY
REGION, DEGREES HELD, AND SEX
OF NONFEDERAL EMPLOYEES^a
(percent distribution and medians)

Income Class	1-3 Years of College		Four Years of College		More than Four Years of College	
	Males	Females	Males	Females	Males	Females
South						
Under \$4,000	0	28.6	0	5.9	0	0
4,000-4,999	13.3	42.8	0	5.9	0	0
5,000-5,999	13.3	28.6	5.6	11.8	0	0
6,000-6,999	20.0	0	22.2	17.6	0	0
7,000-7,999	0	0	0	0	0	0
8,000-8,999	0	0	29.6	44.1	28.6	75.0
9,000-9,999	0	0	0	0	0	0
10,000-11,999	53.4	0	25.9	8.8	7.1	25.0
12,000-14,999	0	0	11.1	5.9	42.9	0
15,000 & over	0	0	5.6	0	21.4	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Median	\$8,624	\$4,666	\$8,750	\$8,200	\$12,999	b
Nonsouth						
Under \$4,000	0	13.3	2.4	12.9	0	0
4,000-4,999	4.3	13.3	2.4	8.6	0	0
5,000-5,999	4.3	6.7	7.2	10.0	4.7	12.5
6,000-6,999	8.7	26.7	3.6	15.7	2.3	12.5
7,000-7,999	0	0	0	0	0	0
8,000-8,999	23.9	26.7	31.3	27.1	4.7	0
9,000-9,999	0	0	0	0	0	0
10,000-11,999	37.0	13.3	22.9	14.2	23.3	25.0
12,000-14,999	19.6	0	27.7	11.4	51.2	50.0
15,000 & over	2.2	0	2.4	0	14.0	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Median	\$10,470	\$6,750	\$10,315	\$8,105	\$12,954	\$12,000

^aComponents may not add to total due to rounding.

^bTotal number of responses in the classification - four.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

TABLE 10

EARNINGS OF HEARING IMPAIRED RESPONDENTS BY
 REGION, DEGREES HELD, AND SEX
 OF FEDERAL EMPLOYEES^a
 (percent distribution and medians)

Income Class	1-3 Years of College		Four Years of College		More than Four Years of College	
	Males	Females	Males	Females	Males	Females
South						
Under \$4,000	0	0	0	11.8	0	0
4,000-4,999	0	7.7	0	0	11.1	0
5,000-5,999	0	15.4	1.9	5.9	0	14.3
6,000-6,999	0	15.4	0	23.5	11.1	0
7,000-7,999	0	0	0	0	0	0
8,000-8,999	0	0	15.1	52.9	0	14.3
9,000-9,999	0	0	0	0	0	0
10,000-11,999	33.3	30.8	37.7	5.9	11.1	57.1
12,000-14,999	50.0	30.8	30.2	0	55.5	14.3
15,000 & over	16.6	0	15.1	0	11.1	0
Total	100.0	100.0	100.0	100.0	100.0	100.0
Median	\$13,000	\$11,000	\$11,800	\$8,222	\$13,200	\$11,000
Nonsouth						
Under \$4,000	0	14.3	0	0	0	0
4,000-4,999	0	14.3	14.3	0	0	0
5,000-5,999	0	28.6	14.3	0	0	0
6,000-6,999	16.6	42.9	28.6	0	0	0
7,000-7,999	0	0	0	0	0	0
8,000-8,999	50.0	0	0	0	0	0
9,000-9,999	0	0	0	0	0	0
10,000-11,999	33.3	0	14.3	0	0	0
12,000-14,999	0	0	28.6	0	100.0	0
15,000 & over	0	0	0	0	0	0
Total	100.0	100.0	100.0	-	100.0	-
Median	\$8,666	\$6,000	\$7,000	-	b	-

^aComponents may not add to total due to rounding.

^bThere were only two responses in this classification.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

college earned substantially higher incomes, in 1969, than deaf males residing in the South. However, the income differential for hearing impaired male workers with four or more years of college and known profiles was only \$345.50. The nonSouth-South income differential for females with four or more years of college and known profiles was \$300.00.⁸

Communication Ability

Studies concerned with the relation between deaf characteristics and earnings have been practically nonexistent. However, two studies have analyzed the income distribution among the deaf in relation to speech and/or lipreading abilities.

The earlier of the two studies, Occupational Conditions Among the Deaf, by Anders S. Lunde and Stanley K. Bigman was a survey of 10,001 deaf persons. Their analysis revealed that a high proportion of deaf persons earning over \$6,000 in 1956-57 (47.4 percent) reported that they either had enough lipreading ability to understand conversation or excellent lipreading skills. At the same time the proportion of deaf persons with high lipreading ability declined to

⁸A chi-square test of the income distribution for both males and females with known profiles by region reveals that regional frequency distributions are probably not significantly different at the five percent level of significance. Due to the small number of respondents with less than four years of college (5) and the small number of males (4) and females (0) in the South with more than four years of college not federally employed, with known profiles, income data based on profiles will be for persons with four or more years of college.

37.4 percent for persons earning between \$2,000 and \$3,000.⁹

A later study, Deaf Persons in Professional Employment, by Alan B. Crammatte¹⁰ did not find any particular concentration of high lipreading skills among those with high earnings. His study reported that while 66 percent of his respondents earning more than \$8,000 could lipread well enough to understand everything said or short conversation, the proportion declined only to 61 percent for those earning less than \$8,000. However, Crammatte found that speech ability seemed to be related to income in that 92 percent of the respondents to his study earning more than \$8,000 had a high proficiency in speech compared to 64 percent with a high proficiency in speech who earned less than \$8,000.

Neither of these studies, however, analyzed the interaction of lipreading, speech, and hearing in relation to income, nor did they analyze any possible differences in the relation by sex. The remainder of this chapter will analyze the interaction between lipreading, speech, and hearing to earnings of those respondents to the Survey with

⁹Anders S. Lunde and Stanley K. Bigman, Occupational Conditions Among the Deaf (Washington: Gallaudet College Press, 1959), pp. 34-35.

¹⁰Alan B. Crammatte, Deaf Persons in Professional Employment (Springfield: Charles C. Thomas, 1968), pp. 72-88.

known abilities in these areas.¹¹

Table 11 below presents median income data based on lipreading and speech profiles for male and female respondents. For ease of analysis the five individual lipreading and speech ability categories were rearranged into three individual ability groupings. These three groupings are as follows: high ability (lipreading 1-2; speech 1-2); middle ability (lipreading 3; speech 3); and low ability (lipreading 4-5; speech 4-5).

It is evident from Table 11 that the relation between lipreading, speech and income reported by Bigman and Lunde, and Crammatte--namely, a decline in income with declining lipreading and speech--is exhibited only for deaf males not federally employed. While the speech-income relation was not evident for deaf males federally employed, the profile-income relation was evident when incomes were related to lipreading abilities.

The relation between lipreading, speech and income observed for males is not evident for females. Based on lipreading abilities the highest income for hearing impaired females was found for those with a "middle" ability. In the case of earnings based on speech profiles those females with the lowest speech ability had the highest earnings. Thus,

¹¹Due to the high correlation between lipreading and speech ($r=.60$) and speech and hearing ($r=.42$) and since there is no a priori reason to assume an additive relation between earnings and communication abilities, the use of an interaction term is indicated.

TABLE 11

MEDIAN INCOMES BY LIPREADING AND SPEECH ABILITIES
OF FEDERALLY AND NONFEDERALLY EMPLOYED MALE AND
FEMALE RESPONDENTS WITH KNOWN ABILITIES IN
LIPREADING AND SPEECH^a

Ability	Not Federally Employed		Federally Employed	
	Lipreading	Speech	Lipreading	Speech
Males				
1-2	\$ 8,999.50 (n=38)	\$ 8,999.50 (n=34)	\$11,666.00 (n=21)	\$ 8,999.50 (n=13)
3	8,666.10 (n=31)	8,888.70 (n=27)	10,999.50 (n=9)	13,199.50 (n=14)
4-5	8,100.90 (n=34)	8,388.00 (n=42)	10,666.10 (n=14)	10,666.10 (n=19)
Females				
1-2	\$ 6,999.50 (n=27)	\$ 6,499.50 (n=16)	\$ 8,499.50 (n=5)	\$ 8,332.80 (n=8)
3	8,166.10 (n=20)	6,570.20 (n=21)	8,332.80 (n=5)	8,666.10 (n=5)
4-5	5,599.50 (n=16)	6,832.50 (n=26)	10,999.50 (n=5)	11,999.50 (n=5)

^a Respondents with four or more years of college.
Since some persons did not have profiles reported for each
category totals for lipreading and speech may not be equal.
N is equal to the number of cell observations.

Source: Survey of the Income and Occupational Distri-
bution of the Gallaudet College Alumni,
1945-1968.

without controlling for other variables we find that the relations found by Lunde and Bigman, and Crammatte hold only for nonfederally employed males.

Earnings and Communication Ability of Nonfederally Employed Males

This section will analyze the relation between lipreading and speech, lipreading and hearing, and speech and hearing to earnings for hearing impaired respondent males not employed by the federal government. The findings will be analyzed statistically in Chapter III to see if they are significant. The relation between communication ability and income for these respondents is presented in Table 12.

The information in Table 12 shows that a relationship between lipreading, speech, and income exists. This can be observed, for example, in the fact that the median earnings of males with high lipreading (1-2) and high hearing (1-3) abilities earned \$10,666 in 1969, compared to males with low lipreading (4-5) and low hearing (4-5) earning \$8,499. In every case presented earnings of those respondents with a "high" or "high-middle" communications ability dominate. While the lowest earnings were found among those males with speech (4-5)-hearing (1-3) the lack of responses in this cell (9) could have biased the results. The relation between income and lipreading-hearing and lipreading-speech revealed that males with the lowest abilities in these areas earned the lowest incomes in 1969.

TABLE 12

MEDIAN EARNINGS OF DEAF MALES BY
LIPREADING-SPEECH, SPEECH-HEARING,
AND LIPREADING-HEARING PROFILES^a

A. Lipreading-Hearing		
Profile Lipreading	Hearing	
	1-3	4-5
1-2	\$10,666.10 (n=25)	\$ 8,999.50 (n=13)
3	8,666.10 (n=13)	8,666.10 (n=18)
4-5	8,666.10 (n=9)	8,499.50 (n=25)
B. Speech-Hearing		
Profile Speech	Hearing	
	1-3	4-5
1-3	\$10,544.90 (n=35)	\$ 8,624.50 (n=24)
4-5	6,499.50 (n=9)	8,570.70 (n=32)
C. Lipreading-Speech		
Profile Lipreading	Speech	
	1-3	4-5
1-2	\$10,221.70 (n=35)	--- (n=3)
3	8,832.50 (n=21)	8,713.50 (n=15)
4-5	8,999.50 (n=6)	8,332.80 (n=31)

^aNonfederally employed males with four or more years of college. Since some persons did not have profiles reported for each category totals for profile groupings may not be equal. N is equal to the number of cell observations.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

If the earnings of those males with "high" or "high-middle" interactions in each of the three interaction classifications (lipreading-hearing, lipreading-speech, speech-hearing) are compared to the average earnings of other males in the same interaction classification, it is found that the high communication ability interaction group earned 25 percent higher earnings based on lipreading-hearing; 24 percent higher earnings based on speech-hearing; and 19.5 percent higher earnings based on lipreading-speech.

A comparison of earnings of those with the highest and lowest ability combinations in these three classifications reveals income differentials ranging from 22.5 percent for lipreading (1-2)-speech (1-3) and lipreading (4-5)-speech (4-5) to 25.5 percent for lipreading (1-2)-hearing (1-3) and lipreading (4-5)-hearing (4-5).

A comparison of earnings based on lipreading and lipreading-hearing (Tables 11 and 12) reveals that those males with high lipreading-hearing interactions earned 18.8 percent more than when earnings were based on lipreading alone. A similar comparison between speech and speech-hearing reveals a 17.1 percent earnings differential for the speech-hearing interaction compared to earnings based on the speech profile only. It thus appears that what is important in determining income is having high ability in more than one communication area. Skill in only one aspect of communication does not help nearly as much.

Earnings and Communication Ability
of Federally Employed Males

An analysis of the interaction of lipreading, speech, and hearing on the earnings of federally employed males must be tempered by two influences. First, persons desiring employment with the Federal Government must pass the Federal Service Entrance Examination (FSEE) before they can be employed. Second, the salary structure of the Federal Government is structured in the sense that certain grade levels are supervisory while lower grade levels are non-supervisory.

The FSEE results in the establishment of some minimum ability and educational input criteria. This means that two of the influences on deaf earnings (innate ability and lack of educational inputs) should be lessened by the application of this standard examination. If the above analysis is correct the large disparity in earnings observed in the prior section should be reduced.

The salary structure of the government should also result in a reduction in earnings differentials among hearing impaired workers. This should occur since salary increases within any given grade level are approximately equal. In addition, if the observation made by Silver is correct, federally employed deaf workers would be limited to nonsupervisory grade levels.¹² Table 13 presents the

¹²Silver, "Employment Practices and Trends in Industry," p. 11.

earnings of federally employed deaf workers.

TABLE 13

MEDIAN EARNINGS OF FEDERALLY EMPLOYED DEAF MALES
BY LIPREADING-HEARING, SPEECH-HEARING AND
LIPREADING-SPEECH^a

A. Lipreading-Hearing			
Profile Lipreading	Hearing		4-5
	1-3		
1-2	\$11,332.70 (n=9)		\$11,332.70 (n=10)
3-5	8,999.50 (n=6)		10,856.00 (n=17)
B. Speech-Hearing			
Profile Speech	Hearing		4-5
	1-3		
1-3	\$10,666.10 (n=10)		\$12,749.50 (n=13)
4-5	11,999.50 (n=5)		10,499.50 (n=16)
C. Speech-Lipreading			
Profile Speech	Lipreading		3-5
	1-2		
1-3	\$11,999.50 (n=19)		--- (n=6)
4-5	--- (n=2)		10,749.50 (n=17)

^aFederally employed males with four or more years of college. Since some persons did not have profiles reported for each category totals for profile groupings may not be equal. N is equal to the number of cell observations.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

It is evident from Table 13 that a definite employment pattern exists among federally employed deaf workers. This is seen in the fact that these male respondents were basically divided between those with high lipreading-speech ability and those with low lipreading-speech ability.

While the earnings of hearing impaired males employed by the Federal Government with a high ability in each of the three communication ability classifications exceeded those with low ability, the differentials were much smaller than for nonfederal workers, ranging from a low of one percent to a high of 12 percent (see Table 14).

TABLE 14

EARNINGS DIFFERENTIALS OF HIGH PROFILE TO LOW
PROFILE ABILITY COMBINATIONS FOR FEDERALLY
AND NONFEDERALLY EMPLOYED MALES
(in percent)

Profile Interactions	Federal Workers	Nonfederal Workers
Lipreading-Hearing	5	25.5
Speech-Hearing	1	23.0
Speech-Lipreading	12	22.5

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

A high median earning-low median earning comparison (see Table 13), by profile interaction, for federally employed males reveals that on the basis of lipreading-hearing there was a 25 percent income differential in 1969, which

was equal to the nonfederal gap. On the basis of speech-hearing abilities the difference in earnings between those with the highest income and those with the lowest was 22 percent for federal workers and 62 percent for nonfederally employed hearing impaired males. In contrast to nonfederal workers, the group that earned the highest income in this classification were those with speech (1-3)-hearing (4-5). Nonfederal employees with speech (1-3)-hearing (1-3) attained the highest earnings as was shown in Table 12.

The dominant position of hearing impaired males with relatively high communications abilities in each of the three ability classifications is not shown by federal workers. Among federal workers, males with lipreading ability 1-2 and speech ability 1-3 again maintained a high relative earnings position. However, while these two profiles resulted in high earnings in combination with hearing ability 1-3 in the case of nonfederal workers, federal workers exhibited equal interaction with hearing 1-3 and 4-5 profiles in the case of lipreading-hearing and a dominant earnings position with hearing 4-5 in the case of speech-hearing.

The smaller income differentials, based on communication ability of hearing impaired federal workers can be readily observed by comparing earnings differentials of males with the highest earnings to all others in a specific interaction profile combination. Table 15 presents the

ratio of high earning profile to all others by interaction combination for both federally and nonfederally employed males.

TABLE 15

RATIO OF HIGH EARNING PROFILES TO ALL OTHERS
BY LIPREADING-SPEECH, LIPREADING-HEARING,
AND SPEECH-HEARING FOR FEDERALLY AND
NONFEDERALLY EMPLOYED HEARING
IMPAIRED MALES

Profile Combination	Federal Workers	Nonfederal Workers
Lipreading-Hearing	107.2	125.0
Hearing-Speech	120.0	124.0
Lipreading-Speech	105.0	119.5

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

It can be seen in Table 15 that the median earnings ratio of high income profiles to all others is less for federal than for nonfederal workers. It thus appears that the government salary structure and the FSEE does have the effect of lessening the large income disparity among hearing impaired workers.

Hearing Impaired Males
Employed in Education

The proportion of hearing impaired males in education in 1969 with known profiles and four or more years of college was more than double the proportion of hearing males in

teaching in 1969.¹³ This extremely high percentage of deaf males in teaching can be due to two factors. First, if discrimination exists in employment opportunities, this may result in hearing impaired males having a limited number of options available other than teaching. Second may be the fact that a high proportion of the deaf enter this occupational field because they feel more "comfortable" among the deaf than they do among hearing persons.

If the first factor is correct there should be a high proportion of hearing impaired males with low communication abilities in teaching. On the basis of lipreading-speech combinations the lowest proportion of hearing impaired respondent males in education were those males with the lowest abilities in lipreading-speech. An explanation for this employment pattern could be a general feeling among superintendents of deaf schools which was expressed by Clarence D. O'Connor, the superintendent of the Lexington School for the Deaf in New York:

But we could not, in justice to our dedication to the objectives of the attainment of maximum speech skills by our pupils employ a large number of deaf teachers. Nor could any other school for the deaf, in my judgment.¹⁴

Thus, even in the field of education the hearing impaired

¹³Hearing impaired males in education - 37.6 percent.
Hearing males in education - 16 percent.

¹⁴Clarence D. O'Connor, "The Preparation of Teachers of the Deaf," Report of the Proceedings of the International Congress on Education of the Deaf (Washington: Government Printing Office, 1964), p. 993.

person finds barriers to employment.

In spite of this barrier, the proportion of respondent males that were employed in this occupation was 39 percent for males with speech ability 1-2, 40.4 percent for those with speech ability 3, and 34 percent for those with speech ability 4-5. Earnings of hearing impaired males in the teaching profession based on lipreading-hearing, lipreading-speech and speech-hearing is presented in Table 16.

A comparison of the earnings by profile interaction combinations for hearing impaired male teachers does not show any large earnings differentials as was the case for nonfederal and federal workers. It should, however, be noted that the lowest earnings reported are for those males that possess the least ability in both lipreading and speech. Thus, not only did this low ability group have the smallest percent employed in teaching, but also earned approximately eight percent less than male educators with the highest lipreading-speech ability.

Earnings and Communication Ability of Nonfederally Employed Females

Due to the small number of respondent females (18) classified as federally employed no significant relation between communication ability and income was expected for this group. However, because of the relatively high earnings of these federally employed females, and the relationship between communication ability and earnings

TABLE 16

MEDIAN EARNINGS OF DEAF MALES EMPLOYED AS
TEACHERS BY LIPREADING-HEARING,
SPEECH-HEARING, AND
LIPREADING-SPEECH^a

A. Lipreading-Hearing		
<u>Profile</u> Lipreading	Hearing	
	1-2	3-5
1-2	\$ 8,999.50 (n=7)	\$ 8,666.10 (n=13)
3-5	--- (n=2)	8,532.30 (n=32)
B. Speech-Hearing		
<u>Profile</u> Speech	Hearing	
	1-3	4-5
1-2	\$ 8,999.50 (n=13)	--- (n=6)
3-5	--- (n=6)	8,608.30 (n=32)
C. Lipreading-Speech		
<u>Profile</u> Lipreading	Speech	
	1-3	4-5
1-3	\$ 8,799.50 (n=31)	--- (n=6)
4-5	--- (n=4)	8,166.10 (n=16)

^aHearing impaired males employed as teachers with four or more years of college. Since some persons did not have profiles reported for each category totals for profile groupings may not be equal. N is equal to the number of cell observations.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

found for nonfederally employed males (see Table 11), I removed this group from consideration in Table 17 which presents the relation between earnings and lipreading-hearing, speech-hearing, and speech-lipreading for nonfederally employed females.

The interaction of deaf profiles and earnings for hearing impaired females presented in Table 17 indicates that a possible relation exists between lipreading-hearing, lipreading-speech and earnings. However, the relation between speech-hearing and earnings evident for nonfederally employed males (see Table 12) is absent for hearing impaired females. In addition, the strong dominance in earnings among hearing impaired males with high or high-middle abilities in each of the profile combinations is not as evident among these deaf females. Thus, while lipreading (1-3)-hearing (1-3) females exhibited the highest earnings, it is lipreading (1-3)-speech (4-5) females that had the highest earnings based on lipreading-speech abilities.

While earnings of deaf females neither exhibit the strong relations between high abilities in deaf characteristics and earnings as was the case with hearing impaired males, nor are earnings comparable to nonfederally employed males, the difference in earnings exhibited between females with the highest earnings and those with the lowest on the basis of lipreading-hearing and lipreading-speech is much greater than for males. A comparison of the earnings

TABLE 17

MEDIAN EARNINGS OF DEAF FEMALES NOT EMPLOYED BY
THE FEDERAL GOVERNMENT BY LIPREADING-HEARING,
SPEECH-HEARING, AND LIPREADING-SPEECH^a

A. Lipreading-Hearing		
<u>Profile</u> Lipreading	Hearing	
	1-3	4-5
1-3	\$ 8,307.10 (n=21)	\$ 6,570.70 (n=22)
4-5	--- (n=5)	5,499.50 (n=10)
B. Speech-Hearing		
<u>Profile</u> Speech	Hearing	
	1-3	4-5
1-3	\$ 6,799.50 (n=23)	\$ 6,199.50 (n=17)
4-5	--- (n=6)	6,599.50 (n=20)
C. Lipreading-Speech		
<u>Profile</u> Lipreading	Speech	
	1-3	4-5
1-3	\$ 6,856.30 (n=31)	\$ 8,272.20 (n=16)
4-5	--- (n=6)	6,332.80 (n=10)

^aN is equal to the number of cell observations. Deaf females with four or more years of college.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

difference for males and females reveals that based on lipreading-hearing, females with the highest earnings and "high-middle" ability earned 51 percent more than deaf females with low earnings and ability; the comparable difference for males was 25 percent. On the basis of lipreading-speech the difference for females was approximately 30 percent, or 7.5 percentage points higher than the difference for males. A striking reversal is found for the high-low earnings gap based on speech-hearing. Nonfederally employed females with "high-middle" ability exhibit the highest earnings, as was the case with deaf males; however, the female income differential was only ten percent compared to 62 percent for males.

It thus appears that for nonfederally employed females "high-middle" lipreading-hearing ability is associated with high earnings as was the case for deaf males, but this ability dominance is not maintained for lipreading-speech or speech-hearing.

Hearing Impaired Females Employed in Education

A high proportion (54.7 percent) of the female respondents were employed in teaching compared to hearing females, as was the case with deaf males. However, the difference between hearing impaired and hearing females in education (10.1 percentage points) is much smaller than the difference for males (21.6 percentage points). This

decrease in the differential can be explained by the fact that teaching has traditionally been a "female" occupation. While this factor undoubtedly accounts for a high proportion of hearing impaired females in teaching, the factors previously cited as influencing deaf male entry into teaching also apply in the case of deaf females.

While the income differentials for males in education did not exhibit any large variation within the three interaction classifications this pattern was not found among female educators. In the case of deaf female educators a definite pattern emerged (see Table 18). On the basis of the interaction of lipreading-hearing and earnings those females with lipreading (1-3)-hearing (1-3) profiles dominated, earning approximately 22 percent more than all other deaf females classified on the basis of lipreading-hearing. In the case of speech-hearing and earnings the earnings differential tended to be centered more on the basis of understandable speech, with little relation to the extent of hearing loss.

In summary, it was shown in this chapter that a strong relation exists between communication ability and earnings for nonfederally employed males. However, the relation between high communication ability and earnings was not as evident for federally employed males or nonfederally employed females.

Since other factors can influence income the communica-

TABLE 18

MEDIAN EARNINGS OF DEAF FEMALES EMPLOYED AS
TEACHERS BY LIPREADING-HEARING,
SPEECH-HEARING, AND
LIPREADING-SPEECH^a

A. Lipreading-Hearing		
Profile Lipreading	Hearing	
	1-3	4-5
1-3	\$ 8,299.50 (n=16)	\$ 6,999.50 (n=20)
4-5	--- (n=5)	--- (n=5)

B. Speech-Hearing		
Profile Speech	Hearing	
	1-3	4-5
1-3	\$ 8,142.10 (n=15)	\$ 8,166.10 (n=13)
4-5	--- (n=6)	6,999.50 (n=11)

C. Lipreading-Speech		
Profile Lipreading	Speech	
	1-3	4-5
1-3	\$ 8,153.30 (n=26)	\$ 8,285.10 (n=11)
4-5	--- (n=2)	--- (n=6)

^aFemales with four or more years of college. Since some persons did not have profiles reported for each category totals for profile groupings may not be equal. N is equal to the number of cell observations.

Source: Survey of the Income and Occupational Distribution of the Gallaudet College Alumni, 1945-1968.

tion ability-income relation for federally employed males and nonfederally employed females could have been clouded. Thus, it cannot be concluded that high communication abilities influence only the earnings of nonfederally employed deaf males. The influence of communication abilities as well as other possible factors as income determinants will be tested statistically in Chapter III.

CHAPTER III

THE INCOME DETERMINANTS OF THE HEARING IMPAIRED

It was shown in Chapter II that the relation between lipreading, speech, and hearing profile interactions and earnings was not the same within the three groups studied (deaf males federally or nonfederally employed and nonfederally employed females). In order to determine the significance of communication ability on earnings a multiple regression equation will be developed for each of these three groups. The regression will incorporate, along with communication ability interactions, other factors that have been shown to be significant earnings determinants for hearing persons. The inclusion of these other parameters will adjust for the possibility of specification bias (see below) as well as providing data on the significance of factors other than deaf characteristics as income determinants for the deaf.

The multiple regression model that will be used is in the following form: $Y = B_0 + b_1 X_1 + b_2 X_2 + \dots + b_k X_k + u$. In the regression $X_1 \dots X_k$ are independent or explanatory variables, u is an unknown random-error term assumed to have a zero mean and finite variance, and $b_1 \dots b_k$ are partial regression coefficients which convert ceteris paribus

changes in each of the explanatory variables into an expected change in the dependent variable Y.

As stated above, the relation between earnings and deaf profile interactions was shown to vary among the three hearing impaired groups studied. Specifically, it was apparent that for nonfederally employed males lipreading (1-2)-speech (1-3)-hearing (1-3) was associated with high earnings, while federally employed males with lipreading (1-2)-speech (1-3) seemed to possess an earnings advantage over federally employed males not possessing these skills. Variations in hearing ability apparently had a minor influence on the earnings of federally employed males. Speech ability appeared to have little effect on the earnings of females, while the possession of lipreading (1-3)-hearing (1-3) seemed to be an important determinant of earnings for this group. Because of this diversity of communication ability influences on the earnings of these three sex-employment groups, separate regressions will be developed for each category. The underlying rationale for presenting the three separate equations is to test for the significance of communication ability interactions as income determinants for these three hearing impaired groups.

As indicated above, the communication ability interaction variable will vary with each of the three groups. In the case of nonfederally employed males the communication ability interaction parameter will be measured by a dummy

variable coded one if the person possessed lipreading (1-2)-speech (1-3)-hearing (1-3) ability. The influence of communication ability on the earnings of hearing impaired federally employed males will be tested with the use of two independent variables. One of these variables will test for the apparent interaction of lipreading and speech on the earnings of this group with the use of a dummy variable coded one if the person possessed lipreading (1-2)-speech (1-3) ability. The other independent variable will test for the significance or nonsignificance of hearing ability on earnings by using the specific hearing profile ability measure (1-5) reported as an independent variable. Two communication ability parameters will be tested for their significance or nonsignificance on the earnings of hearing impaired females. These two are: (1) a lipreading (1-3)-hearing (1-3) dummy variable which is coded one if the criteria are met; and (2) a speech parameter measured on the basis of the speech ability the person exhibited in her speech ability test.

Each of these equations will test the significance of five other independent variables as income determinants. These variables, which have been shown to be significant income determinants for hearing persons, the reason for their inclusion in the equations, and the basis of their measurement are presented below.

The relation between earnings and communication

ability may be influenced by the fact that some members of the sample possess only four years of college while others have graduate work. This means that the positive relation between earnings and communication ability uncovered in Chapter II may be due to persons with higher lipreading, speech, and hearing abilities acquiring graduate degrees, which results in higher earnings. If so, a failure to account for these degrees will result in a specification bias being introduced into the regression equation.¹ This is cited as a possible influence on deaf earnings since it has been demonstrated by others that a positive relation exists between the level of education and income.² More specifically, Hanoch found in his study that the earnings of males with graduate degrees was seven percent higher than the earnings of males with only four years of college.³ In order to account for the possible influence of graduate

¹If an education variable is not included and if communication ability and education are positively related, a measure of the contribution of communication ability and earnings that ignores the education variable will be biased upward by the amount $B_{ed}b_{ed-ca}$ where B_{ed} is the regression coefficient of the education variable and b_{ed-ca} is the regression coefficient of education on communication ability.

²H. S. Houthakker, "Education and Income," The Review of Economics and Statistics, LIX (February, 1959), 24-28; H. P. Miller, "Annual and Lifetime Income in Relation to Education, 1939-1959," American Economic Review, L (December, 1960), 962-987; Dael Wolfe, "Economics and Educational Values," The Review of Economics and Statistics, XLII (August, 1960), 178-179.

³Giora Hanoch, "An Economic Analysis of Earnings and Schooling," The Journal of Human Resources, II (Summer, 1967), 310-325.

education on earnings a dummy variable coded one if the person possessed a master's degree will be used in the regression.

The specific relation between ability and income, which has been shown to be a significant income determinant, must also be taken into account.⁴ Two variables were available for the measurement of ability. One was the Graduate Record Examination verbal (GREV) scores and the other was the Graduate Record Examination quantitative (GREQ) scores attained by the respondents. Because of the high correlation ($r=0.55$) between these two measures of ability and the resulting problem of multicollinearity the GRE verbal and quantitative scores will be entered into each regression separately. The variable with the highest t-ratio will be retained. Failure to account for an ability factor can result in misspecifying the equation in two ways. First, if persons with higher skills in lipreading, speech, and hearing acquire more educational inputs from any given educational experience, and if earnings are determined in part directly by ability the importance of communication skills will be overstated. Second, if persons with higher

⁴John Conlisk, "A Bit of Evidence on the Income-Education-Ability Interrelation," The Journal of Human Relations, VI (Summer, 1971), 358-362; John C. Hause, "Earnings Profile: Ability and Schooling," The Journal of Political Economy, LXXX (May/June, 1972), 108-138; B. A. Weisbrod and Peter Karpoff, "Monetary Returns to College Education, Student Ability, and College Quality," The Review of Economics and Statistics, L (November, 1968), 491-497.

lipreading, speech, and hearing go on to graduate school and an ability variable is not taken into account it can lead to a misspecification of the educational component of the regression.

The influence of family background in the determination of incomes has also been analyzed. Bowles postulated that significant influences on an individual's income are family income, parental wealth, and the parents' position in the work hierarchy.⁵ He feels that a failure to take account of these influences has had an upward bias in the estimates of the role of schooling in income generation. However, as he points out, he did not have data on parental wealth or the position of parents in the work hierarchy. Instead in his study he adjusted the reported fathers' socioeconomic class upward to correct for a downward bias in fathers' occupations reported by their sons.⁶ Bowles found that there was a significant relation between a father's occupational status and earnings of sons. However, it was stated by Becker that since the adjustment performed by Bowles on family background was larger than the adjustments he made to other variables the importance of family background would

⁵Samuel Bowles, "Schooling and Inequality From Generation to Generation," The Journal of Political Economy, LXXX (May/June, 1972), 223.

⁶Bowles points out that the Blau and Duncan study found that the zero-order correlation between occupational status reported by father and son to be 0.74.

be increased.⁷ Because of Becker's criticism and also since no information is available on the correlation between a father's actual occupation and reported occupation by hearing impaired children an unadjusted socioeconomic status index of the father (as classified by Duncan) is used in this study.⁸

While most previous studies have used the respondent's age as an indicator of years of work experience, this parameter does not accurately reflect the work experience an individual possesses in his current occupation.⁹ If on-the-job training is an important influence on earnings, a better measure of this variable would be years of work experience the individual possesses in his current occupation. Specific data on the actual number of years of experience in their current occupation was collected from the respondents to this survey. This variable, measuring the actual number of years of work experience in the respondents' current

⁷Gary S. Becker, "Comment," The Journal of Political Economy, LXXX (May/June, 1972), 252-255.

⁸The "socioeconomic index" was derived from a multiple regression equation which was estimating the prestige rating of occupations. The regression was a function of education and income levels for various occupations. The index is therefore an estimate of the percentage of "excellent" or "good" ratings various occupations receive by the public.

⁹Roy L. Lassiter, Jr., "The Association of Income and Education for Males by Region, Race, and Age," The Southern Economic Journal, XXXI (July, 1965), 15-22; Randall D. Weiss, "The Effect of Education on the Earnings of Blacks and Whites," The Review of Economics and Statistics, LII (May, 1970), 153.

occupation and which will more accurately reflect on-the-job training, will be used rather than age or number of years since leaving school.

It was shown in Chapter II that lower earnings were exhibited for nonfederally employed males employed in the teaching profession. If these males, employed as teachers, have on the average either lower or higher abilities in lipreading, speech, and hearing compared to nonteachers a misspecification bias would occur in the regression. For this reason a dummy variable coded one for educators will be included in the regression for nonfederally employed males. The regression for federally employed males will also include a dummy occupational variable which will be coded one for federally employed males in professional occupations. While hearing impaired females employed in teaching had slightly higher earnings than nonteaching females, failure to account for this group could also lead to a misspecification bias. Because of this a dummy variable coded one for female teachers will be included in the equation for nonfederally employed females.

In summary, the following variables will be tested to determine if they are significant income determinants for the hearing impaired alumni of Gallaudet College: communication abilities, education level, ability, father's socioeconomic status, years of work experience, and an occupational variable. The following four regressions will be

developed to test for the significance of these parameters as income determinants:

1. Males nonfederally employed

$$\text{Income} = B_1 + B_2\text{CA} + B_3\text{ED} + B_4\text{AB} + B_5\text{FSE} + B_6\text{WE} \\ + B_7\text{OCC}$$

2. Males federally employed

$$\text{Income} = B_1 + B_2\text{CA} + B_3\text{HR} + B_4\text{ED} + B_5\text{AB} + B_6\text{FSE} \\ + B_7\text{WE} + B_8\text{OCC}$$

3. Females nonteaching and nonfederally employed

$$\text{Income} = B_1 + B_2\text{CA} + B_3\text{ED} + B_4\text{AB} + B_5\text{FSE} + B_6\text{WE}$$

4. Females teaching

$$\text{Income} = B_1 + B_2\text{CA} + B_3\text{ED} + B_4\text{AB} + B_5\text{FSE} + B_6\text{WE}$$

Where:

CA = Communication ability interaction dummy variable
(see individual regressions for specific
interaction dummy variable)

HR = Hearing ability

ED = Education dummy variable (coded one for master's
degree; there were no respondents with degrees
higher than a master's degree with known profiles)

AB = Ability (GRE quantitative or verbal score)

FSE = Father's socioeconomic status as measured by the
Duncan index

WE = Work experience (actual number of years experience
in current occupation)

OCC = Occupation dummy (specified in the equation).

Table 19 presents the regression equations for these sex-employment categories.

TABLE 19
REGRESSION EQUATIONS

Independent Variable	Regression Coefficient	t
Regression 1--Males Nonfederally Employed		
Constant term	\$ 4,220.90	4.15 ^c
Communication ability (dummy) (lipreading(1-2)-speech(1-3)- hearing(1-3)=1)	1,040.80	2.03 ^d
Education level (MA=1)	1,849.15	3.39 ^c
Ability (quantitative)	6.90	3.20 ^c
Father's socioeconomic class	-0.75	-0.09
Work experience	351.30	4.76 ^c
Occupation (dummy) (teaching=1)	-924.65	-2.09 ^d
R ² =0.31	R=0.55	Degrees of Freedom=94
Regression 2--Males Federally Employed		
Constant term	\$ 3,480.10	1.61 ^e
Communication ability (dummy) (lipreading(1-2)-speech(1-3) =1)	1,183.40	1.48 ^f
Hearing ability	368.35	1.01
Education level (MA=1)	107.00	0.08
Ability	a	
Father's socioeconomic status	-21.00	-1.30
Work experience	452.65	3.14 ^c
Occupation (dummy) (professional=1)	4,097.00	3.09 ^c
R ² =0.33	R=0.57	Degrees of Freedom=35

TABLE 19--Continued

Independent Variable	Regression Coefficient	t
Regression 3--Females Nonteaching and Nonfederally Employed ^b		
Constant term	\$-1,975.45	-0.82
Communication ability (lipreading(1-3)-speech(1-3)- hearing(1-3)=1)	1,837.50	2.42 ^d
Ability (quantitative)	12.00	2.16 ^d
Education level (MA=1)	2,524.70	1.67 ^f
Father's socioeconomic status	27.95	2.17 ^d
Work experience	568.70	3.53 ^c
R ² =0.38	R=0.61	Degrees of Freedom=18
Regression 4--Females Teaching		
Constant term	\$ 6,951.35	3.37 ^c
Communication ability (lipreading(1-3)-speech(1-3)- hearing(1-3)=1)	-60.45	-0.08
Ability (quantitative)	0.55	0.10
Father's socioeconomic status	-7.40	-0.54
Work experience	-100.60	-0.68
Education level (MA=1)	2,246.60	2.15 ^d
R ² =0.006	R=0.08	Degrees of Freedom=31

^aBecause of the high correlation between the education variable and the GRE quantitative score ($r=0.40$), and the nonsignificance at the ten percent level of either as income determinants, only the education variable is presented.

^bBecause of a high correlation between the initial hearing (1-3)-lipreading (1-3) dummy variable and speech ability for females (-0.35) and a high proportion of females with known profiles in the teaching profession (61 percent) two separate regressions were computed for this hearing impaired group. These two regressions were for (1) female

TABLE 19--Continued

nonteachers, and (2) females in the teaching profession. The communication ability variable was altered from a hearing-lipreading dummy variable with a separate speech variable to a dummy variable which included lipreading, speech, and hearing. Hearing and lipreading abilities 1-3 were retained in the dummy variable along with speech 1-3. The reason for the inclusion of speech 1-3 as a component part of this variable was its significance for nonfederally employed males.

^cSignificant (one-tailed) at the 0.5 percent level.

^dSignificant (one-tailed) at the 2.5 percent level.

^eSignificant (one-tailed) at the 5.0 percent level.

^fSignificant (one-tailed) at the 10.0 percent level.

Approximately one-third of the variance of earnings for both hearing impaired males and females (except for female educators) is explained in these regressions. In addition, communication ability interactions are significant determinants of earnings for federally employed males, nonfederally employed males, and nonteaching females. It should be noted that the independent variable with the highest t-ratio is in each case (except for teaching females) work experience of the respondent.

The significance of a high communication ability for males can be seen in the fact that nonfederally employed males with a high-middle ability in lipreading, speech, and hearing earn \$1,040.80 more than those males with lower abilities in these areas. "Average" incomes for these males calculated with the use of the independent variables (other than dummy variables) is presented in Table 20.

TABLE 20

"AVERAGE" INCOME FOR NONFEDERALLY EMPLOYED MALES^a

Classification (1)	High Communication Ability (2)	Low Communication Ability (3)	2/3 (4)
Nonteachers (BA)	\$ 9,304	\$ 8,263	112.5
Nonteachers (MA)	11,154	10,113	110.3
Teachers (BA)	8,379	7,339	114.2
Teachers (MA)	10,229	9,188	111.3

^aAverage incomes were derived by multiplying the means of nondummy variables (ability, father's socioeconomic status, and work experience) by their respective values. The high communication ability average was obtained by adding the value of this variable to each of the four classes. The average income for teachers was obtained by subtracting the regression coefficient for teachers from the nonteaching values. The average income of persons with master's degrees was obtained by adding in its value to the nonteaching and teaching average incomes.

After controlling for the other income producing variables in the regression the earnings differential between nonfederally employed hearing impaired males with high and low communication abilities is approximately 12 percent. If this differential is maintained over a 35 year work span and there is no cumulative impact it means that the high communication ability group will earn approximately \$37,000 more than those deaf males with lower abilities in lipreading, speech, and hearing. Thus, the possession of high abilities in these areas results in significantly higher

earnings for nonfederally employed males.

High abilities in lipreading and speech also results in significantly higher earnings (\$1,183.40) for deaf males employed by the Federal Government. It should be noted that variations in hearing ability do not have a significant impact on the variations in earnings for this group.

"Average" earnings for federally employed males is presented in Table 21.

TABLE 21

"AVERAGE" EARNINGS FOR FEDERALLY EMPLOYED MALES^a

Classification (1)	High Communication Ability (2)	Low Communication Ability (3)	2/3 (4)
Nonprofessional (BA)	\$ 7,447	\$ 6,263	118.9
Professional (BA)	11,544	10,360	111.4
Professional (MA)	11,650	10,467	111.3

^aAverage incomes were derived by multiplying the means of nondummy variables (ability, father's socioeconomic status, hearing ability, and work experience) by their respective values. The high communication ability average was obtained by adding the value of this variable to each of the three classes. The average income for professionals was obtained by adding the regression coefficient for professionals to the nonprofessional value. The average income for persons with master's degrees was obtained by adding in its value to the professional (BA) average income.

The earnings differential between hearing impaired males with high and low abilities in lipreading-speech who were employed by the Federal Government averaged 14 percent.

If this differential is maintained over a 35 year work span, without a cumulative impact, it means that the high communications ability group earns approximately \$41,000 more than those males with lower abilities in lipreading and speech.

While the sample size is extremely small (24), non-teaching deaf females with high-middle communication abilities had significantly higher earnings than those with lower ability interactions. The t-statistic for communication ability is significant at the 2.5 percent level, which is the same as that exhibited for nonfederally employed males.

While the possession of a master's degree was a highly significant influence on earnings of nonfederally employed males it was not a significant influence on the earnings of federally employed males. The possession of a master's degree was a significant determinant of earnings for both groups of hearing impaired females studied. A possible explanation for the nonsignificance of the master's degree for federally employed males is the fact that those deaf that have passed the FSEE and have entered government service, whether they possess an MA degree or not, have approximately the same ability and thus, do not receive an earnings differential.

Table 22 presents the increase in human capital due to the increase in education beyond the bachelor's degree for nonfederally employed males and females, assuming a rate

of return for this education of five, six, seven, and eight percent and a work span of 35 years.

TABLE 22

INCREASE IN HUMAN CAPITAL DUE TO THE POSSESSION
OF A MASTER'S DEGREE FOR NONFEDERALLY EMPLOYED
MALES AND TEACHING AND NONTEACHING FEMALES^a

Rate of Return	Males	Females	
		Teaching	Nonteaching
5%	\$30,370	\$36,776	\$41,329
6%	26,812	32,575	36,608
7%	23,906	29,093	32,695
8%	21,542	26,173	29,412

^aHuman capital values obtained by multiplying the present value of an annuity of \$1 per period (35 year work span assumed) at rates of five, six, seven, and eight percent by the increase in earnings due to the possession of a master's degree for nonfederally employed males and teaching and nonteaching females.

As previously noted, Hanoch reported in his study that the rate of return for a graduate education for white males was seven percent. If this return is applied to the alumni of Gallaudet College it is apparent from Table 22 that there is an increase in human capital of approximately \$24,000 for hearing impaired males and \$30,000 for deaf female educators and \$33,000 for deaf females, other than teachers.

The high positive relation observed between quantitative ability and earnings, rather than verbal ability for

nonfederally employed males and nonteaching females, would at first seem to be related to the fact that this group, being deaf, would have obvious problems in acquiring verbal cognitive ability and, therefore, gravitate to occupations in which quantitative ability was more important. However, Ashenfelter and Mooney found in their study that mathematical aptitude rather than verbal aptitude was a significant influence on incomes of hearing males.¹⁰ Thus, the deaf seem, at least in this area, to have the same influence on earnings as was shown to be significant for those hearing males studied by Ashenfelter and Mooney.

Bowles found that the adjusted occupational status of fathers was a significant determinant of income, with fathers in higher status occupations "passing on" higher incomes to their sons.¹¹ A consistent relation between the deaf respondents' fathers' unadjusted socioeconomic status and earnings was not found in the above regressions. While a significant relation was found between this variable and earnings for nonteaching deaf females, the small number of respondents in this group may have biased the results. In all other cases the relation was not only not significant, but the coefficient had a negative sign which is opposite

¹⁰Orley Ashenfelter and Joseph D. Mooney, "Graduate Education, Ability, and Earnings," The Review of Economics and Statistics, LX (February, 1968), 82.

¹¹Samuel Bowles, "Schooling and Inequality From Generation to Generation," The Journal of Political Economy, LXXX (May/June, 1972), 223.

that found by Bowles.

A possible explanation for this nonsignificance of family background on the earnings of the deaf could be the fact that hearing impaired students from families of high socioeconomic backgrounds were children of hearing parents. If this were true and if there were a lack of family communication between the hearing parent and the deaf child, the socioeconomic factors that may be necessary for "success" may not have been passed from father to son.

In addition, the greater the extent that deaf children (from high socioeconomic status families) attend residential schools and, therefore, do not have their families' influence for nine months a year the less likely it is that they will acquire those socioeconomic factors necessary for "success". Since a high proportion of the respondents to the Survey (approximately 90 percent) attended residential schools, it seems that this is also a causitive factor. Bowles pointed out that:

. . . the authoritarian social relations of working-class high schools compliment the discipline-oriented early socialization patterns experienced by working-class children.¹²

Thus, if the residential schools try to instill within the deaf child a strong sense of obedience rather than a sense of self-reliance and succeed even hearing impaired children from high socioeconomic status families will acquire

¹²Ibid., p. 226.

characteristics that differ from those of their parents. If this is true the relation between the parents' socioeconomic status and income found by Bowles will not be apparent for the hearing impaired.

In summary, those factors that were significant influences on the earnings of the deaf were high communication abilities, level of education (except for federally employed males), Graduate Record Examination quantitative scores (except for federally employed males and female educators), and length of work experience.

The importance of the latter three factors is not unexpected since these factors have been shown to be significant income determinants for hearing persons. The significant relation between high communication abilities and earnings, after adjusting for other parameters, supports the relation shown in Chapter II and the hypothesis in Chapter I. It is now apparent that those deaf that have higher communication abilities (in combination) will earn higher incomes compared to those deaf with lower communication ability interactions.

CHAPTER IV

CONCLUSION AND RESULTS

Introduction

It was hypothesized in Chapter I that lipreading, speech, and hearing abilities are significant determinants of deaf earnings. Two previous studies, those of Bigman and Lunde, and Crammatte, tended to support the hypothesis in relation to either lipreading or speech ability. However, neither of these studies analyzed the impact of communication ability interactions on earnings nor did they study the interaction of these variables with sex.

This study enlarged upon their work since it analyzed the relation between all three deaf characteristics and earnings as well as analyzing the relation between communication abilities and earnings for federally or nonfederally employed males and nonfederally employed deaf females.

In addition, parameters that were shown to be significant income determinants for hearing persons were tested in Chapter III to see to what extent they influenced the earnings of the deaf. As was shown in Chapter III, it was necessary to include these other parameters in order to correct for possible specification bias in the regressions which would lead to erroneous conclusions concerning the

relation between communication abilities and earnings among the hearing impaired. Thus, this study is important since it is the first study of the deaf which analyzes the overall determinants of earnings among the deaf.

Findings

It was shown in Chapter III that, except for the hearing impaired female teachers, communication ability interactions are significant income determinants of the deaf. Specifically lipreading, speech, and hearing interactions were shown to be significant determinants of earnings for nonfederally employed males and nonteaching females. In addition, lipreading and speech interactions were significant income determinants for federally employed males. It can thus be concluded that those hearing impaired with higher communication abilities will earn a significantly higher income than those with lower ability interactions.

There are two obvious explanations for this phenomenon. First, those deaf with higher communication abilities being more "normal" find less barriers to earnings than those deaf with lower abilities. Second, while other parameters were taken into account some innate factors that cannot be measured, such as a drive to get ahead, influence earnings and could vary between those hearing impaired with high and low communication abilities in some systematic way. Thus, if the hearing impaired with higher communication abilities have a stronger drive to succeed, this could be reflected

in higher earnings.

The regression analysis in Chapter III found that factors that have been significant income determinants among the hearing (work experience, level of education, occupation, and ability) were also significant influences on the earnings of the deaf. Specific exceptions were found for the socioeconomic status of the respondents' fathers, the educational attainment and ability parameter for federally employed males and ability and work experience for hearing impaired female teachers. Thus, the results found among this deaf group support other human capital studies and are significant since they show that a deaf person's communication abilities per se are not all encompassing income determinants.

The insignificance as an income determinant of variations in ability for federally employed deaf males can be explained by the reduction in ability variations due to the Federal Service Entrance Examination. This means that the establishment of some minimum criteria has had the result of lessening earnings differentials based on differences in ability.

It was shown in Chapter II that the strong communication ability-earning relation exhibited for deaf males was not as apparent for hearing impaired females. However, when other parameters were taken into account the relations between lipreading, speech, and hearing interactions and

earnings for nonfederally employed males and nonfederally (nonteaching) employed females was significant at the same level (2.5 percent). It now appears that a high ability combination in lipreading, speech, and hearing adds more to female earnings than to male earnings. Thus, the relation shown in Chapter II between communication ability interactions and earnings for females was masked by the other variables that were not taken into account.

It is also evident that while high communication abilities are significant determinants of income for the hearing impaired (except for female educators) the level of significance varies from 10 percent in the case of federally employed males to 2.5 percent for the other two groups. While no specific reasons can be given for this phenomenon, several hypotheses can be put forth. First, the weaker relation for federally employed males could be due to a smaller amount of discrimination against the deaf by the government than by private employers. Second, the small number of respondent females and federally employed males with known profiles may have biased the results. A more extensive analysis is needed in order to specifically analyze this phenomenon.

Questions Raised by This Study

While this study is an important step in the analysis of the determinants of the earnings of the hearing impaired it must be emphasized that many questions remain to be

answered. Some of the more important questions are as follows:

1. While it was shown in this study that the socio-economic status of a father was not an important income determinant for the hearing impaired, except for nonfederally (nonteaching) females, the question raised is: Would the earnings of the deaf be significantly influenced by the hearing ability of the parent? This factor could be a significant determinant of earnings since deaf parents will probably have the hearing of their child tested at an earlier age, be more aware of the problems of deafness, and be able to communicate more easily with their deaf child than hearing parents.
2. What differences in earnings will be exhibited among the deaf, if any, depending on the type of communication used between parent and deaf child? Due to a lack of data this study could not test for differences in earnings between the deaf based on differences in communication between the deaf child and parent. This question is one that should be pursued. If it is found that communication based on the manual alphabet, signs, and lipreading in combination have a significant positive impact on earnings, it could influence not only the education of the deaf, but also the relation between a deaf

child and a hearing parent.

3. The relation between the type of school a deaf child attended prior to entering Gallaudet College (residential, day class, public) and earnings could not be analyzed due to a lack of data on students that attended day classes or regular public schools. However, a comparative study of the relation between communication ability interactions and earnings should be carried out.

In conclusion, it was shown in this study that communication ability interactions have a positive influence on the earnings of the deaf. In addition, it was revealed that factors that account for differences in earnings among hearing persons also influence the earnings of the deaf and, therefore, to this extent the determinants of the earnings of the deaf are the same as any other group.

APPENDIX A

THE RAINBOW PASSAGE

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow.

The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it.

When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

APPENDIX B

SURVEY OF THE INCOME AND OCCUPATIONAL
DISTRIBUTION OF THE GALLAUDET
COLLEGE ALUMNI

**SURVEY OF THE INCOME AND OCCUPATIONAL DISTRIBUTION
OF THE GALLAUDET COLLEGE ALUMNI
PERIOD: 1945-1968**

Conducted by
MR. IRA WINAKUR
Economics Department, Gallaudet College

Dear Gallaudet College Alumnus:

Enclosed you will find the final questionnaire which will enable us to complete our survey of the income and occupational distribution of the Gallaudet College alumni. The response to the first questionnaire was gratifying. We again ask for your cooperation in answering this final questionnaire as our study depends heavily on your response.

This part of the survey will allow us to find out the following information: first, have the incomes of the Gallaudet College alumni kept pace with the cost of living increases over the past year; second, how does the income of the Gallaudet College alumni compare with the incomes of other college alumni; third, how does the income of the Gallaudet College alumni compare with other persons in the same occupation as reported in the 1970 census.

I hope that you will take the ten to fifteen minutes required to fill out this form and return it in the self-addressed, stamped envelope. The success of the survey depends on your response. All of the information obtained is confidential and only group totals will be reported.

Preliminary reports on the first part of the survey will be forthcoming soon in the *Alumni Newsletter*.

Thank you for your cooperation,

Ira Winakur

Ira Winakur
Assistant Professor of Economics

CONFIDENTIAL

IBM Control Number:

1. Sex: Male Female

2. Date of birth: _____

3. Age of onset of deafness: _____

4. Type of school(s) attended before Gallaudet College (years):

Residential school for the deaf _____ years

Public school. _____ years

Day classes (or school) for the deaf _____ years → Was this in a regular public school? Yes No

5. Age when you left or graduated from Gallaudet College: _____

6. Are you: Single Married Separated or divorced Widowed

7. Are you the head of the household? Yes No

8. Number of dependents in the household (those persons other than the head of the household who receive major support from the head of the household): _____

9. What is the highest degree you hold?

High school diploma Bachelor's Master's Ph.D. Other (specify): _____

10. What was your major at Gallaudet College? _____

11. What was your father's job for most of his life? _____

12. What is your present job? _____

13. How long have you been doing the type of work at which you are now employed? _____ years

14. What was your first full-time job after graduating or leaving Gallaudet College? _____

15. Are you a union member? Yes No

↓
How long have you been a member of your present union? _____ years

16. Are you self-employed? Yes No

↓
If no:

Would you classify your present employer as a:		
<input type="checkbox"/> State government	<input type="checkbox"/> Local government	<input type="checkbox"/> Federal government
<input type="checkbox"/> Private business (specify type such as chemical research, book publishing, etc.) _____		
<input type="checkbox"/> Other (specify type) _____		

17a. How much did you receive in 1969 from wages and salaries before taxes? (If self-employed, what was your income, net of operating expenses.)

- Under \$3,000 _____
- \$ 3,000 - 3,999 _____
- 4,000 - 4,999 _____
- 5,000 - 5,999 _____
- 6,000 - 6,999 _____
- 7,000 - 8,999 _____
- 9,000 - 10,999 _____
- 11,000 - 12,999 _____
- 13,000 - 15,999 _____
- 16,000 and over _____

17b. Was this income (wages and salaries) from more than one job?

Yes

No

↓
If no:

↓
If yes:

1. How many months or weeks counting paid vacation did you work in your job in 1969?
 _____ months and/or _____ weeks

2. In 1969 about how many hours a week did you work? (Teachers assume 40 hours a week.)
 _____ hours.

3. For those in education only:
 3a. How many months did you actually teach in 1969?
 9 months 10 months 11 months 12 months

3b. What subject did you teach? _____

MAIN JOB	SECOND JOB	THIRD JOB
<p>1. What was your wage and/or salary in your main job in 1969 before taxes?</p> <p>Under \$3,000 _____ \$3,000 - 3,999 _____ 4,000 - 4,999 _____ 5,000 - 5,999 _____ 6,000 - 6,999 _____ 7,000 - 8,999 _____ 9,000 - 10,999 _____ 11,000 - 12,999 _____ 13,000 - 15,999 _____ 16,000 and over _____</p> <p>2. How many months or weeks counting paid vacation did you work in your main job in 1969? _____ months and/or _____ weeks</p> <p>3. In your main job about how many hours a week did you work (teachers assume 40 hours a week)? _____ hours</p> <p>4. For those in education only: 4a. How many months did you actually teach in 1969? <input type="checkbox"/> 9 months <input type="checkbox"/> 10 months <input type="checkbox"/> 11 months <input type="checkbox"/> 12 months</p> <p>4b. What subject did you teach? _____</p>	<p>1. What was your wage and/or salary in your second job in 1969 before taxes?</p> <p>Under \$499 _____ \$ 500 - 999 _____ 1,000 - 1,999 _____ 2,000 - 2,999 _____ 3,000 - 3,999 _____ 4,000 - 4,999 _____ 5,000 - 5,999 _____ 6,000 - 6,999 _____ 7,000 and over _____</p> <p>2. How many months or weeks counting paid vacation did you work in your second job in 1969? _____ months and/or _____ weeks</p> <p>3. In your second job about how many hours a week did you work? _____ hours</p> <p>4. What was this second job? _____</p>	<p>1. What was your wage and/or salary in your third job in 1969 before taxes?</p> <p>Under \$499 _____ \$ 500 - 999 _____ 1,000 - 1,999 _____ 2,000 - 2,999 _____ 3,000 - 3,999 _____ 4,000 - 4,999 _____ 5,000 - 5,999 _____ 6,000 - 6,999 _____ 7,000 and over _____</p> <p>2. How many months or weeks counting paid vacation did you work in your second job in 1969? _____ months and/or _____ weeks</p> <p>3. In your third job about how many hours a week did you work? _____ hours</p> <p>4. What was this third job? _____</p>

18. How much income was received by other members of your household in 1969?

None _____	6,000 - 6,999 _____
Under \$1,000 _____	7,000 - 8,999 _____
\$1,000 - 1,999 _____	9,000 - 10,999 _____
2,000 - 2,999 _____	11,000 - 12,999 _____
3,000 - 3,999 _____	13,000 - 15,999 _____
4,000 - 4,999 _____	16,000 and over _____
5,000 - 5,999 _____	

APPENDIX C

CORRELATION COEFFICIENTS

MALES NONFEDERALLY EMPLOYED

	MA	GREQ	FSE	WE	TEACH	CA
MA	1	0.0286	-0.1092	0.0965	0.2435	0.1591
GREQ		1	0.0451	-0.0791	0.0235	-0.1180
FSE			1	-0.1570	-0.1633	0.0032
WE				1	0.2564	0.0526
TEACH					1	0.0052
CA						1

MA = Master's Degree

GREQ = Graduate Record Examination Quantitative Scores

FSE = Father's Socioeconomic Status

WE = Work Experience

TEACH = Teaching

CA = Communication Ability (lipreading (1-2)-speech (1-3)-
hearing (1-3)=1)

MALES FEDERALLY EMPLOYED

	MA	FSE	WE	PROF	L-S	HR
MA	1	-0.0299	-0.1279	0.1053	0.0468	0.0249
FSE		1	-0.2795	0.0759	-0.0047	-0.1109
WE			1	-0.1321	-0.1102	0.0782
PROF				1	0.1171	0.0499
L-S					1	-0.2219
HR						1

MA = Master's Degree

FSE = Father's Socioeconomic Status

WE = Work Experience

PROF = Professional Occupation

L-S = Lipreading (1-2)-speech (1-3)=1

HR = Hearing Ability

FEMALES NONTEACHING AND NONFEDERALLY EMPLOYED

	CA	GREQ	MA	FSE	WE
CA	1	-0.1296	-0.1070	-0.2077	-0.08875
GREQ		1	-0.1425	-0.1101	-0.4161
MA			1	-0.1580	0.2055
FSE				1	-0.1516
WE					1

CA = Communication Ability (lipreading (1-3)-speech (1-3)-
hearing (1-3)=1)

GREQ = Graduate Record Examination Quantitative Scores

MA = Master's Degree

FSE = Father's Socioeconomic Status

WE = Work Experience

FEMALES TEACHING

	CA	GREQ	WE	FSE	MA
CA	1	0.1765	-0.2396	0.0465	0.0403
GREQ		1	-0.2205	-0.0388	0.1027
WE			1	-0.0615	0.1839
FSE				1	-0.0392
MA					1

CA = Communication Ability

GREQ = Graduate Record Examination Quantitative Scores

WE = Work Experience

FSE = Father's Socioeconomic Status

MA = Master's Degree

BIBLIOGRAPHY

- Ashenfelter, Orley, and Mooney, Joseph D. "Graduate Education, Ability, and Earnings." Review of Economics and Statistics, LX (February, 1968), 78-86.
- Becker, Gary S. "Comment." Journal of Political Economy, LXXX (May/June, 1972), 252-55.
- _____. The Economics of Discrimination. Chicago: University of Chicago Press, 1971.
- Bowles, Samuel. "Schooling and Inequality From Generation to Generation." Journal of Political Economy, LXXX (May/June, 1972), 219-55.
- Colberg, Marshall R. Human Capital in Southern Development, 1939-1959. Chapel Hill: The University of North Carolina Press, 1959.
- Conlisk, John. "A Bit of Evidence on the Income-Education-Ability Interrelation." The Journal of Human Resources, VI (Summer, 1971), 358-62.
- Crammatte, Alan B. Deaf Persons in Professional Employment. Springfield: Charles C. Thomas, 1968.
- Formby, John P. "The Extent of Wage and Salary Discrimination Against Non-white Labor." The Southern Economic Journal, XXXV (October, 1968), 140-50.
- Gwartney, James. "Changes in Nonwhite/White Income Ratio - 1939-1967." American Economic Review, LX (December, 1970), 872-83.
- Hanoch, Giora. "An Economic Analysis of Earnings and Schooling." The Journal of Human Resources, II (Summer, 1967), 310-25.
- Hause, John C. "Earnings Profile: Ability and Schooling." Journal of Political Economy, LXXX (May/June, 1972), 108-38.

- Houthakker, H. S. "Education and Income." Review of Economics and Statistics, LIX (February, 1959), 24-28.
- Lassiter, Roy L., Jr. "The Association of Income and Education for Males by Region, Race, and Age." Southern Economic Journal, XXXI (July, 1965), 15-22.
- Lunde, Anders S., and Bigman, Stanley K. The Occupational Conditions Among the Deaf. Washington: Gallaudet College Press, 1959.
- Miller, H. P. "Annual and Lifetime Income in Relation to Education, 1939-1959." American Economic Review, L (December, 1960), 962-87.
- National Education Association. Research Memo, Number 5. Washington: 1969.
- O'Connor, Clarence D. "The Preparation of Teachers of the Deaf," in Report of the Proceedings of the International Congress on Education of the Deaf. Washington: Government Printing Office, 1964.
- Office of Demographic Studies. Annual Survey of Hearing Impaired Children, Series D, Number 4. Washington: Gallaudet College Press, 1970.
- . Annual Survey of Hearing Impaired Children, Series D, Number 9. Washington: Gallaudet College Press, 1971.
- Reiss, Albert J., Jr.; Duncan, Otis Dudley; Hatt, Paul K.; and North, Cecil C. Occupations and Social Status. New York: Free Press of Glencoe, 1961.
- "Schools and Classes." American Annals of the Deaf, CXVII (April, 1972), 172-237.
- Silver, Norman H. "Employment Practices and Trends in Industry." New Vistas for Competitive Employment of Deaf Persons. Edited by William N. Craig and James L. Collins. Knoxville: University of Tennessee Press, 1970.
- Temporary State Commission to Study and Investigate the Problems of the Deaf. The Minority Group Needs of The Deaf. Albany: State of New York, 1968.
- U.S. Bureau of the Census. Current Population Reports, Number 75. Washington: Government Printing Office, 1970.

- U.S. Department of Health, Education, and Welfare.
Education of The Deaf. Washington: Government
Printing Office, 1965.
-
- . Human Communication and Its Disorders - An
Overview. Washington: Government Printing Office,
1969.
- Weinrich, John E. "Direct Economic Costs of Deafness in
the United States." American Annals of the Deaf,
CXVII (August, 1972), 446-54.
- Weisbrod, B. A., and Karpoff, Peter. "Monetary Returns to
College Education, Student Ability, and College
Quality." Review of Economics and Statistics, L
(November, 1968), 491-97.
- Weiss, Randall D. "The Effect of Education on the Earnings
of Blacks and Whites." Review of Economics and
Statistics, LII (May, 1970), 150-59.
- Wolfe, Dael. "Economics and Educational Values." The
Review of Economics and Statistics, XLII (August,
1960), 178-79.